

Hardware

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1 Introduction

Knowing your machine's hardware is just good practice. You should know the basic terminology, what parts look like, be able to exchange them, the whole shebang. In this document, we will cover the basic parts of a computer, what they look like, and how you use them.

2 Vocabulary

When somebody talks about a "box", they're referring to a computer. The plural of this is "boxen". A computer is NOT: mouse, keyboard, monitor, flash drive, printer, camera...etc. These are the peripherals that interact with your computer to provide a richer experience for the user (how would you like using your computer without a keyboard? Didn't think so).

3 Components

3.1 Integral parts of your computer

3.1.1 Chips, Power, and Cooling

- Motherboard. Otherwise known as a "mobo", it's a large slab of silicon with things stuck on it. All of the components hook into the motherboard in one way or another, and if your motherboard breaks, then you're not in a good position.
- CPU (Central Processing Unit). This is also called the processor. This is pretty much the brain of your computer, where all of the calculations are made. Fast. The "clock speed" is how many calculations the processor can perform each second: a 2 gigahertz (GHz) processor can make 2,000,000,000 calculations every second.
- Your processor is covered by a large piece of metal to siphon off excess heat, and help keep the processor from overheating. This is known as the heatsink. On top of this is a fan, also helping to remove the heat from the processor.
- Fans. Your computer has one or more fans for circulating air; these are an integral part of the cooling system. The air that the fan pushes out the back holds a lot of heat. Thus, by removing this heat, your computer will stay cool and function at normal temperature.

- **Power Supply Unit (PSU):** The computer is powered by a power supply, which converts the electricity from your wall (AC) into something your computer can use (DC). This small box has a place for a wall connection, an additional air outlet built in, and a whole mass of cables coming out of the other end. The lines are red, yellow, and green, and the biggest bundle goes to the motherboard. The end is made of whitish-clear plastic and plugs into a matching socket on the motherboard. To remove it, you may need to lift a little plastic tab on the side. Or you might not. The rest of these wires connect to your hard drives, CD/DVD drives, and floppy drives to provide power to them.

3.1.2 Buses

- **RAM:** You also have several long slots (there are usually two or four). At least one of these slots has a long rectangle inserted into it. This is your RAM (random access memory), and each one is called a stick. Nowadays a gig of ram is about standard. You can increase your memory by buying another stick thereof; just make sure that you buy the right type to fit into your board. Usually, they push in and are removed by pushing on the pads to either side. Memory is used for storing information temporarily while it is being used, so more memory can be useful for making certain games faster, although the effect lessens beyond a certain point. There is also a kind of "pretend ram" that is stored on disk; see swap.
- **PCI:** There are several buses on your motherboard. First of all, unless your box is really ancient you have PCI card slots down the back, probably four or five of them. These are used to connect modules to your computer. These are the kind of modules you rarely change: NICs, sound, graphics, etc. (If you don't know those, skip down to the next section where they are described.) You may need a screwdriver to install these because you have to remove a small metal panel covering the opening of each slot, and you need to screw in your new PCI card. Disregard the previous statement if you have a "screwless" computer design, meaning that you don't need any screws to secure parts onto your computer.
- **USB:** The next bus type is USB (Universal Serial Bus). This is designed to be hot swappable. You can take things out and plug them in again to your heart's content. Most modern computers have four or six USB ports on them: four in the back and two in the front is one of the most common setups. There are two USB standards (so far): USB 1.1 and USB 2.0. It's backwards and forwards compatible, but 2.0 capable devices can be faster on a 2.0 bus. USB is designed for just about everything: the most common uses that are standardized are power, mass storage (external drives or flash drives), cameras, and printers. USB 3.0 is just at the beginning of its life, showing that it can transfer up to 4.8 Gbit/s. This standard has yet to be fully designed and approved.
- **AGP:** There may be one AGP slot. It is located just above the PCI slots, and it is for graphics cards. Only graphics cards. But it's better to use an AGP graphics card than a PCI one. To remove an AGP card, you must push a small tab located at one end of the slot, near the board, to the side. Many motherboards today don't come with an AGP slot, as this standard has been replaced by PCIe.

3.1.3 Drives

- Disk Drives: Disk drives connect to your motherboard. There's more than one possible bus that the disks could use, and these are explained in this section, along with lots of other useful information. With the most common type, each drive has two connections: one is a power cable that comes from the power supply, and one is for data read/write.
- CD/DVD Drives: I know you have one of these. If you don't, then Linux installation is a little bit trickier, but by no means impossible; there are many other ways. We recommend that you buy a drive or get someone to help you out. This has a little tray (unless this is a newer Mac) that shoots out, and isn't a cup holder.
- Floppy drive: this is the first thing you might not have. Most computers sold after 2005 or 2006 no longer come with floppy drives. Anyway, floppy disks have come in three different formats throughout the ages. From oldest to newest, they are 8", 5.25", and 3.5" floppies. These disks work by recording data onto a thin magnetic film. The latest generation of floppies was able to hold up to 1.44 MB, which is now a minuscule amount of storage.

3.2 Cards

- Sound Card: It plays sound. It is almost always integrated nowadays, but didn't used to be. Yes, it used to be that sound was only for high-end boxes. You might still want one of these, however. For one thing, a good sound card can do a lot more than an input and an output: you could have MIDI ports (for keyboards and such. Oh, sorry. Music keyboards, not typing keyboards.) or multiple sound inputs, or better quality, or whatever. But I don't.
- Modem Card: I don't have one on any computer I use (except my laptop, which has one built in) and I don't really know how to use one. Never tried. But I do know that they work and can be used for networking to your home, dial-up or whatever. I've just never done it.
- NIC: Stands for Network Interface Card. Never say NIC card; that's like ATM machine. Bad. NICs are for networking; you have one. These connect you with the other computers on your network, along with the internet, so you don't have to read those book things.

3.3 Integration

Something you should know: Integrated hardware. Recent motherboards always integrate a lot of these things. You probably have an integrated graphics card, and I'm certain you have an integrated NIC and sound card. Of course, this is assuming you aren't using that old box from '98. You don't ever have to use integrated hardware. In fact, it may become a good idea not to, since oftentimes integrated graphics cards are complete and utter rubbish. They age, too. Your NIC may not be gigabit, in which case you'd want to add a NIC on PCI if you were to set up a gigabit network at home.

3.3.1 Ports

Connectors are either male or female. Female connectors have holes, males have the pins that go to the holes, if you couldn't figure that out.

- USB: See previous section.
- VGA: For graphics. Really old. Generally has blue plastic on the female connector. Pretty large, it has two screw holes on either side of the female connector for to securely attach the cable. There are three rows of pins, totaling fifteen, arranged in a D-shape. Practically every monitor in the world used this connector a while ago. (Except a really old Mac I picked up, a Performa 6115. It didn't use the connector Apple used, that would be too easy. By the way, Apple doesn't use those connectors any more. If you have an old Mac, you know the ones I mean. And if you don't, you don't care. But this connector was special: only three models had it. It was never used again, but I had to order a special adapter from some place in Georgia because the adapter sold with every one of these Macs didn't come into my possession. Grrr.) But most monitors still use VGA: your non-Apple laptop has a VGA connector in the back, your graphics card almost certainly has a VGA out (although it may also have others), some TVs have them (the ones with every input type under the sun)... Yeah. There were some "mini-VGA" ports on Macs (laptops), but you probably don't have one.
- DVI: What you have if you don't have VGA. DVI was developed in 1999 (VGA's from '86). This was mainly to deal with some problems from using VGA, intended for analog, with new flatscreens with discrete pixels. So the DVI standard is better for digital transmission of data. Some graphics cards have only DVI, some have DVI in addition to VGA, there are converters for DVI-to-VGA... Apple laptops have mini-DVI, and Apple computers use DVI (I think. I don't own Apples other than that Performa, so feel free to correct me.).
- Serial: This you may not have. Newer laptops don't. It used to be very heavily used, but it is one of the ports USB was designed to replace (which it has). Exact same shape as VGA, but only two rows of pins this time. For instance, the Lego Mindstorms infrared tower is serial. Modem/networking used to be done with serial. (Modems actually are serial. Windows (er.. DOS) calls serial lines COM ports. Console lines are serial (That probably doesn't mean anything to you, though. Maybe I'll discuss it in consoles if I ever do it myself.). You can install Linux over a serial line (one of the myriad alternatives to CD-based, but not one I recommend). And most extra peripherals, the ones that would use USB nowadays, used serial. (Like the Mindstorms tower.) Actually, serial connections are also probably the best things to use if you make your own piece of hardware, too. Easy to program with. There are serial mice, too. I've seen two of them. Ever. Oh, one other thing: the connector on your box is male, which is the opposite of every other connector there. Go figure.
- Parallel: Another one you might not have. This one's like a serial port, but longer. Let me go count the pins... All right, I'm back. Twenty-five pins in two rows, several inches long. This one

was used for printers. There's usually only one (which made it complicated, although possible, if you had more than one printer: this is one reason USB is better). I also had a toy with semi-programmable chips, and the programmer-esque thing used a parallel port. It was really annoying, since the printer occupied that port and I'd have to unplug it any time I wanted to use this thing. Why do products have such stupid designs?

- Game port: Again, not used anymore. It was for joysticks and game pads. Sometimes this would be integrated onto the sound card. Say hello, USB.
- MIDI port: Generally not on boxes. If you want it, get a mixer or a sound card that has one on it. The CSL has a few of these cards.
- Ethernet: 10BaseT, Fast Ethernet, something else BaseT... These are all different protocols. Today, all of them usually run on a form of unshielded twisted-pair cabling called Cat5 (or Cat5e or Cat6, if you use gigabit networking). The cabling is distinctive: everyone calls the terminator RJ45, even though it's not (RJ45 is an obscure telephone cable terminator that isn't used anymore and looks similar). It's clear plastic, rectangular with several contacts (six) on one side, and a plastic tab on the other. Press it to remove the cable from its socket. Read about making the cables over at ethernet cables. One last type of networking is *fiber*, which uses two fiber optic cables to relay your information.

3.4 Peripherals

These are all the things you plug into your computer. Chief among them being keyboard, mouse and monitor. You don't actually need these for a functioning machine. Running a box without keyboard mouse or monitor is called running it headless; you can still connect from the network, and I have taken machines to corners and removed these three after installation before. Even if you don't have a limited number of keyboards, monitors, and mice, you have a limited amount of space. It's good to have a single workspace, trust me.

- Speakers. Blasting techno is really fun, so I'd have speakers on a box if you can.
- Printer. Linux has a wonderful printing system called CUPS (Common UNIX Printing System). I run CUPS and print from a printer attached to the family computer upstairs, which runs Windows. Works perfectly, and the rest of my family is happy.
- Video card. Linux can run very well as... well, as a Tivo. But better. Get a cable feed or other video type, and there you go.
- Camera: Not required at all. You can get a digital camera and connect it via USB, or a webcam.

Thank you for taking your time to read through this document. We hope you got lots of valuable information out of your time. If you would like something to be improved in this, please email me at trepetsk@gmail.com.

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