



## SiSoftware Sandra Help

Welcome to **SiSoftware Sandra**, an information and diagnostic utility.

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## Foreword

There are tens of million PC Compatibles world-wide, all due to the enormous popularity of the standard IBM PC. All these are supposed to be 100% compatible to the *real thing*. However, nowadays, as IBM is no longer sets the standard, there is no such thing as a true IBM compatible; this term might mean, today, the most popular specification, i.e. a certain processor, graphics card, sound card, printer, etc. which is widely used - therefore supported by most software. A true PC compatible might mean the one (if available) that the software companies use (e.g. Microsoft) - if it works on theirs it should work on yours, too.

Now Windows! Windows has brought us the key to all this - your program is supposed to work on every machine if you stick to the operating system calls (API). (Other operating systems like Windows NT, OS/2, UNIX, Linux, etc. all do much the same thing or have done long before Windows; I will stick to Windows as Sandra is targeted at this operating system) In a way this is true, most programs now work on systems under Windows that they would not have under DOS.


As far as Sandra is concerned, the situation has not become that much better... Yes, it is easier to detect the characteristics of the system components (if the respective drivers are installed) but not always - the drivers have bugs themselves and sometimes lie for whatever reason. There are still holes in Windows, in the way that you still have to do much of the detection yourself. Worse, Windows is far cleverer than DOS and you can't get away with the things that some DOS programs do. In Windows 9X/Me still need DOS for many things, it gets a bit complicating to juggle virtual & protected mode, ring 0 & ring 3, VxDs & callgates and all other things. In Windows NT/2000/XP/2003 there are other problems... Then we have Windows CE...

Anyway, we'll find out soon enough what the future holds in store...

Have fun with SiSoftware Sandra and we hope it will be useful to you. We also hope that it will help you learn more about your computer and so make you more aware of what's going on as well as improving your productivity. In any case don't lose too much sleep over it...


## **Program Information**

The latest information about SiSoftware Sandra, and the index of the documentation.

Click here  to open the document on the web.


## **Who is Sandra?**

Find out what Sandra is and what it can do for you.

Click here  to open the document on the web.


## **Program Requirements**

Find out what you need to have in order to run SiSoftware Sandra at peak performance and how to get the most out of it.

Click here  to open the document on the web.


## **What's New / ReadMe**

The latest information on Sandra and other utilities (*Read Me! Document*).

Click here  to open the document on the web.

## **Questions & Answers (FAQ)**

The answer to most questions, bugs listings & fixes, etc.

Click here  to open the document on the web.



## Introduction

**SiSoftware Sandra** (The "**S**ystem **A**Nalyser, **D**iagnostic and **R**eporting **A**ssistant") is a Windows 32/64 information/diagnostic utility. It provides more information (including undocumented) than most commercial diagnostic software, usually included with a tools/utilities package.

SiSoftware Sandra was designed to run on Windows 32/64. It is a 32/64-bit native application that takes advantage of all the improvements made to the operating system - especially Windows Me and also runs on SMP/SMT Windows 2000/XP/2003 as well as Windows CE/2003 systems.

Incompatible modules will not appear in the listing or will shutdown automatically depending on system characteristics. Therefore, not all modules may be available on your system.

Click [here](#) for more information.

## The Sandra Program Interface

This picture is similar to what you should see when you run Sandra:



As you can see, SiSoftware Sandra looks and behaves like any other Windows application - nothing different. If you don't recognise most of the elements featured you should read the Windows manual.

## Module List

The modules in SiSoftware Sandra are divided into four main classes:

- [Information Modules](#)
- [Benchmarking Modules](#)
- [Listing Modules](#)
- [Testing/Diagnostic Modules](#)

A further special class is the Wizard class that interfaces with all the above classes:

- [Wizard Modules](#)

For more information, see

- [Tips \(Performance\) List](#)
- [Report File Formats](#)

## Information Modules

- [APM \(Advanced Power Management\) Information](#)
- [ATA/ATAPI Information](#)
- [CMOS Information](#)
- [Communication Devices Information](#)
- [Computer \(CPU/Bus/BIOS/Chipset\) Information](#)
- [Data Sources \(ODBC\) Information](#)
- [DirectX Information](#)
- [DOS Device Drivers Information](#)
- [DOS Memory Information](#)
- [Drives Information](#)
- [Font Information](#)
- [Game Controllers Information](#)
- [IP Network Information](#)
- [Keyboard Information](#)
- [Mainboard Information](#)
- [MCI \(Multimedia\) Devices Information](#)
- [Modules Information](#)
- [Mouse Information](#)
- [Network Information](#)
- [OLE Servers Information](#)
- [OpenGL Information](#)
- [PCI & AGP Buses & Devices Information](#)
- [Ports \(Serial/Parallel\) Information](#)
- [Printers Information](#)
- [Processes/Threads Information](#)
- [Remote Access Service Connections](#)
- [SCSI Information](#)
- [Services Information](#)
- [Sound Devices \(Sound Card\) Information](#)
- [System Summary](#)
- [Video System Information](#)
- [Windows & DOS OS Information](#)
- [Windows Memory Information](#)
- [WinSock \(Internet\) Information](#)

## **Benchmarking Modules**

- [Cache & Memory Benchmark](#)
- [CD-ROM/DVD Benchmark](#)
- [CPU Arithmetic Benchmark](#)
- [CPU Multi-Media Benchmark](#)
- [File System Benchmark](#)
- [Internet Connection Benchmark](#)
- [Internet Peerage Benchmark](#)
- [Memory Bandwidth Benchmark](#)
- [Network/LAN Bandwidth Benchmark](#)
- [Removable Storage/Flash Benchmark](#)
- [Video Benchmark](#)

## Listing Modules

- [AutoExec.bat Listing](#)
- [Autoexec.dos Listing](#)
- [AutoExec.nt Listing](#)
- [Boot.ini Listing](#)
- [BootLog.txt Listing](#)
- [Config.dos Listing](#)
- [Config.nt Listing](#)
- [Config.sys Listing](#)
- [Control.ini Listing](#)
- [DrWatson Log](#)
- [Dump Hardware Settings](#)
- [Environment List](#)
- [Event Log](#)
- [File Types](#)
- [Installed Applications](#)
- [Installed Programs](#)
- [MsDos.sys Listing](#)
- [NDisLog.txt Listing](#)
- [NetLog.txt Listing](#)
- [Protocol.ini Listing](#)
- [ScanDisk Log](#)
- [System.ini Listing](#)
- [Win.ini Listing](#)

## Testing/Diagnostic Modules

- [DMA Channel Settings](#)
- [Hardware Irq Settings](#)
- [I/O Ports Settings](#)
- [Memory Range Settings](#)
- [Plug & Play Enumerator](#)
- [Software Protected-Mode Irq Handlers](#)
- [Software Real-Mode Irq Handlers](#)

## Wizard Modules

- [Add Module Wizard](#)
- [Burn-in Wizard](#)
- [Combined Performance Index Wizard](#)
- [Connect Wizard](#)
- [Create a Report Wizard](#)
- [Performance Tune-up Wizard](#)
- [Register Wizard](#)
- [Web-Update Wizard](#)

For more information, see

- [Tips \(Performance\) List](#)
- [Report File Formats](#)



## Command Line Options

SiSoftware Sandra supports a variety of command line options:

- Create a Report in Batch Mode

Syntax: **sandra.exe /r <report script>**

Click here  to load a sample script (**Report Script.sis** under **\Examples** folder).

You can click **F1** for each module to find out the respective command-line option, or try **Module Properties**.

- Load up and display a module

Syntax: **sandra.exe /m <module command-line option>**

You can use this for shortcuts and other things. The module will only load if it is compatible with the system's set-up.

Sandra does support other command line options. However they are for internal use only so they are undocumented. Please don't use them even if you figure them out. You have been warned...

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All other trademarks acknowledged. E. & O. E.

## Technical Support & Points of Contact

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**Secondary User E-Mail:** [PostMaster@sisoftware.net](mailto:PostMaster@sisoftware.net)  
[WebMaster@sisoftware.net](mailto:WebMaster@sisoftware.net)

**Primary Product Pages:** [Sandra http://www.sisoftware.co.uk/sandra/](http://www.sisoftware.co.uk/sandra/)

**Secondary Product Pages:** [Sandra http://www.sisoftware.net/sandra/](http://www.sisoftware.net/sandra/)

### Very Important Notes:


- Please consult the [Read Me!](#) topic for up-to-date information.
- The subject of the e-mail message **should** begin with the program name, i.e. **Sandra** followed by the **type** (Standard, Advanced, Professional, Enterprise, etc.) and **version** (see Help-About), e.g. **Sandra Standard Version 2003.X.0.0 : Program Errors**. E-mail is sometimes re-routed via different accounts and it may get lost otherwise...
- We reply to almost all e-mail submissions and inquiries. If you do not receive a reply within a reasonable time, send your message again, giving a better return path (a surprising number of mailers do not insert a correct **From:** address!)
- Please **include a report** (Use the *Create a Report Wizard* to save one to disk or e-mail it) when you have a hardware problem! Otherwise we cannot help. Also, it will help us improve the program and fix any problems. **Very important!**
- Please write in **English**. Use the alternate addresses for support in other languages.

Click here  to open the document on the web.




## **Hardware & Software Compatibility Document**

The list of hardware and software SiSoftware Sandra has been tested with and works with no problems.

Click here  to open the document on the web.



## **Read Me! Document**

This document contains the latest information about SiSoftware Sandra, including bugs, features, options, compatibility and various other information that does not appear elsewhere. You are strongly advised to read it.

Click here  to open the document on the web.

## License Information Document

For **SiSoftware Sandra Standard**:


- Click here  to open the **End-User Licence** document on the web.
- Click here  to open the **Distribution Licence** document on the web.

For **SiSoftware Sandra Professional**:

- Click here  to open the **End-User Licence** document on the web.
- **You cannot distribute this version in ANY way.**

## Ordering/Upgrading Information Document


This document is the most important of them all! It tells you how to order the registered versions of **SiSoftware Sandra**, order more copies or upgrade your version.

Click here  to open the document on the web.



## Order Cool Stuff

This link allows you to order cool stuff relating to **SiSoftware Sandra**, including merchandise, associated devices and more!

Click here  to open the document locally.

## Add Module Wizard

This wizard allows you to add modules to your display list if they are not already present (deleted) or were not compatible with your system.

- To see all the available modules make sure the *Display Class* reads *All Modules*. To change the display class list select the **View** menu and then click **All Modules**.
- Select the modules you want to add by holding down **Shift** while clicking on the module.
- You can select individual modules by holding down **Control** while clicking on the module.

### Shortcut

Keys: CTRL+A

## **LIST OF PERFORMANCE TIPS**

## **List of Performance Tips**

The best way to get more information about a specific tip, either double-click on it or press Enter/Return while the tip is selected in any of the dialogs. A pop-up help window with more information on the tip will be shown.

For more information, please see the [FAQ](#).

**Warning W1** - Please read the help file (i.e. this document), the [\(FAQ\)](#) and make sure you know what you're doing before proceeding.

**Tip T2** - This tip just reminds you that you can double-click tip or press Enter while a tip is selected for more information about the tip.

If you need more information than a tip provides, please see the [\(FAQ\)](#).

**Warning W3** - No data has been generated by the module thus the list is empty. Some options are disabled which may account for this. Make sure you DO want those options turned off. You should consider turning them on to get data in this module.

**Warning W4** - All options for this module are disabled thus no data has been generated. If you don't need this module you can delete it; otherwise consider enabling some of the options to get some data in this module.



**Tip T100** - Large memory systems (1GB or greater) should use Registered/Buffered memory, especially if more than 2 are installed on the same channel. This improves signal quality by reducing the load on the chipset channel. While these modules add an extra clock delay due to the on-board buffers (thus CL2 effectively becomes CL3), the stability will be worth it. Server chipsets with many memory slots generally **require** Registered memory.

**Fix:** If you plan on adding more memory, consider replacing the modules with Registered/Buffered modules. Do note that you cannot mix Unbuffered and Registered/Buffered modules on the same channel, but you may be able to if the chipset has multiple memory channels.

For more information, please see the [FAQ](#).

**Tip T101** - Large memory systems (1GB or greater) should be ECC/Parity. Since the probability that a bit will be corrupt is the same or increases with module density, the bigger the module, the bigger the overall probability that you will get one or more corrupted bits. While these modules add an extra delay on partial writes (e.g. less than data width) as parity for the whole line must be re-calculated, the stability will be worth it.

**Fix:** If you plan on adding more memory, consider replacing the modules with ECC/Parity modules. Do note that running plain and ECC/Parity modules will turn off ECC/Parity for the whole memory array.

For more information, please see the [FAQ](#).

**Tip T102** - You are using the ANSI version of Sandra. For Windows NT/2000/XP/2003 systems consider using the Unicode version, native for these platforms.

**Fix:** Uninstall Sandra; when re-installing select the Unicode version of Sandra. You may need to upgrade if such an option is not available.

For more information, please see the [FAQ](#).

**Tip T103** - Servers generally use ECC/Parity memory. Since the probability that a bit will be corrupt increases with the operational time and servers are in operation longer than typical workstations/home computers the risk of corruption is greater.

**Fix:** If you plan on adding more memory, consider replacing the modules with ECC/Parity modules. Do note that running plain and ECC/Parity modules will turn off ECC/Parity for the whole memory array.

For more information, please see the [FAQ](#).

**Tip T200** - SMBIOS/DMI (System Management or Desktop Management Interface) is not supported. The operating system may not be able to tune the system to maximum performance.

**Fix:** Try to upgrade (flash) the BIOS if possible. Check whether a BIOS update is available from your mainboard/PC manufacturer.

For more information, please see the [FAQ](#).

**Tip T201** - The system BIOS is more than 3 years old.

**Fix:** Try to upgrade (flash) the BIOS if possible. Check whether a BIOS update is available from your mainboard/PC manufacturer.

For more information, please see the [FAQ](#).

**Tip T202** - Windows needs a 586 class CPU or better for optimum performance. Windows XP/2003 and later needs a 686 class CPU or better for optimum performance.

**Fix:** You should upgrade to a 585, 686 class machine or better to run at peak performance.

For more information, please see the [FAQ](#).

**Tip T203** - A Plug & Play BIOS is required for today's hardware.

**Fix:** Check whether a BIOS update is available from your mainboard/PC manufacturer.

For more information, please see the [FAQ](#).



**Warning W204** - Older CPUs (e.g. 486) do not support the CPU identify instruction.

**Fix:** You should upgrade to a 585 class machine if you have a 386 or 486 system. Some early 586 systems also don't support this instructions.

For more information, please see the [FAQ](#).

**Tip T205** - Most new games, multi-media software and some applications can run faster and better on MMX CPUs. Since a MMX version also means a new, improved CPU even if MMX is not used you will still get 10-20% faster performance.

**Fix:** You need to upgrade to a MMX processor. If your mainboard supports MMX (dual-voltage) then you can buy a normal processor, otherwise you'll need an OverDrive.

For more information, please see the [FAQ](#).

**Error E206** - Your Pentium CPU has the infamous FPU (co-processor) bug.  
**Fix:** Contact Intel Corp. for a free replacement.

For more information, please see the [FAQ](#).

**Tip T207** - A SMBIOS/DMI 2.3 compliant BIOS can allow the operating system and special programs to tune-up your system.

**Fix:** Try to upgrade (flash) the BIOS if possible. Check whether a BIOS update is available from your main board/PC manufacturer.

For more information, please see the [FAQ](#).

**Tip T208** - The BIOS does not support the Enhanced Disk Drive Specification. You may not be able to use the latest disk drives and technologies (e.g. 4-8GB and larger).

**Fix:** Try to upgrade (flash) the BIOS if possible. Check whether a BIOS update is available from your main board/PC manufacturer.

For more information, please see the [FAQ](#).

**Tip T209** - The BIOS is not NEC PC98 compliant. All Japanese computers sold in 1998 and later should be.

**Fix:** You cannot have a NEC PC98 compliant system by upgrading the BIOS only - your peripherals must support certain advanced functions as described in the specification. This applies only to Japanese systems.

For more information, please see the [FAQ](#).

**Tip T210** - The main board supports faster CPUs so you don't need to upgrade the main board when you decide to install a new CPU. However, a new main board will yield faster performance with a new CPU simply because it will use a new chipset.

**Fix:** Nothing to fix.

For more information, please see the [FAQ](#).

**Tip T211** - The BIOS can be updated (flashed) using a special program. This is a very important feature to keep your system up-to-date with new hardware.

**Fix:** Nothing to fix.

For more information, please see the [FAQ](#).



**Tip T212** - The BIOS can be shadowed. Shadowing is a technique of copying the BIOS program from slow EPROM or EEPROM to RAM. This may yield some increase in performance.

**Fix:** Go to BIOS set-up and make sure that *System BIOS* is both shadowed and cached.

For more information, please see the [FAQ](#).

**Tip T213** - The BIOS cannot be updated (flashed). The only way is to buy a replacement chip. All new computers should have a BIOS that can be flashed.

**Fix:** You cannot fix this - but keep it in mind when you buy your next main board.

For more information, please see the [FAQ](#).

**Warning W214** - The BIOS can be updated (flashed) but is surface mounted. If the update goes wrong you may not be able to get a new chip to replace the old BIOS. This does not mean that you cannot recover from an unsuccessful flash but it removes an option. (Intel main boards and those using AWARD BIOS have a recovery option)

**Fix:** You cannot fix this - but keep it in mind when you buy your next main board.

For more information, please see the [FAQ](#).

**Warning W215** - CPU temperature is too high (i.e. over rated core temperature). This should appear only if your CPU has a temperature-monitoring sensor installed. Most modern systems should have such a sensor installed – but check the manual to make sure.

**Fix:** Power down the system immediately. Open the case and check that the CPU fan is working and the heat sink is not unusually hot. Make sure the CPU has good all-round ventilation.

For more information, please see the [FAQ](#).

**Warning W216** - The CPU fan has failed. This should appear only if the CPU has a fan with tachometer installed, connected correctly to the main board data capturing chip.

**Fix:** Power down your system immediately. Open the case and check that the CPU fan is working and the heat sink is not unusually hot. Make sure the CPU has good all-round ventilation.

For more information, please see the [FAQ](#).

**Tip T217** - ECC is not enabled for the L2 cache. Modern CPUs have ECC L2 cache. Any cache errors can be detected and corrected (2 & 1 bit respectively).

**Fix:** This option should always be enabled for stability.

For more information, please see the [FAQ](#).

**Tip T218** - Most new games and multi-media software can run faster and better on 3Dnow! or Enhanced 3DNow! CPUs. 3DNow! is a powerful development of the original MMX technology although it has been made obsolete by SSE/SSE2.

**Fix:** You need to upgrade to a 3DNow! Processor. If your main board supports CPU voltage setting then you can buy such a processor. Check with the manual.

For more information, please see the [FAQ](#).

**Tip T219** - Most new games and multi-media software run faster and better on Streaming SIMD (SSE/SSE2) CPUs. SSE is a powerful development of the original MMX technology; SSE2 is an even more powerful instruction set.

**Fix:** You need to upgrade to a SSE/SSE2 processor. If your main board supports such a processor you just need to upgrade the CPU. Otherwise you will need a new board also. Check with the manual.

For more information, please see the [FAQ](#).



**Warning W220** - The CPU serial number is enabled. This unique identifier can be used by software to identify your system for various purposes (transactions, software licensing, etc.)

**Fix:** If you consider such an ID an invasion of your privacy, then you should be able to disable it from the BIOS. See the main board manual on how to do so. There is also a program on Intel's website that can help should the BIOS not support such an option.

For more information, please see the [FAQ](#).

**Warning W221** - The CPU serial number is disabled. This unique identifier may be required by some software to run, in which case you should turn it on.

**Fix:** Enable it from the BIOS. See the main board manual on how to do this.

For more information, please see the [FAQ](#).

**Warning W222** - The CPU is operating above its frequency specification (rated speed), a condition commonly known as *overclocking*. The CPU may be unstable or produce erroneous results, some of which may not be readily apparent. The life expectancy will be reduced.

**Fix:** If you haven't overclocked it yourself then you should contact the place-of-purchase for an explanation. You may have a remarked processor. To confirm, download the manufacturer's own utility.

For more information, please see the [FAQ](#).

**Warning W223** - The CPU rated speed may be inaccurate. For certain CPUs this information has been obtained from unofficial sources and may not be accurate for all models. Engineering sample CPUs generally do not contain this information.

**Fix:** If it does not seem correct, disregard it.

For more information, please see the [FAQ](#).

**Notice N224** - SMBIOS/DMI information may be inaccurate. This information is reported *verbatim* and cannot be checked by Sandra. While brand-name companies set this information most *generic* manufacturers use generic data that is meaningless. This issue generates more technical support queries than all other issues combined.

**Fix:** If the information is not correct, check for a BIOS update (clear DMI pool) or fix any errors using the DMICFG tool provided with the board. Alternatively, disable Sandra's *DMI/SMBIOS* reporting from module *Options*.

For more information, please see the [FAQ](#).

**Warning W225** - The CPU is not a production (release) version but an ES (engineering sample or alpha/beta silicon) and thus not meant for distribution or extended usage. Such a CPU may behave differently or contain bugs/errata; the information displayed may be inaccurate.

**Fix:** If you have bought this CPU, return it for a production version.

For more information, please see the [FAQ](#).

**Warning W226** - The information on the non-BSP (i.e. not boot) CPU may be inaccurate on OSes that do not have the MP kernel installed. This is because Sandra cannot override the OS and interrogate the other processors.

**Fix:** Use a MP-aware OS with the MP kernel installed.

For more information, please see the [FAQ](#).

**Warning W227** - CPU FSB higher than rated FSB of the CPU. Even if you're below the CPU rated speed, by over clocking the FSB you are running the CPU I/O buffers above spec – just be aware of this.

**Fix:** Reduce the FSB to rated FSB. You can increase the multiplier if the resulting speed is less than CPU rated speed.

For more information, please see the [FAQ](#).



**Warning W228** - The CPU has not been validated for MP usage, as running in this MP system. While it may work in MP mode, it may not support certain functions required for proper MP operation or have different timings or voltage requirements. MP CPUs need to pass more stringent tests, thus a CPU not validated for MP usage may fail in boundary cases.

**Fix:** Double-check if this is a MP certified CPU, if not attempt to swap it for a MP certified one.

For more information, please see the [FAQ](#).

**Tip T229** - ECC is not enabled for the L3 cache. Modern server CPUs have ECC L3 cache. Any cache errors can be detected and corrected (2 & 1 bit respectively)

**Fix:** This option should always be enabled for stability.

For more information, please see the [FAQ](#).

**Warning W230** - The CPUs in this MP are not all the same type/version. To use all processors the operating system restricts itself to the features of the least capable processor in the system. Should problems occur with this system, contact the CPU manufacturer to see if this mix of processors is supported.

**Fix:** Try swapping the AP CPU(s) with one(s) of the same type/version as the BSP.

For more information, please see the [FAQ](#).

**Warning W231** - The IOQD (Host Bus In-Order Queue Depth) is set too low, most likely 1, i.e. no queue. This indicates the depth of the host bus pipelining; thus 1 indicates that no pipelining is to be done on the bus. This reduces the performance of the host bus which is crucial to performance. P6 (Pentium Pro, II, III, Celeron) has an IOQD depth of 8 while the P4 has an IOQD of 12. Most chipsets have an IOQD of 4 or more.

**Fix:** Check that BIOS settings were not reset or set to Fail-Safe defaults. Reset them to *Optimised* or *Normal* settings.

For more information, please see the [FAQ](#).

**Tip T232** - You are using the 32-bit version of Sandra on a 64-bit IA64 system. Consider using the 64-bit IA64 version of Sandra, native for this system.

**Fix:** Uninstall Sandra; when re-installing select the 64-bit IA64 Unicode version of Sandra. You may need to upgrade if such an option is not available.

For more information, please see the [FAQ](#).

**Tip T233** - You are using the 32-bit version of Sandra on a 64-bit AMD64 system. Consider using the 64-bit AMD64 version of Sandra, native for this system.

**Fix:** Uninstall Sandra; when re-installing select the 64-bit AMD64 Unicode version of Sandra. You may need to upgrade if such an option is not available.

For more information, please see the [FAQ](#).

**Warning W234** - You are using a Hyper-Threaded system on an Operating System that either does not support HT or does not support the total number of logical CPUs of the system. Thus Hyper-Threading is not properly utilised. You may as well disable it.

**Fix:** Make sure you are using the right Hyper-Threading kernel or update your Operating System for HT support (use Windows XP/2003 or later). Do note that some Operating Systems and software have licensing limits that may prevent you from using all CPUs or you may be in violation of your licence.

For more information, please see the [FAQ](#).

**Warning W235** - Processor Vcore less than rated minimum. Unless the reported value is incorrect or the processor is a different type that is not correctly detected, the voltage is lower than it should be. If you're under-clocking the processor you may have pushed too far.

**Fix:** If the BIOS supports processor Vcore setting, check that the voltage programmed is correct for the processor installed. If not, check whether the mainboard supports the installed processor.

For more information, please see the [FAQ](#).



**Warning W236** - Processor Vcore higher than rated maximum. Unless the reported value is incorrect or the processor is a different type that is not correctly detected, the voltage is higher than it should be. If you're over-clocking the processor you may have pushed too far.

**Fix:** If the BIOS supports processor Vcore setting, check that the voltage programmed is correct for the processor installed. If not, check whether the mainboard supports the installed processor.

For more information, please see the [FAQ](#).

**Warning W237** - Processor power exceeds maximum power for this processor. If the processor Vcore is correct, the cooling system may need to be improved to cope with such a processor.

**Fix:** Check cooling system and upgrade if required. Make sure it is rated to cope with the processor you have installed.

For more information, please see the [FAQ](#).

**Warning W238** - Cooling system thermal resistance is abnormally high. If the values reported for CPU power, CPU and environment temperatures are correct then something may be wrong with the cooling system. Fan may have failed or be off.

**Fix:** Check cooling system, including the fan(s) and thermal interface material. Also check that the cooling system is rated to cope with the processor you have installed at the speed it is running. If you have over-clocked the processor you may need a better cooling solution.

For more information, please see the [FAQ](#).

**Warning W239** - Cooling system thermal resistance is higher than recommended for this type of processor. Manufacturers recommend a certain performance for their thermal solutions (aka coolers) that is very important especially for very fast processors that generate a huge amount of heat (50W or more). **Fix:** Check that the cooler is properly installed. Check interface material between cooler and CPU and consider using some high-performance interface material (e.g. Artic Silver). Check that the cooler is rated to support the processor you have installed at the speed it is running. If you have over-clocked the processor you may need a better cooling solution.

For more information, please see the [FAQ](#).

**Warning W300** - using the *unknown monitor* setting may result in incompatibilities and flickering.

**Fix:** Go to *Control Panel\Display\Display Properties\Settings*, click *Advanced Properties\Monitor* and click *Change*. Select your monitor model from the list or a similar one.

For more information, please see the [FAQ](#).

**Tip T301** - 64/128-bit cards need at least 4MB video memory for optimum performance. If the card has 3D functions at least 8/16MB memory is recommended as well as AGP support.

**Fix:** Check your video card manual to make sure that the card's memory can be upgraded and get more memory for it.

For more information, please see the [FAQ](#).

**Warning W302** - 16 colour (4-bit) modes are obsolete and may cause trouble.  
**Fix:** Switch to a at least 256 colour mode.

For more information, please see the [FAQ](#).

**Warning W303** - 24-bit colour depth uses 3 bytes that is not a power of 2 number. 32-bit colour depth uses 4 bytes (64-bit) and can be accessed much faster resulting in a performance increase even though more video memory is used.

**Fix:** If you have enough video memory (33% more than for 24-bit mode) always use 32-bit modes instead of 24.

For more information, please see the [FAQ](#).



**Warning W304** - VGA desktops (640x480) are the absolute minimum, XGA (1024x768) is the norm for 15" LCDs and 17" monitors. There's no point in using anything less. The best selling monitors are the 19" and the best selling LCDs are the 17" and 18" with larger to follow.

**Fix:** Use a bigger monitor or a higher video mode.

For more information, please see the [FAQ](#).

**Tip T305** - Video drivers designed for Windows are 32/64-bit and are faster than older 16-bit drivers on new hardware.

**Fix:** Check for a new driver, specifically for your operating system version, is available for your video adapter.

For more information, please see the [FAQ](#).

**Tip T306** - A Plug & Play / DDC compliant video driver is recommended today since it removes most configuration/resource allocation problems and optimises the video mode as well.

**Fix:** If both your video card and monitor support PnP then check whether an updated video driver or BIOS, which is DDC compatible, is available.

Otherwise, you will need a new monitor or video adapter that supports DDC.

For more information, please see the [FAQ](#).

**Warning W307** - The video hardware acceleration is not set to full. You should not reduce it unless you have video problems with your video adapter/driver. The full mode offers the best performance.

**Fix:** Go to *Control Panel\Display\Display Properties\Settings*, click *Advanced Properties\Performance* and move the *Hardware Acceleration* slider to *Full*.

For more information, please see the [FAQ](#).

**Tip T308** - The video card does not support the VESA interface. Most do, but this interface is not used by Windows unless the video driver is the generic SVGA VESA driver.

**Fix:** If you still run high-resolution DOS games you will need a TSR VESA BIOS or a video BIOS update.

For more information, please see the [FAQ](#).

**Tip T309** - Your video BIOS does not support the latest VESA BIOS interface.

**Fix:** While this is not important unless you actually need it, find out whether a video BIOS update is available.

For more information, please see the [FAQ](#).

**Tip T310** - DirectDraw is not installed. All recent and future Windows games and multi-media applications use DirectDraw so you may need to install it sooner or later. Also, full-motion video players may run faster with it.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T311** - Direct3D is not installed. New Windows 3D games and multi-media applications are starting to use Direct3D for 3D rendering.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).



**Tip T312:** The OpenGL driver is not hardware accelerated.

**Fix:** If you have a modern graphics card, the video driver should include an ICD/MCD to accelerate OpenGL functions. This will allow you to use OpenGL software and games on your computer where it was intended to be used. Check whether an OpenGL driver is available for your video card.

For more information, please see the [FAQ](#).

**Warning W313** - While the *font smoothing* feature makes the display look much better, it reduces the overall graphics performance by a significant amount.

**Fix:** If the display seems sluggish - disable this feature from *Control Panel\Display\Display Properties\Plus!*

For more information, please see the [FAQ](#).

**Warning W314** - The video BIOS is more than 3 years old. If the video adapter has a flash video BIOS, check whether an update is available and install it. You may gain extra performance or bug fixes.

**Fix:** If your video card has a flash BIOS check whether an updated version is available from the manufacturer.

For more information, please see the [FAQ](#).

**Tip T315** - 15-bit colour depth uses 15-bit which is not a multiple of 8-bit (a byte) like 16-bit modes (2 bytes). Most adapters use 16-bit anyway for 15-bit since it's faster but reduce the number of simultaneous colours available on the display to 32K instead of 64K.

**Fix:** 16-bit modes instead of 15-bit always.

For more information, please see the [FAQ](#).

**Tip T316** - A DPMS saving monitor can turn itself off (when instructed by the video adapter) and thus reduce power consumption as well as increasing its life. Nowadays all monitors should support DPMS.  
**Fix:** You cannot fix it - but keep it in mind when you buy your next monitor.

For more information, please see the [FAQ](#).

**Warning W317** - The video adapter is not hardware VGA compatible. Some DOS display modes, some games or DOS applications display correctly.

**Fix:** Some video adapters need a TSR or a video BIOS update to handle this.

For more information, please see the [FAQ](#).

**Warning W318** - You are using the highest mode supported by the monitor. Since you're at the limit, the image may be less focused/sharp and the colours less bright. You may also see interference.

**Fix:** Usually it is better to decrease the resolution to the next down or buy a new monitor if you want use this mode.

For more information, please see the [FAQ](#).

**Tip T319** - Usually, a refresh rate of 75Hz or more is necessary to completely remove flicker from monitor screens - depending on resolution, the brightness of the display and the person itself. If you have a flat-panel (LCD) display ignore this tip.

**Fix:** Switch to a higher refresh rate from *Control Panel\Display\Display Properties\Settings*, click *Advanced Properties\Adapter*. Choose the highest supported.

For more information, please see the [FAQ](#).



**Warning W320** - The hardware cursor should be enabled unless you have problems with it. Disabling it will cause the cursor to flicker.

**Fix:** Go to *Control Panel\Display\Display Properties\Settings*, click *Advanced Properties\Performance* and move the *Hardware Acceleration* slider to *Full*.

For more information, please see the [FAQ](#).

**Warning W321** - The LFB (Linear Frame Buffer) should be enabled - otherwise performance may suffer.  
**Fix:** Check your video card manual to make sure that the video card supports a LFB. If yes, then check whether it is enabled and that you have the latest video driver.

For more information, please see the [FAQ](#).

**Tip T322** - It's better (and greener) to use the power-down function of the monitor instead of silly screen saver. You are supposed to **save** the screen!

**Fix:** Go to *Control Panel\Display\Display Properties\Screen Saver*, set the *Screen Saver* to *(none)* and set time-outs for *Low-power standby* and *Shut-off monitor*.

For more information, please see the [FAQ](#).

**Tip T323** - Unless you have a lot of RAM and computing power, using a desktop wallpaper consumes memory and decreases the display speed since it must be re-painted when needed.

**Fix:** Go to *Control Panel\Display\Display Properties\Background* set the *Wallpaper* to *(none)*.

For more information, please see the [FAQ](#).

**Tip T324** - The video driver you are using was included with Windows itself. While this means it is certified to be stable, almost certainly an updated driver is available from the video adapter manufacturer that should be superior overall.

**Fix:** Check whether an updated driver is available from the video card manufacturer.

For more information, please see the [FAQ](#).

**Tip T325** - Windows animation is cute at the beginning but reduces display speed and can become annoying.

**Fix:** Turn it off using the *TweakUI* utility from *Microsoft's PowerToys*.

For more information, please see the [FAQ](#).

**Tip T326** - Animated cursors are fun but they consume memory and quite a few processor time. Unless you have the very latest video adapter they also flicker.

**Fix:** Unless you're really keen on them you could consider turning them off from *Control Panel\Mouse\Pointers*.

For more information, please see the [FAQ](#).

**Tip T327** - While 24-bit or 32-bit colour modes provide the best palettes for graphic use and modern games and multimedia programs, most video cards are much slower in 32-bit than in 16-bit. Also more memory and resources is consumed for storing screen bitmaps and textures.

**Fix:** Consider switching to 16-bit mode. In most cases, the quality is just as good.

For more information, please see the [FAQ](#).



**Tip T328** - Higher resolution increase the desktop available and can increase productivity. The resolution you're using is very high which may reduce the range of colour depths as well as the refresh rates supported.

**Fix:** Consider reducing it to balance the resolution with colour depth and refresh rate.

For more information, please see the [FAQ](#).

**Tip T329** - For full-movie movie playback (MPEG, DVD) you need to use 24/32-bit colour depth if you want to get a quality picture.

**Fix:** Switch to 24 or 32-bit colour modes.

For more information, please see the [FAQ](#).

**Tip T330** - Using small icons will make them harder to see and click but you will gain a considerable increase in usable desktop space.

**Fix:** Go to *Control Panel\Display\Plus!* And uncheck *Use Large Icons*.

For more information, please see the [FAQ](#).

**Tip T331** - Using small fonts will make text harder to read and dialogues smaller but you will gain a considerable increase in usable desktop space.

**Fix:** Go to *Control Panel\Display\Settings* and choose *Small Fonts* from the *Font Size* combo-box.

For more information, please see the [FAQ](#).

**Tip T332** - Modern monitors are Plug & Play (VESA/DDC) compatible. Windows detects them automatically and optimises the refresh rates automatically.

**Fix:** You cannot fix this if your monitor is not Plug & Play - unless you buy a new one. If your monitor is PnP but your video card is, make sure that you buy one that supports PnP when you decide to replace it. If both are PnP, make sure you have the latest driver and video BIOS for your video card. If you have a BNC cable you need to use the standard 15-pin one - PnP does not work over BNC.

For more information, please see the [FAQ](#).

**Warning W400** - the printer driver was written for a previous version of Windows.

**Fix:** To take full advantage of the device, get an updated printer driver from the manufacturer.

For more information, please see the [FAQ](#).

**Tip T401** - the resolution of the printer is low for this type of printer. Make sure this is what you want, otherwise you will get less quality print-outs than possible with your printer.

**Fix:** Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Graphics* and change the *Resolution*.

For more information, please see the [FAQ](#).

**Warning W402** - the print quality of the printer is low for this type of printer. Make sure this is what you want, otherwise you will get less quality print-outs than possible with your printer.

**Fix:** Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Graphics* and uncheck the *Draft* option if one is present.

For more information, please see the [FAQ](#).



**Tip T403** - generally you should use the EMF data format since it is faster and takes less space. Use RAW only if the printer (i.e. faxes) cannot use EMF, only RAW data format.

**Fix:** Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Details* click *Spool Settings* and choose *EMF* from the *Spool Data Format* check-box.

For more information, please see the [FAQ](#).

**Tip T404** - while printing directly is faster, your machine may become unresponsive during printing. Spooling the print data takes longer but your machine will become available sooner.

**Fix:** Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Details* click *Spool Settings* and choose *Spool Print Jobs* together with *Spool After the first page is spooled*.

For more information, please see the [\(FAQ\)](#).

**Tip T405** - if you use the actual fonts built-in your printer you will get faster printing since the fonts do not need to be downloaded or rendered.

**Fix:** See your printer manual for the list of built-in fonts. If you have a print cartridge installed make sure you installed the *soft* fonts that come with it so that Windows can use them. Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Fonts* and enter the relevant information there.

For more information, please see the [FAQ](#).

**Tip T406** - you're using a very high resolution. While the quality increases, so do the printing speed and resources consumed. Unless you really need to use it, you should reduce it.

**Fix:** Go to *Control Panel\Printers*, right-click this printer and choose *Properties\Graphics* and change the *Resolution*.

For more information, please see the [FAQ](#).

**Tip T407** - by optimising the PostScript driver settings you may obtain faster printing and/or better quality.  
**Fix:** See your printer manual for more information. Go to *Control Panel\Printers*, right-click this printer and choose *Properties*.

For more information, please see the [FAQ](#).

**Tip T500** - The WinSock version is earlier than 2. Version 2 introduces many new enhancements that may improve performance.

**Fix:** Upgrade to the latest service pack for your operating system.

For more information, please see the [FAQ](#).

**Tip T501** - The IPX/SPX protocol is mainly used by Netware and other LAN networks.

**Fix:** If you are not on a LAN, you only need TCP/IP to connect to the Internet - IPX/SPX does not help you. Even if you have a LAN, most LANs use NetBEUI that is the default for Microsoft networks. In these cases you should remove IPX/SPX. *Open Control Panel\Network\Configuration*, click on *IPX/SPX* and click *Delete*. Reboot your computer.

For more information, please see the [FAQ](#).

**Warning W502** - A 16-bit WinSock stack is needed if you run 16-bit Internet applications.

**Fix:** The TCP/IP stack seems to be incorrectly installed. Go to *Open Control Panel\Network Configuration*, click on *TCP/IP* and click *Delete*. Then click *Add* and add it back. Restart your computer.

For more information, please see the [FAQ](#).



**Warning W503** - Some simple IP services are enabled. The simple services include *Echo*, *Discard*, *Day Time*, *Quote of the Day* and so on. While most UNIX workstations enable them by default, most of the time they are not required.

**Fix:** Uninstall or disable them unless you really need them.

For more information, please see the [FAQ](#).

**Warning W504** - Some server IP services are enabled. These include *FTP, POP3, DNS, HTTP, Gopher, SMTP* and so on. Workstations typically don't offer any such services. Servers do offer such services, but make sure you enable only the ones that you need - for resource and security reasons.

**Fix:** Uninstall or disable them unless you really need them.

For more information, please see the [FAQ](#).

**Warning W700** - a sound card is required in today's PCs since most programs need one, not just games.  
**Fix:** You should purchase a sound card or install the correct drivers if you already have one.

For more information, please see the [FAQ](#).

**Warning W701** - wave/audio drivers are vital to the operation of the sound card.

**Fix:** Unless your sound card supports only MIDI, this means that some drivers are not installed properly. Run the Add New Hardware Wizard.

For more information, please see the [FAQ](#).

**Warning W702** - wave/audio recording drivers are not installed. You will not be able to record using your sound card. Generally all sound cards support recording.

**Fix:** Check with your sound card manual and try un-installing and re-installing the drivers.

For more information, please see the [FAQ](#).

**Warning W703** - MIDI/music input drivers are not installed. You will not be able to plug-in and use external MIDI devices like keyboards and synthesisers.

**Fix:** Check with your sound card manual and try un-installing and re-installing the drivers.

For more information, please see the [FAQ](#).

**Warning W704** - MIDI/music playback drivers are not installed. You cannot play MIDI music. Most sound cards do have a synthesiser built-in.

**Fix:** Check with your sound card manual and try un-installing and re-installing the drivers.

For more information, please see the [FAQ](#).

**Warning W705** - no mixer drivers are installed. All sound cards contain a mixer. If mixer drivers are not installed you won't be able to set the volume/balance for channels or you may not hear any sound at all.  
**Fix:** Check with your sound card manual and try un-installing and re-installing the drivers.

For more information, please see the [FAQ](#).



**Warning W706** - no auxiliary drivers are installed. This means that some channels may be muted or you won't be able to adjust their volume/balance. Check that your sound drivers have been properly installed.  
**Fix:** Check with your sound card manual and try un-installing and re-installing the drivers.

For more information, please see the [FAQ](#).

**Tip T707** - Today's sound cards use 16-bit sampling which offers better sound quality.  
**Fix:** While 8-bit devices still work you should upgrade your sound card.

For more information, please see the [FAQ](#).

**Tip T708** - Today's sound cards support at least 2 channels (stereo). Stereo, 4, 5.1 and 7.1 channel devices have long superseded mono sound cards.

**Fix:** You should upgrade your sound card.

For more information, please see the [FAQ](#).

**Tip T709** - Your sound card does not support the high quality sample rates used for high quality (CD) music. The quality of sound from audio devices (wave, video, etc.) may be less than optimal.

**Fix:** You should upgrade your sound card if possible.

For more information, please see the [FAQ](#).

**Warning W710** - the driver for the sound card seems to be obsolete.

**Fix:** Make sure it was written specifically for Windows and it is not an old (legacy) driver. Check whether an updated driver is available from the sound card manufacturer.

For more information, please see the [FAQ](#).

**Tip T800** - Make sure the *Accessibility Features* are not enabled by mistake. If you are not disabled it or you don't use them it's best to either uninstall them or disable them.

**Fix:** Go to *Control Panel\Add/Remove Programs\Windows Setup* and uncheck *Accessibility Options*. On Windows 2000/XP/2003 you cannot fully remove them, so just disable them.

For more information, please see the [FAQ](#).

**Tip T801** - the DOS mouse driver version is very old.

**Fix:** You should use the DOS mouse driver supplied with Windows or the latest version provided by the mouse manufacturer. Remove any mouse drivers from *config.sys* or *autoexec.bat*.

For more information, please see the [FAQ](#).

**Warning W802** - the double-click speed has been set very low - make sure you're able to double-click!  
**Fix:** Go to *Control Panel\Mouse\Buttons* and move the *Double-click speed* slider towards *Fast*.

For more information, please see the [FAQ](#).



**Tip T803** - a mouse with wheel (e.g. IntelliMouse) will greatly enhance your control in Windows, especially when browsing and using complex applications.

**Fix:** Consider getting one as it will improve your Windows and Internet experience.

For more information, please see the [FAQ](#).

**Tip T804** - you have a serial/bus mouse. Modern computers use PS/2 or USB mice. This way you can have both serial ports free to use with serial devices.

**Fix:** If your mainboard has PS/2 or USB sockets (check the manual) then you'll need to purchase such a mouse. Keep this in mind when you buy your next computer.

For more information, please see the [FAQ](#).

**Tip T900** - Make sure the *Accessibility Features* are not enabled by mistake. If you are not disabled it or you don't use them it's best to either uninstall them or disable them.

**Fix:** Go to *Control Panel\Add/Remove Programs\Windows Setup* and uncheck *Accessibility Options*. On Windows 2000/XP/2003 you cannot fully remove them, so just disable them.

For more information, please see the [FAQ](#).

**Warning W901** - the type of keyboard installed is not the standard type. Unless you're using a laptop or a special keyboard you could be using the wrong driver.

**Fix:** Go to *Control Panel\Keyboard\General* and check whether you have installed the correct driver for your keyboard. If not click *Change* and select the correct type.

For more information, please see the [FAQ](#).

**Tip T902** - If you don't live in the U. S. and use DOS shells/programs you may find that certain characters cannot be typed or other characters are typed in their place. Usually this means that the computer thinks that you're using a U. S. type keyboard while you may be using a British keyboard, for example.

**Fix:** You need to install the *keyboard.sys* driver and/or *contry.sys* driver. See the *Windows 9X/Me Resource Kit* for more details or your MS-DOS manual.

For more information, please see the [FAQ](#).

**Tip T1100** - Typically desktops don't need to use APM. Monitors don't need APM to shut-down, this is done using VESA/PM by the video adapter.

**Fix:** Unless you're actually using it, go to *BIOS Setup\APM* and disable it. If you are using it run the *Control Panel\Add New Hardware Wizard* to install the drivers for APM. If ACPI enabled you should disable APM.

For more information, please see the [FAQ](#).

**Warning W1101** - Since APM tries to conserve energy at the expense of performance, if you don't need to conserve energy you should disable APM to get the maximum available performance out of your PC.  
**Fix:** Unless you're actually using it, go to *BIOS Setup\APM* and disable it. If ACPI enabled you should disable APM.

For more information, please see the [FAQ](#).

**W1102** - If CPU clock-slowdown is enabled you will get reduced performance.  
**Fix:** Unless you're actually using it, go to *BIOS Setup\APM* and disable it.

For more information, please see the [FAQ](#).



**W1103** - The battery level is low.

**Fix:** Find a mains supply, change the battery or save your work before it's too late.

For more information, please see the [FAQ](#).

**Tip T1104** - The latest version of APM adds various new improvements.  
**Fix:** Check whether a system BIOS upgrade is available.

For more information, please see the [FAQ](#).

**W1105** - The drive spin-down time may be too low. In general manufacturers recommend 30-60 minutes for a desktop or 10-30 minutes for a portable. A small value may reduce the drive's life since changes in temperature adversely affect hard drives.

**Fix:** Go to *Control Panel\Power\Disk Drives* and increase the *When powered by AC power* drive spin-down time.

For more information, please see the [FAQ](#).

**Tip T1006** - Drive spin-down is not very useful for desktops running from the mains since other devices consume much more power. Usually hard drives are left running since this keeps the temperature relatively constant which requires less thermal re-calibration.

**Fix:** Go to Control *Panel*\Power\*Disk Drives* and uncheck the checkbox next to *When powered by AC power*.

For more information, please see the [FAQ](#).

**Tip T1007** - ACPI (OnNow!) is not supported. ACPI can put the system in hibernate mode or suspend its state to disk thus making boot-up almost instantaneous. Also, it manages the power much better resulting in a more efficient system.

**Fix:** Check whether a system BIOS upgrade is available.

For more information, please see the [FAQ](#).

**Tip T1200** - As discussed above, PCI 2.10 revision offers more functions and greater compatibility since the new PCI devices are 2.120 compatible and may not run on older versions.

**Fix:** Check whether a system BIOS upgrade is available. This will only work if the chipset can support PCI 2.10.

For more information, please see the [FAQ](#).

**Warning W1201** - This device is the very first revision. While this does not mean it is buggy in any way, all new devices are potentially buggy. It's up to you if you want to live on the *bleeding edge*.

**Fix:** You cannot fix this - but keep it in mind when you buy your next mainboard or devices.

For more information, please see the [FAQ](#).

**Tip T1202** - Bus mastering is a method of transmitting data by taking control of the bus. This is much faster than making many smaller transactions if a lot of data is to be transferred over the bus. Advanced devices transferring a lot of data support this feature.

**Fix:** You cannot fix this - but keep it in mind when buying your next device.

For more information, please see the [FAQ](#).



**Warning W1203** - VGA palette snooping is only useful if you have an ISA bus capture or overlay card to synchronise with the palette of the video card. Otherwise you should disable it or video performance may be seriously impaired.

**Fix:** Go to *BIOS Setup\Settings* and **disable** ISA VGA palette snooping.

For more information, please see the [FAQ](#).

**Warning W1204** - This device seems slow. While this does not hamper the bus speed directly transactions with this device will take longer and thus reducing the overall efficiency.

**Fix:** You cannot fix this - but keep it in mind when buying your next device.

For more information, please see the [FAQ](#).

**Tip T1205** - An AGP 2/3 or later device (or AGP Pro) video board and chipset would offer better performance.

**Fix:** AGP 2 offers 4x transfers, fast-writes and other enhancements to speed-up video performance further. AGP 3 offers 8x transfers. *You cannot update AGP 1 hardware to AGP 2/3 or later!* When upgrading, upgrade to an AGP 2/3 or later device.

For more information, please see the [FAQ](#).

**Warning 1206** - Device latency is high - the higher the latency, the more data a device can transfer in one go. The device may be hogging the bus for too long. Some video card drivers set the latency high in order to perform faster. The problem is that other devices (especially sound cards, network) won't have enough time to transfer their data resulting in lower performance (e.g. sound drop outs, lockup). Generally, all devices should have latency of 32, with high performance devices (e.g. video card, disk, giga-LAN) with 64 and AGP to 128.

**Fix:** Go to *BIOS Setup\Settings\PCI & AGP Devices* and reduce PCI latency to 64 or 32. Contact the mainboard manufacturer or video card manufacturer for more details.

For more information, please see the [FAQ](#).

**Warning 1207** - AGP 2/3 devices may be incompatible with AGP 1 mainboards and may need later drivers (e.g. AGP miniport, video drivers).

**Fix:** Make sure you have updated your System BIOS and Video BIOS. If you're using Windows 95 with the AGP/USB patch, consider upgrading to Windows 98/Me or 2000/XP/2003. If you're not using an Intel chipset, download the latest version of the miniport driver for your chipset.

For more information, please see the [FAQ](#).

**Warning 1208** - The video card shares and interrupt with another device. This may cause problems in certain cases. It is advisable that the video card has its own interrupt.

**Fix:** Change the interrupt assigned to the video card from the *BIOS Setup\Settings\PCI & AGP Devices* or force it from *Control Panel\System\Devices*. If that does not work, change the interrupt of the other device (using the same method) or plug the other device in another slot. See the mainboard manual for a list of interrupts and their slots.

For more information, please see the [FAQ](#).

**Warning 1209** - The video card does not have an interrupt assigned. All modern video cards need an interrupt. Even older PCI video cards work faster if an interrupt is used.

**Fix:** Go to *BIOS Setup\Settings\PCI & AGP Devices* and set *Assign IRQ to video card* to **yes**. You may also try setting *First Video Adapter* setting to *AGP*. Some video cards may need to be configured to use an interrupt, either through an utility or a jumper.

For more information, please see the [FAQ](#).

**Tip T1300** - If you are the owner of this copy of Windows and this computer is at your home it is customary to enter the house name and address or just **home**.

**Fix:** You need to use a utility like Winhacker, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).



**Tip T1301** - You should enter you full name if you're the owner of this copy of Windows.

**Fix:** You need to use a utility like Winhacker, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).

**Tip T1302** - If you're not using any real-mode DOS DMA drivers you can save memory and improve performance by disabling double-buffering. The system should do this for you.

**Fix:** You need to use a utility like Winhacker, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).

**Tip T1303** - You should disable DriveSpace or DoubleSpace if you're not using compression to save memory.

**Fix:** You need to use a utility like Winhacker, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).

**Tip T1304** - The Plus! Pack includes many new improvements and it is generally worth buying unless you are really short of money. While it uses more resources it will make you Windows experience more enjoyable.

**Fix:** Purchase and install the *Plus! Pack* or *Microsoft Internet Explorer 5* or later.

For more information, please see the [FAQ](#).

**Tip T1305** - Windows has been running for a long time on this machine. Windows 9X/Me is still not as reliable as Windows NT/2000/XP/2003 and performance may deteriorate over time due to rogue programs or memory fragmentation.

**Fix:** You should reboot it regularly.

For more information, please see the [FAQ](#).

**Tip T1306** - The **win.ini** configuration file is much larger than usual. If you have installed and un-installed many programs or have used Windows for years it may be time to clean-it up.

**Fix:** Use an UnInstaller type program or go to *Control Panel\Add/Remove Programs* and uninstall the applications you no longer use. Also you should delete Windows completely and do a fresh install every 1-2 years.

For more information, please see the [FAQ](#).

**Tip T1307** - The registry is much larger than usual. If you have installed and un-installed many programs or have used Windows for years it may be time to clean-up.

**Fix:** Use a registry clean program like *Microsoft RegClean* or *Norton WinDoctor*.

For more information, please see the [FAQ](#).

**Tip T1308** - While the Windows logo is cute, if you want to see the boot-up messages and boot faster you should consider turning it off.

**Fix:** Install the *Microsoft Power Toys* and go to *Control Panel\TweakUI\Boot* and uncheck *Display splash screen while booting*.

For more information, please see the [FAQ](#).



**Tip T1309** - The task-bar should be set to auto-hide to maximise available desktop space, especially on a small monitor. This way you get the best of both worlds unless you need to switch between applications regularly.

**Fix:** Right-click on the task-bar, choose *Properties* and check *Auto Hide*.

For more information, please see the [FAQ](#).

**Tip T1310** - You are running the very first version of Windows 95.

**Fix:** A patch for the original version of Windows 95 (OSR1 to 950a) can be downloaded and installed from Microsoft's site. You are advised to do it.

For more information, please see the [FAQ](#).

**Tip T1311** - You are running Windows 95.

**Fix:** The upgrade to Windows 98/Me/XP is not free, but worth it for most people - especially if you have a modern computer with new hardware and software. It also includes all the patches released for Windows 95 and support for new technologies like AGP, USB, Firewire, etc.

For more information, please see the [FAQ](#).

**Tip T1312** - The **system.ini** configuration file is much larger than usual. If you have installed and uninstalled many programs or have used Windows for years it may be time to clean-it up.

**Fix:** Use an UnInstaller type program or go to *Control Panel\Add/Remove Programs* and uninstall the applications you no longer use. Also you should delete Windows completely and do a fresh install every 1-2 years.

For more information, please see the [FAQ](#).

**Tip T1313** - You are running Windows 9X/Me.

**Fix:** The upgrade to Windows 2000/XP is not free but should be worth on a modern system due to the improved stability and performance of the 32/64-bit NT kernel.

For more information, please see the [FAQ](#).

**Tip T1314** - You are using 32-bit Windows on a 64-bit IA64 machine. Consider using the native Windows 64-bit IA64 version for your machine. This version is native for your machine instead of using legacy/compatibility mode.

**Fix:** You will need to upgrade to Windows 2003 64-bit IA64 edition.

For more information, please see the [FAQ](#).

**Tip T1315** - You are using 32-bit Windows on a 64-bit AMD64 machine. Consider using the native Windows 64-bit AMD64 version for your machine. This version is native for your machine instead of using legacy/compatibility mode.

**Fix:** You will need to upgrade to Windows 2003 64-bit AMD64 edition.

For more information, please see the [FAQ](#).

**Notice N1316** - This version of Windows contains Product Activation Technology (WPA). This may mean that you need to inform the vendor of any major upgrades or system changes. Unless you do that the system may stop working after a specified time.

**Fix:** If you are not OK with WPA, consider using an older version of the Operating System or using the volume licensing version that does not contain WPA.

For more information, please see the [FAQ](#).



**Warning W1317** - This version of Windows contains Product Activation Technology (WPA) and has not yet been activated.

**Fix:** If you have made all your system changes and the system is stable, activate your system as soon as possible. If the period expires you may not be able to boot/login until you activate.

For more information, please see the [FAQ](#).

**Tip T1400** - To get reliable and fast communications in Windows the UART driving the COM port must have large (e.g. 10-16+) internal data buffers. Only 16550 or later UARTs do and you should have at least a 16550A UART especially if you have a high-speed modem.

**Fix:** You may need to use an internal modem or buy a fast serial card for your computer.

For more information, please see the [FAQ](#).

**Warning W1600** - This process is either a 16-bit process written for Windows 3.1 or a 32-bit process written for Windows NT 3.

**Fix:** You should check whether a new version is available from the manufacturer.

For more information, please see the [FAQ](#).

**Warning W1601** - This process consumes a huge amount of memory.

**Fix:** If you have many processes like this one, make sure you have enough physical memory to sustain them. Otherwise the system performance may decrease due to lack of memory.

For more information, please see the [FAQ](#).

**Warning W1700** - This module is either a 16-bit process written for Windows 3.1 or a 32-bit module written for Windows NT 3.

**Fix:** You should check whether a new version is available from the manufacturer.

For more information, please see the [FAQ](#).

**Warning W1800** - the free space on this drive is very low. Programs using temporary files may crash.  
**Fix:** Delete some files, relocate them to another drive or consider compressing the drive.

For more information, please see the [FAQ](#).

**Warning W1801** - compression programs may be incompatible with certain programs and typically reduce performance as well as using system resources (processor power, memory).

**Fix:** You should consider buying a new, roomier driver which does not need to use compressors.

For more information, please see the [FAQ](#).

**Warning W1802** - large cluster sizes (e.g. 16KB or larger) greatly increase the amount of slack (disk space wasted).

**Fix:** You should re-partition the drive into smaller parts or use a 32-bit FAT like FAT32 (Windows 9X/Me) or NTFS (Windows NT/2000/XP/2003). If you have Partition Magic then you can do that in Windows the FAT Converter in Windows 98/Me or the Drive Manager in NT/2000/XP/2003.

For more information, please see the [FAQ](#).



**Tip T1803** - the maximum disk cache size is low for the amount of system memory you have installed. Generally this should not be lower than  $\frac{1}{4}$  of physical memory installed.

**Fix:** Compute  $\frac{1}{4}$  of you physical memory in kilobytes (say 8192KB for 32MB). In *system.ini* find the *[vcache]* section and add *MaxFileCache=8192* (i.e. the number you computed). Reboot Windows.

For more information, please see the [FAQ](#).

**Tip T1804** - the minimum disk cache size is high for the amount of system memory you have installed. The system may need to use the swap file more, thus decreasing performance. Generally, this should not be higher than  $\frac{1}{4}$  of physical memory installed.

**Fix:** Compute  $\frac{1}{8}$  of your physical memory in kilobytes (say 4096KB for 32MB or use 512KB). In *system.ini* find the *[vcache]* section and add *MaxFileCache=512* (i.e. the number you computed). Reboot Windows.

For more information, please see the [FAQ](#).

**Tip T1805** - if you have a lot of memory, changing the typical role to *network server* will improve disk performance at the expense of memory - but this should not be a problem for you.

**Fix:** Go to *Control Panel\System\Performance\File System\Hard Disk* and select *Network Server* as *Typical role of this machine*.

For more information, please see the [FAQ](#).

**Tip T1806** - if you have little memory installed, changing the typical role to *mobile computer* will decrease memory usage, and thus improving overall performance.

**Fix:** Go to *Control Panel\System\Performance\File System\Hard Disk* and select *Mobile Computer* as *Typical role of this machine*.

For more information, please see the [FAQ](#).

**Tip T1807** - the size of the read-ahead buffer is too small for the size of the memory installed. You should set it to maximum to improve disk performance.

**Fix:** Go to *Control Panel\System\Performance\File System\Hard Disk* and move *the Read-ahead optimisation* slider to *Full*.

For more information, please see the [FAQ](#).

**Warning W1808** - large cluster sizes (e.g. 16KB or larger) greatly increase the amount of slack (disk space wasted). You should re-partition the drive into smaller parts or use a 32-bit FAT like FAT32 (Windows 9X/Me) or NTFS (Windows NT/2000/XP/2003).

**Fix:** You should re-partition the drive into smaller parts or use a 32-bit FAT like FAT32 or NTFS. If you have Partition Magic then you can do that in Windows or the FAT Converter in Windows 98/Me or Drive Manager in NT/2000/XP/2003.

For more information, please see the [FAQ](#).

**Tip T1809** - the CD-ROM cache size is too large compared to the amount of physical memory installed. You should reduce it to improve overall system performance at the expense of a slight drop in CD-ROM performance.

**Fix:** Go to *Control Panel\System\Performance\File System\CD-ROM* and move the *Supplemental cache size* slider towards *Small*.

For more information, please see the [FAQ](#).

**Tip T1810** - using a 32/64-bit disk driver is recommend. If you are using a legacy 16-bit driver there must be a conflict between Windows and such a driver.

**Fix:** Remove old device drivers from *config.sys* and let Windows use a native driver. If Windows does not have such a driver, contact the computer manufacturer for an updated driver.

For more information, please see the [FAQ](#).



**Tip T1811** - turning on the troubleshooting options may result in incompatibilities. Generally you should not change them.

**Fix:** Go to *Control Panel\System\Performance\File System\Troubleshooting* and uncheck all the boxes there.

For more information, please see the [FAQ](#).

**Tip T1812** - the Recycle Bin size is rather large compared to the free disk space on this drive.

**Fix:** Consider emptying it - but check whether you are likely to need any of the deleted files: you won't be able to get the back! Right-click on it, choose *Properties\Global* and move the slider to reduce the percentage of space allocated to the Recycle Bin.

For more information, please see the [FAQ](#).

**Tip T1813** - you should scan you drive for errors at least weekly to prevent data loss or other problems. Set-up an automatic scan at pre-defined times.

**Fix:** Right-click on the drive in *My Computer*, select *Properties\Tools* and click *Check Now*.

For more information, please see the [FAQ](#).

**Tip T1814** - you should optimise the drive at least monthly to keep it in shape.

**Fix:** Right-click on the drive in *My Computer*, select *Properties\Tools* and click *Defragment Now*.

For more information, please see the [FAQ](#).

**Tip T1815** - if you have moderate memory installed, changing the typical role to *desktop computer* may yield the best performance.

**Fix:** Go to *Control Panel\System\Performance\File System\Hard Disk* and select *Desktop Computer* as *Typical role of this machine*.

For more information, please see the [FAQ](#).

**Tip T1816** - the CD-ROM optimise pattern may be set up incorrectly. Generally it should match the speed of the CD-ROM drive.

**Fix:** Go to *Control Panel\System\Performance\File System\CD-ROM* and select the correct speed for your drive from the *Optimise access pattern for* combo-box.

For more information, please see the [FAQ](#).

**Tip T1817** - you should back-up the drive at least weekly to prevent data loss. You should schedule backups at regular intervals to tape, CD-ROM, DAT, etc.

**Fix:** Right-click on the drive in *My Computer*, select *Properties\Tools* and click *Backup Now*.

For more information, please see the [FAQ](#).

**Tip T1818** - you should scan the drive for viruses at least weekly, even if you have a virus monitor program. You never know how viruses manage to sneak in downloaded files and other similar ways.  
**Fix:** If you have an anti-virus program installed (e.g. *Norton Anti-Virus*), right-click on the drive in *My Computer* and select *Scan*.

For more information, please see the [FAQ](#).



**Tip T1819** - you should image the drive at least weekly to improve the chances of error detection and correction should any problems arise.

**Fix:** Right-click on the drive in *My Computer*, select *Properties\Norton* and click *Image Now*.

For more information, please see the [FAQ](#).

**Tip T1820** - your virus definition files seem old. You should update them at least quarterly, preferably monthly.

**Fix:** Use the *Norton On-Line Update Wizard* to download the new virus definition files.

For more information, please see the [FAQ](#).

**Tip T1821** - generally, all drives should have names.  
**Fix:** Label/name the drive.

For more information, please see the [FAQ](#).

**Tip T1822** - DMA transfers are not enabled for this drive. Check whether your drive supports DMA transfers and enable it in Control Panel - System. DMA is faster as the processor is not involved in the data transfer and can do other processing in the meantime.

**Fix:** Go to *Control Panel\System\Device Manager*, click *Disk Drives* and double click the drive. Click *Settings* and check the *DMA* check-box.

For more information, please see the [FAQ](#).

**Tip T1823** - while ATA drives are cheap and fast, SCSI drives and controllers are recommended for their performance as well as upgradability. You should use SCSI devices if you can.

**Fix:** You cannot fix this - but keep it in mind when you buy your next device. Make it SCSI.

For more information, please see the [FAQ](#).

**Warning W1824** - free disk space is low on this drive.  
**Fix:** Free more space by emptying the Recycle Bin.

For more information, please see the [FAQ](#).

**Warning W1825** - free disk space is low on this drive.  
**Fix:** Make more space available by compressing the drive.

For more information, please see the [FAQ](#).

**Warning W1826** - free disk space is low on this drive.

**Fix:** Free more space by deleting some of the unused files and folders.

For more information, please see the [FAQ](#).



**Warning W1827** - the BIOS drive settings do not seem to be correct.

**Fix:** Go to BIOS Set-up and check them to see if they are set up properly.

For more information, please see the [FAQ](#).

**Tip T1828** - the CD-ROM cache size is too small for the physical amount of memory installed. You should increase this to increase the CD-ROM performance.

**Fix:** Go to *Control Panel\System\Performance\File System\CD-ROM* and move the *Supplemental cache size* slider towards *Large*.

For more information, please see the [FAQ](#).

**Tip T1900** - the free base memory is very low. You may be unable to run larger DOS programs. **Fix:** As Windows provides 32/64-bit device drivers you can remove DOS TSR (Terminate and Stay Resident) programs and any device drivers that Windows does not need from *config.sys* and *autoexec.bat*.

For more information, please see the [FAQ](#).

**Warning W1901** - the EMS memory manager is disabled. This is fine if you don't use any DOS programs that require EMS (only quite old programs do), but should you need to run such a program you will need to enable the EMS memory driver.

**Fix:** Right-click on the DOS program's PIF, choose *Properties\Memory* and select the appropriate size of memory required in the *EMS memory* combo-box.

For more information, please see the [FAQ](#).

**Warning W1902** - the DPMI memory manager is disabled. This should not happen generally as most modern DOS programs and games use DPMI memory.

**Fix:** Remove the *emm386* driver from *config.sys* and let Windows allocate EMS memory as needed for legacy DOS programs.

For more information, please see the [FAQ](#).

**Tip T1903** - the DPML memory that Windows provides to DOS programs is too small to be useful. Most programs require at least 2MB.

**Fix:** Right-click on the DOS program's PIF, choose *Properties\Memory* and select the appropriate size of memory required in the *XMS memory* combo-box.

For more information, please see the [FAQ](#).

**Warning W1904** - DOS programs using EMS version 3.2 need a page frame to work unlike EMS version 4.0 programs. You need to set-up a EMS page frame in order to use them. You will lose 64K worth of UMB.

**Fix:** Remove the *emm386* driver from *config.sys* and let Windows allocate EMS memory, as needed for legacy DOS programs.

For more information, please see the [FAQ](#).

**Tip T1905** - DOS is usually loaded into HMA by default since it generally makes the best use of it. Only in special circumstances should you load another program into HMA instead of DOS. Remember that only one program can use the HMA. Any memory left cannot be used.

**Fix:** Modify *config.sys* so that a line **DOS=HIGH** is present in it.

For more information, please see the [FAQ](#).



**Tip T2000** - You need to install more memory to use Windows at peak performance.

**Fix:** Upgrade your memory. Check your mainboard manual first to make sure which type and speed of memory is needed. As a rough guide Windows 98/Me needs around 64MB, 2000/XP/2003 around 256MB or more.

For more information, please see the [FAQ](#).

**Warning W2001** - The free system resources are low. You may have insufficient memory to use all the currently loaded applications simultaneously. Alternatively if some programs have crashed or Windows is running for a long time, there may be too much memory/heap fragmentation.

**Fix:** Close down some programs or re-boot Windows if this does not help.

For more information, please see the [FAQ](#).

**Warning W2002** - The memory load is 95% or more. Windows is using more than the memory you have installed which is not recommended. Your system may become too slow to be usable.

**Fix:** Close down some applications or install more memory if you need to run them all simultaneously.

For more information, please see the [FAQ](#).

**Warning W2003** - The swap file is almost full.

**Fix:** You should increase the size of the swap *file* (*Control Panel\System\Performance\Virtual Memory*) if you decided not to let Windows manage the swap file itself. However, if the swap file is currently as big or bigger than the installed physical memory you may need to add more memory rather than increase the size of the swap file.

For more information, please see the [FAQ](#).

**Warning W2004** - The swap file is too large compared to the amount of physical memory installed. There is no point in making the swap file bigger than 2-2.5 the size of physical memory as the system will become unusable long before this limit is reached. You may be wasting disk space unnecessarily.

**Fix:** Go to *Control Panel\System\Performance\Virtual Memory*, select *Let me specify my own virtual memory settings* and reduce the *Maximum* number to at most 2.5 times your physical memory.

For more information, please see the [FAQ](#).

**Tip T2005** - While letting Windows manage the swap file is safer, performance may suffer as the swap file needs to grow/shrink depending on memory requirements. Also, it may become fragmented or allocated in a different part of the disk, which further reduces performance.

**Fix:** Defragment your drive first. Go to *Control Panel\System\Performance\Virtual Memory*, select *Let me specify my own virtual memory settings*, select the fastest and roomiest drive. Calculate 2 times your physical memory and enter this number in both *Maximum* and *Minimum* boxes.

**NB.** If you want more safety, leave the *Maximum* blank so that Windows can grow the swap file should you run out of virtual memory; the *Minimum* will ensure the swap file is generally not fragmented.

**NB.** On systems with 128MB or more you may consider creating a swap file equal to the memory size unless you're running a server that needs large amounts of memory. Systems with 256MB or more could run with no swap file at all.

For more information, please see the [FAQ](#).

**Warning W2006** - The free base memory available to Windows is low. This typically means that there are legacy TSR and DOS device drivers which may not be needed in the present configuration since Windows uses 32/64-bit plug & play device drivers. You should remove all DOS TSR and legacy device drivers that are no longer needed.

For more information, please see the [FAQ](#).

**Warning W2007** - The swap file driver is currently 16-bit (i.e. using compatibility mode).

**Fix:** Open *Control Panel\System* and fix the problems. Typically a DOS legacy device driver is loaded in *config.sys* and interferes with Windows' own disk drivers.

For more information, please see the [FAQ](#).



**Warning W2008** - The drive that holds the swap file is almost full. The swap file will be unable to grow and you may run out of memory.

**Fix:** Free some disk space or move the swap file to a roomier drive.

For more information, please see the [FAQ](#).

**T2009** - Memory doublers/compressors rarely do what it is stated on the box and are more trouble than they are worth. Since physical memory prices are rather low it is better to buy more physical memory than use software memory compressors.

**Fix:** You should remove the memory doubler.

For more information, please see the [FAQ](#).

**Warning W2010** - Your memory manager is not the one provided with Windows and appears to be obsolete. This may cause many problems.

**Fix:** You should un-install it and let Windows use its own memory manager.

For more information, please see the [FAQ](#).

**Tip T2100** - you do not need to load EMM386 even if your DOS programs need EMM memory. Windows provides an EMM virtual device driver itself.

**Fix:** You should remove it from *config.sys* to save memory.

For more information, please see the [FAQ](#).

**Warning W2101** - while Quarterdeck's QEMM is a great memory manager, some of its advanced functions may cause incompatibilities and other problems. In the days of DOS and Windows 3.1 QEMM was great but in Windows 32 it is not needed.

**Fix:** You should un-install it.

For more information, please see the [FAQ](#).

**Tip T2102** - you only need SETVER if you use old DOS programs, which do not want to run with DOS 7, included in Windows 9X or DOS 8 in Me. Otherwise it is not useful.

**Fix:** You should remove (delete it from *Windows\Command*) it to save memory.

For more information, please see the [FAQ](#).

**Warning W2103** - using compression (e.g. DriveSpace) may increase your disk space but performance may decrease and some incompatibilities may appear. Also, you computer becomes harder to repair when disaster strikes.

**Fix:** You need to use a utility like Winhacker 9X, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).

**Warning W2104** - you do not need to use double buffering unless you use DOS DMA SCSI disk drivers. However this may cause conflicts with Windows's own drivers. Check whether double buffering is really needed.

**Fix:** You need to use a utility like Winhacker 9X, Tweaki or MoreControl to change this setting.

For more information, please see the [FAQ](#).



**Tip T2105** - you only need the DOS SoundBlaster drivers if you play games in straight DOS. Windows games or DOS games in a Windows shell do not need them.

**Fix:** You should remove them from *config.sys*.

For more information, please see the [FAQ](#).

**Tip T2106** - DOS SCSI drivers are not needed in Windows. Unless you need them for straight DOS mode it is best to remove them.

**Fix:** You should remove them from *config.sys*.

For more information, please see the [FAQ](#).

**Tip T2120** - you do not need DISPLAY device driver for anything unless you want to change the properties of the DOS shell.

**Fix:** You should remove it from *config.sys*.

For more information, please see the [FAQ](#).

**Tip T2121** - ANSI was a great device driver in DOS days but it is not used unless you use DOS and want some fancy stuff.

**Fix:** You should remove it from *config.sys*.

For more information, please see the [FAQ](#).

**Tip T2122** - Windows does not need DOS CD-ROM drivers. Unless you are using straight DOS (not shells) you should remove them to save memory and reduce incompatibilities.

**Fix:** Remove it from *config.sys* and also remove *MSCDEX* from *autoexec.bat*.

For more information, please see the [FAQ](#).

**Tip T2130** - Service may be disabled on Personal/Professional version of the OS.

**Fix:** If you want to conserve resources, you may disable this service if you're using the OS for personal use - if you're not using it. Go to Control Panel\Services and set the start-up to *Demand* instead of *Auto* so that the service will still be started if required but not by default.

For more information, please see the [FAQ](#).

**Tip T2200** - DirectX is not installed on your computer. Most new games and multimedia applications use it so you'll have to install it eventually. Also, most new drivers include DirectX components anyway.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2201** - DirectDraw is not installed. This probably means that your video drivers are not installed properly or there is some conflict.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).



**Tip T2202** - Direct3D is not installed. Most new video cards should come with drivers that include Direct3D even if they do not support accelerated 3D functions.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2203** - DirectSound is not installed. This probably means that your sound card drivers are very old. are not installed properly or there is some conflict.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2204** - DirectPlay is not installed.

**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2205** - The DirectX version installed is old.  
**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2206** - The video driver does not support Direct3D.

**Fix:** You should check for an updated video driver from the manufacturer.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2207** - Your video card does not support any hardware 3D functions or they are not implemented in this version of the video driver.

**Fix:** If you do have the latest video driver, consider upgrading the video card if you play 3D games.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Tip T2208** - Your video card uses bank switching which is much slower than LFB (Linear Frame Buffer).  
**Fix:** You should consider upgrading your video card.

For more information, please see the [FAQ](#).

**Tip T2209** - The free video memory available for Direct3D is very small.

**Fix:** Consider upgrading the video memory on your video adapter or reducing the resolution/colour depth of the display.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).



**Warning W2210** - DirectInput is not installed.  
**Fix:** Install the latest version of DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Warning W2211** - The video hardware does not support colour-space conversion. This may be required for games or video players (MPEG, DVD).

**NB:** Not applicable to 3D only cards like the 3Dfx VooDoo or VooDoo II.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).

**Tip T2212** - The video hardware does not support stretching in hardware. Full-screen performance for games and video will be reduced.

**NB:** Not applicable to 3D only cards like the 3Dfx Voodoo or Voodoo II.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).

**Tip T2213** - The video hardware does not support overlay in hardware. Overlay video applications like TV and video capture may be affected.

**NB:** Not applicable to 3D only cards like the 3Dfx Voodoo or Voodoo II.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this.

For more information, please see the [FAQ](#).

**Tip T2214** - The video card does not support mip-mapping. New games use this feature for improved display quality.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this.

For more information, please see the [FAQ](#).

**Tip T2215** - The video hardware does not support texture mapping. This is a major function that all 3D hardware should support.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).

**Tip T2216** - The video hardware does not support Z-buffering (depth). This is a major function that all modern 3D hardware should support.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).

**Tip T2217** - The video hardware does not support dithering. This is used to improve the display quality especially when running in high-colour modes.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).



**Tip T2218** - The video hardware does not support alpha-blending.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this.

For more information, please see the [FAQ](#).

**Tip T2219** - The video hardware does not support perspective-correction. This is a major function that all modern 3D hardware should support.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this. If not, consider upgrading the video card.

For more information, please see the [FAQ](#).

**Tip T2220** - The video hardware does not support transparency.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this.

For more information, please see the [FAQ](#).

**Tip T2221** - The driver is not certified by Microsoft.

Fix: This is not a problem since most drivers are not certified (takes time) but it's good to have a certified driver to check whether the bugs are in the driver or in the application.

For more information, please see the [FAQ](#).

**Tip T2222** - The video hardware does not support fog.

**Fix:** You should check for an updated video driver from the manufacturer if you know the card should support this.

For more information, please see the [FAQ](#).

**Warning W2223** - DirectX version is old; the DirectDraw interface supported is old.  
**Fix:** Upgrade DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Warning W2224** - DirectX version is old; the Direct3D interface supported is old.  
**Fix:** Upgrade DirectX.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Warning W2300** - The modem does not seem to be Plug & Play. Modern modems are PnP to allow Windows to detect them automatically and set them up to the optimum performance.

**Fix:** You cannot fix this but bear it in mind when you upgrade your modem.

For more information, please see the [FAQ](#).



**Tip W2500** - Windows considers this PC to be rather slow. This is usually due to insufficient memory (less than 16MB) but a faster CPU would also help.

**Fix:** Upgrade the memory. Check the mainboard manual first to make sure which type and speed of memory is needed. As a rough guide Windows 98/Me needs around 64MB, 2000/XP/2003 needs 256MB or more.

For more information, please see the [FAQ](#).

**Tip T2501** - External or L2 cache greatly increases system performance. Without it you generally have a 15-30% slower PC especially in memory intensive applications.

**Fix:** Get some external cache. Check the mainboard manual first to make sure the type and size of cache supported. Also check whether the mainboard has a COAST socket where you can install this cache. Pipeline burst cache is preferred, go for 512KB or 1MB. If the cache is soldered on the mainboard you cannot change it.

For more information, please see the [FAQ](#).

**Tip T2502** - While the *asynchronous* cache was the original type of cache used on 386, 486 & 5x86 CPUs, new chipsets work best with *pipeline-burst* cache. If the chipset supports it you can get 5-15% improvement just by changing the cache.

**Fix:** Get some pipeline burst cache. Check the mainboard manual first to make sure this type is supported. Also check whether the mainboard has a COAST socket where you can install this cache. If the cache is soldered on the mainboard you cannot change it.

For more information, please see the [FAQ](#).

**Tip T2503** - If you have 64MB or more you should have 512KB L2 cache installed for optimum performance. Also check whether the chipset can cache more than 32/64MB of memory. With some mainboards you need to increase the cache when you increase memory.

**Fix:** If the mainboard has a COAST socket and supports more than 256KB of cache then get 512KB or more cache - preferably *pipeline-burst*.

For more information, please see the [FAQ](#).

**Tip T2504** - If you have a lot of memory (256+) you may need as much as 1MB L2 cache. Remember that some 486 systems had 8M RAM and 256KB cache, so 1MB is little if you have 128MB RAM or more.

**Fix:** If you have a 586 class mainboard with a COAST socket which supports more than 256KB of cache then get 512KB or more. If you have a CPU with integrated cache, you will have to upgrade to a processor with more L2 cache.

For more information, please see the [FAQ](#).

**Warning W2505** - If the system does not support memory error detection, any memory malfunction will not be detected resulting in corrupt data or crashes. All systems should support error detection. However most memory is non-parity these days.

**Fix:** Use parity (1-bit error detection) or ECC (2-bit error detection) memory. Make sure the chipset supports this kind memory. Some chipsets support ECC up to a certain memory bus speed or FSB.

For more information, please see the [FAQ](#).

**Warning W2506** - If the system does not support memory error correction (e.g. using ECC) if an error is detected the system will stop. A system that supports correction will attempt to correct the error and continue. A server should use error-correcting memory always.

**Fix:** Use ECC (1-bit error correction) memory. Make sure the chipset supports ECC memory. Some chipsets support ECC up to a certain memory bus speed or FSB.

For more information, please see the [FAQ](#).

**Warning W2507** - There are very few memory slots. If some are already filled, to upgrade the memory will mean to discard some of the existing modules that will prove expensive. Try not to buy a mainboard with less than 6 SIMM sockets or 2 DIMM or RIMM sockets.

**Fix:** You cannot fix this - but keep it in mind when you buy your next mainboard. Buy one with more memory slots and use higher capacity memory modules.

For more information, please see the [FAQ](#).



**Warning W2508** - All the memory slots are full. To upgrade the memory you will need to discard some or even all the existing modules that may prove expensive.

**Fix:** You cannot fix this - but keep it in mind when you buy your next mainboard. Buy one with more memory slots and use higher capacity memory modules.

For more information, please see the [FAQ](#).

**Tip T2509** - Memory bus speed seems low. Check that you are running it at the correct speed.

**Fix:** Most modern (585 class or later) computers use bus speeds of 66MHz or higher. If yours is lower you may be able to increase it, depending on processor.

For more information, please see the [FAQ](#).

**Warning W2510** - The chipset may not have the capability to cache all the installed memory (e.g. Intel Triton chipsets cannot cache more than 64MB). While the overall performance may be higher if you're using all the installed memory, you may get higher performance if the additional memory is not used. Alternatively upgrade the mainboard with one using a more advanced chipset.

**Fix:** You cannot fix this - but keep it in mind when you buy your next mainboard. Buy one with a good chipset.

For more information, please see the [FAQ](#).

**Tip T2511** - You still have some free memory slots so you can upgrade the memory easily when the time comes.

**Fix:** Nothing to fix.

For more information, please see the [FAQ](#).

**Warning W2512** - The USB host controller is obsolete. Some incompatibilities may arise when you connect new USB devices.

**Fix:** You cannot fix this. Windows 98/Me/2000/XP/2003 have it built in. Windows NT does not support USB.

USB2 requires special drivers in Windows 2000/XP; Windows 98/Me do not support USB2. Windows 2003 has it built in.

For more information, please see the [FAQ](#).

**Warning W2513** - The AGP bus is disabled.

**Fix:** If you have an AGP mainboard, you should get a AGP video adapter to take advantage of it. An AGP adapter would greatly improve 3D performance. However, it should still have at least 8-16MB of local memory.

For more information, please see the [FAQ](#).

**Tip T2514** - The read timing for the memory seems low. Some OEMs don't optimise the BIOS timings before shipping the computer resulting in inferior performance.

**Fix:** Go to **BIOS set-up** then **Advanced BIOS Settings** or **Chipset Set-up** and select **60ns** timing if you have 60ns or faster FPM/EDO memory or decrease the memory timing from x444 to x333 or even **x222**. Also decrease the leadoff as much as you can (e.g. **7** or lower). If SDRAM is used, decrease the SDRAM timings (e.g. CAS2 from CAS3).

For more information, please see the [FAQ](#).

**Tip T2515** - The write timing for the memory seems low. Some companies don't optimise the BIOS timings before shipping the computer resulting in inferior performance.

**Fix:** Go to your **BIOS set-up** then **Advanced BIOS Settings** or **Chipset Set-up** and select **60ns** timing if you have 60ns or faster FPM/EDO memory or decrease the memory timing from x444 to **x333** and also decrease the leadoff as much as you can (e.g. **5** or lower). If SDRAM is used, decrease the SDRAM timings (e.g. CAS2 from CAS3).

For more information, please see the [FAQ](#).



**Tip T2516** - Modern computers use RDRAM or SDRAM memory to improve performance.

**Fix:** Buy RDRAM, SDRAM or even BEDO or EDO especially if you need to add more memory. Check whether the chipset supports this kind of memory before trying this option.

For more information, please see the [FAQ](#).

**Tip T2517** - Modern computers can use 60ns or even faster memory to improve performance.

**Fix:** If you already have EDO it's not worth fixing. But if you have older memory, buy SDRAM or EDO especially if you need to add more memory. Check whether the chipset supports this kind of memory.

For more information, please see the [FAQ](#).

**Warning W2518** - Mainboard temperature is too high (i.e. over 50°C). This should appear only if the mainboard has a temperature-monitoring sensor installed.

**Fix:** Power down the system immediately. Open the case and check that all the fans are working and check whether components are unusually hot inside. Make sure the components have good all-round ventilation. Use more fans if required.

For more information, please see the [FAQ](#).

**Warning W2519** - One of the mainboard fans has failed or is spinning too slowly. This should appear only if the mainboard has a temperature-monitoring sensor installed and the fans have tachometers. If the fan is speed controlled, this may be normal.

**Fix:** If the fan is not speed controller, power down the system immediately. Open the case and check that all the fans are working and check whether components are unusually hot inside. Make sure the components have good all-round ventilation.

For more information, please see the [FAQ](#).

**Warning W2520** - The PCI bus speed is too high. The PCI bus speed should not be increased over **36MHz**. While most PCI cards may work, some hard drives, CD-ROMs, network cards and other cards may not and you could get data corruption without knowing.

**Fix:** Make sure the FSB is not higher than 68MHz. While 75, 83 or 90MHz give you higher performance the data loss may not be worth it. If the chipset supports asynchronous PCI, enable this option to keep the speed at 33MHz, independent of FSB.

For more information, please see the [FAQ](#).

**Warning W2521** - The AGP bus speed is too high. The AGP bus speed should not be increased over **75MHz** (base clock). Most AGP cards won't work or will default to 1x mode.

**Fix:** Make sure the AGP/CLK selector (if present in the BIOS) is 2x for 133MHz or 2/3 for 100MHz FSB. FSB speeds higher than the standard may result in AGP bus speeds way outside the specification.

For more information, please see the [FAQ](#).

**Tip T2522** - SDRAM, HSDRAM or RDRAM is recommended for systems with high memory bus speeds, e.g. 100, 133MHz or faster. If you have older memory that you want to use, check whether the system allows you to run it at AGP bus speed (66MHz). However, there will be a drop in performance.

**Fix:** Replace the memory with PC800 RDRAM, PC100 SDRAM, PC133 HSDRAM memory or faster. You may wish to consider CAS2 memory for faster performance. If data integrity is a priority, specify ECC memory.

For more information, please see the [FAQ](#).

**Warning W2523** - The memory bus speed exceeds the module speed rating. While most memory will operate at slightly higher speeds, this is not recommended. Consider buying higher rated memory.

**Fix:** If the memory bus speed always equals FSB for your system, reduce FSB speed. If the system allows you to run the memory bus speed at AGP bus speed or a lower speed, set it to use the lower speed. Alternatively, if you happen to have CAS2 memory, you can set it for CAS3 if the other parameters are within range.

For more information, please see the [FAQ](#).



**Tip T2524** - The AGP aperture size may not be set properly. Generally the AGP aperture size should be at most equal to system memory and generally lower. While the GART driver will allocate memory to be used for AGP dynamically it is good to set an upper bound in order to maximise memory utilisation. In any case, it should not be disabled.

**Fix:** Go into *BIOS Setup* and change it to match system memory size or set it lower, e.g. 64MB. Note that some adapters may work better if you set it to the maximum value 256MB, or at least 64MB. Consult the video board manual for more details.

For more information, please see the [FAQ](#).

**Tip T2525** - Current AGP data rate not optimal, i.e. less than chipset's maximum AGP data rate. E.g. current AGP data rate is 1x while the chipset and the AGP card both support 2x. You should get better performance with a higher data rate but this depends on the application.

**Fix:** First, use the **PCI & AGP Information** module to confirm that the AGP card also supports the maximum chipset data rate. If it does not, don't worry about it. For non-Intel chipsets, make sure you install the latest version of their AGP mini-drivers. You should update the video card drivers as well. Some non-Intel chipsets can only work in 1x mode with some video cards.

For more information, please see the [FAQ](#).

**Warning W2526** - Current ISA/DMA bus speed is too high. Generally the ISA bus speed should not exceed 10MHz (8MHz rated speed) and the DMA bus speed should not exceed 5MHz (4MHz rating).  
**Fix:** Increase PCI/ISA multiplier (e.g. from 1/2 to 1/3) from the BIOS or reduce PCI bus speed.

For more information, please see the [FAQ](#).

**Notice N2527** - A compensation value (calibration constant) was added to external temperature sensors. Depending on the CPU type, a compensating value must be added if the temperature sensor does not actually touch the CPU. This correction is not defined for all CPUs and there are exceptions to the rule. Don't compare the BIOS that is tuned for your board with Sandra which must work on ALL boards!  
**Fix:** Right-click module, select *Options* and *unchecked Use temperature compensation for external sensors*. See the System Monitor topic in the FAQ for more information.

For more information, please see the [FAQ](#).

**Warning W2528** - System monitor device implementation is known to vary. System monitoring devices can be used in different ways on different mainboards (e.g. sensor 1 measures CPU temperature instead of board temperature or Vin1 measures +5V instead of +12V) rather than using the manufacturer's implementation guidelines that we're using. The software will show incorrect data in this case as it cannot know the specific implementation details.

**Fix:** Let us know so we can attempt to support your board. As always, assume the BIOS is right as it is tuned specifically for your board rather than being generic like Sandra which supports thousands of different boards.

For more information, please see the [FAQ](#).

**Warning W2529** - The APIC bus speed is high. Generally APIC speed should be 1/4 to 1/1 of PCI speed (usually 1/2) up to 33MHz or so.

**Fix:** Check and reduce PCI bus speed to the specified 33MHz and/or reduce PCI/APIC multiplier in the BIOS.

For more information, please see the [FAQ](#).

**Tip T2530** - The MP BIOS in this machine is not MPS 1.04 or later compatible. This specification contains many improvements and is recommended for MP systems.

**Fix:** Check BIOS settings and set to MPS 1.04 or higher; otherwise consider a BIOS upgrade if there is no later BIOS upgrade available.

For more information, please see the [FAQ](#).

**Warning W2531** - The MP BIOS configuration table seems inaccurate.  
**Fix:** Update the BIOS and/or check BIOS settings and return to defaults.

For more information, please see the [FAQ](#).



**Tip T2532** - The MP system supports more CPUs than installed. Generally in order to use such a board to its full potential all CPUs should be installed.

**Fix:** Add more CPUs up to the maximum. You may need to upgrade the BIOS, the OS kernel, device drivers and various settings to take advantage of the new CPUs. Make sure they are all utilised by the system after installation.

For more information, please see the [FAQ](#).

**Warning W2533** - The system has host controllers that have not been enabled by the BIOS/OS. It may be possible to obtain information by querying devices (if any) attached to these host controllers if they were to be enabled.

**Fix:** Check BIOS settings and enable the host controllers. Or change Sandra options to enable them.

For more information, please see the [FAQ](#).

**Warning W2534** - Enabling the disabled host controllers using Sandra is risky and should only be attempted as a last resort as it may not be registered correctly with the OS.

**Fix:** Either do not do it if you are unsure or keep a lookout for any problems.

For more information, please see the [FAQ](#).

**Notice N2535** - The disabled host controllers have been enabled.  
**Fix:** Nothing to fix - keep a lookout for any problems.

For more information, please see the [FAQ](#).

**Notice N2536** - The system has no enabled SMBus/i2c/BMB controller or Sandra does not support it. Most modern systems have at least one.

**Fix:** If Warning W2533 is also issued, see its topic. If not check the manual to check whether such a controller is present; if it is please contact us.

For more information, please see the [FAQ](#).

**Warning W2537** - Enabling the disabled hardware monitors using Sandra is risky and may not yield the expected results. This is because Sandra is generic and not customised for your respective mainboard.  
**Fix:** Nothing to fix - keep a lookout for any problems.

For more information, please see the [FAQ](#).

**Warning W2538** - The system has hardware monitors that have not been enabled by the BIOS/OS. It may be possible to obtain information by querying them if they were to be enabled.

**Fix:** Check BIOS settings and enable the hardware monitors. Or change Sandra options to enable them.

For more information, please see the [FAQ](#).

**Notice N2539** - The disable hardware monitors have been enabled.  
**Fix:** Nothing to fix - keep a lookout for any problems.

For more information, please see the [FAQ](#).



**Warning W2540** - No APIC (advanced PIC) has been detected for this MP system. All modern MP systems should contain an APIC; some advanced single-CPU systems may also contain one.  
**Fix:** Check BIOS settings and enable the APIC.

For more information, please see the [FAQ](#).

**Warning W2541** - FSB exceeds chipset rated FSB. If you're over clocking the system just be aware that it may not be as stable as you may think.

**Fix:** Reduce the FSB in the BIOS settings/jumpers to the rated FSB.

For more information, please see the [FAQ](#).

**Warning W2542** - Memory bus speed exceeds chipset rated memory bus speed. . If you're over clocking the system just be aware that it may not be as stable as you may think. Also you may be over clocking the memory modules themselves.

**Fix:** Reduce the FSB or reduce the FSB/Memory multiplier.

For more information, please see the [FAQ](#).

**Warning W2543** - Memory hole detected may not be required. For legacy reasons (with 16-bit device drivers/hardware), most chipsets allow you to set memory holes in the legacy memory space (either in the 1st MB or between 0 to 16MB) to be used for data transfers. If you do not have such legacy devices, make sure the hole is off.

**Fix:** Check BIOS settings and disable the hole.

For more information, please see the [FAQ](#).

**Warning W2544** - The chipset appears to have a built-in chip that uses system memory as video memory. Be aware that this reduces available system memory bandwidth quite a bit, especially when using high resolutions/colour depths/refresh rates or 3D applications. This reduces system performance appreciably.

**Fix:** If possible, use an external graphics adapter.

For more information, please see the [FAQ](#).

**Tip T2545** - Large memory modules (256MB or greater) should be Registered/Buffered, especially if more than 2 are installed on the same channel. This improves signal quality by reducing the load on the chipset channel. While these modules add an extra clock delay due to the on-board buffers (thus CL2 effectively becomes CL3), the stability will be worth it. Server chipsets with many memory slots generally **require** Registered memory.

**Fix:** If you plan on adding more memory, consider replacing the modules with Registered/Buffered modules. Do note that you cannot mix Unbuffered and Registered/Buffered modules on the same channel, but you may be able to if the chipset has multiple memory channels.

For more information, please see the [FAQ](#).

**Tip T2546** - Large memory modules (512 or greater) should be ECC/Parity. Since the probability that a bit will be corrupt is the same or increases with module density, the bigger the module, the bigger the overall probability that you will get one or more corrupted bits. While these modules add an extra delay on partial writes (e.g. less than data width) as parity for the whole line must be re-calculated, the stability will be worth it.

**Fix:** If you plan on adding more memory, consider replacing the modules with ECC/Parity modules. Do note that running plain and ECC/Parity modules will turn off ECC/Parity for the whole memory array.

For more information, please see the [FAQ](#).

**Tip T2547** - Speed set by jumpers/switch. For flexibility, consider by BIOS/software.

**Fix:** Set BIOS to ignore switches/jumpers or set switches to BIOS speed. Then set the speeds via the BIOS. This will also allow Sandra to read-back the speed settings.

For more information, please see the [FAQ](#).



**Tip T2548** - Speed set by software. For reliability, consider by jumpers/switch.

**Fix:** Set BIOS to use switches/jumper settings. Set the speeds via the switches/jumpers.

For more information, please see the [FAQ](#).

**Tip T2549** - Spread spectrum is off. Consider turning it on to minimise EMI. This feature of the PLL IC (clock generator) varies the base frequency area within a certain field range to reduce strong EMI peaks that could cause interference in electronic devices.

**Fix:** Turn spread spectrum on in the BIOS. You may also need to use speed by BIOS instead of jumpers/switches in order to turn this on.

For more information, please see the [FAQ](#).

**Warning W2600** - The SCSI device does not adhere to any of the ANSI standards (SCSI-1, SCSI-2, etc.)  
**Fix:** Generally ATA/ATAPI emulated by Windows generates this warning - this is normal - ATA/ATAPI devices do not adhere to SCSI. If it's a SCSI device it must be rather old. All modern SCSI devices should support (at least) SCSI-2.

For more information, please see the [FAQ](#).

**Tip T2700** - The number of fonts installed in this system is very high. Memory may be at a premium. Typically office suites, DTP and graphics programs may install 100's of fonts you don't use and don't need.

**Fix:** Go to *Control Panel\Fonts* and go through them. Go to the *View* menu and select *List fonts by similarity*. Remove the fonts you do not use - especially if there is another one that looks very much like it already.

For more information, please see the [FAQ](#).

**Warning W2900** - the phone number is not specified. Usually this means that you've entered it wrongly.  
**Fix** - make sure that the country code, area code and local phone number are all entered correctly. Go to *My Computer\Dial-Up Networking*, right-click the connection and choose *Properties* and enter the correct information.

For more information, please see the [FAQ](#).

**Tip T2901** - IP header compression is not used. Most hosts support IP header compression which reduces the packet size and therefore the overhead for data packets. It should be enabled unless you know that it causes problems.

**Fix** - Go to *My Computer\Dial-Up Networking*, right-click the connection and choose *Properties\Server Types*, click *TCP/IP Settings* and check the corresponding check-box.

For more information, please see the [FAQ](#).

**Tip T2902** - Software compression is not used. Software compression will only work if both computers support it, but you should keep it enabled as most computers do. This will compress data exchanges resulting in higher throughput.

**Fix** - Go to *My Computer\Dial-Up Networking*, right-click the connection and choose *Properties\Server Types* and check the corresponding check-box.

For more information, please see the [FAQ](#).

**Tip T2903** - PPP is not used. Currently PPP is the preferred framing protocol. UNIX machines use SLIP, Netware uses NRN, etc. Make sure that you need to use other protocol instead of PPP - if not switch to PPP.

**Fix** - Fix - Go to *My Computer\Dial-Up Networking*, right-click the connection and choose *Properties\Server Types* and select *PPP* from the combo-box.

For more information, please see the [FAQ](#).



**Tip T2904** - A script file is not used. If you connect to a system daily it's easier to set-up a script file that does the log-in for you automatically. This way you can be connected at a touch of a button.

**Fix** - If you are running the original version of Windows 95, you need to install the Scripting Tool from the CD or install MS-Plus! Windows 98/Me/2000/XP/2003 have it built-in. Read the documentation on how to write a script file then go to *Go to My Computer\Dial-Up Networking*, right-click the connection and choose *Properties\Scripting* and enter the filename in the corresponding box.

For more information, please see the [FAQ](#).

**Warning W3000** - ODBC data layer installed is obsolete. For modern applications ODBC version 3.5x or later is recommended with ODBC 3 required by almost all applications.

**Fix:** Please download and install MDAC 2.6 or later from Microsoft.

For more information, please see the [FAQ](#).

**Warning W3001** - ODBC driver installed is obsolete. For modern applications ODBC driver version 3.5x or later is recommended with ODBC 3 required by almost all applications.

**Fix:** Please download and install MDAC 2.6 or later from Microsoft that contains many drivers. If the driver for the database is not included in the MDAC please download and install the latest version from the vendor's website.

For more information, please see the [FAQ](#).

**Tip T3100** - SMART is not enabled. For safety/reliability it is best for it to be enabled. SMART monitors critical drive parameters and is able to warn you if the drive is about to fail so that you can back up the data and replace the drive. It has minimal performance impact that is offset by the security.

**Fix:** Look in the BIOS settings and enable SMART monitoring for all drives.

For more information, please see the [FAQ](#).

**Warning W3101** - Power management is enabled. For desktops this is best to be disabled. If it is enabled, it may cause the drive to go into a low power/performance state or turn off.

**Fix:** If this is a desktop, look in the BIOS settings and disable power management/sleep for drives. If this is a laptop that is usually used on battery power, leave it as it is.

For more information, please see the [FAQ](#).

**Warning W3102** - Read Cache (look-ahead buffer) or Write Cache (write-back) are disabled. For performance both should be enabled. The look-ahead buffer should only be disabled in specialised applications where the majority of I/O is random and look ahead would not be beneficial. The write-back cache should only be disabled if data is paramount or the system is prone to power loss that would prevent the cache to flush.

**Fix:** You may need to use a specific utility for the drive downloadable from the manufacturer's website to enable or disable these settings. Some advanced controllers allow you to set such settings also.

For more information, please see the [FAQ](#).

**Warning W3103** - Acoustic Management enabled. While this reduces the noise the drive generates, the performance is almost always impaired. Most of the time fans generate more noise than the drive itself. If the drive does generate a lot of noise, it may be faulty. You could also consider swapping the drive for another model that generates less noise.

**Fix:** You may need to use a specific utility for the drive downloadable from the manufacturer's website to enable or disable these settings.

For more information, please see the [FAQ](#).

**Warning W3104** - Current transfer mode not optimal, i.e. not highest supported. This affects drive performance. If the controller is also capable of the highest supported transfer mode, there is no reason not to use it.

**Fix:** First check controller supported transfer modes. Then check the mode the driver for the controller/BIOS is set to use and modify; some default to a lower mode for compatibility. You may need to install newer drivers if the current drivers do not natively support the controller (especially for RAID). You may need to update the controller BIOS or drive firmware, if the mode does not stick. If data corruption occurs verify the cable and consider switching (if any) drives on the same channel onto other channels.

If the built-in controller does not support the mode, consider using the on-board/RAID controller or even disable the built-in controller and install a new controller.

For more information, please see the [FAQ](#).



**Warning W3105** - Current block size not optimal, i.e. not highest supported. This affects transfer performance.

**Fix:** Check BIOS settings and set block size to *maximum*. Some advanced controllers allow you to set such settings also.

For more information, please see the [FAQ](#).

**Error E3106** - SMART has detected a possible problem with the drive. It is best to close all programs and back up all the data on the disk. The disk may fail.

**Fix:** Contact the drive manufacturer's technical support. Usually they will replace the drive or at least test it and return it if it is a false alarm.

For more information, please see the [FAQ](#).

**Warning W3107** - Drive temperature is too high (>60C). Check system fans status.

**Fix:** Check that all fans work and check case temperature. If the fans are OK and case temperature is high (>40C) review cooling system arrangements (i.e. check air flow and either replace fans with better versions or install more) or device installation (i.e. leave some space between drives).

For more information, please see the [FAQ](#).

**Warning W3108** - Drive is using PIO instead of DMA. This seriously limits performance of modern drives.  
**Fix:** Check controller and driver settings and make sure you enable DMA. If the current driver does not support the controller natively install an updated driver.

For more information, please see the [FAQ](#).

**Tip T5000** - the processor utilisation is too high. This means that there are background applications that are using the processor while the benchmark is executing.

**Fix:** You should close these processes down as they interfere with the benchmark.

For more information, please see the [FAQ](#).

**Tip T5001** - the Dhrystone score seems low for this type of processor/class.  
**Fix:** Check whether the settings are correct.

For more information, please see the [FAQ](#).

**Tip T5002** - the Whetstone score seems low for this type of processor/class.  
**Fix:** Check whether the settings are correct.

For more information, please see the [FAQ](#).

**Warning W5003** - the benchmark has tested the primary CPU only. This may not reflect the total power of the system

**Fix:** Turn on the multi-processor option. You need to use Windows NT/2000/XP/2003 and the multi-processor kernel to use the other processors.

For more information, please see the [FAQ](#).



**Notice N5004** - The benchmark is synthetic and measures one aspect of system performance. It is **not** meant to indicate *real-life* performance, whatever the latter means for you. This depends on what specific applications you run, amount of data manipulated, etc. There are other benchmarks (BapCo, WinStone, WinBench) that attempt to measure general application performance.

**Fix:** As long as you keep this in mind, all should be OK. To find out more about just what the benchmarks measure, refer to Help, the on-line documentation and FAQ. Do not try to infer more than can be inferred from the results.

For more information, please see the [FAQ](#).

**Warning W5005** - Use the dynamic load balance option in special cases only. This is meant for AMP (asynchronous multi-processor) systems or SMP systems running with different speed CPUs. The calibration routine is run for each CPU in turn and the work is divided according to initial CPU performance. While this works OK on SMP systems as well, the algorithm incurs higher overheads that may result in slightly different results.

**Fix:** If you do not have such a system, disable dynamic load balancing.

For more information, please see the [FAQ](#).

**Notice N5006** - We make changes to the benchmark code from version to version and generally overhaul them completely when the major version changes (e.g. 9.0 from 8.x). This is unavoidable if we are to keep the benchmarks up-to-date with new technology and optimise the results following feedback from previous releases.

**Fix:** As long as you keep this in mind, all should be OK.

For more information, please see the [FAQ](#).

**Warning W5007** - This MP system does not have the MP kernel installed and thus only one CPU will be used by the benchmark. The performance index does reflect the performance of the system, as it is but not the true performance of the system with the correct kernel.

**Fix:** Upgrade to a MP-aware OS and/or install the correct MP kernel.

For more information, please see the [FAQ](#).

**Tip T5008** - If you want to run a specific benchmark instead of the best benchmark for the system click the Option button and enable/disable the benchmarks you want.

**Fix:** Nothing to fix.

For more information, please see the [FAQ](#).

**Warning W5009** - Mobile processors may yield lower indexes in power management modes. Unlike desktop/standard processors that run at the maximum speed all the time (except some sleep modes) modern mobile processors are capable of multiple performance modes that vary the frequency and core voltage based on utilisation and power.

**Fix:** If the index is lower than expected, check the manual to see how to force the processor to run at the highest rated speed or highest performance mode.

For more information, please see the [FAQ](#).

**Warning W5100** - Low video index.

**Fix:** Please close all running programs.

For more information, please see the [FAQ](#).

**Warning W5200** - the available free space on this drive is low.  
**Fix:** Increase free space before running the benchmark.

For more information, please see the [FAQ](#).



**Tip T5201** - the disk index seems low for this type of drive.  
**Fix:** Check controller settings and driver settings.

For more information, please see the [FAQ](#).

**Tip T5202** - If *use cache* option is disabled in the benchmark the Windows disk cache is bypassed by the test. Generally programs do not do this as this improves disk performance significantly.

**Fix:** If you want to measure Windows disk performance set the benchmark to use the Windows disk cache from module *options*.

For more information, please see the [\(FAQ\)](#).

**Tip T5203** - If *use cache* option is enabled in the benchmark the Windows disk cache is not bypassed by the test. The results may not tally with the results expected for the drive or controller.

Fix: If you want to measure the raw disk controller/drive performance set the benchmark to bypass the Windows disk cache from module *options*.

For more information, please see the [FAQ](#).

**Warning W5204** - CPU utilisation is high. Modern ATA and SCSI disk controllers use DMA bus-mastering which frees the CPU from transferring data from/to the disk and increase system performance. Such systems typically use maximum 10% of CPU time while other systems use 90-99% of CPU time during transfers.

**Fix:** Check if the disk controller and drives support bus-mastering. If yes, check for updated drivers for the disk controller from the manufacturer. Refer to the manual for information on how to turn DMA bus-mastering on. If you're using the Windows bus-mastering drivers, check the *DMA* box in *Control Panel\System\Device Manager\Disk Drives\Disk* click *Properties* and open the *Settings* tab.

For more information, please see the [FAQ](#).

**Warning W5205** - The write index/performance seems low. While (generally) the sustained read performance will be higher than the write performance, the write performance (on uncompressed drives) should be comparable, e.g. not ½ or less than read performance.

**Fix:** Some SCSI hard drives/controllers may have *write verify* on; this feature checks that the data written matches the data on the disk by reading and comparing it. While this function is very important for data integrity, the performance hit is large.

More commonly the write cache may be off (i.e. write through mode). This is done to protect the data in case of power/system failure by making sure it is always written to disk synchronously. Again, this feature causes a performance hit so enable only if necessary.

**NB.** If your drive is compressed (e.g. by setting "*Compress drive to save disk space*") this warning is generally issued unless the system is very fast and able to compress the data very quickly; generally the hit is enough to cause the write speed low as decompression is much faster. This is by design.

For more information, please see the [FAQ](#).

**Warning W5206** - The drive index seems low.

**Fix:** While this is a generic warning - i.e. it does not specify the nature of the problem - generally, the problem would be the lack of DMA bus-mastering which forces the drive to work in PIO mode which not only hurts performance but also increases CPU utilisation. Check that the controller drivers are installed and that DMA is enabled for the channel and the drive itself.

For more information, please see the [FAQ](#).

**Tip T5300** - a full VideoCD or DVD movie disk is recommended for thorough testing. Otherwise the results may have a higher degree of inaccuracy.

**Fix:** Use a full VideoCD or DVD with a 300MB file or larger.

**Tip T5301** - a data CD-ROM which a huge file is recommended for thorough testing. Otherwise the results may have a higher degree of inaccuracy.

**Fix:** Use a data CD with a file of 300MB or larger.

For more information, please see the [FAQ](#).



**Tip T5302** - if you want to test the video performance of your CD-ROM/DVD use a VideoCD or DVD.  
**Fix:** Use a VideoCD or DVD.

For more information, please see the [FAQ](#).

**Tip T5303** - if you want to test the data performance of your CD-ROM use a data CD with very large files.  
**Fix:** Use a data CD.

For more information, please see the [FAQ](#).

**Tip T5304** - the drive index seems low for this type of CD-ROM.  
**Fix:** Check controller settings and cache settings.

For more information, please see the [FAQ](#).

**Warning W5400** - Low memory bandwidth efficiency (advanced test). Generally this means a setting is incorrect or set too “safe” resulting in too low performance.

**Fix:** Check memory timings (reduce them) or check other chipset or memory speed settings.

For more information, please see the [FAQ](#).

**Warning W5401** - Low memory bandwidth efficiency (legacy test). Generally this means a setting is incorrect or set too “safe” resulting in too low performance.

**Fix:** Check memory timings (reduce them) or check other chipset or memory speed settings.

For more information, please see the [FAQ](#).

**Warning W5402** - Low L2 cache memory index. The throughput for the cache seems low.

**Fix:** If the system has L2 cache, make sure it is enabled. Some systems disable the L2 cache if the memory installed is larger supported by the cache controller.

For more information, please see the [FAQ](#).

**Warning W5403** - The tests using multi-media instructions MMX/SSE(2) are not standard as STREAM was defined. While they follow the same algorithm, the data is processed in blocks rather than one at a time. This may yield different results from the tests using the standard instructions.

**Fix:** Disable multi-media tests from module *options* or keep this in mind when comparing with other results.

For more information, please see the [FAQ](#).

**Notice N5404** - You may need to run the benchmark a few times to obtain a stable result. While in general the benchmark is stable (as it averages the results internally) and one run is enough, in certain circumstances (e.g. program activity, SMP operation) the results may vary by a certain amount from run to run.

**Fix:** Run the benchmark until the score does not change from run to run.

For more information, please see the [FAQ](#).



**Notice N5405** - System bandwidth appears to be FSB limited. Generally this means that FSB bandwidth is < 50% total memory interface bandwidth, thus memory bandwidth is wasted. Some systems use the additional bandwidth for built-in video (if applicable) if video memory is shared with system memory.

**Fix:** Attempt to increase FSB (keep memory bus speed constant) to increase FSB bandwidth and thus improve overall bandwidth performance.

For more information, please see the [FAQ](#).

**Notice N5406** - System bandwidth appears to be memory limited. Generally this means that memory bandwidth is < 50% FSB bandwidth, thus CPU is starved. This generally indicates a mismatch between memory and system. Note that this does not indicate that memory timings are wrong, but the memory itself is slow.

**Fix:** Use higher performance memory (e.g. DDR or RDRAM) or use any additional memory channels (if present) to increase memory bandwidth performance.

For more information, please see the [FAQ](#).

**Warning T5500** - The CPU does not support MMX/SSE(2) instructions, the ALU is used instead. While the code is optimised for greater performance on modern CPUs, the performance will be much lower than on a MMX/SSE(2) processor.

**Fix:** Upgrade to a MMX or SSE(2) processor.

For more information, please see the [FAQ](#).

**Warning T5501** - The CPU does not support SSE(2) or 3DNow! instructions, the FPU is used instead. While on processors with pipelined FPUs (e.g. Pentium II) the optimised FPU code runs quite fast, performance will be lower than when using a SSE(2) or 3DNow! capable processor.  
**Fix:** Upgrade to a SSE(2) or 3DNow! processor.

For more information, please see the [FAQ](#).

## **ERRORS & WARNINGS**

**Error E1:** Module execution has failed. The error is in the message.

**Fix:** The error message should give you some information as to how to diagnose the problem. Each module has different requirements, see the

For more information, please see the [FAQ](#).

**Warning W2:** Benchmarking stresses components. Some components may fail if they have any weaknesses.

**Fix:** Just make sure you understand what this means.

For more information, please see the [FAQ](#).

**Error E3:** No modules have been selected.

**Fix:** For this wizard to work you need to select at least one module. Re-start the wizard and select one or more modules.

For more information, please see the [FAQ](#).



**Error E4:** This hardware device has a problem. The problem is in the message itself.

**Fix:** The error message should give you some pointers as to what has gone wrong. You can also use the *Help and Support Windows* help for more information about this specific device problem. Use the *Troubleshooters* to attempt to diagnose the problem.

**Error E300:** Failed to initialise OpenGL.

**Fix:** Check that the OpenGL drivers are correctly installed. It is possible the OpenGL driver does not support the current video mode, you may need to reduce resolution, colour depth or refresh rate. Try the OpenGL screen-savers to see if they work correctly.

For more information, please see the [FAQ](#).

**Error E301:** Failed to create OpenGL test window.

**Fix:** The OpenGL driver may not support the current video mode, you may need to reduce resolution, colour depth or refresh rate. Try the OpenGL screen-savers to see if they work correctly. This may also denote a low-memory condition.

For more information, please see the [FAQ](#).

**Error E400:** Failed to open/connect to printer.

**Fix:** Check that the printer is correctly installed and the printer is on-line. You can try deleting and reinstalling the printer. If it is a network printer make sure the print server is on-line and that your current credentials allow you to connect to and query the printer.

For more information, please see the [FAQ](#).

**Error E401:** Failed to allocate buffer for the printer information.

**Fix:** Check that the printer is correctly installed and the printer is on-line. You can try deleting and reinstalling the printer. If it is a network printer make sure the print server is on-line and that your current credentials allow you to connect to and query the printer.

For more information, please see the [FAQ](#).

**Error E402:** Cannot get printer information.

**Fix:** Check that the printer is correctly installed and the printer is on-line. You can try deleting and reinstalling the printer. If it is a network printer make sure the print server is on-line and that your current credentials allow you to connect to and query the printer.

For more information, please see the [FAQ](#).

**Error E500:** Winsock library has failed.

Fix: Check the network adapter configuration, the protocols (i.e. TCP/IP) and bindings. If you have updated it make sure it has been updated correctly.

For more information, please see the [FAQ](#).

**Error E501:** No hosts have been detected on the network.

**Fix:** If there are other hosts on the specified network (aka domain/workgroup/IP net) make sure that they are operational and visible from Network Neighbourhood. Some hosts require valid credentials to query their presence/information, other are hidden on purpose.

For more information, please see the [FAQ](#).



**Error E1000:** No game controllers are present.

**Fix:** If you do have game controllers (joystick, game-pad, etc.) check that they are properly connected to the right port. Some require drivers – make sure the drivers are appropriate for the operating system you are using.

For more information, please see the [FAQ](#).

**Error E1001:** Failed while querying game controller. The error code is in the message.

**Fix:** Depending on the error code displayed attempt to resolve the issue. You may need to use the device manual for more information.

For more information, please see the [FAQ](#).

**Error E1200:** PCI/AGP initialisation failed.

**Fix:** Check that the program has initialised its device driver successfully; if correctly installed make sure you have administrator permissions that allow device driver registration/execution. Otherwise ask the administrator to set up the driver to load at boot.

On old systems it is possible the PCI interface is not working correctly or it has not been enabled.

For more information, please see the [FAQ](#).

**Error E1400:** Cannot open port.

**Fix:** If you are using a device (e.g. modem, direct-cable networking) that currently uses the port this is normal. Otherwise please close as many applications as you can, especially communication programs.

For more information, please see the [FAQ](#).

**Error E1500:** No MCI devices seem to be present or are responding.

**Fix:** All systems generally contain some MCI devices (multi-media device control interface). Unless you have explicitly deleted them make sure the registry is valid. Check the MCI panel within Control Panel for more details.

For more information, please see the [FAQ](#).

**Error E1600:** Cannot find the process, process no longer exists.

**Fix:** The process may have disappeared between the time the list of processes has been created and the time the process was queried.

For more information, please see the [FAQ](#).

**Error E1601:** Cannot get the list of processes.

**Fix:** Generally this denotes a low-memory condition. Alternatively your credentials may not allow you to list processes running although this is unusual.

For more information, please see the [FAQ](#).

**Error E1800:** Drive access error – not present.

**Fix:** If the drive is removable make sure there is formatted media into it. If the drive is fixed make sure the drive is on-line – it may be in power-save mode.

For more information, please see the [FAQ](#).



**Error E2100:** DOS interface has failed.

**Fix:** Check that the program is correctly installed. Check that the 16-bit support interface is executing correctly.

For more information, please see the [FAQ](#).

**Error E2200:** DirectInput error. The error string is included in the message.

**Fix:** This depends on the error string shown and should give you a good idea as to what has gone wrong.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Error E2201:** DirectPlay error. The error string is included in the message.

**Fix:** This depends on the error string shown and should give you a good idea as to what has gone wrong.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Error 2202:** Memory allocation for buffer(s) has failed.

**Fix:** Generally this denotes a low-memory condition. Please close as many of open applications as you can. If this does not help and the system has been running for many days, consider rebooting.

For more information, please see the [FAQ](#).

**Error E2203:** DirectSound error. The error string is included in the message.

**Fix:** This depends on the error string shown and should give you a good idea as to what has gone wrong.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Error E2204:** DirectDraw error. The error string is included in the message.

**Fix:** This depends on the error string shown and should give you a good idea as to what has gone wrong.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Error E2205:** Direct3D error. The error string is included in the message.

**Fix:** This depends on the error string shown and should give you a good idea as to what has gone wrong.

For a second opinion, run [DirectX Diagnostics](#).

For more information, please see the [FAQ](#).

**Error E2300:** Could not detect port of the modem.

**Fix:** Generally all modems use a port (either physical or virtual) to interface with the system. The only exception are advanced modems (ISDN/DSL) that emulate network adapters – but they should not appear in this category. Check that the drivers are correctly installed and configured.

For more information, please see the [FAQ](#).



**Error E2301:** Port is in use.

**Fix:** Generally this is fine as another application is currently using the port. If you are currently connected using the modem then the modem/port are in use and thus cannot be queried. Try again after you disconnect.

For more information, please see the [FAQ](#).

**Error E2302:** Cannot initialise port data buffers.

**Fix:** Check that the port is correctly configured in the BIOS and in Windows. You may need to delete the port and allow Windows to re-detect it if you've made modifications to its configuration in the BIOS. In a few cases this may also denote a low-memory condition – close some open applications

For more information, please see the [FAQ](#).

**Error E2303:** Could not set port state and timeouts.

**Fix:** Check that the port is correctly configured in the BIOS and in Windows. You may need to delete the port and allow Windows to re-detect it if you've made modifications to its configuration in the BIOS. Some older ports may not support this functionality.

For more information, please see the [FAQ](#).

**Error E2304:** Modem/terminal adapter did not reply.

**Fix:** Check that the modem/terminal adapter is turned on and connected correctly. If has multiple connections, check that there are no active connections. You could reboot it if it still does not reply after these checks.

For more information, please see the [FAQ](#).

**Error E2600:** SCSI interface query has failed.

**Fix:** Make sure the ASPI drivers are installed correctly, especially on Windows 9X/Me where you can update them. For Windows NT/2000/XP/2003 you do **not** need **nor** should you install any ASPI drivers.

For more information, please see the [FAQ](#).

**Error E2601:** No SCSI devices found on SCSI channel.

**Fix:** If there are no SCSI devices installed on the channel this is fine. If there are devices connected, check that they are on-line and correctly configured for the channel.

For more information, please see the [FAQ](#).

**Error E2700:** Font no longer exists.

**Fix:** Generally this means that the font enumerated is not actually present in the system. It may not be installed (anymore) even if it is registered. If you have removed the font, the un-registration may still be active until a reboot or it has not been actually executed.

For more information, please see the [FAQ](#).

**Error E2701:** Could not create device DC to render font.

**Fix:** Check that there is plenty of free system and video memory; Windows 9X/Me systems may also run out of GDI heap space and you may need to close other open applications or reboot.

For more information, please see the [FAQ](#).



**Error E2900:** Cannot enumerate dial-up (RAS) connections.

**Fix:** Check that there are RAS connections defined and that the database is valid. It is also possible that your credentials do not allow you to enumerate the RAS connections.

For more information, please see the [FAQ](#).

**Error E2901:** Cannot allocate buffer for RAS connection query data.

**Fix:** Check that the program supports the operating system you are using. You may have to update the program.

For more information, please see the [FAQ](#).

**Error E2902:** Failed to query RAS connection.

**Fix:** Check that the RAS connection defined is valid. It is also possible that your credentials do not allow you to enumerate the RAS connection.

For more information, please see the [FAQ](#).

**Error E3000:** Could not connect to database server.

**Fix:** Make sure the database connection settings are correct (check spelling). Check server is on-line and reachable by using the database test utilities supplied. Check that the credentials specified are correct and allow remote connection.

For more information, please see the [FAQ](#).

**Error E3001:** Functionality not supported (list types, tables, procedures, etc.)

**Fix:** Make sure the credentials allow you to list/query the specified functionality (e.g. can view tables, procedures, etc.). It is also possible there are no tables, procedures, etc. defined yet. You can double-check by connecting with the database test utilities supplied.

For more information, please see the [FAQ](#).

**Error E3100:** This hardware device has a problem. The problem is in the message itself.

**Fix:** The error message should give you some pointers as to what has gone wrong. You can also use the *Help and Support Windows* help for more information about this specific device problem. Use the *Troubleshooters* to attempt to diagnose the problem.

For more information, please see the [FAQ](#).

**Error E3200:** Failed to open event log.

**Fix:** Check that the event log is not corrupted and that your credentials allow you to open logs on the system

For more information, please see the [FAQ](#).

**Error E5200:** Cannot create/write to drive. Check permissions.

**Fix:** Check that the drive can be written to so that it can be benchmarked.

For more information, please see the [FAQ](#).



**Error E5201:** Cannot allocate memory data buffer.

**Fix:** The benchmarks need a lot of resources to run. Please close as many applications as possible to give more memory to the application.

For more information, please see the [FAQ](#).

**Error E5202:** Not enough free space on the drive. The size is specified in the message.

**Fix:** The benchmark needs a certain free space to create the test file. Please free as much space as required to benchmark the drive.

For more information, please see the [FAQ](#).

**Error E5203:** Test file is missing.

**Fix:** This is an unexpected error message. It may be a problem with the drive or the file system on the drive.

For more information, please see the [FAQ](#).

**Error E5204:** Read error.

**Fix:** Run a disk-check on the drive and specify surface scan.

For more information, please see the [FAQ](#).

**Error E5205:** Seek error.

**Fix:** Check that the drive is correctly configured by the BIOS.

For more information, please see the [FAQ](#).

**Error E5206:** Write error.

**Fix:** Run a disk-check on the drive and specify surface scan.

For more information, please see the [FAQ](#).

**Error E5300:** The test files on the disk are too small. The size is specified in the message.  
**Fix:** Please use a disk with larger files as instructed in the message itself.

For more information, please see the [FAQ](#).

**Error E5600:** Cannot get IP address of the host.

**Fix:** Check that TCP/IP protocol is correctly installed and bound to the network interface. Also check that WINS or DNS servers are available on the network. Check that you can ping the host by name from a command prompt.

For more information, please see the [FAQ](#).



**Error E5601:** No reply from host.

**Fix:** Check that the host is on-line and connected to the network. Check that the host is configured to reply to ICMP packets – especially if a firewall is installed on the host.

For more information, please see the [FAQ](#).

**Error E5602:** Transfer packet too large for host/network.

**Fix:** Generally this is a driver issue. Modern network cards and driver support fragmentation of ICMP packets but some older devices and drivers do not. If you are using the built-in drivers try installing updated drivers from the manufacturer's website.

For more information, please see the [FAQ](#).

**Error E5700:** Cannot initiate Internet connection.

**Fix:** Make sure you are connected to the Internet; if using dial-up either manually initiate a connection or set it up so that the system automatically dials-up when a connection is required.

For more information, please see the [FAQ](#).

**Error E5701:** Cannot connect to the server.

**Fix:** Make sure the server name is correct (check spelling). If it is, try pinging it from a command-line prompt. If look-up fails, try using its IP address. If it is a web server, try to connect to it using your browser. If it is a FTP server, try to connect to it using an FTP program.

For more information, please see the [FAQ](#).

**Error E5702:** The path/folder or file specified was not found.

**Fix (path/folder):** Make sure the path/folder entered is correct (check spelling) and that it exists on the server. If you want to create it make sure you have permissions to create folders on the server. Some systems do not allow you to create more than one level in one go.

**Fix (file):** Make sure the file entered is correct (check spelling) and that it exists on the server. If you want to create it make sure you have permissions to create files in the path/folder specified on the server.

For more information, please see the [FAQ](#).

**Error E5703:** The request to the server failed. The error code of the failure is in the message.

**Fix:** This depends on the error code returned by the server. Generally either your credentials do not allow you to execute the request (check login) or the request made is incorrect (check request) or not supported by the server (check server config).

For more information, please see the [FAQ](#).

**Error E5704:** Failed to create local file.

**Fix:** Check whether you have permissions to create files in the path/folder specified and that the name is valid. If a file with the same name already exists in the path/folder specified check that it can be overwritten.

For more information, please see the [FAQ](#).

**Error E5705:** Download has failed. The error code of the failure is in the message.

**Fix:** Generally other errors displayed previously tell you what has gone wrong with the download. If there are no other errors displayed, use the error code to diagnose what is amiss. Generally the transfer itself has failed (timeout/corruption); try again.

For more information, please see the [FAQ](#).



**Error E5706:** Failed to create remote file.

**Fix:** Check whether you have permissions to create files in the path/folder specified and that the name is valid on the server. If a file with the same name already exists in the path/folder specified on the server check that it can be overwritten.

For more information, please see the [FAQ](#).

**Error E5707:** Upload has failed. The error code of the failure is in the message.

**Fix:** Generally other errors displayed previously tell you what has gone wrong with the upload. If there are no other errors displayed, use the error code to diagnose what is amiss. Generally the transfer itself has failed (timeout/corruption); try again.

For more information, please see the [FAQ](#).

**Error E8000:** Temporary folder not set; cannot create temporary file.

**Fix:** Make sure a temporary folder is set (check TMP and TEMP environment variables) and that there is plenty of space on the drive it points to.

For more information, please see the [FAQ](#).

**Error E8100:** Cannot create printer device context.

**Fix:** Make sure the printer selected is correctly installed and it is on-line. You can try deleting and re-installing the printer.

For more information, please see the [FAQ](#).

**Error E8101:** Printer object creation has failed.

**Fix:** Generally this is a program error; check that the program is valid.

For more information, please see the [FAQ](#).

**Error E8102:** ADO error; the error code is in the message itself.

**Fix:** Depending on the error code and message displayed take appropriate action to correct the problem. Generally it is a connection problem. Also make sure the latest version of **MDAC** (2.5 or later) is installed.

For more information, please see the [FAQ](#).

**Error E8103:** Cannot initialise ODBC interface.

**Fix:** Check that ODBC is correctly installed. You may need to re-install **MDAC** or a later version of it to correct the problem.

For more information, please see the [FAQ](#).

**Error E8104:** Failed to connect to database.

**Fix:** Make sure the database connection settings are correct (check spelling). Check server is on-line and reachable by using the database test utilities supplied. Check that the credentials specified are correct and allow remote connection.

For more information, please see the [FAQ](#).



**Error E8105:** Report creation failed. The error code is in the message.

**Fix:** Depending on the error code and message displayed you can get a good idea as to what went wrong.

If you have aborted the operation yourself this message is normal.

For more information, please see the [FAQ](#).

**Error E8106:** Failed to send e-mail by MAPI.

**Fix:** Check that a MAPI client is installed and configured as the default MAPI provider. Generally this would be your e-mail client. Make sure an account is set-up and correctly configured.

For more information, please see the [FAQ](#).

**Error E8107:** Failed to send e-mail by SMTP.

**Fix:** Check that the details of SMTP server entered are correct and that the server is on-line. Try pinging it from a command prompt or try sending an e-mail through it using your normal e-mail client. It is also possible that your credentials do not allow e-mail relaying or that the message does not satisfy the relay criteria defined by the administrator.

For more information, please see the [FAQ](#).

**Error E8108:** Failed to post message by NNTP.

**Fix:** Check that the details of NNTP server entered are correct and that the server is on-line. Try pinging it from a command prompt or try sending a message through it using your normal news client. It is also possible that your credentials do not allow news posting or that the message does not satisfy the post criteria defined by the administrator.

For more information, please see the [FAQ](#).

**Error E8109:** Failed to post message to the queue.

**Fix:** Check that the details of MSMQ server entered are correct and that the server is on-line. Try pinging it from a command prompt and check that the queue exists. It is also possible that your credentials do not allow posting to that queue or that server.

For more information, please see the [FAQ](#).

**Error E8110:** File upload failed.

**Fix:** Generally other errors displayed previously tell you what has gone wrong with the upload. If there are no other errors displayed, use the error code to diagnose what is amiss. Generally the transfer itself has failed (timeout/corruption); try again.

For more information, please see the [FAQ](#).

**Error E8111:** Unknown or undocumented error.

**Fix:** This is an unexpected error thus no further information is available.

For more information, please see the [FAQ](#).

**Error E8112:** Generic error.

**Fix:** This is an unexpected error thus no further information is available.

For more information, please see the [FAQ](#).



**Error E8113:** Not enough free disk space.

**Fix:** Clear up the drive on which the file is being created and make more free space available. Alternatively create the file on a different drive/partition.

For more information, please see the [FAQ](#).

**Error E8114:** Not enough free memory.

**Fix:** Close down as many applications as possible to give more memory to the application. Alternatively increase the swap file size or install more memory.

For more information, please see the [FAQ](#).

**Error E8115:** The operation has been aborted.

**Fix:** Nothing, you have aborted the operation yourself.

For more information, please see the [FAQ](#).

**Error E8116:** The operation has been aborted.

**Fix:** Nothing, you have aborted the operation yourself.

For more information, please see the [FAQ](#).

## **INFORMATION & DEFINITIONS**

## **CPU/Processor Information**

The processor (also called CPU – Central Processing Unit) is the heart or brain of the system, executing the software running on your PC.

**Performance Rating** - How fast a Pentium Classic processor must run to be as fast as your processor. This is useful when comparing different processors. Generally it is the score obtained by running WinStone (a system benchmark using real applications) on a test machine.

## FPU/Co-Processor Information

The co-processor (also called FPU – Floating Point Unit) is a special processor that does floating-point calculations directly, much faster than the processor would have done. While today this is integrated in the processor, in the past it was a separate chip that you had to buy if you used mathematical intensive programs/computations.

## CPU Clock Multiplier

This is the internal processor multiplier that governs the speed of the processor w.r.t. to FSB speed. The speed of the processor is simply the multiplier \* FSB speed (MHz).

To overclock, you can just increase the multiplier thus increasing the CPU's speed. However, most modern processors have locked/fixed multipliers; thus only increasing the FSB is the only option.



## Cache Memory

Fast but small memory used by the CPU or Chipset to hold recently accessed data and greatly speed up the system. Size varies between 1KB to 8MB, the more you have the better. Very important especially if a lot of system memory is installed.

**Internal Code/Data Cache** - Very fast but rather small memory built-in the processor that holds recently accessed data. Also called L1 cache. Some processors have separate code & data caches, others have a unified cache. The size varies between 1kB to 64kB. The bigger the better but depends on processor type so you can't add more. The L1 cache runs at processor speed.

**L2/L3 Cache** - Some processors have a second/third levels of cache, larger than the L1 cache (64kB to 2MB) but slower. The caches can either be built-in (thus running at processor speed) or on-board (thus running at a fraction of processor speed or even FSB speed).

## CPU Features Support

Modern processors support new features that allow increased performance in applications that specifically use the features in question. Here are the most important:

**MMX** is an extension to the x86 instruction set that allows multiple bytes of data to be packed together in a single register and operated on simultaneously. MMX consists of 57 new instructions for speeding multimedia tasks. The trick to these new instructions is that they operate on many different data elements at once, which increases the overall amount of work the processor can do. Examples range from operating on multiple pixels in a bitmapped image to multiple sound channels in an audio stream. MMX is not intrinsically a graphics or multimedia acceleration technology, but those are the types of applications that stand to benefit most. MMX will provide a substantial performance boost for some new applications that are coded to use MMX (more so for home rather than for business applications).

**3DNow! Technology** - this is a set of instructions added by AMD to speed-up 3D multimedia applications using the processor. Unlike MMX, it works with floating point data. Support is included in DirectX 6 and later.

**Enhanced 3DNow! Technology** - this is a set of instructions added by AMD to speed-up 3D multimedia applications using the processor. It adds further instructions to the original 3DNow! Support is included in DirectX 7 and later.

**SSE** is an extension to the MMX instruction set designed to accelerate software performance in application that use 3D graphics, 3D geometry, signal processing, simulation, video and 3D software rasterisation, video encoding/decoding (e.g. MPEG, MPEG2).

**SSE2** is a superset of SSE set of instructions added by Intel to speed-up multimedia applications by using SIMD (single instruction multiple data) type operation like multi-processor arrays. While SSE works with single float data, SSE2 works double float data.

Cooler/Heat Sink/Thermal Solution

## Chipset Information

The ancillary chips on the mainboard that complete the computer by connecting the processor(s), memory and the devices through various buses. Modern systems have integrated chipsets of only one or two (North-bridge and South-bridge) that supply all the required functionality; older designs may contain a multitude of chips to supply all the required functionality. The two are connected through the hub interface or by a PCI bus.

The **North-bridge** communicates with the processor(s) through the FSB and usually contains the memory controller(s), AGP controller and other high-speed bus interfaces (PCI-X, PCI-66).

The **South-bridge** usually contains the controllers, e.g. ATA/ATAPI, USB, FireWire/1394, SMBus, Network, etc.

## **Mainboard Information**

This is the primary board inside the system in which all the other components plug into (CPU, FPU, memory, cards, etc.) and also holds the Chipset, the on-board Controllers, any on-board Devices and their associated Buses.

## **Memory Controller Information**

The memory controller is the part of the chipset that manages the system memory. The cache controller interfaces between it and the CPU in order to speed-up the process.

## **Memory Banks Information**

Lists the memory installed, size and read/write speed in each logical banks on the mainboard. There are various RAM technologies, with RDRAM (Rambus DRAM) the fastest, SDRAM (Synchronous Dynamic RAM), BEDO (Burst EDO), EDO (Extended Data Out), FPM (Fast Page Mode) being the classic type.

Your chipset must specifically support that type of memory so check before you buy.

## Memory Modules Information

This information is displayed together with the settings for the logical/chipset memory settings. It identifies the critical parameters of new RIMM/DIMM/SIMMs that have a SPD (Serial Presence Detect) chip built-in. There are many conventions:

### • PC66/100 SDRAM Intel Specification - Version 1.0 to 1.2:

PCx-abc-defm (e.g. **PC100-322-622R**) where:

- x** - Speed rating (MHz). Memory bus speed should be equal/lower.
- a** - CAS latency (CL cycles). Lower the better (faster), but more expensive.
- b** - RAS to CAS delay (tRCD cycles). Lower the better.
- c** - Row precharge (tRP cycles). Lower the better.
- d** - Read data access time (tAC ns). Lower the better.
- e** - SPD chip revision. 2 corresponds to SPD 1.2.
- f** - Design revision. 2 corresponds to Rev 1.2.
- m** - R for registered DIMMS. 256MB and bigger modules need to be registered.

### • PC100/133+ SDRAM Extended Intel Specification - Version 1.2b+:

PCx-abc-ddeefm (e.g. **PC100-322-54122R**) where:

- x** - Speed rating (MHz). Memory bus speed should be equal/lower.
- a** - CAS latency (CL cycles). Lower the better (faster), but more expensive.
- b** - RAS to CAS delay (tRCD cycles). Lower the better.
- c** - Row precharge (tRP cycles). Lower the better.
- dd** - Read data access time (tAC ns). 54 corresponds to 5.4ns. Lower the better.
- ee** - SPD chip revision. 12 corresponds to SPD 1.2.
- f** - Design revision. The current is 2 corresponding to Rev 1.2.
- m** - R for registered DIMMS. 256MB and bigger modules need to be registered.

### • PC133+ H/E/VC/SDRAM IBM/VIA/Micron/NEC Specification - Version 2.0:

PCxm-abc-dde (e.g. **PC133U-222-452**, **PC133R-333-542**)

- x** - Speed rating (MHz). Memory bus speed should be equal/lower.
- m** - Module Type (R = Registered, U = Unbuffered, B = Buffered).
- a** - CAS latency (CL cycles). Lower the better (faster), but more expensive.
- b** - RAS to CAS delay (tRCD cycles). Lower the better.
- c** - Row precharge (tRP cycles). Lower the better.
- dd** - Read data access time (tAC ns). 54 corresponds to 5.4ns. Lower the better.
- e** - SPD chip revision. 2 corresponds to SPD 2.0.

### • PC1600+ DDR SDRAM Micron/Samsung/Hyundai Specification - Version 1.0:

PCxm-aabc-dde (e.g. **PC1600R-2533-750**)

- x** - Memory bandwidth (MB/s). Memory bus speed should be 1/16 or lower.
- m** - Module Type (R = Registered, U = Unbuffered, B = Buffered).
- aa** - CAS latency (CL cycles). Lower the better (faster), but more expensive.
- b** - RAS to CAS delay (tRCD cycles). Lower the better.
- c** - Row precharge (tRP cycles). Lower the better.
- dd** - Read data access time (tAC ns). 54 corresponds to 5.4ns. Lower the better.
- e** - SPD chip revision. 0 corresponds to SPD 1.0.

### • PC600+ RDRAM Rambus Specification - Version 1.0:



**xMB/a b c PCd-e** (e.g. **256MB/16 ECC PC800-45**)

**x** - Module size in Mbytes on the module.

**a** - Number of RDRAM devices on the module.

**b** - Error correcting support (e.g. ECC)

**c** - Reserved.

**d** - Speed (Mega data transfers per second, Mt/s). Memory bus speed should be 1/2 or lower.

**e** - Response Time (ns).

• **SDRAM/DDR read/write/CL latency specification:**

**a-b-bR c-d-d-dW e-f-g-hCL**

**a** - read page hit clocks for first item

**b** - read page hit clocks for follow-up items

**c** - write page hit clocks for first item

**d** - write page hit clocks for follow-up items

**e** - CL (CAS latency)

**f** - SDRAM tRCD (RAS to CAS delay)

**g** - SDRAM tRP (RAS precharge)

**h** - SDRAM tRAS (Active-to-Precharge Delay)

• **RDRAM read/write/CL latency specification:**

**a-b-b-bR c-d-d-dW e/fCL**

**a** - read page hit clocks for first item

**b** - read page hit clocks for follow-up items

**c** - write page hit clocks for first item

**d** - write page hit clocks for follow-up items

**e** - RDRAM tRCD (Row to Column delay)

**f** - RDRAM tCAC (Channel to Channel delay)

## **Hub Interface**

Also known as the I/O controller hub, this is the interface between modern North Bridge and the South Bridge that provides I/O access to the rest of the system. While older designs used the standard PCI bridge to connect the two, the hub interface ensures that the I/O sub-system, both PCI and integrated controllers receive adequate bandwidth for peak performance.

## **Environment/Hardware Monitor Information**

This is a chip designed to help manage the system by monitoring critical system parameters, diagnose the system, report errors and signal other devices to recover from critical states.

Usually such a chip monitors the temperatures, fan speeds, voltages and electrical drawn currents in the system and alerts the user/etc. of out-of-range errors and thus preventing system/data damage.

### **System Clock Generator (PLL IC) Information**

Also known as the timing generator, this chip provides the base timing (aka frequency clock) as well as customised timing for all the on-board devices, including CPU, Chipset, Controllers, etc. Modern versions can be programmed to change the timing and thus change the frequency the devices run at.

## **APIC Information**

This device provides multi-processor interrupt management as well as interrupt distribution across processors. In a uni-processor system, the APIC's dedicated bus reduces latencies compared with the standard PIC. The APIC communicates with the CPU's local APIC through a dedicated APIC or IMB bus.

## **SMBus, BMBus, i2c Controller Information**

The SMBus, BMBus and i2c controllers provide a simple, slow, serial bus (10-100kHz) for devices on the mainboard to communicate with each other as well as with the system itself. Generally environment monitor chips, memory modules EEPROM and other EEPROM devices use this bus.

## **PC Card/CardBus/PCMCIA Controller Information**

The PCMCIA (16-bit) or CardBus (32-bit) controllers provide an automatically configurable high-speed bus for connecting high-speed devices to laptops including network adapters, modems and other controllers like USB or FireWire.

## **Firewire/1394 Controller Information**

The Firewire/1394 controller provides a fast serial bus (400MHz) that allows a fast, automatically configurable, data link between your system and other high-speed devices like digital camcorders, storage devices and even other systems.

While most controllers offer a limited number of ports (2 or 3) by using a hub, many more devices can be connected, although the bandwidth is be shared by all the devices on a port.



## **USB Controller Information**

The USB controller provides a medium (USB 1.x – 24/48MHz) or fast (USB 2.x – 480MHz), automatically configurable, data link between your system and most type of peripherals like keyboards, mice, printers, scanners, digital cameras, etc.

This bus has eliminated the need for different buses (serial, parallel, X-bus, SCSI) and connectors (serial, parallel, PS/2, external SCSI) that plagued legacy systems.

While most controllers offer a limited number of ports (2 or 3) by using a hub, many more devices can be connected, although the bandwidth is be shared by all the devices on a port. Modern computers generally include multiple USB controllers as well thus offering many ports.

## **LPC Legacy Controller Information**

ISA (Industry Standard Architecture) is the original bus used in the 1st PC. It started with 8-bits at 8MHz, moving to 16-bit at 8-9MHz with the 286 processor. Even today it is still present in PCs to cater for modems, sound cards, I/O boards, etc. PC99 specification calls for the ISA bus to be absent from systems.

## **LPC Hub Controller Information**

Also known as the Super I/O controller, this provides a higher performance ISA/X-Bus that is compatible with existing devices. It usually includes all the legacy interfaces, e.g. keyboard controller, floppy disk controller, serial/parallel ports controllers, power management controller and possibly a built-in environment monitor.

## VESA Bus Information

VESA (Video Electronics Standards Association) was an extension to ISA using 32-bits and variable speed - same as the processor speed - closely coupled to the 486 architecture. While it was very fast, only 2-3 cards could be plugged-in at lower speeds. Superseded by PCI.

**VESA Speed** - the actual speed of the VESA bus. The standard is the same as FSB.

## MCA Bus Information

MCA (Micro Channel Architecture) was supposed to be the successor to ISA as designed by IBM and used in the PS/2 range of PCs. 32-bit, with arbitration and burst mode like EISA but not compatible with ISA at all. However it did not catch on with other PC manufacturers and was superseded by PCI.

## **PCI Bus Information**

PCI (Peripheral Component Interconnect) is a local bus capable of self-arbitration. Current versions (2.XX) are 32-bit at 33MHz with 64-bit 66MHz and faster available.

## **AGP Bus Information**

AGP (Advanced Graphics Port) is an extension to PCI (though not slot compatible) allowing graphic adapters to use system memory, as well as being faster at 66MHz and above. Using 2x, 4x or 8x data rates, even more throughput is possible (133 & 266 data transfer rate respectively). With DIME, graphics cards can texture from AGP memory using textures much larger than would fit in local video memory.

## **Buses Information**

A bus is a set of wires (lines on boards, etc.) that allow devices to communicate. Generally this is done in parallel fashion to make the exchange of bytes faster. Modern systems have many buses that connect the various chips and devices together as well as providing data links to peripherals.



## FSB (Front-Side Bus)

The FSB is the connection between the processor(s) and the chipset. The data rate (i.e. the amount of data transferred) may be higher than the actual speed.

To overclock, the FSB can be increased, thus increasing the CPU speed; however, increasing FSB speed may result in increased speed of other devices that may not work at the increased speed.

## **PCI-X Bus Information**

PCI-X is a new, faster version of the PCI Bus with 64-bit data width running at 133MHz for much faster data transfer.

## BIOS Information

The BIOS (Basic Input Output System) contains the start-up code that initialises and starts your PC. It also serves as an interface between hardware and software.

## Plug & Play Information

Plug & Play is a resource management interface that allows automatic configuration of add-in cards to avoid resource conflicts. Some buses like PCI, PCMCIA, EISA take care of this themselves so Plug & Play must act as a liaison between them.

## SMBIOS / DMI

SM (System Management) or Desktop Management Interface (DMI) is an interface through which software can obtain very detailed asset/system information either from local or remote workstations.

## LIST OF MODULES

## System Summary

Shows a summary of all your system's characteristics and status. This is useful when you want to see at a glance the main features of the system. You can find detailed information elsewhere.

- Computer Type, Description
- CPUs
- BIOS
- System Bus Types
- Memory Installed
- Monitor & Video Adapter(s) Installed
- Sound Card Installed
- Communication device(s) Installed
- Floppy Disks, Hard Disks, CD-ROM/DVD & other drives
- Ports (serial/parallel/USB)
- Input Devices - Keyboard, Mouse, Game controller(s)
- Windows & legacy DOS
- Network(s) Support
  
- **Command Line Switch:** SummaryInfo
- **Requirements:** See elsewhere
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

See the following topics for explanations:

- [Communication Devices Information](#)
- [Computer \(CPU/Bus/BIOS/Chipset\) Information](#)
- [Drives Information](#)
- [Joystick Information](#)
- [Keyboard Information](#)
- [Mainboard Information](#)
- [Mouse Information](#)
- [Network Information](#)
- [PCI & AGP Buses & Devices Information](#)
- [Ports \(Serial/Parallel\) Information](#)
- [Printers Information](#)
- [Sound Devices \(Sound Card\) Information](#)
- [Video System Information](#)
- [Windows & DOS OS Information](#)
- [Windows Memory Information](#)
  
- [List of Acronyms](#)

## Options

- Include DMI/SMBIOS Information** - query the DMI/SMBIOS hive of the system.
- Include System Bus(es) Information** - query the buses on the system.
- Include Peripherals Information** - query the attached peripherals.
- Include Drive(s) Information** - query the attached drives and controllers.
- Include Operating System(s) Information** - query the operating systems installed.

**Include Network Information** - query the attached networks.

**Include BIOS Information** - query the BIOS of the system.

**Include Chipset Information** - query the system chipset.

**Include CPU(s) MSR(s) Information** - query the CPU by accessing its MSRs.

**Include CPU(s) EEPROM(s) Information** - query the CPU by accessing its EEPROMs.

**Ignore Disabled Hosts** - if disabled, attempt to enable the controllers.

**Detect Bus Multiplexors** - if enabled, attempt to detect and enable any bus multiplexors.

**Include IRQ APIC Information** - query the system APIC if present (SMP generally).

**Include X-Bus Information** - detect legacy X-Bus through LPC.

**Use bridges by PCI-to-PCI bridge configuration** - get no/type of busses through bridges; otherwise get through OS.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List



## Mainboard Information

Shows detailed information about the following devices and general characteristics:

- System information
  - Chassis information
  - Mainboard information
  - Multi-processor information
  - Chipset information
  - Memory controller(s) & banks information
  - Memory modules information
  - Buses information
  - Expansion slots & ports information
  - System health & monitoring information
  - System clock information
- **Command Line Switch:** MBIInfo
  - **Requirements:** Modern BIOS (SMBIOS/DMI 2.0+)
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

Please see individual tips for explanations.

See [List of Acronyms](#) for more information.

### Options

**Include System Information** - show information about the whole system.

**Include Chassis Information** - show information about the system's chassis.

**Include Main board Information** - show information about the installed main board.

**Include Memory Controller Information** - query the memory controller of the system.

**Include Chipset Information** - query the system chipset.

**Include Memory Slots Information** - query the memory slots and show what's installed in them.

**Include System Bus(es) Information** - query the buses on the system.

**Include DMI/SMBIOS Information** - query the DMI/SMBIOS hive of the system.

**Include Expansion Slots Information** - query the expansion slots and show what's installed in them.

**Include Port Connectors Information** - query what ports the main board has.

**Include On-Board Devices Information** - query what on-board devices are installed.

**Include Temps, Fans and Voltages Information** - query the environment monitor for temperature, cooling and voltage sensors.

**Include CPU(s) MSR(s) Information** - query the CPU by accessing its MSRs.

**Include Memory Module SPD Information** - query the memory modules by accessing their EEPROM SPD.

**Include CPU(s) EEPROM(s) Information** - query the CPU by accessing its EEPROMs.

**Use temperature compensation for external sensors** - add temperature compensation for the external temperature sensors.

**Include PLL IC Information** - query the Programmable Clock Generator of the main board.

**Ignore Unknown PLL IC** - do not query PLL IC if it is not supported.

**Auto-detect PLL IC** - attempt to detect what PLL IC is installed.

**Enable Disabled HW Monitors** - enable the environment monitors if they are not enabled.

**Ignore Disabled Hosts** - if disabled, attempt to enable the controllers.

**Detect Bus Multiplexors** - if enabled, attempt to detect and enable any bus multiplexors.

**Include IRQ APIC Information** - query the system APIC if enabled.

**Include X-Bus LPC Information** - detect the legacy X-Bus and legacy LPC.

**Include (S)MP Information** - show MP system information (MP systems).

**Use bridges by PCI-to-PCI bridge configuration** - get no/type of busses through bridges; otherwise get through OS.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List

## CPU, FPU, caches and BIOS Information

Shows detailed information about the following devices and general characteristics:

- System BIOS Information
- BIOS Properties
- CPU/FPU Information & Performance Rating(s)
- CPU Upgrading Information
- CPU Settings
- CPU Health Monitoring
  
- **Command Line Switch:** CPUInfo
- **Requirements:** Modern BIOS, CPU, Bus
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

Please see individual tips for explanations.

See [List of Acronyms](#) for more information.

### Options

**Include DMI/SMBIOS Information** - query the DMI/SMBIOS hive of the system.

**Include System BIOS Information** - query the BIOS of the system.

**Include System BIOS Properties Information** - show the characteristics of the BIOS.

**Include CPU Information** - show information about the CPU model.

**Include CPU Socket Information** - show upgrading information, i.e. about the CPU Socket.

**Include CPU Feature Flags Information** - show the features supported by the CPU.

**Include Temps, Fans and Voltages Information** - query the environment monitor for temperature, cooling and voltage sensors.

**Include CPU(s) MSR(s) Information** - query the CPU by accessing its MSRs.

**Include Advanced CPU Information** - show specific CPU status/settings.

**Include CPU(s) EEPROM(s) Information** - query the CPU by accessing its EEPROMs.

**Use temperature compensation for external sensors** - add temperature compensation for the external temperature sensors.

**Include CPU Serial Number Information** - show the CPU's serial numbers.

**Include System Bus(es) Information** - query the buses on the system.

**Include CPU Micro-Code Information** - show CPU micro-code properties.

**Enable Disabled HW Monitors** - enable the environment monitors if they are not enabled.

**Ignore Disabled Hosts** - if disabled, attempt to enable the controllers.

**Detect Bus Multiplexors** - if enabled, attempt to detect and enable any bus multiplexors.

**Include CPU MTRR Information** - show memory type range registers settings.

**Include CPU PAT Information** - show page attribute table settings.

**Use bridges by PCI-to-PCI bridge configuration** - get no/type of busses through bridges; otherwise get through OS.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)



## Video System Information

Shows detailed information about the monitor/LCD, video adapter(s) and video drivers installed in the system:

- Monitor/LCD Information, Characteristics
  - Monitor/LCD established/programmed Timings
  - Video Adapter Characteristics
  - Video Driver Information
  - Video BIOS Information
  - VESA Video BIOS & VESA Extensions Information
  - Video Device Characteristics
- 
- **Command Line Switch:** VideoInfo
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**Monitor Name** - the type and make of your monitor if known.

**Maximum Resolution** - the maximum resolution supported by your monitor. Usually you use a lower resolution since the very top one has low refresh rate.

**Horizontal Scan Range** - the horizontal scan range in kHz. It is dependent on horizontal scan range and resolution.

**Vertical Refresh Range** - or the refresh in Hz is the range of the number of times the screen can be repainted in one second - typically stated at a low resolution, not the top one. Higher numbers are better.

**DPMS Energy Star Support** - indicates whether your monitor can go to sleep mode, i.e. reduce its power. VESA DPMS (Display Power Management Signalling) is an interface through which the video adapter can power down the monitor.

**Energy Star** - is a programme administered by U. S. EPA (Environmental Protection Agency) to reduce the power consumed by computers and peripherals.

**Video Adapter** - the name and make of the video adapter if known.

**Total Memory** - the amount of memory installed on the video adapter.

**Video Memory** - the amount of local (on the card) memory installed.

**AGP Memory** - if the adapter supports AGP, the amount of system memory allocated to AGP. This depends on the size of the system memory.

**DIME Support** - DIME (Direct Memory Execution) AGP cards can texture directly from AGP memory. Otherwise textures must either be stored in local memory or copied using DMA or PIO from system memory to local memory when texturing is to be done.

**Hardware Revision** - the silicon revision of the chipset on the video adapter.

**VESA/DDC Support** - indicates whether the video driver/adapter supports VESA DDC (Display Data Channel) which is an interface through which the video adapter can communicate with the monitor to optimise video parameters.

**Current Video Mode** - the current resolution and colour depth of the display.

**Vertical Refresh Rate** - the number of times the screen is painted every second. This number should be over 70Hz if you don't want to see flickering or over 85Hz if you're using a high resolution.

If you're using a flat-panel (LCD) display, the refresh rate is not relevant anymore and 60Hz is good enough, although high-performance LCDs support 75Hz or more.

**Supported Refresh Rates** - the list of supported refresh rates at this resolution. Flat-panel (LCD) displays may support only one refresh rate.

**Video Driver ID** - the file name of the video driver.

**Video Driver Version** - the version of the video driver.

**Supported Windows Version** - the version of Windows the driver was designed for. For Windows 9X/Me/NT4 this should be **4.0**. For Windows 2000, XP, 2003 this should be **5.0**.

**Plug & Play Video Driver** - indicates whether the driver is plug & play compliant. Nowadays all drivers should support plug & play.

**Video Acceleration** - indicates the amount of acceleration you want out of the video adapter. Full acceleration is the fastest and recommended for most computers. If you're having trouble with the video and you suspect the video driver/adapter reduce the acceleration until the problems disappear.

**Screen Saver Active** - indicates whether the screen saver is set-up.

**Screen Saver Time-out** - indicates the amount of idle time after which the screen saver will become active.

**Supported Video Modes** - list of all video modes, colour depths and refresh rates supported by your adapter. High performance display adapters support many video modes. Flat-panel (LCD) displays may support only one native video mode - although lower resolutions may still be used.

**Video BIOS** - the BIOS (Basic Input Output System) contains the start-up code that initialises and starts your video adapter. It also serves as an interface between hardware and software.

**Video BIOS Manufacturer** - company that wrote the BIOS code.

**Video BIOS Date** - the date the BIOS was released.

**Video BIOS Version** - the software version of the BIOS.

**VESA BIOS** - is a generic interface through which software can communicate with the video adapter. Most modern cards have this capability, which was very important in DOS days of high-resolution games, but it is not required in Windows. Sandra cannot detect VESA versions released **after** this release of Sandra. Update your copy of Sandra if this happens.

**Version** - the version of the standard the interface supports. Most cards should support version 2.00 although new cards come with the latest 3.00.

**Manufacturer** - company that wrote the VESA BIOS code.

**Video Adapter** - the name of the video adapter.

**Adapter Version** - the version of the video adapter.

**VESA OEM BIOS** - the company that wrote the original VESA BIOS code.

**VESA OEM Version** - the version of the BIOS code.

**Total Video Memory** - the video memory available for VESA use in MB.

**Video Mode** - the current hardware video mode in hexadecimal.

**Linear Frame Buffer Address** - the linear frame buffer is the address at which the video adapter's memory is mapped in the processor's 32/64-bit address space. Cards that support LFB (Linear Frame Buffer) are much faster since the memory is accessed in 32/64-bit.

**8-bit Mode DAC** - the DAC (Digital to Analogue Converter) supports 8-bit modes.

**VGA Compatible** - indicates whether the card is hardware VGA compatible. Since the boot-up modes, DOS modes, etc. are VGA all cards should be compatible.

**VESA Video Modes** - list of all VESA video modes (in hexadecimal), resolutions, colour depths and memory needed supported by the video adapter through the VESA BIOS interface.

**DirectX** - DirectX is a video support library from Microsoft that caters especially for multi-media applications and games, including 3D, sound, music, input and multi-player capability.

**DirectX- DirectDraw Support** - indicates the version of DirectDraw display driver interface. DirectDraw is a Windows software interface that allows programs to take control of the display directly, bypassing the GUI. This is important for multi-media games and full-motion video.

**DirectX Direct3D Support** - indicates the version of the Direct3D display drivers interface. Direct3D is a set of libraries that handle 3D rendering for games and other multi-media applications.

**OpenGL Support** - indicates the version of the OpenGL libraries. OpenGL is a set of standard multi-platform software libraries offering sophisticated 3D rendering. Can be used on a SGI, PC, MAC, etc. unlike DirectX.

**Animation Effects** - indicates whether window animation is on.

**Full Windows Drag** - indicates whether while moving/resizing a window the contents of the window is updated in real-time.

**Font Smoothing** - indicates whether screen fonts will be anti-aliased. This method reduces font *jaggies* and makes the display look better but reduces performance.

**Video Device Mode** - various characteristics of the video mode that are self-explanatory.

**Video Capabilities** - lists the various functions the video adapter/driver support natively. Windows will emulate functions not supported. Very fast video adapters implement most of the listed capabilities and, generally, this is why there can be a large difference between two adapters even if the same chipset is used. The video driver can be more important than the chipset itself!

**Video Clipping Capabilities** - lists the clipping capabilities of the video adapter.

**Video Raster Capabilities** - lists the drawing capabilities of the video adapter.

**Video Curve Capabilities** - lists the curve drawing capabilities of the video adapter.

**Video Line Capabilities** - lists the line drawing capabilities of the video adapter.

**Video Polygonal Capabilities** - lists the polygon/triangle capabilities of the video adapter.

**Video Text Capabilities** - lists the text drawing capabilities of the video adapter.

See [List of Acronyms](#) for more information.

## **Options**

**Include Monitor(s) Information** - show information about the monitors.

**Include Video Adapter(s) Information** - show information about the video adapters.

**Include Video Driver Information** - query the video driver.

**Include Supported Video Modes Information** - list the modes supported.

**Include Video BIOS Information** - query the video BIOS of the adapter.

**Include VESA BIOS Information** - query the VESA interface of the BIOS.

**Include Special Capabilities Information** - show the advanced capabilities of the driver.

**Include Video Device Information** - query the video device.

**Include Video Device Capabilities Information** - show the capabilities of the device.

**Include DirectX Information** - query the DirectX video interface.

**Include Temps, Fans and Voltages Information** - query the video environment monitor for temperature, cooling and voltage sensors.

**Use temperature compensation for external sensors** - add temperature compensation for the external temperature sensors.

**Enable Disabled HW Monitors** - enable the environment monitors if they are not enabled.

**Ignore Disabled Hosts** - if disabled, attempt to enable the controllers.

**Use bridges by PCI-to-PCI bridge configuration** - get no/type of busses through bridges; otherwise get through OS.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

[Tips \(Performance\) List](#)

## Printer & Fax Information

Shows detailed information about the printer(s) and fax device(s) available to this system either local or remote:

- Printer Information
  - Printer Settings
  - Printer Driver Support
  - Printer Driver Settings
  - Printer Device Characteristics
- 
- **Command Line Switch:** PrinterInfo
  - **Requirements:** Printer or Fax & drivers installed
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**Printer Name** - the type and make of the printer.

**Printer Status** - the status of the printer. The printer can be **idle**, **printing** documents or in an **error** mode. The error type is specified if known.

**Printer Type** - the printer can be either local or remote (i.e. on a network).

**Shared As** - the name of the shared resource that represents this printer.

**Port** - the port the printer is connected to.

**Comments** - user defined comments for this printer.

**Print Processor** - the print engine that the printer driver uses. Generally it is Windows but there are other specialised print processors, especially on a network.

**Data Type** - the format in which printing information is stored on your disk. Generally **EMF** (Enhanced Metafile Format) is faster as it is smaller and is printer independent. **RAW** format is printer specific and takes more space but some printers (e.g. faxes) cannot use EMF.

**Default Printer** - indicates whether this is the default printer.

**Shared Printer** - indicates whether this printer can be shared with other users on a network.

**Spooler Priority** - the process priority of the print spooler. **Maximum** prints faster but the machine becomes very slow since most time is spent printing. The default is **minimum**.

**Driver Version** - the version of the printer driver.

**Supported Windows Version** - the version of Windows the driver was designed for. For Windows 9X/Me/NT4 this should be **4.0** and **5.0** for Windows 2000, XP, 2003.

**Print Driver ID** - the filename of the print driver.

**Printer Driver Version** - the file version of the print driver.

**Print Technology** - the technology used by the printer. Most printers are **raster** printers (i.e. deal with dots) - only plotters use **vector**-printing technology.

**Printer Mode** - the resolution in dpi (dots per inch) and monochrome/colour depth.

**Print Quality** - the print quality either as a term (e.g. Draft, Proof) or specified in dpi.

**Paper Size** - the paper type used and its dimensions.

**Page Orientation** - can either be portrait or landscape.

**Paper Source** - the bin used for printing.

**ICM Colour Matching** - the system used to optimise the printing of colours or grey scales.

**True Type Font Support** - specifies whether the printer can download the fonts (i.e. the printer does the rendering) or print them as graphics (i.e. rendered by the computer).

**Printer Bins** - the list of paper bins supported by the printer.



**Paper Types** - the list of paper types and dimensions supported by the printer.

**Printer Modes** - the list of supported printer resolutions and monochrome/colour depths.

**Printer Device Mode** - various characteristics of the video mode that are self-explanatory.

**Printer Capabilities** - lists the various functions the printer supports natively. Windows will emulate functions not supported. Very fast printers implement most of the listed capabilities and, generally, this is why there can be a large difference between two printers even if the same hardware is used. The printer driver can be more important than the hardware itself!

**Printer Clipping Capabilities** - lists the clipping capabilities of the printer.

**Printer Raster Capabilities** - lists the drawing capabilities of the printer.

**Printer Curve Capabilities** - lists the curve drawing capabilities of the printer.

**Printer Line Capabilities** - lists the line drawing capabilities of the printer.

**Printer Polygonal Capabilities** - lists the polygon/triangle capabilities of the printer.

**Printer Text Capabilities** - lists the text drawing capabilities of the printer.

**Printer Drive Escapes** - lists the specialised functions the printer driver supports.

See [List of Acronyms](#) for more information.

## Options

**Include General Printer/Fax Information** - show the basic device information.

**Include Printer/Fax Driver Information** - query the driver for information.

**Include Printer/Fax Device Information** - query the device for information.

**Include Printer/Fax Device Capabilities Information** - show the device capabilities.

**Include Paper Bins Information** - show the installed paper bins.

**Include Paper Types Information** - show the supported paper types.

**Include Print Modes Information** - list the modes supported.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## WinSock (Internet) Information

Shows detailed information about the Windows Sockets Interface that connects your computer to the Internet via various protocols:

- WinSock Library Information
- Local Host Information
- Network Services Information
  
- **Command Line Switch:** WinSockInfo
- **Requirements:** Internet connection, WinSock v2
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**32/64-bit WinSock Library** - Windows 32/64 programs use a 32/64-bit version of the library that is faster and offers more functions.

**16-bit WinSock Library** - the 16-bit version is used by legacy programs, e.g. Windows 3.1x programs.

**Version Required** - the version required by most popular Internet programs. Your library should support at least version 2.0.

**Highest Version** - the highest version supported by the library. The latest version is 2.02 that adds various new functions and improvements.

**Description** - the name and version of the WinSock library.

**System Status** - the current status of the library.

**Maximum Sockets** - the maximum number of sockets a process can use. This is roughly the number of connections that can be made at any one time.

**Maximum UDP datagram size** - the maximum size (in KB) of a packet that can be sent by UDP. UDP is a connectionless protocol (resembling the postal service) through which applications can transmit messages.

**Host Name** - the fully qualified name (including domain) of your computer.

**IP Address(es)** - list of IP addresses used by your computer.

**IPX Address(es)** - list of the hardware (MAC) addresses of your computer.

**Services Information** - list of services, including name, port and protocol used. Services include FTP, TELNET, HTTP (web) and many others. You can find a complete list and descriptions in any TCP/IP book.

See [List of Acronyms](#) for more information.

### Options

**Include 32/64-bit WinSock Library Information** - query the 32/64-bit WinSock library.

**Include 16-bit WinSock Library Information** - query the 16-bit WinSock library.

**Include Local Host Information** - query the local host.

**Include Network Services Information** - query the active IP services running.

**Include SNMP Information** - attempt to query information by SNMP.

**Include Network Adapter(s) Information** - list network adapters details.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

Tips (Performance) List

## Game Controllers Information

Shows detailed information about the game controller(s) connected to the system and the driver software:

- Game Controller Driver Characteristics
- Game Controller General Characteristics
- Game Controller Current Status Information
- Game Controller Calibration Settings
  
- **Command Line Switch:** JoystickInfo
- **Requirements:** Joystick, game-pad, game port and joystick driver
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Name** - the name and make of the game controller.

**Manufacturer** - the manufacturer of the game controller driver.

**Driver ID** - the filename of the joystick driver.

**Support** - the maximum number of game controllers supported by the driver.

**Buttons** - the number of buttons on the game controller.

**Z-Coordinate** - the game controller supports depth.

**Rudder** - the game controller supports rudder style use.

**U-Coordinate** - the game controller supports U-axis.

**V-Coordinate** - the game controller supports V-axis.

**Point-Of-View** - the game controller supports point-of-view hat or mode.

**Continuous Degree Bearings** - the game controller supports rotation.

**State** - specifies whether the device is plugged-in or not.

**Min/Max X-Position** - the range of values possible for X-axis.

**Min/Max Y-Position** - the range of values possible for Y-axis.

**Min/Max Polling Interval** - the range of time intervals the device can be polled at. This determines the responsiveness of the controller.

### Options

**Include Game Controller Driver Information** - query the controller driver.

**Include Game Controller Device Information** - query the game device.

**Include Game Controller Status Information** - query for the status of the device.

**Include Calibration Information** - show the calibration device settings.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)

## Sound Card Information

Shows detailed information about the sound card installed, and the various sound drivers installed:

- Wave Devices - Recording and Playback
- MIDI Devices - Control (input/output) and Playback
- Mixer Devices
- Auxiliary Devices
  
- **Command Line Switch:** SoundInfo
- **Requirements:** Sound card, multi-media drivers installed
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Wave Devices** - are the digital audio devices present in your system. They are used for voice playback and special effects in games.

**MIDI Devices** - are the music devices present in your system. MIDI is an interface allowing the connection of various musical devices for playback or recording purposes.

**Mixer/Auxiliary Devices** - are mixer channels that handle the mixing of the audio, MIDI, Video, line-in, line-out, CD, microphone, etc. devices.

**Name** - the name of the device. Sandra cannot (sometimes) detect devices released **after** this release of Sandra! Update your copy of Sandra.

**Manufacturer** - the name of the company that wrote the driver for the device.

**Version** - the version of the device driver.

**Product ID** - the unique ID number assigned to this device.

**Sampling Bits** - the maximum number of sampling bits used for playback or recording. Current devices use 16-bits which convey higher quality music than older 8-bit devices.

**Sampling Rate** - the maximum sampling rate supported by the device in kHz. This is the number of times the sound is sampled in one second. Latest devices can sample at 44.1kHz.

**Channels** - the number of supported channels.

**MIDI Device Type** - the type of MIDI device the device implements, generally the type of synthesiser implemented.

**Auxiliary Device Type** - the type of input/output device this mixer channel deals with.

**Voices** - the maximum number of voices that can play at any one time.

**Notes** - the maximum number of notes that can play at any one time.

**Device Capabilities** - lists the various functions the device supports. This depends on the type of device. A device does not need to support all the functions, some are not required. The performance has nothing to do with the number of functions supported - only usability is affected.

See [List of Acronyms](#) for more information.

### Options

**Include Device Capabilities Information** - show the capabilities of the sound device.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

## Tips (Performance) List

## Mouse Information

Shows detailed information about the mouse input device and drivers installed:

- Mouse Information
  - Mouse Driver Information
  - Configuration Settings
  - Windows for Pens Support
  - Accessibility Features
- 
- **Command Line Switch:** MouseInfo
  - **Requirements:** Mouse or pen present
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win64) Support:** Windows XP/2003

## Explanations

**Name** - the type and make of the mouse.

**Buttons** - the number of buttons the mouse has and is supported by the mouse driver.

**Type** - the way the mouse is connected to the PC. Most mice today are PS/2 type, but there are also USB, Serial and Bus mice.

**Port** - the port the mouse is connected to.

**Interrupt** - if the mouse requires a specific interrupt, the number of the hardware interrupt used by the mouse.

**COM Port Address** - if the mouse is connected through a serial (COM) port, the hardware address of the I/O ports used by the serial port.

**Plug & Play Version** - the version of plug & play the mouse supports.

**Driver ID** - the filename of the mouse driver.

**Version** - the version of the mouse driver.

**DOS Version** - if a DOS (real-mode) mouse driver is installed, the version of the DOS mouse driver.

**Pen Windows** - specifies whether the mouse driver supports pen input.

**Button Configuration** - specifies whether the user uses the mouse with the right or the left hand.

**Pointer Trails** - specifies whether the pointer trails are active. Pointer trails improve mouse pointer visibility on laptop displays.

**Tracking Speed** - the index of tracking speed.

**X/Y Threshold** - the X/Y-axis movement threshold, i.e. no. of units of movement that the mouse must be moved in order to register a movement.

**Double Click Speed** - the maximum time between 2 mouse clicks that are taken to represent a double-click instead of 2 separate clicks.

**Accessibility Features** - various settings used to make Windows more accessible for disabled users. Must be installed and configured specifically.

See [List of Acronyms](#) for more information.

## Options

**Include Accessibilities Features Information** - query the accessibility features driver.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

Tips (Performance) List



## Keyboard Information

Shows detailed information about the keyboard input device and drivers installed:

- Keyboard Information
  - Keyboard Driver Information
  - Configuration Settings
  - Accessibility Features
- 
- **Command Line Switch:** KeyboardInfo
  - **Requirements:** Keyboard present
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**Type** - the name and type of the keyboard.

**Type/Sub Type** - the hardware type and sub-type assigned to this type of keyboard.

**Function Keys** - the number of function keys available on the keyboard. Modern keyboards have 12 function keys, F1 to F12.

**Intercept Support** - whether the keyboard controller supports a special function used to change various settings.

**Get/Set Typematic Rate** - an enhanced functionality of some keyboards. This enables you to modify the Repeat Speed and Repeat Delay. These two variables can be changed usually from the BIOS.

**Keyboard Controller** - the controller built-in your keyboard. Usually this is an Intel 8042 or compatible. However, some keyboards may have different controllers that support different functions.

**Layout ID** - the ID number assigned to this keyboard layout.

**Layout Type** - the country this keyboard was designed for.

**Driver ID** - the filename of the keyboard driver.

**Version** - the version of the keyboard driver.

**DOS Version** - if a DOS (real-mode) keyboard driver is installed, the version of the DOS keyboard driver.

**Code Page** - the code page the keyboard uses. Code pages specify characters used by different countries.

**Repeat Delay** - shows how long the computers waits after you press and hold down a key. For example 2 is a medium repeat delay (nearly the default) while 0 is fast, i.e. the computer will not wait at all.

**Repeat Speed** - shows how fast a key repeats when you press and hold it down. Roughly it means characters/second. For example 16 is a medium repeat speed; 22 is fast where 9 is slow

**Accessibility Features** - various settings used to make Windows more accessible for disabled users. Must be installed and configured specifically.

See [List of Acronyms](#) for more information.

### Options

**Include Accessibilities Features Information** - query the accessibility features driver.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)



## Media Control Devices (MCI) Information

Shows detailed information about the Media Control Devices installed in your system:

- AVI, MPEG, VideoCD, Motion Video
  - Animation
  - Video Cassette Recorder (VCR)
  - Laser Disc
  - Wave Audio
  - MIDI Sequencers
  - CD Audio
- **Command Line Switch:** MCInfo
  - **Requirements:** Multimedia drivers installed
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**MCI** - Media Control Devices are device drivers that handle various aspects of the Windows system by providing a simple generic interface that lets you play multimedia files (audio, video, animation, MIDI, etc.). Sandra cannot (sometimes) detect devices released **after** this release of Sandra! Update your copy of Sandra if this happens.

**Name** - the name and make of the device.

**Type** - the type of device.

**Alias** - the shortened name that uniquely identifies this device.

**Full Name** - the complete name and interface type of this device.

**Driver ID** - the file name of the device driver.

**Version** - the version of the device driver.

**Device Capabilities** - lists the various generic functions the device supports. This depends on the type of device. A device does not need to support all the functions, some are not required. The performance has nothing to do with the number of functions supported - only usability is affected.

**Specific Device Capabilities** - lists the various specific functions the device supports. This depends on the type of device. A device does not need to support all the functions, some are not required. The performance has nothing to do with the number of functions supported - only usability is affected.

See [List of Acronyms](#) for more information.

### Options

**Include Device Capabilities Information** - show the capabilities of the MCI device.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)

## Advanced Power Management (ACPI & APM) Information

Shows detailed information about the ACPI & APM interfaces and drivers installed:

- ACPI Interface Information
  - APM Interface Information
  - Power Status
  - Battery Status
  - System Status
- 
- **Command Line Switch:** APMInfo
  - **Requirements:** APM/ACPI BIOS, APM/ACPI support enabled
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**ACPI** - The Advanced Configuration and Power Interface (ACPI) specification is the key element in Operating System Directed Power Management (OSPM). OSPM and ACPI both apply to all classes of computers, explicitly including desktop, mobile, home, and server machines. ACPI evolves the existing motherboard configuration interfaces to support these advanced architectures in a more robust, and potentially more efficient manner.

Generally if ACPI enabled, APM should be disabled as it may interfere with normal ACPI operation.

**ACPI Version** - the version of the ACPI BIOS interface. Latest version is 1.00.

**ACPI Manufacturer** - the company that wrote the ACPI BIOS interface.

**APM** - Advanced Power Management is a system which manages the power of your PC. Usually this means the power of batteries for notebooks although it is also used in desktop computers. By turning off some devices (e.g. power down monitor, stop hard disk rotation, reduce CPU frequency, etc.) the power consumption is reduced thus increasing the life of the batteries. Also, in the case of monitors the life of the tube is also increased.

**APM Version** - the version of the APM BIOS interface. Latest version is 1.02.

**Program Support** - whether the APM interface supports 16-bit and/or 32/64-bit protected mode software or just real mode.

**APM Status** - whether the APM is currently operational or it has been disabled.

**AC Line Status** - the status of the power connection to your PC. It can be On-line, i.e. powered by the mains or Off-line, i.e. powered by batteries.

**Battery Status** - whether a battery is currently plugged-in and if so whether it is charging.

**Battery Life** - the percentage of the full capacity that is still available.

**Battery Remaining Time** - an estimation of the time left before no more power is left based on the current rate of consumption or based on recent history.

**Clock slow-down** - whether APM can reduce the CPU frequency in order to conserve power.

**Global stand-by** - whether the computer can enter stand-by mode.

**Time Wake-up** - whether the computer can wake-up at a certain time automatically

**Ring Wake-up** - whether a telephone ring can wake up the computer using a modem.

**PCMCIA Ring Wake-up** - whether a telephone ring can wake up the computer using a PCMCIA modem.

See [List of Acronyms](#) for more information.

## Options

**Include DMI/SMBIOS Information** - query the DMI/SMBIOS hive of the system.

**Include ACPI Information** - query the ACPI system.

**Include APM BIOS Information** - query the APM BIOS of the system.

**Include APM System Information** - query the system APM interface.

**Include Drives Power Management Information** - query the drives for PM settings.

**Include BIOS SMBus Information** - query the BIOS SMBus interface.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

Tips (Performance) List

## PCI, AGP, CardBus Buses and Devices Information

Shows detailed information about the PCI, AGP, CardBus, PCMCIA buses and the devices (cards) connected to them:

- PCI, AGP, CardBus, PCMCIA Bus Interface Information
- Device Information & Capabilities
- **Command Line Switch:** PCInfo
- **Requirements:** PCI, AGP, CardBus system, version 2.00 or higher
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Interface Version** - the version of the PCI standard this implementation complies with. However, while the 2.20 specifications include 66MHz support this does not mean that 2.20 compliant buses and adapters will actually run at 66MHz. Similar for other features. Also, note that ALL adapters must support a feature for it to be enabled, so don't use very old cards.

**Windows Device Name** - the name of the device Windows thinks this device is. This is the name of the product and not the name of the actual chipset/device. Same device sold by multiple vendors may use different names and different drivers.

**OEM Device Name** - the real name of the chipset/device. This includes the name of the real manufacturer (OEM) and not that of the re-seller. This determines the driver used for this device by Windows. Sandra cannot detect devices released **after** this release of Sandra! Update your copy of Sandra if this happens.

**Hardware ID** - the unique PCI identifier for this device. No two different devices have the same id. Every new PCI device/chipset must be registered with the PCI Standards Organisation and assigned a unique id.

**Product Device Name** - the name of the product and that of the product manufacturer. This should tally with the Windows Device Name unless you're using different drivers. This was introduced to differentiate between products using the same chipset. Sandra cannot detect devices released **after** this release of Sandra! Update your copy of Sandra if this happens.

**Product Hardware ID** - the unique PCI identifier for this device. No two different devices have the same id. Every new PCI device/chipset must be registered with the PCI Standards Organisation and assigned a unique id.

**Revision** - the revision of the device (silicon mask version). 0 means the very first version. Usually, later versions contain bug fixes and maybe performance enhancements.

**AGP Version** - the version of the AGP standard the device complies with. The latest is 2.00.

**Command Queue Length** - the length of the command queue determines the number of outstanding requests that can be buffered. The more commands buffered the more time the CPU has to do other work - while the AGP device is busy.

**Side Band Addressing Support** - whether the device supports side banding. It allows the overlapping of commands and data and thus improving performance.

**Data Transfer Support** - all AGP devices must support 1x. This mode is similar to the PCI data mode. Advanced AGP devices support 2x or 4x.

**Power State D1-D2 Support** - which power management modes (if any) the device supports. In these modes part of the device's systems are shut-down thus reducing power consumption.

**Device Properties** - lists the various generic characteristics of the device. This depends of the type of device. A device does not need to support all the functions but sometimes the more it supports the better.

Also the performance may vary to the actual setting of some of these variables.

**Line Cache Size** - the size of the buffer-cache in bytes. A small cache can speed-up some transactions, and some devices have a 8-byte (2 32-bit words) cache.

**Latency Timer** - specifies the maximum length of a bus transfer in cycles set-up for this device. Higher numbers means this device can use more of the bus bandwidth but this can slow-down other devices. You can set modify this value from the BIOS, higher numbers (up to a point) are better. The range is between 32-255.

**I/O Access** - specifies whether this device uses I/O ports.

**Memory Access** - specifies whether this device uses system memory.

**Bus-Master Capable** - specifies whether this device can take control of the bus and transfer data without outside support - which is generally faster.

**Special Cycle Recognition** - the device recognises and can transmit messages to all the other devices on the bus using special broadcast cycles.

**Memory Write & Invalidate** - whether this device supports a caching algorithm similar to write-back caching used by system caches.

**VGA Palette Snoop** - whether the device allows access to its palette registers by other cards. Typically PCI video cards must allow snooping by ISA overlay cards for the ISA card to use the correct palette.

**Parity Error Response** - whether the device supports parity generation and detection.

**Wait Cycles** - whether this device uses wait cycles in order to operate correctly. If all signals can become active simultaneously, wait cycles are not used, resulting in higher performance.

**System Error Line** - whether the system error line is active. This line must be active if the system is to detect parity errors reported by the devices.

**Fast back-to-back Transactions** - specifies whether this device can coalesce transactions and execute them in less time, one after another, in less time than if done normally. This compression can result in higher performance if many transactions need to be done.

**66MHz Bus Support** - whether this device can run at 66MHz. A PCI bus runs at 66MHz only if all devices can run at this speed.

**User Defined Features Support** - whether this device supports user defined features.

**Device Select Timing** - specifies the timing used for this device. This does not specify the actual speed of the device, but rather what timing is used to identify this device on the bus.

**Interrupt Line** -the actual hardware IRQ used by this device, if any. If the device uses a PCI interrupt line, this must be mapped to a hardware interrupt (e.g. ISA). However, modern chipsets and the newest Windows 98/Me and 2000/XP/2003 uses PCI IRQ Steering to use only one hardware interrupt (shared) for all the PCI cards. Otherwise, there would not be enough hardware interrupts.

**Interrupt Pin** - the PCI interrupt line used by this device. There are 4 interrupt pins for PCI (A to D) assigned to each PCI adapter. If the device requires an interrupt, generally INT A is assigned; the other 3 are used for the other functions in a multi-function device.

See [List of Acronyms](#) for more information.

## **Options**

**Include Bus Capabilities Information** - query the bus for capabilities.

**Include Device Capabilities Information** - query the device for capabilities.

**Include Device Special Capabilities Information** - show the specific capabilities of device.

**Include Hardware Resources Information** - show the hardware resources allocated to each device.

**Uses busses by PCI-to-PCI Bridge Configuration** - build bus schema by querying the PCI-to-PCI bridges on the main bus. Disable if some busses do not show.

**Include CardBus Buses/Device Information** - show CardBus busses and devices attached to them.

**Include PCMCIA Buses/Device Information** - show PCMCIA busses and devices attached to them.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List



## Data Sources (ODBC) Information

Shows detailed information about the DSNs (data source names) set-up on the system:

- ODBC Settings
- Supported ODBC Functions
- Supported ODBC Data Types
- Tables & Views in Database (full description)
- Procedures & Functions in Database (full description)
  
- **Command Line Switch:** ODBCInfo
- **Requirements:** ODBC version 3.50 or higher
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Settings** - complete list of ODBC parameters and their current settings. Please refer to ODBC v3 documentation for more information on the parameters and the values; a list and explanation is beyond the scope of this document.

**Function Conformance** - the current status of the function in v3 ODBC.

**Function Support** - whether the data source supports the function in question.

**Data Type** - name, type, precision, characteristics of each supported data type.

**Tables/Views** - type, permission, list of fields and their name, type, comments.

**Procedures/Functions** - type, permission, list of parameters and their name, type, comments.

### Options

**Include System Data Sources** - list system data sources.

**Include User Data Sources** - list user specific data sources.

**Include ODBC Information** - list ODBC parameters and their values.

**Include Supported ODBC Functions Information** - show list of supported functions.

**Include Supported ODBC Types Information** - show list of supported data types.

**Include Table/Views Information** - show list of tables & views.

**Include Procedures/Functions Information** - show list of procedures & functions.

**Ask for Login to Connect in Display Mode** - ask user to login if cannot connect using current/default credentials.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

Tips (Performance) List

## Windows Operating System Information

Shows detailed information about Windows and its subsystems:

- Windows Operating System Information
- DOS Sub-System Information
- OS Properties
- OS Folders
- Regional Settings
  
- **Command Line Switch:** WinInfo
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Name** - the name and version of the operating system as reported.

**Full Name** - the true name, version, revision and other information about the operating system.

**Windows ID** - the product ID of the operating system.

**Owner** - the name of the licensee.

**Organisation** - the name of the organisation the licensee's organisation.

**Plus! Version** - the name and version of the Plus! Pack if installed.

**Plus! ID** - the product ID of the Plus! Pack if installed.

**DOS Operating System** - the name, version and revision of the DOS operating system your current operating system runs on or emulates.

**Computer Name** - the name assigned to this computer.

**User Name** - the log-in name of the current user (i.e. you).

**Display Scheme** - the name of the display scheme used.

**Time since start-up** - the time this system has been running for.

**Debug Version** - whether this version is the special version used by developers.

**Security Present** - whether this version implements tough security precautions (e.g. NT).

**Double-byte Compatible** - whether this version supports double-byte characters as used in the middle-east or oriental languages.

**Middle-East Compatible** - whether this version supports the middle-east specific additions and modifications.

**Boot Type** - whether the boot was the normal type of booting or safe-mode, safe-mode with network, safe-mode with logging, etc. The other types are used only when a problem appears.

**Boot Configuration** - if boot configurations are used, the name of the configuration used at boot-up time.

**Boot into Windows** - whether Windows is loaded automatically or the booting stops when the command prompt is reached (i.e. like DOS). To start Windows, type **win**.

**Multi-boot Enabled** - whether this system can boot into different operating systems at start-up, e.g. DOS, Windows 9X/Me, 2000, XP, etc.

**Boot Windows by Default** - whether Windows is chosen as the default operating system at boot-up if the system is configured for multi-boot.

**Start-up Delay** - how long Windows will wait after starting the boot-up process to check whether any function keys are pressed.

**Show Boot Menu** - whether a boot menu is shown every time Windows is booted. Usually this menu is shown only when a problem has been detected or you have modified the boot process by pressing the function keys.

**Boot Keys Enabled** - whether the boot function modifier keys can be used.

Default Menu Item - the name of the menu item used as the default for boot-up.

**Default Menu Select Delay** - how long Windows waits if you have not chosen a boot-up menu item before it automatically selects the default one.

**Show Windows Logo** - whether the animated splash screen is shown during booting.

**Auto-load Double Buffering** - whether double-buffering is enabled. This is automatically enabled if DOS DMA drivers are used (e.g. SCSI drivers).

**Auto-load DoubleSpace** - whether DoubleSpace is enabled. If you're not using compression, this should be disabled to save more memory for other programs.

**Auto-load DriveSpace** - whether DriveSpace is enabled. If you're not using compression, this should be disabled to save more memory for other programs.

**Load Command Interpreter High** - whether the command interpreter can be loaded into HMA (High Memory Area) or HMB (High Memory Blocks) to free base memory for other programs. This should be set unless you're using old versions of the Novell NetWare Shell.

**Network Drivers Enabled** - whether the network drivers are enabled or not. These should be disabled when you suspect there may be a problem caused by the network.

**Safe Mode Start-up Warning** - whether the system will inform you of a previous system crash and whether it will boot into Safe Mode by default.

**Logging Disabled** - whether the boot-up logging is enabled or disabled. This is useful to check whether the problem occurs.

**Windows Folder** - the location of the main Windows folder.

**System Folder** - the location of the System folder.

**Program Path** - the path used by the system.

**Temporary Folder** - the location of the folder used for temporary files.

**Country** - the country the computer is in.

**ANSI Code Page** - the code page used for the ANSI character set.

**OEM Code Page** - the code page used for the OEM character set.

See [List of Acronyms](#) for more information.

## **Options**

**Include Login Information** - query system for logins information.

**Include OS Properties Information** - show operating system properties.

**Include OS Folders Information** - show the location of system folders.

**Include OS Regional Settings Information** - show the regional settings.

**Include Product Ids Information** - show the serial numbers and product Ids.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

[Tips \(Performance\) List](#)

## DOS Memory Information

Shows information about the DOS memory available to a process in a DOS virtual machine:

- Base Memory (Low) Information
  - UMB Memory Information
  - EMS Memory Information
  - XMS Memory Information
  - HMA Memory Information
  - DPMI, VCPI Memory Information
- 
- **Command Line Switch:** DosMemInfo
  - **OS (Win32) Support:** Windows 9X

### Explanations

**Base Memory** - (DOS or real mode memory) this is the memory used by DOS and its programs to run in (below 1MB). No matter how much memory you actually have, you still cannot use more/bigger DOS programs unless they use EMS or XMS memory.

**Total** - the total amount of base memory. This should always be **640KB** unless you use some special hardware or your computer is very old.

**Free** - the total amount of currently available base memory.

**UMB** - (Upper Memory Blocks) are blocks of memory found between memory locations B000-EFFF (or C800-EFFF), the area normally reserved for various BIOS ROMs. But, these do not occupy all the space, so we can use these holes to load programs and free base memory. UMBs are provided by an EMS driver like EMM386, QEMM386 or Windows. Depending on configuration you may have around 160KB of UMB space. If you use EMS memory with a page frame then you lose 64KB. The more cards you have the less UMB space remains free. You can load TSR programs in the UMBs left using DOS commands manually or using MemMaker.

**Total Memory** - the sum of all UMBs provided by the memory manager.

**Free Memory** - the sum of all available UMB blocks. Note that due to fragmentation some of those blocks may be too small to be used.

**EMS Memory** - As Base Memory is restricted to about 640KB, a Lotus / Intel / Microsoft (LIM) collaboration developed a technique for making more memory available to programs. The EMS (Expanded Memory Specification) bypasses these limits by supporting memory cards (386+ computers usually emulate it with emm386 or compatible memory manager) that contain 16KB memory pages (banks) that are mapped into the address space by the processor. Applications must be specially written to use EMS, so most old DOS heavyweight programs use it. You will need to specify a generous amount of it in the program properties if you work with large data.

**LIM Version** - the EMS specification supported by the EMS memory manager. The latest is **4.0** - and is compatible with older versions.

**EMS Page Frame** - the real mode address of the memory buffer used to transfer data between programs and the EMS memory pool.

**Total Memory** - the default amount of memory Windows provides to DOS programs.

**Free Memory** - the amount of currently available EMS memory. This is always **100%** as Windows does not use any.

**XMS Memory** - Windows uses XMS (eXtended Memory Specification) memory itself provided by HIMEM (or compatible memory manager) accessing it directly. Windows also caches XMS through the memory manager, taking advantage of the attributes of Windows applications memory segments. Also, Protected Mode DOS applications can use DPMI and VCPI to access XMS.

**Interface Version** - the XMS specification supported by the XMS memory manager. The latest is **3.0** -

and is compatible with older versions.

**Driver Version** - the version of the XMS driver itself which is in addition to the version of XMS memory it provides.

**Total XMS** - the total amount of XMS memory available to Windows. This should be equal to the physical memory installed in your computer.

**Free XMS** - the default amount of XMS memory currently available to DOS applications.

**HMA Memory** - HMA (High Memory Area) is a 64K block of memory above 1MB that can be accessed by real mode programs due to a quirk in the x86 processor architecture. This can be used to increase the available DOS memory. A XMS driver is required.

HMA in use - whether the HMA is used or it is free.

**Total HMA** - the total size of the HMA block. This should be **64K** except in special circumstances.

**Free HMA** - the amount of free memory in the HMA left unused.

**DPMI** - DPMI (DOS Protected-Mode Interface) is a memory interface that enables DOS programs to run in protected mode using a DOS extender. These DOS programs can be 32-bit (like Windows 9X/Me) and use all the installed memory directly, without the need of cumbersome memory managers like EMS or XMS. The Base Memory limitation does not matter any more. Most modern games requiring megabytes of memory uses this interface.

**Interface Version** - the specification of the DPMI standard supported by the driver. The latest is **1.0**.

**Provider Type** - whether 32-bit programs are supported or not.

**Total Physical Memory** - the size of the memory installed in your computer.

**Swap File Size** - the size of the virtual memory that is available for use.

**Free Memory** - the amount of system memory (physical & virtual) that is currently available for use.

**Page Size** - the size of the memory block the memory is partitioned in. Memory is managed in blocks of this size, not in bytes which would make allocation and management much more difficult. Currently this is **4KB**.

See [List of Acronyms](#) for more information.

## Options

**Include Base Memory Information** - show base memory data.

**Include UMB Information** - show upper memory blocks data.

**Include HMA Information** - show high memory area data.

**Include EMS Information** - show EMS provider & settings.

**Include XMS Information** - show XMS provider & settings.

**Include DPMI/VCPI Information** - show DPMI/VCPI provider & information.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## Windows Memory Information

Shows information about the system's memory, resources, heaps and drivers:

- Physical and Virtual (Swap File) Information
- Heaps Information
- Resources Information (16-bit as well)
- Windows Base Memory Information
  
- **Command Line Switch:** WinMemInfo
- **OS (Win32) Support:** Windows 9X, Me; 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Total System Memory** - the total amount of memory (physical & virtual) that is available to Windows.

**Free System Memory** - the total amount of memory (physical & virtual) that is currently unused.

**Total Physical Memory** - the amount of physical memory installed in your computer.

**Free Physical Memory** - the amount of unused physical memory. This can be zero most of the time as Windows tries to use all available physical memory to improve performance.

**Maximum Swap File** - the maximum size that the swap file (virtual memory) can grow to. Generally this is somewhat less than the free space on the drive that contains the swap file.

**Current Swap File** - the current size of the swap file. This should be as low as possible, since virtual memory is very slow compared to physical memory.

**Free Page File** - the current size of unused space in the swap file. Too high a number may mean that the swap file is too large; too low a number may mean that you need to add more physical memory or increase the size of the swap file.

**Page File Drive** - the drive that contains the swap file.

**NB** - Unless you know what you are doing you should let Windows manage the swap file.

**True Allocated Memory Load** - the percentage of allocated memory with respect to the installed physical memory. This is almost always over 100% since Windows utilizes all physical memory as well as a bit of the swap file even when it does not need any.

**Total Windows Base Memory** - the total size of DOS memory available to Windows programs. This should always be 640K unless special memory managers are used or special cards.

**Free Windows Base Memory** - the total size of DOS memory that is available to use by Windows programs. While Windows programs don't use base memory, some need it to communicate with DOS programs, device drivers or legacy hardware.

**Largest Free Base Memory Block** - the size of the largest contiguous block of free base memory available. Due to fragmentation this is less than the free base memory.

**System Resources** - the percentage of free system resources in the 16-bit Windows sub-system. While Windows 9X/Me provide much better resource management than Windows 3.1, 16-bit code is still present. This is the percentage of free 16-bit heaps and you should keep it above 20%.

**GDI Heap Free** - the GDI Heap is memory used to store the graphical elements in Windows, e.g. icons, pens and bitmaps. If you run programs that use a lot of bitmaps, icons, etc., you could run out of GDI Heap. In Windows 3.1 this was only 64KB no matter how much memory you had. You should keep it above 20%, otherwise crashes can occur.

**User Heap Free** - the User Heap is memory used to hold information on active windows and other related information. In Windows 3.0 the Menu and String Heaps are included in the User heap. In Windows 3.1 this heap was only 64KB. Running many large applications may result in a crash if the free percentage becomes lower than 20%.

See [List of Acronyms](#) for more information.

### **Options**

**Include System Memory Extra Information** - show extended memory status.

**Include 16-bit SubSystem Information** - query (16-bit 9X/Me) sub-system.

**Include Statistics Information** - show memory statistics.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### **Tips**

[Tips \(Performance\) List](#)

## Ports Information

Shows detailed information about the parallel (LPT), serial (COM), USB and FireWire (1394) ports available to your system:

- Port Device Information
  - Port Driver Information & Settings
  - Device(s) Connected to Port
  - Port Configuration
  - Provider Capabilities
- 
- **Command Line Switch:** PortsInfo
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

## Explanations

**Port ID** - the port name.

**Port Type** - the port type, e.g. serial or parallel.

**Port UART** - serial ports use an UART (Universal Asynchronous Transmitter) chip that is a converter that transforms data from parallel 8-bit to the required standard and vice-versa. It also manages the COM port and the connections. This is very important for communications throughput and all modern computers use at least a **16550A** or better.

**Driver ID** - the port driver file name.

**Driver Version** - the port driver file version.

**Devices Connected to Port** - the list of devices connected to this port.

**Packet Version** - the version of the send/receive packets.

**Packet Size** - the maximum size of a data packet.

**Provider Type** - the type of port hardware.

**Receive Buffer** - the size of the receive buffer in bytes.

**Transmit Buffer** - the size of the transmit buffer in bytes.

**Provider Capabilities** - the list of supported functions provided by the port driver. Not all functions need to be supported although most usually are. The performance of the port does depend on the supported functions although this depends on port type, usage, etc.

**Default Port Configuration** - the settings used as default for the port. Do note that modems and other hardware using the port re-configure these settings when they become active, so this list is just a guideline.

See [List of Acronyms](#) for more information.

## Options

**Include Port Information** - query the port itself.

**Include Port Driver Information** - query port driver.

**Include Device(s) Connected to Port Information** - query for devices connected to the port.

**Include Port Properties Information** - show the port capabilities.

**Include Provider Capabilities Information** - show the provider capabilities.

**Include Port Configuration Information** - show current port settings.



**Include USB Ports Information** - query USB controller/hubs if present.

**Include Connected USB Devices Information** - query for devices connected to the USB port.

**Include FireWire/1394 Ports Information** - query FireWire/1394 controller/hubs if present.

**Include Connected FireWire/1394 Devices Information** - query for devices connected to the FireWire/1394 port.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List

## OLE Servers Information

Shows detailed information about the OLE object types installed in your system and the servers that provide them:

- OLE Object Information
- OLE Server Information
- **Command Line Switch:** OLEInfo
- **Requirements:** OLE servers installed
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

**OLE** - or Object Linking & Embedding is a method of exchanging information between running applications. You can create a document that includes information such as charts, graphics, and spreadsheet data created by other applications. You can embed objects created by applications that support Windows and object embedding. You must have enough memory to run all of the applications you are using at once. All the information used to create the object is kept with the document that contains it. To edit the object, you simply select it. The server is started so you make the editing or formatting changes you want. When you switch back, the object is updated with the changes you made.

**Class ID** - the ID number that identifies this OLE server.

**Object ID** - the ID name (or nickname) that identifies this OLE server.

**DDE Support** - DDE or Dynamic Data Exchange is a set of procedures that are used by applications to communicate with one another using defined protocols that may not be application specific. Information contained in a document created by another application, for example, can be updated automatically when it changes - ensuring information synchronisation. Here, it means that the server has defined the DDE commands that can be used to communicate with it. The available commands vary from application to application, but there is a set of main functions.

**Insertable** - specifies whether the object can be inserted (as a container) in an OLE client.

**OLE 2 Object** - specifies whether the server supports the OLE 2.0 standard which enables in-situ editing of objects, i.e. the server application takes over the client application - which makes easier editing. All new Software Suites support this for better integration

**Server Application Information** - the server file name, properties and information.

See [List of Acronyms](#) for more information.

## Options

**Include Legacy Objects Information** - query legacy (OLE1) objects.

**Include Server File Information** - query file of the object server.

**Include Server Application Information** - show OLE server details.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## Processes Information

Shows detailed information about the processes, i.e. jobs running in your system. A process can create many threads and tasks:

- Process Information
  - Module Information
  - Threads Owned Information
  - Modules Used Information
  - Memory Footprint Information
- **Command Line Switch:** ProcessInfo
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

## Explanations

**Window Class** - the name of the class the window of this process belongs to. Each window belongs to a class that holds the windows attributes, settings, etc.

**Module Name** - the name of the module in the system.

**File Name** - the file name of the module in the file system.

**Process Type** - the type of process, e.g. 16/32/64-bit.

**Process Priority** - the priority of the process. All processes, except special system processes should run at the normal priority. VIP processes run at higher priorities and idle processes run at lower priorities.

**Expected Windows Version** - the version of Windows this process was designed for. For Windows 9X/Me/NT4 this number should be **4.0**. For Windows 2000, XP, 2003 this number should be **5.0**.

**Total Threads** - the number of threads that belong to this process.

**Usage Count** - the number of processes that use this process.

**Process / Global Count** - the number of instances of this process.

**Started By** - the name of the process that started this process.

**Memory Used** - the amount of memory used by this process (excluding libraries).

**Modules Used** - the list of libraries used by this process, including their name, type (16/32/64-bit), number of processes that use that library and amount of memory used by the library.

**Threads** - the list of threads created by this process and their priorities.

**Heaps** - the list of heaps used by this process (dynamic data allocation), their size and the total amount of memory used by all the heaps.

**Total Process Memory Used** - the total amount of memory used by this process, including libraries, threads, heaps, stacks and other memory.

**File Information** - the process file name, properties and information.

See [List of Acronyms](#) for more information.

## Options

**Include Process Window Information** - query the process's window.

**Include Process Information** - query the process itself.

**Include Module Usage Information** - show module usage by this process.

**Include Threads Information** - show process's threads.

**Include Heaps Information** - show process's heaps.

**Include File Information** - query file of the process.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List

## Modules Information

Shows detailed information about the modules loaded in your system. Tasks, processes, drivers, libraries, etc. are modules themselves:

- Libraries (DLL, OCX, etc.)
- Processes (EXE)
- Device Drivers (DRV)
  
- **Command Line Switch:** ModuleInfo
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

**File Name** - the module file name.

**Module Usage** - the number of processes and modules that use this module.

**Expected Windows Version** - the version of Windows this process was designed for. For Windows 9X/Me/NT4 this number should be **4.0**. For Windows 2000, XP, 2003 this number should be **5.0**.

**Module is a Library** - whether the module is a library or not.

**Module Type** - whether this module is 64, 32 or 16-bit.

**Self-Loading Module** - whether this module is loaded by Windows by default.

**Implicit-Loading Module** - whether this module is implicitly loaded by Windows.

**Module Has Shared Data** - whether this module uses shared data.

**Module Has Auto Data** - whether this module uses automatic data.

**File Information** - the module file name, properties and information.

See [List of Acronyms](#) for more information.

## Options

**Include Module Information** - query the module itself.

**Include Module Usage Information** - show module usage by this module.

**Include Heaps Information** - show module's heaps.

**Include File Information** - query file of the module.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## Drives Information

Shows detailed information about the drivers connected to your system removable, fixed or remote.

- Drive & Controller Information
  - Volume Information & Properties
  - Logical Drive Information
  - Disk Cache Information
  - Physical Drive Information
  - Extended Information
  - Partition Information
  - Drive Statistics & Slack Information
- **Command Line Switch:** DrivesInfo
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

## Explanations

**Drive Class** - the type of drive: floppy, fixed, CD-ROM, memory, etc.

**Drive Device** - the full name of the drive type.

**Drive Type** - extra type information about the drive, e.g. fixed drives can be ATA/ATAPI/SCSI/RLE, etc.

**Disk Controller** - the name of the disk controller the drive is attached to.

**ATA Device Configuration** - if the drive is ATA, whether this drive is a master or slave.

**DMA Transfers Enabled** - whether this drive uses DMA transfers or PIO. DMA is faster, especially if Ultra-DMA is supported.

**Total Space** - the total space on the drive in MB.

**Free Space** - the total amount of free space on the drive in MB.

**Volume Name** - the name of the drive label.

**File System** - the type of file system used by the drive, e.g. FAT, FAT32, NTFS, etc.

**Serial Number** - the drive's serial number.

**Maximum Filename Length** - the maximum size a filename can have. Older drives allow only 11 (8.3) characters, while new ones support 255.

**Preserves Filename Case** - whether the filename case is preserved.

**Supports Case Sensitive Search** - whether filename case is important..

**Supports Unicode Filenames** - whether UNICODE is supported.

**Supports Access Control Lists** - whether access control security is supported.

**Volume is Compressed** - whether this drive is compressed.

**Supports Individual File Compression** - whether individual files or folders can be compressed.

**Sectors Per Cluster** - the number of sectors in one cluster.

**Bytes Per Sector** - the number of bytes in one sector. Usually this number is **512** bytes.

**Cluster Size** - the size of the cluster. This should be as low as possible to minimise wasted space.

**Total Clusters** - the total number of clusters on this drive.

**Total Free Clusters** - the total number of available clusters on this drive.

**Current Disk Cache** - the current size of the disk cache in MB. This should be as high as possible but not at the expense of system memory.

**Maximum Disk Cache** - the maximum size the disk cache can grow to.

**Minimum Disk Cache** - the minimum size the disk cache can shrink to.

**Typical Role** - the typical role of your computer. The disk cache is optimised according to this role.

**Physical Drive ID** - the physical disk ID number if ATA/RLE.

**CMOS Disk No** - the CMOS physical disk type. Drives no. 1-45 are pre-defined, while types 46 & 47 can be defined by user or auto-detected by the BIOS.

**Cylinders** - the number of cylinders of the physical disk.

**Heads** - the number of heads of the physical disk.

**Sectors Per Track** - the number of sectors in one track/cylinder.

**Bytes Per Sector** - the number of bytes in one sector. Usually this number is **512** bytes.

**Cylinders** - the number of cylinders belonging to this drive out of all the cylinders on the physical disk.

**Heads** - the number of heads belonging to this drive out of all the heads of the physical disk.

**Sectors Per Track** - the number of sectors in one track/cylinder.

**Bytes Per Sector** - the number of bytes in one sector. Usually this number is **512** bytes.

**Copies of FAT** - the number of FATs (File Allocation Table) the drive keeps. This number should be 2 (1 for backup) unless the drive is guaranteed not to fail (e.g. memory, CD-ROM).

**Sectors Per FAT** - the number of sectors that make up a FAT.

**Media Descriptor** - the media ID number for this drive.

**Max. Root Entries** - the maximum numbers of files & folders on the root of the drive.

**Sectors Per Cluster** - the number of sectors in one cluster.

**Reserved Sectors** - the number of sectors that are reserved (e.g. boot sector).

**Hidden Sectors** - the number of sectors that are hidden (e.g. partition info).

**No. Files** - the total number of files on this drive.

**No. Folders** - the total number of folders on this drive.

**Space Used** - the exact total space taken by the files and folders, not rounded.

**Space Allocated** - the actual total space taken by the files and folders, rounded to the cluster size.

**Slack** - the percentage of disk space wasted due to large cluster size. This number should be as small as possible, preferably under 10-20%.

**Last Backup** - the date you last backed up the drive. You should do it at least every week.

**Last Scan** - the date you last checked the drive for errors. You should do it at least every week.

**Last Optimised** - the date you last optimised the drive. You should do it at least monthly.

**Last Image** - the date you last imaged the drive. You should do it at least weekly.

See [List of Acronyms](#) for more information.

## Options

**Include General Drive Information** - show generic information.

**Include Volume Information** - query the drive's volumes.

**Include Volume Properties Information** - show volume properties.

**Include Logical Drive Information** - query the logical drive device.

**Include Disk Cache Information** - query the disk cache driver.

**Include Physical Disk Information** - query the physical disk of the drive.

**Include Extended Drive Information** - show the extended drive properties.

**Include Drive Statistics Information** - show the drive's statistics.

**Include Removable Drives Information** - if disabled, ignore removable drives.

**Include Fixed Drives Information** - if disabled, ignore fixed drives.

**Include Memory Disks Information** - if disabled, ignore memory disks.

**Include Network Drives Information** - if disabled, ignore network drives.

**Include CD-ROM/DVD Information** - if disabled, ignore CD-ROM/DVD drives.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

Tips (Performance) List



## DOS Device Drivers Information

Shows detailed information about the DOS device drivers installed in your system. While most have been replaced with 32-bit drivers in Windows 9X/Me (VxDs) they still include memory managers, disk, CD-ROM drivers and other various drivers.

- Device Driver Type
- Device Driver Attributes
- **Command Line Switch:** DosDrvInfo
- **OS (Win32) Support:** Windows 9X

### Explanations

**Driver Name** - the name of the device driver.

**File Name** - the file name that corresponds to this device driver. Some are built-in DOS or Windows and are not stand-alone devices.

**Attributes** - the properties of the device driver. The list of attributes is shown below:

**Character** - device performs input/output one character at a time (e.g. keyboard, screen).

**Block** - device transfers blocks of data (e.g. disk, tape).

**Input** - this character device is the standard input device (STI).

**Output** - this character device is the standard output device (STO).

**32-bit Sec** - this block device uses 32-bit sector addressing instead of 16-bit.

**Nul** - this device is the NULL device.

**Clock** - this device is the CLOCK device.

**Fchar** -this character device supports fast character output.

**Gen-IO** - this block device supports logical drive mapping, generic IOCTL (Input Output Control) queries of both.

**Query** - this device supports IOCTL queries.

**O/C/RM** - this device supports the open/close/remove media functions.

**FAT-Req** - this block device needs a FAT to build the DCB.

**OTB** - this character device supports output 'till busy command.

**R/W** - this device supports read/write IOCTL functions.

See [List of Acronyms](#) for more information.

### Options

**Include Device Information** - show device information.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)

## DirectX Information

Shows detailed information about the DirectX interface, devices and drivers installed in the system.

- DirectDraw Video Devices Information
- Direct3D Hardware 3D Accelerators Information
- DirectSound Sound Card Information
- DirectSound Capture (Emulation) Information
- DirectMusic Information
- DirectPlay Connections Information
- DirectInput Interface Information
  
- **Command Line Switch:** DirectXInfo
- **Requirements:** DirectX drivers installed
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

**DirectX** - Microsoft developed DirectX so that the performance of applications running in the Windows operating system can rival or exceed the performance of applications running in the MS-DOS operating system or on game consoles. Developers of these games had to conform to a number of hardware implementations for a variety of cards. With DirectX, games developers get the benefits of device independence without losing the benefits of direct access to the hardware. The primary goals of DirectX are to provide portable access to the features used with MS-DOS today, to meet or improve on the performance of MS-DOS console-based applications, and to remove the obstacles to hardware innovation on the personal computer. Additionally, Microsoft developed DirectX to provide Windows-based applications with high-performance, real-time access to available hardware on current and future computer systems. DirectX provides a consistent interface between hardware and applications, reducing the complexity of installation and configuration and using the hardware to its best advantage. By using the interfaces provided by DirectX, software developers can take advantage of hardware features without being concerned about the implementation details of that hardware.

**DirectDraw** - is a software interface that provides direct access to display devices while maintaining compatibility with the Windows graphics device interface (GDI). It is not a high-level application-programming interface (API) for graphics. DirectDraw provides a device-independent way for games and Windows subsystem software, such as 3-D graphics packages and digital video codecs, to gain access to the features of specific display devices. DirectDraw works with a wide variety of display hardware, ranging from simple SVGA monitors to advanced hardware implementations that provide clipping, stretching, and non-RGB colour format support. The interface is designed so that applications can enumerate the capabilities of the underlying hardware and then use any supported hardware-accelerated features. DirectX emulates features that are not implemented in hardware.

**Direct3D** - Direct3D is designed to enable world-class game and interactive three-dimensional (3-D) graphics on a computer running Windows. Its mission is to provide device-dependent access to 3-D video-display hardware in a device-independent manner. Simply put, Direct3D is a drawing interface for 3-D hardware.

**DirectSound** - The Microsoft DirectSound application programming interface (API) is the audio component of the DirectX. DirectSound provides low-latency mixing, hardware acceleration, and direct access to the sound device. It provides this functionality while maintaining compatibility with existing device drivers.

**DirectPlay** - The Microsoft DirectPlay application programming interface (API) for Windows is a software interface that simplifies application access to communication services. DirectPlay has become a technology family that not only provides a way for applications to communicate with each other, independent of the underlying transport, protocol, or online service, but also provides this independence for matchmaking servers and game servers. Applications (especially games) can be more compelling if they can be played against real players, and the personal computer has richer connectivity options than any game platform in history.

**DirectInput** - Microsoft DirectInput provides support for input devices including the mouse, keyboard, and joystick, as well as for force-feedback (input/output) devices.

See [List of Acronyms](#) for more information.

## **Options**

**Include DirectDraw Information** - query the DirectDraw Interface.

**Include DirectDraw Capabilities Information** - show the DirectDraw capabilities.

**Include DirectDraw Video Modes Information** - show supported video modes.

**Include Direct3D Information** - query the Direct3D Interface.

**Include Direct3D Capabilities Information** - show the Direct3D capabilities.

**Include Direct3D Line Capabilities Information** - show the Direct3D line capabilities.

**Include Direct3D Triangle Capabilities Information** - show the Direct3D triangle capabilities.

**Include DirectSound Information** - query the DirectSound interface.

**Include DirectSound Capabilities Information** - show the DirectSound capabilities.

**Include DirectPlay Information** - query the DirectPlay interface.

**Include DirectPlay Capabilities Information** - show the DirectPlay capabilities.

**Include DirectSoundCapture Information** - query the DirectSoundCapture interface.

**Include DirectSoundCapture Capabilities Information** - show the DirectSoundCapture capabilities.

**Include DirectInput Information** - query the DirectInput interface.

**Include DirectInput Capabilities Information** - show the DirectInput capabilities.

**Include Texture Support Information** - show the texture capabilities of Direct3D.

**Include DirectMusic Information** - query the DirectMusic interface.

**Include DirectMusic Capabilities Information** - show the DirectMusic capabilities.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

[Tips \(Performance\) List](#)

## Communication Devices Information

Shows detailed information about the communication devices(s), e.g. modems, terminal adapters, connected to your computer.

- General Device Information
- Modem Driver Settings
- Built-in Modem Information
- Connection Test
  
- **Command Line Switch:** ModemInfo
- **Requirements:** Modem or terminal adapter installed
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Manufacturer** - the modem manufacturer.

**Modem** - the type and name of the modem.

**Serial Number** - the modem driver serial number.

**Plug & Play Version** - the version of the PnP standard the modem adheres to.

**Port** - the port ID the modem is connected to.

**Port Configuration** - the settings used as default for the port. Do note that modems and other hardware using the port re-configure these settings when they become active, so this list is just a guideline.

**Modem Information** - the actual modem information and configuration.

**Name & Type** - the name of the modem manufacturer and type.

**Plug & Play ID** - the unique ID number for this modem.

**Configuration Settings** - the list of current modem settings.

**Product Code** - the modem product code. This is a unique number for this model that may be required by technical support staff.

**Memory Checksum** - the result of the memory checksum.

**Self-Diagnostic Result** - the result of self-diagnostic tests. This should be OK.

**Modem Settings** - the current configuration including internal registers.

**NVRAM Settings** - the settings stored in modem's NVRAM (Non-Volatile RAM).

**Diagnostics Results** - the result of self-diagnostic tests.

**Dialling Information** - information about the dialled numbers, errors, time connected, etc.

**Link Diagnostic Results** - information about the modem to modem connection.

**FAX Classes** - the classes supported by this modem. Most modems should support classes 1.0 and 2.0.

**Connection Test** - the result of the loop-back connection test.

See [List of Acronyms](#) for more information.

### Options

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)



## Network Information

This module lists all the networks your system can connect to, their resources, workgroups and any other information. A list of supported protocols is also included.

- List of Networks
  - List of Domains/Workgroups
  - Network Information
  - Network Protocols
  - Workstation Information
  - Resources Information
- 
- **Command Line Switch:** NetInfo
  - **Requirements:** TCP/IP protocol installed and bound to Microsoft Client/Sharing services.
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

## Explanations

**Network Version** - the version of the network driver for this type of network.

**Network Status** - the current status of the connection to this network. Usually this should be **running**.

**Network Driver** - whether the network driver is 16/32/64-bit.

**Network Protocols** - the list of all networking protocols supported by your computer.

**Capabilities** - the list of supported capabilities for each protocol. Some protocols guarantee delivery, support compression, encryption, broadcasting, fragmentation, etc.

**Workstations** - the list of all workstations in this network workgroup/domain, including its name, type and list of resources available.

**IP Address** - the TCP/IP address of the workstation.

**MAC Address** - the MAC (e.g. Ethernet) address of the workstation.

**Folders** - the list of all shared drives or folders for this workstation.

**Printers** - the list of all shared printers for which this workstation acts as a print server.

See [List of Acronyms](#) for more information.

## Options

**Include All Domains/Workgroups Information** - if disabled, query only current domain/workgroup.

**Include Connection/Link Information** - query the link layer for connection statistics.

**Include IP Services Information** - query the host for active IP services.

**Include SNMP Information** - query host through the SNMP interface.

**Include Server Information** - query host for active server services.

**Include Hidden Resources Information** - show hidden server resources.

**Include Open Files/Resources Information** - show open files and taken resources.

**Include Network Adapter(s) Information** - show network adapters details.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## Font Information

This module shows detailed information about the fonts and font systems currently installed in your system.

- Font Class & Type
- Font Script (language)
- Logical Font Attributes
- Physical Font Attributes
  
- **Command Line Switch:** FontInfo
- **Requirements:** None
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

**Font** - A collection of characters and symbols that share a common design.

**Font Family** - One of two attributes used to organise OpenType fonts. Family names include Courier New, Arial, and Times New Roman.

**Font Style** - One of two attributes used to organise OpenType fonts. Style names include extra-bold, bold, and italic.

**Font Mapper** - An algorithm that Windows uses to determine which available font most closely matches a requested font.

**OpenType Font** - A font whose glyphs are stored as a collection of line and curve commands plus a collection of hints. Windows uses the line and curve commands to define the outline of the glyph's bitmap. Windows uses the hints to adjust the length of the lines and shapes of the curves. These hints and the respective adjustments are based on the amount of scaling used to reduce or increase the size of the bitmap.

**Height** - Specifies the height, in logical units, of the font's character cell or character. The character height value is the character cell height value minus the internal-leading value.

**Ascent** - Specifies the ascent (units above the base line) of characters.

**Descent** - Specifies the descent (units below the base line) of characters.

**Escapement** - Specifies the angle, in tenths of degrees, between the escapement vector and the x-axis of the device. The escapement vector is parallel to the base line of a row of text.

**Orientation** - Specifies the angle, in tenths of degrees, between each character's base line and the x-axis of the device.

**Width** - Specifies the average width, in logical units, of characters in the font.

**Internal Leading** - Specifies the amount of leading (space) inside the bounds set by the height. Accent marks and other diacritical characters may occur in this area.

**External Leading** - Specifies the amount of extra leading (space) that the application adds between rows.

**Weight** - Specifies the weight of the font in the range 0 through 1000. For example, 400 is normal and 700 is bold.

**Pitch** - Specifies whether all the characters have the same width or different widths.

**Recommended Aspect Ratio** - The aspect ratio of the device for which the font was designed.

See [List of Acronyms](#) for more information.

## Options

**Include Raster Fonts Information** - query raster/display fonts.

**Include Vector Fonts Information** - query vector fonts.

**Include OpenType Fonts Information** - query OpenType fonts.

**Include Logical Font Information** - show the logical font properties.

**Include Physical Font Information** - show the physical font properties.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List



## OpenGL Information

This module shows detailed information about the OpenGL capabilities of your video adapter and driver.

- Video board/driver manufacturer
- Video renderer information
- OpenGL Extensions Supported
  
- **Command Line Switch:** OpenGLInfo
- **Requirements:** OpenGL compatible board
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**OpenGL** - is an industry standard 2D & 3D rendering only graphics interface, vendor and operating system independent. It is highly versatile, and includes support for all advanced features (texture mapping, fog, alpha blending, motion blur, etc.) as well as the standard functions any graphics interface needs to contain. It has been integrated in Windows NT/2000/XP/2003 although a OpenGL ICD/MCD is needed for best performance.

**OpenGL Extensions** - a mechanism that allows vendors to add additional capabilities to the implementation that can be used by programs to access performance and technological innovations.

**Manufacturer** - the company that wrote the OpenGL renderer (i.e. OEM maker).

**Renderer** - the type of renderer, generally video board name.

**Version** - full version of renderer.

**Acceleration** - whether the OpenGL driver is hardware accelerated.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## IP Network Information

This module lists all the IP interfaces/networks your system can connect to, their hosts, services, and any other information.

- Interfaces
- List of Hosts
- Host Information
- IP Services of each Host
  
- **Command Line Switch:** IPNetInfo
- **Requirements:** TCP/IP protocol installed, WinSock v2.
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

**NB.** Since this module scans the entire IP range of the host's interface and pings each address in turn, it may take some time to execute. Please allow it plenty of time before giving up.

### Explanations

**IP Address** - the IP address of the host

**Host Name** - the DNS name of the host

**IP Services List** - the list of IP supported services

### Options

**Include Point-to-Point Networks Information** - if disabled, do not query PTP networks.

**Include IP Services Information** - query the host for active IP services.

**Include SNMP Information** - query host through the SNMP interface.

**Assume all hosts are on Local LAN** - if disabled, increase discovery/ping timeout by 10.

**Include Network Adapter(s) Information** - show network adapters details.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)

## Remote Access Service Connections

This module shows detailed information about the remote access connections (dial-up) set-up on the machine to connect to other machines, other networks or the Internet.

- Dial-up phone number
  - Addressing information
  - Security settings
  - Network protocols
  - Connection devices
  - User/System Credentials
- 
- **Command Line Switch:** RasInfo
  - **Requirements:** Communication adapter, RAS installed
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
  - **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
  - **OS (Win64) Support:** Windows XP/2003

### Explanations

**Country Code** - the international phone code for the country.

**Area Code** - the local area code for the zone.

**Phone Number** - the local phone number for the computer to dial-in to.

**Script Filename** - the full filename of the script that automates the log-in process.

**IP Address** - the IP address for this connection.

**DNS Servers** - the IP address(es) of the DNS (Domain Name Servers) for the connection. These servers resolve remote (Internet) machine names into IP addresses.

**WINS Servers** - the IP address(es) of the WINS (Windows Name Servers) for the connections. These servers resolve local (Intranet) machine names into IP addresses.

**IP Header Compression** - whether this type of compression is used or not.

**Software Compression** - whether this type of compression is used or not.

**Use Remote Gateway** - whether IP traffic is routed to the remote gateway or not.

**Disable PPP/LCP Extensions** - whether this extensions should be used or not.

**Encrypted Password Required** - whether only encrypted passwords are exchanged between computers for added security.

**Microsoft Encrypted Password Required** - whether only Microsoft encrypted passwords are exchanged between computers for added security.

**Data Encryption Required** - whether only encrypted data is exchanged between computers.

**Log onto Network** - whether you are logged on the remote network after connection.

**Use Log-on Credentials** - whether you are logged on the remote network using the credentials for the current session.

**Network Protocols** - the enabled network protocols over this connection.

**Framing Protocol** - the framing protocol used. PPP is the currently most popular protocol for PCs.

**Device Type** - the type of device used for the connection. Generally a modem or TA (terminal adapter) is used.

**Device Name** - the name of the device used for the connection.

**User Name** - the user name used for log-on.

**Password** - the password used for log-on. (Sandra will **not** display it for security reasons).

**Domain** - the domain to connect to.

## **Options**

**Include Connection Data Information** - show connection type and characteristics.

**Include Connection Settings Information** - show connection settings.

**Include GUI Connection Settings Information** - show the GUI-mode settings.

**Include Network Security Settings Information** - show security settings.

**Include Network Protocols Information** - list supported protocols.

**Include Connection Device Information** - show device (through which connection is made) settings.

**Include Credentials Information** - show user credentials information.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List

## CPU Arithmetic Benchmark

Tests how your CPU stacks up to other typical combinations:

- Multi-Processor (SMP) support for up to 32/64 CPUs & SMT.
- Test takes about 20/30 seconds on P6-class PCs.
- Test is repeated 3 to 5 times to get a realistic result.
- Results outside the confidence limits (5%) are discarded.
- **Command Line Switch:** CPUAABench
- **Requirements:** None
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

MP Dhrystone (MIPS) CPU (Arithmetic) Benchmark  
MP Whetstone (MFLOPS) FPU (Floating Point) Benchmark  
MP Whetstone (MFLOPS) SSE2 (Floating Point) Benchmark

See [Computer \(CPU/Bus/BIOS/Chipset\) Information](#) topic for more information.  
See also [Questions and Answers](#) document for full information.  
See [List of Acronyms](#) for more information.

### Acknowledgements

**Dhrystone Benchmark** - Based on the original C Dhrystone 2.1 by Reinhold P. Weicker, Siemens AG.  
**Whetstone Benchmark** - Based on the original C Whetstone 2.0 translated from the original Algol program by H. J. Curnow and B. A. Wichman.  
**SSE2 Whetstone Benchmark** - Written by Intel/Srinivas L based on the Whetstone C 2.0 benchmark.

**MP/MT harness** - by C. Adrian Silasi.

See [Acknowledgements](#) topic for more information.

### Options

**Include Extra System Information** - show some more details about tested system.  
**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.  
**Include DMI/SMBIOS Information** - query the system through the DMI/SMBIOS interface.  
**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.  
**Enable SSE2 (Float) Benchmark** - if disabled, do not use the floating-point SSE2 benchmark.  
**Enable SSE2 (Integer) Benchmark** - if disabled, do not use the integer SSE2 benchmark.  
**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.  
**Include CPU MSR Information** - get CPU info by MSR.  
**Enable Parallel Execution** - enable PE support in harness.  
**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)



## CPU Multi-Media Benchmark

Tests how your CPU stacks up to other typical combinations:

- Multi-Processor (SMP) support for up to 32/64 CPUs & SMT.
- Test takes about 20 seconds on P6-class PCs.
- Test is repeated 3 to 5 times to get a realistic result.
- Results outside the confidence limits (5%) are discarded.
- **Command Line Switch:** CPUMMBench
- **Requirements:** MMX (Enhanced), 3DNow! (Enhanced) or SSE(2/3) recommended
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

The test involves the generation of Mandelbrot Set fractals that are used to realistically describe and generate natural objects such as mountains or clouds. By using various multi-media extensions MMX, 3DNow!, SSE(2/3) better performance is achieved.

The test has two parts:

#### **Integer test - using integer data:**

- MP SSE3 is used for better performance if supported.
- MP SSE2 is used for better performance if supported.
- MP SSE (Streaming SIMD) is used for better performance if supported.
- MP Enhanced MMX is used for better performance if supported.
- MP MMX is used for better performance if supported.
- MP ALU is used otherwise.

#### **Floating-point test - using floating point data:**

- MP SSE3 is used for better performance if supported.
- MP SSE2 is used for better performance if supported.
- MP SSE (Streaming SIMD) is used for better performance if supported.
- MP 3DNow! Enhanced is used for better performance if supported.
- MP 3DNow! is used for better performance if supported.
- MP FPU is used otherwise.

See [Computer \(CPU/Bus/BIOS/Chipset\) Information](#) topic for more information.

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### Acknowledgements

**ALU Integer Benchmark** - Written by C. Adrian Silasi, based on Intel's Mandelbrot application note.

**MMX Integer Benchmark** - Written by AMD/Paul Hsieh based on his Mandelbrot 4x engine.

**MMX Enhanced Integer Benchmark** - Written by C. Adrian Silasi based on the MMX benchmark.

**SSE Integer Benchmarks** - Written by C. Adrian Silasi/Ronen Z based on the MMX benchmark.

**SSE2 Integer Benchmarks** - Written by Intel/Ronen Z based on the SSE benchmark.

**FPU Float Benchmark** - Written by C. Adrian Silasi, based on Intel's Mandelbrot application note.

**K6 3DNow! Float Benchmark** - Written by C. Adrian Silasi based on the SSE benchmark.

**Alternative K6 3DNow! Float Benchmark** - Written by Paul Hsieh based on his Mandelbrot 4x engine.

**Athlon 3DNow! Enhanced Float Benchmark** - Written by AMD/Paul Hsieh based on his Mandelbrot 4x

engine.

**SSE Float Benchmark** - Written by C. Adrian Silasi/Ronen Z based on 3DNow! benchmark.

**SSE2 Float Benchmark** - Written by Intel/Ronen Z based on the SSE benchmark.

**Original Mandelbrot Engine** - by Paul Hsieh.

**MP/MT harness** - by C. Adrian Silasi.

See [Acknowledgements](#) topic for more information.

## **Options**

**Include Extra System Information** - show some more details about tested system.

**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.

**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.

**Include DMI/SMBIOS Information** - query the system through the DMI/SMBIOS interface.

**Enable MMX (Integer) Benchmark** - if disabled, do not use the MMX benchmark.

**Enable Enhanced MMX (Integer) Benchmark** - if disabled, do not use the Enhanced MMX benchmark.

**Enable SSE (Integer) Benchmark** - if disabled, do not use the SSE benchmark.

**Enable SSE2 (Integer) Benchmark** - if disabled, do not use the SSE2 benchmark.

**Enable SSE3 (Integer) Benchmark** - if disabled, do not use the SSE3 benchmark.

**Enable 3DNow! (Float) Benchmark** - if disabled, do not use the 3DNow! benchmark.

**Enable Enhanced 3DNow! (Float) Benchmark** - if disabled, do not use the Enhanced 3DNow! benchmark.

**Enable SSE (Float) Benchmark** - if disabled, do not use the SSE benchmark.

**Enable SSE2 (Float) Benchmark** - if disabled, do not use the SSE2 benchmark.

**Enable SSE3 (Float) Benchmark** - if disabled, do not use the SSE3 benchmark.

**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.

**Include CPU MSR Information** - get CPU info by MSR.

**Enable Parallel Execution** - enable PE support in harness.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

[Tips \(Performance\) List](#)



## **Video Benchmark**

This module is **deprecated**, i.e. it has been removed. A *meaningful* 3D benchmark in the current environment is beyond the scope of this software.

## **Acknowledgements**

See [Acknowledgement](#) topic for more information.

## **Options**

No options.

## **Tips**

[Tips \(Performance\) List](#)

## File System Benchmark

Tests how your drive(s) and controller(s) compare to other devices in a typical system:

- Read Test: Buffered, Random, Sequential
- Write Test: Buffered, Random, Sequential
- Seek Test
  
- Test needs up to 512KB or more free space on the floppy disk tested.
- Test needs up to System Memory Size or more free space on the hard-drive tested.
- Test needs up to 10MB or more free space on the remote/network drive tested.
- Test needs up to 4MB or more free space on the memory-drive tested.
  
- Please ensure that any important information is backed up prior to starting the test.
- Test takes about 5 minutes on P6-class machines with 8GB or larger hard disks.

**Drive Index:** is a composite figure representing an overall performance rating based on the average of the read, write, and seek tests, and file and cache size. The Drive Index is intended to represent drive performance under typical use in a PC. A larger number means better performance. The weighting of the results is not equal it represents the distribution of different files sizes as used on these devices (obtained through field research).

- **Command Line Switch:** DriveBench
- **Requirements:** None
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

All devices referenced include a device description this can be found in ( ) for example (15Krpm, 8M cache) this means that the drive tested run at 15,000 rpm and has 8MB of drive cache.

All devices referenced include a file system description this can be found in [ ] for example [FAT16, WinXP] this means that the test was carried out on a file system with FAT16 on Windows XP.

See [Drives Information](#) topic for more information.

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### Options

**Bypass Windows Cache** - use write-through mode to bypass cache. If disabled, use normal mode.

**Include Extra Disk Information** - show some more information about the drive.

**Include Write Benchmark** - do the write tests as well.

**Benchmark Floppy Drives** - if disabled, ignore floppy drives.

**Benchmark Removable Drives** - if disabled, ignore removable drives.

**Benchmark Hard Disks** - if disabled, ignore hard disks.

**Benchmark All Hard Disk Partitions** - if disabled, benchmark the first partition of the hard disk only.

**Benchmark Memory Drives** - if disabled, ignore memory drives.

**Benchmark Network Drives** - if disabled, ignore network drives.

**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.

**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.

**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.  
**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### **Acknowledgements**

See [Acknowledgements](#) topic for more information.

### **Tips**

[Tips \(Performance\) List](#)

## CD-ROM/DVD Benchmark

Tests how your CD-ROM/DVD drive and controller compares to other CD-ROM/DVD drives in a typical system:

- Read Test: Buffered, Random, Sequential
- Seek Test

This benchmark consists of 2 different tests:

- **Data CD performance**
- **VideoCD / DVD performance**

For the Data CD test, a 600MB+ data disk is required which contains large (64MB+) data files. Data disks which contain MPEG, MOV, AVI or large databases are suitable.

For the VideoCD test, a 300MB+ VideoCD is required. A 600MB+ VideoCD is recommended. Do note that many drives/software drivers may not read CDI disks. Also, a DVD disk can be used for this test.

- Test takes about 10 minutes on P6-class machines with 32x CD-ROM.

**CD/DVD Drive Index:** is a composite figure representing an overall performance rating based on the average of the read, write, and seek tests, and file and cache size. The CD/DVD Drive Index is intended to represent drive performance under typical use in a PC. A larger number means better performance. The weighting of the results is not equal it represents the distribution of different files sizes as used on these devices (obtained through field research).

- **Command Line Switch:** CDROMBench
- **Requirements:** CD-ROM/DVD drive installed
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

See [Drives Information](#) topic for more information.

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### Options

**Bypass Windows Cache** - use write-through mode to bypass cache. If disabled, use normal mode.

**Include Extra Disk Information** - show some more information about the drive.

**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.

**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.

**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Acknowledgements

See [Acknowledgements](#) topic for more information.

### Tips

Tips (Performance) List

## Memory Benchmark

Tests how your memory sub-system compares to other systems with the same or similar memory in other systems. The benchmark is based on the well-known STREAM memory bandwidth benchmark.

- Multi-Processor (SMP) support for up to 32/64 CPUs & SMT.
- Arithmetic Operations Benchmark (assignment, scaling, addition, triad)
- Floating-point Operations Benchmark (assignment, scaling, addition, triad)
- Test needs at least **50% or more** of free physical memory free.
- Close all programs before running it especially if you have less than 16MB.
  
- Test takes about 2 minutes on P6-class machines with 64MB.
  
- **Command Line Switch:** MemBench
- **Requirements:** None
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### Acknowledgements

**ALU/FPU Memory Tests** - Based on the C STREAM benchmark by Dr. John D. McCalpin. Optimised P6 assembler by C. Adrian Silasi

**I MMX Memory Test** - by C. Adrian Silasi based on ALU test.

**I/F SSE Memory Tests** - by C. Adrian Silasi based on SGI memory bandwidth paper.

**I/F EMMX/SSE Memory Tests** - by AMD/Mike W. based on AMD bandwidth paper.

**I/F SSE2 Memory Tests** - by C. Adrian Silasi/Ronen Z based on ALU/FPU tests.

**MP/MT harness** - by C. Adrian Silasi.

See [Acknowledgements](#) topic for more information.

### Options

**Include Extra System Information** - show some more details about tested system.

**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.

**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.

**Include DMI/SMBIOS Information** - query the system through the DMI/SMBIOS interface.

**Disable MMX (Integer) Benchmark** - if enabled, do not use the MMX benchmark.

**Disable Enhanced MMX (Integer) Benchmark** - if enabled, do not use the Enhanced MMX benchmark.

**Disable SSE (Integer) Benchmark** - if enabled, do not use the SSE benchmark.

**Disable SSE2 (Integer) Benchmark** - if enabled, do not use the SSE2 benchmark.

**Disable MMX (Float) Benchmark** - if enabled, do not use the MMX benchmark.

**Disable Enhanced MMX (Float) Benchmark** - if enabled, do not use the Enhanced MMX benchmark.

**Disable SSE (Float) Benchmark** - if enabled, do not use the SSE benchmark.

**Disable SSE2 (Float) Benchmark** - if enabled, do not use the SSE2 benchmark.

**Use 50% of Memory for Test** - if enabled, use 50% of memory; if disabled, attempt to use all free memory for test.

**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.

**Include Memory Banks Information** - show memory banks arrangement.

**Use buses by PCI-to-PCI bridge configuration** - get bus information by bridges; otherwise get by OS.

**Include CPU MSR Information** - get CPU info by MSR.

**Enable Buffering/Block Prefetch Benchmarks** - use advanced benchmarks instead of linear benchmarks where possible; enable buffering & BP in harness.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

Tips (Performance) List

## Cache & Memory Benchmark

Tests how your CPU cache and memory sub-system(s) compares to other systems with the same or similar CPU & memory in other systems. The benchmark is based on the [Memory Bandwidth Benchmark](#) test.

- Multi-Processor (SMP) support for up to 32/64 CPUs & SMT.
- Floating-point Operations Benchmark (assignment, scaling, addition, triad)
- Close all programs before running it especially if you have less than 16MB.
  
- Test takes about 10 minutes on P6-class machines with 64MB.
- Test takes about 5 to 10 times longer than the Memory Bandwidth test.
  
- **Command Line Switch:** CacheBench
- **Requirements:** None
- **OS (Win32) Support:** Windows 98, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

See also [Questions and Answers](#) document for full information.  
See [List of Acronyms](#) for more information.

### Acknowledgements

**FPU Memory Tests** - Based on the C STREAM benchmark by Dr. John D. McCalpin. Optimised P6 assembler by C. Adrian Silasi

**I/F SSE Memory Tests** - by C. Adrian Silasi FPU tests.

**I/F SSE2 Memory Tests** - by C. Adrian Silasi FPU tests.

**MP/MT harness** - by C. Adrian Silasi.

See [Acknowledgements](#) topic for more information.

### Options

**Include Extra System Information** - show some more details about tested system.

**Enable MP/MT Benchmarks** - if disabled, run single-threaded even on MP systems.

**Use Static MP Load Balance** - if disabled, calibrate on each CPU before executing and use variable work units.

**Include DMI/SMBIOS Information** - query the system through the DMI/SMBIOS interface.

**Disable Enhanced MMX (Float) Benchmark** - if enabled, do not use the Enhanced MMX benchmark.

**Disable SSE (Float) Benchmark** - if enabled, do not use the SSE benchmark.

**Disable SSE2 (Float) Benchmark** - if enabled, do not use the SSE2 benchmark.

**Enable SMT/HyperThreading Benchmark** - enable SMT support in harness.

**Include Memory Banks Information** - show memory banks arrangement.

**Use buses by PCI-to-PCI bridge configuration** - get bus information by bridges; otherwise get by OS.

**Include CPU MSR Information** - get CPU info by MSR.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)





## Network/LAN Bandwidth Benchmark

Tests how your TCP/IP network compares to other networks with similar configurations. It uses the ICMP (ping/echo) interface to measure the response time and transfer bandwidth to a host.

- Test takes about 10 seconds on P6-class machines with 10Mbps network adapters.
- **Command Line Switch:** LANBench
- **Requirements:** TCP/IP protocol installed and bound to Microsoft Client/Sharing services, WinSock v2
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

See [Network Information](#) or [WinsockInformation](#) topics for more information.

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### Options

**Include Ping Information** - use ping to query host for connection status.

**Include Transfer Information** - show transfer statistics.

**Include IPX/SPX Information** - query host through IPX/SPX if installed.

**Include All Domains/Workgroups Information** - if disabled, query only current domain/workgroup.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Acknowledgements

See [Acknowledgements](#) topic for more information.

### Tips

[Tips \(Performance\) List](#)

## Acknowledgements

We'd like to thank the following entities for help (in alphabetical order):

3B Software – our US distributor ([www.3bsoftware.com](http://www.3bsoftware.com))  
AMD ([www.amd.com](http://www.amd.com))  
Intel Corp ([www.intel.com](http://www.intel.com))  
Jagged Online – our EU distributor ([www.jaggedonline.co.uk](http://www.jaggedonline.co.uk))  
PowerVR Technologies ([www.powervr.com](http://www.powervr.com))  
SiS ([www.sis.com.tw](http://www.sis.com.tw))  
VIA ([www.via.com.tw](http://www.via.com.tw))

We'd like to thank the makers of the following technologies for help:

InnoSetup (installer - <http://www.jrsoftware.org/>)  
UPX (executable packer - <http://upx.sourceforge2003/>)

We'd like to thank the following sites for help (in alphabetical order):

[H]ardOCP ([www.hardocp.com](http://www.hardocp.com))  
2 CPU ([www.2cpu.com](http://www.2cpu.com))  
AMD MB ([www.amdmb.com](http://www.amdmb.com))  
AMD World ([www.amdworld.co.uk](http://www.amdworld.co.uk))  
Benchmark HQ ([www.benchmarkhq.ru](http://www.benchmarkhq.ru))  
Burnout PC ([www.burnoutpc.com](http://www.burnoutpc.com))  
CDV Software Entertainment ([www.cdv.de](http://www.cdv.de))  
Club Overclocker ([www.cluboc2003](http://www.cluboc2003))  
CNet/ZDNet ([www.cnet.com](http://www.cnet.com))  
Computer Buyer ([www.computerbuyer.co.uk](http://www.computerbuyer.co.uk))  
Computer Games Online ([www.cgonline.com](http://www.cgonline.com))  
Computer Shopper ([www.computershopper.co.uk](http://www.computershopper.co.uk))  
Excessive Hardware ([www.excessivehardware.com](http://www.excessivehardware.com))  
EXHardware ([www.exhardware.com](http://www.exhardware.com))  
HalloweenComputers ([www.halloweencomputers.com](http://www.halloweencomputers.com))  
HAL-PC Magazine ([www.hal-pc.org](http://www.hal-pc.org))  
Hard Tecs 4U ([www.hardtecs4u.com](http://www.hardtecs4u.com))  
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Hexus ([www.hexus2003](http://www.hexus2003))  
Hot Hardware ([www.hothardware.com](http://www.hothardware.com))  
Icronic ([www.icronic.com](http://www.icronic.com))  
Komputer SWIAT Magazine ([www.komputerswiat.pl](http://www.komputerswiat.pl))  
Maximum 3D ([www.maximum3d.com](http://www.maximum3d.com))  
Meet The Geek ([www.meetthegeek.co.uk](http://www.meetthegeek.co.uk))  
MikroBitti ([www.mikrobitti.fi](http://www.mikrobitti.fi))  
Nordic Hardware ([www.nordichardware.com](http://www.nordichardware.com))  
OC Shoot ([www.ocshoot.com](http://www.ocshoot.com))  
OcAddiction ([www.ocaddiction.com](http://www.ocaddiction.com))  
OcPrices ([www.ocprices.com](http://www.ocprices.com))  
OverClocked Café ([www.overclockedcafe.com](http://www.overclockedcafe.com))  
PC Format ([www.pcformat.co.uk](http://www.pcformat.co.uk))  
PC Mech ([www.pcmach.com](http://www.pcmach.com))  
PC Pro ([www.pcpro.co.uk](http://www.pcpro.co.uk))  
PC Scoop ([www.pcscoop.com](http://www.pcscoop.com))

PC World US ([www.pcworld.com](http://www.pcworld.com))  
Radeonic ([www.radeonic.com](http://www.radeonic.com))  
Riva Station ([www.rivastation.com](http://www.rivastation.com))  
Sharky Extreme ([www.sharkyextreme.com](http://www.sharkyextreme.com))  
SimHQ ([www.simhq.com](http://www.simhq.com))  
Soundcard Central ([www.soundcardcentral.com](http://www.soundcardcentral.com))  
The DDR Zone ([www.theddrzone.com](http://www.theddrzone.com))  
Tweak 3D ([www.tweak3d2003](http://www.tweak3d2003))  
Tweakers Guide ([www.tweakersguide2003](http://www.tweakersguide2003))  
Unique PC ([www.unique-pc.com](http://www.unique-pc.com))  
Van's Hardware ([www.vanshardware.com](http://www.vanshardware.com))  
VIA Arena ([www.viaarena.com](http://www.viaarena.com))  
VNU Germany ([www.vnu.de](http://www.vnu.de))  
VTR-Hardware ([www.vtr-hardware.com](http://www.vtr-hardware.com))

We'd like to thank the following people for help (in alphabetical order):

Adam Honek  
Alexander van Kaam  
Andreas Goettl  
Andrew Thomas  
Andy Lee  
Armand Hirt  
Arne Westin  
Azman Sahari  
Benjamin Brooks III  
Birgir 'Iceman' Gudjonsson  
Bubba Wolford  
Chris Pittman  
Clarice Simmons  
Colin Hoare  
Craig Hart  
Dan Bennis  
Dark Druid  
David Altavilla  
David Marsiglia  
David Ross  
Derek Ryba  
Dirk van den Berghe  
Duane Davis  
Edward J. Nethercott  
Elie Ayache  
Francis Devereux  
Fred Dunlap  
Galen S. M. Chai  
James Campbell  
Jane Xia  
Jens Scheibel  
Jim 'Justifier' Miller  
Jim Miller  
Jim Nucci  
Johannes Friederich  
John Gatt  
John McCrae  
John Stephens

Jonathan The  
Jordan Russel  
Kai Schmerer  
Keith 'Mortin' Whitsitt  
Ken Schutt  
Kim Roney  
Kirk Johnson  
Kyle Benett  
Laszlo Molnar  
Li Shi  
Marco Chiappetta  
Markus F.X.J. Oberhumer  
Mark Bedingford  
Mark Daly  
Mark Gaffney  
Martin 'Major' Jorgensen  
Martin Malik  
Mats Petersson  
Matt Dunford  
Mattias Pettersson  
Meikel Weber  
Micah Schmidt  
Michael Herf  
Michael Knutson  
Michael Schuette  
Mike Wall  
Mike Warner  
Min-Han Lee  
Mircea Cioata  
Nancy Salani  
Nicolas Thibieroz  
Nigel A. Dight  
Patrick Evans  
Paul Hsieh  
Paul Kinnaly  
Peter Baekgaard Madsen  
Peter Hubinsky  
Ralf Schafer  
Richard Brown  
Robert White  
Ronen Zohar  
Roy Russo  
Sander Sassen  
Sandy Chen  
Serge-Yvan Parel  
Shane Dennison  
Shervin Kheradpir  
Simon Cole  
Srinivas Chennupaty  
Steve Nutt  
Steve Winburn  
Steven C Schult  
Tara Kalavade  
Theresa Chen  
Tom Ellis

Van Smith  
Vince Freeman  
Vincent Valmond  
Viorica Silasi  
Vlado  
Ylona Brooks  
Yohai Merzel

**NB.** If anyone that has helped does not see his or her name here, please forgive us and let us know – we will add it as soon as possible.

## SCSI Information

Shows the list of SCSI adapters installed on the system and the devices connected to them. For each device, specific information is displayed.

- SCSI Host Information
- SCSI Device Information
- SCSI Block Devices Extra Information
  
- **Command Line Switch:** SCSIInfo
- **Requirements:** SCSI Host Adapter, SCSI devices and 32/64-bit ASPI drivers.
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

See [List of Acronyms](#) for more information.

**Note:** Windows uses drivers that make ATAPI devices look like SCSI devices for consistent management. This is done since ATAPI is in many ways quite similar to SCSI. Therefore, some of your ATA devices may appear as SCSI devices as well. This is not a bug - but a feature of the operating system.

**Host** - The host is the controller that manages the SCSI bus. Most SCSI controllers support up to 7 devices (8 including the controller itself). Each device on the SCSI bus has a unique address.

**Device** - The devices that can be connected to the SCSI bus are varied and include the usual hard disks, CD-ROMs, backup devices, tape drives, scanners, optical disks and many others.

**Device Type** - the type of the device.

**Manufacturer** - the company that manufactured the device.

**Product** - the full name of the product.

**Version** - the product version or revision.

**Extra Information** - extra information about the device, generally either a serial number or the release date.

**Removable Device** - whether the media of the device is fixed or removable.

**Target ID** - SCSI devices occupy (i.e. respond to) one address on the SCSI bus. Generally, the SCSI device provides a means (e.g. switches, jumpers) to select one of the eight available addresses (0 through 7). This address is used during bus arbitration and selection or re-selection of SCSI devices. Each device on the SCSI bus is assigned a unique address.

**Logical Unit Number** - Each target has one or more logical units, beginning with logical unit zero. There is a maximum of eight logical units. These logical units are usually mapped directly to peripheral devices, but they may be a portion of a peripheral device or may comprise multiple peripheral devices.

**Device Currently Connected** - Whether this device is currently on-line or not. Some devices can disconnect from the bus.

**Bus Width** - The SCSI bus width. Usually it is 8-bit but Wide SCSI supports 16-bit for faster data transfer. Some SCSI implementations even support 32-bit.

**SCSI ANSI Version** - The device complies to this version of SCSI. This code designates this standard upon approval by ANSI.

**Supports Relative Addressing Mode** - device supports the relative addressing mode for this logical unit.

**Supports Synchronous Transfers** - device can transfer data synchronously.

**Supports Command Queues** - device supports queued commands.

**Supports Linked Commands** - device supports command linking.

**Supports Soft Reset** - device can be soft reset in addition to the hard reset.

**Supports Terminate I/O** - device can terminate a I/O transaction.

**Int 13h Drive No.** - if the device is a hard disk, this is the BIOS ID for the drive. With an ID the BIOS and DOS can use the drive without specific drivers.

**Heads** - the number of heads (tracks) for the device.

**Sectors** - the number of sectors per track for this device.

### Options

**Include General Properties Information** - show generic SCSI device data.

**Include Drive Information** - query the drive device.

**Include Disk/Media Information** - query the installed media of drive.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

### Tips

[Tips \(Performance\) List](#)



## **ATA/ATAPI Information**

Shows the list of ATA/ATAPI adapters installed on the system and the devices connected to them. For each device, specific information is displayed.

- ATA Controller Information
- ATA/ATAPI Device Information
- Device State Information
  
- **Command Line Switch:** ATAInfo
- **Requirements:** ATA Controller, ATA/ATAPI devices and 32/64-bit ATA/ATAPI drivers.
- **OS (Win32) Support:** Windows 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Explanations**

See [List of Acronyms](#) for more information.

## **Options**

**Include ATA Devices Information** - query ATA devices.

**Include ATAPI Devices Information** - query ATAPI devices.

**Include Hosts Information** - query the controller.

**Include Transfer Mode(s) Information** - show the transfer mode(s) supported and enabled.

**Include SMART Information** - show SMART details.

**Include SMART Data Information** - show the drive's SMART parameters.

**Include Temps, Fans and Voltages Information** - query the environment monitor for temperature, cooling and voltage sensors.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## **Tips**

[Tips \(Performance\) List](#)

## Services Information

Shows the installed/registered Windows services and device drivers, active or not on the current system.

- Service/Device Driver Information
- Service/Device Driver Configuration Information
- File Information
  
- **Command Line Switch:** ServicesInfo
- **Requirements:** services and device drivers.
- **OS (Win32) Support:** Windows 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## Explanations

See [List of Acronyms](#) for more information.

**Name** - the registered unique name of the service

**Full Name** - the description of the service

**Type** - the type of service (process) device driver (kernel driver)

**File Name** - the full file name and parameters of the service

**Current Status** - whether the service is active or not

**Start-up Type** - how does the service start and stop

**Error Control** - how the service reports errors

**Dependencies** - the services this service needs in order to operate

**Log on As** - the user under which the service runs

**File Information** - the process file name, properties and information.

## Options

**Include Windows Services Information** - query the Windows services.

**Include Device Drivers Information** - query device drivers.

**Include Active Services Information** - query only the active services/device drivers.

**Include Inactive Services Information** - query only the inactive services/device drivers.

**Include Service File Information** - query the service's file.

**Include Performance Enhancing Tips** - if disabled, do not display any tips.

## Tips

[Tips \(Performance\) List](#)

## **Config.sys Listing**

Shows information about the Windows/MS-DOS initialisation file **Config.sys** and its contents.

- **Command Line Switch:** Config.sys
- **OS (Win32) Support:** Windows 9X

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Config.dos Listing**

Shows information about the MS-DOS initialisation file **Config.dos** and its contents. This file is used when you boot into the previous version of MS-DOS instead of Config.sys.

- **Command Line Switch:** Config.dos
- **OS (Win32) Support:** Windows 9X

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Config.nt Listing**

Shows information about the Windows NT/2000/XP initialisation file **Config.nt** and its contents. This file is used when you boot into Windows NT/2000/XP instead of Config.sys.

- **Command Line Switch:** Config.nt
- **OS (Win32) Support:** Windows 2000, XP, 2003

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **AutoExec.bat Listing**

Shows information about the Windows/MS-DOS initialisation file **AutoExec.bat** and its contents.

- **Command Line Switch:** AutoExec.bat
- **OS (Win32) Support:** Windows 9X

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **AutoExec.dos Listing**

Shows information about the MS-DOS initialisation file **AutoExec.dos** and its contents. This file is used when you boot with the previous version of MS-DOS instead of the usual AutoExec.bat.

- **Command Line Switch:** AutoExec.dos
- **OS (Win32) Support:** Windows 9X

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **AutoExec.nt Listing**

Shows information about the Windows NT/2000/XP initialisation file **AutoExec.nt** and its contents. This file is used when you boot with Windows NT/2000/XP instead of the normal AutoExec.bat.

- **Command Line Switch:** AutoExec.nt
- **OS (Win32) Support:** Windows 2000, XP, 2003

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)



## **MsDos.sys Listing**

Shows information about the Windows/MS-DOS initialisation file **MsDos.sys** and its contents. This file determines the way Windows loads and behaves at boot time. It also allows you to boot to MS-DOS.

- **Command Line Switch:** MsDos.sys
- **OS (Win32) Support:** Windows 9X

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Boot.ini Listing**

Shows information about the Windows NT/2000/XP initialisation file **Boot.ini** and its contents. It allows you to boot into different Windows versions as well as into other operating systems (e.g. legacy DOS or Windows 9X/Me).

- **Command Line Switch:** Boot.ini
- **OS (Win32) Support:** Windows 2000, XP, 2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **Dr. Watson Log**

Shows information about the errors detected by the Dr. Watson application for Windows NT/2000/XP. This way you can check this log for any problems (if any).

- **Command Line Switch:** DrWtsn.log
- **OS (Win32) Support:** Windows 2000, XP, 2003

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **System.ini Listing**

Shows information about the Windows initialisation file **System.ini** and its contents.

- **Command Line Switch:** System.ini
- **OS (Win32) Support:** Windows 9X, Me

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Win.ini Listing**

Shows information about the Windows initialisation file **Win.ini** and its contents.

- **Command Line Switch:** Win.ini
- **OS (Win32) Support:** Windows 9X, Me

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **Control.ini**

Shows information about the Windows initialisation file **Control.ini** and its contents:

- **Command Line Switch:** Control.ini
- **OS (Win32) Support:** Windows 9X, Me

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Protocol.ini Listing**

Shows information about the Windows network initialisation file **Protocol.ini** and its contents.

- **Command Line Switch:** Protocol.ini
- **OS (Win32) Support:** Windows 9X, Me

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **BootLog.txt Listing**

Shows information about the Windows boot log file **BootLog.txt** and its contents.

- **Command Line Switch:** BootLog.txt
- **OS (Win32) Support:** Windows 9X, Me

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)



## **ScanDisk.log Listing**

Shows information about the ScanDisk boot log file **ScanDisk.log** and its contents. This file holds the log of tests done on the drives and any errors (if any) encountered and corrections (if any) attempted.

- **Command Line Switch:** ScanDisk.log
- **OS (Win32) Support:** Windows 9X, Me

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **NetLog.txt Listing**

Shows information about the Windows network boot log file **NetLog.txt** and its contents:

- **Command Line Switch:** NetLog.txt
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **NDisLog.txt Listing**

Shows information about the Windows network initialisation file **NDisLog.txt** and its contents:

- **Command Line Switch:** NDisLog.txt
- **OS (Win32) Support:** Windows 9X, Me

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Dump Hardware Settings**

Dumps the hardware settings from the system registry. Very useful to technical support people to check that a hardware was correctly installed in Windows and the correct settings are used.

- **Command Line Switch:** DumpHardware
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Environment List**

Shows the list of environment variables and their values. Environment variables are still used to store configuration information by Windows & console programs.

- **Command Line Switch:** EnvVar
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **CMOS Information**

Displays the CMOS hardware settings and shows various information encoded in CMOS.

- Time, Date, Alarm
  - System Status
  - Equipment Installed
  - Floppy Disks and Hard Disks
  - Memory Size & Type
- **Command Line Switch:** CMOSInfo
  - **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003

### **Explanations**

This information is only useful to programmers and therefore is beyond the scope of this document. You can get information about this settings from your BIOS manual or an advanced computer book that deals with this topic.

See [List of Acronyms](#) for more information.

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **Installed Applications**

Lists all installed and registered applications on the system.

- **Command Line Switch:** InstalledApps
- **OS (Win32) Support:** Windows 9X, Me, NT, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **Installed Programs**

Lists all installed and registered programs on the system.

- **Command Line Switch:** InstalledProgs
- **OS (Win32) Support:** Windows 9X, Me, NT, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)



## **File Types**

Lists all registered file extensions (aka document type) on the system and the associated server application that manages the document type.

- **Command Line Switch:** FileTypes
- **OS (Win32) Support:** Windows 9X, Me, NT, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **Event Log**

- **Command Line Switch:** EventLog
- **OS (Win32) Support:** Windows NT, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

## **Options**

This module has no options to set.

## **Tips**

[Tips \(Performance\) List](#)

## **Dump Hardware Registers**

Dumps the registers from the system hardware. Very useful to technical support people to check that a hardware was correctly installed in Windows and the correct settings are used.

- **Command Line Switch:** DumpRegisters
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## Hardware Irq Settings

Shows the list of interrupt requests lines (IRQ), their settings and the hardware (device) that uses each setting.

- **Command Line Switch:** HardIrq
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Hardware Interrupts (Irq)** - are the interrupts generated by hardware. There are 16 in total in today's PC. However most of them are used before you add any devices. Most hardware devices (keyboard, mouse, modem, disk controller) need an interrupt to interface to the CPU.

**Channels** - There are 2 interrupt controllers in today's PC, each providing 8 channels. One channel is used to connect the master interrupt controller to the slave interrupt controller, leaving 15 free interrupts. However, the chipset itself uses many interrupts (about 11) leaving only about 3-6 free. Until recently no two devices could share and interrupt (in most cases) since the software could not tell them apart, but new BIOSes & OSes have implemented a resource sharing protocol since there are just not enough free interrupts for all the hardware to use.

**Irq. No.** - The number of the hardware interrupt that is used by a device or more.

**Device** - The name and type of hardware device or devices that owns/own the hardware interrupt.

See [List of Acronyms](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## Software Protected-Mode Irq Handlers

Shows the list of software interrupt requests lines (Int), their settings and module that handles this interrupt in protected mode (16/32/64-bit).

- **Command Line Switch:** Prolrq
- **OS (Win32) Support:** Windows 9X, Me

### Explanations

**Software Interrupts** - are interrupts generated by software, Typically they are used to call services provided by a BIOS (system, video, hardware). There are 256 in total that include the 16 hardware interrupts. When an interrupt occurs the CPU jumps to the interrupt handler that is listed in a table called the 'interrupt vector table'. The handler saves the current CPU state, deals with the interrupt, and restores the initial state and exits.

**Irq. No.** - The number of the software interrupt in hexadecimal.

**32/64-bit Address** - The address (32/64-bit flat mode) of the protected mode interrupt handler. Protected mode is the mode in which Windows runs on.

**Handler** - The name of the Windows module/device driver that handles the interrupt.

**Description** - The purpose of the interrupt and typical usage or device that uses it.

See [List of Acronyms](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## Software Real-Mode Irq Handlers

Shows the list of software interrupt requests lines (Int), their settings and module that handle this interrupt in real mode (16-bit).

- **Command Line Switch:** Reallrq
- **OS (Win32) Support:** Windows 9X, Me

### Explanations

**Software Interrupts** - are interrupts generated by software, Typically they are used to call services provided by a BIOS (system, video, hardware). There are 256 in total that include the 16 hardware interrupts. When an interrupt occurs the CPU jumps to the interrupt handler that is listed in a table called the 'interrupt vector table'. The handler saves the current CPU state, deals with the interrupt and restores the initial state then exits.

**Irq. No.** - The number of the software interrupt in hexadecimal.

**16:16-bit Address** - The address (16bit segment + 16bit offset) of the real mode interrupt handler. The real mode is the mode MS-DOS runs on.

**Handler** - The name of the Windows module/device driver that handles the interrupt.

**Description** - The purpose of the interrupt and typical usage or device that uses it.

See [List of Acronyms](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## **DMA Channel Settings**

Shows the list of direct memory access channels (DMA), their settings and the hardware (device) that uses each setting.

- **Command Line Switch:** DMARes
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### **Explanations**

**DMA** - DMA or Direct Memory Access is a method of transferring data between a device and memory without CPU involvement. This way is faster. Also, the CPU can do other computation in the mean-time.

**Channels** - There are 2 DMA controllers in a PC, each providing 4 channels. Since one channel is used to connect the master DMA controller to the slave DMA controller there are 4 8-bit and 3 16-bit available channels. One channel can be used by one hardware device only.

**DMA Ch. No.** - the channel number used by a hardware device.

**Device** - the name and type of hardware device that uses the DMA channel.

See [List of Acronyms](#) for more information.

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## **I/O Port Settings**

Shows the list of input/output ports (I/O), their settings and the hardware (device) that uses each setting.

- **Command Line Switch:** IORes
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### **Explanations**

**I/O Ports** - are ports that can be used by software to talk to hardware directly without using interrupts and the BIOS. There are 65 thousand ports, but each hardware device may use as many as 20-40, i.e. a range. Some are input only, some are output only and some are input/output depending on hardware. No two devices may share one port, so ranges must not overlap.

**I/O Port** - the port range used by the hardware device.

**Device** - the name and type of hardware device that uses this I/O port range.

See [List of Acronyms](#) for more information.

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)



## Memory Settings

Shows the list of memory blocks, their settings and the hardware (device) that uses each setting.

- **Command Line Switch:** MemRes
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Memory** - a 32-bit processor (386, 486, Pentium, etc.) has an address range of 4GB (00000000 - FFFFFFFF in hexadecimal); a 36-bit PAE processor (Pentium Pro/II/III) has an address range of 64GB (000000000-FFFFFFFF in hexadecimal); a 64-bit processor (Alpha, Opteron, MIPS, Itanium, etc.) has an address range of 16,384 PB (0000000000000000 -FFFFFFFFFFFFFFFF in hexadecimal).

The installed physical memory, the video adapter memory, BIOSes can be mapped somewhere in this address space. While the address range is huge, there may still be conflicts since most devices try to use the same lower addresses.

**Memory Range** - the memory address range used by the hardware device.

**Device** - the name and type of hardware device that uses this memory address range.

See [List of Acronyms](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## Plug & Play Enumerator

Shows the list of devices installed in your system, together with their type, version, resources allocated and software drivers used.

- **Command Line Switch:** PnPEnm
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Manufacturer** - the manufacturer for this device.

**Device Name** - the full product name for this device.

**Hardware Version** - the device version if known.

**Resources** - the hardware resources this device uses.

**Irq. No.** - the number of the hardware interrupt that is used by a device or more.

**DMA Ch. No.** - the channel number used by a hardware device.

**I/O Port** - the port range used by the hardware device.

**Memory Range** - the memory address range used by the hardware device.

**Driver** - the software driver that interfaces this device to Windows.

**Driver Date** - the date the driver was released.

**Driver Version** - the version of the driver. For the current version of windows this should be 4.0 or higher.

**Information File** - the name & path of the information file that was used to install this software driver.

**Information File Section** - the name of the section within the information file used to install this software driver onto the operating system.

**Device Loader** - the device driver that installs this driver.

**Device Enumerator** - the device driver that detects (enumerates) this type of devices.

**Miniport Driver** - a miniport driver is a generic driver for a specific type of device (e.g. ATA controllers) which interfaces with a specific driver for your hardware. This way the specific driver is simpler and thus easier to write and release.

**Universal Driver** - an universal driver is similar to a miniport driver, however it is a fully fledged driver which does not need a specific driver to drive your hardware. You will gain better support and stability but some specific functions of your hardware may go unused.

See [List of Acronyms](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## **Create a Report Wizard**

Runs the Create a Report Wizard that helps you create a system report quickly. You can:

- Print, Fax, Save or E-Mail the report
- Create a script with the choices made for batch-mode runs
- Select only the modules that you require
- Adjust the information type/amount each module provides
- Schedule reports (Windows System Agent feature)
- Run batch-mode reports (*/r* command line option)

### **Shortcut**

Keys:       CTRL+R

**Open Module**


Loads (runs/executes/activates/updates) the selected module.

**Shortcut**

Keys: Enter


## Run Control Panel

Loads the Windows **Control Panel** utility. This utility allows you to change your system's settings and is an integral part of Windows.

Click here  to run **Control Panel**.

## Run Scan Disk

Runs the disk testing and fixing Windows utility **ScanDisk**. ScanDisk can detect and repair most disk problems.

Click here  to run **ScanDisk**.

## Run Disk Defragmenter

Runs the disk defragmenter Windows utility **Defrag**. By defragmenting your hard disk you speed it up thus improving the system's performance.

This utility is **not** present on Windows NT systems. You will need to get a 3rd party utility to defragment your disk (e.g. DiskKeeper). Windows 2000 includes a scaled-down version of DiskKeeper.


Click here  to run **Windows 9X/Me Defrag**.

Click here  to run **Windows 2000/XP/2003 Defrag**.

## Run System Files Configuration Editor

Runs a program which allows you to view and edit the system files (Config.sys, Autoexec.bat, Win.ini and System.ini) as well as back them up. Should be used with care as it is not a supported program.

This utility is not present on Windows NT/2000/XP/2003 systems since they do not use these configuration files.


Click here  to run **System Editor**.



## Run Registry Editor

Runs the registry editor utility that allows you to view, add, delete and modify registry keys and values. Unless you know what you're doing you should not try it as you may destroy the system set-up.


This utility comes with all versions Windows but is **hidden** since only advanced users should use it.

Click here  to run **Registry Editor**.

## Run Policy Editor

Runs the policy editor that allows you to grant or revoke user privileges including using system programs, changing system configuration and many other things. Useful only to system administrators and multiple users of the same system. Do not use otherwise.


You must install this program yourself manually from the Windows 9X/Me CD. See the **Admin** directory. If you have the **Plus!** Pack you can install it using the install program that comes with Plus!


Click here  to run **Policy Editor**.

## Run the IP Configuration Editor

The TCP/IP configuration editor allows you to view and set various settings which mainly relate to the Internet and/or Network connection. These should be done once at the beginning and left well alone unless you change your set-up.


You must have the TCP/IP network protocol installed. Windows NT/2000/XP systems do not have this utility as a different network system is used.

Click here  to run **Windows 9X/Me IP Configuration Utility**.

Click here  to run **Windows NT/2000/XP IP Configuration Utility**.


## Run WordPad

Runs **WordPad**, the basic word-processor application included with Windows.

Click here  to run **WordPad**.

## Run NotePad

Runs **NotePad**, the basic text editor application included with Windows.

Click here  to run **NotePad**.

## Run BackUp

Runs **Windows BackUp**, the disk back-up application. You should use this regularly (or another back-up application) to back your hard disk(s) to tape(s) or other removable media. Just in case...

If you haven't installed it, run **Control Panel\Add-Remove Programs\Windows Setup\Disk Tools**, select **Backup** to install it. Windows 9X, 2000/2003 come with different backup programs thus backups made with one program may not work at all with another one. Windows Me does not have a backup utility.

Click here  to run **Windows 98 Backup**.

Click here  to run **Windows NT/2000/XP Backup**.

## Run Registration Clean-up

Runs the **Registration Clean-up Wizard** which is an application which checks and removes garbage from the system's registry as well as checking the validity of keys and data to a certain extent.

You need to get this yourself (it's **free**) from Microsoft's Web Site. Click here  to connect to it. Search for **RegClean**.

Click here  to run **Registration Clean-up Wizard**.

## Run System Monitor

Runs the **System Monitor**, an application which monitors system resources and shows you various graphs so you can check your system's load. This may tell you that you need more memory or a faster processor, etc.

If you haven't installed it run **Control Panel\Add-Remove Programs\Windows Setup\Accessories** and select **System Monitor** to install it. Windows NT/2000/XP/2003 systems come with a different utility.

Click here  to run **Windows 9X/Me System Monitor**.


Click here  to run **Windows NT/2000/XP/2003 System Monitor**.



## Run the Microsoft System Information

Runs the **Microsoft System Information**, Windows utility which provides most of the information Sandra provides. You may want it to compare results and make sure.

The program comes with **Microsoft Office** and is included with Windows 9X and 2000/XP/2003. Windows NT comes with a different utility.

Click here  to run **System Information**.

## Run DirectX Diagnostics

Runs the **Microsoft DirectX Diagnostic Tool**, a diagnostic and information utility for DirectX. It is included in the full DirectX 6 release or later. If you don't have it, make sure you've installed DirectX 6 or later.

It is included in Windows 98, Me, 2000, XP.

Click here  to run **DirectX Diagnostics**.

## Run Windows Tune-Up

Runs the **Microsoft Maintenance Wizard**, a utility that cleans up your system, checks the system for errors and optimises the systems so that programs start faster. It also allows you to schedule the maintenance sessions.

This utility is included in Windows 98/Me.

Click here  to run **Windows 98/Me Tune-Up**.

## Run System Troubleshooter

Runs the **Microsoft System Configuration**, a utility that automates the routine troubleshooting steps that Microsoft Technical Support engineers use when diagnosing issues with the Windows. This tool permits you to modify the system configuration through a process of elimination with check boxes.


This utility is included in Windows 98, Me, 2000, XP.

Click here  to run **System Troubleshooter**.

## Run Disk Clean-Up

Runs the **Microsoft Disk Clean-Up**, a utility that lets you regain disk space by deleting unneeded files from various parts of the system or by un-installing programs or parts of Windows.

This utility is included in Windows 98, Me, 2000, XP, 2003.

Click here  to run **Disk Clean-Up**.

## **Loads SiSoftware Sandra's WWW Page**

Starts up your default World-Wide-Web browser and loads up the **SiSoftware Sandra WWW page**.

If this does not work, try entering the address manually in your WWW browser. See [Technical Support and Points of Contact](#) topic for more information.

## **Connect**

Runs the **Connect Wizard** which helps you select the computer you wish to connect to using Sandra Client/Server version. All the information Sandra Client displays refers to the remote computer.

To connect to more than one computer simultaneously or run the statistics wizards from the same copy of the program, you need the special add-ons. However, you can run more than one copy of Sandra Client simultaneously without using any add-ons.

## **Shortcut**

Keys:      CTRL+C

**Disconnect**

Disconnects from the current Sandra's connection(s). This does not disconnect you from the Internet or your other network(s).

**Shortcut**

Keys: CTRL+D



## **Set Options**

Allows you to set options.

## **Set Options**

Allows you to set options.

## **View Module Properties**

Shows the Sandra module's properties and various other information:

- Module Information
- Display Capabilities
- Command Line Option
- OS Support
- Module Settings

This information is useful if you wish to create scripts or customise Sandra in special ways.

### **Shortcut**

Keys:      Alt+Enter

**View Information Modules**

Shows only Information Modules.

## **View Benchmarking Modules**

Shows only Benchmarking Modules.

## **View Listing Modules**

Shows only Listing Modules.

**View Testing/Diagnostic Modules**

Shows only Testing/Diagnostic Modules.

**View All Modules**

Shows all modules, including Wizards.



## **Large Icons**

Use Large Icons for the module list.

## **Small Icons**

Use Small Icons for the module list.

## List

Shows modules in a list.

## **Details/Report**

Shows modules in a report and shows module information.

**Refresh**

Refreshes the module list.

**Arrange modules by name**

Arranges modules by name.

### **Arrange modules by description**

Arranges modules by their description.

## **Auto Arrange**

Auto arranges the module list



## **Exit Application**

Closes Down SiSoftware Sandra. It also disconnects all Sandra connections if any.

## **Shortcut**

Keys:      Alt+F4

**View Toolbar**

Shows or hides the Sandra's standard toolbar.

**View Status Bar**

Shows or hides Sandra's status bar.

## **Help Contents**

Displays the SiSoftware Sandra's help topics.

## **Help Search**

Searches the on-line documentation for keywords.

## **Tip of the Day**

Shows a tip of the day from Sandra's tip database. This is a standard feature on modern Windows applications.

## **About SiSoftware Sandra**

Displays program information, version and copyright details. See the [License Details](#) topic for more information.

## Change Module Options

This wizard allows you to:

- Select the tests the module runs. This is useful if some tests lock the computer or you don't require them.
- Adjust the amount of information to your specific requirements. Some information may not be needed or may be too large for some reports.
- Check or uncheck the checkboxes next to the option you want to select/de-select.
- Options are saved for later use.
- While the options come into effect immediately, you may need to click the **Update** button to refresh the module's information.

### Shortcut

Keys:      CTRL+O



## **Create a Report Wizard**

This wizard allows you to run one or any group of modules and save the output to almost any device. You can also set the options to each module to select just the data needed.

You can also use the settings in a profile to configure the settings of the wizard and thus create a report in a specific format all the time.

You can also create a script of the settings to be used in batch-mode to create unattended reports.

### **Shortcut**

Keys:      CTRL+R

## Create a Report Wizard - Step 1

Here you can select the manner in which you want the report to be created:

- **Make choices and generate report** - continue with the wizard making choices as to what, how and where the report should be create and generate it.
- **Save the settings in a script file for later use** - a script will be created using the current options defined in the wizard. You can run the script later using the command: **Sandra /r <script file name>**. This option *does not* generate a report - only saves the options you selected.
- **Load the settings from a script file** - select a script file and use the settings in it to generate a report interactively. This is a good way to check whether a previously generated script (either manually or automatically) does work the way you expect.
- **Use the settings from a built-in profile** - select one of the profiles listed in the combo-box (if any) and enter any information that may be needed to complete the report. This way you can create a report in the specific format as defined by the profile creator.

## Create a Report Wizard - Steps 2

### Burn-In Wizard - Step 1

This wizard allows you to select which modules you want to include in the report:

- Check the checkbox next to each module you want to include in the report.
- Uncheck the checkbox next to each module you want to exclude from the report.
  
- All modules are selected by default.
- To select all modules, click the **Select All** button.
- To deselect all modules, click the **Clear All** button.
- If you want to set a module's options, click the **Options** button.

## **Create a Report Wizard - Step 6**

Enter your comments in the edit box. If you don't type anything, no comments will appear in the report.

If you choose to e-mail/post the report, this text becomes the message body (the actual report is send as an attachment) so you should definitely enter some information for the receiver of the message.

## Create a Report Wizard - Step 7

### Performance Tune-Up Wizard - Step 2

Here you can choose the way you want the report to be delivered:

- **Save to Disk** - you will be able to select the drive, path and filename for the report.
- **Print or Fax** - you will be able to choose the printer or fax you want to send the report to and also set the device settings, number of copies, etc. A print or fax needs to be installed.
- **E-Mail by MAPI** - you will be able to enter the message subject and the recipient's name(s). The report will be send as a file attachment. Make sure you check the **compress** checkbox to minimise message size. A 32/64-bit MAPI compatible client needs to be installed and configured properly.
- **Email by SMTP** - you will able to enter the message subject and the recipient's name(s). Also, you will need to enter the SMTP server details and user account information. The report will be send as a file attachment. Make sure you check the **compress** checkbox to minimise message size. CDO need to be installed and the SMTP service configured.
- **Post by NNTP** - you will able to enter the message subject and the newsgroup(s). Also, you will need to enter the NNTP server details and user account information. The report will be send as a file attachment. Make sure you check the **compress** checkbox to minimise message size. CDO need to be installed and the NNTP service configured.
- **Upload it** - you will be able to enter the URL of the server you want to upload it to, the account user name and password. If you're uploading to a FTP server, use the <ftp://ftp.server.com/folder> convention. If you're uploading to a web/http server, use the <http://www.server.com/folder> or <https://www.secure.com/folder> convention.
- **ODBC database** - you will be able to enter the DSN (data source name), the user name and password to connect to it. You need a previously set-up data source (generally a system data source) through the ODBC Control Panel extension. Any (relational) database supported by ODBC can be used. See [Database Schema](#) for schema information.
- **ADO database** - you will be able to enter the provider (i.e. the database layer, e.g. SQLOLEDB), server host name, database name, user and password. Generally this is the recommended option for SQL Server or other specialised storage providers. See [Database Schema](#) for schema information. You can also connect through ODBC if a DSN-less connection is required.
- **Post to MSMQ queue** - you will be able to enter the queue name and the account user name and password. If you're posting to a private queue, make sure you prefix the queue name with the **private\$** keyword.

## Create a Report Wizard - Step 8

### Performance Tune-Up Wizard - Step 3

Here you can choose the way the report file is created:

- **Text Document (.txt)** - This is the normal format, readable by humans (i.e. with proper formatting, alignments and other things). But it cannot be easily imported into a database or spreadsheet. Sandra herself cannot read it.
- **Report/Hierarchical Compatible (.rpt)** - To allow Sandra to read it back, you should choose this option. While not readily accepted as input to a database or spreadsheet - a converter can be quickly made to convert most other formats. For more information see [Report Format](#).
- **Web/Html Compatible (.htm)** - If you want to create a report for Internet publication or to print out. It looks better but it is much larger than a text report. It should also be used if you intend to use proportional fonts or import it into a modern editor. You can import your own *style sheet* if you don't like the default. For more information see [HTML File Format](#).
- **Web/XML Compatible (.xml)** - Create a report in XML format, from which you can readily import it into any XML compliant system, format or convert to any other format. You can view or format it directly with Microsoft Internet Explorer 5 or later. For more information see [XML Format](#).
- **CIM SMS/DMI Compatible (.mif)** - Create a report in CIM (Common Interface Model) format developed by DMTF (Desktop Management Task Force) part of WBEM (Web-Based Enterprise Management) initiative. Microsoft's SMS (Systems Management Server) uses it and you can import a report directly into it. Any CIM/DMI compliant system should work also. For more information see [CIM Format](#).
- **Append to Existing Report** - Check it if you want the new report to be appended to the selected file instead of overwriting the file. Be warned that this only works for normal, text type reports.
- **Compress Report (.cab)** - Available only if you save the report to a file (including e-mail/post/etc). The report will be compressed in the Windows cabinet format. As the file is text the saving may be appreciable (90% or more).
- **Encrypt Report (.cry)** - Available only if you save the report to a file (including e-mail/post/etc). The report will be encrypted using a well-known algorithm using a key of 128-bit or higher (depending on encryption pack) hashed from the key you've entered. Make sure the key you're using is not too simple (e.g. 8 characters or more, etc.).

## **Database Schema**

The schema for the database that Sandra requires is analogous to the XML schema (naturally) and thus requires a relational database. A modern database (Oracle, SQL Server, Access) will do just nicely, however any ODBC/OLE DB/ADO compliant database should work also.

Due to the design of the system, the schema is not complex with few enforced keys, but that makes queries quite hard. Please refer to the examples for example SQL queries; you need to be familiar with the SQL syntax.

## **Database Creation Schema Scripts**

There are script schemas for all tested/supported databases in the **\Examples** folder:

- **Microsoft Access/Jet** - *Report Schema.mdb*
- **IBM DB2** - *IBM DB2 Schema.sql*
- **Microsoft SQL Server** - *SQL Server Schema.sql*
- **Oracle** - *Oracle Schema.sql*
- **MySQL** - *MySQL Schema.sql*

Please use them for creating the database/schema.

## **Tables**

**Report** - this is the primary table; each module belongs to only one report.

**Module** - this groups data by module; each item belongs to only one module.

**Class** - this is optional, only for 3rd level modules; each class belongs to only one module.

**Device** - this is optional, only for 2nd and 3rd level modules; each device belongs to either a class or directly to a module.

**ItemGroup** - this groups items logically, and is used by most modules; each item group belongs to either a class, device or directly to a module.

**Item** - this is the data tuple itself and holds the actual data; each item belongs to an item group or directly to a module in special cases.

## **Relationships**

As discussed above there is more than one relationship link depending on module type:

**Simple:** Report -> Module -> Item

**1st Level:** Report -> Module -> ItemGroup -> Item

**2nd Level:** Report -> Module -> Device -> ItemGroup -> Item

**3rd Level:** Report -> Module -> Class -> Device -> ItemGroup -> Item

Generally the keys present in the tuple can determine the type of module:

**Simple:** GroupID key of Item table is null.

**1st Level:** ClassID and DeviceID keys of ItemGroup table are null.

**2nd Level:** ClassID key of ItemGroup table is null.

**3rd Level:** Both ClassID and DeviceID keys of ItemGroup table are valid.

There are also a couple of bits that let you determine the type of module:

**Simple:** as per above.

**1st Level:** HasClass and HasDevice bits of Module table are false.

**2nd Level:** HasClass bit of Module table is false.

**3rd Level:** Both HasClass and HasDevice bits of Module table are true.

### **Query Tips**

Due to the multiple types of relationships, queries that need to return the data for any module may need to use multiple selects, using union statements to merge the results together. Generally this can be avoided if the data from the intermediary tables (i.e. Class, Device, ItemGroup) is not needed, thus go from Module -> Item directly.

For performance reasons, it is recommended to avoid the unions or at least manage to do with non-unique unions. As most queries will select on text columns, make sure you set up indexes on those columns, preferably compound indexes on the specific joins you are using.

### **SQL Query Examples**

See the *SQL Example Queries.txt* file in the **\Examples** folder for example SQL queries.



## Report/Hierarchical Format

The file extension used by the report generator is **.rpt**

The format follows the Windows INI file format with special tags to identify modules, device classes, devices, sub-titles and attributes.

- A module has the tag **[module:{mn}]** where *mn* is the name of the module. Underneath this tag, the classes belonging to this module are listed.
- A class tag also contains the module name in the tag name, thus for **[class:{cn}module:{mn}]** *cn* is the class name and *mn* is the module the class belongs to. Every class has a parent module. Underneath this tag, the devices belonging to this class are listed.
- A device tag also contains both the module and class names, thus for **[device:{dn}class:{cn}module:{mn}]** *dn* is the device name, *cn* is the class it belongs to and *mn* is the module it belongs to. Underneath this tag, the attributes are listed.
- A sub-title has the tag *sn=a,b* where *sn* is the sub-title name, *a* is the icon ID (internal) and *b* is the formatting style (internal).
- An attribute has the tag *an=a,b,vn* where *an* is the attribute name, *a* is the icon ID (internal), *b* is the formatting style (internal) and *vn* is the value of the attribute.

Here's an example:

```
[module:{Sound Card Information}]  
Wave Input Devices (Recording)=0
```

```
[class:{Wave Input Devices (Recording)}module:{Sound Card Information}]  
SB Live! Wave In [D000]=0
```

```
[device:{SB Live! Wave In [D000]}class:{Wave Input Devices (Recording)}module:{Sound Card Information}]  
General Device Information=1,0  
Device Name=-1,0,SB Live! Wave In [D000]
```

## Web/HTML Format

The file extension used by the report generator is **.htm** not *.html*.

The HTML file format adheres to **HTML 4.0** but only uses HTML 3.0 tags and thus should display on almost all browsers.

The report is one huge table. Thus the browser must support **tables** – otherwise it will not display correctly.

The page has a built in style definition block, but you can overwrite it by providing a **ReportStyle.css** style sheet in the same folder as the report.

## XML Format

The file extension used by the report generator is **.xml**

The DTD schema for the file is called **ReportSchema.dtd** and can be found in the **\Examples** folder within the Sandra folder.

The XML schema for the file is called **ReportSchema.xml** and can be found in the **\Examples** folder within the main Sandra folder.

An example XLS style-sheet to convert a XML report into HTML can be found in the **\Examples** folder – name **ReportStyle.xls**.

An example of a dynamic HTML page (MS-IE 5.0 or later required) that shows how to generate HTML from XML using a XLS can be found in the **\Examples** folder – name **Dynamic XML Report.htm**.

- The report uses the **<Report>** tag and contains at least one module.
- The module uses the **<Module>** tag and contains a title, one or more device class(es), one or more device(s), one or more information group(s) or one or more information item(s).
- The device class uses the **<DeviceClass>** tag and contains a title, an icon ID and one or more device(s).
- The device uses the **<Device>** tag and contains a title, an icon ID and one or more information group(s).
- The information group uses the **<InfoGroup>** tag and contains a title, an icon ID and one or more information item(s).
- The information item uses the **<InfoItem>** tag and contains a title, an icon ID, a format specifier and a value tag.
- The useful tags are **<Title>** and **<Value>**, the others are reserved.

Here's an example:

```
<Report>

  <Module>
    <Title>Sound Card Information</Title>

    <DeviceClass>
      <Title>Wave Input Devices (Recording)</Title>
      <Icon>0</Icon>

    <Device>
      <Title>SB Live! Wave In [D000]</Title>
      <Icon>0</Icon>

    <InfoGroup>
      <Title>General Device Information</Title>
      <Icon>1</Icon>

    <InfoItem>
      <Title>Device Name</Title>
      <Icon>-1</Icon>
      <Format>0</Format>
      <Value>SB Live! Wave In [D000]</Value>
```

</InfoItem>

## CIM Format

The file extension used by the report generator is **.mif**

The class specified is **SiSoftware|SiSoftware Sandra|001**

- The report uses the **Component** tag. The start of the report is marked by the **Start Component** tag and the end of the report is marked **End Component**.
- The module uses the **Group** tag. The start of the module is marked by the **Start Group** tag and the end of the module is marked **End Group**. The module is at level 1.
- The device class uses the **Group** tag. The start of the device class is marked by the **Start Group** tag and the end of the device class is marked **End Group**. The device class is at level 2, i.e. within a module group.
- The device uses the **Group** tag. The start of the device is marked by the **Start Group** tag, and the end of the device is marked **End Group**. The device is at level 3, i.e. within a device class group.
- The information group uses the **Group** tag. The start of the information group uses the **Start Group** tag, and the end of the information group is marked **End Group**. The information group is at level 4, i.e. within a device group.
- The information item uses the **Attribute** tag. The start of the information item uses the **Start Attribute** tag, and the end of the information item is marked **End Attribute**. The information item can be found at any levels from 1 to 4.
- The useful attributes of an information item are **Name** and **Value**. The other can be useful for SMS/DMI systems or compatible.

Here's an example:

```
Start Component
  Name = "SiSoftware Sandra"
  Description = "SiSoftware Sandra"

  Start Group
    Name = "Sound Card Information"
    ID = 6
    Class = "SiSoftware|SiSoftware Sandra|001"
    Description = "Sound Card Information"

    Start Group
      Name = "Wave Input Devices (Recording)"
      ID = 1
      Class = "SiSoftware|SiSoftware Sandra|001"
      Description = "Wave Input Devices (Recording)"

      Start Group
        Name = "SB Live! Wave In [D000]"
        ID = 1
        Class = "SiSoftware|SiSoftware Sandra|001"
        Description = "SB Live! Wave In [D000]"

        Start Group
          Name = "General Device Information"
          ID = 1
          Class = "SiSoftware|SiSoftware Sandra|001"
          Description = "General Device Information"

          Start Attribute
```

```
Name = "Device Name"  
ID = 1  
Description = "Device Name"  
Access = Read-Only  
Storage = Common  
Type = String(64)  
Value = "SB Live! Wave In [D000]"  
End Attribute
```

## **Create a Report Wizard - Last Step (Save to Disk)**

Here you can specify the file name of the report you want to be generated.

## Create a Report Wizard - Last Step (MAPI Email)

Here you can specify:

- **E-Mail Message's Subject** - type your own subject or accept the default.
- **E-Mail Recipient(s)** - type the address(es) of the recipients for the message. They are usually separated by ',' or ';'. You don't need to type the person's name, only the address.



## Create a Report Wizard – Last Step (SMTP Email)

Here you specify:

- **E-Mail Message's Subject** - type your own subject or accept the default.
- **E-Mail Recipient(s)** - type the address(es) of the recipients for the message. They are usually separated by ',' or ';'. You don't need to type the person's name, only the address.
- **E-Mail Sender** - type the account name or address of the sender.
  
- **SMTP Server Host** - type the name of the host of the SMTP relay server or **localhost** if local.
- **SMTP Server Port** - type the port of the SMTP relay server. Usually it is **25**.
- **Use SSL to Authenticate** - check it if you want SSL protocol to be used for authentication. Make sure the server
  
- **Account User Name** - type in the user name of the account if a login is required.
- **Account Password** - type in the password of the account if a login is required. Leave blank if anonymous login is fine.

## Create a Report Wizard – Last Step (MSMQ queue)

Here you specify:

- **Queue** - type the queue name in the correct format, i.e. <computer>\<queue name> (if remote) or .\private\$\<queue name> if it's a private queue on the local machine.
- **Transactional** - check if the queue is a transactional. Since a single message is sent, the queue does not need to be transactional.
- **Publicly accessible** - check if the queue is to be accessible by other users not just the creator.
- **Encrypt message body** - check if you would like the message body to be encrypted. This is done by MSMQ and not Sandra, thus the cryptographic provider is the default provider for that copy of Windows. The user's certificate is used as the key.
- **Use default user credentials** - uncheck if the current user does not have rights to post to the queue and enter the account details of a user that is allowed to post to the queue.
- **Account User Name** - type in the user name of the account if the current login credentials are not enough.
- **Account Password** - type in the password of the account if a login is required.

## Create a Report Wizard – Last Step (NNTP News)

Here you specify:

- **News Message's Subject** - type your own subject or accept the default.
- **Newsgroups(s)** - type the newsgroup(s) of the recipients for the message. They are usually separated by ',' or ';'.
- **E-Mail Sender** - type the account name or address of the sender.
  
- **NNTP Server Host** - type the name of the host of the NNTP relay server or **localhost** if local.
- **NNTP Server Port** - type the port of the NNTP relay server. Usually it is **119**.
- **Use SSL to Authenticate** - check it if you want SSL protocol to be used for authentication. Make sure the server
  
- **Account User Name** - type in the user name of the account if a login is required.
- **Account Password** - type in the password of the account if a login is required. Leave blank if anonymous login is fine.

## Create a Report Wizard - Last Step (Upload)

For **web/http** upload you can specify:

- **Host** - type the full URL and folder of the destination, e.g. <http://www.server.com/uploads/>. For SSL secured, use <https://www.secure.com/uploads/>.
- **User** - the name of the user account (or leave blank if anonymous).
- **Password** - the password for the user account (or leave blank if anonymous).

For **ftp** upload you can specify:

- **Host** - type the full URL and folder of the destination, e.g. <ftp://ftp.server.com/uploads/>.
- **User** - the name of the user account, or *anonymous*.
- **Password** - the password for the user account, or e-mail address if anonymous.

## Create a Report Wizard - Last Step (ODBC database)

Here you can specify:

- **DSN** - the data source name on the local machine.
- **User** - the database user name or blank if anonymous.
- **Password** - the database user password or blank if none needed.
- **Use Client Cursors** - uncheck if server/driver support server cursors, this is more efficient; check if need to use client cursors to make things work.
- **Supports ODBC 3.x or later** - check if the ODBC driver is version 3.5x or later (recommended). Uncheck if the ODBC driver is version 2.xx. Older versions are not supported.

Create the DSN using *Control Panel\Admin Tools\ODBC*. It is advisable you make it a system DSN rather than a user DSN unless this is a security measure. Please set all the required settings (if any) there.

For **SQL Server** databases, specify:

- **Supports Identity/AutoIncrement** - check.
- **Supports Sequences** - uncheck.
- **Use Client Cursors** - uncheck.

For **Oracle** databases, specify:

- **Supports Identity/AutoIncrement** - uncheck.
- **Supports Sequences** - check.
- **Use Client Cursors** - check (v7/8 driver).

Note that you need to install the Oracle Client software and the SQL\*Net drivers and configure them properly before attempting to connect. Use the ODBC option to test the connection first.

For **Access/Jet** databases, specify:

- **Supports Identity/AutoIncrement** - check.
- **Supports Sequences** - uncheck.
- **Use Client Cursors** - uncheck.

For **MySQL** databases, specify:

- **Supports Identity/AutoIncrement** - uncheck (even if supported).
- **Supports Sequences** - uncheck.
- **Use Client Cursors** - uncheck (v3 driver); check (v2 driver).

**NB.** Some client software may overwrite the ODBC drivers or other libraries. You can try reinstalling the latest version of MDAC afterwards.

## Create a Report Wizard - Last Step (ADO database)

For **SQL Server** databases, specify:

- **Provider** - SQLOLEDB
- **Server** - the host name of the SQL Server database.
- **Database** - the database (schema) name.
- **Driver** - leave blank.
- **Use Windows Authentication** - check if security is to be handled by Windows. The current login user name/password will be used as credentials. If unchecked, specify user name and password.
- **Supports Identity/AutoIncrement** - check.
- **Supports Sequences** - uncheck.
- **Use Client Cursors** - uncheck.
- **User** - database user name (blank if anonymous) if not using Windows authentication.
- **Password** - database user password (if needed) if not using Windows authentication.

For connection **ODBC** databases specify:

- **Provider** - MSDASQL
- **Server** - host name of server if applicable; blank otherwise.
- **Database** - database name if server specified or database file name.
- **Driver** - full name of ODBC driver, verbatim.
- **Use Windows Authentication** - leave unchecked.
- **Supports Identity/AutoIncrement** - check or uncheck depending on database.
- **Supports Sequences** - check or uncheck depending on database.
- **Use Client Cursors** - check or uncheck depending on database.
- **User** - the database user name or blank if anonymous.
- **Password** - the database user password or blank if none needed.

This mode of connection is very useful when no ADO/OLE DB driver is available for the database but a DSN-less connection is required. It is recommended to test the connection through ODBC first.

For **Oracle** databases, specify:

- **Provider** - MSDAORA
- **Server** - the host name of the Oracle database.
- **Database** - the schema (database) name.
- **Driver** - leave blank.
- **Use Windows Authentication** - check if security is to be handled by Windows. The current user login needs to be set up as an external user. If unchecked, specify user name and password.
- **Supports Identity/AutoIncrement** - uncheck.
- **Supports Sequences** - check.
- **Use Client Cursors** - check; the OLE DB provider does not support server cursors.
- **User** - the database user name or blank if anonymous.
- **Password** - the database user password or blank if none needed.

Note that you need to install the Oracle Client software and the SQL\*Net drivers and configure them properly before attempting to connect. Use the ODBC option to test the connection first.

For **Access/Jet** databases, specify:

- **Provider** - *Microsoft.Jet.OLEDB.X.XX* where X.XX is the Jet version, e.g. 4.0, 3.51, etc.
- **Server** - leave blank.
- **Database** - file name of the database.

- **Driver** - leave blank.
- **Use Windows Authentication** - leave unchecked.
- **Supports Identity/AutoIncrement** - check.
- **Supports Sequences** - uncheck.
- **Use Client Cursors** - uncheck.
- **User** - the database user name or blank if anonymous.
- **Password** - the database user password or blank if none needed.

**NB.** Some client software may overwrite the OLE DB drivers or other libraries. You can try reinstalling the latest version of MDAC afterwards.

## **Benchmarking Status**

This window notifies you that SiSoftware Sandra is benchmarking your system and you should not disturb the system while this is going on. If you do the results will be lower than expected.

### **Don't:**

- Press any keys
- Move the mouse or click the buttons
- Run background processes (MIDI/Wave/Video playback, Internet transfers, network transfers, etc.)

Please wait until the test is completed. Most take less than 1 minute and no test lasts more than 5 minutes



## Creating Report Status

This window shows the status of report creation:

- The type of report created and on what device
  - Report creation status
  - Current running module
  - Any warnings encountered
  - Completion percentage
- 
- At any time you can click the **Cancel** button to abort the report.
- 
- The animation tells you if Sandra is running properly or it has locked.
  - If the animation is running, don't worry if the creation takes a long time: if you include all modules (especially the disk benchmarks) the total time may be well over 10 minutes.

## Tip of the Day

This window shows a tip of the day.

- Click the **Next Tip** button to see the next tip.
- Click the **Close** button to close the window.
- Un-check the **Show Tips at Startup** checkbox if you don't want the Tip of the Day window to appear each time you start the program.

## **Registered SiSoftware Sandra Required**

Sorry, this module only runs on the **registered** versions of Sandra, either **Professional** or **Enterprise**. You will need to purchase one of these versions to get this module.

You can delete the module (click **DEL** or right-click and choose **Delete**) to get rid of this message. This is not a nag screen, just an information screen that can be turned off.

To find out how to order the **Professional** or **Enterprise** versions, see the [Ordering Information](#) topic.

**NB.** Some modules may be available in the more advanced shareware versions, aka **Advanced**.

## Burn-in Wizard

This wizard allows you to run any benchmark (in verify mode) or burn-in module (or a group of them) either continuously or a specified amount of time in order to test the stability of the system.

While the benchmarks are not designed for burning-in, they are designed to stress the component(s) they test to the limit, being CPU, chipset, memory or disk bound and thus test the stability of the system. The burn-in wizard puts them in **verify mode** (if supported) that tests the results after completion.

The burn-in modules are designed to stress the component(s) by executing tasks that are known to cause problems and test/use as much of the component(s)'s functionality as possible. Most of the time, this means causing the component(s) temperature to be raised as much as possible.

**Warning: Burning-in stresses components. Thus any weaknesses may cause them to fail or be damaged permanently. Do not run unless you know what and why you do it.**

### Shortcut

Keys: CTRL+B

## Burn-in Wizard - Step 2

Here you can specify various settings relating to the burn:

- **Count** - the number of times you want the test suite to be executed.
- **Continuously** - run the test suite continuously; useful when you want to test the system for a long amount of time or in the background.
- **Low Priority** - run the test suite at low priority so that other processes on the system can execute; useful when you want to test the system for a long time or to run the burn-in in the background.
- **Monitor System Health** - check the environment hardware system monitor regularly to check the system temperatures, voltages, fans, etc.
- **Terminate on Overheat/Fail** - stop the test if the settings fall outside the normal parameters.

### **Burn-in Wizard - Step 3**

Here you can specify the processor utilisation should you not want them to be tested at 100% utilisation. This is useful when the processor(s) is/are not stable at full utilisation or you do not want to trigger over temperature, etc. alarms.

You can select the processors you want to test should you not want to test all of them. Check the checkboxes next to the processor in the processor list that you want to test. You obviously need a multi-processor system with the multi-processor OS kernel installed in order for this to work.

#### **Burn-in Wizard – Step 4**

This is just a warning and confirmation that you understand what is going to happen and that you're OK with it.

## **Performance Tune-up Wizard**

This wizard runs all enabled information & testing/diagnostic modules and collects the performance enhancing tips as well as other errors or warnings and displays them in a list.

It is a convenient way of obtaining a complete view of your system in one go without going through every module. Do note that this operation may take some time, although less than creating a complete report.

### **Tips**

See the modules below for information about the tips displayed:

#### Tips (Performance) List

### **Shortcut**

Keys:      CTRL+P



## Web-Update Wizard

This wizard helps keep Sandra up-to-date. The wizard uses your computer's modem or Internet connection to automatically download updates directly from the web. These updates are free.

You should run this wizard **monthly** to see if there are any new updates. New updates add more modules, new features and/or fix bugs or other incompatibilities. So don't forget.

Click here  to open the download information document locally.

## **Register Wizard**

This wizard registers or activates your copy of the program.

## **Combined Performance Index Wizard**

This wizard allows you to quickly compare all the performance indexes (i.e. benchmark results) of your system with the reference systems by generating a combined index.

This is done by executing all relevant benchmarks in succession and displaying the results using a convergence matrix (currently a pentagon). This allows you to quickly see in which areas (if any) your system is deficient and what needs to be changed to ensure full overlap. This is most useful when upgrading or replacing equipment.

In simple terms:

- The back-end matrix (i.e. blue pentagon) represents the reference system as selected.
- The front-end matrix (i.e. red pentagon) represents your system.
- If there are areas where the back-end matrix shows through, then in that area your system is inferior to the reference system.
- If you do not see the back-end matrix in an area, then your system is superior to the reference system.
- Generally you do not want to see the back-end matrix at all (i.e. no blue). This means your system is as good as or superior to the selected reference system.

More benchmarks will be added in the future to ensure all areas of the system are tested.

### **Shortcut**

Keys:      Ctrl+W

## **Delete Module(s)**

Delete/remove the selected module(s). This operation will remove the selected module(s) from the display list and will unload them from memory. Note that you cannot delete the wizard modules.

To add the module(s) back, use the **Add New Module Wizard**.

## **Shortcut**

Keys: Del

**No Help Available**


No help is available for this area of the window.

**No Help Available**

No help is available for this message box.


## Reset All Sandra Options

If you have played with the Sandra's options and messed them up, here's how you can reset them to the built-in defaults (no need to reinstall):

- Click here  to run the **Registry Editor** utility
- Double-click **HKEY\_USERS**
- Double-click **.Default**
- Double-click **Software**
- Double-click **SiSoftware**
- Right-click **Sandra** and select **Delete**
- Answer **Yes** to the confirmation dialogue box
- Close Registry Editor

## Reset the Module List

If you have played with the module list (swapping icons back and forth) or other module options you can reset them to the default this way:

- Click here  to run the **Registry Editor** utility
- Double-click **HKEY\_USERS**
- Double-click **.Default**
- Double-click **Software**
- Double-click **SiSoftware**
- Double-click **Sandra**
- Right-click **Modules** and select **Delete**
- Answer **Yes** to the confirmation dialogue box
- Close Registry Editor



## **The VideoCD Benchmark**

This benchmark is different from the normal data-disk benchmark. This is because the data is encoded differently on these disks and the CD-ROM driver treats them differently. The disk access is optimised for sequential scan and pre-fetch while buffering is kept to a minimum.

If you want to test your CD-ROM's VideoCD performance, then run this test. Data disk performance may be irrelevant for VideoCD performance. A drive & software driver which perform brilliantly with data disks may cause jerky VideoCD playback.

A 600MB+ VideoCD will yield true values for the random read performance and access time. When different size CDs are used the results are extrapolated statistically for a 600MB disk. This makes the benchmark test disk size independent.

## **The Data CD Benchmark**

This benchmark is different from the VideoCD benchmark. Disk access is optimised in the same way as for hard drives, i.e. mainly buffering and random access. While there are data CDs which contain MPEG, MOV or AVI files, the performance could be much worse than for a VideoCD.

A 600MB+ data disk with 600MB+ data files is recommended for true benchmark results. When different size CDs are used the results are extrapolated statistically for a 600MB disk. This makes the benchmark test disk size independent.

Suitable CDs for testing:

- Ziff-Davis PC Benchmarks CD-ROM - recommended
- Microsoft VC++ 4.0 or later
- Microsoft Visual Basic 4.0 or later

## List of acronyms

<b>3DNow!</b>	Multi-Media Extensions (AMD)
<b>AC</b>	Alternating Current
<b>ACPI</b>	Advanced Configuration and Power Interface
<b>ACR</b>	Advanced Communications Riser
<b>AE</b>	Applications Engineer
<b>AFS</b>	Andrew File System
<b>AGP</b>	Accelerated Graphics Port
<b>AI</b>	Artificial Intelligence
<b>ALU</b>	Arithmetic-Logic Unit
<b>AM</b>	Amplitude Modulated
<b>AMD</b>	Advanced Micro Devices, Inc.
<b>AMD</b>	Air Moving Device (aka fan)
<b>AMI</b>	American Megatrends Inc.
<b>AMR</b>	Audio Modem Riser
<b>ANSI</b>	American National Standards Institute
<b>APIC</b>	Advanced Programmable Interrupt Controller
<b>APM</b>	Advanced Power Management
<b>ASCII</b>	American Standard Code for Information Interchange
<b>ASIC</b>	Application Specific Integrated Circuit
<b>ASPI</b>	Advanced SCSI Programming Interface
<b>AT</b>	Advanced Technology
<b>ATA</b>	AT bus Attachment
<b>ATAPI</b>	ATA Packet Interface
<b>ATDM</b>	Asynchronous Time Division Multiplexing
<b>ATM</b>	Asynchronous Transfer Mode
<b>ATX</b>	AT eXtended
<b>AUI</b>	Attached Unit Interface
<b>BBS</b>	Bulletin Board System
<b>BCC</b>	Block Check Character
<b>BCD</b>	Binary Coded Decimal
<b>BE</b>	Back End
<b>BEDO</b>	Burst EDO
<b>BiCMOS</b>	Bipolar Complementary Metal-Oxide Semiconductor
<b>BIOS</b>	Basic Input / Output System
<b>BMB</b>	Baseboard Management Bus
<b>BNC</b>	Bayonet Nut Connector
<b>BPS/bps</b>	Bytes/bits Per Second
<b>BSC</b>	Binary Synchronous Communications
<b>BSD</b>	Berkeley Standard Distribution
<b>BT</b>	Base Transmit
<b>BTU</b>	British Thermal Units
<b>CAD</b>	Computer Aided Design
<b>CAM</b>	Computer Aided Manufacturing
<b>CAM</b>	Content Addressable Memory
<b>CAM</b>	Common Access Method
<b>CAS</b>	Column Address Strobe
<b>CBX</b>	Common Branch eXtender

<b>CCD</b>	Charge Coupled Device
<b>CCITT</b>	Consultative Committee of International Telephony and Telegraphy
<b>CD</b>	Carrier Detect
<b>CDDI</b>	Copper Distributed Data Interface
<b>CDROM</b>	Compact Disk Read Only Memory
<b>CGA</b>	Colour Graphics Adapter
<b>CHS</b>	Cylinder Head Sector
<b>CISC</b>	Complex Instruction-Set Computer
<b>CLA</b>	Carry Look-ahead Adder
<b>CMOS</b>	Complementary Metal-Oxide Semiconductor
<b>CNR</b>	Communications and Network Riser
<b>CODEC</b>	
<b>CP/M</b>	Control Program / Monitor
<b>CPI</b>	Clocks Per Instruction
<b>CPU</b>	Central Processing Unit
<b>CQFP</b>	Ceramic Quad Flat Pack
<b>CR</b>	Carriage Return
<b>CRC</b>	Cyclical Redundancy Check
<b>CRIMM</b>	Continuity RIMM
<b>CRQ</b>	Command Response Queue
<b>CRT</b>	Cathode Ray Tube
<b>CS</b>	Chip Select
<b>CSMA/CD</b>	Carrier Sense Multiple-Access /with Collision Detect
<b>CSR</b>	Command Status Register
<b>CST</b>	Container Security Breach (aka door open)
<b>CTS</b>	Clear To Send
<b>DAT</b>	Digital Audio Tape
<b>DBI</b>	Dynamic Bus Inversion
<b>DC</b>	Direct Current
<b>DCD</b>	Data Carrier Detect
<b>DCE</b>	Data Circuit-terminating Equipment
<b>DD</b>	Double Density
<b>DDC</b>	Display Data Channel
<b>DDR</b>	Double Data Rate
<b>DEC</b>	Digital Equipment Corporation
<b>DES</b>	Data Encryption Standard
<b>DHCP</b>	Dynamic Host Configuration Protocol
<b>DID</b>	Direct Inward Dial
<b>DIMM</b>	Dual Inline Memory Module
<b>DIN</b>	Deutsche Industrie Norm (German)
<b>DIP</b>	Dual-In-line Package
<b>DIS</b>	Draft International Standard
<b>DMA</b>	Direct Memory Access
<b>DMI</b>	Desktop Management Interface
<b>DOS</b>	Disk Operating System
<b>DP</b>	Dual Processor
<b>DPE</b>	Data Parity Error
<b>DPSK</b>	Differential Phase Shift Keying
<b>DRAM</b>	Dynamic Random Access Memory
<b>DRDOS</b>	Digital Research Disk Operating

	System
<b>DRM</b>	Dual Retention Mechanism
<b>DS</b>	Double Sided
<b>DSP</b>	Digital Signal Processor
<b>DSR</b>	Data Set Ready
<b>DTC</b>	Data Terminal Controller
<b>DTE</b>	Data Terminating Equipment
<b>DTMF</b>	Dual-Tone Multi-Frequency
<b>DTR</b>	Data Terminal Ready
<b>DVD</b>	Digital Video/Versatile Device/Disk
<b>EBCDIC</b>	Extended Binary Coded Decimal Interchange Code
<b>EC</b>	Error Check
<b>ECC</b>	Error Check and Correction
<b>ECL</b>	Emitter-Coupled Logic
<b>ECO</b>	Engineering Change Order
<b>ECP</b>	Enhanced Communication Port
<b>ECP</b>	Extended Capabilities Port
<b>ECU</b>	EISA Configuration Utility
<b>EDO</b>	Extended Data Out RAM
<b>EDPT</b>	Enhanced Disk Parameter Table
<b>EEPROM</b>	Electrically Erasable Programmable Read Only Memory
<b>EFI</b>	Extensible Firmware Hub
<b>EGA</b>	Enhanced Graphics Adapter
<b>EIA</b>	Electronic Industries Association
<b>EIDE</b>	Enhanced Integrated Device Electronics
<b>EISA</b>	Enhanced Industry Standard Architecture
<b>EMC</b>	Electro-Magnetic Compatibility
<b>EMF</b>	Electro-Magnetic Force
<b>EMI</b>	Electro-Magnetic Interference
<b>EMS</b>	Expanded Memory Specification
<b>EOF</b>	End Of File
<b>EOL</b>	End Of Line
<b>EOS</b>	Electrical Over Stress
<b>EPP</b>	Enhanced Parallel Port
<b>EPROM</b>	Erasable Programmable Read Only Memory
<b>ESCD</b>	Extended System Configuration Data
<b>ESD</b>	Electro-Static Discharge
<b>ESDI</b>	Enhanced Small Devices Interface
<b>FAT</b>	File Allocation Table
<b>FCC</b>	Federal Communications Commission
<b>FDD</b>	Fixed / Floppy Disk Drive
<b>FDDI</b>	Fiber Distributed Data Interface
<b>FDM</b>	Frequency Division Multiplexing
<b>FDX</b>	Full-Duplex Transmission
<b>FE</b>	Front End
<b>FEP</b>	Front End Processor
<b>FF</b>	Form Feed
<b>FIFO</b>	First-In First-Out
<b>FILO</b>	First-In Last-Out
<b>FM</b>	Frequency Modulation

<b>FPGA</b>	Field Programmable Gate Array
<b>FPM</b>	Fast Page Mode RAM
<b>FPU</b>	Floating Point Unit
<b>FRC</b>	Functional Redundancy Checking
<b>FRU</b>	Field-Replaceable Unit
<b>FSB</b>	Front Side Bus
<b>FSF</b>	Free Software Foundation
<b>FSK</b>	Frequency Shifty Keying
<b>FTP</b>	File Transfer Program
<b>FWH</b>	Firmware Hub
<b>GAS</b>	Gallium Arsenide
<b>GFLOPS</b>	Billions of FLOating Point Operations Per Second (GigaFlops)
<b>GNU</b>	Gnu's Not UNIX
<b>GUI</b>	Graphical User Interface
<b>GXB</b>	Graphic eXpansion Bridge
<b>HBA</b>	Host Bus Adapter
<b>HD</b>	High Density / Hard Disk
<b>HDD</b>	Hard Disk Drive
<b>HDX</b>	Half-Duplex Transmission
<b>HFS</b>	Hierarchical File System
<b>HPFS</b>	High Performance File System
<b>HS</b>	Helical Scan
<b>I/O</b>	Input / Output
<b>I2C</b>	Intelligent Controller
<b>IA</b>	Intel Architecture
<b>IB</b>	In-Bound
<b>IBM</b>	International Business Machines Corporation
<b>IC</b>	Integrated Circuit
<b>ICMP</b>	Internet Control Message Protocol
<b>IDC</b>	Insulation Displacement Connector
<b>IDE</b>	Integrated Device Electronics
<b>IEEE</b>	Institute of Electrical and Electronic Engineers
<b>IFB</b>	I/O and Firmware Bridge
<b>IMP</b>	Interface Message Processor
<b>IOAPIC</b>	Input Output Advanced PIC
<b>IPC</b>	Inter Process Communication
<b>IPX</b>	Inter network Packet eXchange
<b>IR</b>	Infra-Red
<b>IRQ</b>	Interrupt ReQuest
<b>ISA</b>	Industry Standard Architecture
<b>ISDN</b>	Integrated Services Digital Network
<b>ISO</b>	International Standards Organisation
<b>ITP</b>	In-Target Probe
<b>JFS</b>	Journalised File System
<b>kVA</b>	KiloVolt-Amps
<b>LAN</b>	Local Area Network
<b>LBA</b>	Linear Block Array / Addressing
<b>LCD</b>	Liquid Crystal Display
<b>LED</b>	Light Emitting Diode
<b>LF</b>	Line Feed
<b>LIM</b>	Lotus/Intel/Microsoft's Expanded Memory Manager (EMS)

<b>LRU</b>	Least-Recently Used
<b>LSB/l<b>sb</b></b>	Least Significant Byte/bit
<b>LSI</b>	Large Scale Integration
<b>LVD</b>	Low Voltage Differential
<b>LUN</b>	Logical Unit Number
<b>MAN</b>	Metropolitan Area Network
<b>MB/Mb</b>	Mega Bytes/bits
<b>MBR</b>	Master Boot Record
<b>MCA</b>	Micro Channel Architecture
<b>MCGA</b>	Multi-Colour Graphics Array
<b>MCH</b>	Memory Controller Hub
<b>MCM</b>	Multi-Chip Module
<b>MDC</b>	Memory Data Component
<b>MDRAM</b>	Multi-bank RAM
<b>MEC</b>	Memory Expansion Cards
<b>MFLOPS</b>	Millions of FLOating Point Operations per Second (MegaFlops)
<b>MFM</b>	Modified Frequency Modulated
<b>MHz</b>	MegaHertz
<b>MICR</b>	Magnetic Ink Character Recognition
<b>MIDI</b>	Musical Instrument Data Interface
<b>MIMD</b>	Multiple-Instruction Multiple-Data
<b>MIPS</b>	Millions of Instructions per Second
<b>MISD</b>	Multiple-Instruction Single Data
<b>MMU</b>	Memory Management Unit
<b>MMX</b>	Multi-Media Extensions
<b>MNP</b>	Microcom Network Protocol
<b>MODEM</b>	MOdulator / DEModulator
<b>MOPS</b>	Millions of Operations Per Second
<b>MOS</b>	Metal-Oxide Semiconductor
<b>MP</b>	Multi-Processor
<b>MPP</b>	Massively Parallel Processor
<b>MPS</b>	Multi-Processor System
<b>MPT</b>	Memory Protocol Translator
<b>MSB/msb</b>	Most Significant Byte/bit
<b>MSDOS</b>	Microsoft's Disk Operating System
<b>MSI</b>	Medium Scale Integration
<b>MTBF</b>	Mean Time Between Failure
<b>MTH</b>	Memory Translator Hub
<b>N/C</b>	No-Connect
<b>NBS</b>	National Bureau of Standards
<b>NEMA</b>	National Electrical Manufacturers Association
<b>NFS</b>	Network File System
<b>NFU</b>	Not-Frequently Used
<b>NIC</b>	Network Interface Card
<b>NMI</b>	Non-Maskable Interrupt
<b>NMOS</b>	Negatively doped Metal-Oxide Semiconductor
<b>NOP</b>	No Operation
<b>NRU</b>	Not-Recently Used
<b>NSF</b>	National Science Foundation
<b>NVRAM</b>	NonVolatile Random Access Memory
<b>OAP</b>	Outside Awareness Panel (aka window)

<b>OB</b>	OutBound
<b>OCR</b>	Optical Character Recognition
<b>ODI</b>	Open Datalink Interface
<b>OEM</b>	Original Equipment Manufacturer
<b>OS</b>	Operating System
<b>OSF</b>	Open Software Foundation
<b>OSI</b>	Open Systems Interconnect
<b>PAC</b>	PCI AGP Controller
<b>PAL/PLA</b>	Programmable Array Logic / Logic Array
<b>PAL</b>	Processor Abstraction Layer
<b>PB</b>	Push Button
<b>PBX</b>	Private Branch eXtender
<b>PC</b>	Personal Computer, Program Counter
<b>PCB</b>	Printed Circuit Board
<b>PCI</b>	Peripheral Component Interconnect
<b>PCM</b>	Pulse Code Modulation
<b>PCMCIA</b>	Personal Computer Memory Card International Association
<b>PE</b>	Processor Element
<b>PFC</b>	Power Factor Correction
<b>PFF</b>	Page Fault Frequency
<b>PGA</b>	Professional Graphics Array
<b>PGA</b>	Pin Grid Array
<b>PIC</b>	Programmable Interrupt Controller
<b>PIO</b>	Programmed Input / Output
<b>PIROM</b>	Processor Information ROM
<b>PLCC</b>	Plastic Leaded Chip Carrier
<b>PLL</b>	Phase Locked Loop
<b>PM</b>	Preventive Maintenance
<b>PME</b>	Power Management Event
<b>PMOS</b>	Positively doped Metal-Oxide Semiconductor
<b>PnP</b>	Plug-and-Play
<b>POST</b>	Power On Self Test
<b>PPP</b>	Point-to-Point Protocol
<b>PQFP</b>	Plastic Quad Flat Pack
<b>PROM</b>	Programmable Read Only Memory
<b>PSIPC</b>	PCI Super I/O Integrated Peripheral Controller
<b>PSTN</b>	Public Switched Telephone Network
<b>PTE</b>	Page Table Entry
<b>PXB</b>	PCI eXpansion Bridge
<b>PXE</b>	Pre-Boot eXecution Environment
<b>QAM</b>	Quadrature Amplitude Modulation
<b>QFP</b>	Quad Flat Pack
<b>QIC</b>	Quarter Inch Cartridge
<b>RAID</b>	Redundant Arrays of Inexpensive Disks
<b>RAM</b>	Random Access Memory
<b>RAMDAC</b>	Random Access Memory Digital to Analogue Converter
<b>RAS</b>	Row Address Strobe
<b>RCA</b>	Radio Corporation of America
<b>RCC</b>	Routing Control Centre



<b>RDRAM</b>	Rambus DRAM
<b>RFC</b>	Request For Comments
<b>RFI</b>	Radio Frequency Interference
<b>RI</b>	Ring Indicator
<b>RIMM</b>	Rambus Inline Memory Module
<b>RISC</b>	Reduced Instruction-Set Computer
<b>RLL</b>	Run Length Limited
<b>RMS</b>	Root Mean Squared
<b>RMW</b>	Read Modify Write
<b>ROM</b>	Read Only Memory
<b>RPC</b>	Remote Procedure Call
<b>RPM</b>	Rotations Per Minute
<b>RTC</b>	Real Time Clock
<b>RTS</b>	Request To Send
<b>SAL</b>	System Abstraction Layer
<b>SAM</b>	Sequential Access Memory
<b>SASI</b>	Shugart Associates Standard Interface
<b>SCI</b>	Special Circumstance Instructions
<b>SCSI</b>	Small Computer Systems Interface
<b>SD</b>	Single Density
<b>SDLC</b>	Synchronous Data Link Control
<b>SDRAM</b>	Synchronous Dynamic RAM
<b>SDRAM BDDR II</b>	Bi-Directional Strobed DDR SDRAM
<b>SDRAM DDR II</b>	Double Data Rate SDRAM
<b>SE</b>	Systems Engineer
<b>SEC</b>	Single Edge Contact
<b>SECC</b>	Single Edge Contact Cartridge
<b>SFF</b>	Small Form Factor
<b>SGRAM</b>	Synchronous Graphics RAM
<b>SIMD</b>	Single-Instruction Multiple-Data
<b>SIMM</b>	Single Inline Memory Module
<b>SIPP</b>	Single Inline Pinned Package
<b>SISD</b>	Single-Instruction Single-Data
<b>SLIP</b>	Serial Line Internet Protocol
<b>SMBUS</b>	System Management Bus
<b>SMD</b>	Surface Mount Device
<b>SMI</b>	System Management Interrupt
<b>SMP</b>	Symmetric Multi-Processing
<b>SMT</b>	Surface Mount Technology
<b>SMT</b>	Symmetric Multi-Threading
<b>SNA</b>	System Network Architecture
<b>SNR</b>	Signal to Noise Ratio
<b>SO/SOL</b>	Small Out Line
<b>SOIC</b>	Small Outline Integrated Circuit
<b>SPDIF</b>	Serial Data Interface
<b>SPOOL</b>	Simultaneous Peripheral Operation On Line
<b>SPT</b>	Sectors Per Track
<b>SPU</b>	Single Processor Unit
<b>SRAM</b>	Static Random Access Memory
<b>SS</b>	Single Sided
<b>SSE</b>	Streaming SIMD Extensions
<b>SSE2</b>	Streaming SIMD Extensions 2
<b>STDM</b>	Synchronous Time Division

	Multiplexing
<b>STN</b>	Super Twisted Nematic
<b>STR</b>	Suspend To RAM
<b>STU</b>	Streaming Tape Unit
<b>SVGA</b>	Super Video Graphics Array
<b>TCM</b>	Trellis Code Modulation
<b>TCP/IP</b>	Transmission Control Protocol / Internet Protocol
<b>TDM</b>	Time Division Multiplexing
<b>TI</b>	Texas Instruments
<b>TIA</b>	Telecomm. Industry Association
<b>TLB</b>	Translation-Lookaside Buffer
<b>TPI</b>	Tracks Per Inch
<b>TRANSISTOR</b>	TRANSformer resISTOR
<b>TSR</b>	Terminate and Stay Resident
<b>TTL</b>	Transistor-Transistor Logic
<b>TUV</b>	Technischer Ueberwachuags Verein (German)
<b>UAE</b>	Unrecoverable Application Error
<b>UART</b>	Universal Asynchronous Receiver/Transmitter
<b>UDP</b>	User Datagram Protocol
<b>UMB</b>	Upper Memory Block
<b>UPS</b>	Un-interruptible Power Supply
<b>USB</b>	Universal Serial Bus
<b>USL</b>	UNIX System Labs
<b>UUCP</b>	UNIX to UNIX Copy Program
<b>VBE</b>	Video BIOS Extensions
<b>VCR</b>	Video Cassette Recorder
<b>VESA</b>	Video Enhanced Standards Association
<b>VGA</b>	Video Graphics Array
<b>VID</b>	Voltage ID
<b>VLB</b>	VESA Local Bus
<b>VLIW</b>	Very Long Instruction Word
<b>VLSI</b>	Very Large Scale Integration
<b>VM</b>	Virtual Memory
<b>VME</b>	Versa Module Euro-card
<b>VRAM</b>	Video Random Access Memory
<b>VRT</b>	Voltage Reduction Technology
<b>VTR</b>	Video Tape Recorder
<b>WAN</b>	Wide Area Network
<b>WATS</b>	Wide Area Telephone Service
<b>WD</b>	Western Digital
<b>WOL</b>	Wake-up On LAN
<b>WORM</b>	Write Once - Read-Many
<b>WRAM</b>	Window Random Access Memory
<b>WS</b>	Wait State
<b>WXB</b>	Wide eXpansion Bridge
<b>XGA</b>	eXtended Graphics Array
<b>XMS</b>	Extended Memory Specification
<b>XOR</b>	Exclusive-OR
<b>XT</b>	eXtended Technology
<b>ZIF</b>	Zero Insertion Force

**Note:** Some of these acronyms are explained elsewhere...



## **Toolbar**

The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in this application.

To hide or display the Toolbar, choose *Toolbar* from the *View* menu (ALT, V, T).

## **Status Bar**

The status bar is displayed at the bottom of the application window. To display or hide the status bar, use the *Status Bar* command in the *View* menu.

The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right areas of the status bar indicate which of the following keys are latched down.

## Close command

Use this command to close the active window or dialog box.

Double-clicking a Control-menu box is the same as choosing the *Close* command.

**Note:** If you have multiple windows open for a single document, the Close command on the document Control menu closes only one window at a time. You can close all windows at once with the Close command on the File menu.

## Shortcuts

Keys:      CTRL+F4 closes a document window  
              ALT+F4 closes the application window or dialog box

## **Restore command**

Use this command to return the active window to its size and position before you chose the *Maximize* or *Minimize* command.

## **Switch to command**

Use this command to display a list of all open applications. Use this *Task List* to switch to or close an application on the list.

### **Shortcut**

Keys:       CTRL+ESC

### **Dialog Box Options**

When you choose the *Switch To* command, you will be presented with a dialog box with the following options:

#### **Task List**

Select the application you want to switch to or close.

#### **Switch To**

Makes the selected application active.

#### **End Task**

Closes the selected application.

#### **Cancel**

Closes the Task List box.

#### **Cascade**

Arranges open applications so they overlap and you can see each title bar. This option does not affect applications reduced to icons.

#### **Tile**

Arranges open applications into windows that do not overlap. This option does not affect applications reduced to icons.

#### **Arrange Icons**

Arranges the icons of all minimized applications across the bottom of the screen.



## **Context Help command**

Use the Context Help command to obtain help on some portion of the program. When you choose the Toolbar's Context Help button, the mouse pointer will change to an arrow and question mark.

Then click somewhere in the application window, such as another Toolbar button. The Help topic will be shown for the item you clicked.

## **Shortcut**

Keys:      SHIFT+F1

**Back Step**

Returns to the previous step in a wizard or return to the previous module.

**Shortcut**

Keys: CTRL+B

**Next Step**

Continue with the next step in a wizard or continue to the next module.

**Shortcut**

Keys: CTRL+N

**Set All**

Select all the choices (modules/options/etc.) as appropriate.

**Shortcut**

Keys: CTRL+A

**Clear All**

Unselects all the choices (modules/options/etc.) as appropriate.

**Shortcut**

Keys: CTRL+C

**Refresh / Update**

Refresh the information displayed or update it.

For information/listing modules the information is updated. For benchmark modules, the benchmarks are re-run. For testing/diagnostic modules the diagnostics/tests are re-run.

**Shortcut**

Keys: F5

## **Save Benchmark Results**

Save the current benchmark results to the user benchmark database. Naturally, this only works for benchmark modules once the benchmark has been performed.

The results are labelled with system name, current date and current time for easy identification. This allows you to see the change in results over time.

If the *User System Reference Results* are not displayed, the display is switched to this view automatically and the newly saved data selected.

### **Shortcut**

Keys:      CTRL+S

## **Switch Benchmark Results**

Switch the reference benchmark results from the Reference Results to the User System Reference Results or both. Select the result type from the pop-up menu.

Naturally, this only works for benchmark modules if you have saved the results at least once beforehand.

### **Shortcut**

Keys:      CTRL+W



## **Copy Data to Clipboard**

Copy the displayed data to the clipboard. The data is copied in text format, equivalent to the format in the report.

### **Shortcut**

Keys:      CTRL+C

## **Switch Chart Type**

Switch the chart type from the Linear (default) to the more specialised types of charts that are available to the specific module. Select the chart type from the pop-up menu.

### **Shortcut**

Keys:      CTRL+G

## **Title Bar**

The title bar is located along the top of a window. It contains the name of the application and document.

To move the window, drag the title bar.

**Note:** You can also move dialog boxes by dragging their title bars.

**Scroll bars**

Displayed at the right and bottom edges of the document window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the document. You can use the mouse to scroll to other parts of the document.

## **Size command**

Use this command to display a four-headed arrow so you can size the active window with the arrow keys.

After the pointer changes to the four-headed arrow:

1. Press one of the DIRECTION keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
2. Press a DIRECTION key to move the border.
3. Press ENTER when the window is the size you want.

**Note:** This command is unavailable if you maximize the window.

## **Shortcut**

Mouse: Drag the size bars at the corners or edges of the window.

## **Move command**

Use this command to display a four-headed arrow so you can move the active window or dialog box with the arrow keys.

**Note:** This command is unavailable if you maximize the window.

## **Shortcut**

Keys:      CTRL+F7

## **Minimise command**

Use this command to reduce the application window to an icon.

### **Shortcut**

Mouse: Click the minimize icon on the title bar.  
Keys: ALT+F9

## **Maximise command**

Use this command to enlarge the active window to fill the available space.

### **Shortcut**

Mouse: Click the maximize icon on the title bar; or double-click the title bar.  
Keys: CTRL+F10



## Select Wizards

Use this command to select which Wizard you want to run/execute.

## **Switch Modules View**

Use this command to switch the type of modules shown in the program window (Information, Benchmarking, Testing, Listing or All Modules).

**Switch View**

Use this command to switch the type of icons shown in the program window (Large, Small, View, Details).

## MAX3 Additions

## Internet Connection Benchmark

This benchmark attempts to determine the total bandwidth of the system's Internet connection; this should be the maximum transfer rate of the link.

- **Command Line Switch:** InetConnBench
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Gateway / Router** - The benchmark first attempts to detect the first gateway/router at the ISP end in order to benchmark the Internet link. This should work in most networks, except some networks where the Internet connection is at the end of a VPN link.

**ADSL / Asymmetric Links** - It is important to note that this is the aggregated of the send and receive rates, thus the result will be approximately the average of the send and receive rates.

**Latency** - The average link latency is also determined by repeatedly pinging the gateway/router.

**Packet loss** - While benchmarking the Internet connection, a count is kept of any un-acknowledged packets and the corresponding packet loss calculated. This determines the quality of the link that is as important as the speed of the link.

**Burn-in Note:** In order to prevent the possible misuse of this test in a DOS (Denial of Service) attack, this module is not burn-in capable. This is by design.

See [List of Acronyms](#) for more information.

### Acknowledgements

**Benchmark Idea** - C. Adrian Silasi; additional input by Craig Hart.

See [Acknowledgements](#) topic for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

## Internet Peerage Benchmark

This benchmark attempts to determine the peerage quality of the ISP by attempting to determine the bandwidth to sites on the Internet. The sites are chosen at random from the list of most popular sites of the Internet. This list is updated with each version and kept up-to-date.

- **Command Line Switch:** InetPeerBench
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

**Site Issues** - While all sites chosen are high-traffic sites and designed to serve a huge number of users, and the home pages designed to load as quickly as possible, site utilisation does play a part in the transfer speed.

**Lantecy** - The average link latency is also determined by pinging the Internet sites.

**Packet loss** - While benchmarking the Internet sites, a count is kept of any un-acknowledged packets and the corresponding packet loss calculated. This determines the quality of the link that is as important as the speed of the link.

**Burn-in Note:** In order to prevent the possible misuse of this test in a DOS (Denial of Service) attack, this module is not burn-in capable. This is by design.

See [List of Acronyms](#) for more information.

### Acknowledgements

**Benchmark Idea** - Mark Gaffney/Demon Internet; additional input by Craig Hart.

See [Acknowledgementstopic](#) for more information.

### Options

This module has no options to set.

### Tips

[Tips \(Performance\) List](#)

**Tip T5207** - Consider using the [File System Benchmark](#) instead if the device is non-Flash based. As there is no reliable way to know the physical type of the device, it is left to the user to use the correct benchmark.

**Fix:** This benchmark has been optimised for solid state (Flash) media, and thus will not yield correct results on other devices. Such devices have negligible seek times and are transfer-speed bound, generally by the interface (e.g. USB 1.x). This is not the case for magnetic based devices like floppies, hard disks and tapes.

For more information, please see the [FAQ](#).

**Warning W5208** - The test files have failed to be deleted from the tested device.  
**Fix:** Make sure the device is not write protected and/or write only.

For more information, please see the [FAQ](#).



**Tip T5208** - Consider using the [Removable Storage/Flash Benchmark](#) instead of the device is Flash based. As there is no reliable way to know the physical type of the device, it is left to the user to use the correct benchmark.

**Fix:** This benchmark has been optimised for magnetic (floppies, hard disks, etc.) where seek times are significant and usually more important than actual transfer speed, i.e. the device is not interface bound. This is not the case for solid state (Flash) media.

For more information, please see the [FAQ](#).

**Warning W2550** - Chipset does not support Hyper-Threading, while the installed CPU does.

**Fix:** If you like to take advantage of the Hyper-Threading technology of your CPU, you will need to update to a Hyper-Threading capable mainboard.

For more information, please see the [FAQ](#).

**Warning W2551** - Chipset does not support Multi-Processors, while the installed CPU(s) do(es).

**Fix:** If you like to take advantage of the Multi-Processor capability of your CPU, you will need a Dual-Processor or Multi-Processor capable mainboard.

**NB.** While some chipsets may use multi-processors with external glue logic, this is not recommended for mission critical systems.

For more information, please see the [FAQ](#).

**Warning W2552** - No NUMA support has been detected. Multiple node systems need NUMA support in both the BIOS and OS for best performance.

**Fix:** Firstly, check that the mainboard does export a NUMA table for the operating system and that this functionality is enabled. Then check that the operating system has NUMA support (e.g. Windows XP/2003 and later) and that the correct kernel has been installed.

**NB.** NUMA is especially important for CPUs that have built-in memory controllers (e.g. AMD Opteron), this works out at one node per CPU. As the memory is local to each CPU, it is important that programs and the operating system allocate the memory on the proper CPU for best performance.

For more information, please see the [FAQ](#).

**Warning W5407** - CPU specific Optimisation Overrides have been engaged! This means that a optimum code path has been chosen for the CPU that does not use the “latest” features but has higher performance.

**Fix:** You can disable this override from module *Options*.

**NB 1.** While some processors support many instruction sets, not all processors perform best using the very latest instruction set due to their architecture. The software then chooses another path that uses older instruction sets but performs better.

**NB 2.** For example both the Intel Pentium M and AMD Athlon 64 support SSE2. Unlike the Intel Pentium 4, they perform better with SSE instructions. The benchmark thus uses SSE instead of SSE2 as higher performance can be obtained by using these instructions.

For more information, please see the [\(FAQ\)](#).

## Removable Storage/Flash Devices Benchmark

Removable Storage devices are typically small, portable media devices. They can be connected into a computer typically via USB (however there are many interface alternatives). These devices are increasing in popularity as users are searching for small (key ring or pen sized devices), which they can use for transferring and backing up the users templates, pictures, documents and more. When Sandra refers to such devices it is referring to the two integrated parts the controller and the memory typically flash internal to the device.

All devices referenced include a device interconnect description this can be found in [ ] for example [USB 2.0] this means that the test was carried out on a PC with a USB 2.0 controller.

As with many tests there are other external factors that may effect the results and may cause a repeat test to produce a slight difference these include but are not limited in motherboard chipset / architecture, USB hub, interface or controller all results are using an Intel EHCI USB controller (USB 2.0).

- Test needs a minimum free space of 16mb with the optimal free space being 50Mb on the device to be tested.
- Please ensure that any important information is backed up prior to starting the test.
- If the device to be tested requires a specific interface port then this is required i.e. USB 2.0 for a USB 2.0 device.
- Test takes about 5 minutes on P6-class machines with 64MB flash device.
- **Command Line Switch:** FlashBench
- **OS (Win32) Support:** Windows 9X, Me, 2000, XP, 2003
- **OS (Win32 CE) Support:** PocketPC 2000/2002/2003, SmartPhone 2002, 2003
- **OS (Win64) Support:** Windows XP/2003

### Explanations

The typical usage model for these devices is File operations, such as Writing a file to the device, reading a file from it, and deleting a file, this benchmark exercises the devices in terms of these operations (to measure the “raw” cluster level performance of the device, it is recommended to also test it by means of the File System Benchmark module).

The following characteristics are measured for each of the four representative files sizes of 512 Bytes (representing a minimal single data cluster file), 32kB, 256kB and 2MB. The weighting of the results is not equal it represents the distribution of different files sizes as used on these devices (obtained through field research):

**Read Performance:** expressed both in terms of Operations per Minute (i.e. the number of files read per minute) and the corresponding net transfer rate in kB/second.

**Write Performance:** similarly expressed both in terms of Operations per Minute (i.e. the number of files written in a minute) and the corresponding net transfer rate in Kbytes/second.

**Delete Performance:** measuring the number of files deleted per minute.

For each of the four file sizes a Combined Index is then calculated, stating the combined performance in terms of Combined Operations Per Second, with respect to a mix of write, read and delete operations.

**Combined Device Index:** is a composite figure representing an overall performance rating based on the average of the Combined Index figures over the four file sizes.

The in the graphical window the Combined Index (**y axis**) is plotted as a function of the file size (**x axis**). The y axis can be toggled between linear and logarithmic scale. Please note that the x axis scale is non-linear and somewhat distorted for ease of comprehension. The chart is intended for easy to use “one-glance” comparison, and it should **NOT** to be used for data readout.

See [Drives Information](#) topic for more information.

See also [Questions and Answers](#) document for full information.

See [List of Acronyms](#) for more information.

### **Acknowledgements**

See [Acknowledgements](#) topic for more information.

### **Options**

This module has no options to set.

### **Tips**

[Tips \(Performance\) List](#)

## 2004 Additions



**Error E5** - Connection to PDA / Smart Phone could not be established. Check that the PDA / Smart Phone is in its cradle or connected to the PC and the link is active.

**Fix:** Make sure that Active Sync (Pocket PC) / Hot Sync (Palm) have the PDA / Smart Phone is correctly set-up and connected.

**Error E6** - Connection to PDA / Smart Phone has failed. Check that the PDA / Smart Phone is in its cradle or connected to the PC and the link is still active.

**Fix:** Make sure that Active Sync (Pocket PC) / Hot Sync (Palm) have the PDA / Smart Phone is correctly set-up and still connected.

**Error E7** - Undocumented or unknown error. Please contact us.

**Fix:** Please contact us. (you should never see this)

**Error E8** - Interface mismatch between PC and PDA.

**Fix:** Try uninstalling any and all copies of Sandra and just install the latest version. Otherwise, please contact us. (you should never see this)

**Error E5408** - Out of memory or resources, the framework was unable to initialise.

**Fix:** Try rebooting the system and running the program just after boot.

**Error E5409** - Thread initialisation has failed, the framework was unable to initialise.

**Fix:** Try rebooting the system and running the program just after boot.

**Tip T10** - To test your PDA / Smart Phone instead, use the **Switch Test System** button on the toolbar. You can then switch back to your desktop/notebook.

## **Switch Test System**

This button / menu allows you to change the system you can obtain information on / benchmark / test / etc. Instead of using your desktop / notebook PC, you can now test your PDA / SmartPhone directly from the desktop!



### **Use Desktop / Notebook as Test**

This selection changes your test system to the desktop / notebook PC.

**Use Pocket PC PDA / SmartPhone as Test**

This selection changes your test system to the Microsoft Pocket PC based PDA or Smart Phone device that is connected to your PC.

**Use Palm PDA / SmartPhone as Test**

This selection changes your test system to the Palm based PDA or Smart Phone device that is connected to your PC.



