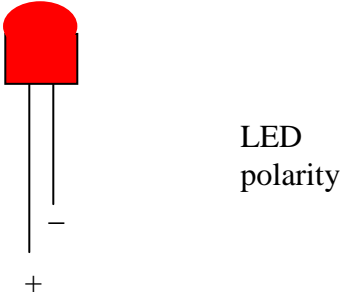


**LED Wiring Notes**  
**Hyperdyne Labs**  
<http://www.hyperdynelabs.com>

Wiring up LEDs to a battery:

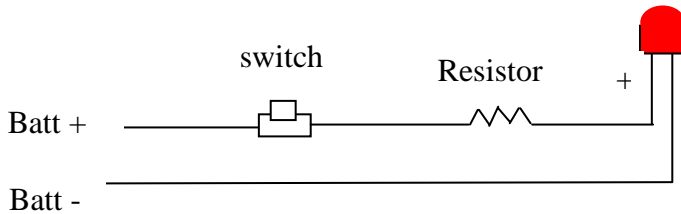
Leds have polarity, one positive leg and one negative leg. The longer leg on the LED is typically the positive (+) leg.



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Hooking up one LED to a battery:

Here all you need is a battery, on/off switch, one resistor, and the LED.



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The resistor value you should use is based on the battery voltage and the color of the LED you are using. Here is a table to help choose the correct resistor (**NA** means the LEDs will not light):

Battery	Red	Green	Yellow	White	Blue
3V	<b>51 Ω</b>	<b>33 Ω</b>	<b>33 Ω</b>	<b>NA</b>	<b>NA</b>
5V	<b>150 Ω</b>	<b>120 Ω</b>	<b>120 Ω</b>	<b>51 Ω</b>	<b>51 Ω</b>
9V	<b>330 Ω</b>	<b>275 Ω</b>	<b>275 Ω</b>	<b>220 Ω</b>	<b>220 Ω</b>

If you want to compute the resistor value yourself, an easy formula is the following:

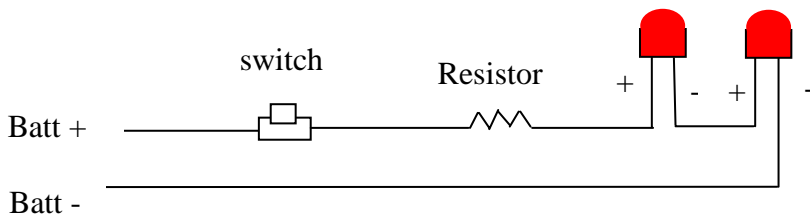
$$\text{Resistor value} = (\text{battery voltage} - \text{LED forward voltage}) * 50 \Omega$$

The battery voltage is self explanatory, and the LED forward voltage is the voltage needed to turn on the LED. Typical values are 1.8V for red LEDs, 2.1V for green LEDs, 3V for blue LEDs, etc. The LED packaging (particularly if you get them at Radio Shack) should list this value as “Vf”.

Hooking up 2 LEDs to a battery:

There are 2 ways to do this. The first is “series”, where 2 LEDs are wired inline with each other. You can do this if your battery voltage is high enough to turn on all the LEDs.

SERIES

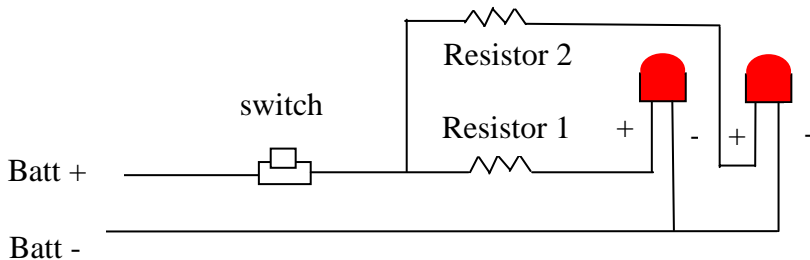


The resistor value you should use is based on the battery voltage and the color of the LED you are using. Here is a table to help out (NA means the LEDs will not light):

Battery	Red	Green	Yellow	White	Blue
3V	NA	NA	NA	NA	NA
5V	51 Ω	33 Ω	33 Ω	NA	NA
9V	220 Ω	180 Ω	180 Ω	80 Ω	80 Ω

PARALLEL

The second method is “parallel”. Here you can hook up as many LEDs as you need, but the current draw on the battery multiplies by the number of LEDs you have.



The resistor value you should for each LED comes from the first table! This is because you are hooking up each LED to the battery in a parallel configuration, which is just an extension of the first figure.