

Wall Warts with Black Leads - Which One is Hot?

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When it comes to Arduinos, a "Wall Wart" does two functions: 1) it converts Alternating Current (AC) into Direct Current (DC); and 2) It changes the voltage from 110 Volts to something lower. An Arduino needs Direct Current and a voltage between 7 and 12 volts to run properly, so when buying a "Wall Wart" you need to make sure the output parameters are in that range (I usually get one that outputs 9 Volts, because they are pretty common). It also needs to be able to supply at least 200 milliamps of power, but almost all of them can do at least that much. But after cutting off the barrel connector, sometimes instead of having a red wire (Positive voltage) and a black wire (Ground), they have two black wires. How do we know which wire is which, because if we get it wrong, we will fry our Arduino?

I know it's tempting, but don't plug the wall wart into the wall just yet. After cutting off the connector and stripping back the outside insulation, you will need to use a voltmeter (sometimes called a VOM for "Volt-Ohm Meter", because most can measure both voltage and resistance) to determine the polarity of the wires. So, strip off about 1/4 to 1/2" inch of insulation from each wire.

Below is a photo of my Voltmeter. You can get them from just about any hardware store, Amazon or Harbor Freight for \$15-20. They come with a red probe that should be plugged into the Input jack of the meter, and a black probe which should be plugged into the "COM" jack ("COM" stands for "Common", but you can also think of it as "Ground" when working with direct current). Such a meter can do a lot of different things, usually by rotating the knob. We expect that the output of our wall wart will be somewhere around 7-12 volts, so on my meter I rotate the knob to the closest setting which is just above that range, the 20V setting for direct current (some meters use a battery symbol for the settings for Direct Current); other meters may have different range settings (NOTE: if you see a setting with a "tilde" (~) that indicates the meter will be measuring Alternating Current and you don't want that). But before testing the wall wart, get a battery and touch the black lead to the battery end marked with the minus sign, and the red lead to the plus sign. If you are testing a standard AA, D or 9V battery and you have done everything correctly, the meter should read 1.5V or 9V if you are testing a battery for a 9V device; but if you inadvertently touched the leads to the wrong ends, a minus voltage will display.

Now for the wall wart. To be absolutely safe, separate the ends by 3-4" and tape them to a piece of wood, or some other non-conducting material, before plugging the wall wart into the wall. Then plug it in and touch the black and red leads to the bare wires. If the voltage display is positive, then the wire you are touching with the red lead is the positive voltage wire. If the voltage reads negative, swap the test leads and this time red lead should read positive, and again, the black lead will be touching the ground. Attach the ground wire to the GND pin of the Arduino (there are two GND pins on an Arduino, and either one will work), and the other wire to the VIN (Voltage INput) of the Arduino.



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