

DR JOHN'S PC GUIDE

Building, Upgrading, Overclocking, Tweaking, and Troubleshooting Your Windows Gaming Computer

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Introduction: This manual is intended for both beginners, and more advanced PC users. I will make every effort to explain things for people with much less background in PC design or the Windows operating system, but I will also go into some detail on the more sticky aspects of PCs and Windows, like flashing your BIOS, creating a restore CD, or editing the Registry. The guide is divided into five parts; Building, Upgrading, Tweaking, Troubleshooting and Maintaining your PC. The major focus of the guide is on hardware installation and setup, rather than software setup. But installation of Windows and driver files is covered.

Buying Parts: One of the most important aspects of building your own computer is finding a good hardware distributor. More than likely you'll need to go to more than one company for your hardware needs.

For example, to get the best deal on high-quality memory, you may have to go to a company that specializes in high-performance memory. Price is not the only consideration, also consider quality and service. For example, it is not uncommon for motherboards, power supplies and disk drives to have problems, or to fail after several weeks of operation. You want to make sure to get your parts from a company that will replace bad parts for you under warranty without hassles or restocking fees. Saving \$5 or \$10 on the purchase won't help much if you can't return bad hardware. As prices on parts continue to drop, manufacturers often reduce their quality control tests. It is not uncommon to get one, or even two bad parts out of every ten, so you need to be careful about where you buy your parts.

One final consideration is whether to buy "retail" or "OEM" (original equipment manufacturer) parts. Retail equipment is more expensive, in part because it comes in a box, typically with a manual, warranty, and often, bundled software. Sometimes, retail video cards come with faster memory than the OEM counterparts. OEM parts come without any special packaging (sometimes just in a plastic bag), without a manual, and with a limited warranty, or almost no warranty at all. Take your pick, but chances are you will be happier in the long run with retail parts than OEM parts. The price difference is usually in the 5% to 15% range. Expect the lowest priced items at Pricewatch.com to be OEM parts. Beware of ultra-cheap, counterfeit hardware, particularly motherboards. If only one supplier is \$25 lower on a \$100 part than all the others, they should be considered suspect.

Getting Started: I am assuming that most people are still using Windows 98SE or Windows Me for gaming. However, hardware installation instructions will be the same regardless of operating system, so Windows 2000, Windows XP, and Linux users can also use this manual. Where there are differences in the procedures, I will make a note of the operating system specifics.

IMPORTANT: Floppy Boot Disk! Before you start doing anything, make sure you have a floppy boot disk handy that gives you CD ROM support. If you don't already have one, make one. You can make a bootable floppy on your computer by using the Windows 98/Me Startup Disk Utility. If you are building a system from scratch and

don't have a working computer handy, you will want to make a floppy boot disk on someone else's computer before you start working. It's not a bad idea to make two of them, in case one fails. Note that for Windows 2000 and Windows XP, you will boot directly from the installation CD (no floppy disk required). To do this, simply start the computer with the CD in the drive. If you are not given an option to install Windows, then you need to go into your motherboard's BIOS menu, and set the system to boot from the CD ROM drive (usually a setting in the "boot" menu).

To make a floppy boot disk in Windows98/Me:

- 1) Open the Control Panel (Start > Settings > Control Panel)
- 2) Double Click on 'Add/Remove Programs'
- 3) Click on 'Startup Disk'
- 4) Click on 'Create Startup Disk' (You will need your Windows 98 or Me CD and a blank 1.44MB floppy disk).
- 5) Test the bootable floppy disk by booting your system with it. This will check to make certain that the floppy drive works properly, and that the floppy disk you made gives you CD-ROM support.

Once you are certain that you can boot from a floppy and can get your CD drive to work in DOS, you are ready to proceed. Keep your Windows CD and video and sound card driver disks handy because you will need them.

Important! Before you start it is a good idea to make sure you have all the latest drivers handy that you will need. You can download the latest drivers from the hardware manufacturer's web sites. Use a recordable CD drive (CD burner) or ZIP drive to store the software drivers you will need during installation. Floppy disks are too small for many current drivers.

If you have an NVidia-based video cards, go here for official drivers:

http://www.via.com.tw/drivers/index_new2.htm

Or here for unofficial, leaked drivers:

<http://www.3dchipset.com/beta/nvidia/nvidia.html>

For Sound Blaster sound card drivers, go here:

<http://www.soundblaster.com/liveware/>

For ATI video cards go here:

<http://support.atitech.ca/drivers/index.html>

There is a more complete list of driver links at the end of the manual.

General work rules: Always work on your computer with the power cord unplugged from the wall socket. You don't want power surges going to the motherboard. Also, if the weather is cold and dry, you may want to have a handy way of discharging static electricity, especially if you have carpeting!

To discharge built-up static, find a metal object near where you are working (one that zaps you when you touch it), and touch it often while you work to eliminate the built-up static on your body. If you have an anti-static wrist strap, or other antistatic devices, use them by all means! It is highly advisable to work in a non-carpeted area. Using a room humidifier in the wintertime can help reduce static buildup. There is little or no chance of static buildup on warm, humid days. In general, rooms with wood, concrete, or linoleum floors make the best computer work areas.

Work slowly and carefully, there is no point in rushing. A properly assembled computer will be more reliable, and will last longer. So take your time, and be methodical. One lost screw wedged under the motherboard is enough to prevent your new computer from booting.

Also don't over-tighten screws. If you strip screws, small pieces of metal can flake off, and can potentially cause a short circuit if they land on a circuit board.

Obvious miscellaneous recommendations include, don't drink and eat while hovering over your work area. You don't want your favorite beverage or burger juice and ketchup landing on the motherboard.

Handle your hardware carefully, dropping your hard drive to the floor may end it's young life prematurely. Don't force things. If something is not snapping into place properly, it may be you are trying to put it in the wrong way. Check to see if there are grooves, keys or notches which only allow cables or hardware to go into the socket one way.

Finally, it's good idea to use a checklist, and check off each step when it is completed. Chapters 1 and 2 provide step-by-step instructions for building and upgrading your computer which can be used as checklists.

Chapter 1

BUILDING A SYSTEM FROM SCRATCH

Parts you will need:

1) ATX case with a 300 or 400 watt power supply. Don't skimp on the case, it's very important. (Doc's recommendation: Antec SX Performance Series: I like the SX1040b, b=black).

2) Motherboard and processor. Best choices: Intel or AMD based motherboards and processors (Doc's current recommendation: Athlon XP 2100+ [=1.73GHz] on an Abit KR7-RAID motherboard)

3) Memory: Choices: PC-133 SDRAM, Double Data Rate DRAM (DDR DRAM) or Direct Rambus DRAM (DRDRAM) (Doc's current recommendation: Crucial or Corsair PC-2100, PC-2400, or PC2700 DDR DRAM, get 512MB either in one 512MB or two 256MB sticks).

4) Video Card: Main Choices:

-Economy: GeForceMX 440, ATI Radeon 7500 or GeForce3 Ti200

-Performance: Radeon 8500, or GeForce 3 Ti500 or GeForce 4 4400/4600 (Doc's recommendation: GeForce4 4400 or Radeon 8500)

5) Hard Drives: ATA/133 vs. SCSI and RAID arrays (Doc's recommendation: 2 Maxtor D740X 60GB ATA/133 7200rpm drives set up for RAID 0)

6) CD, DVD, CDRW, or DVDRW drive: (Doc's recommendation: Asus 52X CD and Plextor Plexwriter 40x10x40A CDRW burner)

7) Sound Card: Anything other than a SoundBlaster?

-Phillips Acoustic Edge

-Hercules Game Theater XP

(Doc's recommendations: Acoustic Edge or SB Live Audigy)

8) Floppy Drive: still needed occasionally (Teac drives are good).

9) Uninterruptible Power Supply (UPS): Protect your investment!

Tools and items needed: You'll need a small and a medium Philips head screwdriver, a regular screw driver, a needle nose pliers, and in some cases a magnifying glass and No. 2 pencil. But other than that, you don't need a lot in the way of tools to work on your computer. It is highly advisable to keep older PC parts that work to help with troubleshooting. For example, having a PS/2 mouse handy can be very helpful while troubleshooting, because if you don't have USB support working properly, you won't be able to use any USB mice. Having extra video cards, sound cards and hard drives available can make troubleshooting much more efficient. If you don't have known-good spare parts, you can't swap out parts you feel may be giving you trouble. So the general rule is, keep your old hardware rather than giving it away when you get a new system.

After you have all your parts together and are ready to proceed, clear a work area, and open up your new computer case. It is advisable, especially in the Winter, not to work in a carpeted area. Carpets can produce a large static buildup, so it is better to work in an area with a hard floor. Humidifiers can help a lot in the Winter if humidity is low.

Choosing the motherboard, processor and memory:

This is a topic that could take up an entire book. There is a lot to know, and a lot to consider when choosing what combination of motherboard, processor and memory to consider.

So what are your choices? Rather than offering a comprehensive review of all the possibilities, I will narrow it down to what I consider the most logical choices. Very soon, new choices will be available, such as NVidia nForce motherboards for Athlon processors. Use the Internet to find out about new hardware. Web sites like www.TomsHardware.com, www.tech-report.com and www.Anandtech.com have reviews of all the latest hardware.

1) Budget System: nForce motherboard, AMD Duron, PC2100 DDR DRAM

The Processor: AMD Duron, 1GHz to 1.3GHz range

The motherboard chipset: NVidia's nForce chipset (I personally like the

Asus A7N266 motherboard)
The memory: PC2100 SDRAM

Pros: The NVidia nForce chipset supports PC2100 DDR DRAM, and is a good low cost platform for AMD Duron processors. The built-in video (GF2 MX) is a bit slow, but otherwise, these make for fast gaming computers. You can always add an AGP video card later to upgrade the system. If you are getting an Athlon processor, I suggest paying a little more for a system with a KT266A chipset (see next system configuration).

Cons: Windows operating systems require you to install special drivers be for optimal performance. You need to be certain to install the correct driver update for your motherboard's chipset, and for the operating system you are using.

2) High-End A: KT266A motherboard, AMD Athlon, PC-2100 or PC2400 DDR DRAM

The Processor: AMD Athlon XP, 1700+ to 2100+ (1.47GHz to 1.73GHz range)

The motherboard chipset: VIA KT266A (I like the Abit KR7-A-RAID motherboard)

The memory: PC-2100 or PC-2400 DDR (double data rate) DRAM

Pros: Low cost, high performance. Excellent gaming platform, and my preferred configuration.

Cons: Windows operating systems require that special drivers be installed for optimal performance. You need to be certain to install the correct driver update for your motherboard's chipset, and for the operating system you are using (Windows 98SE vs. Windows 2000).

3) High-End B: i850 motherboard, Pentium4, Rambus PC800 DRAM

The Processor: Intel Pentium 4, 1.8GHz to 2.2GHz

The motherboard chipset: Intel i850 chipset

The memory: Direct Rambus DRAM

Pros: Fast at most applications and games. The best Quake III platform available. Will work better with future optimized software. Good all around choice if the price is not a big consideration. Rambus DRAM is the fastest available PC memory. This system is the most forward-looking, and will work especially well with future games and applications that support it's new features.

Cons: Relatively expensive, especially if you opt for the 2.2GHz Pentium4 and lots of PC800 Rambus DRAM. Slow for it's GHz rating compared with Athlon systems. This type of system is not well optimized for some older applications. Older Pentium 4 motherboards (423 pin socket) are not ungradable. Get a 2GHz or faster model and appropriate motherboard to make sure you're getting the newer, better version of the Pentium 4.

As a side note, I personally don't want to support Rambus Inc., because they have engaged in deceptive and illegal business practices. But now there are new chipsets that support DDR DRAM with the Pentium 4, bringing us to a fourth possible setup.

4) High-End C: VIAP4X266 motherboard, Pentium4, PC-2400 DDR DRAM

The Processor: Intel Pentium 4

The motherboard chipset: VIA P4X266

The memory: PC-2100 or PC-2400 DDR DRAM

Pros: Fast, and slightly cheaper than the Rambus option. Excellent Quake III platform, and good all round choice. PC2400 DDR DRAM running at 140MHz or more is an excellent lower-cost alternative to Rambus DRAM. PC-2400 DDR DRAM is a newer faster version. It can be run between 140MHz and 150MHz. PC-2100 would also work just fine up to about 140MHz in this type of system.

Cons: Windows operating systems require that special drivers be installed for optimal performance. You need to be certain to install the correct driver update for your motherboard's chipset, and for the

operating system you are using (Windows 98SE vs. Windows 2000).

Choosing the motherboard, processor and memory is a critical decision you will need to make. As mentioned above, these sites have excellent hardware reviews:

www.AnandTech.com

www.TomsHardware.com

www.tech-report.com

Operating Systems: If you are interested in playing computer games, you are probably going to want to install some version of Windows. It is possible to play some games under Linux, but if you want flexibility in what games you can play, you'll opt for Windows. But which version is best? I personally do not like Windows XP, even though it is a good operating system. The problems with it include 1) you must "activate" the software by registering it, and re-registration is required if you change more than 6 hardware items, 2) Microsoft has added many financial "features" to Windows XP, including "Passport" and "dot-Net" which pressure users to sign up with Microsoft for these paid services, and 3) some peripherals do not have proper drivers available for Windows XP, and some companies (UMAX, for example) are even charging for updated XP drivers for their hardware. Add to this list the fact that if you have a home local area network (LAN), you will need to buy a full retail version of Windows XP for each machine, because each licenced version of the operating system will not install on more than a single machine hooked to a network. The Home version of XP is about \$200, while the professional version (dual CPU support, etc) is about \$300. Both Windows 98SE and Windows 2000 do not check whether the same license is installed on other machines on the network.

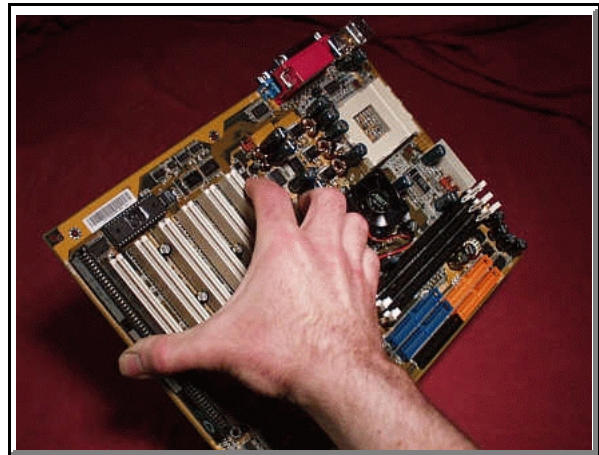
So if you decide to forgo Windows XP, what's the best option? Windows 98SE is easy to install, is backward compatible with all older software and hardware, it runs all games, and is easy to troubleshoot. The cons for Windows 98SE include the fact that it is not very stable, and you don't get as much control over the operating system as you have with Windows 2000. For most people, Windows 2000 offers the best compromise between compatibility with software and hardware, and stability. But be warned, Windows 2000 is much more complicated

to setup than Windows98SE, particularly the networking features.

If you're going to be using Windows 2000 or Windows XP Pro, you may want to consider getting a dual processor system. These are often much more expensive, and not all applications take advantage of the second processor (for example, games). Dual processor systems based on Intel's chips are often too expensive for home computers. However, you should be able to get your hands on a dual Athlon motherboard, such as the Tyan Tiger MP. Keep in mind that you will need to buy special "MP" rated Athlon processors to work in this kind of setup. They are more expensive than standard Athlon processors, but much less expensive than Intel's dual processor offerings.

Hardware Setup

The first thing to do is lay your opened ATX case on it's side to make it easier to install the motherboard. Some ATX cases have removable motherboard trays, which can make installation even easier.



Take the motherboard out of its wrapper, holding it by the edges to avoid getting oil from your fingers on any of the solder joints. You can also hold motherboards from above by grabbing the AGP socket and one of the other sockets (see picture). Position the motherboard inside the case just to check the alignment of case mounting holes, with mounting holes on the motherboard. This is a critical step.

Your ATX case should have come with a bagful of screws and mounting studs. The studs are usually threaded like a screw, and have a threaded hole in the top for inserting a metal screw (note: some snap into place). These will hold the motherboard in the correct location in the case, and provide electrical grounding. Spread the screws and studs out on the table and check which screws fit into the metal studs. The "metal studs" are what you will use to mount the motherboard into the case. This is a critical step in making a stable computer. The

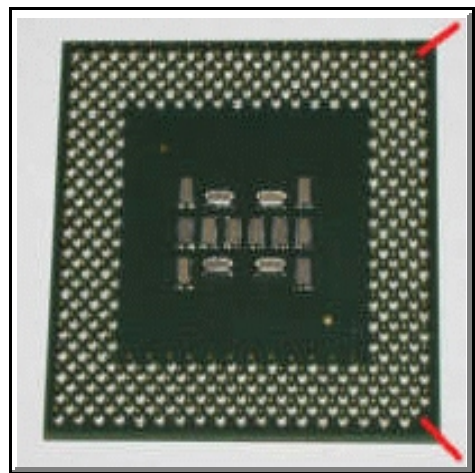
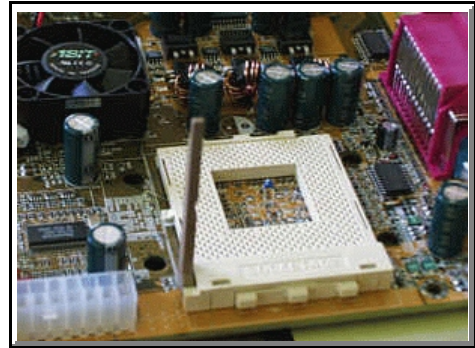
motherboard is electrically grounded with these studs, and their placement is a very important for proper grounding. You can check your motherboard's manual for more information on mounting the motherboard in an ATX case.

Step by Step Instructions:

1. It is a very good idea to mount "socket-type" processors and their heat sinks before installing the motherboard in your ATX case. Duron, Athlon, Pentium III and Pentium 4 processors all come in a socket format now. To install the CPU and heat sink, follow these instructions:

NOTE: if you are going to overclock an Athlon or Duron processor, you may need to make a small, simple modification to the chip before you install it on the motherboard. Go to the Athlon/Duron overclocking section below (Chapter 3) before proceeding. Read the section on "unlocking the CPU multiplier".

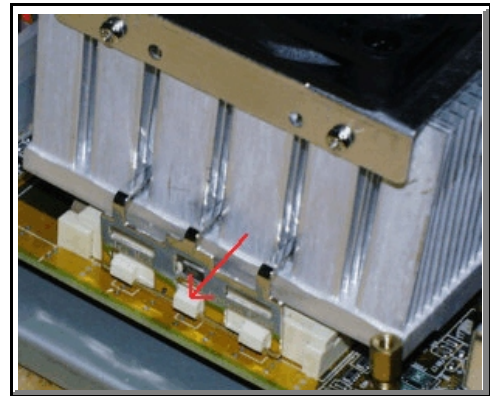
- a. Lay the motherboard's plastic wrapper onto a solid, flat table surface, and place the motherboard on it.
- b. Open up the small latch at the side of the CPU socket (swing it up 90 degrees). There is a clip holding it down, so pull the latch away from the socket slightly to undo the clip.
- c. Check the orientation of the pins on the bottom of your processor. There are pins missing in one or two corners, and these need to line up with the corners of the socket which are missing pin holes.
- d. Insert the CPU into the socket, make sure it is seated properly, and then close the latch.
- e. Now it's time for the heat sink and fan. Check the bottom of the heat sink. It has some thermal compound in a small rectangle. **Important:** The thermal



Pins missing at 2 corners

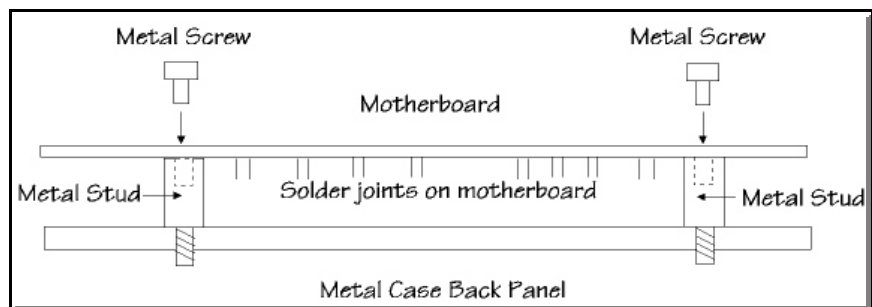
compound is often covered by a plastic protective sheet that must be removed. Then you need to make certain that the exposed thermal compound on the bottom of the heat sink lines up with the raised part of the CPU. The thermal compound is typically "off-center", so check which way the heat sink needs to be attached to get the thermal compound lined up with the raised rectangle in the middle of the CPU.

With some CPU and motherboard combinations attaching the heat sink can be difficult, and prone to accidents. The hard part is that you need to exert significant force on the metal clips that hold the heat sink tightly onto the CPU socket. Tools such as a screwdriver and/or needle nose pliers may be required. Make sure you are very careful not to crack the motherboard with excessive pressure, and that you don't slip with the screwdriver or pliers when connecting the clip, because you may gouge the motherboard's surface. Start by connecting the most obstructed retainer clip first. Then attach the second clip. This one will take some effort. Make sure you work on a solid surface so the motherboard does not flex. Also, take your time, and make sure you don't damage the motherboard.



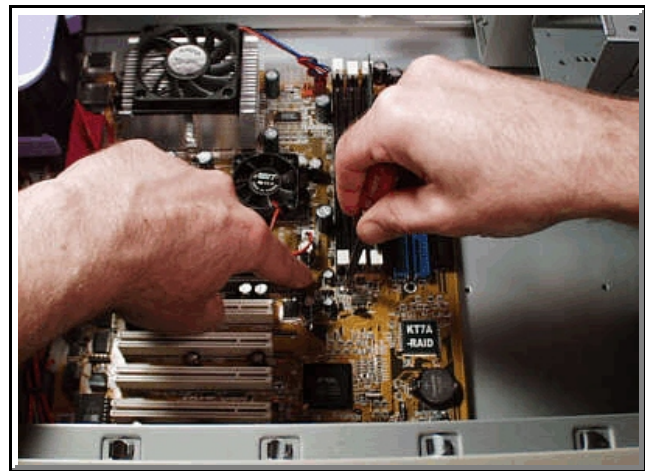
Heat Sink retainer clips at the side of the CPU socket

2. **IMPORTANT:** You need to make certain that only the proper holes in the case get the metal "stand-offs" screwed into them. To do this, carefully hold the motherboard by the edges (don't touch the solder joints if you can avoid it) and lay the motherboard into the case where it will sit when finished. You should see a threaded screw hole lined up with most (but probably not all) holes in the motherboard. The retaining screws



and stand-offs (known as “studs”) come with your case, not with the motherboard. They should be metal, not plastic, otherwise your motherboard will not be grounded properly. Proper grounding is essential. BUT! ONLY install metal studs in holes in the case that line up perfectly with grounded holes (the ones with a metal ring around them) on the motherboard! If you put studs in the case where they do not line up with grounded holes on the motherboard, they may short out contacts on the bottom of the motherboard, in which case the system will not boot. Check the motherboard manual for more details, and see the cut-away side view in picture above.

3. After screwing metal studs firmly into the proper mounting holes in the case back panel, check one more time for the final alignment of mounting holes in the motherboard with the studs you installed. Make sure that the mouse, keyboard and USB ports on the motherboard are lined up with the correct holes in the back panel of the computer case, and that no metal parts are blocking any of these ports. When you are sure that you have all the correct studs in place, and the proper alignment, screw the motherboard into place.



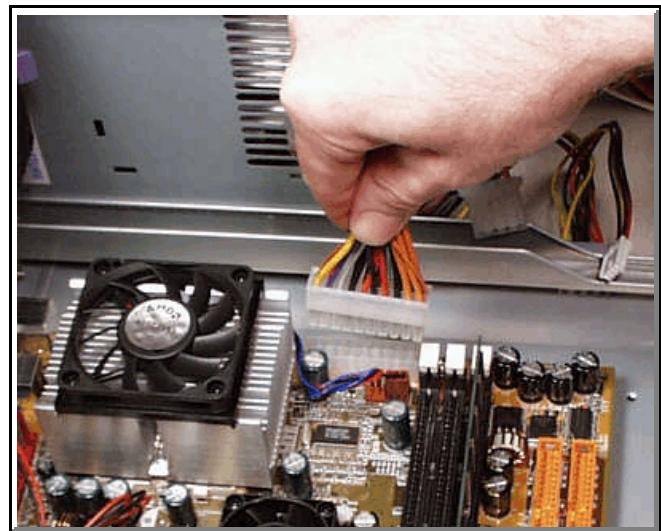
Hint: it may be difficult to get all the holes to line up. It may require that you push the motherboard towards the back of the ATX case in order to get several of the screw holes to line up. This can be a little tricky. Some screw holes will be hard to get to. Be patient, and don't try to rush it. Before tightening any screws, make sure the connectors on the back of the motherboard are free and clear of obstacles. Some cases have metal flashing that can obstruct keyboard or mouse connectors, so make sure that nothing is in the way before screwing the motherboard in place. Also, don't screw any of the screws down tight until you have started threading all of them. Tightening the first few screws completely may make it much more difficult to line up the

holes for the last few screws.

Once you have started threading all of the screws, then you can tighten them the rest of the way up. Only tighten the screws enough to hold the motherboard. (Don't over-tighten them! You can crack the board).

4. Make sure the CPU fan's power cable is plugged into the motherboard. Some motherboards, such as the Abit KT7A, require that you hook the CPU fan to a specific fan connector, or the motherboard will not boot. This is to protect you from running the system without the fan connected. You can install the memory sticks now too. Check your motherboard manual for which memory slot is the first one (slot 0). That is the socket that your memory stick should go into. Sometimes it is the socket furthest from the CPU socket, so check with your motherboard manual. If you have more than 1 stick, fill them in order starting with slot 0. (Note: on some DDR motherboards like the Abit KG7, it is recommended to fill the memory slots starting at the highest number. Check the motherboard manual).

5. Connect the power cable for the motherboard. Look for the clip on the side of the power connector, it shows you which way the plug goes. The motherboard manual shows where the power connector on the motherboard is located. The connector only fits in one direction. Note: Pentium 4 motherboards have a second power connector. Check your motherboard manual for its location.



6. Install your disk drives in appropriate drive bays, including floppy, CD, DVD, CDRW and hard drives. Keep in mind the distance to the IDE controllers on the motherboard, and the length of the IDE cables.

7a. Install your video card into the available AGP socket on the motherboard. It is a good idea to install only your video card at first. It is easier to get the system up and running without the additional PCI cards installed at first boot-up. You can add the other cards in one at a time later, and get the drivers for each of them loaded before proceeding to the next peripheral. This often will make the installation process go more smoothly.

Many builders will attempt a first boot at this point, to make sure that the motherboard installation is correct, and that the power supply is working. If you want to do this now, go to step 10 below and connect the case wires to the correct motherboard pins. Hook up your keyboard and monitor, and plug in the power cord. If the system POSTs properly (POST = power on self test) return to step 7b. If you hear a single beep from the system after powering on, then everything is working, and you can return to building your PC. If the system does not start, then you need to go back and check your connections and the motherboard installation. Troubleshooting tips can be found later in this chapter, and in chapter 4.

7b. Install your audio, network and/or modem and other cards one at a time into available PCI and ISA slots. Install the driver files for each one before proceeding to the next device. It is much better to proceed one peripheral and driver at a time. Make sure the device is working properly before proceeding to the next peripheral. Detailed instructions on installing drivers can be found later in this chapter.

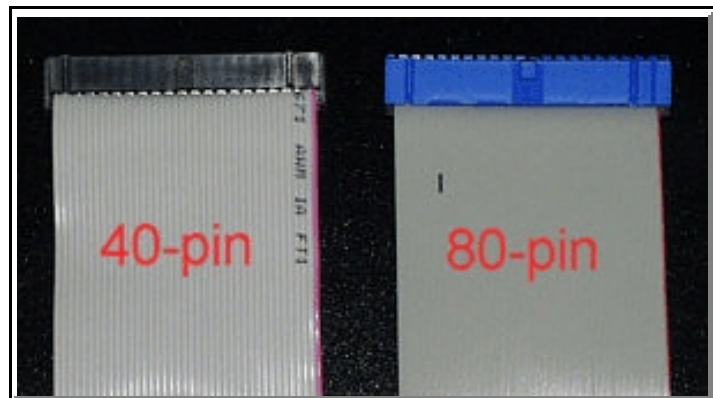
Your motherboard manual should show which PCI slots share IRQs with each other. You want to try to manage what peripheral cards share IRQs with each other, because some play nice together, and some don't. As an example, on the Abit KT7A motherboard, the AGP slot shares an IRQ with PCI slot #1 (the adjacent slot). Because AGP cards need a dedicated IRQ in most cases, it's a good idea to try and leave PCI slot#1 free. I like to put "slot-blower" fans into those slots, which then help to cool your video card. You can get "slot-coolers" or "PCI fans" from several manufacturers.

8. Connect the data cables from your motherboard IDE controllers to your disk drives. Check your motherboard manual to see which

direction you need to connect the data cable to the motherboard's IDE connectors. Some IDE cables have a key tab which only allows the cable to connect the correct way. With other cables you will need to check the motherboard manual for which side of the IDE connector that "pin 1" is on. The red stripe on the edge of the IDE data cable must point towards pin 1.

The other end of the data cables must be connected to your disk drives. The rule is that the red colored edge of the data cable points toward the power connector on the back of the disk drive. This is true of hard drives, CD or DVD drives, and most floppies. If you put the cable on so that it is pointed in the wrong direction, you will get a disk read failure. Don't worry, it won't hurt anything, it just won't work until you put the cable on correctly.

There are two types of IDE cables. One is the old 40-pin (or 40-conductor) cables, the other is the newer, ATA/100-compatible 80-conductor (80-pin) cable. You can use the newer 80-pin, or the older 40-pin cables for CD, DVD or CDRW drives. For ATA/100 hard drives, use the 80-conductor cables exclusively.



Two types of IDE data cable

General rules for connecting drives to IDE controllers.

a. Keep drives on their own dedicated IDE cable and IDE controller if possible. All drives should be set to master in this situation. (Master and slave drives settings are done with jumpers at the back on each drive. The various options should be listed on the top of the drive).

b. If you have more than one drive on a cable, make sure that one is set to master and the other is set to slave. This is done with jumpers on the back of the drives. Often, the master, slave and cable-select jumper positions are shown on a sticker on the top of the drive. Sometimes abbreviations are shown right next to the jumpers

themselves (M for master, S for Slave, and CS for cable select).

c. Note: Later you may need to go into your motherboard's BIOS setup menu to enable all the IDE channels that you will be using.

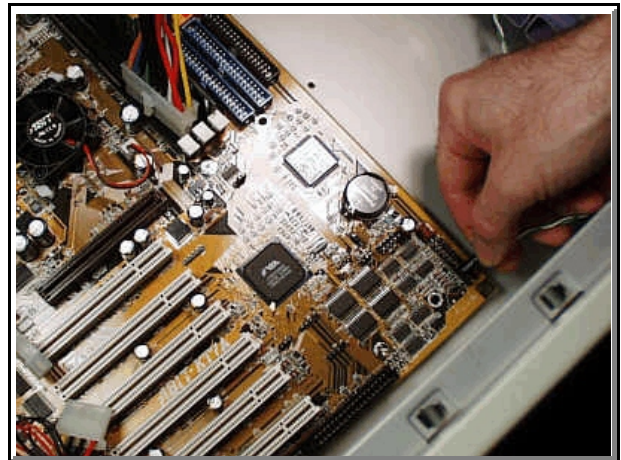
Floppy exception. Some floppy disk drives have the power connector on the opposite side of the data cable connector. If you have the data cable on backwards, you will be able to tell because the floppy disk drive light will stay on all the time. If you see that the floppy drive light remains on even when the drive is not in use, turn the computer off, and reverse the data cable. Note that if you had a floppy disk in the drive while the data cable was reversed, there is a chance the data on the floppy disk will be erased.

9. Connect the other end of the disk drive data cables to the motherboard connectors. Check the motherboard manual to make sure you connect the hard drive to IDE channel 1, the CD cable to IDE channel 2, and the floppy drive to the floppy connector.

10. Carefully connect the ATX case wires to the motherboard as indicated in the motherboard manual. These are the pairs of white and colored wires built-in to the ATX case. There are at least five of them. 1) Power On, 2) Reset, 3) Hard drive LED, 4) Speaker and 5) Power LED.

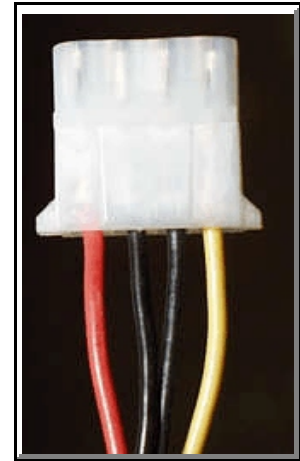
Check the motherboard manual to find out which pins each connector goes to on the

motherboard. There is also very small writing next to each set of pins that you can use to help locate the correct ones. The rows of pins at the bottom right of the motherboard (as it sits in the upright case) are the pins that these case connectors plug into. The connectors for the LED's are polarized, which means if you put them on backwards, the Power and Hard Drive LED's won't light up. If these two lights don't work, just reverse the connector on the same pins to get the light to function. YOU MUST ATTACH THE CASE POWER BUTTON WIRES TO



THE CORRECT PINS ON THE MOTHERBOARD FOR THE POWER BUTTON TO FUNCTION. Check the motherboard manual if you are not sure what to do.

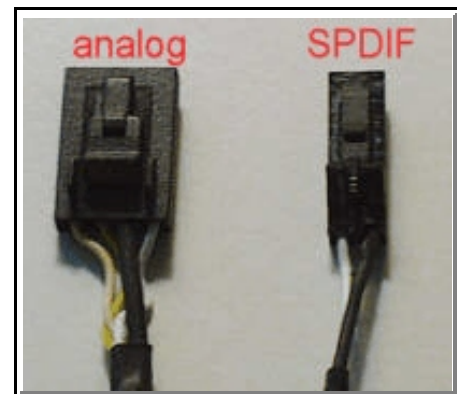
11a. Plug power connectors into your disk drives. These are the power connectors that come from the power supply in your computer case. There are 4 wires on each one, 2 are colored black (ground), one is red (5 volts), and the other is yellow (12 volts).



4-pin large Plug

The power connectors come in two sizes, big and small. The floppy drive will take one of the smaller connectors, but hard drives and CD drives will take the standard, large 4-pin power connectors.

11b. Your CD drive and/or sound card should come with 'audio cables', and these need to be connected from your sound card to your CD drive if you want to play audio CDs on your system. There are several types of audio cables, and two types of connectors on the back of drives. The flat 4-pin connectors are for analog CD sound, while the smaller, 2-pin connectors are for digital audio (called SPDIF or Sony-Phillips Digital Interconnect Format). If your sound card and CD or DVD drive offer SPDIF



CD audio cables

connectors, then you can use the digital interface to deliver digital-quality sound. If not, you can still connect the CD drive to your sound card with the large, flat analog connectors. Check your sound card's manual for what connectors to use. Some sound cards have the connectors labeled. If your system has "on-board" sound on the motherboard, rather than a sound card, there should be an analog audio cable connector somewhere on the motherboard.

12. Plug in your keyboard, mouse, and monitor cables.

13. Plug in the power cord.

14. Cross your fingers! Drum roll please..... Start the computer!

15. You should hear one single beep from your computer. It is normal for Windows to find new hardware when booting with the new motherboard. You may need your Windows CD. If you hear a series of beeps, or if nothing happens when you turn on the power, then unplug the computer and check all the connections. First, make sure the cables are pushed in all the way, and also make sure your cards are fully seated in the AGP, PCI and ISA slots on the motherboard. Make sure the memory sticks are properly installed in their sockets, it may help to remove, and replace them to make sure contact is good. Make sure the power connector from the case power supply is connected to the motherboard.

If your system booted properly, congratulations on a great job!

16. If your computer does not boot properly, make sure that the memory and all the cards are pushed fully down into their slots. Incorrectly seated memory sticks and peripheral cards are the most common reasons that a new system won't boot. Incorrect placement of metal studs in the wrong holes in the case can cause short circuits on the motherboard, and is another common source of problems. If you are still having trouble after checking all connections and the mounting of the motherboard, go to the troubleshooting section for more information (Chapter 4).

Note on starting your computer: If you want to quickly check if the motherboard will boot with the CPU and memory before you install everything else, and hook up the case wiring, here's a little tip. Get the motherboard, CPU and memory installed in the case, hook up the main power supply cable to the motherboard, plug the computer in, and short out the two pins which would normally get the "Power On" wires from the case connected to them. All that the main power button does is short out these two pins for a second, and that signals the motherboard to boot. Your motherboard manual will tell you where the two "power on" pins are located on the motherboard. They are located along with the other case wire connectors (e.g., speaker).

BIOS settings

BIOS settings are a critical aspect of getting your computer to work as fast as possible. They are also critical for maintaining stability. One incorrect setting in the BIOS can reduce a computer to an unworkable pile of metal and plastic. The motherboard manual is your first and the best source of information on how to set your BIOS settings correctly. The settings can be quite different on different motherboards, so check your motherboard manual for details.

Many motherboards come with excellent manuals that clearly describe most of the BIOS settings. Some manuals may not be as comprehensive, and in that case you may need to look to the Internet for information about the best BIOS settings. The options that you will get in your motherboard's BIOS menu will depend upon the chipset on the motherboard, and the type of BIOS chip (Award and AMI are common BIOS chips).

Chipsets: What is a motherboard chipset? It is usually made up of two integrated circuit chips (called the Northbridge and Southbridge) which link the various parts of the motherboard together. The Northbridge manages traffic between the processor, AGP socket and the memory chips. The Southbridge handles traffic between the processor and all the other slots on the motherboard, including PCI and ISA slots, and on-board IDE controllers. Some of the most popular motherboard chipsets now are the VIA KT266 chipset for Athlon and Duron processors, and the Intel i845E chipset for Pentium 4 processors.

It is becoming much more common for motherboard manufacturers to add overclocking features to the BIOS menu on their motherboards. For example, Abit motherboards have a feature called Softmenu, which permits the user to change the various speed settings for the processor. Other BIOS settings control the timing characteristics for retrieving information from memory, and still others control how the AGP and PCI slots on the motherboard function. You should only change BIOS settings whose function you understand. If you are not certain what a particular BIOS setting does, you should leave it alone

until you get more information.

To get to the BIOS menu for your motherboard, what the text that appears when you first turn on the computer. The first screen should list how to activate the BIOS menu near the bottom of the screen. Very often, for example with Abit and Asus motherboards, the "Del" (delete) key is the way into the BIOS menu. Hitting the Del key several times when the computer first starts will get you to the BIOS menu. Other motherboards can use different keys, such as the F1 key. If you are not sure how, your motherboard manual will have the information. Some motherboards boot very quickly, so you may need to start pressing the Del key right after pressing the power button.

There is more information about your computer's BIOS in the "Tweaking, Updating and Overclocking" section (Chapter 3).

BIOS Example: As an example of how to set the BIOS configuration for a very popular Athlon motherboard, I will detail the most important BIOS settings for the Abit KT7A-RAID motherboard.

Abit KT7A-RAID motherboard:

I have only listed the settings you really need to worry about. Use the PgUp and PgDn keys to make changes in the BIOS. Don't forget to save the changes by using the F10 key before exiting the BIOS.

Abit Softmenu III:

-CPU operating speed:	User define
-Multiplier factor:	variable (use to overclock)
-CPU FSB/PCI clock:	variable (use to overclock)
-CPU FSB Plus (MHz):	0
-Speed error hold:	Disabled
CPU power supply:	
-Core voltage:	user defined
	1.70v to 1.80v (use lowest voltage possible)
-I/O voltage:	3.4v

- Fast CPU command decode: Fast
- CPU drive strength: 2
- Enhance chip performance: enable
- Force 4-way interleave: enable
- Enable DRAM 4K page mode: enable
- DRAM clock: host clock

Standard CMOS settings: make sure that all required IDE channels are set to auto.

Advanced bios features setup menu: make sure the video bios shadow is disabled

Advanced chipset features setup menu:

- SDRAM cycle length: 3 for CAS3 SDRAM, or 2 for CAS2 memory
- AGP-4X Mode: Disabled (try enabled)
- Fast write supported: No support (you can try enabling this)
- K7 CLK_CTL Select: Optimal

NOTE: You can Enable all items below this listing in this menu

Integrated Peripherals menu:

Disable one or both Onboard Serial Ports if you are not using the rear COM ports

Power Management menu:

PM Controlled by APM: No

PNP/PCI Configurations menu:

PNP OS installed: No

Partitioning and formatting your hard drives

1) You will need your DOS floppy boot disk with CD ROM support for the next phase. See the introduction of this manual if you have not made a floppy boot disk yet.

2) Boot from the floppy disk by starting the computer with the floppy disk inserted in the floppy drive (Drive A:).

Notes: If the system does not boot from the floppy, it could be several things. A setting in the standard CMOS setup (BIOS setup) for your motherboard determines what drives the system will attempt to boot from, and in what order. You may need to enable a BIOS feature called "boot from floppy disk", or something similar.

Also, it is not uncommon for floppy disks to fail in certain floppy drives. If you just can't get a particular boot floppy to work, make a new one and give that a try (page 2).

3) At the A:\ prompt, type `fdisk` and hit enter.

4) At the first screen, it will ask about large hard drive support. You want to choose Yes (y), and hit enter.

5) If your hard drive is new and unformatted, you can select option 1 and hit enter (it is the default selection, so you can just hit enter). (Note: if it is formatted, you will need to undo the existing partition. Choose option 3 and hit enter. Delete the existing partition, which should be choice 1).

6) Select option 1 and hit enter (again, it is the default selection, so you can just hit enter)

7) Tell fdisk to use the entire drive for the primary partition. There is little reason to set up multiple partitions on large modern drives.

8) Also accept the choice to make the partition active. This will make the drive into the "boot drive" for the system.

9) When done, use Esc to exit fdisk, and reboot the system. You can reboot with the Ctrl-Alt-Del key combination, or with the reset button on the front of the computer case. Leave the floppy boot disk in drive A: during the reboot.

10) At the A: prompt type `format c:` and hit the enter key. Don't forget the colon after the letter c.

11) You will get a warning that all data on non-removable drive C: will be lost. Choose `y` for yes, to confirm that you want to proceed, and hit the enter key.

12) It will take some time to finish up the formatting. Wait until the process is done.

13) When done, you can type `sys c:` and hit the enter key. This will make your C: drive bootable by transferring the "system files" for DOS onto the hard drive.

The drive is now ready for either RAID setup, or installation of the operating system.

IDE RAID Setup:

Setting up a RAID array with a HighPoint or similar RAID controller is very easy. First, you physically set up the drives with 80 conductor IDE cables and power cords. Plug the computer back in, and start it up. When you see the HighPoint BIOS appear, you need to hit Ctrl-H to bring up the RAID setup menu. You use this menu to specify which disks are used for the RAID array, and what type of RAID array you will have. Don't bother doing any setup such as formatting with the hard drives that will be in the RAID array, since assigning drives to an array wipes out all the formatting and other information on them. So if your hard drive has anything on it, you need to back up the data before assigning that drive to a RAID array. Likewise, if you undo an existing RAID array, all data on the array will be lost.

The two main ways of setting up a RAID array are known as "striping" and "mirroring". If you set up drive striping (RAID level 0), then the two drives will appear as one larger, faster drive, even to FDISK. If you set up drive mirroring (RAID level 1), you'll need to proceed to the next menu where the disk duplication process is performed. Drive striping increases performance, but also increases the risk of data loss

due to a hard drive crash, since without any mirroring, the loss of either striped drive will result in the loss of all data on both drives. Drive mirroring allows you to set up "backup" disks, so that each time data is written to the primary hard drive, it is duplicated on the mirror drive. This greatly increases the security of your data by making an instantaneous backup on a spare hard drive.

Other drive array options include striping and mirroring together (4 drives required), which offers the best of both worlds. You get the increased performance and the increased data security. Another method of setting up an array is known as spanning. This makes 2 or more drives appear like one large drive, but without the performance increase of striping.

Once you have set up the array the way you want, you exit the RAID array setup menu. Next, you need to boot the system with a DOS floppy boot disk. Then, as you might expect, you need to run FDISK and select the new drives. Make sure you enable large drive support (Y at the opening FDISK message). Continue with the drive partitioning, and then exit FDISK. Reboot the system again with the DOS floppy boot disk. This time you'll need to run Format, in order to format the drives in the array. After this is done, you can reboot the system, and proceed with software installation.

Installing the Operating System

These instructions will work for Windows 98 second edition (Win98SE), Windows Millennium edition (Win Me), Windows 2000 or Windows XP. To install Windows 98SE for the first time, you can use a floppy boot disk that gives you access to your CD ROM drives (your "startup disk"). For Windows Me, Windows 2000 or Windows XP you should be able to boot your computer directly from the Windows CD. Try starting the computer with the Windows CD in the CD drive. If a menu comes up asking if you want to boot from the CD ROM, make that selection and press the enter key. (NOTE: This feature can be enabled as a setting in your BIOS. Make sure that the CD drive is one of the so-called 'boot devices' in the boot list, and move it to the top of the list if necessary). If the Windows CD boots automatically, you can skip steps

1-4 below, which should only be necessary for installing Windows 98SE.

For Win98SE:

1) You will need your DOS floppy boot disk with CD ROM support for the next phase. See the introduction of this manual if you have not made a floppy boot disk yet.

2) Boot the computer with the floppy disk, and make sure it loads with CD ROM support, or boot directly from the Windows CD.

3) Put your Windows CD into the CD drive. Check to see what drive letter is assigned to the CD drive. If you have 1 hard drive, the CD drive will probably be drive E: To check, type this at the DOS prompt:

e:

then hit the enter key. Then type:

dir

and hit the enter key. A list of file names should come up. If you see setup.exe in the list, then you have found the CD drive. If it gives an error message, then hit Esc and try again with other drive letters, like D: or F: (note: you need to use the colon sign : to designate a drive).

4) Type this at the DOS prompt (change the drive letter depending on where you find the CD drive):

cd\e: (or cd\d: or cd\f:)

and hit the enter key.

For All Versions of Windows:

5) Type:

setup

and hit the enter key. At this point a hard drive test will begin. When it is done, use the right arrow key to highlight "exit", and hit the enter key.

6) The installation program should begin. Follow the instructions to complete the installation. Use the default directory (C:\Windows) when prompted. At one point in the Windows 98SE and Me installation you will be given the options of what Windows components to install. Most folks can choose "typical" but many of you will want to select various parts to install. Use the detail button after highlighting a group of components, and you will get a checklist of all the sub-components in that group. When you have selected the components you want installed, continue with the installation. With Windows 2000 or XP, you will be given choices for what type of file system to use for the hard drive. The major choices are FAT32 (file allocation table, 32-bit) or NTFS, (new technology file system). FAT32 is best for home use, NTFS has more overhead, and more security, and is better for business LANs. With 2000 and XP you will also be required to enter names and passwords for "Administrator" access. Don't forget the password you enter!!

7) When Windows installation is nearly done, you will have to enter your Windows CD code, which should be with your Windows disk and paperwork. Enter the code exactly, or the installation will not proceed.

8) You will also need to choose things like your country, keyboard type (104 key) and time zone.

9) When the installation is finished, you will be using Windows standard VGA video driver. This driver will not let you run many Windows applications, so the first thing you should do is install the newest Windows video driver for your video card.

With Windows XP, you must finish the Windows Product Activation registration. You have a limited amount of time that you can use the system without registering. Registration can be done online in a fairly straightforward manner. Enter the hardware code that they system generates exactly when prompted to do so, and the activation process

will be complete. Windows XP Note: you do not need to sign up for the "Passport" service, and I recommend that you do not.

Installing the Drivers

What is a Driver? 'Driver' is computer jargon for the set of files that Windows needs in order to talk to various peripheral devices, like printers, video cards and modems. Without any driver file at all, Windows will not know how to use a peripheral such as a modem. Windows is a so-called "plug-and-play" operating system, meaning it recognizes and configures many types of peripheral hardware devices relatively automatically. But that capability is limited, so you will probably need to do a bit of work to get all of your devices working properly.

Proper functioning of your computer is very much controlled by the driver files you install for your various pieces of hardware. The wrong video driver can make your computer in-operable, while the correct driver files can optimize your video card's performance.

The first rule of drivers is to get the newest official version for your hardware. The easiest way to get the latest official drivers is to go to the Web sites for the manufacturers of each piece of hardware you have. So, for example, for Sound Blaster Live cards, go to www.SoundBlaster.com to download the newest drivers.

In many cases, especially in the case of video cards and sound cards, you will need to "un-install" the old driver first. This is a critical step in the process of updating a driver, so don't forget to check the "Add/Remove Programs" utility in the control panel, and see if there is a listing for your current video or sound card. The Sandblaster Live series of sound cards, for example, will have listings in Add/Remove Programs. Always un-install the old driver and any utilities before attempting to install new drivers.

Add New Hardware Wizard: There are several ways to install new driver files. You can do this manually from the device manager, or you can use the "Add New Hardware" wizard in the control panel. During a

first time installation of Windows, the "Add New Hardware" wizard will start automatically. At other times, to use the 'Add New Hardware' wizard, simply double-click on that icon in the control panel. Click on the next button two times to get to the list of plug and play devices that are not yet properly installed. Here you choose the device that you would like to install. If no devices are listed, then proceed with the automatic search option (Yes, recommended), and let Windows attempt to find your new hardware. If the wizard detects new hardware it will guide you through the driver installation process.

Automatic Hardware Search:

- 1) Click on the 'add new hardware' icon in control panel
- 2) click next (two times)
- 3) If there are listed devices on the next screen, Windows has already found hardware that needs drivers installed. Select a device from the list and click next. Otherwise you will get a choice of "yes" or "no" to do the automatic search. Choose yes and click on next.
- 4) click next again, and wait for windows to finish detecting your hardware.
- 5) When it is done you will see a Window that tells you if Windows found a new device or not. If it reports that it did not find any new hardware, then you can hit the cancel button to end the routine. If it did find new hardware, then you should continue with the automatic driver detection routine.

Video Drivers:

Different video cards require different video drivers. But unfortunately, the CD that comes with virtually all video cards will have a driver that is sadly out of date. That means you will almost certainly want to update your video card's driver. There are detailed instructions on installing NVidia's reference drivers in the Tweaking, Updating and Overclocking Section (Chapter 3).

General Video Driver Guide:

If you have not installed any video driver on your system, then you will be using Windows standard VGA driver. This will drastically limit the video options you have, and some programs will not work with this

generic VGA driver. To update your video card to it's correct driver, use the add new hardware wizard, or right-click on an empty part of the desktop in Windows, and choose "properties" (you can also double-click on the 'Display' icon in the Control Panel). Then select the "settings" tab. Click on the 'advanced' button and then the 'adapter' tab. Click on the 'change' button, and then click on the 'next' button. Choose the *"display a list of drivers in a specific location, so you can select the driver you want"* option. Click on the 'have disk' button, and use the browse button to navigate to the directory where you have the newer driver files located. Click on the 'OK' button to continue. Finish up the driver installation and the system will reboot.

Setting the video card to 'standard VGA' can be useful during troubleshooting and when changing drivers that don't have an uninstall feature.

If an uninstall routine is not available for your video card in Add/Remove Programs, change your video card to "standard VGA".

- Go to the display icon in Control Panel
- Select the 'Settings' tab
- Click on the 'Advanced Button'
- Select the 'Adapter' tab
- Click on the 'Change' button
- Click on the 'Next' Button
- Click on the 'Show all hardware' Radio Button
- Select 'Standard display types' at the top of the Manufacturers list
- Select 'Standard display adapter (AGP)' under the Models list
- Click on the 'Next' Button (if a warning appears that the driver is not written specifically for your hardware, select the 'Yes' button).
- Finish up the procedure

To set up your video card with the correct driver, you have two options. The first is to use the driver that comes with the video card. This is generally not a good idea because drivers which are bundled with video cards are often quite old, sometimes as much as six months out of date. These drivers will probably work, but certainly will not give you the best possible performance with your video card.

Therefore it's a very good idea to download the latest video driver for your video card from the manufacturer's web site.

Sometimes a so-called reference driver is available which some people find preferable to the manufacturer's version of the same driver. A reference driver is made by the manufacturer of the graphics chipset, with NVidia being a good example. NVidia makes GeForce2 and GeForce3 graphics chips, but does not manufacture any of the video cards that they are used in. So, for example, if you have an Asus GeForce3 card, the chip is made by NVidia, but the card is made by Asus. You have the option of using the driver provided by Asus on their website, or the latest reference driver from NVidia. Instructions on how to install NVidia reference drivers can be found on page 41.

Direct X: If you installed Windows 98SE, you will want to update your system to Direct X 8.1. Direct X includes 3D and audio additions to Windows that let you play games and use multimedia applications. This update can be downloaded from Microsoft's web site.

<http://www.microsoft.com/directx/default.asp>

Network Setup

Follow these general rules for setting up a home network between two or more computers. I recommend "Fast Ethernet" network cards and a good network "router", so that multiple computers on your home network can access the Internet through a single Internet connection.

- 1) Set up the two network cards in the two computers.
- 2) connect the computers with a "crossover" network cable, a network hub, router, or switch and CAT5 cables. (Crossover cables cross the input and output lines so you don't need a hub, switch or router).
- 3) Install the device drivers that come with the cards.

Now you need to set up the network protocols:

First, go to the device manager. It is found under the system icon in Control Panel. Check both computers to make sure that the network cards are properly installed. Under networks, you should see the network card listed, and there should not be a yellow exclamation mark next to it. If the cards are listed in both device manager's, and there are no yellow exclamation mark's, then you can proceed.

Next, go to the network icon under control panel. First, make sure that "client for Microsoft networks" is set as the "primary log on network". Then click on the "file and printer sharing" button. Check off both check boxes so that you can send and receive files over your network. Select OK.

Then check to see what adapters and protocols are listed for your network on both machines. It should read out a list of things like this:

Client for Microsoft networks
dial-up adapter
dial-up adapter #2 (VPN support)
"your network card" (Linksys, 3Com, Intel, Netgear etc)
Microsoft virtual private networking adapter
TCP/IP => network card (whatever it's name is)
TCP/IP => dial-up adapter
file and printer sharing for Microsoft networks

There may be differences between this and your exact read out, but these basic components should be there. If these basic components are listed, then you can proceed.

Find the listing in your network for TCP/IP support with your network cards. In the list above, it is this one:

TCP/IP => your network card

There should only be a single listing for the TCP/IP protocol to that network card. If there are multiple identical listings, that could be one of your problems. It's very common when you use older drivers on a

newer operating system to get that multiple listing problem.

If there are no multiple listings for the same exact protocol, then all we need to do is set up a so-called IP address. To do this, double-click on the TCP/IP => network card listing. A page for putting in an IP address should come up. Click on the radio button that says "specify an IP address". Then put in this exact address:

IP address: 192.168.0.1
subnet mask: 255.255.255.0

Select OK. The computer may ask you for the Windows 98SE/Me CD. It will also need to reboot.

Repeat this procedure for the other machine on the network, making a single change. Give the second computer a unique IP address in the same format. I suggest using this address:

IP address: 192.168.0.2
subnet mask: 255.255.255.0

Note: If the TCP/IP protocol is not present in your network configuration box, then you simply need to add it. This is done with the "add button" in the network configuration box. Select protocol (as opposed to adapter) and then choose Microsoft. At that point TCP/IP will be one of the protocols you can add. Add it, and finish up the procedure.

Chapter 2

UPGRADING YOUR RIG

Let's say you are at the point where upgrading the memory, CPU or video card just isn't going to make enough of a difference to be worth it. This usually happens when your motherboard has gotten too old to accept newer, faster processors. In that case, it's time to upgrade the motherboard in your system. Here are step-by-step instructions for upgrading the motherboard, CPU and memory on your system. If your case is old, that probably should be replaced as well. Indeed, you'll need an ATX 2.03 compatible power supply if you are getting a Pentium 4, because Pentium 4 motherboards need a secondary power connector only found on version 2.03 ATX power supplies.

Don't throw away or give away your old parts!! If you are planning on working on your own computer, you will need spare parts that you know to be good. It is a critical aspect of troubleshooting computer problems that you have access to key replacement parts. For example, if your system doesn't boot one day, and issues one long and three short beeps, that means your video card isn't working. It may just need to be pushed further into the AGP socket, or it may have died. Having an old TNT-2 video card lying around that works will let you test the system. So build up a supply of older, known-good parts (video card, hard drive, power supply, motherboard and CPU, etc) to make troubleshooting easier.

Step-by-Step Instructions:

1. **Unplug your computer!**
2. Open the case up.
3. Carefully check how things are set up, so you'll know how to take things apart, and get them back together.

4. Get the new motherboard manual out, and keep it handy for information you will need on connectors. There is plenty of good information in Abit, Asus and most other motherboard manuals, and they are often worth looking through quickly before starting.

5. Remove the data cables for your disk drives. Rocking them slightly as you pull may help dislodge the connectors, but don't put excessive strain on the cables when you pull.

6. Unplug the power cables to your drives (rocking may help).

7. Unscrew the bracket screws holding your video, sound and modem cards to the case.

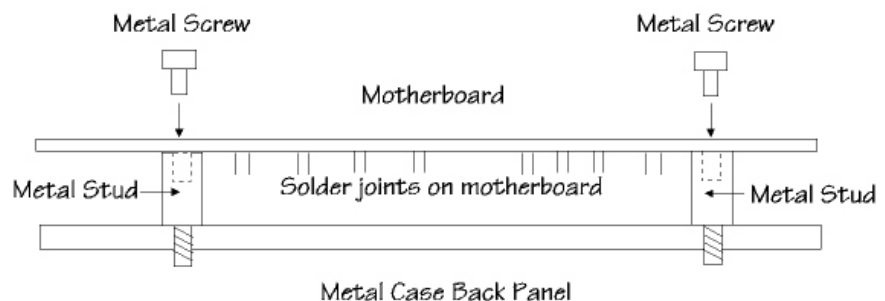
8. Carefully remove your cards, again rocking them in the slot as you pull up may help. Set the cards aside in a safe place.

9. **If you are keeping your current case, don't remove your disk drives, just go to the next step.** If you have a new computer case, remove your disk drives from your old case, and install them into the new case.

10. Disconnect the power cable going to the motherboard, and, if you have an ATX case which you are going to use, unscrew the screws holding the motherboard in the case. Remove the old motherboard.

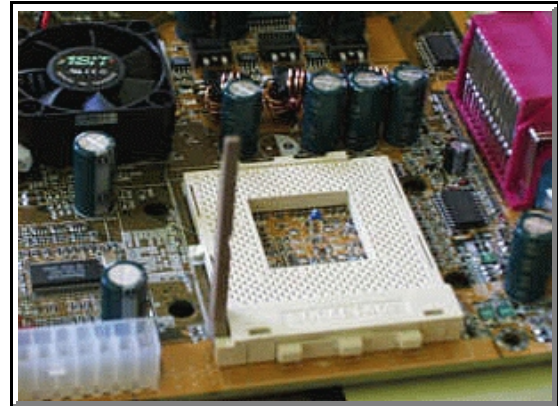
11. **IMPORTANT:** Make sure that the proper holes in the case have the metal

"stand-offs" screwed into them. To do this, carefully hold the motherboard by the edges (don't touch the solder joints if you can avoid it) and lay the motherboard into the case where it will sit when finished. You should see a threaded screw socket lined up with most (but probably not all) holes in the motherboard. The retaining screws and stand-offs (known as "studs") come with your case, not with the



motherboard. They should be metal, not plastic, otherwise your motherboard will not be grounded properly. Proper grounding is essential. BUT! ONLY install metal studs in holes in the case that line up with grounded holes (the ones with a metal ring around them) on the motherboard! If you put studs in the case where they do not line up with grounded holes on the motherboard, they may short out contacts on the bottom of the motherboard, in which case the system will not boot. Check the motherboard manual for more details, and see the picture above. If you are changing to a new motherboard, you must recheck the mounted studs and make sure they line up with holes in the motherboard precisely.

12. It is best to install the CPU, heat sink, fan and memory on the motherboard at this point before finally mounting the motherboard in the case. To install the CPU and heat sink, follow these instructions:

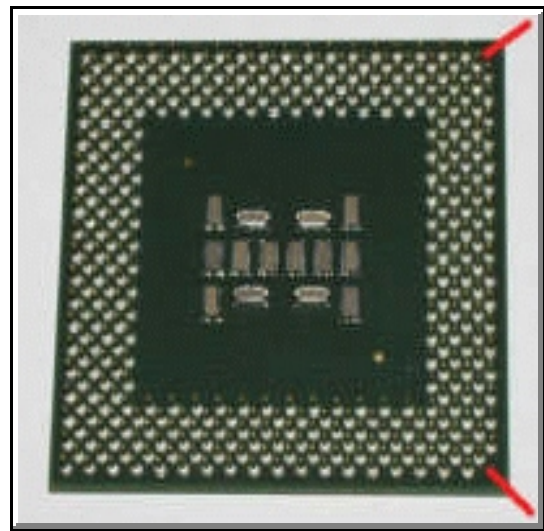


NOTE: if you are going to overclock an Athlon or Duron processor, you may need to make a small, simple modification to the chip before you install it on the motherboard. Go to the Athlon/Duron overclocking section below (Chapter 3) before proceeding. Read the section on “unlocking the CPU multiplier”.

- a. Lay the motherboard’s plastic wrapper onto a solid, flat table surface, and place the motherboard on it.
- b. Open up the small latch at the side of the CPU socket (swing it up 90 degrees). There is a clip holding it down, so pull the latch away from the socket slightly to undo the clip.
- c. Check the orientation of the pins on the bottom of your processor. There are pins missing in one or two corners, and these need to line up with the corners of the socket which are missing pin holes (pic below).

- d. Insert the CPU into the socket, and close the latch.
- e. Now it's time for the heat sink. Check the bottom of the heat sink. It has some thermal compound in a small rectangle. It is often covered by a plastic protective cover that needs to be removed. Then you need to make certain that the exposed thermal compound on the bottom of the heat sink lines up with the raised part of the CPU. The thermal compound is typically "off-center", so check which way the heat sink needs to be attached to get the thermal compound lined up with the raised rectangle in the middle of the CPU.

With some CPU and motherboard combinations attaching the heat sink can be difficult, and prone to accidents. The hard part is that you need to exert significant force on the metal clips that hold the heat sink tightly onto the CPU. Tools such as a screwdriver and/or needle nose pliers may be required. Make sure you are very careful not to crack the motherboard with excessive pressure, and that you don't slip with the screwdriver or pliers when connecting the clip, because you may gouge the motherboard's surface. Take your time when mounting the heat sink.



Pins missing at 2 corners

13. Screw the motherboard in place, making sure that the mouse, keyboard and USB ports on the motherboard are lined up with the correct holes in the back panel of the computer case. (Hint: don't screw any of the screws down tight until you have started threading all of them. Once you have started threading all of the screws, then you can tighten them the rest of the way up. Only tighten the screws enough to hold the motherboard. (Don't over tighten them! You can crack the board).

14. Make sure the CPU's fan power cable is plugged into the motherboard (it should be connected when you get it, but check to make sure).

15. Connect the power cable for the motherboard. Look for the clip on the side of the power connector, it shows you which way the plug goes. The motherboard manual shows where the power connector on the motherboard is located. If your case's power connector does not fit the motherboard's receptacle, then you do not have an ATX-compatible power supply. You need to get an ATX case with an ATX-type power supply.

16. Connect power cables to your disk drives.

17. Install your video, audio, and modem cards into the available AGP, PCI and ISA slots on the motherboard. (**Note:** in some situations, it is a good idea to install only your video card at first. It is easier to get the system up and running without the additional PCI cards installed at first boot-up. You can add the other cards in later, one at a time, and get the drivers for each of them loaded before proceeding to the next peripheral. This often will make the installation process go more smoothly).

18. Connect the data cables to your disk drives. The rule is that the red colored edge of the data cable points toward the power connector on the back of the disk drive. This is true of hard drives, CD or DVD drives, and most floppies. If you put the cable on so that it is pointed in the wrong direction, you will get a disk read failure. Don't worry, it won't hurt anything, it just won't work until you put the cable on correctly.

Floppy exception. Some floppy disk drives have the power connector on the opposite side of the data cable connector. If you have the data cable on backwards, you will be able to tell because the floppy disk drive light will stay on all the time. If you see that the floppy drive light remains on even when the drive is not in use, turn the computer off, and reverse the data cable. Note that if you had a floppy disk in the drive while the data cable was reversed, there is a chance the data on the floppy disk will be erased.

18. Connect the other end of the disk drive data cables to the motherboard connectors. Check the motherboard manual to make

sure you connect the hard drive to IDE channel 1, the CD cable to IDE channel 2, and the floppy drive to the floppy connector.

19. Carefully connect the ATX case wires to the motherboard as indicated in the motherboard manual. These are the pairs of white and colored wires built-in to the ATX case. There are at least five of them. 1) Power On, 2) Reset, 3) Hard drive LED, 4) Speaker and 5) Power LED. Check the motherboard manual to find out which pins each connector goes to on the motherboard. There is also very small writing next to each set of pins that you can use to help locate the correct ones. The rows of pins at the bottom right of the motherboard (as it sits in the upright case) are the pins that these case connectors plug into. The connectors for the LED's are polarized, which means if you put them on backwards, the Power and Hard Drive LED's won't light up. If these two lights don't work, just reverse the connector on the same pins to get the light to function. **YOU MUST ATTACH THE CASE POWER CONNECTOR TO THE CORRECT PINS ON THE MOTHERBOARD FOR THE POWER BUTTON TO FUNCTION.** Check the motherboard manual if you are not sure what to do.

20. Check all your connections and cables, and make sure everything inside the case looks proper. Each drive should have a power and data cable, the motherboard should have a power cable, and all the internal case wires for power, reset, HD light, etc should be properly connected to the motherboard.

21. Plug in your keyboard, mouse, sound and monitor cables.

22. Plug in the power cord.

23. Cross your fingers, and start the computer!

24. You should hear one single beep from your computer. It is normal for Windows to find new hardware when booting with the new motherboard. You may need your Windows CD. If you hear a series of beeps, or if nothing happens when you turn on the power, then unplug the computer and check all the connections. First, make sure the cables are pushed in all the way, and also make sure your cards are fully seated in the AGP, PCI and ISA slots on the motherboard.

Make sure the memory is properly installed in their sockets, it may help to remove, and replace them to make sure contact is good.

If your system booted properly, congratulations on a great job!

25. If your computer does not boot properly, make sure that the memory and all the cards are pushed fully down into their slots. Incorrectly seated memory sticks and peripheral cards are the most common reasons that a new system won't boot. Incorrect placement of metal studs in the wrong holes in the case can cause short circuits on the motherboard, and is another common source of problems. If you are still having trouble after checking all connections and the mounting of the motherboard, go to the troubleshooting section for more information.

26. Note: If you moved your old hard drive with Windows on it to your new upgraded system, and the new motherboard has a different chipset than your old motherboard, then I recommend running the "Add New Hardware" Wizard in the Control Panel. This is a precautionary step to help Windows recognize all the new hardware resources that come with the newer chipset on your motherboard. If your new motherboard does not have an Intel chipset, you should run the Add New Hardware Wizard after you install the latest motherboard/chipset drivers. Microsoft does not provide true support for VIA, ALi, SiS, or AMD chipsets, and therefore you need to download and install the appropriate drivers yourself. For VIA chipset motherboards go to www.via.com.tw, for SiS chipsets, go to www.sis.com.tw, for Ali chipset motherboards, go to www.ali.com.tw, and for AMD chipset motherboards go to www.amd.com. After installing the latest drivers for your motherboard, you should run the 'Add New Hardware Wizard' (Control Panel) to be sure that everything is properly recognized. There is more on this topic in the Troubleshooting section (Chapter 4). Intel chipset motherboards (including the i815, i820, i840, i845, and i850 chipsets) are fully supported by Microsoft operating systems, and don't need additional driver support. All other chipset motherboards need additional drivers to function correctly with Windows.

Initial Bootup Driver Tips:

- If your system originally had a motherboard with an Intel chipset before the upgrade, and you are changing to an AMD system with a third party chipset (for example, VIA), the system will detect many new resources on first boot up. This is normal, but it may lead to difficulties in getting new drivers installed. If the CPU to PCI bridge or IDE bus master drivers are not found automatically, it may be difficult to get access to your CD drive.

Therefore, when new resources are found, the first place to tell the system to look for the correct new drivers is in this directory:

`c:\windows\system`

Many basic system driver files are maintained in this directory, so always tell any stalled Windows driver installation applet to check there first. Hopefully, the critical files needed to access the CD drive will be found there. But, just because you got access to certain devices like the CD drive by this method does not mean you have the best driver installed. That's why installing the latest driver pack for your (VIA, AMD, Ali or SiS) motherboard's chipset is important.

The next place to look if the system does not find the correct driver files is on your Windows 98 or Windows Me CD. Windows 98 has a browse function that lets you navigate to the CD drive so the system can locate the driver files it needs there. Windows Millennium edition has an improved driver search function which will automatically look for new drivers in any location. If you have Windows Me, use that method, then select the best driver.

When you get the system up and running, you can follow the directions in Chapter One on setting BIOS settings and installing drivers. If you have trouble with specific hardware or drivers with the new motherboard and processor installed in your system, you can go to the troubleshooting section of this guide to try and resolve the problem. However, there are cases where no amount of fiddling with drivers, BIOS updates, moving PCI cards to different slots, or other tricks will get your original copy of Windows working properly with the

new hardware. Sometimes your Registry is just too messed up, and the best thing to do is reformat your hard drive and reinstall the operating system. Reinstalling Windows is discussed in detail in chapter 5.

General Upgrade Tips: When upgrading, especially with a new motherboard, Windows will need to re-install it's support for many system resources. This may cause temporary problems which need work-arounds. For example, if you are forced into Safe Mode, you will lose all USB support, so having an old PS/2 mouse and keyboard around can be quite handy. Also, if the PCI bridge is not found by Windows, you may lose access to your CD drive, making driver updating impossible until fixed. Always tell Windows to look in `c:\windows\system\` first, in the hopes that a workable driver will be located there. Often, after it looks as though your system is done finding all the new hardware on your new motherboard, it's a good idea to run the "add new hardware" wizard in the control panel one more time to be sure. Let it search automatically, and it may find something it had missed the first time around.

ACPI BIOS: One thing that has worked for me when all else fails to fix driver problems that occur after switching to a new motherboard with a new chipset is to "Nuke" all the system devices in device manager. To do this just remove the 'ACPI BIOS' listing from device manager. Your system won't like this one bit, but it should be able to reboot. After rebooting, it will say that your video card is not set up correctly. Continue with the update, and Windows will re-locate everything. This can take up to 20 minutes, and you'll need your Windows CD and driver disks handy! Don't do this unless all else has failed to get the proper drivers installed after an upgrade. As mentioned above, if reinstalling all the devices does not fix your driver problem, then it's probably time to back up your data, and reinstall Windows from scratch.

Chapter 3

TWEAKING, UPDATING AND OVERCLOCKING

Keeping your computer up-to-date is very important. The way to do that is to periodically check for newer video card, sound card, motherboard chipset, and other drivers for your various peripherals.

Typically, you need to get newer driver files from the peripheral manufacturer's web sites. So for Sound Blaster cards, for example, you need to go to <http://www.soundblaster.com>.

Each web site is organized differently, but try the "support", or "driver", or "download" section at each manufacturer's web site, and check for newer drivers for your video cards, sound cards, modems, controller cards, etc. If newer drivers are available, download them and install them, following the manufacturers instructions. Make sure to get the correct driver for the operating system you are using. There are different drivers for Windows 98/Me, Windows 2000, and Windows XP. In some cases (for example, SB Liveware drivers) there are distinct drivers for Windows 98 and Windows Me. It is critical to get the correct driver files for both your particular hardware, AND your operating system.

There are other types of drivers too, for example drivers for VIA-chipset motherboards which support Athlon, Duron and Pentium III processors. They are called "VIA 4-in-1" drivers. Microsoft Windows only provides full support for Intel chipsets, so if you have a motherboard with a VIA, AMD, SiS or ALI chipset, you will need to get the latest driver for your motherboard from the manufacturer's web site.

Note that you need to get the correct driver version for the chipset on your motherboard. Intel chipset motherboards do not require the VIA driver, but all motherboards with chipsets made by VIA must have the VIA 4 in 1 driver installed for Windows to function properly. Some

Athlon motherboards, especially Double Data Rate DRAM motherboards, have a chipset made by AMD. If you have an AMD-chipset motherboard, you need to install the newest AMD chipset driver, which can be downloaded from AMD's web site.

AMD chipset drivers: <http://www.amd.com/products/cpg/bin/>

VIA chipset drivers: www.via.com.tw

SiS (Silicon Integrated Systems) chipsets drivers: www.sis.com.tw

ALi (Acer Labs) chipset drivers: www.ali.com.tw

Follow the instructions that come with these chipset drivers to install them in Windows.

3A: Basic Tweaking

Setting up a Static Swap File for Windows:

The Windows swap file is an area of your hard disk that Windows sets aside for its exclusive use. It makes a file on your hard drive's root directory (C:\) called Win386.swp. By default, Windows dynamically adjusts the size of the swap file based on need, so if more hard drive space is needed to load more programs, Windows increases the size of Win386.swp on the fly. This process takes up processor time, so making a static swap file that does not get resized will keep your CPU free to do other things.

To set up a static swap file in Windows, just go to the system icon in the Control Panel. Click on the "Performance" tab, and then click on the "Virtual Memory" button. In the next box, click on the "Let me specify my own virtual memory settings" selection. Set both the minimum and maximum settings to 400 (this is my choice for the size of the swap file. If you feel you need more than 400MB of swap file space, simply set the min and max to 500MB, or whatever you feel you need). Click on the OK button. While your at it, click on the "File System" button (to the left of the Virtual Memory button). Under "Typical role of this computer", select "Network server", and click on OK. Now click on OK in the System Properties applet, and you are done. The system will ask if you want to restart, select yes.

Flashing your motherboard's BIOS to the newest version

The BIOS on most motherboards can be updated. Check your motherboard maker's web site for more recent BIOS updates. If your computer is working well, you may want to leave well enough alone. But if you know that your BIOS is out of date, and you want to get the newer features offered by a new BIOS revision, then "flashing" the BIOS is usually an easy procedure.

What is the BIOS? The BIOS (basic input/output system) is a set of basic instructions for running your computer. The BIOS loads before anything, giving the system basic instructions so that the computer can continue to load the operating system. The first part of the bootup process is known as the "POST" (power-on self test). This includes setting the CPU speed and testing the memory, among other things. Then the BIOS code for communicating with disk drives and other peripherals is loaded.

The chip on your motherboard that stores BIOS information is called the CMOS chip. It is connected to the small, round battery on your motherboard so that the CMOS chip can retain your settings even when the computer is turned off and unplugged. If your computer begins losing time, and the motherboard is getting old, it may be that your battery is low, and therefore the built-in clock runs slow. If this happens, simply take the old battery to a local electronics store and get a replacement.

Why should you consider flashing your motherboard's BIOS? Most people are forced to update their BIOS when they try to upgrade to a newer CPU that is not recognized by the older BIOS version. If the CPU operating frequency, core voltage, or multiplier factor are out of the range that the BIOS can recognize, the system may not boot at all. The other reason to update is to add new BIOS features. Some motherboard makers add new features to the BIOS to control various CPU and chipset features.

Flashing the BIOS will require different procedures for different types of motherboards. Check your motherboard's manual or the

manufacturer's web site for specific information on how to update your motherboard's BIOS. The basic idea is to download the latest version of the BIOS for your specific model motherboard, along with a small executable program that performs the flash update.

It is a great idea to have your system on an "un-interruptible power supply" or UPS. This is a battery system that keeps your computer running for awhile even if the power goes out. Flashing the BIOS is a particular time where you really, really don't want the power to go out. That's why a UPS is a great idea in general, and an imperative during a flash update. Never stop the flash program while it is in progress, or you may never get the motherboard to boot again!

Important NOTE: It is absolutely imperative that you check what model and make a motherboard you have before attempting to flash update the BIOS. If you accidentally use the wrong BIOS update file, you will probably render the motherboard useless. So make absolutely certain that you find out what company made your motherboard. For example Asus, Abit, AOpen, Gigabyte and MSI all make good quality motherboards. Then you must find out exactly what model motherboard you have. Finally, be sure to get the correct BIOS update file for that make and model motherboard before proceeding.

BIOS Flash Procedure:

The basic idea behind flash updating your motherboard's BIOS is that you need two files which are downloaded from the motherboard maker's web site on the Internet. One file is a utility, typically called a flash utility program, which lets you update the BIOS, and the other file is the new data that the utility will program into the BIOS chip. The data file is in binary format, and ends with the file suffix .bin.

So typically, you will download a ZIP file from the motherboard manufacturer's web site. When you un-ZIP that file you will often get three or more additional files. One will have a name such as award.exe, awflash.exe or something like that. It should be the only executable file, so you will know which one it is by the .EXE file suffix. This is the flash update utility program. One other file ends with .BIN as the file suffix, and that will be the data file that is used to program

the new BIOS. You may get other files as well including a read me text, and sometimes a batch file which can be used to automate the update process. Read the read me text that comes with your BIOS update file, and make sure you follow the directions exactly. If you make a mistake, it may be impossible to correct it later. So follow the directions carefully.

Note: If the power goes out in your house for even a second during the BIOS update process, the update will fail and you will probably not be able to boot your motherboard. It will probably also be difficult or impossible to fix the problem short of replacing the BIOS chip. Therefore I highly recommend that you have the system plugged into an uninterruptible power supply, or UPS, which will give you several minutes of battery backup time if the power goes out. I can't stress enough how important having a computer on a UPS is. It can really save your bacon during blackouts, brownouts, and short duration power interruptions.

Example: As an example of how to flash a BIOS chip, I will discuss how to update the BIOS on the Abit KT7A-RAID motherboard. First, go to aid Abit's Web site and download the latest version of the BIOS for the KT7A. This will give you an idea of how to flash other motherboard's BIOS chips, but remember to read the instructions that come with updated BIOS files, and follow the directions exactly.

For Abit motherboards, go here for updates (in the download section).

<http://www.abit.com.tw>

There is a list of common motherboard BIOS update web sites at the end of this manual.

Note: Sometimes there are two versions of a motherboard (such as revision 1.0 and revision 1.1). Make sure you get the correct BIOS update if different BIOS updates are required for the different revision motherboards. For revision 1.0 of the KT7A, the current BIOS update is 4A. After you download the latest BIOS update, you need to download the latest Award flash program. The file is named 'awdf.flash.exe'.

Flashing the Abit KT7A (and KT7A-RAID) motherboard's BIOS:

- 1) Once you have the two files downloaded, unzip the BIOS update to a new directory (for example, C:\AbitKT7A).
- 2) Now make a simple bootable floppy without any autoexec.bat or config.sys files. This bootable floppy must not load any software or drivers other than DOS itself. You don't want any drivers, memory managers or other things getting in the way of flashing the BIOS. So don't use the Windows "create Windows Boot disk" option. Just use the Windows "format" and "copy system files" options in the floppy disk format utility. To do this, open the My Computer icon on the desktop. Right click on the floppy disk icon (with a blank disk inserted in the floppy drive). Choose 'format' and then choose "copy system files only" and hit the start button.
- 3) Now copy the BIOS update files you unzipped to the new bootable floppy disk you just made.
- 4) Boot the computer from the new floppy disk.
- 5) (NOTE: this is for the Abit KT7A motherboard ONLY. Abit supplies a batch file called Abitfae.bat. It can be run from the DOS prompt, and automates the update process). At the A:\ prompt, type:

abitfae kt7_3r.bin (this runs the batch file, and tells it to use the kt7_3r.bin binary data file).

Now hit the enter key. You'll have to hit the enter key twice again to proceed.
- 6) The flash update should proceed normally. When you are sure it's done, you can reboot the computer.
- 7) Your system will give a CMOS checksum error message. This is normal. Just reset the BIOS settings the way you had them before, and you should be fine.

Selective Startup

Automatically loading too many programs and utilities at Windows Startup can seriously affect the overall performance and stability of your computer. Every program running in the background takes up valuable resources, including CPU time. Also, the more programs and utilities running at once, the greater the risk that one of them will interfere with another, causing a system crash. If you want your computer to run as smoothly as possible, you should have virtually no programs or utilities (other than those needed by Windows to function) running in the background.

- 1) Open the "System Information" utility (start > programs > accessories > system tools > system information).
- 2) Click on the "Tools" menu and select the 'system configuration utility'.
- 3) Click on the 'Startup' tab
- 4) Every program or utility that starts automatically when Windows starts is listed here. The items that have a check mark next to them will be loaded at startup. The items you uncheck will not be loaded (you can always re-enable them later by checking the box again).
- 5) Uncheck items you recognize that you don't want loaded. Things to leave alone include: ScanRegistry, LoadPowerProfile, HIDserv (USB server), and anything that you are not sure what it does. Other things, like MS Office, or HP printer utilities can all be disabled to save system resources.

Memory Resources: Windows applications and games often do not "release" all the memory they were using when they quit. Over time, your Windows resources will decline, slowing things down, and this continues until you reboot your computer. Utilities are available which will manage your Windows memory, and give you full control over how it is recovered after applications close. One is called MemoryBoost Pro, and I highly recommend it. <http://rosecitysoftware.com/MemBoost/>

Installing NVidia Reference video drivers:

1) Download the newest NVidia reference driver (currently Detonator-3 version 12.41) (Note: get the right ones for your operating system!)

[NVidia](#)

[Leaked Files](#)

2) Unzip the downloaded drivers to a separate directory (I recommend naming the directory c:\Detonator12.41).

3) Uninstall your old NVidia drivers using "add/remove programs" in the control panel.

3a) If the uninstall is not available, change your video card to "standard VGA". (If the uninstall works, you can skip these change-to-VGA steps)

-Go to the display icon in Control Panel

-Select the 'Settings' tab

-Click on the 'Advanced Button'

-Select the 'Adapter' tab

-Click on the 'Change' button

-Click on the 'Next' Button

-Click on the 'Show all hardware' Radio Button

-Select 'Standard display types' at the top of the Manufacturers list

-Select 'Standard display adapter' under the Models list

-Click on the 'Next' Button (if a warning appears that the driver is not written specifically for your hardware, select the 'Yes' button).

-Finish up the procedure.

4) After the system reboots, direct the Install New Hardware Wizard to the directory containing the unzipped 12.41 files.

-Click on the 'Next' Button

-Choose 'Display a list of all the drivers in a specific location...'

-Click on the 'Next' Button

-Click on the 'Have Disk' Button

-Click on the 'Browse' Button

-Click on the 'Drives' drop-down menu

- Pick the drive where you put the NVidia files you downloaded and unzipped
- Navigate to the correct directory (c:\detonator12.41 in the above example)
- Select OK and click on 'Next' to continue. Finish up and you're done.

Note: If the Install New Hardware program does not start automatically, when you reboot (this will happen if you set the video card to "standard VGA") you can launch it from the Control Panel. The procedure is a little different though.

- Click on the 'Next' Button
- Click on the 'Next' Button
- Click on "No, the device is not in the list"
- Click on "No, I want to select the hardware from a list"
- Click on 'display adapters'
- Click on the 'Next' Button
- Click on the 'Have Disk' Button
- Click on the 'Browse' Button
- Click on the 'Drives' drop-down menu
- Pick the drive where you put the NVidia files you downloaded and unzipped
- Navigate to the correct directory (c:\detonator12.41 in the above example)
- Select OK and click on 'Next' to continue. Finish up and you're done.

3B: Overclocking Your System

Overclocking theory: For those of you who are new to overclocking, I will go over some of the basic concepts. The speed rating for any computer is determined by two factors. The first factor is called the multiplier. The multiplier determines how many CPU cycles can occur during a single clock cycle. Therefore, a CPU with a 10 X multiplier can run 10 operations in a single clock cycle.

The second factor that affects the speed rating of your computer is called the 'front side bus frequency', or more simply the bus

frequency. This refers to the MHz rating for the interactions between the CPU, Northbridge chip, and memory. Most Athlon processors run on a 133MHz front side bus. But the bus on Athlon motherboards is "double pumped", meaning that two operations can occur during each current pulse. So the effective front side bus frequency on Athlon systems is said to be $133\text{MHz} \times 2 = 266\text{MHz}$. Duron and Celeron processors typically run on a 100MHz bus. Pentium 4 processors run on a quad pumped 100MHz bus, which equals an effective speed of 400MHz. Pentium III processors, which are in the process of being phased out, run on a 133MHz front side bus.

The biggest difference between overclocking Intel and AMD processors is that Intel locks the multipliers on their processors at the factory in such a way they cannot be changed. On the other hand, AMD locks their processor's multiplier settings in such a way that the end-user can modify the processor, and change the multiplier. Therefore, Intel processors can only be overclocked by increasing the front side bus frequency. AMD processors can be overclocked by changing both the multiplier factor and the front side bus frequency. This gives you far more control over the overclocking process with AMD processors. Nonetheless, some Intel processors overclock quite well on the front side bus.

Your best friend while overclocking your processor is the ability to change the core voltage going to the processor itself. This can often be done in the BIOS along with the settings for the multiplier and the front side bus frequency. Increasing the core voltage from its default value by 0.1 V will often make the difference. On newer motherboards like the Abit KG7 motherboard, you can even increase the voltage to the DDR DRAM in order to help with stability at higher memory bus speeds (like 140MHz or more).

Often, the key to successful overclocking is balancing increased processor core voltages against increased heat production. That means that as you increase the bus frequency, and the core voltage setting, you should check the processor's operating temperature. Most motherboards allow you to do this in the BIOS, under this section called "hardware monitor" or "PC health" or similar such names. You want to make sure that you're processor runs at the lowest possible

temperature. When overclocking, your processor is going to run at a higher temperature. This is okay, but you want to check on the temperature occasionally to make sure it's not getting too hot. In general, most processors can run very well between 40 degrees Centigrade and 50 degrees Centigrade (120 Fahrenheit). Some chips will even operate acceptably at 55 degrees Centigrade (130 Fahrenheit) or more. Keeping the temperature down will prolong life of your chip and make it's operation more stable, but 110 to 120 Fahrenheit is not too hot. At 130 Fahrenheit, you are getting nearer to acceptable limits.

The other things you can do to try to stabilize your system at higher overclocked speeds is to add a larger heat sink and fan to the processor, or add more fans to your computer case to increase the airflow. For true enthusiasts, you might consider getting an active cooling system such as a Peltier cooler, or a water cooling system. Water cooling systems have become much more reliable, and much less prone to leaking water all over your motherboard while running. Within a year or two I expect that most very high speed computers will incorporate some type of active cooling system.

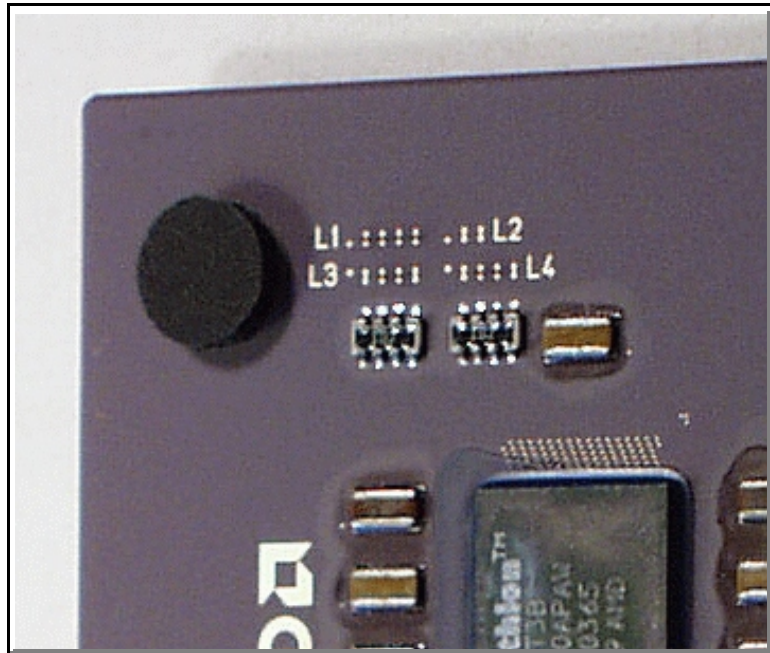
Athlon and Duron overclocking

Reconnecting the L-1 lines (not available on XP processors).

This section only pertains to the Thunderbird version of the Athlon. Owners of the newer Athlon XP will find that the L1 lines have been made much harder to work on. It is still possible, but it involves much more work and risk. Use bus frequency overclocking on XP CPUs.

If you look at the top of your Athlon or Duron processor you'll see several rows of small gold-colored lines. These surface contacts control the multiplier and other parameters of your processor. One row is labeled L-1.

This is the row that controls the multiplier lock on the processor. You may need a magnifying glass to see the L-1 lines clearly. Check to see if they are intact or if they have a notch cut through each one. If there is a notch cut through each one, you'll have to reconnect them in order to be able to change the multiplier setting on the processor. To do this all you need is a sharp No. 2 pencil.



Using the magnifying glass, carefully draw a pencil line along each of the L-1 lines. Be careful not to cross-connect the four lines with any of the graphite from the pencil. But you will need to draw the pencil back and forth along each L-1 line in order to be certain that you get enough graphite into the cut in each line.

If you do not get enough graphite into the cut lines, you will not be able to overclock the multiplier. If some of the multiplier settings work, but others do not, you will need to reapply graphite to the L-1 lines again. So in order to avoid having to remove the heat sink and apply more graphite, be sure the first time that you rub the pencil back and forth at least six or seven times over each line. Then gently blow the excess graphite dust off of the surface of the processor. **Note:** Some of the new 1.2 through 1.4GHz Athlons have been coming out with their L1 lines intact, so no re-connecting is required.

Installing the heat sink.

You must be very careful when installing the heat sink clamp on your new processor. You may need to use either a screwdriver, pliers, or some other tool to help you secure the clamp, but be very careful not

to slip and gouge the motherboard. It's worth taking the time to be careful at this step. The AMD heat sink has thermal compound on it, but you will need to remove the piece of plastic covering the thermal compound before you clamp the heat sink on the processor. Check the orientation of the heat sink before clamping it in place. The thermal compound is often "off-center", so that it can only go on one way and have proper contact between the thermal compound and the raised center of the Athlon or Duron processor. After attaching the heat sink clamp, don't forget to plug-in the power cord for the fan. It attaches to a fan power plug near the processor socket on the motherboard.

When the system boots, and you go into the BIOS menu, you should be able change the multiplier setting for your processor. Keep in mind when shopping for your motherboard to get one that permits multiplier overclocking in the BIOS menu. Abit and Asus are examples of companies that make excellent overclockable motherboards for AMD Athlon and Duron processors. Also it is critical that the motherboard allow changing the core voltage to the CPU

Intel Pentium III and Pentium 4 overclocking

Intel processors are multiplier locked, and can only be overclocked by increasing the "bus frequency". AMD was nice enough to go out of their way and put the multiplier circuitry on the surface of the chip where we overclockers can get to it. Intel, on the other hand, buried the multiplier circuitry inside the chip, where we can not venture.

So first, if you want to overclock a Pentium III or 4 chip, make sure you get a motherboard that will let you adjust the "front side bus frequency" from the BIOS menu. Abit and Asus make good Pentium type motherboards with built-in overclocking features. These are jumperless motherboards, which means the CPU settings can be changed in BIOS setup menu. Abit's BIOS setup menu is called Softmenu III. Other motherboard brands may require that you set dip switches or jumpers on the motherboard. Check your motherboard manual for details on changing the CPU frequency (also known as the Front Side Bus).

All you need to do is try higher CPU frequency settings. The settings sometimes go in 1MHz increments, sometimes in jumps of 5 or 10MHz. Go one step at a time, and test to see if the system is stable. If the system does not act strangely, continue to increase the front side bus frequency until you encounter problems. At that point, back the system off by one or two steps.

Video card overclocking in general:

If you want to overclock your video card, but don't want to mess around with the Registry or such things, you can download a utility that will overclock almost any video card. It's called PowerStrip by Entech. You can get it here:

<http://www.entechtaiwan.com/ps.htm>

PowerStrip gives you unprecedented control over your video card and monitor settings. The freeware version can be downloaded and used without time limits. You will need to pay \$30 for the utility if you want to avoid a 5 second delay at bootup. But offering this utility for free is an incredible deal. PowerStrip is probably the best way to overclock your video card. It gives GeForce owners separate control over the graphics core and memory speeds. It also contains other very nice utilities, including the ability to save you icon placement, so you can easily restore your icons after a video card change.

If you'd rather go the way of the Maverick, and overclock your video card manually, then check out the various options listed below.

Overclocking NVidia cards with Coolbits (only works on older NVidia reference drivers)

To overclock your NVidia card with the Coolbits utility, you will need to do some basic Registry editing. If you are not comfortable with this

procedure, don't do it. But if you are careful, there shouldn't be any problem.

-Go to the start menu and select 'run'

-a box will appear. Type in the following word and hit the OK button
regedit

You are now in the Windows Registry editing tool.

Next you need to find this key value by navigating the Registry.

HKEY_LOCAL_MACHINE\Software\NVIDIA Corporation\Global

To navigate the registry, you click on the + next to the key that you want to expand. So to get to the correct area of the Registry, do this:

-Click on the plus sign next to HKEY_LOCAL_MACHINE

-Click on the + next to software

-Click on the + next to NVIDIA Corporation

Now you need to make a new key under the global key and you need to name it NVTweak. To do this, simply right-click on the global key (keys look like folders) and a menu will appear. Select 'New' from the menu, and then select "key".

A new key (folder) will appear under the global folder. Name this new key

NVTweak

Now you'll have this new listing in the Registry.

HKEY_LOCAL_MACHINE\Software\NVIDIA Corporation\Global\NVTweak

-Now right click on the new NVTweak key and select 'new' from the menu again.

-Now make a DWORD value in the NVTweak key and name it 'Coolbits' (no quote marks)

-Next you need to set the value to 3. To do this, right click on the new Coolbits DWORD that you just made, and click on 'modify' in the menu.

-a box will come up with a value that is set at zero as the default. Change the zero to a three and click OK.

When you reboot, a new hardware options tab will appear in the GeForce advanced menu. To find the new option in nVidia's driver applet go here:

Control panel > display > settings tab > advanced button > GeForce tab > additional properties button > hardware options tab.

Move the memory slider to the right. Go in 10 MHz increments and then test the system to see if you've gone too far. Remember, you need to test the settings with the test button before you can apply them. You can also try boosting the core clock speed, but it will have only a very small effect on performance. You'll get much more of a performance boost by increasing the memory speed.

Note: Some NVidia reference driver versions do not allow the Coolbits utility to be enabled. Follow the instructions below to enable them.

Enabling Coolbits with the new 12.41 whql drivers:

The newest NVidia whql (Microsoft certified) drivers for GeForce cards are designated Detonator-3 12.41. They are very stable, support GeForce3 cards, and have full DirectX 8 support. But! The Coolbits overclocking utility has been disabled again (they do it periodically, only to resurrect it later).

How do you re-enable it? Follow these instructions:

1) Download both the 12.41 and 12.10 versions of the NVidia reference drivers here (get the right ones for your operating system!):

[NVidia](#)

[Leaked Files](#)

2) Unzip the downloaded drivers to separate directories (I recommend naming the directories 12.41 and 12.40).

3) Uninstall your old NVidia drivers using "add/remove programs" in the control panel.

4) When the system reboots, direct the install new hardware wizard to the directory containing the unzipped 12.41 files. (Use the "display a list of drivers in a specific location" option, and then use the "have disk" button. Navigate to the correct directory using browse, and then hit the OK button. Finish up and reboot).

4) Now you need to replace two files in the c:\windows\system subdirectory.

5) Locate and rename these two files:

nvqtwk.dll and nvcpl.dll

(quick tweak and control panel). I suggest renaming them to nvcpl.new and nvqtwk.new since they are the newer versions that don't have coolbits support.

6) Now copy the older versions of these two files from Detonator-3 12.40 to the c:\windows\system subdirectory.

That should do it. Now you will be able to get coolbits running by using the instructions above.

Overclocking Voodoo5 cards

OK, so 3Dfx went out of business, but you still have a Voodoo 5 card lying around that you want to use. Chances are you'll probably want to try overclocking that Voodoo 5 card, so here's how to do it in Windows 98/Me:

Go to the start menu and select the run command

Type in `regedit` and click on the OK button

(The key you are looking for is this:
HKEY_LOCAL_MACHINE\Software\3dfx Interactive\3dfx
Tools\Installed\Tools\). To get there do this:

Click on the plus sign next to HKEY_LOCAL_MACHINE

Click on the + next to software
Click on the + next to 3dfx Interactive

Click on the + next to 3dfx tools

Click on the + next to installed

Click on the + next tools

Now find this exact key:

{AB040305-8AA1-11D2-8DD1-00104BB5EAD6}

When you click on it you'll see the word CompleteRegistration in the
right window of regedit

Use the Right mouse button to click on CompleteRegistration

Choose "modify" from the menu

Type in the No. 1 (just 1, and nothing else)

Click on the OK button

Exit regedit, and reboot your computer normally.

Now when you go into the display properties advanced settings menu
you will see a 3dfx overclock tab. Go in there and increase the speed
to 180 MHz. Make sure that you click on the 'Apply' button before
exiting the overclock utility.

Other tweaks

If you are still using Windows98SE, and want to speed up a gaming computer that does not need to connect to the internet, or you'd rather use Netscape Navigator, Windows Lite might be right for you. It lets you strip out things like Internet Explorer, which will speed the system up, and make it more stable. You can get Windows98 Lite here:

<http://www.98lite.net/products.html>

Memory Management

Windows does not always handle memory in the most efficient way, and many Windows games and applications do not free the memory they were using when they quit. So having some type of memory manager on your system can reduce the number of times you have to reboot due to low memory and resources.

Powerstrip by Entech (mentioned in the video overclocking section) has other nice features built in, including a memory recovery feature. It is under the resource manager menu (options > resource manager > recover memory now). You can also assign hot key combinations to recover memory (options > hot key manager). Select "recover memory now" from the list on the right, then select whether you will use Ctrl/Alt or Ctrl/Shift or Ctrl/Win as the prefix, and simply type the key you want to use as the suffix (I use R for recover). So in my case, Ctrl/Alt/R immediately invokes the memory recovery feature.

Other programs like MemoryBoost Pro can automatically clean up after programs that don't surrender memory properly when they quit.

<http://www.rosecitysoftware.com/MemBoost/>

The problem is, programs like Memory Boost Pro can seriously degrade 3D game performance, so I don't recommend background memory managers for gaming.

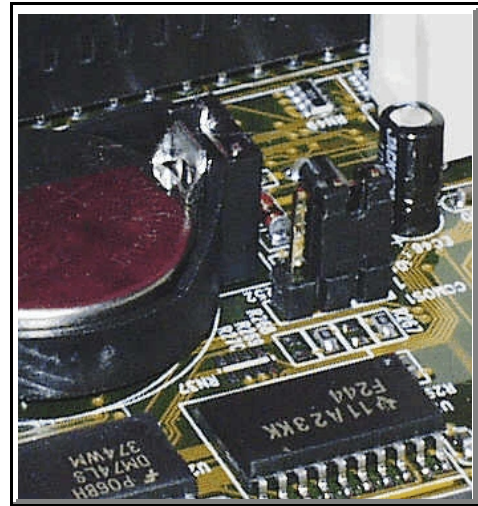
Chapter 4

TROUBLESHOOTING

Basic Troubleshooting techniques:

If you have just put your computer together and it does not boot, you first need to check all cable connections (power to motherboard, power to drives, data cables to hard drives, CD-type drives, and floppy, and the case wiring to the motherboard). If those are correct, you need to make sure that all the cards, and memory sticks are inserted properly. Also check the motherboard manual to make sure you have put your memory stick in the first memory socket. The memory banks are numbered 0 through either 2 or 3. Place the first memory stick in bank 0, the second in bank 1, etc. If none of these suggestions help, then it is time for some troubleshooting.

Resetting the CMOS data: If you played around with the computer's BIOS settings, and a problem occurred, it might be a good idea to reset the CMOS data. One incorrect setting in the BIOS can be enough to bring your computer to a halt. CMOS chips store important information about your computer's configuration, as well as other data including the time and date. The CMOS values can be changed in the BIOS setup menu for your motherboard. A battery located on the motherboard keeps the information in the CMOS intact even when the power to your computer is turned off.



Clear CMOS jumper

Resetting the CMOS data on most computers is very simple. Check your motherboard manual for the location of the CMOS clear jumper. Typically the CMOS clear jumper is located near the battery on the motherboard. It often consists of three pins, two of which are

connected by a jumper. The jumper is located at the "operate" position during computer use (usually pins 1 and 2). When you want to clear the CMOS, you need to turn off the computer, and move the jumper from pins 1 and 2 to pins 2 and 3 for just a second. Then move it back to its original location. That's it! You have just shorted-out that battery, which clears the CMOS data (just as if you had removed and replaced the battery). Now start the computer and see if it boots. If so, then your problem was an incorrect setting in the BIOS. Read the motherboard manual on how to set the BIOS settings for your motherboard and configuration. Change only one or a few settings at a time and reboot. Keep track of which settings you just changed in case the boot problem resurfaces after a BIOS setting change.

Some motherboards, for example those from Asus, don't always have a 'clear CMOS' jumper. They may just have two solder joints on the board near the battery. Check your motherboard's manual. If your board has one of these CMOS clear contacts, you will need to short them out with a piece of metal that will cross-connect the two solder joints. I use a tweezer to do this, but any piece of conducting material that will cross the two contacts will do the job. Just connect them (while the power cord is unplugged) for about a second, and that's it. You will have to reset the correct BIOS settings, including time, date, and motherboard settings. You can also remove the battery and then replace it 30 seconds later to clear the CMOS.

First Rule of Troubleshooting: The first rule of troubleshooting a computer is to limit the amount of hardware in the system to the bare minimum. The purpose of this is to eliminate the possibility of hardware conflicts, or bad Windows device drivers. This means removing soundcards, network cards, DVD encoder cards, and all other PCI or ISA cards from the system. Leave only your AGP video card (or PCI video card if that's what you have). If you have older IDE devices like ZIP drives in your system, it is a very good idea to disconnect those too, as they can lead to boot problems. CD drives and hard drives can be left connected.

Device Manager: Your best friend while troubleshooting in Windows is the device manager. In Windows 98SE, the device manager is available through Control Panel, by clicking on the system icon. Choose

the 'device manager' from here. In Windows 2000 and XP, you first need to select the "hardware" tab, and then choose the device manager. The device manager gives you access to information on all of the hardware in your computer. When everything is set up correctly there will *not* be any 'red Xs' or 'yellow exclamation marks' next to any of the device listings. You will see a red X next to devices that have been disabled, either in the BIOS or in the device manager. Yellow exclamation marks (actually black exclamation marks inside of yellow circles) will show up next to devices that have a problem. Often the problem is just with the driver for the device. Either you have not installed a driver yet, or the driver was installed incorrectly, or the wrong driver was installed.

Double-click on an item to bring up its properties box. There are several tabs you can select from in each property box. The 'general tab' just gives you information about the device, including whether or not Windows thinks it is working properly. The 'driver tab' gives you access to details about the driver files, as well as the ability to update the driver. The resources tab tells you what memory addresses and input-output ranges the device is using, or attempting to use. Some devices, such as CD-ROM drives, have a 'settings tab' as well. Here you can do things like enable or disable DMA mode, and turn the 'auto insert notification' for your CD drive on or off.

Fixing problem devices involves uninstalling and reinstalling device drivers, getting updated drivers, moving PCI cards to different PCI slots, and sometimes updating "firmware". Firmware is the general term for the chips in various devices such as hard drives and CD burners which store information about the device. These chips are analogous to the BIOS chips on motherboards, and can also be updated by 'flashing' to a newer firmware revision. You will need to check with the manufacturer of each device to see if firmware updates are available, and how to install them.

Duplicate Listings: Sometimes you may find duplicate listings in the device manager. This often happens when you install a new device driver without uninstalling the original first. Simply removing one of the two duplicate listings will not help. Instead, it is best to remove both device listings and then reboot the computer. When Windows

starts again, the "Add New Hardware" wizard should open automatically. Reinstall the driver for the device that had the duplicate listings, and you should end up with a single listing for the device in the device manager.

Troubleshooting Sequence: Try to boot the system again, with the minimal configuration. If it boots with everything removed but the video card, you probably had a hardware conflict, or driver problem. You are making progress if that worked, and you can skip to the next paragraph. If that still did not get your system to boot, it may be a video driver problem. One way to try to get around that potential problem is to boot into **Windows Safe Mode**. To do this, start the computer and keep hitting the F8 key once every second after text first appears on the screen. About 30 to 50 seconds after first starting the computer, this should bring up a text menu which offers you choices on how to boot the computer. With the arrow keys, scroll down to the option called Safe Mode, and hit the enter key. This will boot windows in safe mode, bypassing your driver files. If the system boots into safe mode, that's a good sign that there is nothing seriously wrong with your computer. It is probably a simple matter of updating the video driver, or in the case of VIA-chipset motherboards, it could be an incorrect VIA driver version. I recommend uninstalling your current video driver using the add/remove programs utility in the control panel. Then when you reboot the computer, the Add New Hardware Wizard will start automatically and ask for the location of the correct driver. Go to the video driver installation section of this manual for more instructions on installing video drivers.

Once you are sure that your video card is working correctly, you can begin to add back your peripheral cards one at a time. It is very important to proceed one step at a time. If you do more than one thing before rebooting, and the problem returns, you won't know which of the two or more things you did is causing the problem. So proceeded slowly. It is even a good idea to write down what you do at each step so that if you get distracted, you can look at the list and see the last thing you did.

Try adding the sound card back first. Sound cards can be quite problematic, especially Sound Blaster Live cards. If the problem returns, then you've nailed at least one of the culprits. If the problem does not return, then continue to add peripheral cards back one at a time. Make certain that you get the correct driver installed for each. You can quickly tell if a peripheral card has a properly functioning driver by checking the device manager (right click on my computer, then choose properties, then the device manager tab). Any device that is having a driver or other problem will have a yellow circle with an exclamation mark next to it. Devices that have the yellow circle and ! next to them need to either have the driver updated/re-installed, or they need to be moved to a different PCI slot on the motherboard.

Moving PCI cards around: One common cause of hardware problems is that two or more devices are using the same **IRQ** (interrupt request line). Modern PCs have a limitation rooted in the early days of computing. IRQ's are limited, very limited, but each peripheral will work best if it has it's own dedicated IRQ. PC's have 15 IRQ's, but many of them are already spoken for before you add anything. At most, you have about 4 IRQ's for Windows to assign to peripheral devices you add. Peripherals that take up IRQ's include video cards, sound cards, network cards, SCSI or IDE controllers, DVD encoder cards, internal modems, external COM (serial) ports, and USB ports.

A feature on newer motherboards, called ACPI (advanced configuration and power interface), which provides for operating system specific configuration of peripherals and power management schemes. ACPI theoretically lets more than one peripheral share a single IRQ without conflicts. But some devices don't work well sharing IRQ's, even when using an ACPI-compliant motherboard. AGP video cards are notorious for requiring their own IRQ. This is easy to accomplish on most motherboards by leaving PCI slot 1 (next to the AGP socket) free. This is because various slot on the motherboard share IRQ's with each other, and on most motherboards, the AGP slot shares an IRQ assignment with the first PCI slot.

So the first rule of managing IRQ's and peripherals is to leave PCI slot 1 un-occupied. The second rule is to move your other problem

peripherals to different PCI slots, each time checking what IRQ's are utilized, and which are still free (if any). You can check what IRQ's are being used by what device with the "system information" utility (start > programs > accessories > system tools > system information). At the left side of the system information utility you will see a listing for hardware resources. Click on the plus sign (+) next to that listing, and then double click on "IRQs". The basic idea is to move PCI cards to different slots to try to get as many peripherals on their own IRQ's as possible. Some devices will have "ACPI holder for PCI steering" listed as on the same IRQ. This is normal. If you do see two different devices listed on 1 IRQ (like a network card and your USB ports), don't worry unless one of the two devices is giving you trouble. If the system is working correctly with a few devices doubled up on the same IRQ, that's fine. It is when a device has a problem you can't figure out, and it is on the same IRQ as another device, that you will want to try moving one the cards to a different slot.

Problem drivers: When you find a specific peripheral that is having a driver-related problem, there are several things you can do to try and get the driver files functioning properly. If you have already made sure the problem device has it's own IRQ (see above), and you have tried to install the driver that came with the peripheral, the next thing to try is to download a newer driver version from the manufacturer's web site. Go to the "support", or "driver", or "download" section of their web site, and check for newer drivers for your video cards, sound cards, modems, controller cards, etc. If newer drivers are available, download them and install them, following the manufacturers instructions. Make sure to get the correct driver for the exact model peripheral you have, and the operating system you are using. There are different drivers for Windows 98/Me and Windows 2000. In some cases (for example, SB Liveware drivers) there are distinct drivers for Win98 and WinMe.

If you mess up the installation of a particular driver, it to easy to start over. Go to the device manager, select that device, and click on the 'remove' button. Then reboot the computer, and the "Add New Hardware" wizard should start automatically when Windows begins. Reinstall the driver correctly. It doesn't seem logical, but there are times when the first or second attempt at installing a driver fails, but

the third time the same exact driver installs properly and works. This is just the property of Windows. It does not necessarily mean you did something wrong. So if you are barely certain you did everything right, it's worth the leading the device from the device manager and trying several times to get the driver installed properly.

Add New Hardware Wizard: The Add New Hardware Wizard in the Control Panel is an excellent tool for getting stubborn drivers installed. With the latest driver version handy for your problem-peripheral, run the Add New Hardware Wizard. It will immediately locate any devices in the device manager that have an exclamation mark next to them, and it will ask if that's the device you want installed. If that is the device you want installed, highlight it and choose "Yes, the device is in the list", and click on the next button. If not, check the "No, the device is not in the list" option, and then click on the next button.

If you chose "No, the device is not in the list" in the previous step, it is a good idea at this time to let Windows search automatically for new hardware. The detection process can take several minutes. If the progress bar stops for a very long time (20 minutes), the system may have hung in the attempt to install a new device.

If you chose "Yes", then the hardware wizard will attempt to install the device you picked from the list. Continue with the installation process until the finish button appears. The system will reboot if it found the hardware and installed the device.

Editing the Registry: The Registry may be your last resort in some cases. Improperly removed video drivers, for example, can leave erroneous entries in the registry which can make the system act abnormally. In such circumstances you may want to try to manually remove entries in the registry from the previous video card installation.

So let's say you removed an old Matrox video card, and when you went to uninstall the driver and applets, it gave you an error message. Then after you install your new video card, you get an error message because the applet for the Matrox card could not initialize properly. More often than not, you can fix this sort of problem by disabling the startup file for the Matrox utility using the system configuration utility's

selective start-up option. But a more satisfactory solution would be to search the registry for entries pertaining to Matrox, and remove them all. An example of editing the Registry can be found on page 47.

Editing the registry is as easy as it is dangerous. Remember, one slip-up and your computer could stop responding altogether. But if you are careful, editing the registry is a snap. Click on the start button and choose the 'run' command. Type `regedit` and click on the OK button. You're now in the Windows registry editor. To find entries pertaining to a particular device, use the 'find' command in the 'edit' menu, or use Ctrl-F. You can also use F3, or the 'find next' command to find the next instance of that word in the registry. When you find a registry entry that you are absolutely certain pertains to something that has been removed from the system, either a piece of hardware or a program, then you can safely delete that entry and all sub-entries. The changes take effect next time you start Windows.

Sound Blaster Live cards: The Sound Blaster live series of sound cards made by Creative Labs can be the source of many potential problems during the set up of your computer. Many motherboard manufacturers recommend disabling two settings in the motherboard's BIOS to limit problems with the Sound Blaster Live Series. The two settings are typically called:

- Delay transaction
- PCI master read caching

Disabling both of these settings may help eliminate certain Sound Blaster Live and Audigy problems.

I have also found that disabling Sound Blaster 16 emulation in the Device Manager can also help eliminate some problems. The so-called Sound Blaster 16 emulation is only used to allow sound in old DOS games that will not run under Windows. So for the vast majority of people this capability is not needed and should be disabled to free up and IRQ and a DMA channel.

In order to disable Sound Blaster 16 emulation go to the Device Manager and click on the + next to "Creative miscellaneous devices".

Double-click on 'Sound Blaster 16 emulation' and check the "disable in this hardware profile" checkbox. Click on the OK button, finish up the process and reboot the computer.

There is also a setting in the Direct X diagnostic tools for sound acceleration which may be a source of some Sound Blaster problems. To get to the Direct X diagnostic tools, you need to start the "system information" utility in Windows (start > programs > accessories > system tools > system information). From there you open the tools menu (and then the 'Windows' menu in Win2000 or WinXP). The Direct X diagnostic tools utility gives you lots of information on Direct X and the drivers installed on your system. Go to the sound tab, and there will be an "acceleration slider" for the "hardware sound acceleration level". It is typically set at "full acceleration", but this may lead to some sound card-related problems. If you are having sound problems, try moving this slider to the next position to the left "standard acceleration". If this does not fix the problem, move the slider back to the "full" position.

Lockups

What are the things to look at if your system hangs while playing games or running applications? First, if the system is overclocked, set the clock settings back to normal and see if that helps. Next, check all your BIOS settings carefully, including items like the bus divider settings (FSB/PCI/AGP speed ratio), the AGP settings, etc. You may need to check your motherboard manual for descriptions of some of the settings. Reset the defaults if you are not sure what to do, and see if the problems go away. Then you will need to go back and add in BIOS tweaks like AGP 4x mode one at a time and see which ones work. Also, lockups can be due to bad video driver installations, or CPU or video card overheating. Overheating is a common cause of hard lockups. Many motherboards let you look at the CPU temperature in the BIOS menu, under the hardware monitor or PC health sections. If your heat sink is very warm to the touch, you may have a cooling problem. Add more fans to the case, or get a bigger and better heat sink/fan unit. Large, copper heat sinks with fast fans make the best coolers. Or you may opt for a water cooling system, which provides the ultimate in heat dissipation.

Chapter 5

MAINTAINING YOUR COMPUTER IN GOOD WORKING ORDER

Software Maintenance:

Windows 98SE and Me editions are not the worlds most stable, reliable operating systems, but they're the best ones out there if you are interested in most games. I personally prefer Windows 98SE over Windows Me, mainly because it has fewer problems with drivers and existing applications. If you want the most stable version of Windows, I recommend Windows 2000 professional. But if you are using Win98 or WinMe, there are numerous things you can do to make sure that Windows will work at it's best.

First off, always back up your important data, either on a ZIP drive, a second hard drive, a tape drive or a writeable CD (also know as a CDRW or CD burner). Then, follow the 6 basic rules of Windows-correctness below, and your Windows experience will be much more enjoyable. CDRW burners are currently the best option for backups.

Most computer problems are software-related, and crop up after installing software. Please make sure that you are cautious about installing software. Follow the general rules below, and you will have fewer software problems with Windows.

1) The first rule of keeping your rig running is to add and remove software properly. Windows maintains a massive database, called the Registry, which keeps track of all your hardware and software. Each time you add new software to your computer, the Registry is updated with information about that program. If you do not un-install the software properly, the entries in the database remain, even though they now point to software which has been removed from the system. This happens over and over again each time you delete programs

without "un-installing" them. Eventually Windows starts mis-behaving or hanging.

To remove programs correctly, go to the Control Panel (in the 'My Computer' folder) and double click on the "Add/Remove programs" icon (or "Change/Remove" in Windows 2000 and XP). Then select the software you want to remove, and click on the Add/Remove button. Confirm that you want to remove the software. If the directory for the software remains after you un-install, you can drag it to the recycle bin, unless you want to save any files the program generated while you were running it. There are numerous programs available, like Norton Uninstall, that will monitor program installations, and give you another option for un-installing software properly. These are typically not necessary though. The Windows Add/Remove function does the job just fine.

2) Always check the web sites for the companies that made your hardware. Go to the "support", or "driver", or "download" section of their web site, and check for newer drivers for your video cards, sound cards, modems, controller cards, etc. If newer drivers are available, download them and install them, following the manufacturers instructions. Make sure to get the correct driver for the operating system you are using. There are different drivers for Windows 98/Me and Windows 2000. In some cases (for example, SB Liveware drivers) there are distinct drivers for Win98 and WinMe.

3) Use some type of Windows-Repair program regularly. Many programs are available, like Norton Utilities, which will check Windows for you, and determine if any problems have developed. They will then automatically fix the problems for you if you request it. We have seen systems come back for "repairs", who's only problem were 130 or more "Windows errors" detected by Norton Utilities WinDoctor program. These were most likely generated by not un-installing software properly. Many other good repair programs are available.

4) Use Disk Defragmenter (under system tools, which is under accessories in the Start Menu) or another defragmenter to optimize your hard drive regularly. As you add and remove software, the files on your system get broken up, and different segments of files are put

at different locations on your drive. This slows drive performance. Optimizing will get you back up to speed.

5) Don't install junk software. This includes lots of shareware unfortunately. Install beta release programs or drivers, and free software, at your own risk. We have had all sorts of problems after installing game demos (which are beta release portions of upcoming games), and then trying to uninstall them later. So beware.

6) One final important performance tip is to keep the number of programs that load at Windows startup to a minimum. They use up valuable memory, and increase the probability that one of them will cause an error. One place where programs are loaded at startup is your startup folder (Start > Programs > StartUp). Deleting these shortcuts will prevent those programs from automatically loading each time you start Windows.

To find out how many programs are actually running in the background after Windows starts, go here:

Start menu / Programs / Accessories / System Tools / System Information

In this utility, go to the Tools menu, and start the "System Configuration Tool". Then select the "Startup" tab. This gives you access to all the programs that are loaded during Windows startup. If you see a program you recognize, and you are sure you don't need it loaded every time Windows starts, then uncheck the box next to that item.

Do not load software at Windows startup unless you really need it. Some programs, like those for fax machines, may need to run in the background, but keep the number of programs that load during startup to a bare minimum. We do NOT recommend loading these at startup:

- 1) Anti-virus software
- 2) Hardware monitoring programs (like Norton System Doctor)
- 3) Anti-crash, or Crash-guard programs
- 4) Program scheduling agents

5) Installation-logging uninstall programs (like Cleansweep)

Run these programs manually when you need them, not all the time in the background. We also recommend turning stand-by and power saving modes off to improve system performance. This can be done from the Power Management icon in the Control Panel.

The System Information Utility has many other valuable tools available under the Tools menu. You can check what items are in your Autoexec.bat, Config.sys, Win.ini and System.ini files, and disable any of them from here. In fact, from the "General" tab, you can enable diagnostic logging, and select which startup files are used when Windows 98 starts, and which are not. Other Utilities that can be found in the Tools menu within System Information include Direct X diagnostics, a Windows System File Checker, a Registry Checker, and the Version Conflict Manager.

How to Make a Restore CD:

If Windows is down for the count, and you don't relish the thought of reinstalling the operating system and all your software, it's awful nice to have a restore CD (or CDs) handy. They are relatively easy to make if you have a CD burner and the right software. It is best to make your restore CDs after the operating system has been installed fresh, and you've got all your software, drivers, and critical applications installed and setup.

Needed:

- 1) CD burner with software such as "Nero" or "EZ-CD Creator"
- 2) Drive imaging software such as Powerquest's "Drive Image"
- 3) Blank CDR disks and a blank 1.44 floppy disk.
- 4) A bootable floppy disk that gives you CD ROM support
- 5) A second hard drive big enough to hold an "image file" of your entire main hard drive. (It can be smaller than your main drive as long as it's got enough room left for a compressed image of your main drive). You can install an old drive temporarily for this purpose if you like.

The first thing to do is to make an image file of your entire main hard drive. For this you will need a drive imaging utility and a place to store the image file (like a second hard drive). I recommend using Powerquest's "Drive Image" software.

<http://www.powerquest.com/driveimage>

- 1) Install Drive Image. It will make a Drive Image floppy disk. Now boot from a bootable floppy and run Drive Image from the floppy disk it created.
- 2) Select the "Make Image" option.
- 3) Select the drive you want to image (C: in virtually all cases).
- 4) Select the destination drive (the second hard drive). You will need to name the restore file and indicate which drive to store the image file on. The image file can't be saved to the same disk drive you are imaging, so that's why you need the second hard drive. So, for example, you may want to save the file to D:\Restore.PQI (PQI is the suffix for Powerquest's image files). Continue.
- 5) Select the compression level (None, Medium, High). The "high" setting can be very handy for getting as much as 1.5GB of data on your hard drive imaged onto a single CDR disk. There is no downside to compressing the data.
- 6) Start the imaging process.
- 7) Exit and Reboot without the floppy disk in the A: drive.
- 8) Now you need to copy several "Drive Image" files to your second hard drive. These include: pqdi.exe, pqdi.ovl, pqdi.pqg, and pqdi.rtc. The pqdi.rtc file is hidden, and you will have to unhide it to copy it.

While in Windows, put the "Drive Image" floppy disk into drive A:. Double click on the 'My Computer' icon on your desktop. Double click on the floppy drive icon. Right click on the pqdi.rtc file. In the menu that comes up choose properties. Now un-check the hidden option,

and click on the Apply button. Click on the OK button. Now copy all 4 of the files listed above to the second hard drive that contains the image file you just made.

9) Now start EZ-CD Creator or you CD burning software.

10) Open the file menu, and choose "New CD Layout".

11) Choose "Bootable CD" from the list

12) Insert a bootable floppy disk that gives you CD ROM support into drive A (see Page 2 of this manual). EZ CD creator uses the boot files on the floppy to make a bootable CD.

13) Continue with EZ CD Creator's create bootable CD routine.

14) Now drag the 4 Drive Image files from the D: Drive into the CD layout

15) Drag the "restore.pqi" file you generated to the CD layout. It will tell you at the bottom of EZ CD Creator if there is enough room to get all the files onto 1 CD. If so, you are ready to go. If you like, you can give the CD volume a name (like RestoreCD), but this is not necessary.

16) Now click on the "Create CD" button to start the CD creation process. If it finishes correctly, it will report that the CD has been successfully created. End the session and remove your restore CD to a safe place.

Using Your Restore CD:

-Place the restoration CD into your CD drive, and a reboot your computer. If the system does not boot to the CD drive, you may need to go into the motherboard BIOS setup menu and select CD-ROM as the first boot device. Save the settings and exit the bios menu.

-When the system boots to the restoration CD, it will ask if you want to start with or without CD ROM support. Select WITH CD support. When

the boot process is finished, you should see a listing of what drive letters were assigned to your CD drives.

-Run Drive Image by typing PQDI at the CD ROM prompt and hit the enter key. So for example, if your CD drive has been designated as drive E:, you would have to enter these DOS commands.

E: (that is - E followed by a colon) -then hit the enter key (this makes the CD drive the default drive)

Now type in the following:

pqdi -then hit the enter key

(Note: if you have a ZIP drive in your computer, you will need to have a ZIP disk inserted in the ZIP drive, or Drive Image will fail to load).

-The image file restoration program called Drive Image should start. You can navigate without a mouse by using the arrow keys and the tab key. Select the "restore image" button. Now select the RestoreCD image file on the restoration CD, you can use the browse button to locate the file (image files end with the file suffix PQI, and there is only one on the restore CD). Choose OK.

-Now select your C: drive (main hard drive or C:) as the destination drive. Click next, and then next again. A warning will appear telling you that any existing data on drive C will be lost. Choose OK to proceed.

- When done, remove the CD from the drive and reboot the computer. If you changed the boot order in the BIOS to CD-ROM 1st, change it back to boot from the main hard drive first.

In case of disaster:

"Dirty Windows Reinstall": If you accidentally mess up Windows, or if Windows starts acting funny, you can try to reinstall it again, without

removing the old version. Just pop in the CD, and start the setup.exe program. This is called a "dirty reinstall" because you are just replacing Windows files, but you are not touching the Windows Registry. So running the setup.exe program from the Windows CD will replace any corrupted or missing Windows files. This can fix certain Windows problems, but not others.

After starting the setup program, it will ask if you'd like to keep your old system files. Tell it no, or you will have two copies of Windows on your system. Follow the instructions to complete the reinstallation of Windows. You will need your CD serial number handy.

If this fixes your Windows problems, consider yourself lucky. All of your programs and files will still be right where you left them. However, you will need to reinstall any updates to Windows that you had applied previously. For example, you will want to update Direct X to version 8.0a after a dirty re-install of Windows.

"Clean Windows Reinstall": If you are having trouble getting into Windows, you can try using safe mode. To do this, hit the F8 key over and over again while the system is booting into Windows until a text menu comes up. One of the options is called "Safe Mode". Select that option and hit the enter key. When Windows loads in safe mode, you can try to run the setup.exe program on the Windows CD and see if you can get Windows reinstalled. If after all attempts you cannot get into Windows, or get the setup program to complete properly, you will need to reformat your hard drive and reinstall Windows from scratch.

What files and directories to save: First off, it might be a good idea to jot down a list of all the important programs you have installed on your system. If you purchased any of them on the Internet, and they required some kind of serial number or key, it would be a very good idea to go to the help section of each of those programs and jot down the serial number for later reference.

Now you need to back up all your important data.

Many programs store files you generate in this directory:
c:\My Documents

Address book data is stored here:

C:\WINDOWS\Application Data\Microsoft\Address Book

Outlook Express data is stored here (the number is probably generated differently for each machine):

C:\WINDOWS\Application Data\Identities\{385E1020-A365-11D4-899A-C9F161536C2E}\Microsoft\Outlook Express

You may also want to backup your saved game files for any current games you are playing. Beyond that, you will of course want to save any files that you generated with various Windows applications including word processor, spreadsheet, paint, drawing or photo programs, etc.

Keep in mind that you will really have to reinstall everything from scratch. Even programs on your D: Drive will have to be reinstalled. This is because the new version of Windows you install will not have them listed in the Registry. So check your hard drive carefully for any directories that contain work you have done. Copy all of your work to your backup device.

My favorite way to do a clean Windows install is to use a new hard drive. This way you can keep all your data without worrying about backing it up. You just remove your old drives temporarily, pop in the new hard drive and install Windows. You shouldn't try to install Windows on a new hard drive while another hard drive is hooked up with its own version of Windows. The Windows installation routine will detect Windows on the other drive and try to install there. So it is a good idea to disconnect your older drives while installing Windows to your new hard drive.

Then you hook up your older drive or drives, and you have access to all of your data. Once you're sure you have all your data transferred to the new drive, you can reformat your old drives and use them as extra space. Or, if they are old and slow, it is better to remove them to improve system performance. Slow IDE drives connected to the same IDE data cable will force newer, faster drives to run at a slower speed.

Other backup options: The best backup option for your files is a CD burner. CD writable disks are very inexpensive, and store nearly 700 MB of data each. Use your favorite CD burner program to back up your data. Most CD burners come with Adaptec's EZ CD Creator program. A favorite of some PC enthusiasts is a program called Nero.

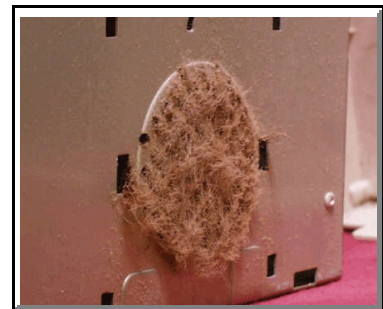
<http://www.ahead.de/>

Both of these burner programs will do an excellent job of backing up your important data. If you don't have a CD burner, and can't afford one, you can use other older storage devices such as ZIP, JAZZ, Ditto or tape drives.

Reformat and reinstall: After backing up your data, it is time to reformat your hard drive. Follow the instructions at the end of Chapter One to do this if you are not sure how. Once you have reformatted your drive and transferred the system files, simply pop in the Windows CD and run the setup.exe program. See page 24.

Physical Maintenance:

One of the major enemies of the modern computer is dust. In a moderately dusty environment a computer can become literally clogged with dust in a matter of months. Dust builds up around fans, and in areas where airflow is greatest. Dust build-up reduces the cooling efficiency of your computer, and may eventually lead to excessive heat concentration in your case. It can also slowly destroy case fans. The only way to avoid this is to clean your computer out regularly. In low dust environments you might be able to go for a year before cleaning is required. In high dust environments (carpets and pets) I recommend cleaning the system out every three to four months.



A customer's front fan port, completely clogged with dust!

The surest way to tell if your computer is accumulating too much dust is that one or more of the fans will start to make noise. Fan noises are

not only irritating, they are often indicative of dust build up inside your computer. So even if only one fan makes noise for a short time at boot up, it is probably an indication you need to open the computer up and vacuum out the dust.

The best way to do this is to unplug your computer, take the case cover off, and carefully use a vacuum cleaner to remove as much visible dust as possible. This will probably not get the dust out of some of the tricky places. Therefore it might be a good idea to remove any fan housings in the case, and vacuum those out as well. Check the air intake slots on the power supply housing as well. They often accumulate dust which you can vacuum away. Finally, if you have drive bay fans in your computer, the front of each hard drive will accumulate dust, and the only way to remove it is to remove your hard drives from the computer case and clean them. Keeping the dust out of your computer will extend it's life, and make it more reliable. If you are adventurous, you can even take the system outdoors, and use a leaf blower to blast the dust out of your system. It really works!



Dust accumulation on hard drives behind a drive-bay fan unit.

If any fans continue to make noise after cleaning, or do not seem to be spinning very fast, or moving much air, then it is time to replace them. You should be able to get the correct size case fans at any computer case distributor, or even Radio Shack. Small case fans are 80mm x 80mm x 25mm (equivalent to 3.125 inches), and large case fans are 90mm x 90mm x 25mm (3.7 inches). If your CPU fan is kaput, you'll need to go to a cooling specialty store or web site.

Internet Information Links: There is a world of free information to be found on the Internet.

NVidia card FAQ page:

<http://www.geforcefaq.com/>

Abit KT7A FAQ:

<http://www.viahardware.com/faq/kt7/kt7faq.htm>

Abit KG7 and KR7 FAQ:

<http://www.viahardware.com/faq/kg7kr7/kg7kr7faq.htm>

AMD processor utilities and drivers:

<http://www.amd.com/products/cpg/bin/>

Driver and BIOS update sites:

Updated driver files and newer BIOS revisions can be found for most hardware at these web sites:

Drivers:

Abit: <http://www.abit.com.tw/>

Asus: <http://www.asus.com/Products/software1.html>

ATI: <http://support.atitech.ca/>

Creative Labs: <http://www.americas.creative.com/>

Diamond Multimedia: <http://www.diamondmm.com>

Direct X: <http://www.microsoft.com/directx/default.asp>

ELSA: <http://www2.elsa.de/internet/ElsaFileArea.nsf/files?openview>

Hercules: <http://us.hercules.com/support/index.php3>

Intergraph: <http://www.intergraph.com/cust/>

Leadtek: <http://www.leadtek.com/drivers.htm>

Matrox: <http://www.matrox.com/mga/support/drivers/home.cfm>

NVidia Reference: <http://www.nvidia.com/view.asp?PAGE=drivers>

NVidia Leaked: <http://www.3dchipset.com/beta/nvidia/nvidia.html>

VIA drivers: <http://www.via.com.tw/jsp/en/dr/driver.jsp>

Visiontek: <http://www.visiontek.com/support/tools.html>

BIOS Updates:

Abit: <http://www.abit.com.tw/>

AOpen: <http://www.aopen.com/tech/download/mbbios/default.htm>

Asus: <http://www.asus.com/Products/software1.html>

EPoX:

<http://www.epox.com/html/english/support/motherboard/bios.htm>

Gigabyte: <http://www.gigabyte.com.tw/support/support.htm>

MSI: <http://www.msi.com.tw/support/bios/note.htm>

General Information Searching Tip:

Use <http://www.Google.com> to search for the information you need. You can use any search engine you like (Yahoo, Excite, etc), but Google will probably give you more pertinent results. Specify your search carefully. Use specifics like filenames and version numbers. If you specify the search correctly, you can find almost anything you need on the Internet.

For excellent hardware reviews, I recommend these three web sites. They cover all the latest hardware, often many weeks before the items hit the store shelves. This gives you plenty of time to compare and contrast the different hardware options which are available.

www.AnandTech.com

www.TomsHardware.com

www.tech-report.com

And if all else fails, you can email me directly with your PC questions: john@kickassgear.com

Also email me if you have suggestions for this manual.

Dr. John

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March 2002

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