How to Build Your Own PC

Mark Endsley

-Introduction-

Building a computer can be easy and fun! The benefits include higher quality and a much lower price tag. Even if you have no technical knowledge you can build your own computer. This manual is all you need to be able to find your own parts, and put them together into a functioning machine!

-Warnings-

1. Computers are electrical devices. Never work on a computer while it is plugged in. Doing so could be hazardous to both hardware and you yourself.
2. Many parts are very fragile, especially the processor. Never touch the pins of a processor or the circuitry of any board or card. Keep fingers clear of fans when computer is running.
3. Circuits can be fried by static shock. As a precaution, touch a grounded piece of metal before working on your computer.

-Tools-

A Philips head Screwdriver

Step 1 – Buying the parts

The first step to building your computer is getting the parts. There are two major challenges in this. The first is buying parts for a computer that fits your needs. The second is buying parts that are compatible with one another. We will select our parts with a method that will allow us to easily meet both of these standards. Go in order on a website that sells computer hardware. I recommend Newegg.com .

- Case- The case is what houses all the parts you will be buying. If you are a beginner than you should start with a full sized case. If you are going to want a CD/Blueray drive you should make sure that the case comes with ports for it. If you are building a computer for games it is recommended you get one with fans to keep it cool.

Techreport.com

-Motherboard- The motherboard is where you are going to need to decided what your needs for this computer are. Recommendations are divided into 3 set-ups. A Cheap Computer, A Fast Computer, and a Gaming Computer.

Cheap: FM2 or FM2+ socket, with Sata ports

Fast: LGA 1150 socket, with Sata ports

Gaming: LGA 1150 or AM3+, with Sata ports & at least one PCI-Express 16x

-Processor- Look at processors that match the socket you chose on your motherboard. If the processor you have does not include onboard graphics make sure the motherboard does. i3, i5, i7, and amd A processors have onboard graphics, others may not. Onboard graphics are not necessary for gaming computers.

-Graphics Card- *GAMING BUILD ONLY!* The graphics card is up to you. NVidia 900 series or AMD R series that use a PCI Express 16x slot.

-Power Supply- ATX size.

Cheap or Fast: 400 – 600 watt with a 20+4 connector

Gaming: you want a 500-1000 watt power supply based on power usage. Take into account the power usage of

your processor and graphics card it will be listed under the specifications. You also must make sure you get enough PCI express connectors for the graphics card you bought.
-Hard Drive- The hard drive should be Sata. Get one no less than 200gb 500gb and up recommended. A high definition movie is 1-3gb.

-RAM- Ram is very inexpensive. You will want between 4 and 8 gigabytes of ram of the DDR3 type. You can buy these all in one stick or in two sticks of the same type and size.

-Monitor- The monitor should use a port that either your motherboard or graphics card has. The types modern ports include VGA, DVI, HDMI, and DisplayPort. Keep in mind VGA is slightly lower quality than the other three. For gaming computers the port must be the graphics card, you cannot plug a monitor into the motherboard if you have a graphics card.

-Sata Cables- Most motherboards come with Sata cables. If yours doesn't make sure you buy at least 1.

-Thermal Grease- Most processors come with thermal grease pre applied. Check your processor to make sure it does. It is also called Thermal paste. If it does not come pre applied you will need to buy some.

-Keyboard and Mouse- Keyboards and mice come in a wide variety. Any of those that use USB ports will due.

-Other Parts- Optional parts include SSD (solid state drive), CD/Blu-ray drive, extra fans, lights, wi fi card, and several others. If you get any of these make sure your power supply and motherboard has the right ports.

To make the part selection process easier use a website called PCpartpicker.com there are lists of parts that are compatible and you can order them all at the same time.

Step 2 – Setting up your work area

Having a good workspace is essential for the building process. The best set up is a large table. If one is not available building a computer on a cheap bed is also acceptable. As a last resort you can build it on the floor, but this is not recommended. If you do make sure you shut doors or make sure not animals or children are around.

The workspace should be free of dirt, dust and clutter. Unbox all of your hardware and set it carefully in a safe place. Now open up the case and lay it on its side.

Step 3 – Installing the Power Supply

Remove the power supply from its packaging. Insert it into the case with the receptacle side in the opening on the back of the case. Make sure the interior fan is pointed towards the inside of the case. Whether it is on the bottom or on the back.

Figure 1 –Rear view-

Figure 2 –Front view-

Use 4 Philips screws to mount the power supply in place. Tighten the screws snug, and move any cables coming off of the power supply out of the way.

Step 4 – Installing Back Plate

In the box for your motherboard you will find a custom back plate for your motherboard. Before you insert the motherboard the first thing you must do is insert this plate. The case you have might come with a plate in that slot, if so remove it. Now from the interior of the case lay your motherboard with the ports laying in the empty box in the back.

This is how your motherboard will eventually rest in your case. Match the orientation of the back plate to match the shapes and sizes of the ports. Remove the motherboard. Now *from the inside* insert the back plate. You may need to push hard to snap it into place. Insert the motherboard and make sure that the ports will fit into place. The rear of the case should look like figure 3.

Figure 3

Once you have confirmed the motherboard will fit correctly into the back plate remove the motherboard and set it aside in a safe place.

Step 5 - Seating the Processor to the Motherboard

At this point we will want to install place the processor into the motherboard. Carefully remove the processor from its packaging. *DO NOT* touch the pins of the processor. Open the door on the processor slot of the motherboard (not all slots will have a door). Remove the black insert from the slot. Match the corners of the processor with those of the slot.

Figure 4 **Tomshardware.com**

Now gently lay the processor into the slot. After the processor is seated close the door and pull the arm of the slot to the down position. After this step is completed the motherboard should look similar to figure 5 with or without the door.

Figure 5 **Tomshardware.com**

Step 6 – Attaching the Cooler to the Processor

-AMD-

The AMD cooler comes with your processor. Apply a pea sized amount of thermal paste to your processor *IF THERMAL PASTE IS NOT PRE-APPLIED*. Lower the cooler onto the processor with the arms of the cooler lining up with the arms of the motherboard on the plastic brace. Gently set the cooler on the motherboard, and attach

the arms of the cooler to the arms of the plastic bracket. Then pull the levers on the cooler until the cooler is held tight to the motherboard.

-Intel-

To Intel cooler comes with your processor. Apply a pea sized amount of thermal paste to your processor *IF THERMAL PASTE IS NOT PRE-APPLIED*. Lower the cooler onto the processor with the four pushpins lined up. Push the pins through the holes in the motherboard. Now pull the lever on top of each pin until the cooler is held tight to the motherboard

-General-

Take the small connector coming from the fan on the cooler. Find the pins on the motherboard labeled “CPU FAN”. Carefully connect the pins.

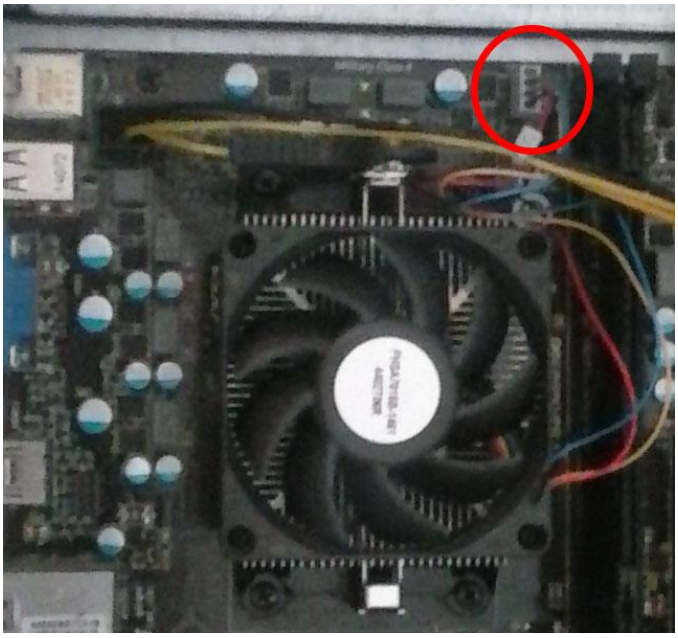


Figure 6

Step 7 – Installing the Hard Drive(s)

Different cases have many different slots for both large and small hard drives. Locate the slot you wish to use. Slide the hard drive in. Make sure the connectors on the rear of the drive is oriented in a way that a Sata cable can be connected to it. Take four Philips screws included with the drive and screw them through the slot into the holes in the drive.

You will may need to take off the other side of the case to access the other two holes on the other side of the slot, depending on the location of your chosen slot.

Step 8 – Prepare the case for the Motherboard

Take the motherboard standoff that came with your motherboard. Insert one into each screw hole in the case that will be covered by the motherboard. Be sure they are oriented so the motherboard can be screwed into them once it is set on top.

Move any cables or wires from the power supply and the case to where they hang over the case and out of the way. Be sure the case is clear of any obstructions.

Step 9 – Insert the Motherboard

Lower the motherboard into the case to where the ports line up with the back plate. Carefully push the ports into the back plate. The holes in the motherboard should now match the standoffs.

Insert 1 Phillips screw into each hole on the motherboard. Be sure to examine the board carefully to ensure all screws are inserted.

Holding the motherboard, carefully lift the case up to ensure the motherboard is held on securely. Once it is secured you can lay the case back down on the table.

Step 9 – Installing Ram

Remove stick(s) of Ram from the packaging. Line up each stick over the slot on the motherboard. Slots are shown in figure 7.

Figure 7

Ensure that the indents in the connectors on the ram line up with the tabs in the slot. Lower the sticks of ram into the slots and push them down evenly until the arms clamp down on both sides of the stick of ram.

Step 10 – Installing Graphics Card (optional)

To install a graphics card onto your motherboard first remove the graphics card from its packaging. Locate the PCI Express x16 port under the processor on the motherboard.

Look for an arm on the end of the port furthest from the back of the case. If there is an arm open it so the card can be inserted. With a Philips screwdriver remove the case plate from the back of the case that corresponds to the PCI Express x16 port. Gently insert the card into the port. It is important the card slides all the way into the slot.

Now use the Philips screw from the removed case plate to secure the graphics card to the back of the case.

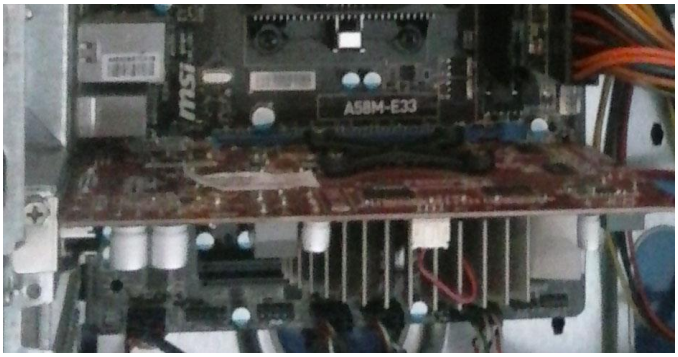


Figure 8

Step 11 – Connecting the Power Supply to the Motherboard

The power supply has a 20+4 connector. It appears as it does in figure 9.

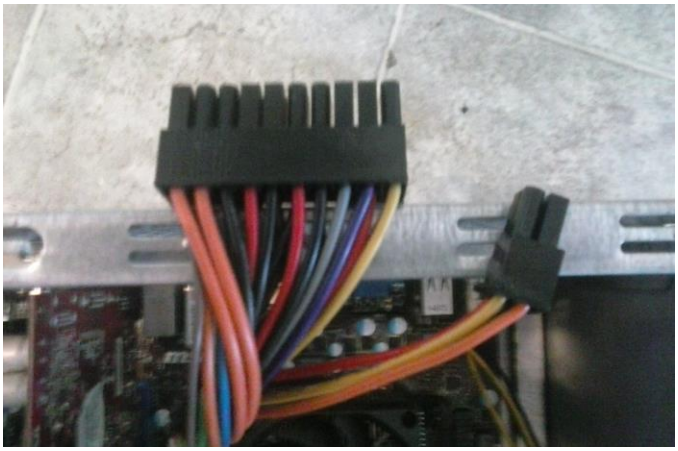


Figure 9

The 4 pin connector can be snapped on to the side of the 20 pin connector in the event you have a 24 pin motherboard. If you have a 20 pin motherboard the 4 pin connector should be put to the side for now. This is known as the main power connector.

Line up the main power connector with the main power port on the motherboard as shown in figure 9.

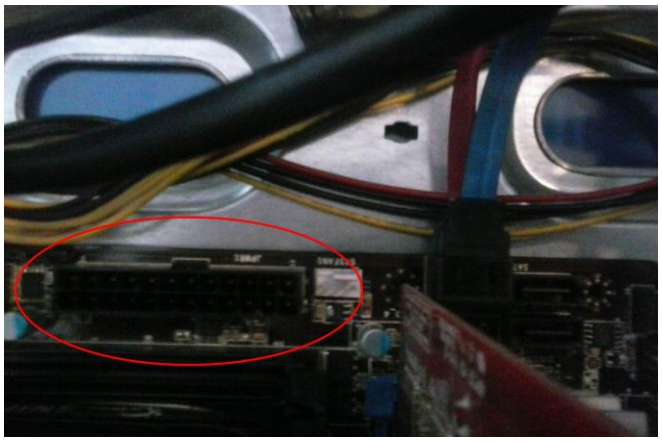


Figure 10

There will be one or two more power slots that require four pin connectors on your motherboard. There is an example of one in figure 11.

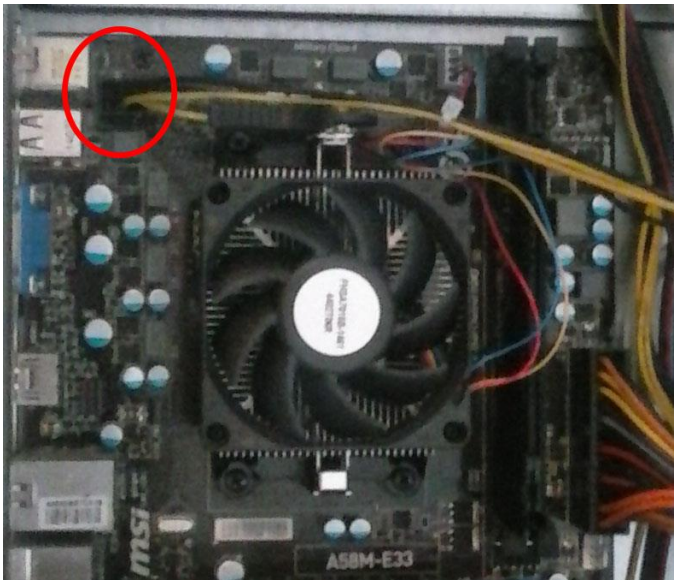


Figure 11

Connect each 4 pin connector that is required to the motherboard.

Step 12 – Connect the Power Supply to the Hard Drive(s)

Now connect hard drive(s) to the power supply with the Sata power connectors. The connectors need to be lined up perfectly to fit in correctly. Try to direct the cable(s) to the hard drive(s) in such a way that they will be out of the way.

Step 13 – Connect the Hard Drive(s) to the Motherboard

Remove the Sata cable(s) from their packaging. Each cable has two sides which are interchangeable. The port on the back of the hard drive is the same as the port on the motherboard. Connect one side of the Sata cable to the back of the hard drive. Then examine the motherboard to find the Sata port labeled “Sata 1”.

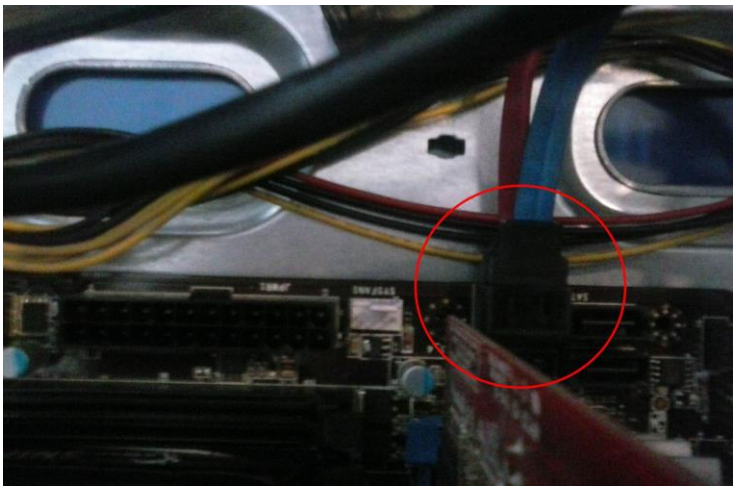


Figure 12

For each remaining Hard drive connect it to the board in Sata slot 2, 3 etc.

Step 14 – Connect the Case to the Motherboard

You will need to consult the instruction manual for your individual case and motherboard in this step. In these manuals there are designations. The case manual will have the definition for the numbers written on the case connectors. Match the definition for the case connectors to the ones for the motherboard pins in the motherboard manual. Connect the connectors accordingly. Motherboard pins can be seen in figure 12.

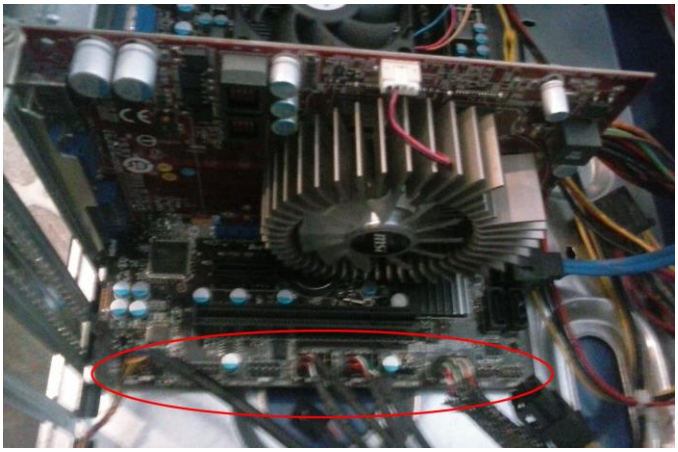


Figure 13

Please note that not all pins will have a connector, and it is possible that not all connectors will have a pin.

Step 15 – Connect DVD/Blu-ray Drives to the Power Supply and Motherboard (optional)

To insert a DVD/Blu-ray drive you may need to remove the plastic decorative piece from your case. This piece simply snaps off when pressure is applied. Some cases alternatively may have doors that will allow access.

Insert the drive into the front of the case in the large slots depicted in figure 14

Figure 14

Just as with the hard drive insert four Philips screws, two on each side of the drive. Now connect the Sata power connector and Sata data cable into the back of the drive. Connect the data cable into a Sata port on the motherboard. Reinstall the front of the case.

Step 16 – Connect the Graphics card to the Power Supply (optional)

While this is an optional step a computer with a graphics card will not function if the card is not powered.

Some graphics cards will require extra power from your power supply. Some require a 4 pin power connector, some require a 6 pin power connector, some contain an 8 pin power connector, and some require no power at all.

Please note that two 4 pin connectors can serve as one 8 pin connector.

Step 17 – Installing Fans (optional)

Some cases come with extra fans already installed. If not it is easy to install extra fans into various places in the case. Find an open fan slot and insert 4 long screws (included) through the holes in the case and the fan.

Each fan has a two ways of being connected.

The 2, 3 or 4 pin connector can be connected to the motherboard. Examine the motherboard to find connectors with the label “SYS FAN”.

Note that lower pins connectors can be connected to higher pin ports.

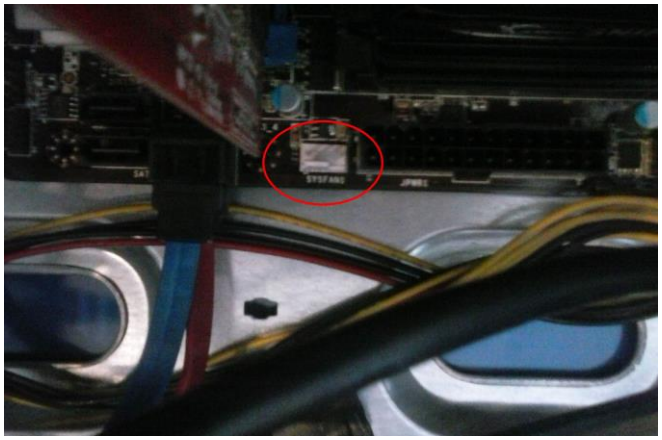


Figure 15

An IDE power adapter (included with fans) can be used to connect the fan directly to the power supply. The IDE connector has four large pins.

Please note that if you do connect the fans directly to the power source you will have no way of controlling the fan speed. The fans will run at full speed while the computer is powered on

Step 18 – Installing a Wi-Fi Card (optional)

Locate an open PCI port near the bottom of the motherboard. With a Philips screwdriver remove the case plate from the back of the case that corresponds to the PCI port. Gently insert the card into the port. It is important the card slides all the way into the slot. Attach the card to the case with a Philips screw.

Step 19 – Connecting Peripherals to the Motherboard.

Connect the monitor to the corresponding port on either the motherboard or the graphics card if one is present.

Connect the keyboard and mouse into usb ports on the back of the motherboard.

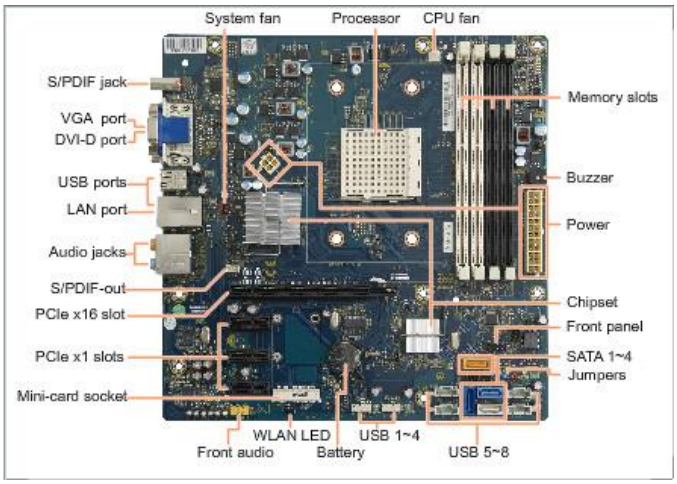
Step 20 – Test your computer.

Put any removed covers back on the case and attach them with Philips screw if necessary. Plug the power cable into the power supply on the back of the case. Switch the power supply switch to the on position.

Hold the power button on the front of the case for one second and release it. Watch the monitor, you should see it come on and display the manufacturer of your motherboard.

If it does Congratulations! Your computer is alive! You will now be able to install an operating system of your choice (not covered in this manual). Listed motherboards are able to run Windows and Linux based operating systems.

-Motherboard Diagram-



Desktop943.rssing.com

-Troubleshooting-

Problem: The computer will not power on at all.

1. Check to make sure the source it is plugged into is receiving power.
2. Be sure the switch on the power supply is toggled to the on position
3. Check to make sure all power ports on the motherboard are plugged into the power supply. Push in carefully to make sure they have snapped in.
4. Check the pins the case is connected to. Ensure that the power switch is on the right pins and that it is connected securely. You can test the switch by putting your screwdriver across the pins your power switch uses.

Problem: The computer power on, but makes loud beeping noises and gives me a warning message on my monitor.

1. Ensure that the power supply is in the correct power mode. Most computers use the lower setting, but check your manual to make sure.
2. Check to make sure all power ports on the motherboard are plugged into the power supply. Push in carefully to make sure they have snapped in.
3. Check all other connections to ensure they are in the right place.
4. Contact your motherboard manufacturer with the exact error message.

Works Cited

"Step 10: Build The Platform (CPU, Cooler, And DRAM) - How To Build A PC: From Component Selection To Installation." *Tom's Hardware*. N.p., 23 June 2014. Web. 17 Feb. 2016.

"Corsair's Obsidian Series 650D Enclosure." *The Tech Report*. N.p., 19 May 2011. Web. 17 Feb. 2016.

"All Desktop Software and How To Questions Posts." *All Desktop Software and How To Questions Posts*. N.p., 08 Aug. 2015. Web. 17 Feb. 2016.