Brains: Wiring

Intro:
The purpose of this section is to wire the PCB, screw shield, and motor shield.

Bill of Materials:

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper Wires – Connected 6” (M/M)</td>
<td>1 Pack</td>
</tr>
<tr>
<td>Jumper Wires – Connected 6” (M/F)</td>
<td>6</td>
</tr>
<tr>
<td>Hook-Up Wire - Assortment (Solid Core, 22 AWG)</td>
<td>1 Pack</td>
</tr>
<tr>
<td>Terminal Block - 12 Position (15A, 600V)</td>
<td>2</td>
</tr>
<tr>
<td>Terminal Block - 6 Position (15A, 600V)</td>
<td>1</td>
</tr>
<tr>
<td>6-32 Socket Head Screw ½”</td>
<td>6</td>
</tr>
<tr>
<td>Dual 80/20® Mount</td>
<td>4</td>
</tr>
</tbody>
</table>
Step 1:
Need:
- Blue Hook-Up Wire

Attach the pins in the Arduino to the screw terminals with hook-up wire following the wire diagram. Try to use minimal wire, as it piles up!

**Step 2:**

Need:
- Red and Black Hook-Up Wire

Connect the PCB to the Arduino's power and ground pins at the top.
Step 3:

Need:
- Jumper Wires – Connected 6” (M/F)
- Completed MicroSD Breakout Board
Attach the MicroSD Breakout Board to the PCB with masking tape or velcro pieces. Follow the wiring diagram to wire the Breakout Board to the Arduino. For now, the Ground and 5V are loose.

**Step 4:**

![Image of the wiring setup](image)

**Need:**
- 6x 6-32 Socket Head Screw ½"
- 4x Dual 80/20® Mount
- 2x Terminal Block - 12 Position (15A, 600V)
- 1x Terminal Block - 6 Position (15A, 600V)

Loosely attach Dual Mounts to both ends of a 12 position terminal block. Attach one Dual Mount to one end of the other 12 position terminal block. Attach one Dual Mount to one end of the 6 position terminal block. Connect them as shown in the picture above.

**Step 5:**

![Image of the final assembly](image)
Slip the structure into the bar’s slot and tighten the screws until firmly attached.

Step 6:
Need:

- Hook-up Wire

Attach the wires as specified in the diagram. Take the rightmost terminal on the PCB and hook it up to the highest terminal on the 6 terminal block. Follow along the bottom of the PCB from right to left until the leftmost terminal on the PCB is connected to the lowest position on the 12 terminal block.
Need:
- Masking Tape
- Heat shrink/Electrical tape
- Hook-up wire

Pull off the motor’s plug to reveal the raw wires underneath. Connect the wires by twisting them, soldering them, and wrapping them in heatshrink or electrical tape. Then, tuck the wires into the tube nearest the motor until they stick out at the other end. Make sure to pass the switch’s wires through, too. Then, using masking tape, label all the loose wires. Motor – is black, Motor + is red, Ground is green, Channel B is brown, Channel A is yellow, and Sensor Power is orange. On the switch, Switch Ground is white, and Switch + is blue.

Step 8:
Need:
- 3x TE Connectivity
- 6x Jumper Wires – Connected 6” (M/M)

Insert a red wire and black wire into the top set and bottom right set (A1 and B1) of power and ground screw terminals, as well as the 20V screw terminal set on the PCB. Then, screw the ends of all three sets into three separate TE Connectivity devices. The set on the top of the motor shield screw onto the 12V power supply on the left leg. The set on the PCB screw onto the 24V power supply on the right leg. Screw the set on the bottom right of the motor shield onto Motor + and Motor -, with A1 going to Motor + and B1 going to Motor -.

**Step 9:**

Screw the Channel A wire into D2, the screw terminal on the top left. Screw the Channel B wire into D3, the one right below the screw terminal on the top left.
Step 10:

Need:
- 1x 220 Ohm resistor
- Hook-up wire
- Electrical tape

Trim and strip the end off the SD ground wire – the one in the picture is orange. Cut a short piece of hook-up wire and screw it into GND on the screw shield. Solder the ends of the SD ground wire and loose hook-up wire that was just screwed into ground together. Then, solder a resistor onto those two wires.

Cut a short piece of hook-up wire, and screw one end in screw terminal 12. Take blue and yellow hook-up wire and twirl together a few feet of it. Label yellow as Foot Switch Ground, blue as Foot Switch Power. Solder the Foot Switch Ground wire to the loose end of the hook-up wire that was just screwed into screw terminal 12.

Solder the connected ends of the ground and screw terminal 12 wire to the other side of the resistor. Wrap all the metal in electrical tape.

Step 11:

Need:
- Hook-up wire
- Electrical Tape
Solder the ends of Switch +, Sensor Power, and a piece of hook-up wire. Cover in electrical tape, and insert the loose end of the hook-up wire into 5v on the screw shield.

**Step 12:**

- Hook-up wire
- Electrical Tape

Solder the ends of SD 5v, Foot Switch Power, and hook-up wire. Cover in electrical tape, and insert the loose end of the hook-up wire into 5v on the screw shield.

**Step 13:**

- Hook-up wire
- Electrical Tape
- 1x 4700 Ohms resistor

Solder the end of Switch Ground and a piece of hook-up wire together. Screw the loose end of the hook-up wire into the D6 screw terminal on the screw shield. Solder the resistor onto that end. Solder a piece of hookup wire to the other end of the resistor. Cover that with electrical tape. Solder the loose end of the wire together with the Ground wire coming from the motor and another piece of hook-up wire. Cover that with electrical tape. Screw the loose end of hookup wire into GND on the screw shield.