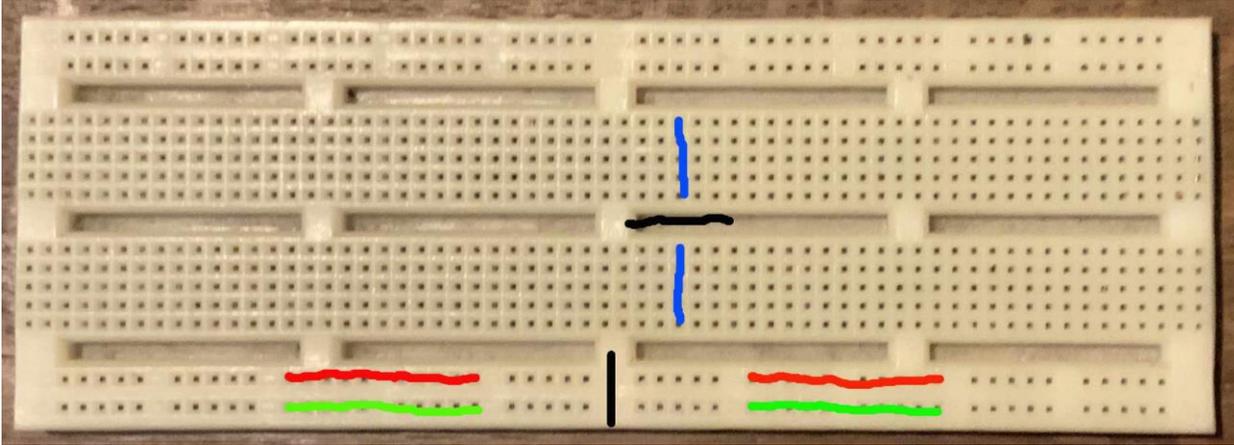


Short Breadboard Tutorial

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In case you are not familiar with this method of breadboarding, this is a very short tutorial.

This is a typical breadboard.



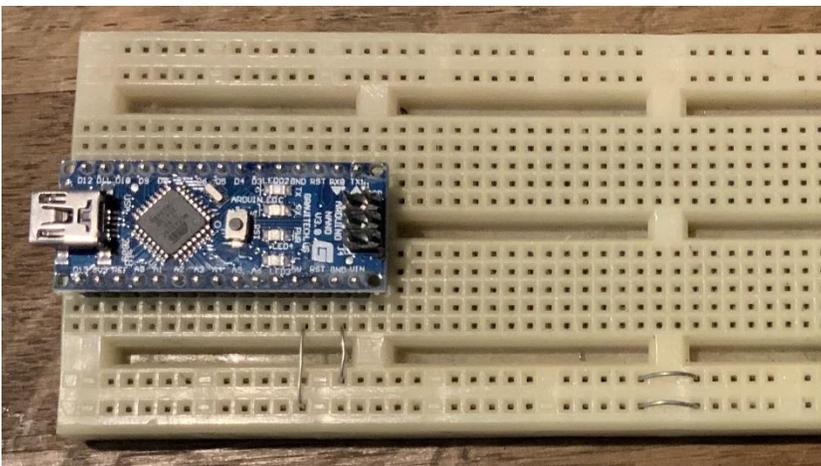
The long horizontal rows of contacts, on the top and bottom of the board, are connected horizontally. The contacts in the RED row are connected and the contacts in the GREEN row are connected. Except, there is a break at the BLACK line. You would need to add a jumper from the left RED row to the right RED row if you needed the whole row as a common bus. Same for the GREEN. Same for the 2 rows at the top.

The short vertical rows, 5 contacts, are connected. They are separated in the middle of the board as shown by the black line.



1/4W resistors are a good source of jumpers for use on the breadboard, lead diameter of about 0.02". Cut the leads off at the body of the resistor. That is a perfect length.

If the leads are too large a diameter you may damage the contacts. If the diameter is too small you will have loose and intermittent connections.



Here we have the NANO inserted into the breadboard.

The left edge NANO pins are offset from the edge of the breadboard by 1 column of contacts. This allows the +5V and GND jumpers to line up properly with the sockets on the horizontal rows.

The left most jumper connects the NANO +5V pin to the bottom row of contacts. The next jumper, shorter, connects the NANO GND pin to the 2nd row of contacts.

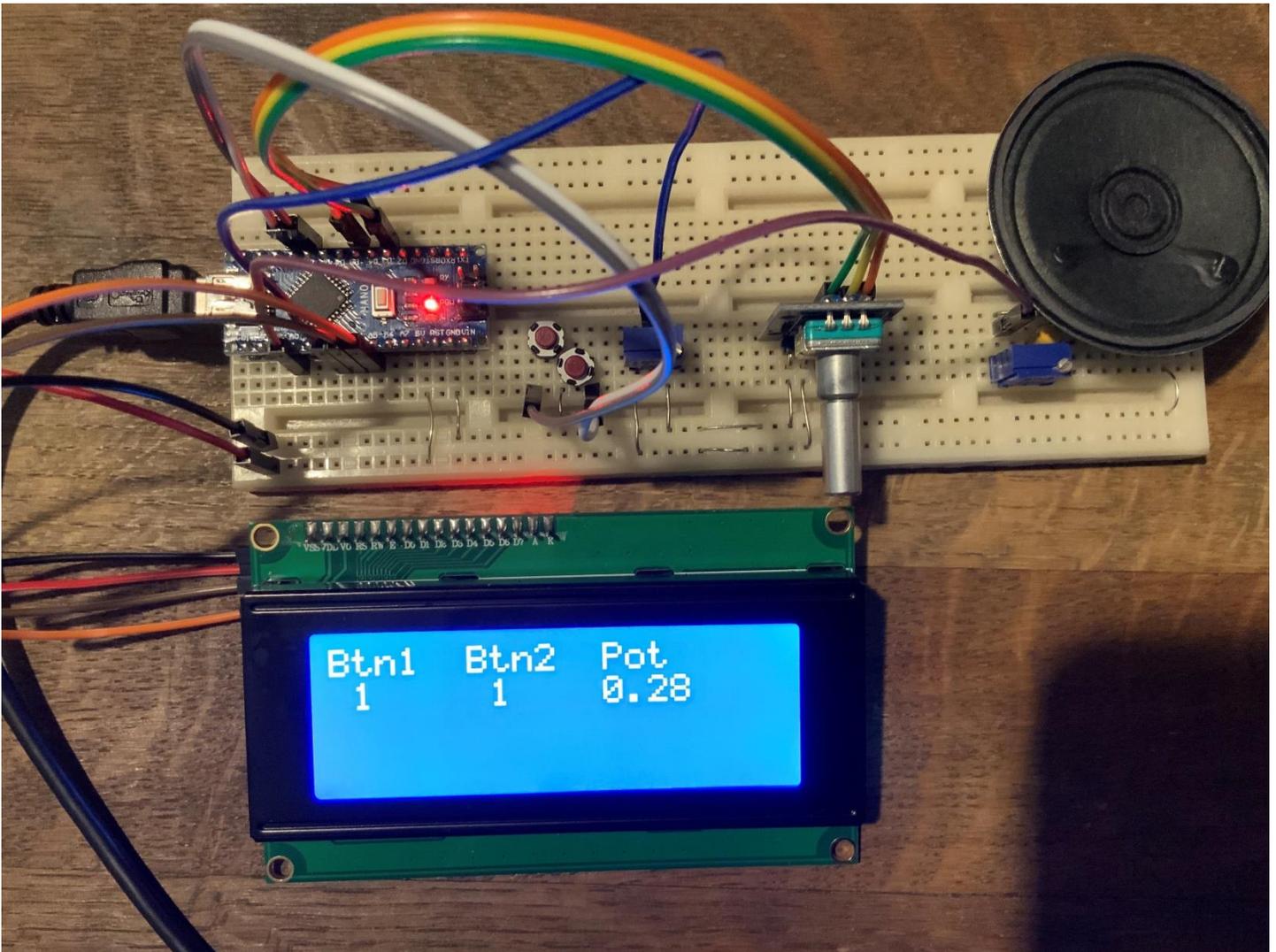
On the right, there are 2 jumpers connecting the left and right rows of contacts. This makes the +5V and GND available to other components on the breadboard.



Solder 2 resistor leads to the speaker. Then you can plug the speaker into the breadboard and it will sit on top.

In the picture below you will find all the components for the programming projects.

From left to right:
NANO, 2 pushbuttons (red buttons), potentiometer (blue) for the A/D, rotary encoder and the potentiometer (blue)



for the speaker with the yellow capacitor between it and the speaker.

You can see some of the wire jumpers connecting +5V and GND to the different components.

Below the breadboard is a 20 character by 4 line LCD but the output has been formatted for a 16 character by 2 line display.

Most of the long, colored jumper wires are pin to pin (male) jumpers. The LCD requires 4 jumpers, socket (female) to pin (male).