

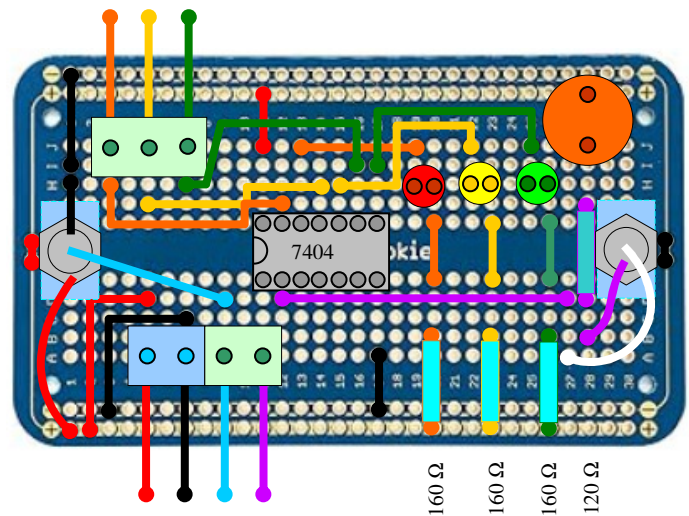
Digital prototype (LabVIEW Assign 6)

Two 0.22 holes need to be over-drilled.

The (5× blue, black, purple, white, red) wires to the switches are **underneath** the board!

For the LEDs, the long leg is power (the side going to the resistors).

When done, use hot glue to prevent rotation of the switches.



Motor Driver (ECA & LabVIEW)

The diode 1N4001 goes from ground to motor+ (dark green/ai0).

The diodes cathode (Stripe) side is to motor+.

It might be hard to cram in all 6 resistors in there!

Since the 15 Ω one is physically larger, consider running the green wire around the other side of the chip.

Consider the 3× 220 kΩ resistors.

Because this value has an uncertainty, some care must be taken when choosing them. The criteria is that the average of the two yellow colored ones must be EXACTLY equal to the light blue one.

For example, suppose that you have 4 to choose from:

- 220.6 kΩ
- 221.3 kΩ
- 219.7 kΩ
- 221.5 kΩ

The best possible use of these specific resistors is to use only the 220.6, 219.7, and the 221.5 resistors. Specifically, if we choose the 221.5 and the 219.7 resistors to be the yellow ones, then their average is exactly 220.6, which is perfect.

In this case, the ratio of the average/darker is:

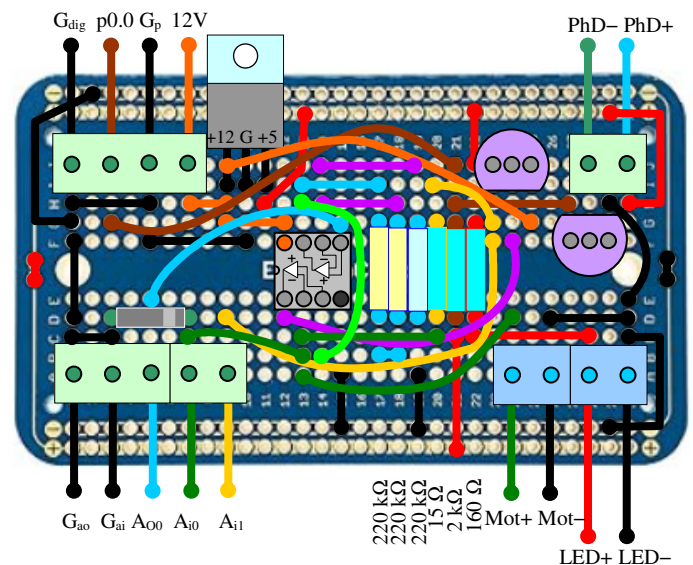
$$\frac{0.5(221.5 + 219.7)}{220.6} = 1.00000$$

If instead I leave out the 219.7 kΩ resistor, the best possible ratio is only 1.00113.

If instead I leave out the 220.6 kΩ resistor, the best possible ratio is only 1.00317.

If instead I leave out the 221.5 kΩ resistor, the best possible ratio is only 1.00045.

Components:	
LM7805AC	(5V regulator)
LM6132	(op amp)
2 × 2N2222	(nnp transistor)
1N4001	(diode)



This last result is “good enough”, but the first two options are *not* good enough.
I made an Excel tool to help with this task... if you’ve measured 5 resistors, it tells you the optimal choices from among those five...