



Basic Kit Construction Guide

**TI Robotics System Learning Kit (TI-RSLK):
The Maze Edition**

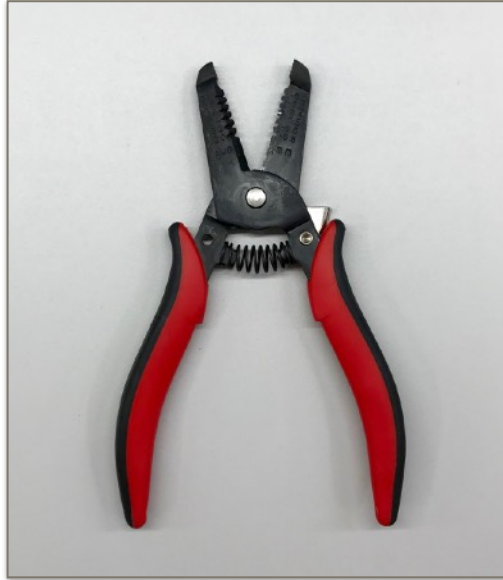
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Lab Tools Needed:



Soldering Iron



Wire Stripper and Cutter



Heat Gun



Precision Knife



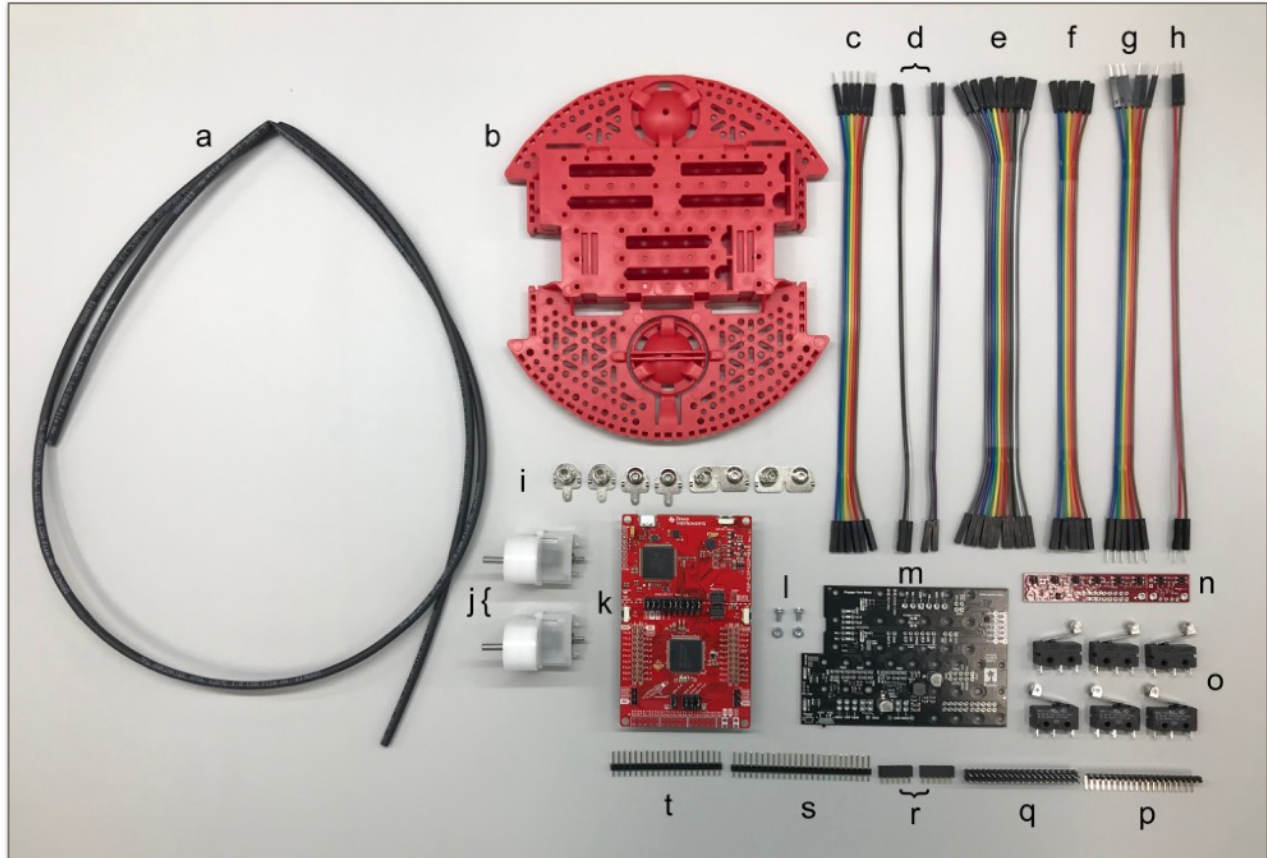
Pliers



Screwdriver

Section 1: Soldering

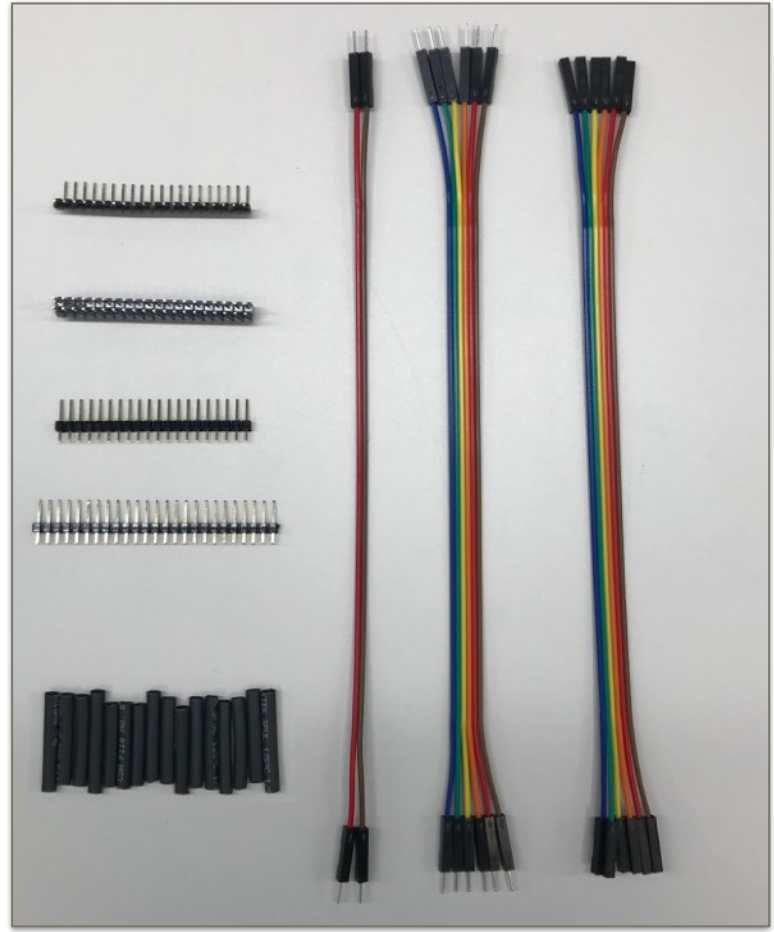
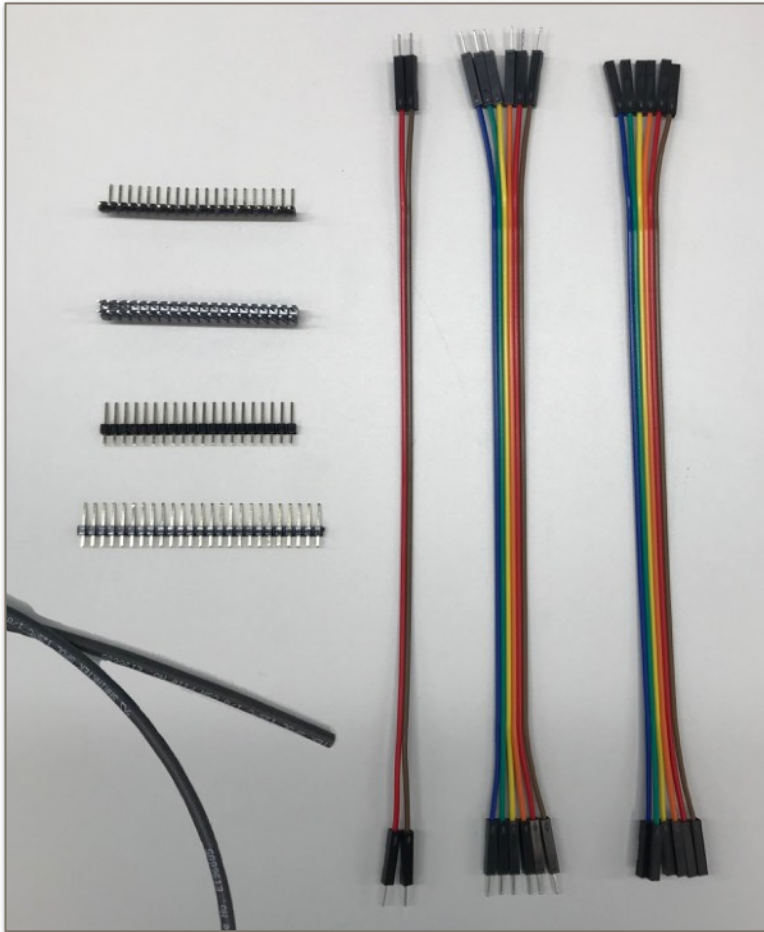
Step 1: Gather Your Supplies



| | Description | Qty | Part # |
|---|---------------------------|-----|----------|
| a | Heat Shrink Tube | 1 | 01M8939 |
| b | Chassis | 1 | 55AC1156 |
| c | 6 Female to Male Wires | 1 | 44AC9484 |
| d | 2 Female to Female Wires | 2 | 44AC9484 |
| e | 11 Female to Female Wires | 1 | 44AC9484 |
| f | 6 Female to Female Wires | 1 | 44AC9484 |
| g | 6 Male to Male Wires | 1 | 44AC9484 |
| h | 2 Male to Male Wires | 1 | 44AC9484 |
| i | Battery Terminals | 1 | 55AC1157 |

| | Description | Qty | Part # |
|---|----------------------|-----|----------|
| j | Motor | 2 | 55AC1157 |
| k | TI LaunchPad™ Kit | 1 | 41Y9541 |
| l | Motor Board Screws | 1 | 55AC1157 |
| m | Motor Board | 1 | 55AC1157 |
| n | Line Follower Sensor | 1 | 55AC1158 |
| o | Bump Switch | 6 | 55AC1159 |
| p | 90° Bent Headers | 1 | 08N6741 |
| q | 2x20 Header | 1 | 93K5757 |
| r | 1x6 Header | 2 | 55AC1157 |
| s | 1x25 Header | 1 | 55AC1158 |
| t | 1x20 Header | 1 | 08N6754 |

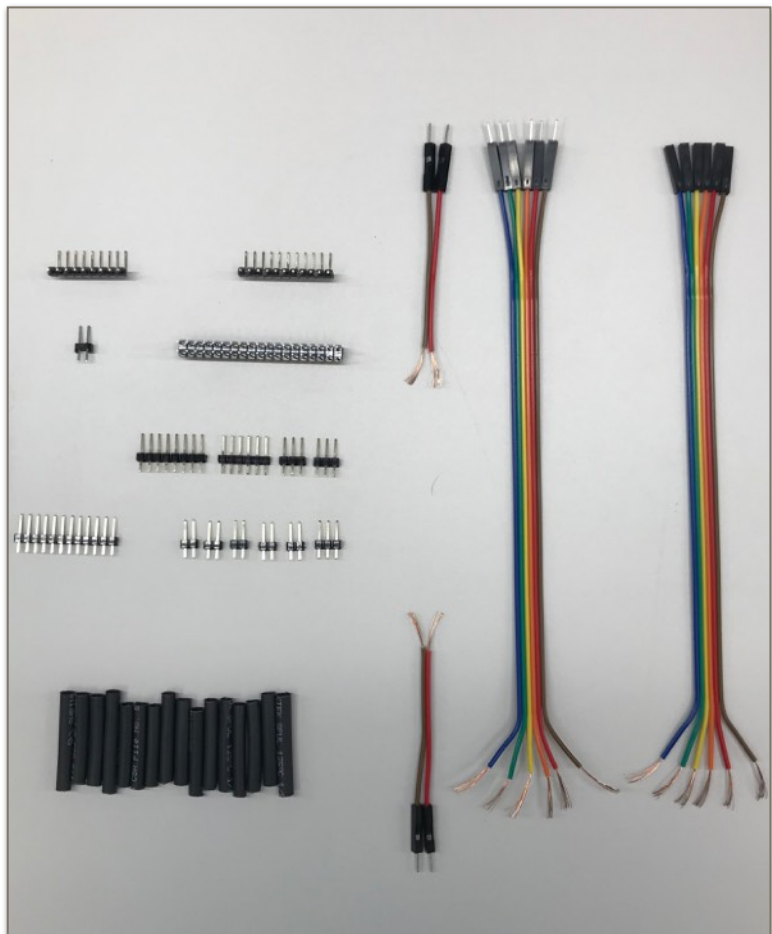
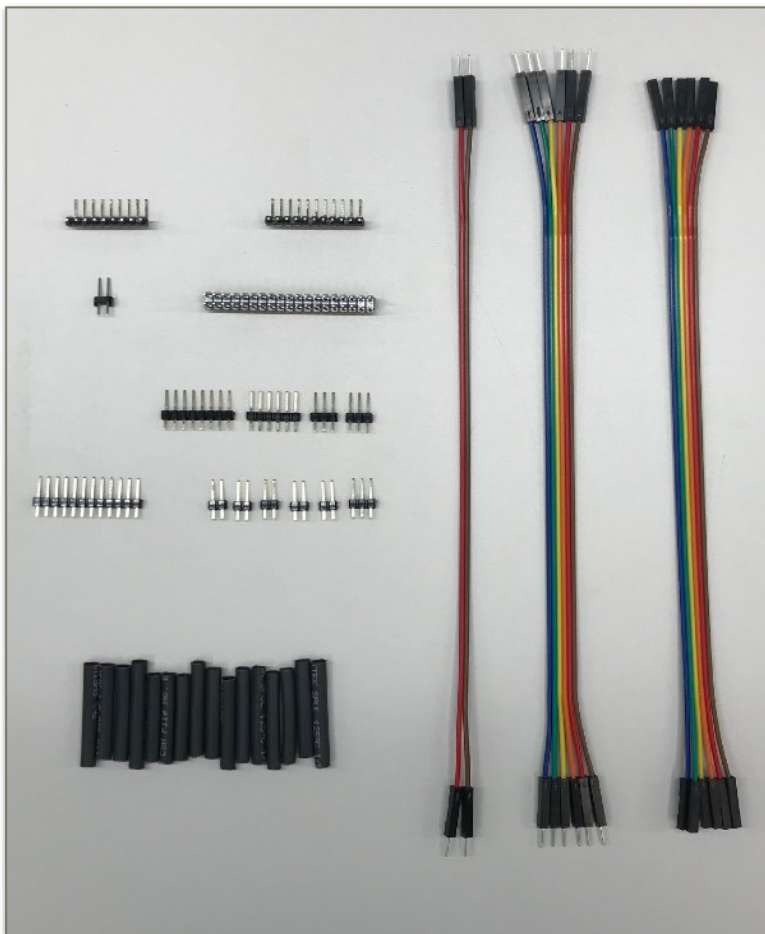
Step 2: Prepare Headers, Tubing, and Wires



Gather the following:

- Heat Shrink Tubing (a)
- 6 Female to Female Wires (f)
- 6 Male to Male Wires (g)
- 2 Male to Male Wires (h)
- 90° Bent Headers (p)
- 2x20 Header (q)
- 1x20 Header (t)
- 1x25 Header (s)

Cut the heat shrink tubing (a) into 16 1in (~2.5cm) minimum pieces.



Cut the following:

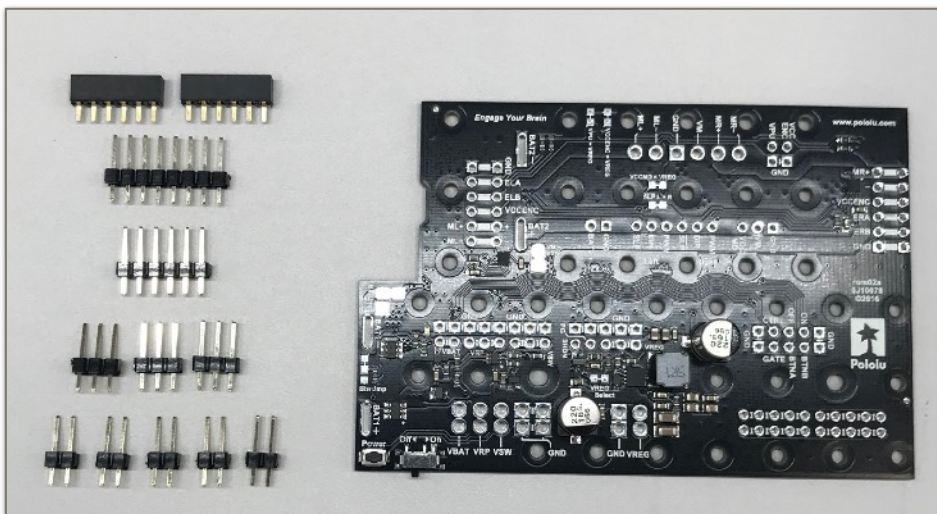
- 90° bent headers (p) into a 1x11
- 2x20 header (q) into a 2x19
- 1x20 header (t) into a 1x8, 1x6, and two 1x3
- 1x25 header (s) into a 1x3 and five 1x2

Cut and strip one end off of the 6 female to female wires (f) using the wire stripper.

Cut and strip one end off of the 6 male to male wires (g) using the wire stripper.

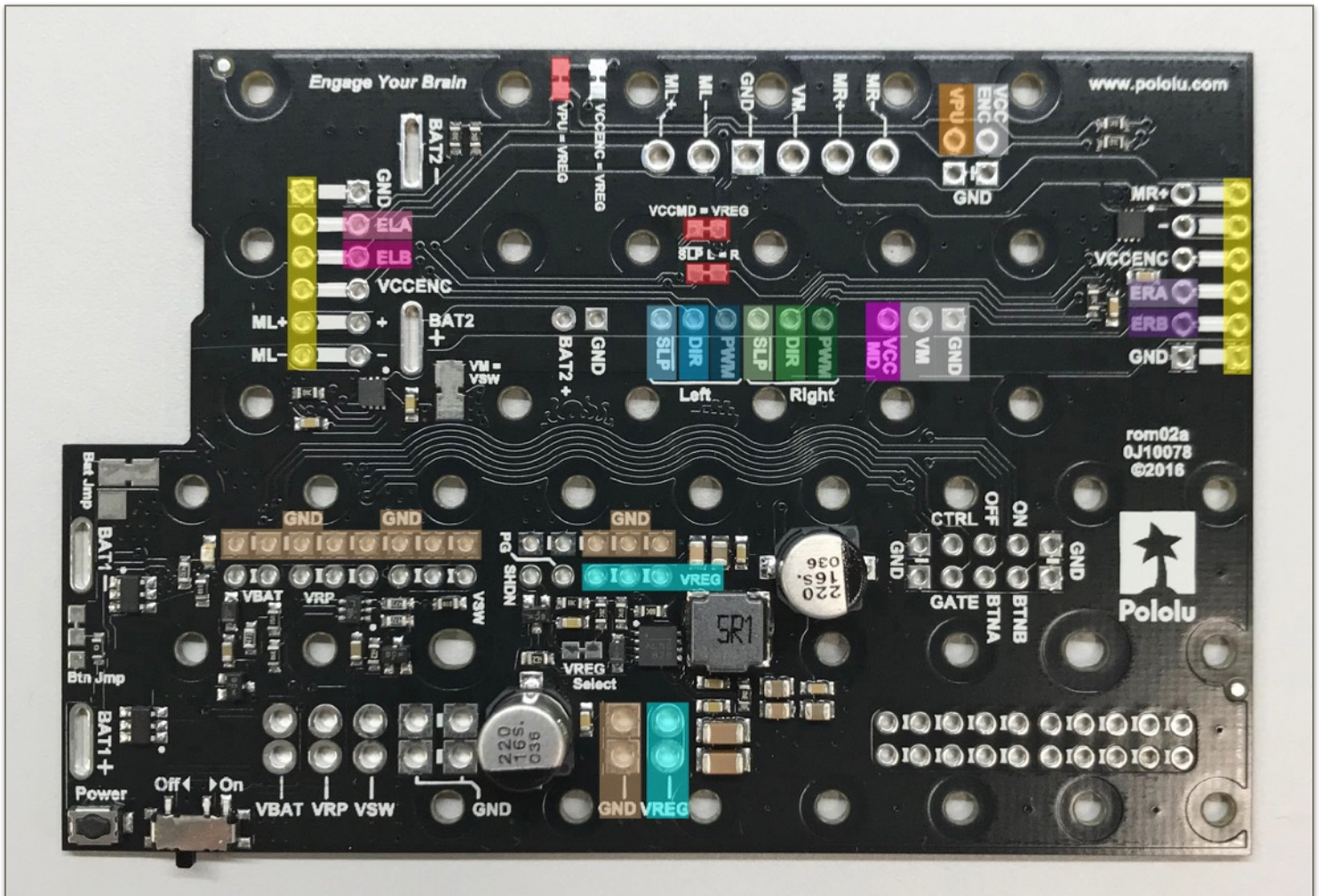
Cut the 2 male to male wires (h) to about 1.5" (~3.8cm) and strip both ends.

Step 3: Prepare the Motor Board



Gather the following:

- Motor Board (m)
- Two 1x6 Headers (r)
- 1x8 Header (Prepared earlier)
- 1x6 Header (Prepared earlier)
- 3 1x3 Headers (Prepared earlier)
- 5 1x2 Headers (Prepared earlier)

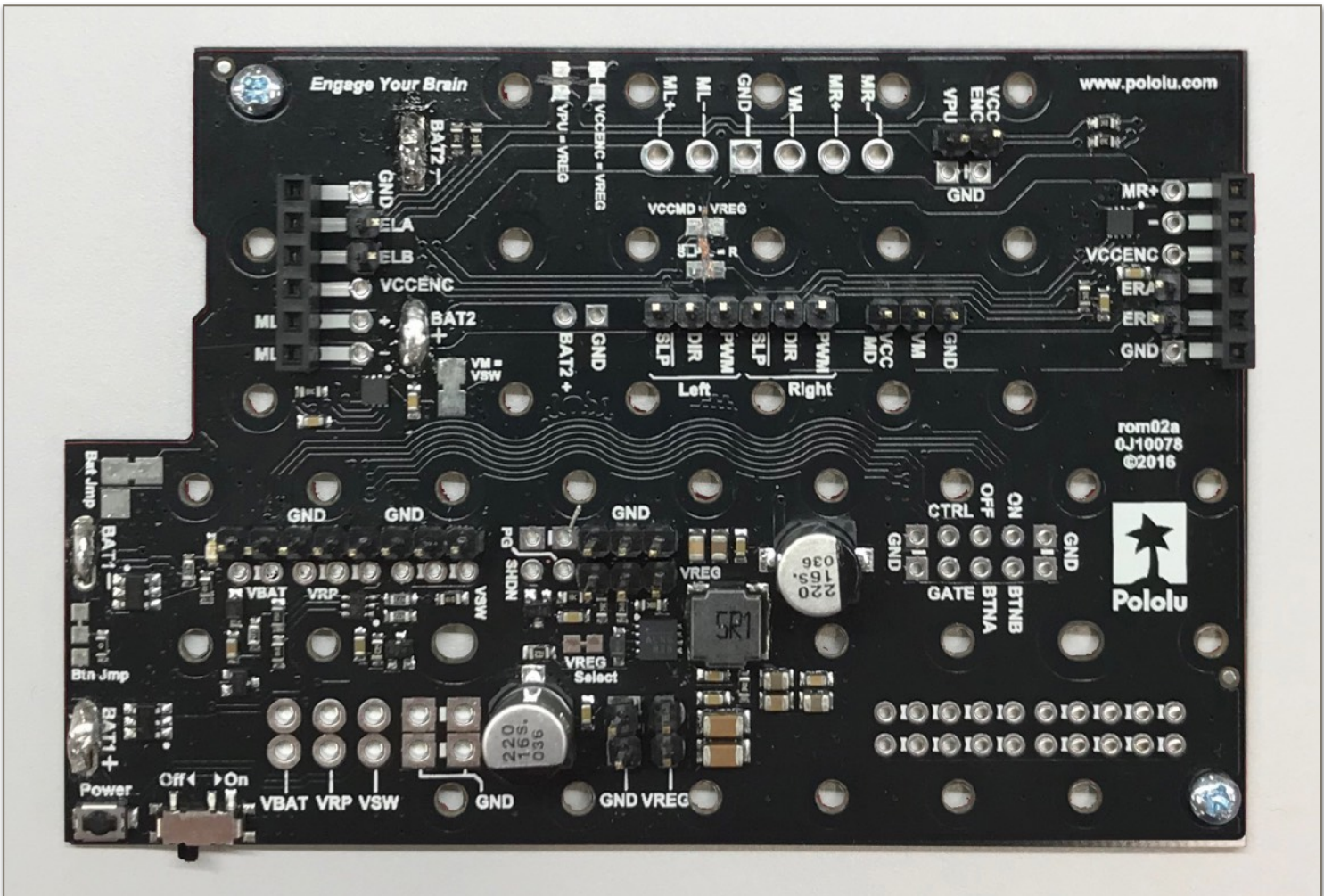


Use a precision knife to cut the **VPU-VREG**, **VCCMD-VREG**, and **SLP L-R** traces.

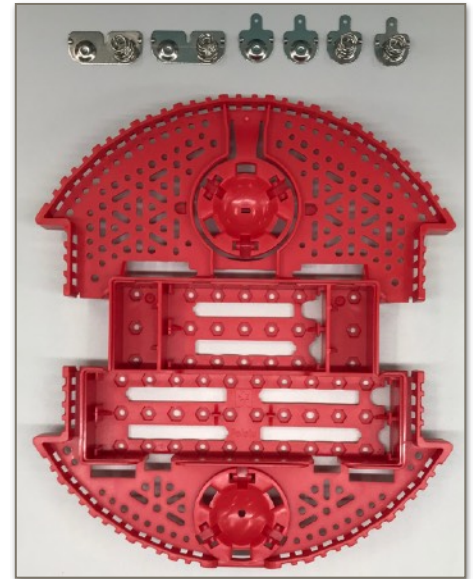
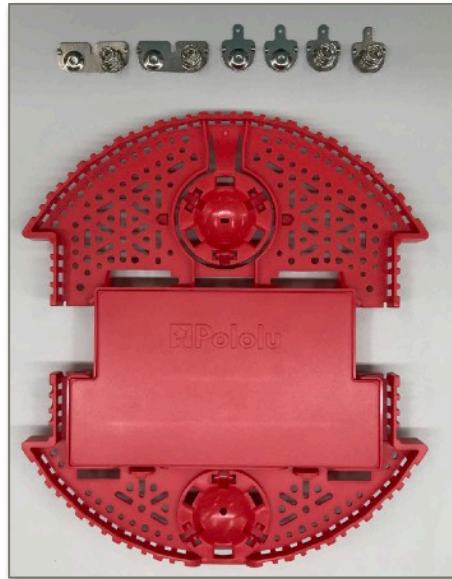
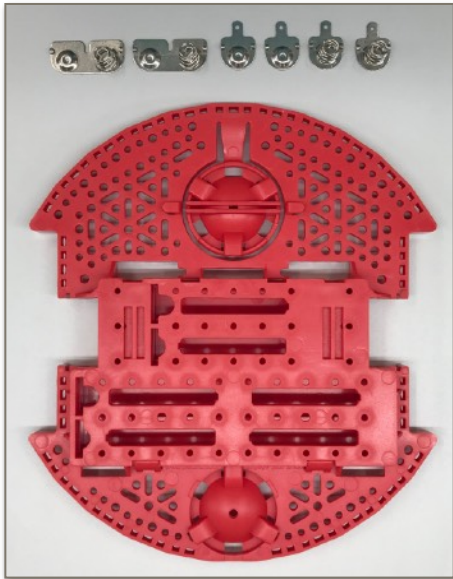
Solder the following:

- two 1x6 headers (r) to the **yellow** connections.
- a 1x2 header cut earlier to the **ELA** and **ELB** connections. **Note:** You will need to bend these to a 45° angle after soldering.
- a 1x2 header cut earlier to the **ERA** and **ERB** connections. **Note:** You will need to bend these to a 45° angle after soldering.
- a 1x2 header cut earlier to the **VPU** connection. **Note:** The white connection will never be used but helps with soldering.
- a 1x3 header cut earlier to the **VCCMD** connection. **Note:** The white connection will never be used but helps with soldering.
- a 1x6 header cut earlier to the **Left** and **Right** motor driver connections.
- a 1x3 and 1x2 header cut earlier to the **VREG** terminals.
- solder 1x8, 1x3, and 1x2 headers cut earlier to the **GND** terminals.

Finished Motor Board:



Step 4: Connect Battery Terminals and Chassis

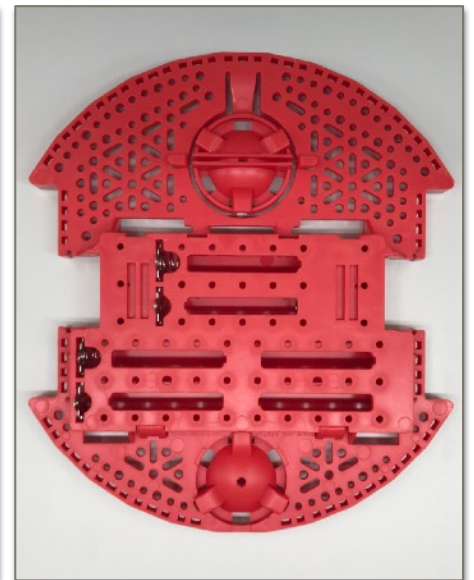
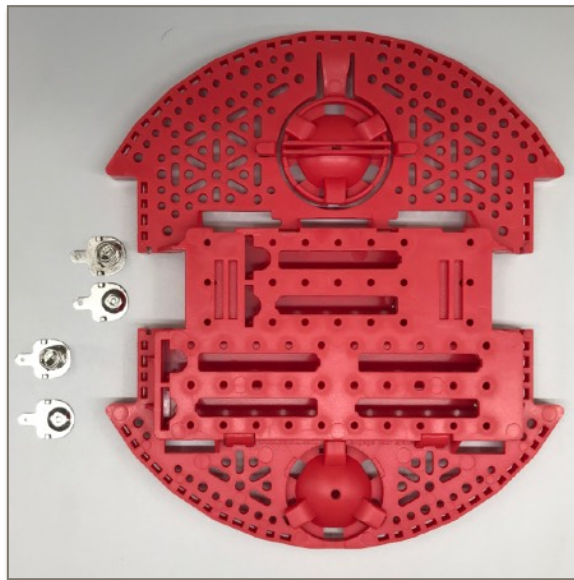
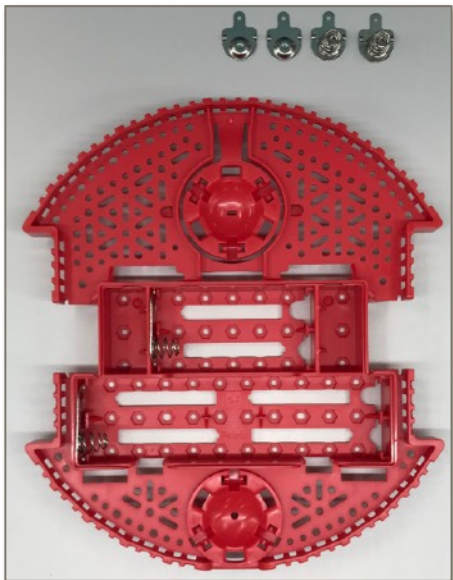


Flip chassis (b) over.

Remove battery cover.

Gather:

- Soldered Motor Board (m)
- Battery Terminals (i)
- Chassis (b)
- Screws for Motor Board (l)

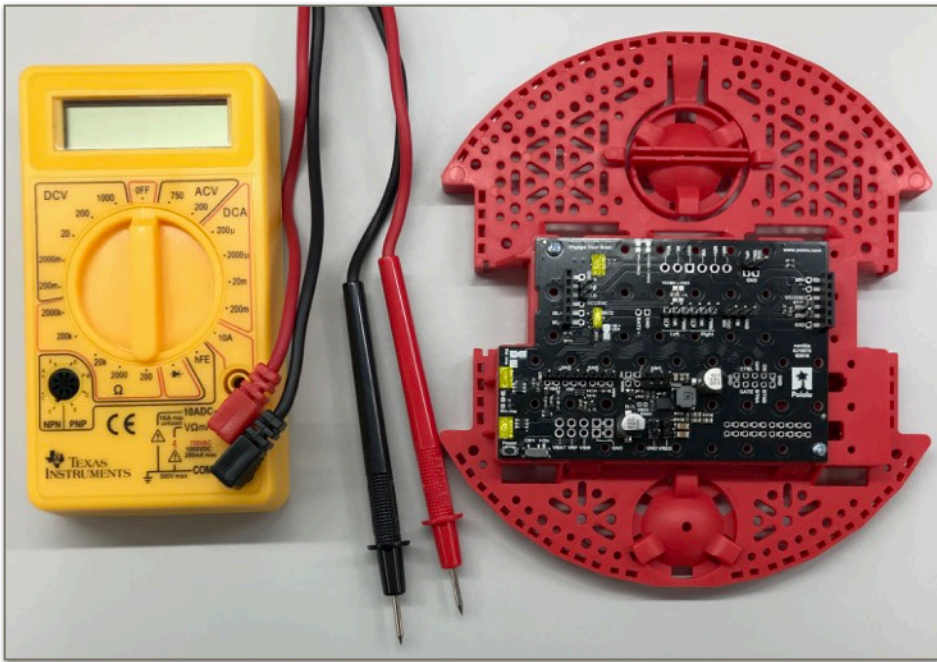


Insert the linking battery terminals (i) into the slots on the left.

Put battery cover back on and flip chassis (b) over.

Insert battery tabs into the slots on the left.

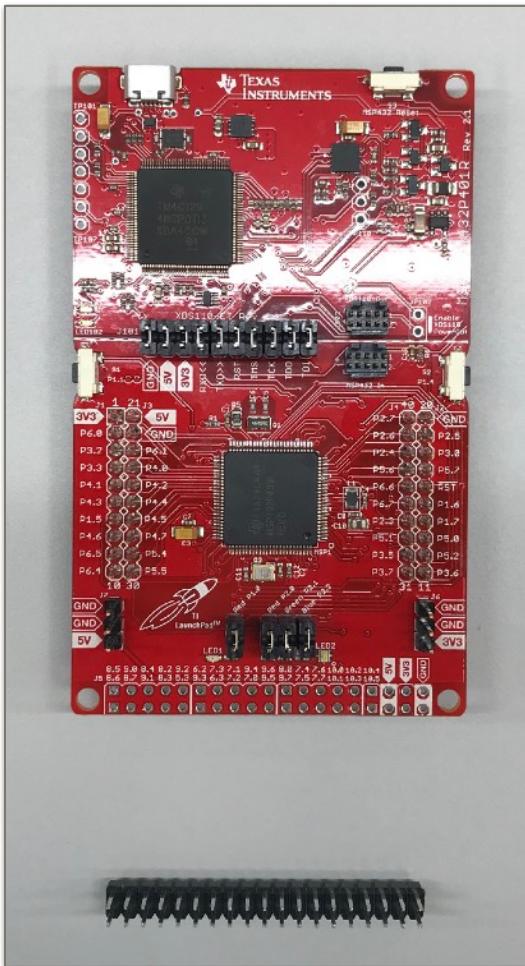
Note: the order from top to bottom is spring, flat tab, spring, flat tab.



Using a voltage meter, verify that the earlier solder connections were made and traces were cut on the motor board (m).

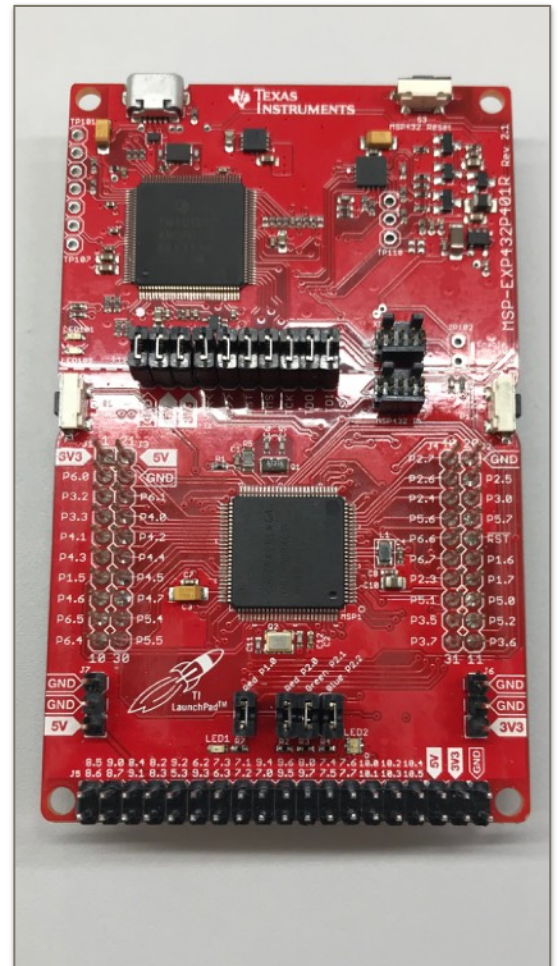
Solder the motor board (m) onto the battery terminals and secure the motor board (m) with two screws (l).

Step 5: Solder LaunchPad Connections

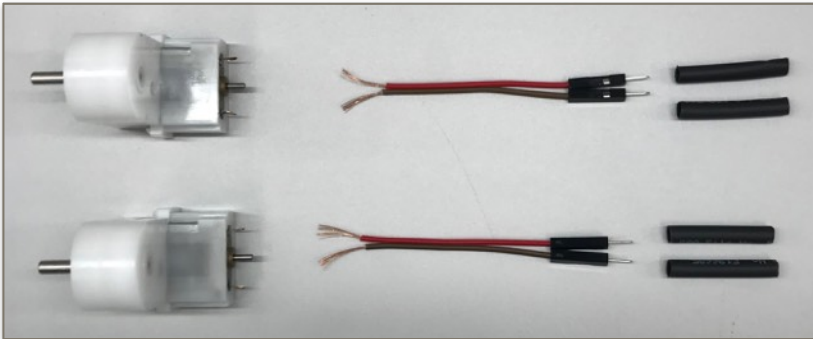


Gather your LaunchPad (k) and the 2x19 header you cut earlier.

Solder the 2x19 header on the J5 pinout at the bottom of the LaunchPad (k) with long pins facing upwards.

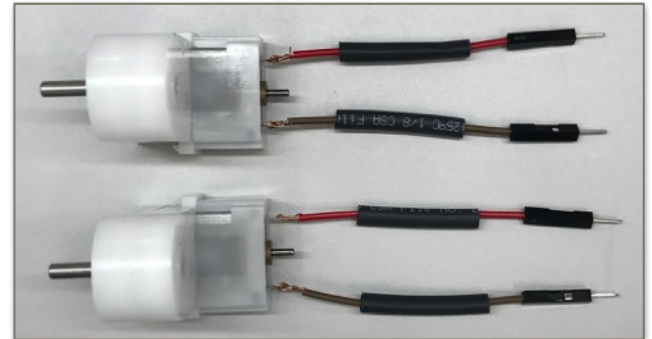


Step 6: Ready the Motors

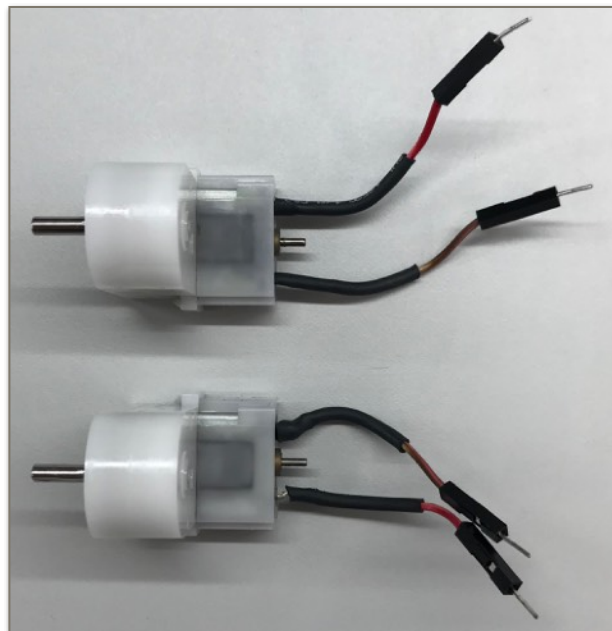


Gather:

- Motors (j)
- 2 Male Wire Pairs separated and stripped earlier (h)
- 4 Heat shrink tube pieces cut earlier (a)

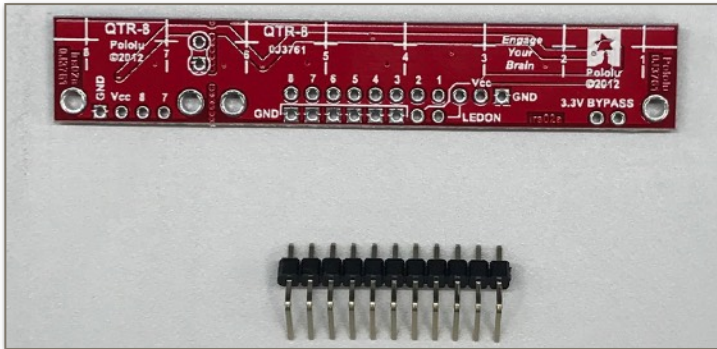


Solder the wires (h) on the ends of each motor (j) and use the heat shrink tubing (a) to protect the connection.

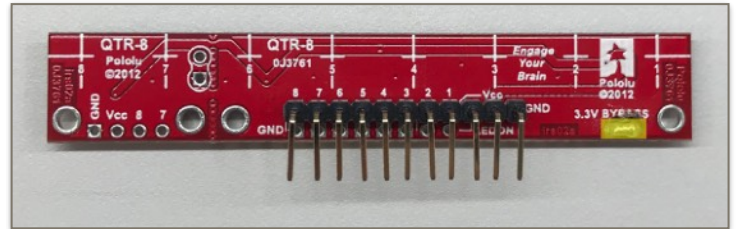


Finished Motors.

Step 7: Solder the Line Sensor Connections

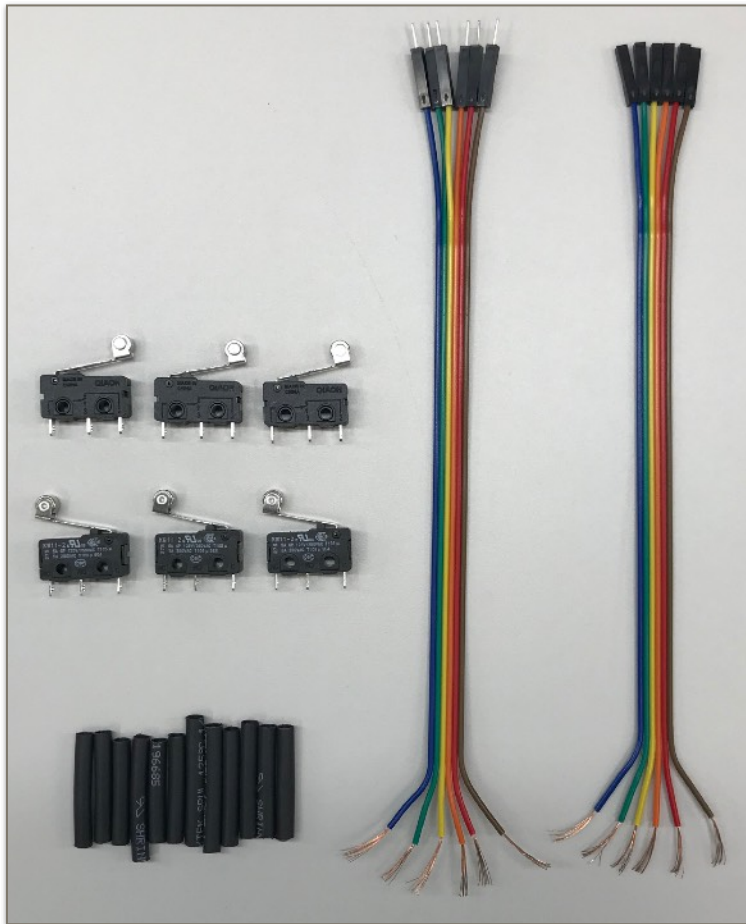


Gather the line sensor (n) and the 1x11 90° bent headers cut earlier.



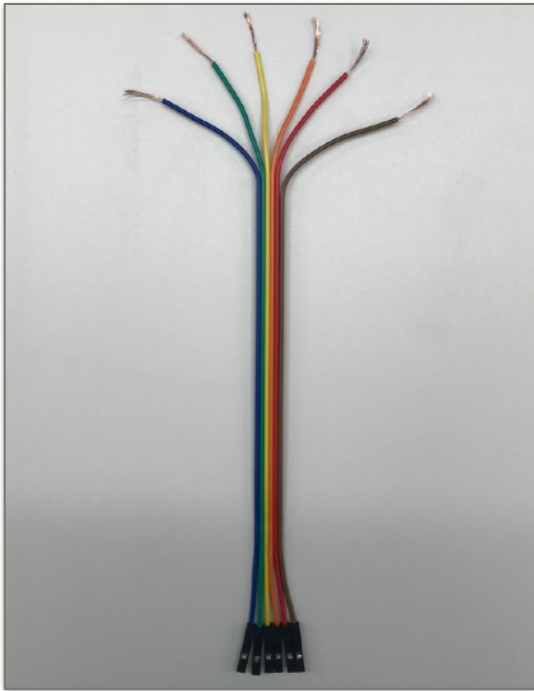
Solder the 1x11 bent headers onto the line sensor (n). Connect the highlighted 3.3V bypass by either creating a solder bridge or soldering a short wire.

Step 8: Prepare the Bump Switches

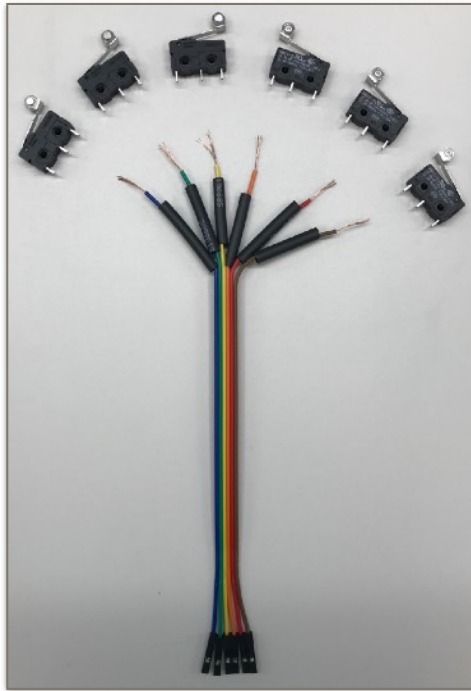


Gather the following:

- 6 Bump Switches (o)
- 12 Heat Shrink Tube pieces cut earlier (a)
- 6 Female wire with one end cut and stripped from earlier (f)
- 6 Male wire with one end cut and stripped from earlier (g)



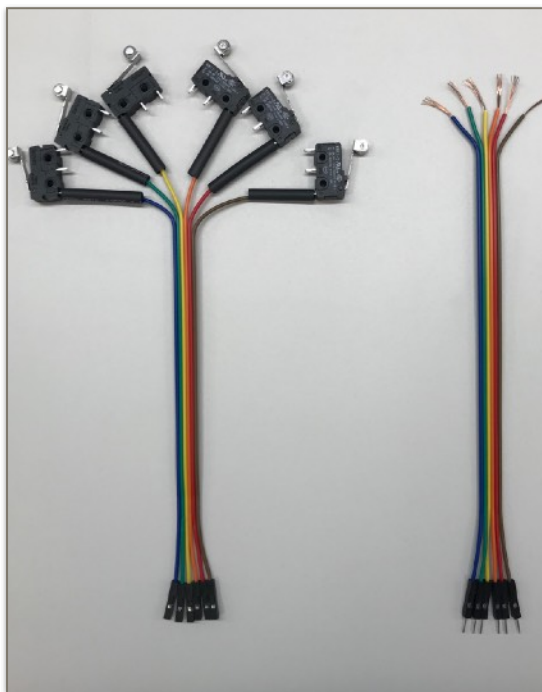
Start with the 6 female wires (f).



Slide a heat shrink tube (a) on each wire.



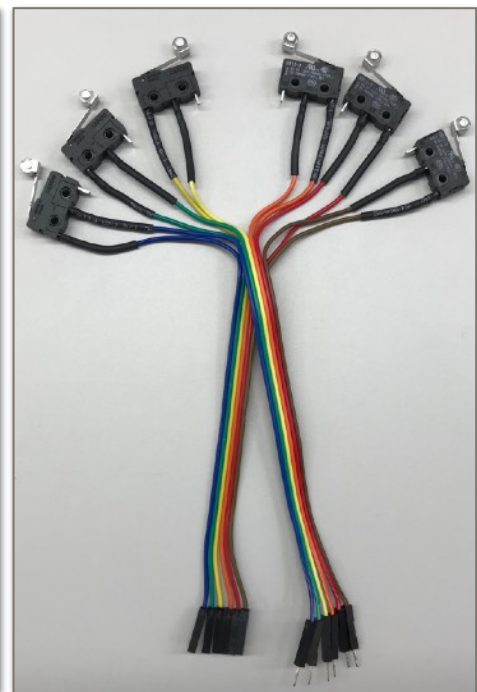
Solder one female wire on the "1" or "C" connection on each bump switch (0).



Ready the 6 male wires (g).
Note: you can separate each wire but for a cleaner look try to keep them together.



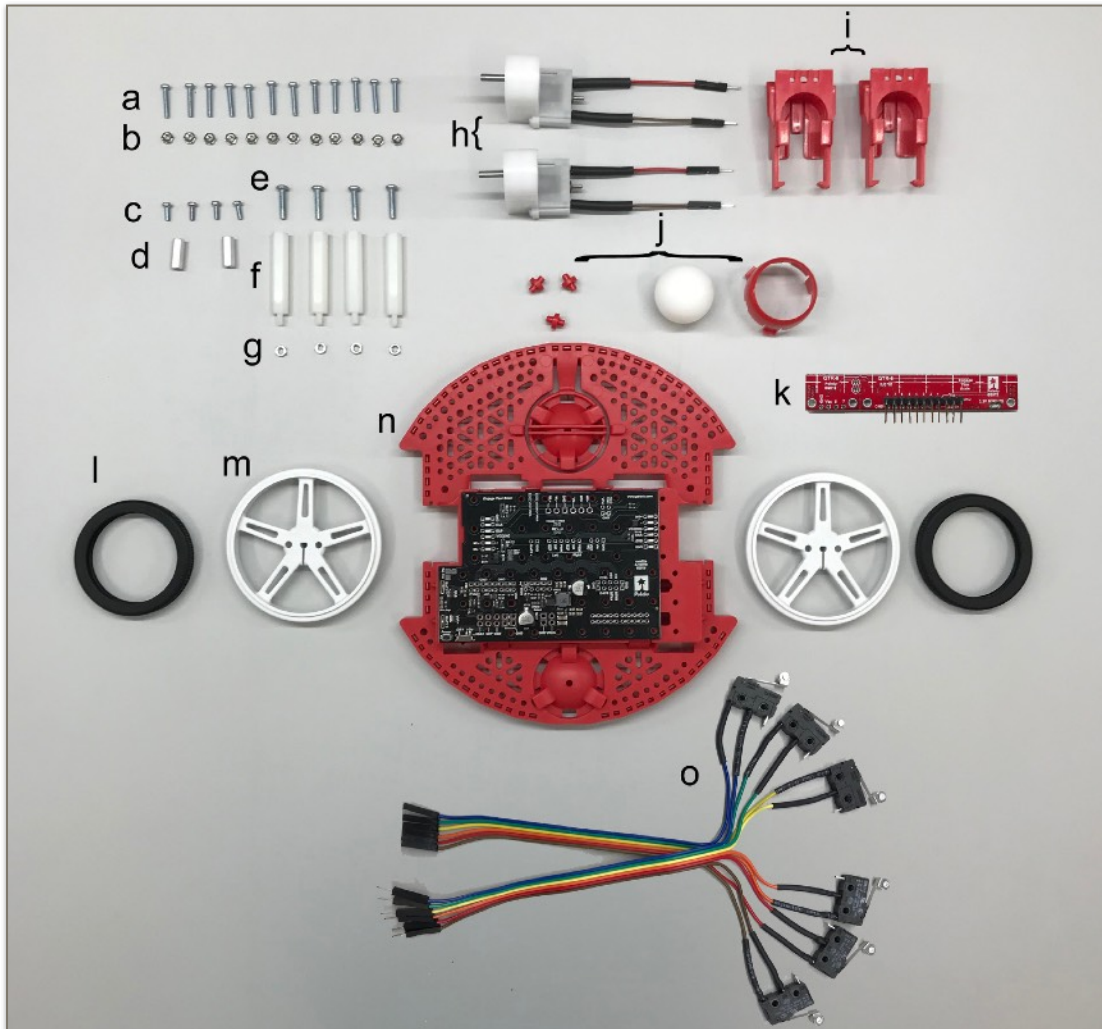
Slide a heat shrink tube (a) on each wire.



Solder one male wire on the "3" or "NO" connection on each bump switch (0). Color coding each switch will help you later when wiring.

Section 2: Assembly

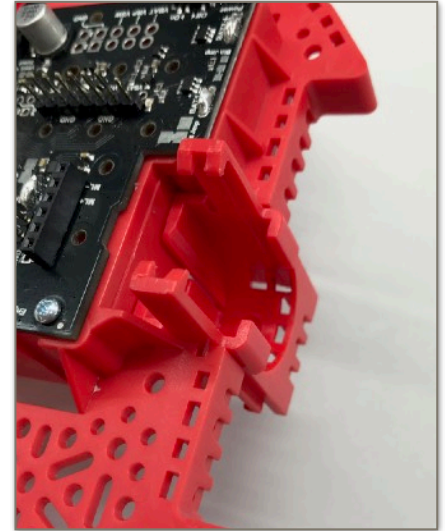
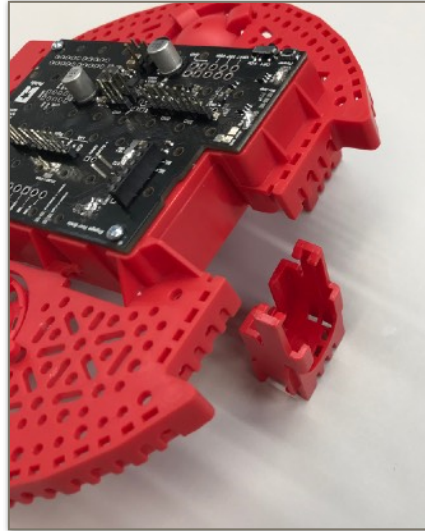
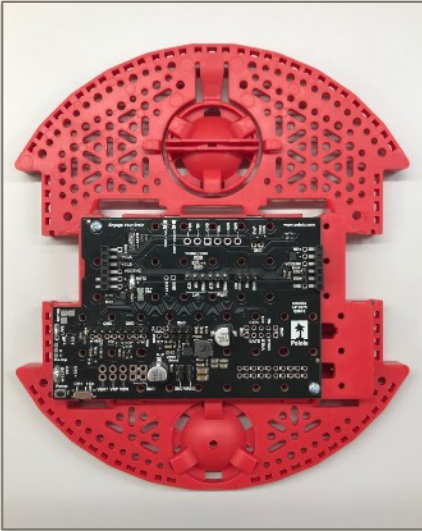
Step 1: Gather Supplies



| | Description | Qty | Part # |
|---|---------------------------|-----|----------|
| a | #2-56 Screw 1/2" | 12 | 55AC7011 |
| b | #2-56 Nut | 12 | 18M5986 |
| c | #2-56 Screw 1/4" | 4 | 56AC1176 |
| d | #2-56 Metal Standoff 1/2" | 2 | 27T8693 |
| e | #4-40 Screw 1/2" | 4 | 55AC7009 |
| f | #4-40 Plastic Standoffs | 4 | 16F1043 |
| g | #4-40 Nut | 4 | 43AC8400 |

| | Description | Qty | Part # |
|---|----------------------|-----|----------|
| h | Prepared Motor | 2 | 55AC1157 |
| i | Motor Clip | 2 | 55AC1156 |
| j | Ball Caster | 1 | 55AC1156 |
| k | Prepared Line Sensor | 1 | 55AC1159 |
| l | Rubber Wheel | 2 | 55AC1156 |
| m | Wheel | 2 | 55AC1156 |
| n | Prepared Chassis | 1 | 55AC1156 |
| o | Prepared Bump Switch | 1 | 55AC1159 |

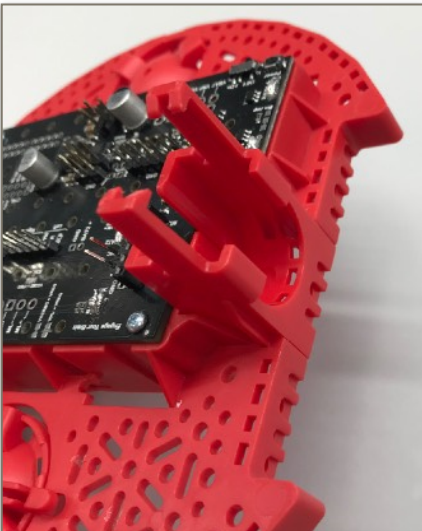
Step 2: Attach Motors



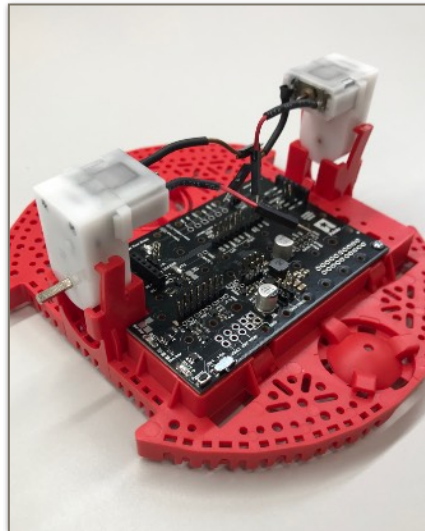
Gather:

- Prepared Chassis and Motor Board (n)
- Motor Clips (i)
- Prepared Motors (h)

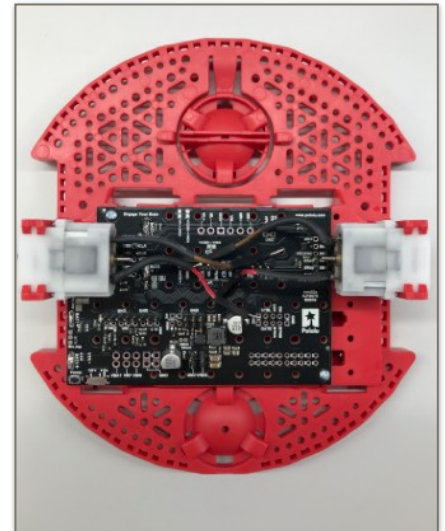
Insert the motor clips (i) into the motor board (n) as shown above.



Ensure the motor clips (i) are fully inserted.



Fully slide the motors (h) into the motor clips (i) as shown above. Be careful not to over-stress the clips.



Step 3: Attach Ball Caster



Gather your Chassis (n) and the Ball Caster parts (j).



Place the three small wheels in the grooves on the short side as shown above.

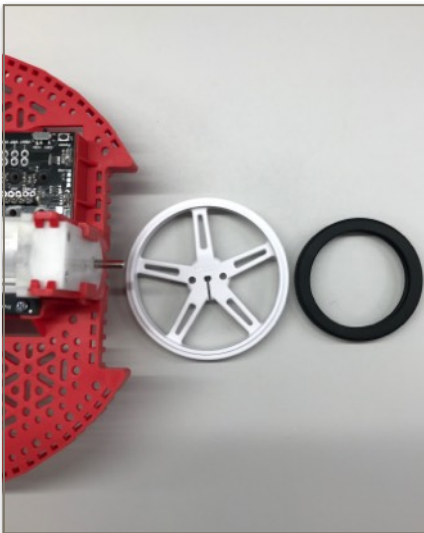


Place the white ball in the groove as shown above.



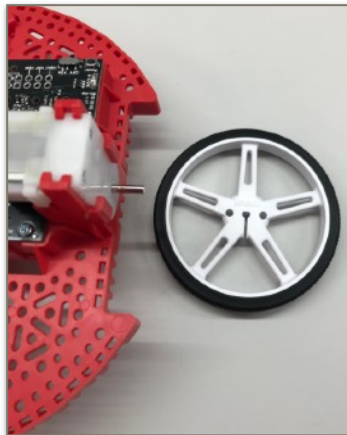
Secure the assembly with the final piece.

Step 4: Attach Wheels



Gather:

- Prepared Chassis
- Wheels (m)
- Rubber Wheels (l)



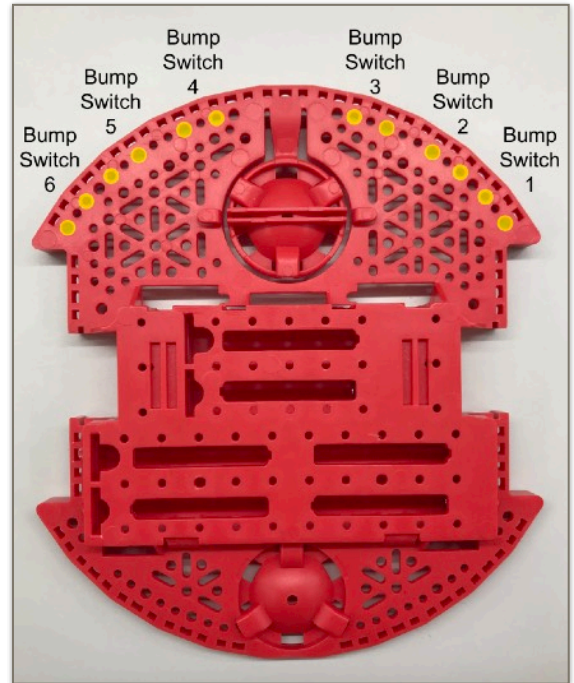
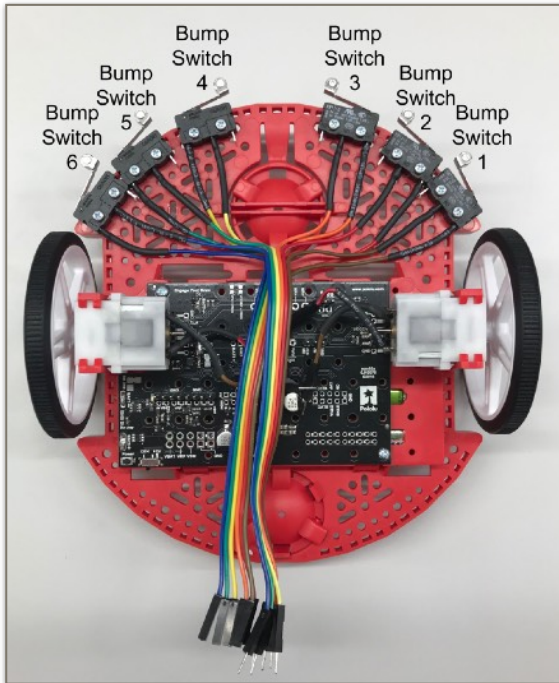
Attach rubber wheels (l) to the wheels (m).



Attach the prepared wheel to the motor. Please be sure to align the flat portions of the wheel and motor.



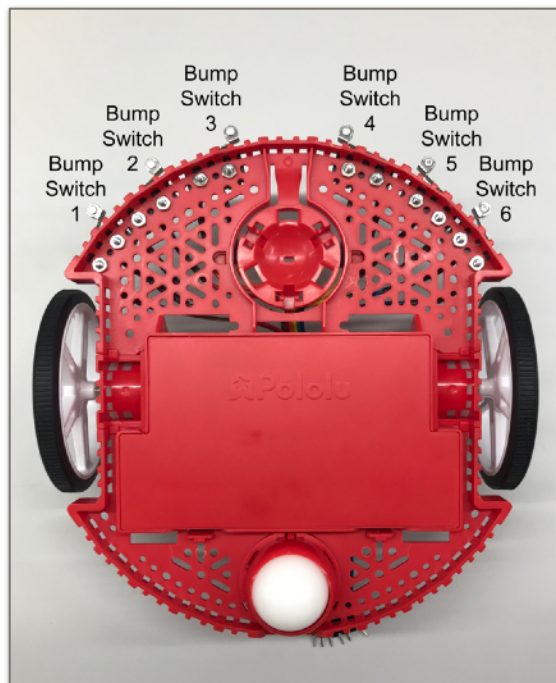
Step 5: Attach Bump Switches



Gather:

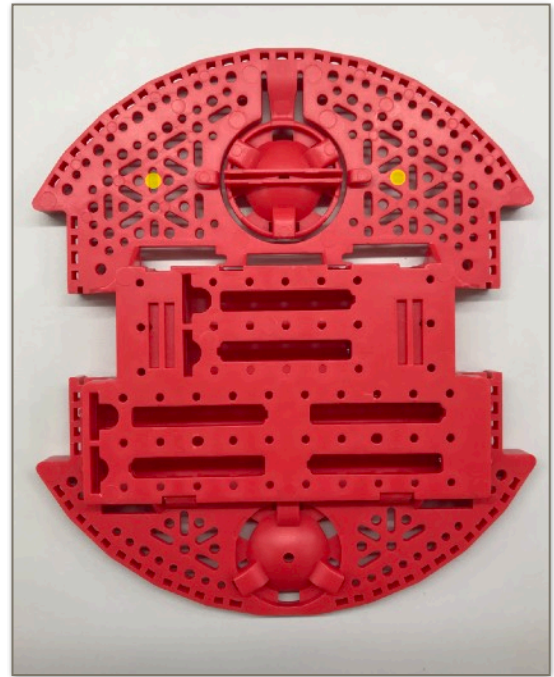
- Prepared Chassis
- Bump Switches (o)
- Screws #2-56 1/2" (a)
- Nuts #2-56 (b)

Attach the bump switches (o) to the chassis via the holes above using the nuts (b) and screws (a).



Bottom View.

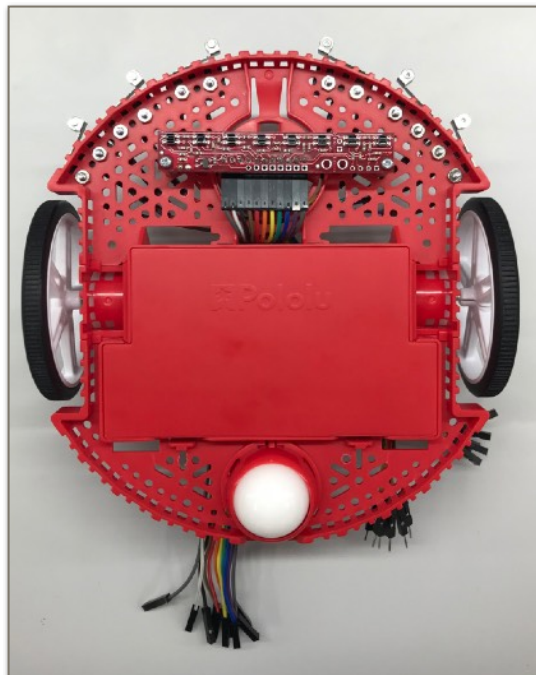
Step 6: Attach Line Sensor



Gather:

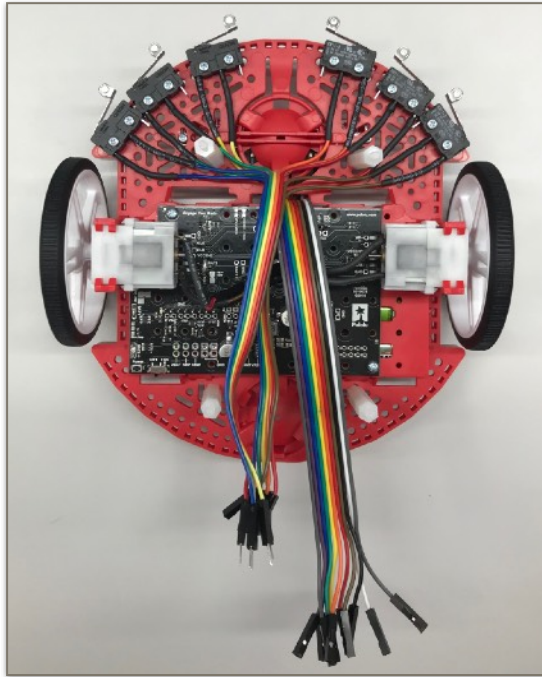
- Prepared Chassis
- Line Sensor (k)
- 11 Female to Female Wires (e from pg. 4)
- Screws #2-56 1/4" (c)
- Standoffs #2-56 (d)

Attach the standoffs (d) to the bottom of the chassis with two screws (c) at the highlighted locations.



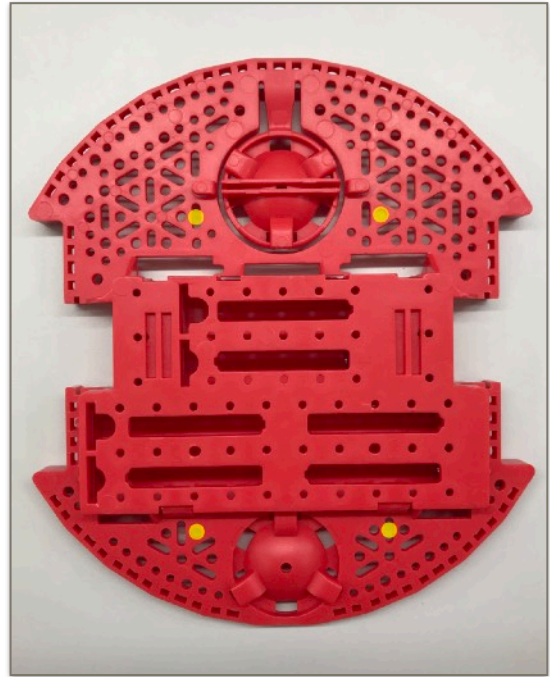
Run the wires (e from pg. 4) through the middle hole of the chassis. Attach the line sensor (k) using two screws (c) to the standoffs (d) you just attached.

Step 7: Attach LaunchPad Standoffs

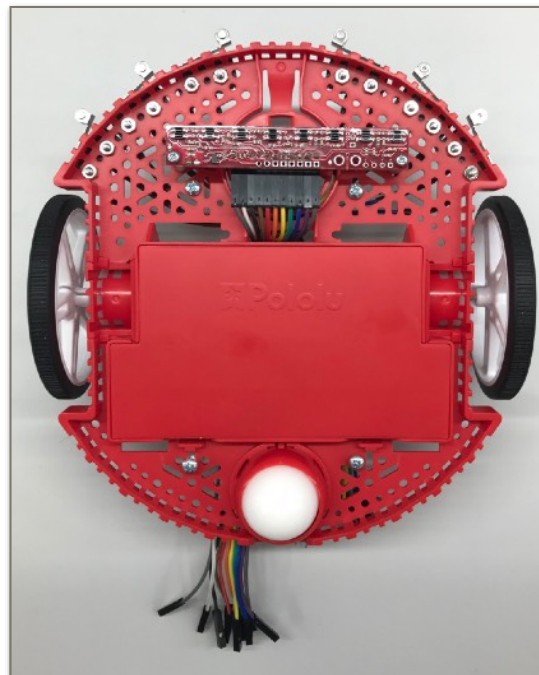


Gather:

- Prepared Chassis
- Plastic Standoffs (f)
- Screws #4-40 1/2" (e)
- Nuts #4-40 (g)



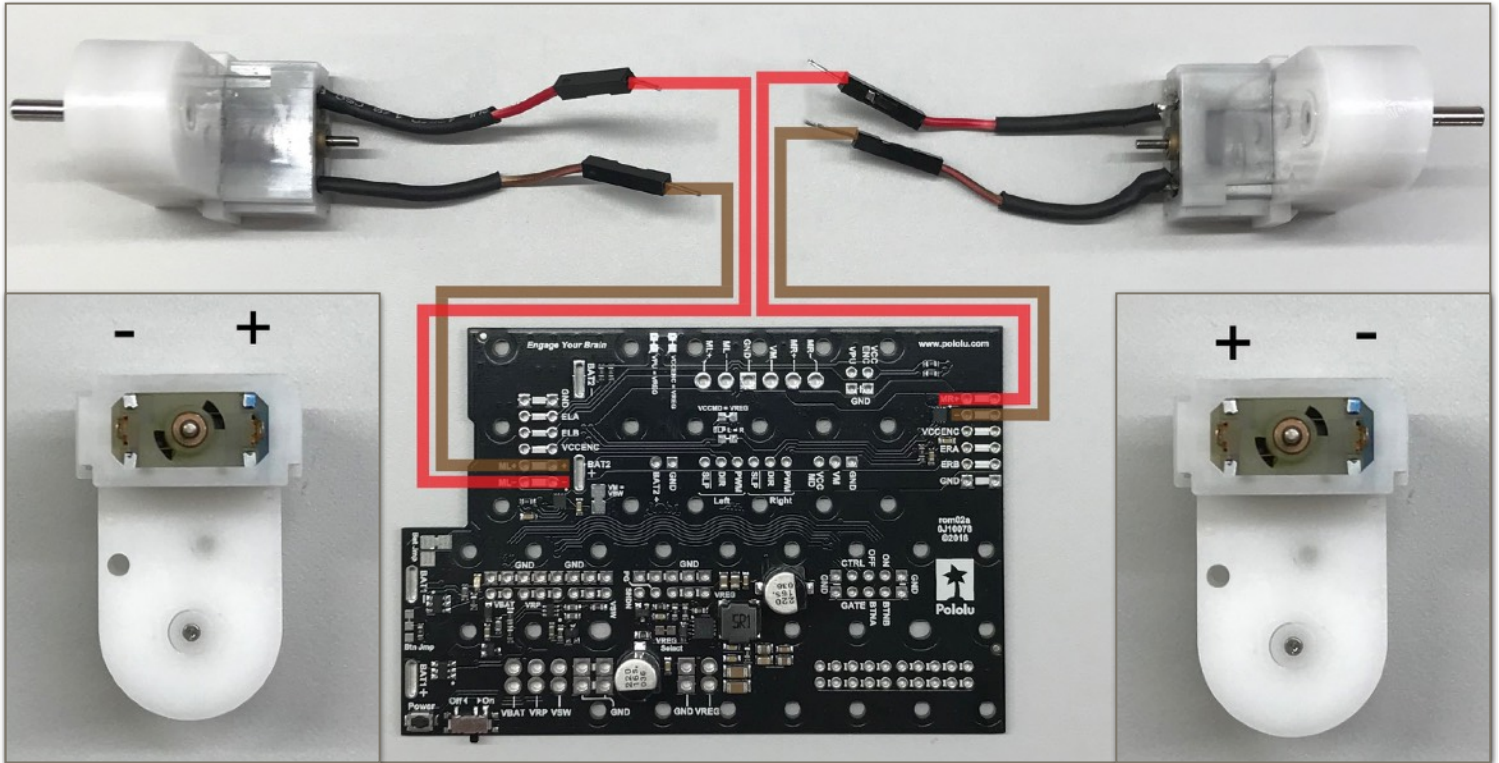
Attach the standoffs (f) to the top of the chassis with screws (e) via the highlighted areas above. Do not over tighten or screw them all the way in.



You will use the nuts (g) to attach the LaunchPad **after** the next section. **Note:** the Chassis holes may be slightly too small, but the screws will fit.

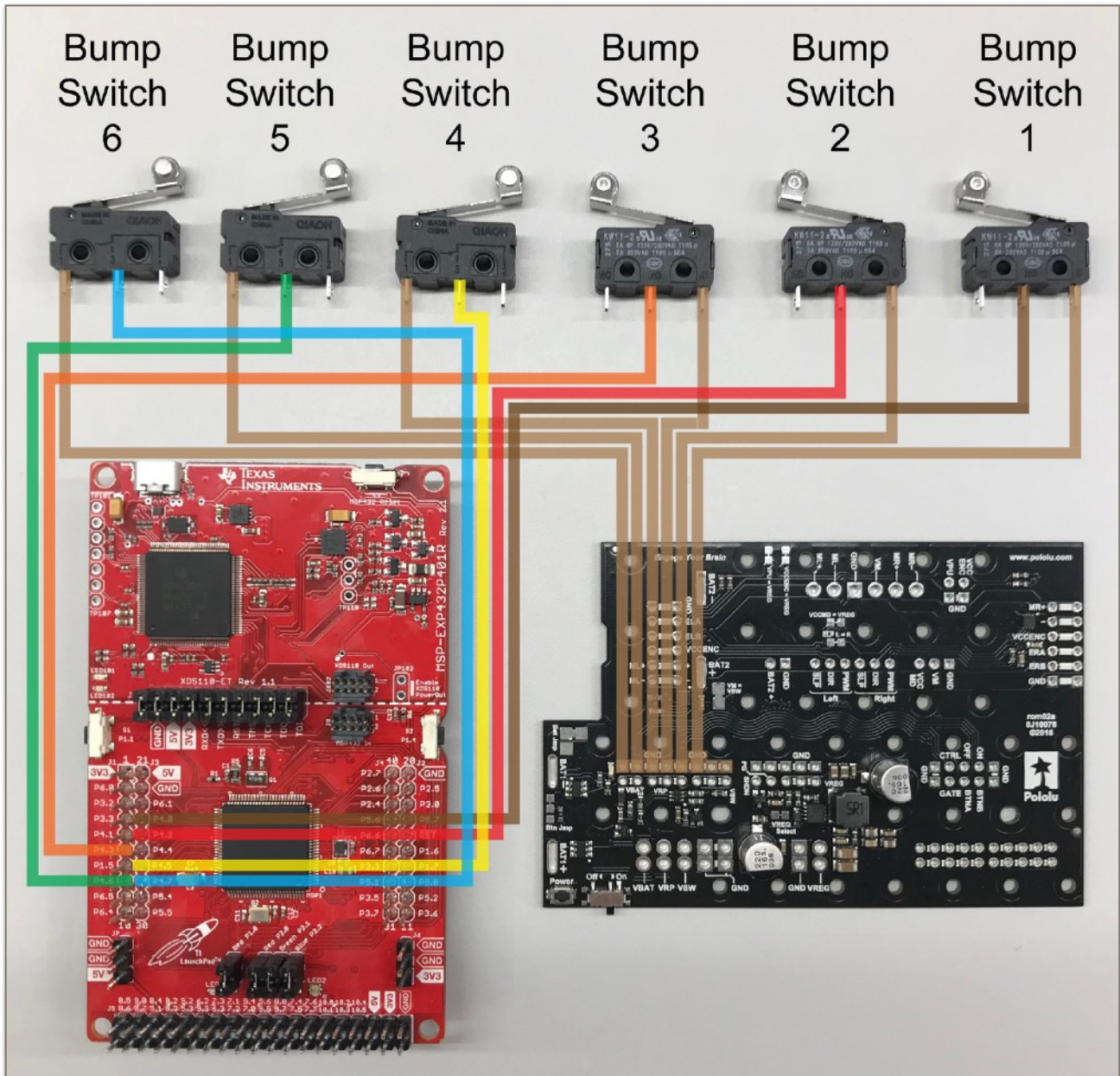
Section 3: Wiring

Step 1: Motors



Connect the motor wires to the positive (+) and negative (-) terminals on the motor driver board. The front of the chassis or forward will be positive (+) and the back of the chassis or backward will be negative (-).

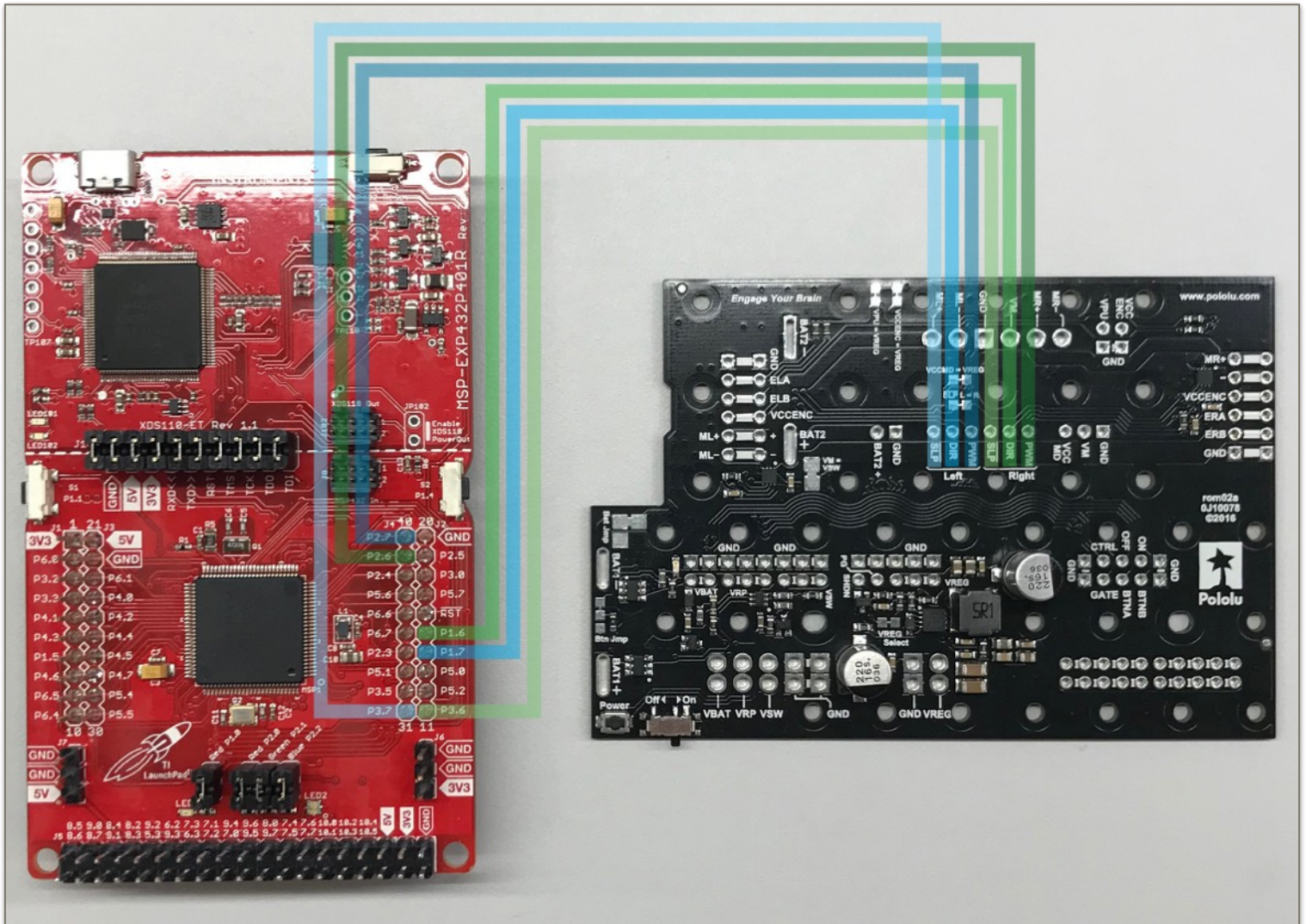
Step 2: Bump Switches



Connect the “1” or “C” output (female wire) from each bumper to GND on the motor board. Connect the “3” or “NO” output (male wire) from each bumper to the LaunchPad inputs below.

| | Bump 1 | Bump 2 | Bump 3 | Bump 4 | Bump 5 | Bump 6 |
|-----------|--------|--------|--------|--------|--------|--------|
| LaunchPad | P4.0 | P4.2 | P4.3 | P4.5 | P4.6 | P4.7 |

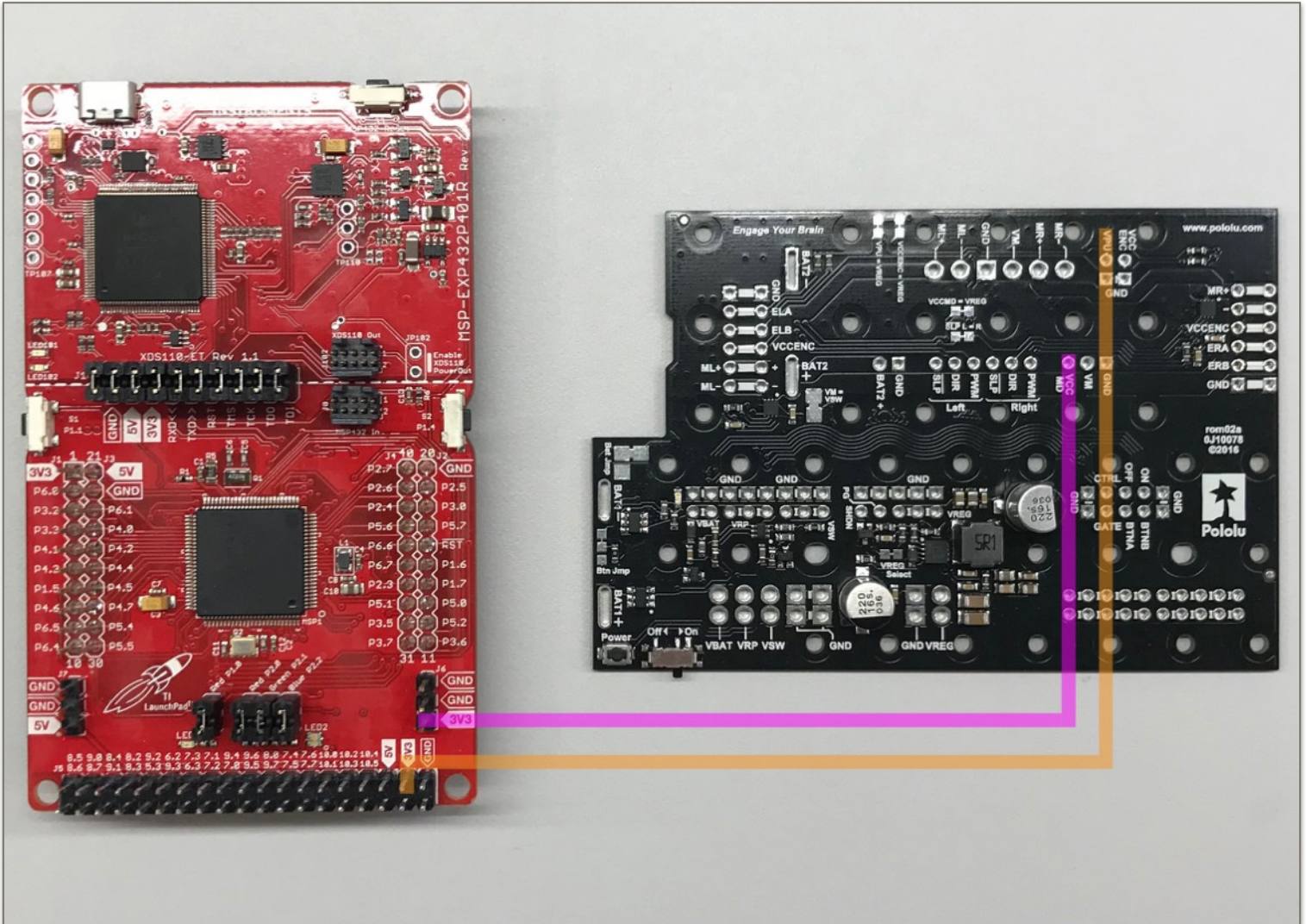
Step 3: Motor Board Logic



Using the 6 female to male wires (c from pg. 4), connect the motor driver connections to the LaunchPad outputs below.

| Motor Board | Left SLP | Left DIR | Left PWM | Right SLP | Right DIR | Right PWM |
|-------------|----------|----------|----------|-----------|-----------|-----------|
| LaunchPad | P3.7 | P1.7 | P2.7 | P3.6 | P1.6 | P2.6 |

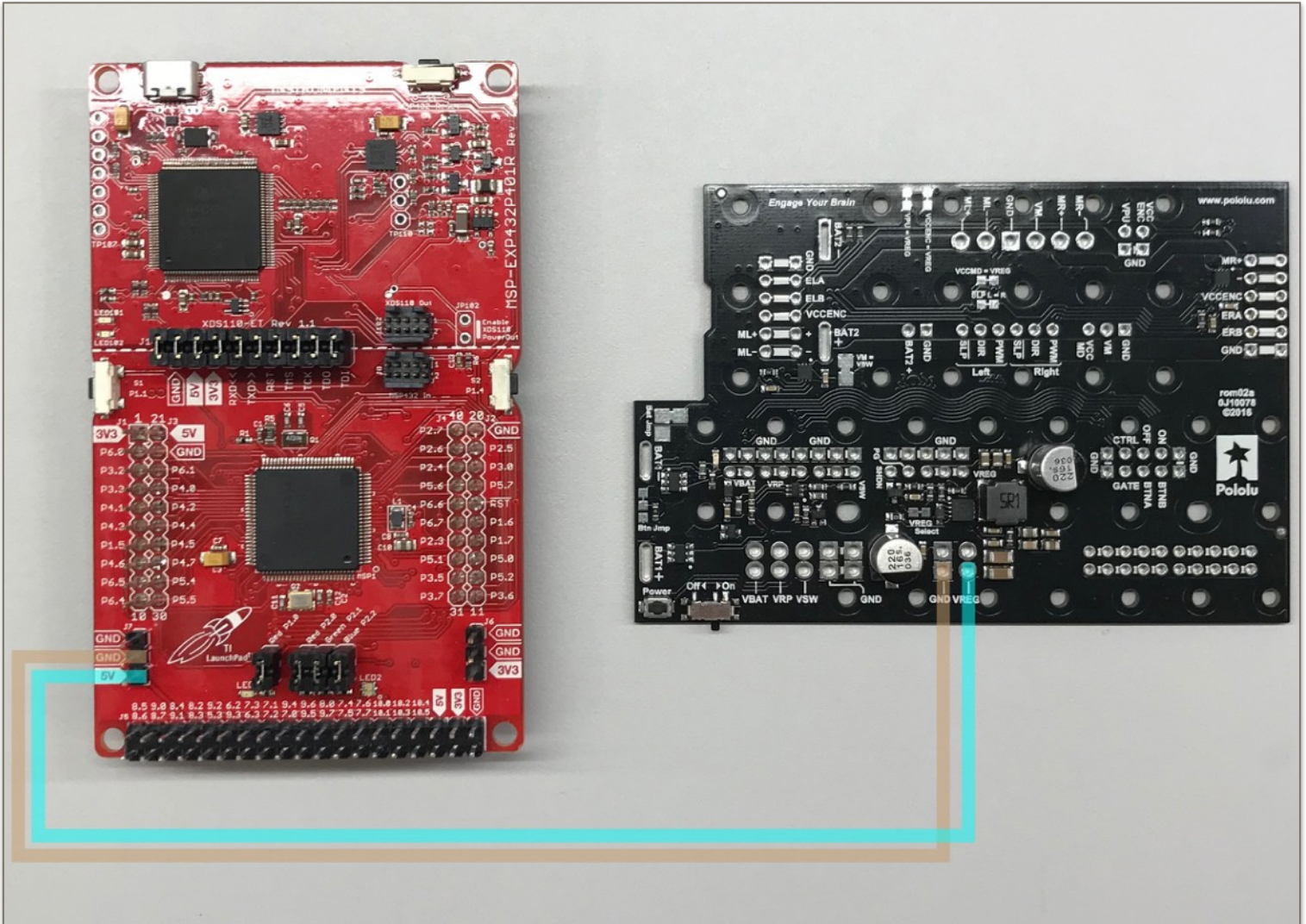
Step 4: Motor Board Power



Using the 2 female to female wires (d from pg. 4), connect the VPU and VCCMD connections to the LaunchPad's 3.3V outputs (3V3).

| | | |
|-------------|-----|-------|
| Motor Board | VPU | VCCMD |
| LaunchPad | 3V3 | 3V3 |

Step 5: LaunchPad Power

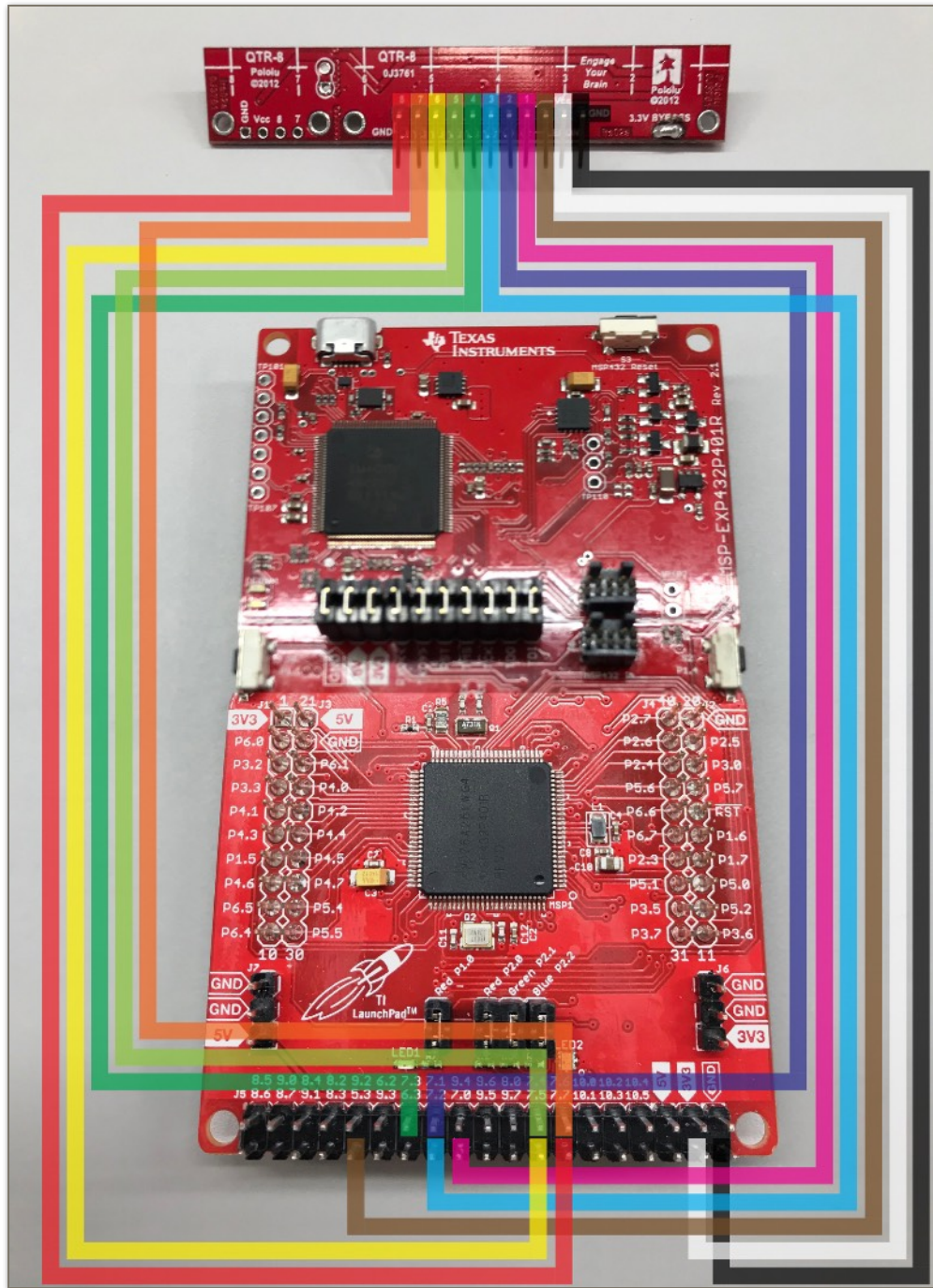


Using the 2 female to female wires (d from pg. 4), connect the VREG and GND connections to the LaunchPad's 5V and GND connections respectively.

Note: You must disconnect these wires every time you connect your LaunchPad to your computer via USB.

| | | |
|-------------|------|-----|
| Motor Board | VREG | GND |
| LaunchPad | 5V | GND |

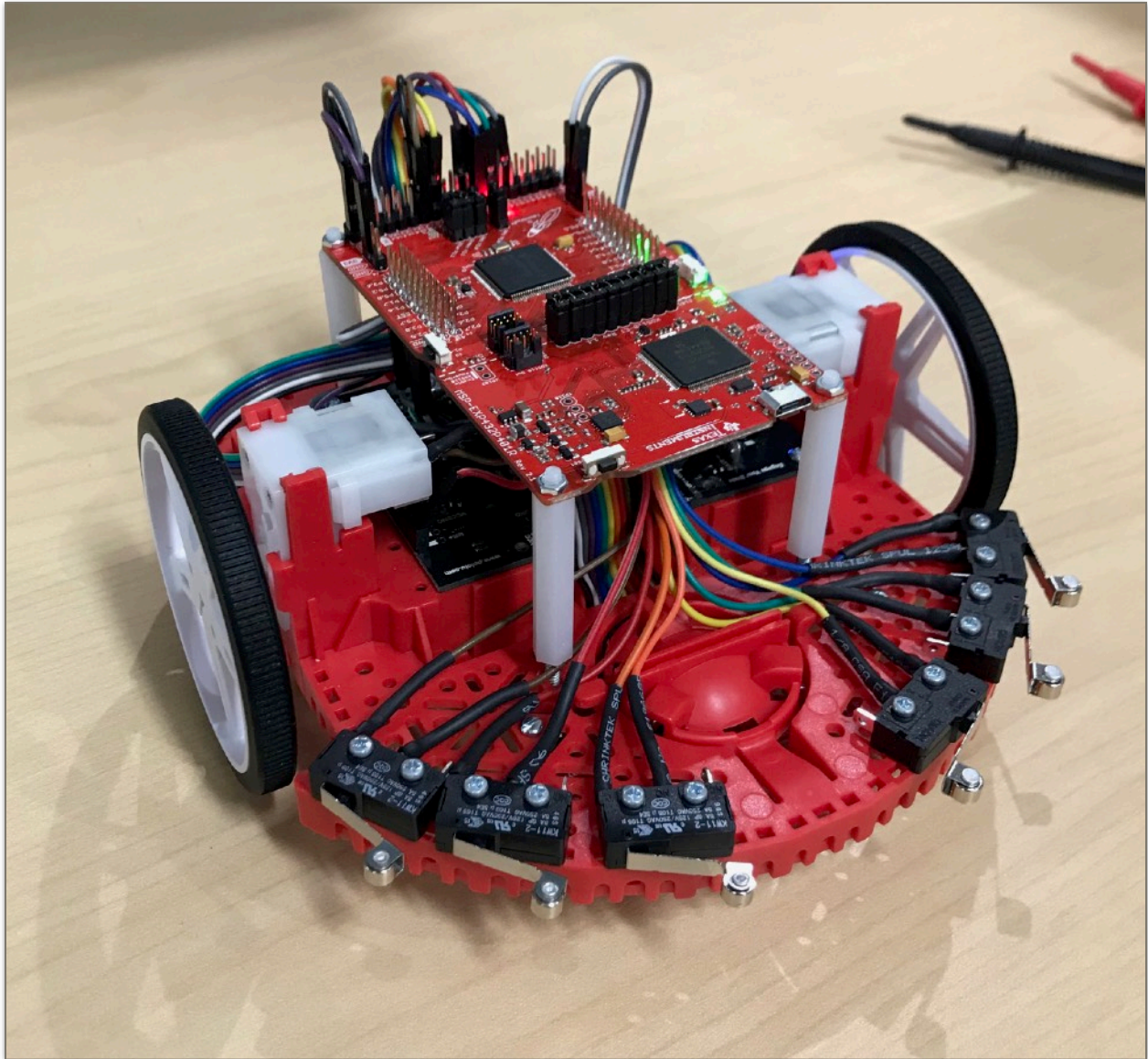
Step 6: Line Follow Sensor



Using the 11 female to female wires (e from pg. 4) you fed through the chassis earlier (Step 6 on pg. 18) make the below connections between the line sensor and LaunchPad.

| | | | | | | | | | | | |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|------------|------------|
| Line Sensor | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | LED ON | VCC | GND |
| LaunchPad | P7.7 | P7.6 | P7.5 | P7.4 | P7.3 | P7.2 | P7.1 | P7.0 | P5.3 | 3V3 | GND |

Step 7: Attach LaunchPad



Lastly, secure the LaunchPad to the LaunchPad standoffs using the nuts you set aside earlier.

Congratulations; your TI-RSLK is built!

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