

## Module 10 – Adding back the ultrasonic sensor

For this module you will need:

- Your car constructed from Module 9
- One 47k $\Omega$  resistor
- One 10k $\Omega$  resistor

The ultrasonic sensor 5V was disconnected in Module 9. The reason being is that whenever the robot is powered by the battery pack, only 6V (from the battery) and 3.3V (from the 3V3 pin) are available. In order to obtain a 5V power source, we are going to make another voltage divider to drop the battery pack voltage from 6V to 5V so that we can power the ultrasonic sensor from the battery pack.

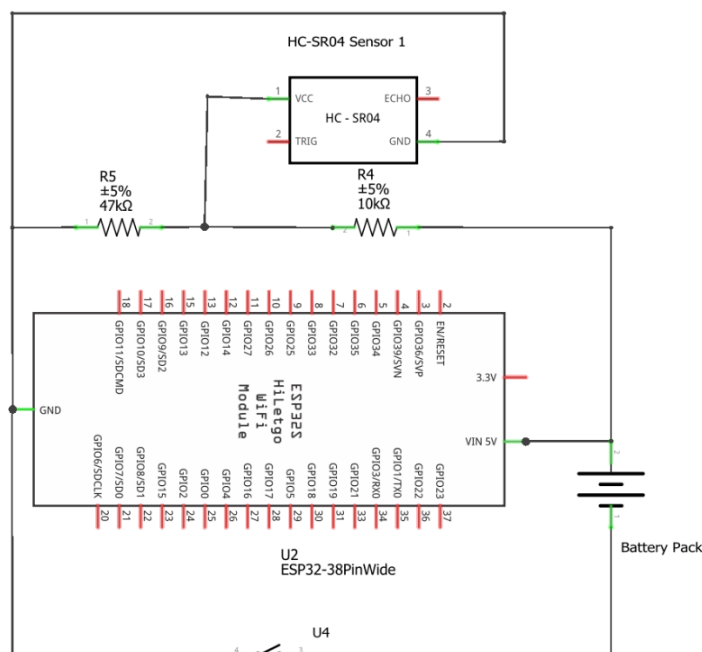
## Calculator

Have some fun experimenting with inputs and outputs to the voltage divider equation! Below, you can plug in numbers for  $V_{in}$  and both resistors and see what kind of output voltage they produce.

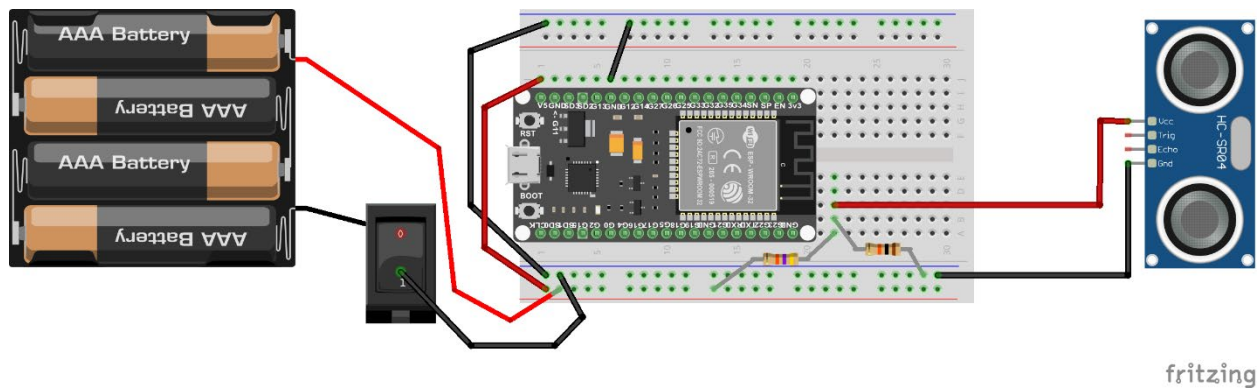
$V_{in} = 6.1$  V  
 $R_1 = 10000$   $\Omega$   
 $R_2 = 47000$   $\Omega$   
 $V_{out} = 5.03$  V

Or, if you adjust  $V_{out}$ , you'll see what resistance value at  $R_2$  is required (given a  $V_{in}$  and  $R_1$ ).

For clarity, here is an depiction of **just the 5V circuit for the ultrasonic sensor when the robot is powered from the battery pack**. Integrate this circuit into the existing car electronics.



fritzing



### 3.3V vs 5V...What's the big deal?

When working with electronics, especially microcontrollers, it is important to understand the device specifications. Some sensors that we can interface with a microcontroller have very strict power requirements, not meeting those requirements can often lead to damages to the components.

It's always important to read the documentation of any electronic modules you work with. Always plan first before you build to avoid damaging your electronics.