Disassembling A Computer

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Objective: to learn the components of a computer system and how they are connected.

1. Open the case. Some cases have screws on the rear. If so, remove the screws that hold the cover to the case. For other case designs, study the case to figure out the appropriate way to open it.
2. Find the power supply. It is normally a rectangular box attached to the rear of the case, and it contains a fan. (There may also be other fans in the computer.) Look for the bundle of red, yellow and black wires coming out of the power supply. These provide power to the motherboard and the storage devices (disk, and sometimes tape, drives).
3. Disconnect the power cables from the storage devices. Connector type is changing, so your connectors may not be as (a) and (b) below describe.
   a. The larger connectors are about 1” wide. Put your thumb and forefinger on opposite sides, and pull one out while rocking it a bit.
   b. Look at the connector end. Notice the “D” shape, so that it cannot be inserted incorrectly. Remove all of the “D” connectors from the drives.
4. Remove the audio cable from the optical (CD- or DVD-ROM) drive. Be sure to press down on the latch on the connector before pulling it out.
5. Find the power cable to the motherboard. Squeeze the latch and pull it out.
6. Note the several ribbon cables. Most of these carry data between the processor and the drives. (Newer computers use narrower serial cables with SATA drives.) Note that each ribbon has a colored edge, which denotes the “pin 1” edge. It is important when reinserting a ribbon cable connector that the pin 1 edge go to the correct side, because some connectors can be inserted backwards. A backwards connector will do no harm, but its disk drive will not work properly until the error is corrected.
7. Remove all ribbon-cable connectors from the drives.
8. Remove the DVD-ROM drive, the uppermost drive, by bending the green “rails” inward and then pulling back.
9. Inspect the drive.
   a. Note the legend, perhaps stamped into the metal cover, that tells what all the connectors are.
   b. Note the jumper shorting two pins. This jumper tells the computer how to tell which drive this is. “CS” means cable select—the cable is wired to decide which drive is which. When there are two drives on a cable, either use “CS” or designate one drive as “master” and the other as “slave” by setting the jumper accordingly.
   c. Note the power connector and the data connector. Pin 1 on the data connector is always adjacent to the power connector.
10. The next drive is the hard drive. Be careful—it's heavier and more fragile than the other drives. This drive stores the software and most of the data on the computer. Because it stores them as magnetism, it will hold the data even when power is turned off—we say it is *non-volatile* storage. It is called *hard* because the rotating platters inside are stiff, not flexible.
    a. Carefully remove the drive.

   b. Once again, note the legend and the jumper.
   c. How many megabytes or gigabytes can this disk store?

11. Remove the mechanism that holds the add-in card(s) in. With some computer cases, each card has a single screw; other cases have an easy-release mechanism instead.
    a. Remove the video adapter. Note that its connector is different than the other cards that may be in nearby slots. That's because data needs to get into the video adapter faster than is needed for most other adapters.
    b. Note the 15-pin video connector. That's where the monitor gets connected.
    c. Note the heat sink on the video processor chip. It acts as a radiator to remove excess heat from the video processor.
12. Look for the large heat sink , which looks like a radiator. It removes heat from the central processor. The CPU (central processing unit) is on the motherboard, under the heat sink. Many computers have a fan to blow air through the CPU heat sink to help keep the CPU cooler. Most computers have the fan mounted on the heat sink. This computer has a separate fan mounted on the back panel of the computer case, and the green cover helps force the air through the heat sink.
13. Look for two or more parallel slots, located away from the expansion slots; at least one should have a long, thin circuit card in it. These are your RAM memory slots. RAM Memory holds the running programs and data; it is volatile: it loses its data when power is removed.
    a. Pull outward (away from the RAM memory card) on the latches at either end of the memory card. That should pull the card out of the socket.
    b. Note the number chips on each side of the card, which is known as a DIMM (dual, in-line memory module). The nine chips mean 8 data bits and one bit for parity, which is used for error detection. An 8-chip card has no parity feature; a 12-chip card has ECC (error-correcting code) memory.
14. Note the white *expansion slots*. One important reason for the success of the PC design is its ability to be expanded as new technologies become available. Many of the ports on the rear of the motherboard were found only on expansion cards in older PC's.
15. Note the sockets, or ports, on the rear of the case. This machine may have a printer port, serial (RS-232) ports, mouse and keyboard ports, Ethernet network port, USB (universal serial bus) ports, and three audio ports. Also look for firewire ports; you may find them on an expansion card.

Reassembling the Computer

1. Look for two parallel slots, perpendicular to the expansion slots. These are your RAM memory slots.
   a. Find the DIMM memory card.
   b. Insert the DIMM into a memory slot. It can go only one way. As you push it in, the retainers at each end should rotate inward, grabbing the edge of the card to keep it from falling out.
2. Find the video adapter card. It has a smaller heat sink on it.
   a. Line up the video adapter with its connector. Note that its connector is different than the other ones that are near it on the motherboard. Push the adapter in until it snaps into the green clip that surrounds its motherboard connector.
   b. Insert any other adapter cards.
   c. Check that the RF shields have not fallen out of position from the back panel.
   d. Fasten the add-in card(s) and RF shields in place.

3. Find the hard drive. Be careful—it's heavier and more fragile than the other drives.
   a. Orient the drive so the connectors are to the rear and the 4-pin power connector is toward the right. Note the power connector (4 large pins) and the data connector(39 pins). Pin 1 on the data connector is always adjacent to the power connector.
   b. Slide the drive into the upper position in the bottom drive cage. It should click into place.
4. Find the DVD-ROM drive.
   a. Note the legend, perhaps stamped into the metal cover, that tells what all the connectors are.
   b. Note the connectors and jumpers, just as on the hard and Zip drives.
   c. Insert the DVD-ROM drive into the upper slot in the upper cage.
5. Note the several ribbon cables. Most of these carry data between the processor and the drives. Note that each ribbon has a colored edge, which denotes the “pin 1” edge. It is important when reinserting a ribbon cable connector that the pin 1 edge go to the correct side, because some connectors can be inserted backwards. A backwards connector will do no harm, but its disk drive will not work properly until the error is corrected.
6. There are two wide ribbon cables. These are for the remaining drives. Make sure the striped edge is toward the power connector. Plug both connectors into the drives. If it won't reach both drives, try reversing which drive the connectors are going to.
7. Connect either connector on the remaining wide ribbon cable to the connector on the DVD-ROM drive. Make sure that the striped edge is toward the power connector.
8. Find the power supply. It is normally a rectangular box attached to the rear of the case, and it contains a fan. (There may also be other fans in the computer.) Look for the bundle of red, yellow and black wires coming out of the power supply. These provide power to the motherboard and the storage devices (disk, and sometimes tape, drives).
   a. Plug the largest power connector into the matching connector on the motherboard. It should click into place.
   b. Plug the remaining power connectors to the drives. They can be inserted only one way. It doesn't matter which connector goes to which drive, as long as connectors reach all drives. Make sure that they are fully seated.
9. Find the audio cable. Plug its connector into the audio port on the DVD-ROM drive. There is only one place and one way that it will fit.
10. You may now close the case.