Tweaking your PC for Audio Applications

Who could this be of interest to?

This document contains information suitable for all users of TerraTec Audio-Cards, even those who don't like manuals at all. :-)

Mainly this document is of interest to those who experience problems with noise, clicks, or other problems caused by an improperly configured computer. But even if your computer is running properly, some information in this document could be quite useful.

In advance, this document has to be considered as a source of information for tweaking the audio performance of your system. We can not be held responsible for any damages or failures that may occur from using this information.

I am experiencing noise. Where is it coming from?

You should differentiate between electrical and digital influences. We won't deal with recording noise, like microphone pops and such in this document.

One of the funniest things in the world is a customer on the phone trying to make a technician familiar with the noises they are experiencing. It is fascinating what kind of sounds the human voice can generate.

Nevertheless, in 99 percent of all audio distortion cases, the computer itself is the problem- the soundcard lands the sad job of presenting these problems to the outside world.

About electrical influences

The magic of today's computers ends when it stops impressing the people of tomorrow. Under the cover lies hidden a lot of heavy analogue technology which has a big effect on the digital side.
We are talking about capacitors as large as beer cans integrated in power supplies and VGA cards, high-performance motors that could power a car, or even exposed wires that create an antenna effect.
In such cases where interference is higher than the shielding of your soundcard can handle, you will surely hear noise.
This noise usually manifests itself as a constant hum or glitches (scratching/clicking sounds), or even a sound relating to the rotary speed of the motor that is influencing the card.

The following components are the usual suspects:

The Power Supply

We life in a time where a CPU's (central processing unit) internal clock speed far exceeds the 1GHz barrier. As the computing power and clock frequencies rise, so does the power consumption. State-of-the-art Athlon processors should not be underestimated by their size, they can draw a current of up to 80 amps. Unfortunately, most of the power consumed by the CPU is lost and ends up being absorbed by the cooling system. In fact, the electrical efficiency of a CPU is quite poor in comparison with other devices.
But before we neglect the other silicone rockets in your PC, we should make mention of high-power VGA cards, hard drives running at 7200 rpm, DVD drives that reach rotation speeds

comparable to a motorbike engine and all the other things that make one's computer happy and expensive.

In any case, the power for the above mentioned devices has to be generated by your AC adapter. Years ago this was not a big problem, but today no modern system can be expected to operate correctly with a power supply that has less then 300 Watts of continuous overall power output.

You may have noticed that the recommendations for the AC Adaptor have risen with the power of the devices attached. So, if you buy your computer in a store where the last digit in the price is a 9, you have most likely purchased a low budget power supply that can barely power the computer itself and will most certainly fail when it comes to powering additional hardware. Even if the lack of power doesn't crash the computer, it can easily lead to problems arising from a non-constant power output.

To put it bluntly, it is very advisable to exchange a weak power supply - good overall performance and stability should be worth a little extra money.

The VGA Card

Calling the graphic card a "VGA card" ignores the fact that today's cards are compatible to the VGA Standard in a way, but they have exceeded the specifications of the good old VGA cards several times over.

Today's gamer card monsters consume almost as much power as the CPU itself, and for sure they can cause interference with other devices.

In particular, fast 3D gamer cards are optimised for best performance without taking heed of other devices in the system.

The best and cheapest way to avoid problems is to place the soundcard as far away from the VGA card as possible. On most VIA based mainboards the bottom PCI slot should not be used anyway (for various reasons), whereas several customers with Intel based mainboards have reported having no problems with this slot.

External Devices (the well-known 50Hz Hum)

You have possibly been the victim of the well-known 50Hz hum that seems to come from nowhere. Actually, "nowhere" is your power supply network. This sound appears when two devices that are already grounded through the PE (ground) contact are connected to the ground through another point. Take, for example, an antenna cable that is connected to a TV or amplifier which is operating in the same circuit.
Usually it helps when you disconnect the antenna cable from the TV to break the undesired connection. This can be done more elegantly with a sheath current filter that separates the ground wires of the antenna cable it is connected to. Such filters are available in stores for about 20 EUR.

Tip: You can easily build a sheath current filter yourself if you aren't afraid of a soldering iron. The easiest version is modifying a 75-Ohms antenna connector with two 100 nF capacitors. To do this, place a capacitor on each unit of the cable on the connector side. In doing so you have gotten rid of the direct electrical connection between the receiver and the ground.

About the Digital Influences

The contemporary "Need For Speed" has certainly turned the developers eyes away from the core criteria: stability. State-of-the-art chipsets outdo older ones like the rock-stable BX440, but when it comes to stability they are not very comparable.

The PCI / AGP Bus System

Basically you can imagine the PC bus to be a motorway. There are exits, lanes, any amount of traffic depending on the time of day, and of course all kinds of problems that can occur when all these factors come together.

The bus runs at high operation speed and transports many small packages of data. Almost all communication between the components is done over the bus. Some packages only go a short way-some of them make a longer trip, eventually passing bridges and gateways to other bus systems in the computer.

Surely you have taken the wrong exit when driving over a motorway. And you have most certainly experienced a traffic jam. All these effects can also happen to the PCI bus.

Components that cause a high amount of traffic or CPU load can slow down other components. Packages can go the wrong way without any return or a component that does not match the standard can jam other devices (imagine a 5 meter wide car and your chances of overtaking it) or the whole system.

Some of these and many other data transport mistakes happen to almost every PC. But while VGA cards have a really efficient error correction (you wont notice if the card drops one faulty picture when it receives 100 new ones within a second) , an audio card is forced to play back all the data it receives. It is clocked by a constant sampling rate and accepts all input signals, even those that may cause undesirable effects.

But not only jammed data packages can be the reason for distortion, also temporarily interrupting the data stream to the audio card can (or most surely will) cause dropouts and glitches in the sound.

The most common case is a PCI card that generates a high amount of bus traffic, like some SCSI/RAID controllers. While this card is busy transferring as much data as possible in the least amount of time (i.e. to outperform a competitors card in a benchmark), your bus motorway is occupied by a heavy transporter that doesn't let other information pass by.

This happens, for example, when you start up Windows and use a so-called start-up sound. When the computer is starting up, all devices use interrupt commands (IRQs). Actually the whole computer runs at full power. And because the MME sound device has a really low priority, it is the first one that has to wait when the power gets scarce. Have you already disabled your Windows system sounds? It's time to do so!

Removing most digital influences

Most, if not all of these weak points can be corrected by little tweaks to the system. Of course we can't mention them all here, but we will address the most common ones.

Before we get started...

...you should ensure that all other hardware in the system is running properly. In almost all cases another component in the computer is jamming the soundcard. For example, there are many cheap mainboards that can cause problems that can really only be addressed by the mainboard manufacturers themselves. SCSI controllers can also be a problem. For example, the Adaptec 2940 is known to be a very critical bus controller.

Chipset driver updates

Actually, today's PCs won't operate remotely stable without a chipset driver update. Chipset drivers enable extended chipset features, i.e. the DMA modes. Even some smaller weak points in a hardware design can be compensated for by a smart driver.

Especially VIA KTxxx based mainboards require the well-known 4in1 "Hyperion" drivers to operate correctly.

And so it is a must to check the mainboard or chipset manufacturer's website for driver updates.

Just to mention a few, here are the website addresses of the most common chipset manufacturers:

VIA (i.e. Apollo KT133, KTxxx etc...)
    http://www.via.com.tw
    http://www.viaarena.com

AMD (i.e. 751)
    http://www.amd.com

ALI (i.e. AliMagik I/II ...)
    http://www.ali.com.tw

INTEL (i.e. BX440, 845, 850 ...)
    http://www.intel.com

SiS (i.e. SiS 660, SiS 730, SiS 735 ...)
    http://www.sis.com

NVidia (i.e. NForce1, NForce2)
    http://www.nvidia.com

VGA drivers and driver updates in general

Of course you should also take care that you use the latest drivers for all components in your PC, as many speed and stability-leaks are removed after the initial first sales-phase of a product.

VGA hardware acceleration

Graphic cards are often optimised in a very aggressive way. They attempt to achieve the best benchmark results without taking heed of other hardware in the system. While working with audio programs, you probably won't need hardcore gaming 3D acceleration, so you can reduce the level of the graphic acceleration. This is done in the display driver properties menu, which can be accessed under Extended Display Properties.

Power Management

As it was mainly developed for the mobile computer market, Power Management doesn't make much sense on a high-performance audio PC. Even if it may save you a few dimes, it slows down the hardware you have invested a lot of money in.
So you should disable all Power Management options in the BIOS setup of your computer.
Also the operating profile in your Windows Control Panel should be changed to "Always on".

Smart is not fast!

Your system may offer an option that is disabled by default but often turned on by people that do not really know what they are doing. We are talking about the "Self-Monitoring, Analysis and Reporting Technology System", aka SMART.
This option is fine for monitoring the "drive fitness" of a hard drive, and actually this is what SMART does. The side effect is that it slows down hard drive access times, therefore it should be disabled.

ACPI Trouble

ACPI is an advanced version of Power Management, which introduces one major problem: It slows down your PC. So if you don't need it for a multiprocessor machine or some mysterious hardware, disable it.
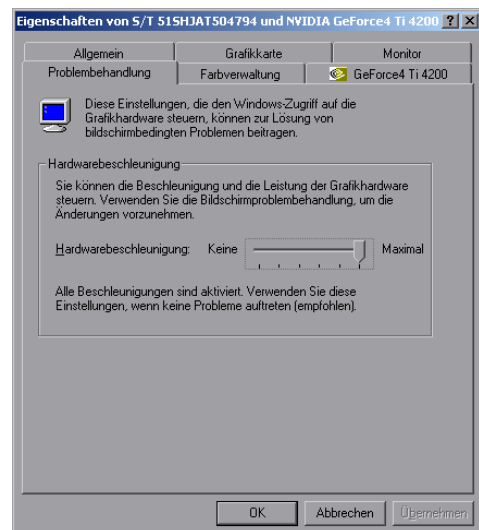
ACPI should be turned off during the Installation of Windows 2000 or Windows XP. Just hit F6 while the install media boots and select "Standard-PC" as system driver.
You can also disable ACPI on a running system, but we don't recommend this method, as it often causes problems. A new installation of Windows is like a fresh shower for the whole system :)

DMA Mode

You should ensure that all hard discs and CD-ROM drives run in DMA mode. DMA mode can also be toggled on and off in the drives or drive controller properties in the device manager.
You find the DMA setup in the properties of the hard drive itself under Windows98/ME, while you will find it in the properties of the corresponding hard drive controller under Windows 2K/XP.

Ant-Virus Software, Local Firewalls and such...

...should be disabled when using audio applications. They slow down memory and hard drive access and can cause conflicts with audio software.

Interrupt Request (IRQ) Sharing

Interrupts make it possible to the processor to manage different I/O (Input-Output) devices. An interrupt event stops the current process the CPU is dealing with and makes it jump to a specific memory address where device code is executed.

In the first beginning the relation between IRQ and device was 1:1, so one interrupt could only take care of one device. With the new PCI specifications it is possible for almost all devices to share IRQs. This also applies to our soundcards, which of course comply with the latest PCI device standards. Unfortunately not every device runs well when forced to share its vital interrupt request with another device.
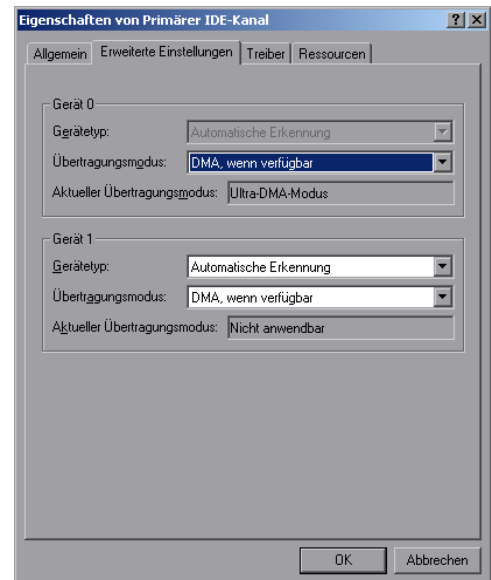
To avoid this kind of trouble you should ensure that your soundcard is using its own IRQ. This can easily be checked in the Device Manager of your Windows system or the PCI Device List during boot-up. Under Windows 98SE and ME you have to double-click on the "Computer" icon at the top of the Device Manger list, under 2K/XP the Device Manager does not correctly reflect the IRQ assignments because of the virtual ACPI IRQ layer. When using these operating systems the PCI Device List must be consulted – this is displayed briefly during the boot phase. There, the „real" (physical) IRQ assignment is shown, but most modern PCs boot so fast that this is displayed for less than one second. Tip: Use the floppy drive as first boot device (in BIOS) and boot the PC with a blank diskette. When the error message comes saying no operating system could be located, the PCI Device List should be visible on the screen ;-).
If the soundcard shares an IRQ with another device, the most efficient way to change it is to swap the PCI slot used by the card (after removing the device from the Device Manager). You can also remap the IRQ settings in the BIOS setup of the computer, but the preferred way is to change the hard-wiring by exchanging the slots as mentioned above.

Hard Drive Problems

If the sound starts to stutter during multi-track operation, you may have run out of hard drive data transfer capacity. Under Windows98SE and Windows ME you have to change the Computer's usage type to "Network Server", under Windows 2000 you have to ensure that at least Service Pack II is installed. Of course you should also check the DMA setting as mentioned above.
We also recommend defragmenting your hard drive regularly.

Windows System Sounds

System sounds have the talent of disturbing and slowing down where it is anything but desired. So, to avoid all trouble regarding Windows sounds, you should turn them off in the Windows Control Panel.

Legacy Devices

The mainboard provides a lot of integrated devices such as serial ports, parallel ports, USB ports, onboard sound chips, and a variety of other special devices. Nowadays most users don't need the legacy ports anymore, so it is advisable to disable all the ports that you don't need. This is usually done in the BIOS setup of your computer.

The Optimal audio system is a legacy-free computer, which means that the COM/LPT/PS2 ports are not used. This can be done when you own a USB keyboard/mouse, no serial devices and of course a printer that uses an interface other than the parallel port.

Undesired Software

As the installation gets older and the computer is used for many things other than just audio software, it is possible that a lot of undesirable software can begin to slow down the system.

We differentiate between two kinds of undesirable software:

1. Adware
   This type of software usually contaminates your computer when you install some strange software like P2P filesharing programs or when you click "Yes" somewhere and don't actually know what you are confirming at the moment. One quite efficient way of getting rid of this type of nuisance is running Ad-Aware, which can remove the majority of these programs.

2. Junk Applications
   Many applications manifest themselves in the autostart file of your computer. For example RealPlayer or Winamp (which is quite harmless in comparison to RealPlayer) include start-up applications that you don't actually need.
   Under Windows ME/XP the easiest way to be rid of these types of programs is to clean the autostart folder and use the autostart editor of *msconfig.exe* to get rid of undesirable applications.
   Under Windows 2000 you have to manually search for these entries in the registry by starting regedit.exe (click on Start→Run) and removing all unnecessary start-up applications under *HKEY_CURRENT_USER/Software/Microsoft/Windows/CurrentVersion/Run.*