# **Modding, Cooling and Over clocking your Computer** by Drew Lankford

Hey gang. I'm Drew Lankford and I'm here to explain some basics about computer case modding and over clocking. To begin with, I'll explain what events led me to undertake these many time consuming projects. I actually stumbled upon the cooling idea because I had added a new video card to my computer. My first computer that I consider half decent (as opposed to my old Apple II E that played a fierce game of Galaga) was my Compaq 5700T. It had a PIII 450 MHz processor, 128 Megs RAM, and an NVIDIA TNT2 Ultra video card. Back in August of 99, this was IT. It was the Alpha machine which crushed all my gaming buddies PC's and forced them to their knees in tears. A year later, it wasn't exactly the beast of old. I needed a new video card and my new weapon of choice was an AOPEN GeForce2 Pro. The card breathed new life into my system and unfortunately, a lot more hot air. That's when things started going wrong. My Presario had turned into a "Pretty-sorry-O". What was wrong? Too much heat from the new video card was overheating my processor and making it lock up. How could I fix this? Cold air.

For the next 2 months, I had my outer shell of the case removed and everything was fine. Unfortunately, this had drawbacks also. Too much dust was getting in the computer. Around this time, I got online to try to see what I could do. One solution was active cooling i.e., cooling fans. Unfortunately, My PC was still under warranty and I couldn't mess with the case. I decided that if I was going to fix up my computer, I wanted to go the extra step. I made a trip to www.pricewatch.com and found a good deal on a motherboard and processor combo. Here's what I decided to get: for my motherboard I chose the ABIT KT7-A RAID. This is because the BIOS for the motherboard allows for a user defined clock multiplier and built in Raid support. Since I was making a switch from Intel to AMD, I figured this could be cool because AMD processors are known for being great over clockable pieces of hardware. The Processor that came with the motherboard was an AMD 1.0 GHz Thunderbird processor. I chose this one because it was ideal for gaming (which was the primary use for my computer). I got these 2 items together from www.accubyte.com for around $350. As surprising as it sounds, 7 months ago when I bought this stuff, the 2 exact same components today cost only $100 less. The motherboard actually still costs around $150. It's a great motherboard for over clockers.

For the case, I had to choose wisely. I wanted something that looked good but also would be user friendly and easy to cut and mod. My quest ended with the magnificent Antec SX840 Mid tower case. To check it out go To Antec this case was an excellent choice for my new monster gaming rig and here is why. It features five 80mm fans for cooling and all are strategically placed. Three suck air in from the front.
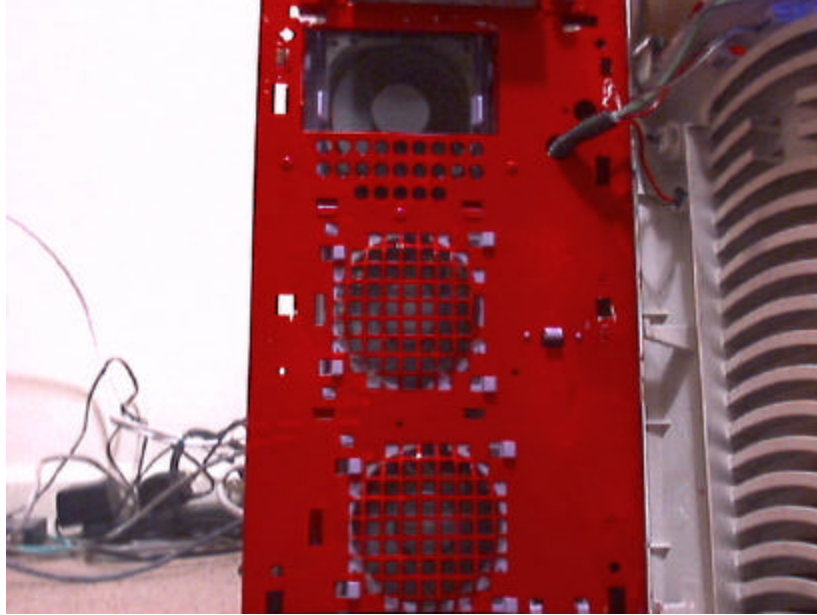
One of those is located directly in front of the hard drive so that if someone has 3 hard drives going, they don't run a risk of over heating. The case also has 2 fans on the back of the case that blow hot air out.
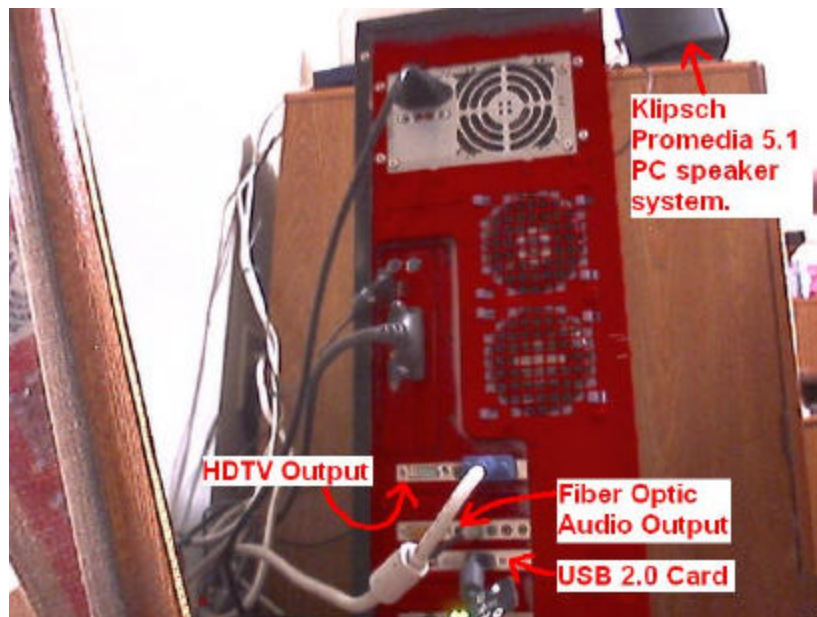
The case comes with small rails which are screwed on to the side of cd rom drives and this enables the drive to easily slide in and out for quick removal. The hard drive(s) and floppy drive(s) also mount into a removable tray for easy access. One really cool feature

on top of these is that the side panel of the case has a latch on it for quick side panel removing. Very cool.

Now, the case looks great but why must 99% of all computer cases be that boring beige color?!? If people want cases in cool colors they either have to shell out an arm and a leg or do it themselves. The latter choice usually ends up not looking as professional as say… an Alienware computer. By the way, Alienware uses Antec to provide it with their cases. Their case is identical to mine except mine doesn't have the large Alienware logo stamped into the front of the case. So, being in the possession of a very cool but bland colored case, I decided to undertake my first act of customization. Painting.

Painting Your Case Before you begin to paint, know this: If you screw up, It will more than likely look like crap. If you don't, It will look better than any of your friends' computers (except mine :) I subscribe to Maximum PC magazine and in their May 01 issue they printed a very thorough guide to painting a case. I followed this article to the "T". Since this is (I'm guessing) supposed to be a rather thorough paper, I'll keep

it short but detailed enough for any reader to get the job done and be satisfied with the results.

What you'll need:

- Sandpaper of various grits

- A spray can of Primer

- Masking Tape

- A small paint brush and Vaseline

- X-Acto knife

- Orbital sander

- Any type paint you choose. (They used car paint. I chose Satin Black) One word of advice: Lowe's offers higher quality paint and a larger selection of colors than Wal-Mart and they cost just about the same. Go to Lowe's.

- Tools to take case apart (Usually a Phillips screwdriver)

STEP 1: Choose and prep your work area. Don't paint outdoors. Dust, dirt and grass make the paint ugly and nasty. Paint indoors where there is plenty of ventilation. Paint fumes make you high. Yeah, yeah, that's great and all but if you are going in and out of consciousness, how can you do a good job painting?

STEP 2: Take your case apart. Here is where you want to make a decision: Do you want to keep the inside of the case that natural metallic color? Or do you want to spice it up? I had bigger plans than just painting (which you'll read about later) so I chose to paint the inside of my case a glossy red. Also, If you are going to paint the front of your optical drives (which you should) take the drive and the face plate surrounding the cd

drive sliding tray should snap off. After that, pull the tray out a little bit and the cover of the cd drive tray should also snap off. On to step 3!

Step 3: Strip the case of all the paint. Here is where the orbital sander comes in handy. Unless you're a body builder, this project is not very feasible by hand. You want to strip the paint because the primer won't stick to the beige paint and all your painting effort will be for naught. You can probably get away with renting a small hand held sander instead of having to buy one. With sander in hand, get to sanding. Make sure you strip all the sides of the case down to the bare metal. For the CD drive parts, you should hand sand those. After you do this, cover any parts that you don't want to be painted with masking tape.

STEP 4: Apply the primer. Before you do, make sure you clean away all the dust and paint that was stripped earlier. Let the primer dry for about 2 hours then hand sand it with 600 grit, then with 1000 grit if you like. Get used to the hand sanding. You'll be doing it from here on.

STEP 5: Paint! Before painting, make sure the primer is as smooth as a baby's butt or else your paint will look rough textured. Before you do this, be sure you mask all other areas you don't want to paint with the first coat or color. In my case, the top of the computer case is riveted onto the frame of the case so I used newspaper to cover up the inside of the case and used masking tape to make sure it was completely sealed off. As you paint, use thin coats instead of 1 thick one. This will prevent running. After the paint dries overnight, use 800~1000 grit sandpaper to smooth it out. After this, apply another thin coat.

STEP 6: After the paint has dried, spray on some clear coat to give it a nice glossy finish if you like. Sand it with 1000~1500 grit sandpaper and repeat as desired. The more coats you apply, the shinier it will look. I wanted mine to look very satin like so I only applied one coat.

STEP 7: Painting the face plates of the optical drives can be tricky. Most drives have a small clear plastic piece that shows the LED during the drive's activity. I used a small paint brush to apply a thin coat of Vaseline over this. Also, I have 2 CD ROMS and I wanted to keep the cool logo on one of them but design a new one for the other drive. Using the brush again, I carefully traced the letters in Vaseline. This prevents paint from covering up the letters on the front of the drive. After this, apply the paint, let it dry and then spray on the clear coat. One other note: My case came with 4 feet on the bottom of the case that rotate out to provide more stability. These were painted in the same manner. No sanding is necessary.

STEP8: Painting the inside of the case is a breeze. Choose your color and paint. Be sure to apply it in thin coats and make SURE you don't paint over onto the outside of the case. Again, I used newspaper and masking tape to completely seal off the outside.

STEP 9: Think you're done? Think it looks good? Think again! After the clear coat has completely dried, take a can of turtle wax and apply it evenly with a car wax applicator pad. Wipe it down with a nice lint-free cloth then step back and admire your work of art.

More Modding Madness….

The modding didn't stop there however. I had a gorgeous black case with a fierce red belly. The problem? What good was the red inside if nobody saw it? The answer

came to me as a window of opportunity. It was perfect. How better to show off my new

beast than with a Plexiglas window! Fortunately, this process turned out to be easier than

painting.

Adding A Custom Window To Your Case
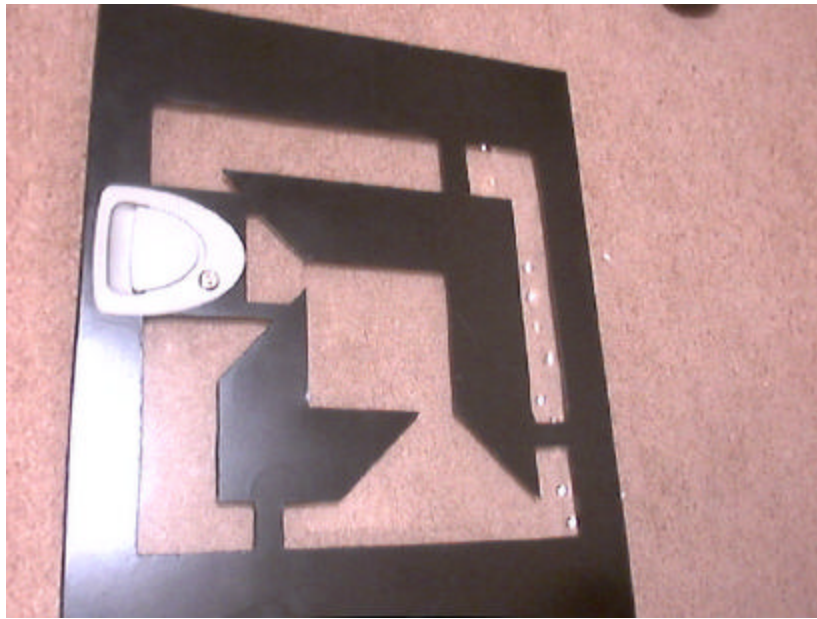
The hardest part of this project turned out to be deciding what type of window I

wanted. Sure I could always just add a plain old rectangular window but how bland is

that? This is supposed to be a custom rig! Since I was enlisting the power of AMD, I

decided it would be really cool to cut a big AMD logo into the side of the case. The

results speak for themselves.

Tools Needed: This is completely at the users discretion. There are several tools that

can be used to cut through the computer case's sheet metal. Most case modders,

including myself, however prefer the Dremel Multi-Tool. (www.dremel.com) If you use

this, make sure you use the carbon fiber reinforced cutting disks. The regular ones get

vaporized in seconds. Other alternatives are jig saws and tin snips.

Regardless of what tool you choose, here are a few steps and precautions. Use safety glasses, especially if you're using a dremel. The disks are not indestructible and if they break they could fly up into your eye. That would suck. So if you decide to be the cheapskate who couldn't afford a two dollar pair of safety glasses and it happens to you, don't blame me. Also cut this thing out doors. The cutting wheel spins at 35,000 RPM's and it shoots sparks and carbon dust everywhere. It's also really loud so make sure you won't piss off any neighbors. With all this in mind, here's how to cut the case.

First you should know what shape you want the window to be. It could be a plain old rectangle or a circle or any shape you desire. Just remember that the more complicated the design, the longer it will take to cut the case. The carbon fiber cutting disks are about 5 bucks for a 5 pack at Wal-Mart and each is good for about 8 or 9 inches worth of cut metal so plan in advance how many disks you are willing to go through and how long you're willing to spend on cutting it. Cutting mine took about 2 hours and about 12 or 13 disks.

Cutting: After you've got a design picked out, make sure that once the design is cut and the window is added they won't interfere with any tabs, hinges, or lips that are used to secure the panel into place. After that, use a sharpie to draw the design on the inside of the side of the case. If your design is a word or something make sure you reverse the image of your design. In my case I had to. After this use the dremel to cut along the lines. Don't apply heavy pressure to the tool because the disks will break and obviously that can be a pain in the butt so use steady, light passes to gradually eat away at the metal. Also, bearing down hard will simply annihilate a cutting disk (even the carbon fiber ones).

Adding the Plexiglas window: After your design is cut, you'll want to use a sanding bit for the dremel to make sure that there are no sharp metal burrs along your cuts. After you've done this, take a trip to Lowe's and if you're lucky, you can check in the Plexiglas section for scrap pieces that could fit your window size. I found a piece that was just right for my window and I got it for free. If not, you should get a 1/8" piece of Lucite plastic glass. It's really strong and won't crack. Drill about 8 holes into the panel and use screws or nuts and bolts to hold the glass in place. After that, NOW you can really sit back and smile upon your masterpiece. Now that that's done, let's put some serious firepower under the hood!

Hardware

After all the above was done, my mobo and processor came in the mail about 2 days later. It was time to take over the world… Before I even put the processor into the motherboard, I knew I wanted to over clock my processor. It was 1GHz by default and the fastest Athlon of its day but I knew I was going to want it to be faster so I tried a little trick I learned from an online site. Here's how to over clock your Thunderbird and Spitfire Duron processors.

Here's a way to look at and hopefully understand the principle of over clocking. Car engine manufacturers make engines that are capable of a certain horsepower rating. They sell the engine at a lower rated horsepower. Why? Because they can sell the exact engine later on at it's designed horsepower rating simply by eliminating the horsepower regulating devices that were previously added on to them.   The same principle holds true for CPU manufacturers. The caveat is that over clocking will void your CPU warranty and can kill your processor in under 5 seconds and even your mobo if you don't know

what you're doing. If you remove the heat sink and carefully remove the processor from the motherboard, you'll see a set of gold contacts labeled L1 – L7 on the face of the CPU. Directly to the right of the L1, you should see 2 rows of 4 very tiny dots. Grab a sharp No. 2 Pencil and connect each pair of dots like this.

```
L1  O   O   O   O
    |   |   |   |
    O   O   O  O
```
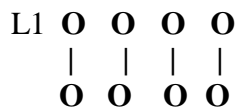

The trick sounds kind of bogus but once you do this and reboot you should have access to the clock multipliers in the BIOS or via jumpers on the motherboard. If it refuses to let you change the clock multiplier, you probably didn't connect the dots good enough.

I followed Abit's mounting instructions to get the motherboard into place. The heat sink that Accubyte provide was a wretched piece of crap. I knew immediately that the CPU might over heat because this pathetic thing they called a heat sink would do little to combat the temperatures my processor would be cranking out. I made a quick run here and ordered a beast of a heat sink. The Alpha PAL8045.
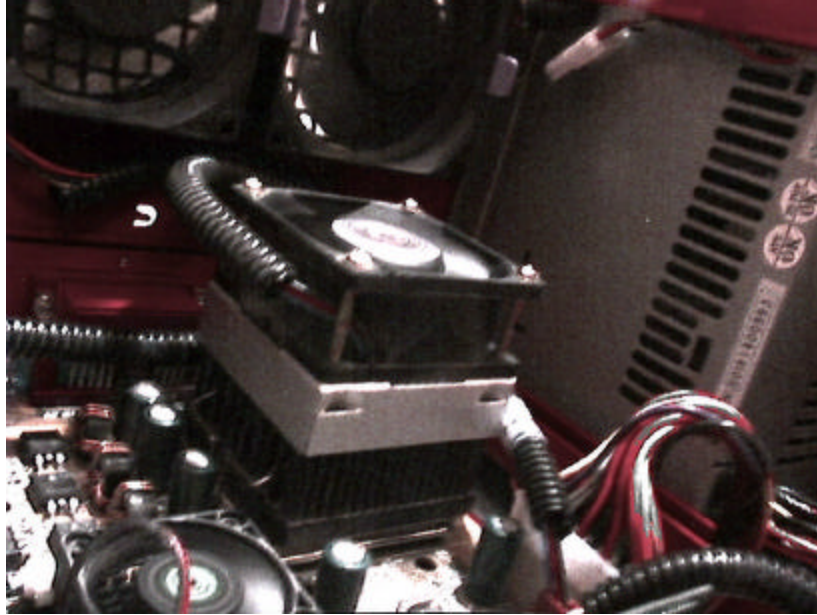
Supporting processor speeds well past 1.5 GHz, I knew this was for me. Not surprisingly, the Alpha cooler was able to beat the cheapie cooler quite easily. But many of you are wondering why the Alpha which at $40 costs 4 times as much. Well to start with it can out perform the inferior one by 20 degrees Celsius. That my friends, is the peril of most CPU coolers; they usually offer what seem to be marginal gains, for a big outlay of money. Keep in mind though; the big and expensive heat sinks are generally better (especially in this case.) They provide more versatility, security, and upwards scalability for next generation processors. While the cheap cooler will be able to keep my dad's PC workable, I hardly doubt that the cheap cooler can be counted on for long term use. I mean when I touched the cheap cooler, it was HOT. The Alpha remained cool enough to touch.

Before I started her up, however, there was one more thing for me to do that in my opinion, every PC manufacturer should do: Round the IDE cables and HIDE THE FREAKING WIRES!!!! What good are a bunch of fans if you've got huge IDE ribbons and cables getting in the way of the precious cool air? Here's a few tricks. First, Take

your IDE cables and lay them out on a flat surface that you're willing to cut (like a cutting board). Then, with an X-Acto Knife, count about 5 little wires from the edge and make a 1" cut. Do this every 5 wires and when you're done, take the cable and tear the cable where the cut was made and the cable should split very easily. When you're about an inch from the connector pins, stop and then repeat for the other sections of the cable. When you've done this on all your cables, use any tape and tightly wrap the cables. This is referred to as cable rounding. Now just look at how much better they look! Now they're easy to conceal and allow more air flow in your case. As for those power wires, go to radio shack and pick up some of that black plastic tubing that has a slit for inserting wires. Next, take out your power supply and get to work on covering all the wires that you'll need with the black tubing. Any other unused wire should be stuffed behind the power supply if possible. I did. If you're careful, you can get away with putting wire behind the motherboard but be careful not to break it. Other good places to hide the wire are inside unused drive bays and along the inside corners of the case. The support beam across the inside of my case is hollow on the other side which made a perfect hiding spot for one of my tubes. Now you should have a much neater case.
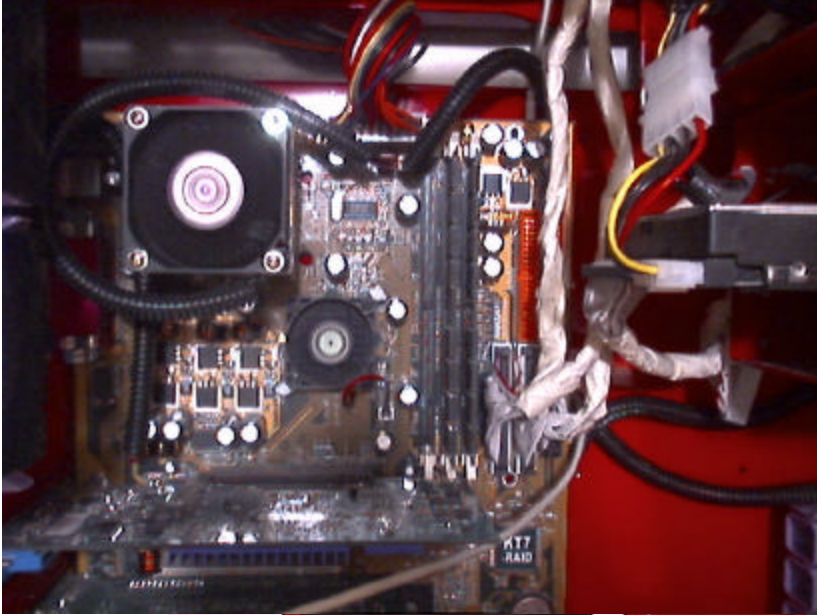
Once all that was done, it was time to really crank it into overdrive and see just how far I could push this thing. Upon entering the BIOS, I went to the menu which controls the clock multipliers. Now, depending on which processor and what multipliers your mobo supports is where things get different. My BIOS has the clock settings listed under the submenu labeled Soft Menu III. Here 5 main things are listed dealing with clock speeds: "Current CPU operating speed", "Multiplier factor" these are listed like X

5.5, X 7, X 8 etc. What this means is that you multiply 100MHz times whatever number comes after the X. For instance, by default, my processor read 1000 MHz as the default and the multiplier factor was X 10. (100MHz X 10 = 1000MHz or 1.0 GHz) As of now, I have it changed to 100 X 13. **<u>DO NOT</u>** set yours this high if its default speed is rated at 1 GHz unless your system is adequately cooled. Also listed in the menu is the CPU FSB/PCI clock. One tells the front side bus speed and the other lists the PCI clock speed. By default, mine read 100/33 MHz and can be pushed all the way up to 155/38 MHz. After that in the menu comes CPU FSB Plus (MHz). Increasing the speed is supported but not guaranteed due to some CPU specs so check up on it before you tinker around. Finally, and very importantly, is the "Speed Error Hold". What this does is essentially lock your system up if you change something that the processor doesn't like. If you set the FSB clock too high, the CPU will freeze up and essentially prevent itself from roasting.

So what comes next? I've got some LED's in the mail!!

[Click here](#) to see what I had to choose from. I got one for the front bottom corner inside the case and one for the back upper corner inside the case. That's it for now. More than

likely I'll be getting a new motherboard and processor around May (for my birthday). AMD just released their Athlon XP 1900+ CPU. It's rated at a little over 1.7 GHz. Why this and not a new Pentium 2.0 GHz? Because A) The AMD is literally HALF as much. B) The speed difference is laughable, and C) AMD processors are great for over clocking. This processor has already been reported to be running stable at around 2.3 GHz! That's without all the extra cooling mind you. Of course, my motherboard wouldn't like a CPU that strong. Right now, I'm leaning towards the Gigabyte GA-7DX. It's only 90 bucks and more than likely something better will be out by May, so nothing is set in stone. I'm almost positive that AMD will break the 2 GHz barrier by then. I'm content with my system right now, however. It screams and I've got the benchmark scores to prove it. Coupled with Windows XP professional, this is the most pleased I've been with a computer since I can remember. The absence of lock ups and errors is simply astounding. This about wraps it up as far as how my current system came to be and I hope you learned a thing or two.

Whether you choose to simply make room for another fan to keep your system cool or go all out to totally re-vamp your computer, remember in the words of Bob Ross, "We don't make mistakes. We have happy accidents." Unless you fry your brand new CPU, you shouldn't worry. If you mess up a cut in the side of the case, so what! Nobody's perfect and it makes your machine a little more unique. Mine is far from perfect but I'm very proud of it because I made it what it is today and no one can change that.

Current system specs

Motherboard: ABIT KT7-A RAID

Processor: AMD 1.0 GHz Athlon Thunderbird over clocked to 1.3 GHz

Case: Black Antec SX840 Mid tower case with Custom AMD logo window.

Speakers: 400 Watt Klipsch (THX certified) Promedia 5.1 audio system.

Monitor: Dell P780 17" Flat screen Trinitron monitor.

Keyboard: Black Keytronic Designer keyboard. You can dump an entire gallon of your liquid of choice onto this thing and it keeps on ticking. It's black, has a cool rubbery membrane too. Is your keyboard guaranteed to last up to 22 million key strokes?

Mouse: Microsoft Intellimouse optical.

Memory: 640 MEGS of Crucial PC-133 RAM. (Hey, DDR Ram is only 8% faster. It's not THAT big of a performance difference. My room mate has a 1.4 GHz T-Bird and 256 MEGS of DDR and his is *BARELY* faster than mine.

Video Card: NVIDIA GeForce3 TI 500 with the core clock @ 260MHz and the memory clock @ 550 MHz. Nothing but the best here!

Soundcard: Sound blaster Audigy Gamer card.

Hard Drive: Well, just recently, my old Quantum Fireball 13 Gig Hdd stopped working and apparently is un-fixable☹. I also have a Western Digital 45 gig Hdd, which runs great aside from an annoying whining sound that only my hard drive has made but it seems that everything is fine so I've ignored it. When both hard drives were in, I took advantage of my motherboard's built in RAID support and had the 2 drives stripped in RAID 0 mode. It was wonderful while it lasted…You're welcome to buy me a new IBM Deskstar drive to make me happy again though.

Optical Drives: Plextor 12/10/32A CD ROM. This baby will cut an 800 MB CD in 12 minutes flat! There are faster drives out there but few of them offer the quality that Plextor offers. It also had Burn Proof technology. I can tell you this, I've gone through almost 150 CDs since I've gotten it and only 1 has been used as a Frisbee. (Hey, I can't help it that the power went out.) The other drive is a Kenwood True-X CD ROM (62X). This thing just smokes. We're talking a transfer rate of up to 9.3 Megs a second!

So that's what all I have. Any questions or comments can be directed to drewlankford@hotmail.com

Thanks for your time!