How To Build A Computer

If you read my first article new systems recommendations and now have several boxes of computer pieces lying on the floor wondering what to do next, you've come to the right place. This article is for you. If, however, you are an old hand and have been building your own computers since Reagan was president, then, feel free to just skim or maybe even pass up this article entirely.

Step One
 Check your stuff

I know, I know. This one sounds obvious, but it's often overlooked. Nothing is more frustrating than being in the middle of building your system only to discover something is missing or broken. This will invariably happen on the weekend when you have everything in the middle of the floor and the place you got it from is closed until Monday. So find your packing slip and make sure you have everything you are supposed to have. Don't overlook the small stuff: manuals, driver disks, and case mounting hardware. Next, check for any obvious physical damage. For instance, the last HSF I received in the mail was damaged. Two of the wires were fused together and the whole thing looked as if it had been in a fire.

Step Two
 Mount major components to the board

Before you begin this step make sure you are grounded. Touching the case chassis is usually sufficient, but a better solution is an anti-static wrist wrap, which you can purchase at Radio Shack for a few dollars. Once you are grounded place the motherboard on an anti-static bag or mat--the one which came with the board will do fine. Next, place the board on a flat hard surface, such as a table. This prevents the board from being overly flexed and breaking a trace. Try to handle the motherboard by the edges. The first component you are going to install is the CPU. This goes in the ZIF socket. If you are unsure where this is located, simply consult the motherboard schematic in the motherboard manual. Raise the lever on the ZIF socket until it sits at 90 degrees, and then check the orientation of the CPU. One side will have fewer pins than the other. Match this with the pin outlay of the socket and carefully insert the CPU into the socket. Do not force it. If it does not go right in, something is wrong. Take it out, re-check the orientation, look for bent pins and try again. When the CPU is firmly in the socket, close the lever and snap it back into place.

Next, attach the HSF. It is usually best to use a screwdriver or a small pair of pliers for attaching the clip to the CPU socket. Be careful not to rock the HSF back and forth or side to side, as you can easily damage the CPU core. Some people use a CPU shim between the CPU and HSF to eliminate this issue. You may have also have heard of people putting a thermal compound on their CPU for better heat transfer from the CPU to the HSF. If you use this be VERY careful. More is not better. If this is the first system you have ever built you are probably better off sticking with the thermal pad that is included on the bottom of most HSFs. When you finish mounting the HSF, make sure to connect it to the motherboard fan header. Again, the exact location of this can be found in your motherboard schematic.

Now we will install the memory. You should usually start with BANK 0. On some boards this is BANK 1, or whichever is the first slot. Note that the memory is keyed so it can only be inserted in one direction. You should hear a click when it is firmly seated. Check to make sure the side clips are also securely in place and in the fully upright position.

Step Three
 Mount Motherboard in case

Place the motherboard in the case and line it up. Make sure that the keyboard and mouse connectors are

facing towards the rear of the case. Remove the Motherboard from the case and insert the brass standoffs that should have come with the case hardware. This part is sort of a trial and error. Screw one or two standoffs into the case and then insert the motherboard. If they line up with the holes in the motherboard then put in a few more. If they don't, remove them and move to a new mounting hole on the bottom of the case. Repeat this operation until you have at least 6 or 8 standoffs in the case--two on each end and two in the middle. A little note here: You might have seen other Motherboards mounted with the plastic standoff, which will work. However, it is difficult to remove a board that has been mounted this way, and often the plastic standoffs break in removal and can't be reused.

Step Four
Hooking stuff up

On the front of the motherboard, at the bottom right-hand side, you will see two small rows of connectors. Your motherboard manual labels these Pin 1 and Pin 2 Headers. These attach to the Small group of leads coming from the power button on the front of the case. Each of these small wires should be labeled. Consult the schematic diagram to determine how these plug into the pin headers. Double-check these connections. It is important that you get this part right. Plug the power connector into the motherboard. You will find this is part of the pig's tail of wires coming from the power supply. This item is keyed, too, so it should only fit in one direction. It also has the largest connector of any of the leads coming from the power supply.

Step Five
Hooking up the hard drive and preparing system for boot

Remove your hard drive from the box and check the position of the jumper at the rear of the drive. It should be set to Master. Take four more screws from your stash and secure the hard drive in the bottom drive cage. Make sure that the end with the connector is facing the back of the computer. Again, if you are unsure consult your manual for a picture. Retrieve a hard drive ribbon cable from your motherboard box. Which one? The wider one. The hard drive uses a 40-pin connector, while the floppy uses a 34-pin connector. Next, open your book and look at the motherboard schematic. Find out which connector is the PRIMARY IDE connector. Also note the direction of PIN 1 on the diagram. Look at your cable closely. Along one edge you should see a faint red stripe. This is the PIN 1 side of the cable. This side must match the PIN 1 designation on the motherboard connector.

Check and see if one end of your forty-pin connector is blue and one is black. If so (most of them are these days), this is an ULTRA DMA 66 ribbon cable. The BLUE end MUST be plugged into the motherboard, and the BLACK end MUST be plugged into your hard drive. If you plug the BLACK end into the motherboard it won't work. If it is not colored as noted, simply plug one end of your cable into the PRIMARY IDE connector, and the other end into the back of your hard drive. Retrieve a power connector from the pig's tail and plug it into the back of the hard drive. If you have performed this operation correctly, the red PIN 1 side of the cable should sit next to a red power wire from the power connector. Take your video card and plug it in to the AGP slot. Usually this is first card connector on the top of the motherboard. (Again), if you are unsure, consult your motherboard schematic in your manual. Firmly tighten a screw at the top of the card where it meets the case.

Step Six
First boot

Check all your connections once again. Also check that all the components you plugged in to the board are secure. Now it is time for first boot. WHY NOW? I still have more components. Shouldn't we install them first? No, and I will tell you why. If first boot is unsuccessful, you want as few components on the board as possible when you start troubleshooting. The more you have installed, the more you have to rule out as potential problems. Plug the cables into the back of the computer. I will assume you know how to do this part--most everyone does. Turn on the power to the monitor, and then to the case. If the machine comes right on, you see a boot screen on the monitor and the system starts a memory check shut it down. All is well. If the

computer does nothing or does something unexpected go to the TROUBLESHOOTING section.

Step Seven
 Finishing it all up

Mount your DVD drive in the first full-sized drive bay at the top of the case. Make sure the jumper is in the master position. Just like the hard drive, attach a second 40-pin ribbon cable to the SECONDARY IDE channel on the motherboard, and the other end to the back of the DVD. Plug in the power connector just as you did with the hard drive. Stop at this point, boot up the system again, and see if it still works. If you should encounter a problem you will know exactly which component is causing it. If it works, continue here. If not, skip down to the TROUBLESHOOTING section.

Mount your floppy. It goes in the half-height drive bay, usually in the middle of the case. After you mount it check that you have an unobstructed path by inserting a floppy in the drive from the front of the case. Next retrieve a 34-pin drive ribbon cable, noting which side is PIN 1. Plug it into the motherboard PIN 1 to PIN 1. Plug the other end into the floppy drive PIN 1 to PIN 1. The floppy drive should have a small 1 on the case to aid you. Plug in a power connector. Note that this connector will have a different end from the poser connector that you plugged into the hard drive and DVD player. Once again stop and try to boot the system. By now you should be familiar with the routine. If it is successful continue here. If not then go to TROUBLESHOOTING.

Install the remaining cards one at a time, checking to make sure the system is still bootable after each card you add. As you are installing the cards note what kind of edge connector they have and plug them into the motherboard on a slot with a similar edge connector. Do not touch cards by the gold colored bottom edge connector that plugs into the motherboard, as this will degrade the electrical connection between the slot connector on the motherboard and your card. Continue this process until all off your cards are installed.

Step Eight
 Post build out

Reboot system and enter the BIOS. This is commonly done by holding down the delete key while the system is booting. Note: This procedure varies on some motherboards. If the delete key doesn't seem to work, consult your motherboard manual for specific information on accessing your BIOS. Since this is a beginner's article, I will suggest you set up your BIOS using SYSTEM DEFAULTS, as a BIOS fine tuning article would take several pages itself, and is far beyond the scope of this article.

Save your settings and reboot to a bootable floppy. From here you may need to FDISK your drive and set up a partition. This is once again beyond the scope of this article, but this information should have been contained with your hard drive. If you are having problems here I suggest you read it. Your next step would be to load an OS. Once you have an OS installed you will want to install your motherboard drivers. They should be located on the CD that came with your motherboard. You are now ready to load your video card driver, your sound card drivers, etc. The last step is loading the rest of the software you plan to use. If you've made it this far, you should now feel a large sense of satisfaction. Be careful, or you will catch the bug!

Step Nine
 Troubleshooting

It has been my experience that if you are having trouble with first boot when you are building a system, it is usually related to one of two things. The first thing is you have plugged something in wrong. Often this will be one of the wires leading to the PIN Headers. Check these first, then check all your other connections using the Motherboard manual as a reference. The second thing to check is to make sure that you don't have a short of some sort between the board and the case. The way to check this is to take the board out of the case and sit a piece of cardboard between it and the case, leaving all things connected. If it boots in this manner

you know you have a short. Replace the standoff screws and paper washers with some new ones, and this should remedy your problem.

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