### Resistors: Identification and Calculation

If at any time one of your components gets **hot**, immediately disconnect your battery, consider the probable cause, and then discuss the issues and corrective action with one of the student instructors.

In the previous exercise you used the resources of the ACES *ProtoKit* to design simple LED circuits. Assuming the goal is to make your LEDs *glow*, not *blow*, it is important for you to review the identification and calculation of fixed, current-limiting resistors in both *single* and *parallel* LED circuits.

### 1. Identification: Reading Resistors

 If you know the acronym for colours of the  (**ROYGBV**) and a little arithmetic, reading a resistor value without the assistance for a DMM is easy and a time-saving skill to have!

### Things to Know

a) Each of the colours are assigned to a digit as follows: **0**-**Black**, **1**- **Brown**, **2**-**Red**,…,**7**-**Violet**, **8**-**Grey**, **9**-White (*see the* ***Colour Codes*** *below left*). The **ROYGBV** acronym covers the digits from 2 through 7.

b) The first two colours (*digits*) form a two-digit number. The third colour (*digit*) represents a power-of-ten multiplier. For example, a resistor with colour bands **Brown**-**Black**-**Red**, has a nominal resistance of **1 0×102** or **1000 Ω**, commonly referred to as **1 kilo Ω** or, simply, **1kΩ**.

|  |  |
| --- | --- |
| **Resistor Colour Codes**<http://darcy.rsgc.on.ca/ACES/images/resistor-color-chart.jpg> | **Resistor Applet**<http://www.dannyg.com/examples/res2/resistor.htm> |
| resistor-color-chart.jpg | ResistorApplet.png |

 c) What is the resistance of resistor with colour bands, **Yellow**-**Violet**-**Brown**? \_\_\_\_\_\_\_\_Ω

 d) What are the colour bands of a **680 Ω** resistor? \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_

Use the Resistor Applet at the URL (indicated above right) to confirm your two answers above.

### 2. LED Calculator: Current Limiting Resistor Value

 a) The screen capture to the right is taken from an online resource found at,

 <http://led.linear1.org/1led.wiz>

 The activity can be used to confirm the exact value of the fixed resistor required to complete a **single** LED circuit.

 In this example, a 9V battery source was supplied, together with the forward voltage (**Vf**) required by your LED (2**V** for a **red** LED) and the desired current of 15 **mA** that is indicated on the LED datasheet.

 Pressing **Find R** yields a recommended of a fixed resistor value of **470 Ω** which you know to be *yellow-violet-brown*.

 b) Go to the site referred to above and determine the recommended value for the fixed resistor in each of the following situations.

###  Single LEDs

 i) 5**V** Source, 1 **red** LED with **Vf** = 2 **V**, with forward current of 15 **mA** ? **\_\_\_\_\_\_\_Ω**

 ii) 5**V** Source, 1 **green** LED with **Vf** = 2.2**V**, with a forward current of 20 **mA** ? **\_\_\_\_\_\_\_Ω**

###  Multiple LEDs

 For the final two configurations, use the *series/parallel* multiple LED wizard found at:

<http://led.linear1.org/led.wiz>

 iii) 9**V** Source, 4 **red** LEDs with **Vf** = 2**V**, with forward current of 20 **mA? \_\_\_\_\_\_\_Ω**

 iv) 4.5**V** Source, 16 **white** LEDs with **Vf** = 2.8**V**, with forward current of 20 **mA? \_\_\_\_\_\_\_Ω**