

LESSON 2

Building Your Pi-Bot

Now that you've successfully completed assembling your gearbox, it's time to build your Pi-Bot!

Identify your Pi-Bot body. The top side can be identified by placing the additional switch hole on the right side. Mount the breadboard to the lower right section of the body, as shown in figure 2.1. The breadboard should be approximated 3mm from the edge.

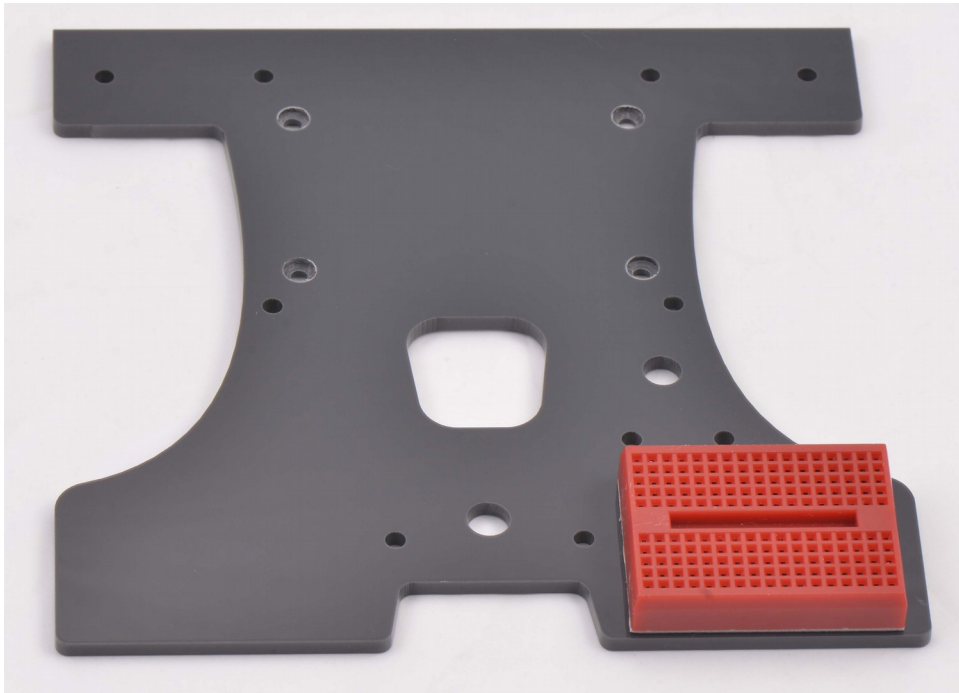


Figure 2.1

Note: The breadboard pictured in figure 2.1 is colored red. Your breadboard may come in any color!

Locate the assembled gearbox as shown in figure 2.2. The gearbox is to be mounted to the underside of the body. The motors point to the rear of the body.

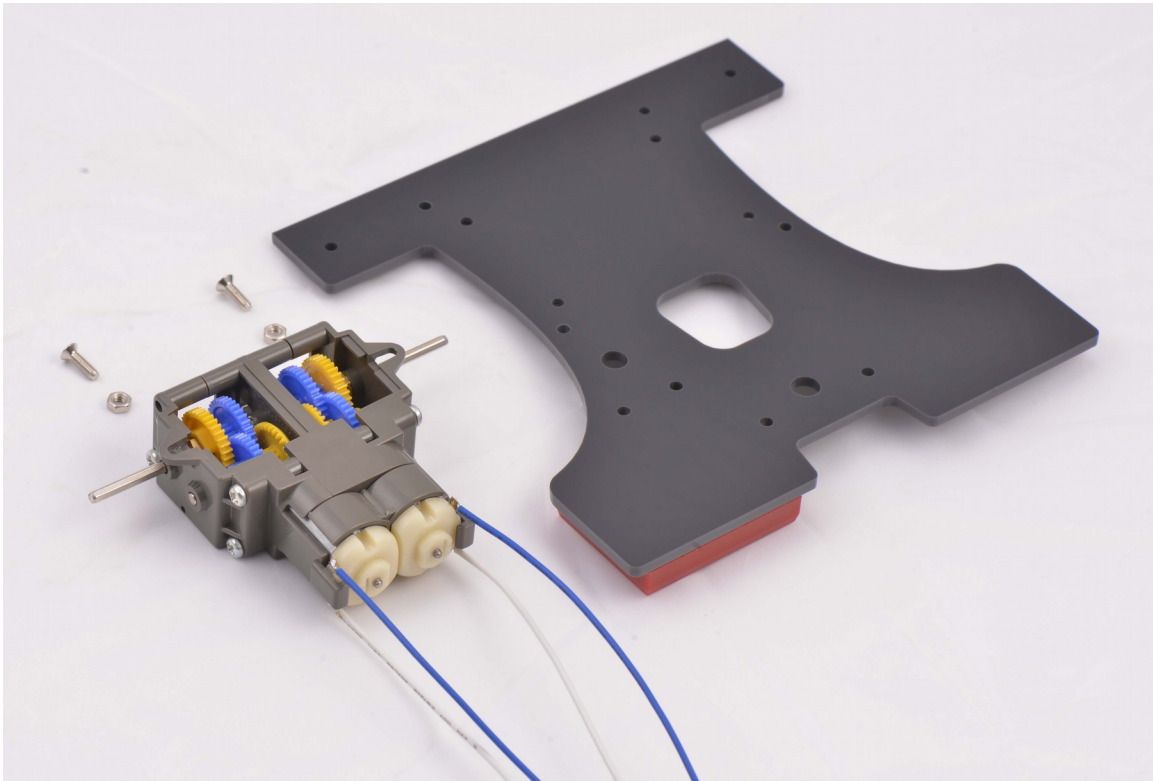


Figure 2.2

The mounted gearbox is shown in figure 2.3. Make sure that the gearbox is mounted using the two center countersunk holes, two (2) flat head 4-40 x 3/8" screws and two (2) 4-40 nuts.

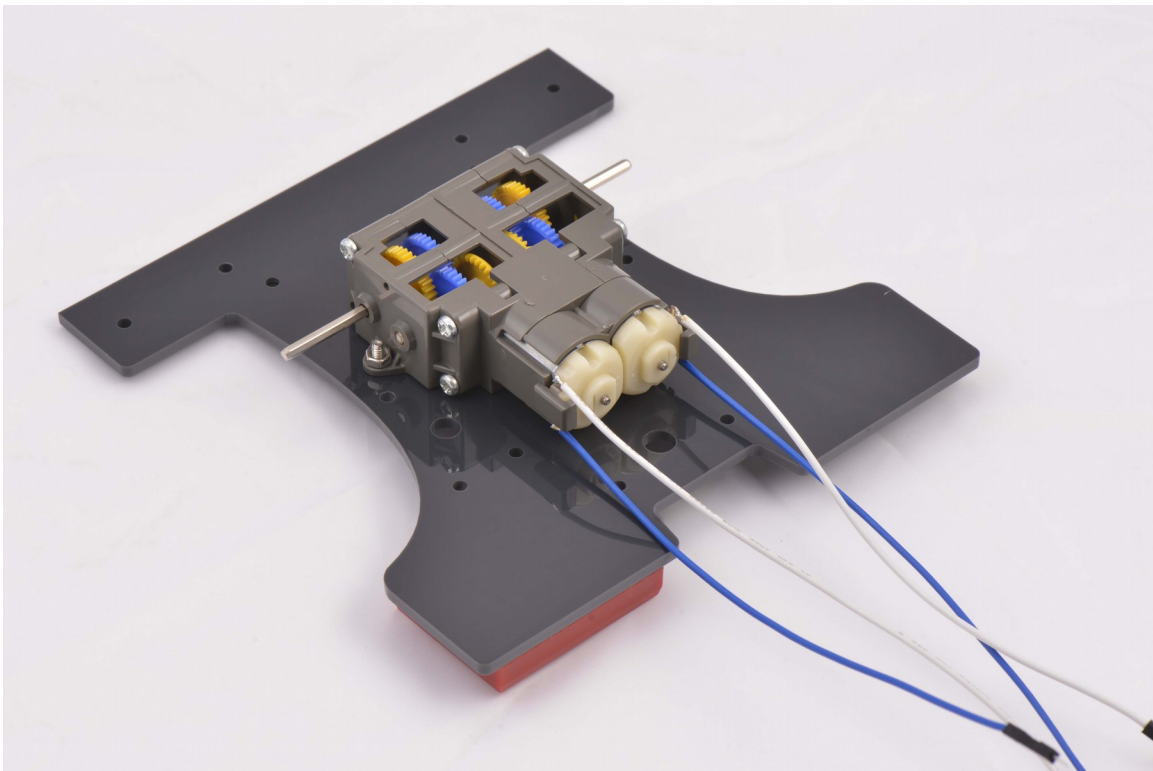


Figure 2.3

Locate the switch with the wires soldered in place. Also locate the flat and locking washers, and two (2) matching nuts. The nuts and washers are arranged in the proper order for installation of the switch. See figure 2.4.

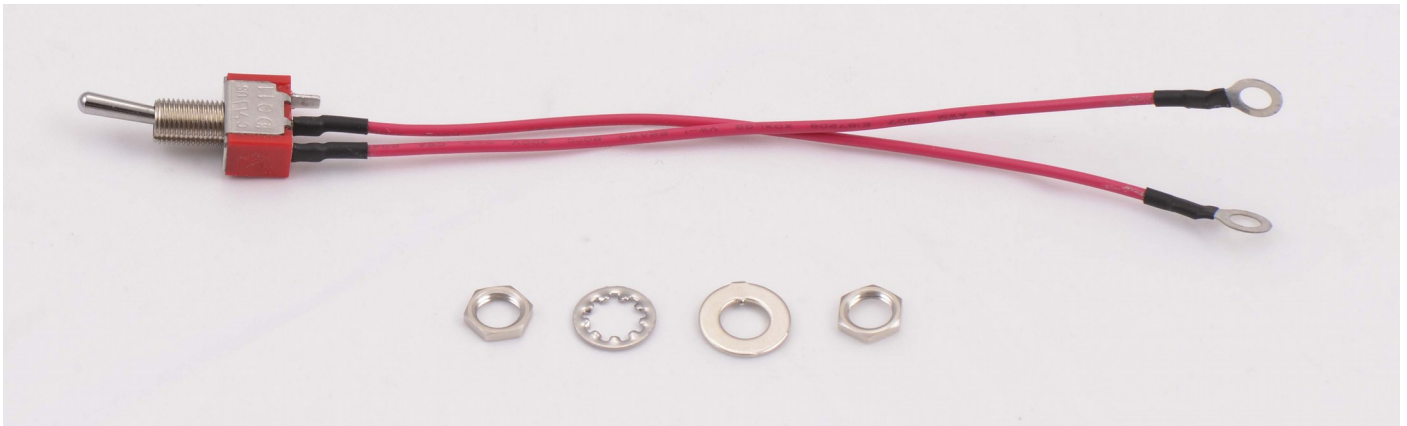


Figure 2.4

Note: The switch is pictured (figure 2.4) in the **ON** position. The **OFF** position is when the lever is pointing away from the side with the empty terminal.

Install the switch such that the toggle is on the top of the body and the wires are the underneath the body, as shown in figure 2.5. Arrange the switch so that the **OFF** position points towards the breadboard.

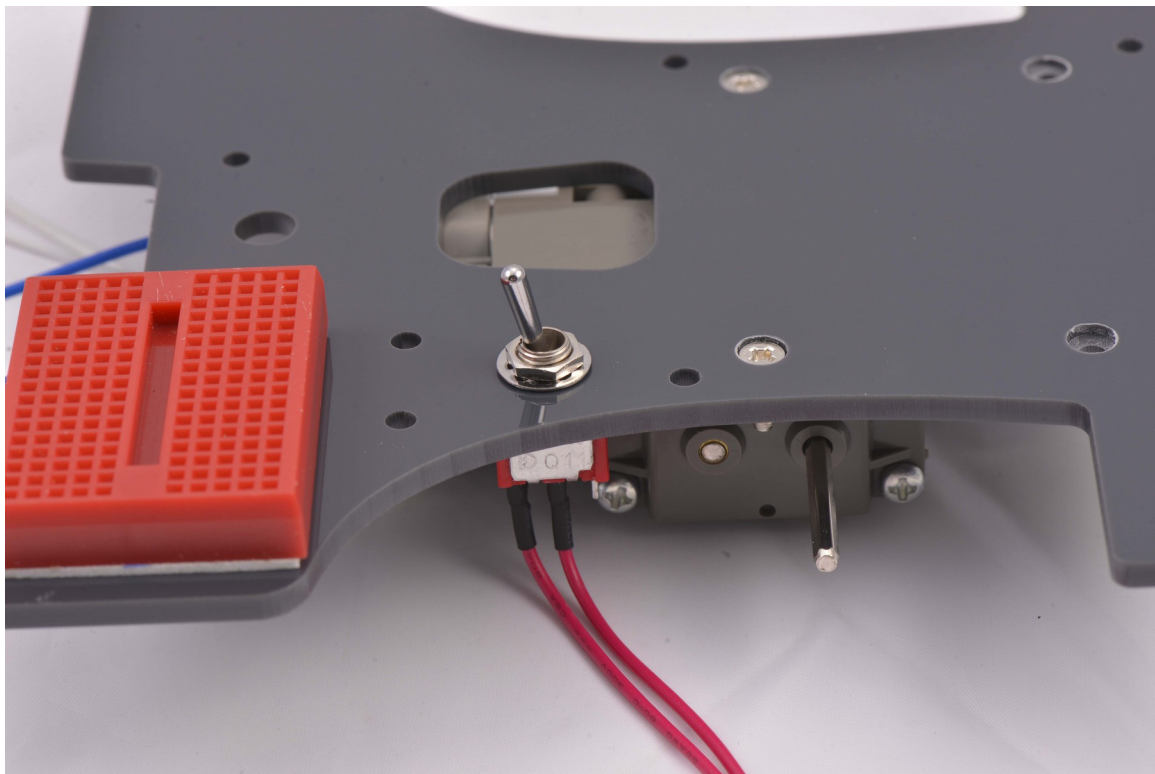


Figure 2.5

Insert two (2) 4-40 x 1/2" screws in the two holes next to the switch to act as terminal blocks. When mounting the screws, the eyelets of the switch wires should be captive, as shown in figure 2.6.

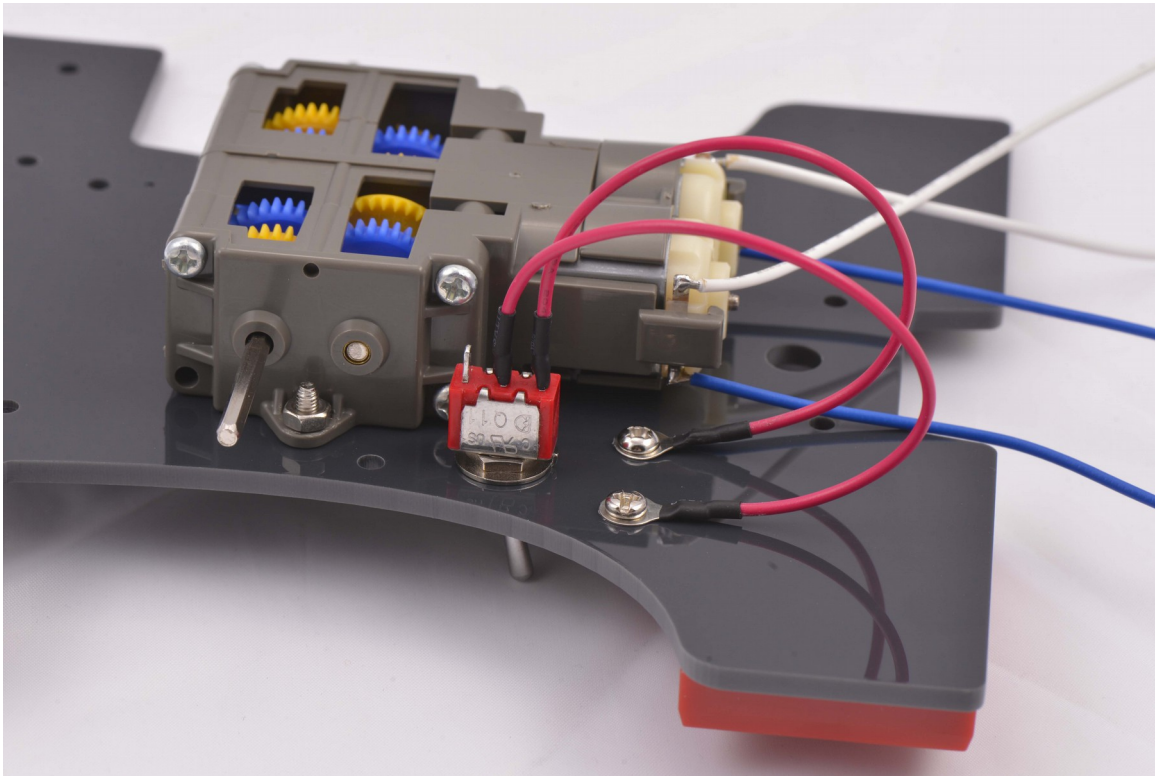


Figure 2.6

Figure 2.7 depicts the screws pointing up through the top side of your Pi-Bot's body. This will be later used to power the gearbox during testing.

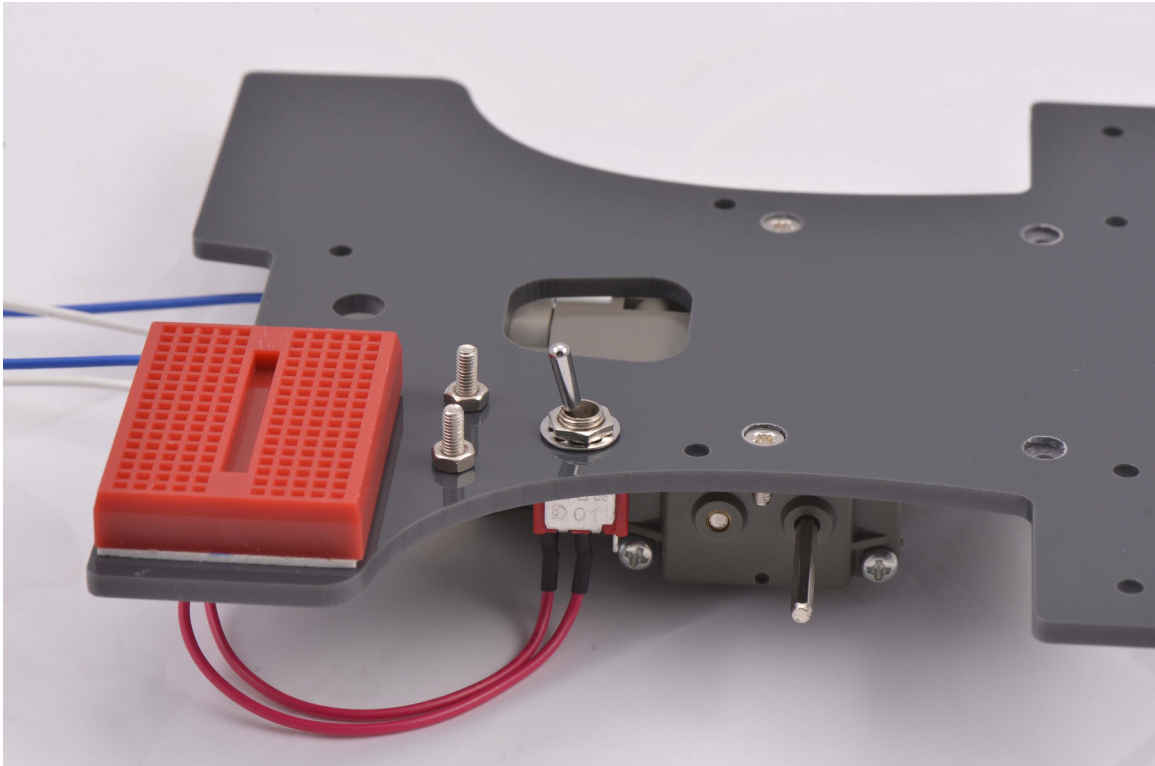


Figure 2.7

Locate the front caster parts, as shown in figure 2.8.



Figure 2.8

Assemble the front caster using the provided screws and nuts, as shown in figure 2.9. The brown-colored spacers are not used, but should be kept for future modification of your Pi-Bot.



Figure 2.9

Locate two (2) 1 inch nylon spacers and four (4) 4-40 screws, and assemble them as shown in figure 2.10.

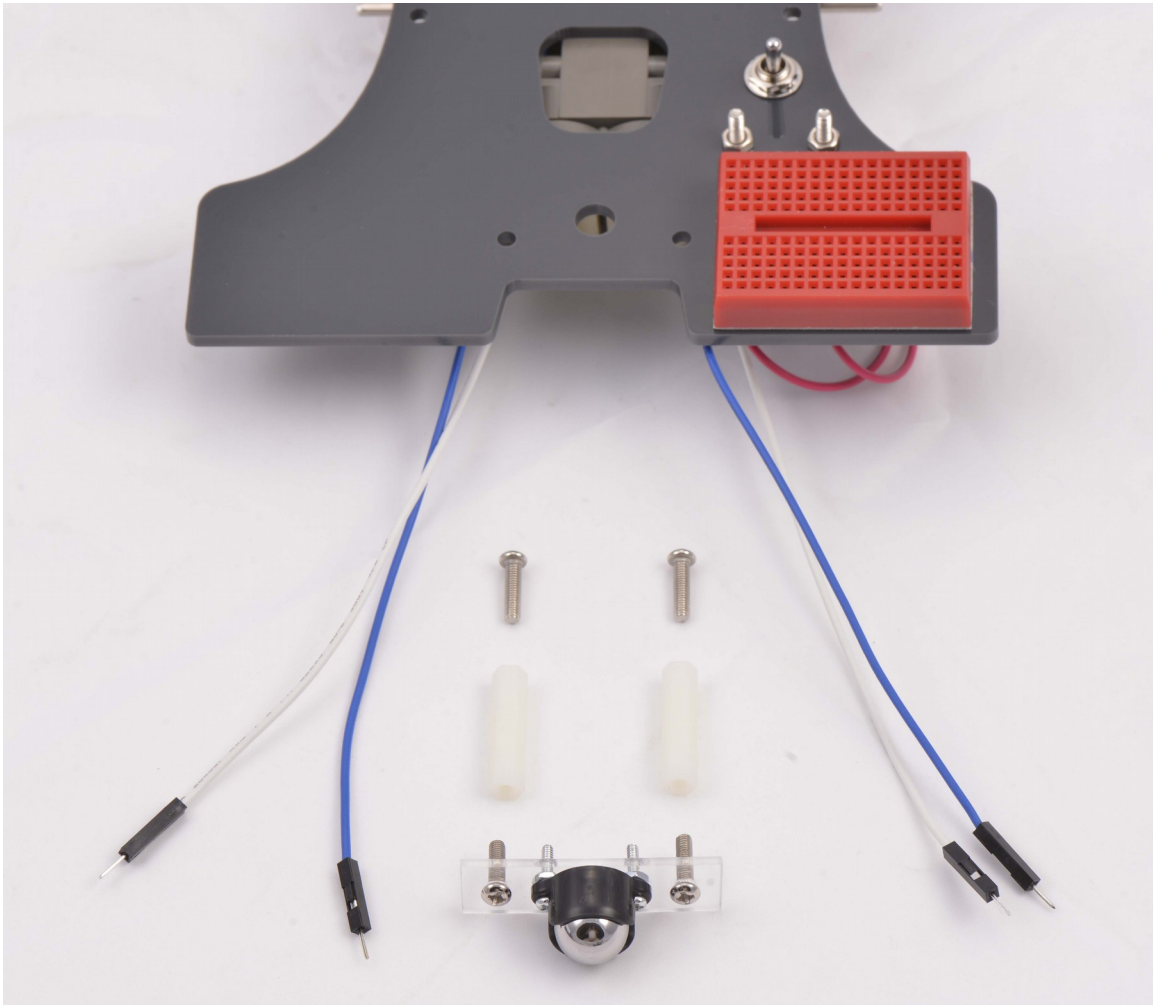


Figure 2.10

Mount the assembled castor to the rear bottom of the body, as shown in figure 2.11. Route the motor wires through the space above the castor.

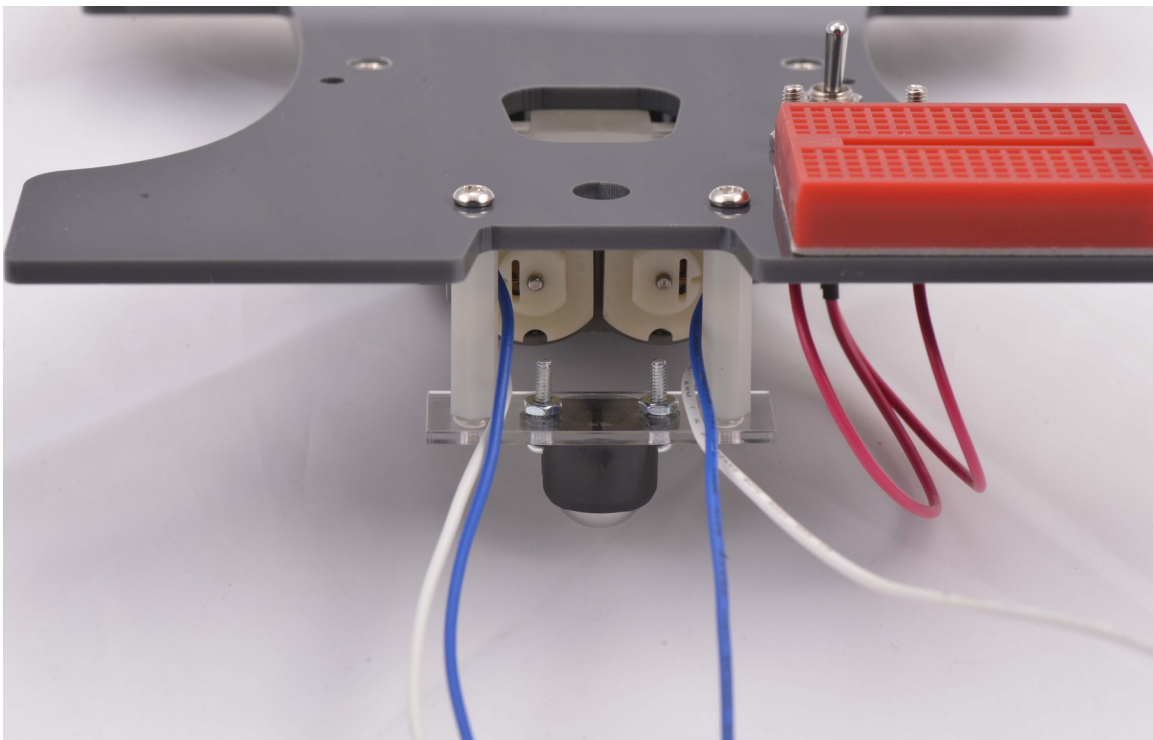


Figure 2.11

Next, we will install the standoffs for the front line sensor.

Use the two remaining countersunk holes in your Pi-Bot. Mount both 3/4 inch spacers using two (2) flat head 4-40 x 3/8" screws, as shown in figure 2.12. Do not mount the line sensor at this time.

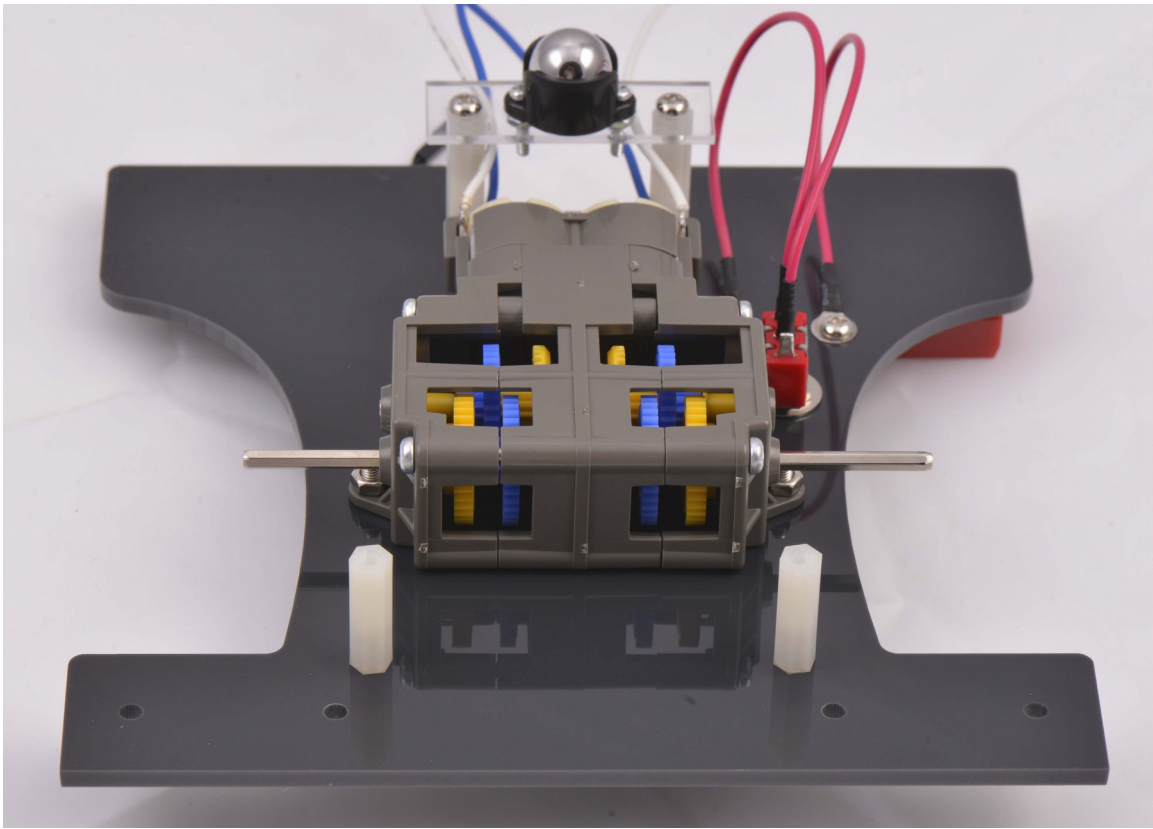


Figure 2.12

Locate the Sports Tire Set, as displayed in figure 2.13.



Figure 2.13

Before assembling and installing the wheels onto the gearbox axles, make sure to correctly attach the wheel hubs using the provided screws and nuts. The wheel hubs should be attached to maximize the wheel base. In other words, insert the screws into the deeper side of each wheel and the nuts into the shorter side.

The Pi-Bot with the correctly installed wheels are depicted in figures 2.14 and 2.15.

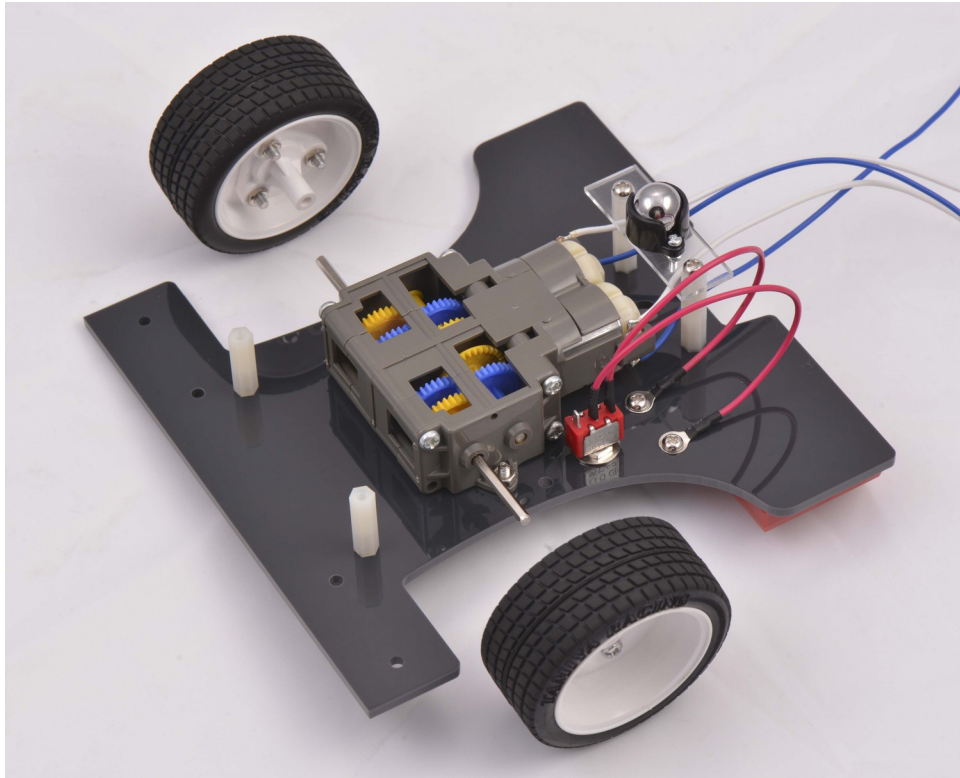


Figure 2.14

Note: Do not force the wheels all the way in! Keep a reasonable clearance between the tires and the body.

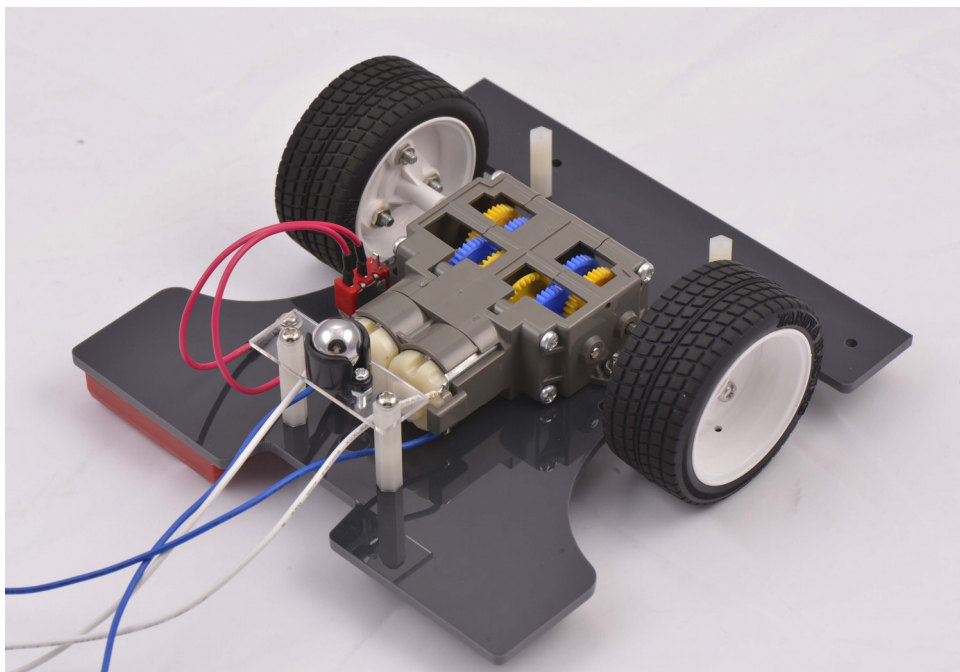


Figure 2.15

Identify the Arduino-compatible STEM Board microcontroller, as shown in figure 2.16.

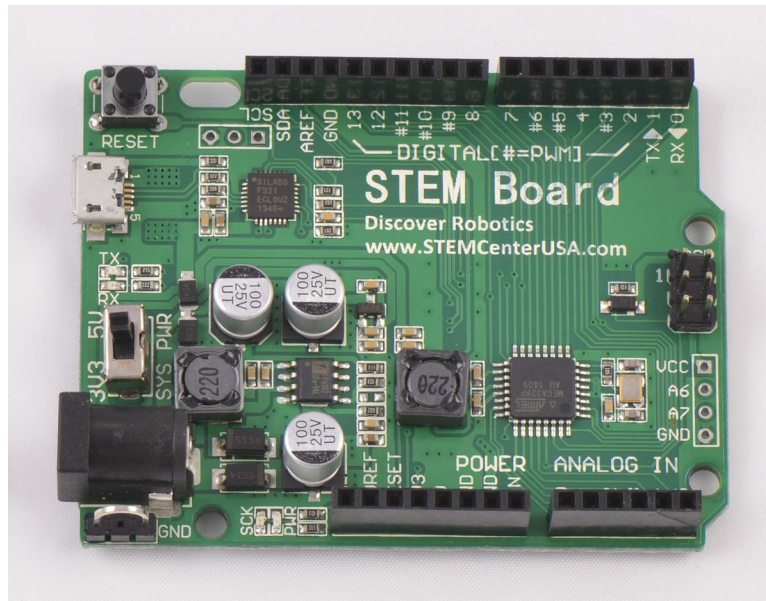


Figure 2.16

Attach four (4) 1 inch nylon standoffs to the bottom of the clear plastic microprocessor mounting board using four (4) 4-40 x 1" screws, as shown in figure 1.7.

CAUTION: The mounting plate is fragile and fits in only one direction. Do not not overtighten the screws, or damage may occur to the components.

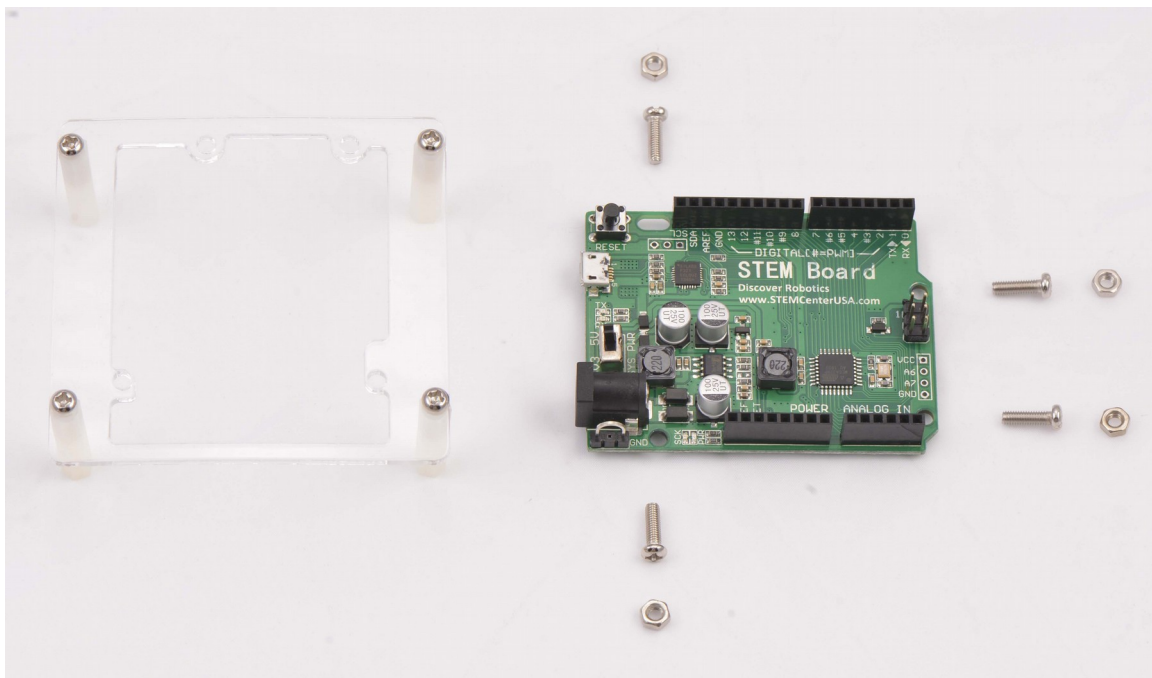


Figure 2.17

Attach the STEM Board microprocessor to the top of the clear plastic mounting plate using four (4) 4-40 x 3/8" screws and four (4) 4-40 nuts. See figures 2.17 and 2.18.

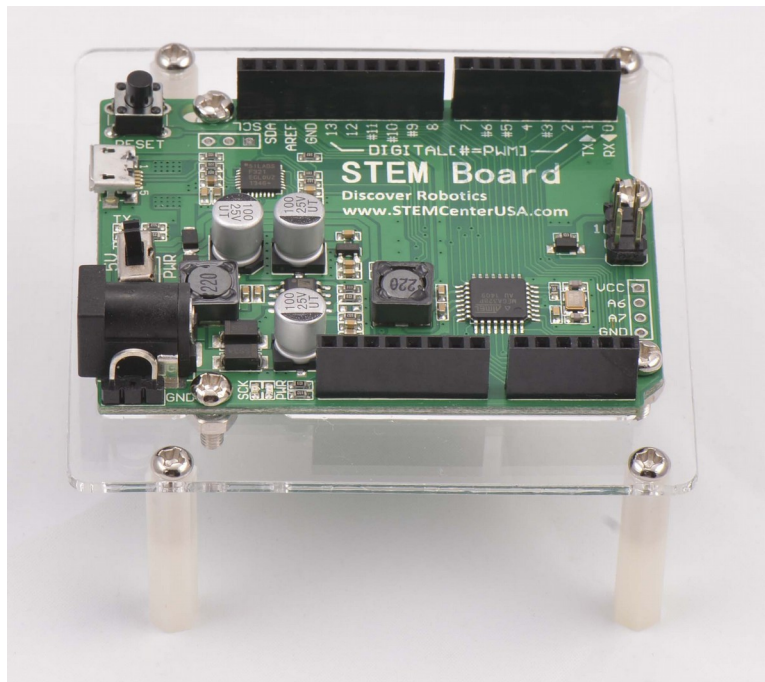


Figure 2.18

Attach the STEM Board microcontroller assembly to the top of the Pi-Bot body, as shown in figure 2.19. The 9V power connector should point towards the rear of the body.

Located between the 1" nylon spacers and the body are the battery guides and the clear guide spacers. Use four (4) 4-40 x 1/2" screws. When positioning the guide spacers, place the notch toward the front of the body and facing outward.

Note: Do not tighten the spacers to the body yet. This will allow battery pack to slide in freely.

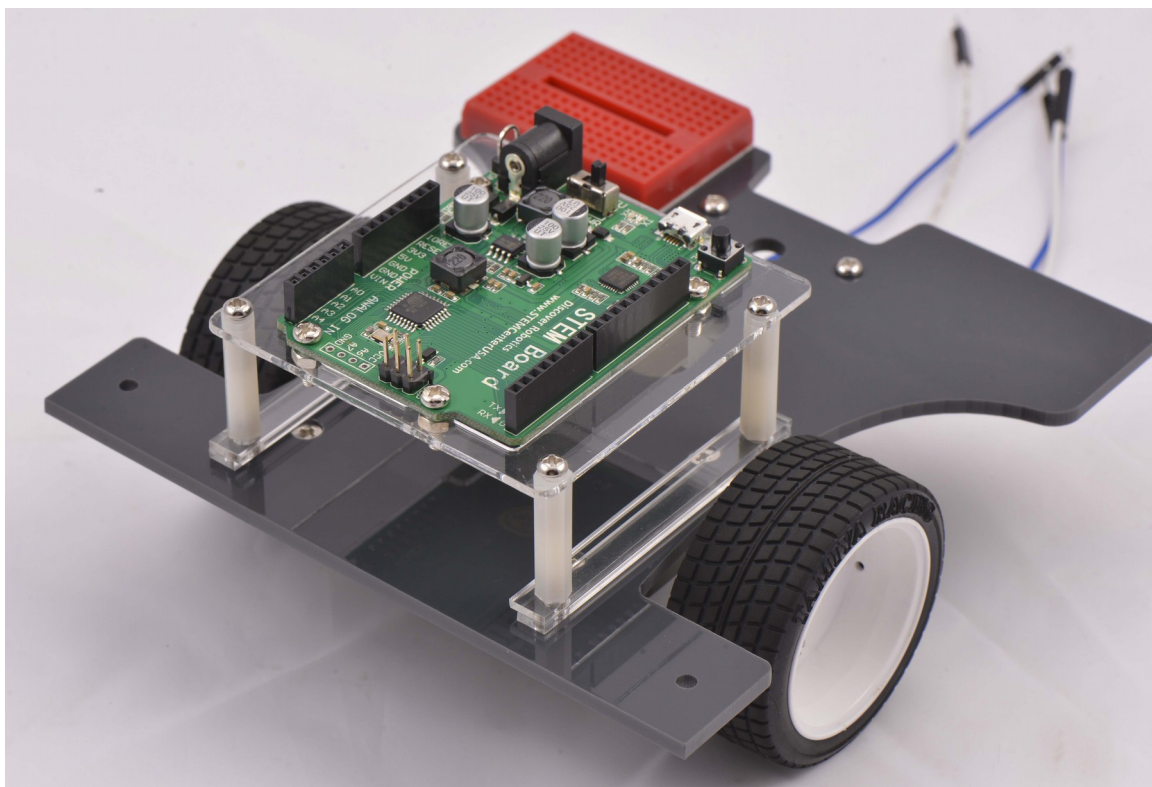


Figure 2.19

Locate the three AA battery carrier, the clear plastic battery slide, and one (1) velcro set, as shown in figure 2.20.

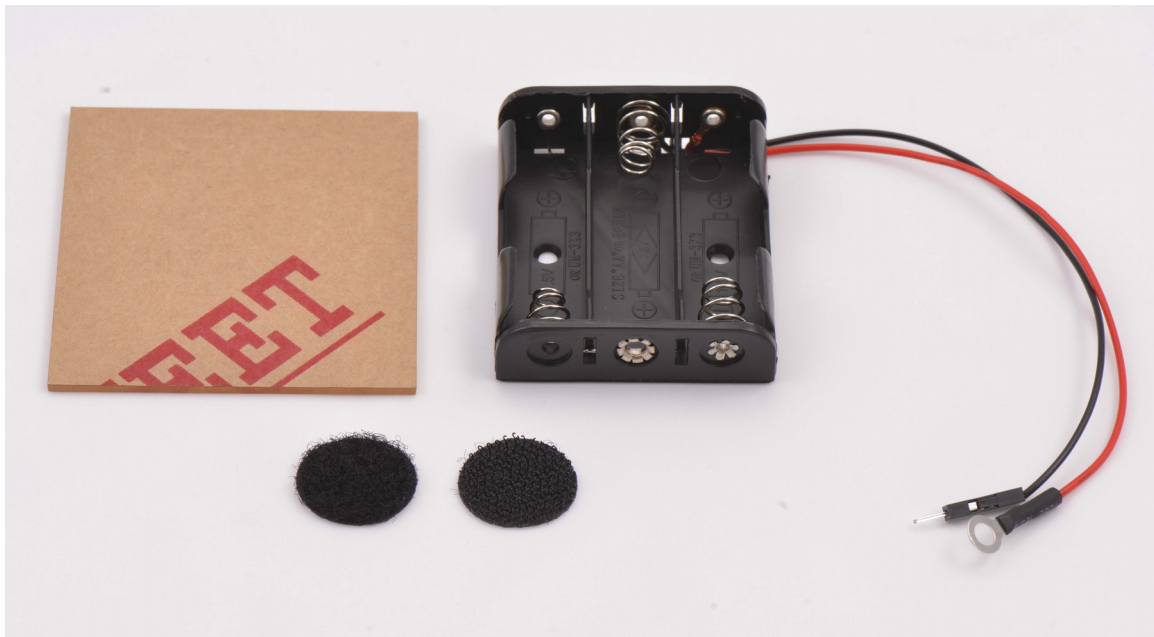


Figure 2.20

Peel off the protective paper from both sides of the clear plastic battery slide, and adhere one half of the velcro to it. Adhere the other half to the bottom of the battery carrier, as shown in figure 2.21.

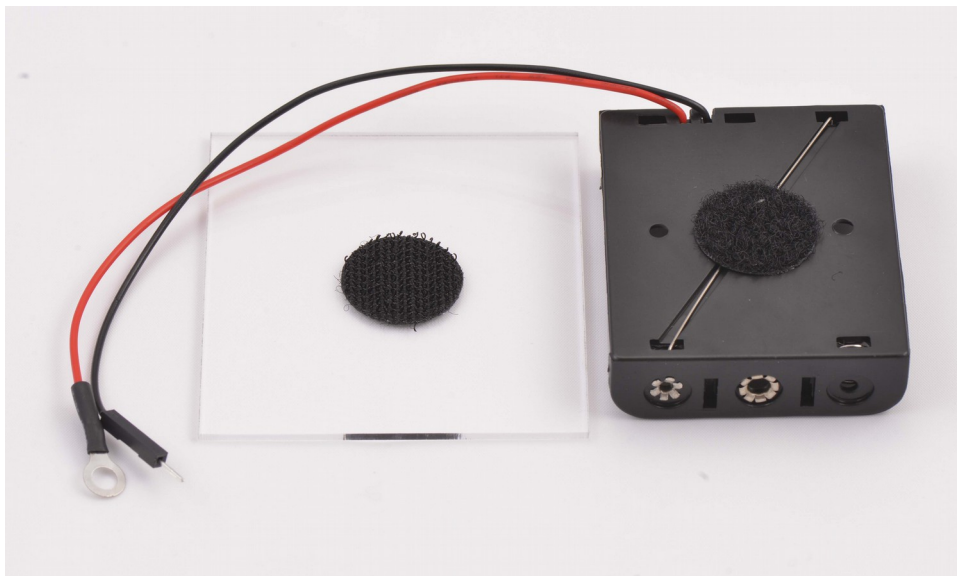


Figure 2.21

Insert the completed battery slide into the slots underneath the STEM Board microcontroller and then tighten the STEM Board spacer screws on the bottom of you Pi-Bot. This will lock the battery slide into place. See figure 2.22 for the inserted battery pack.

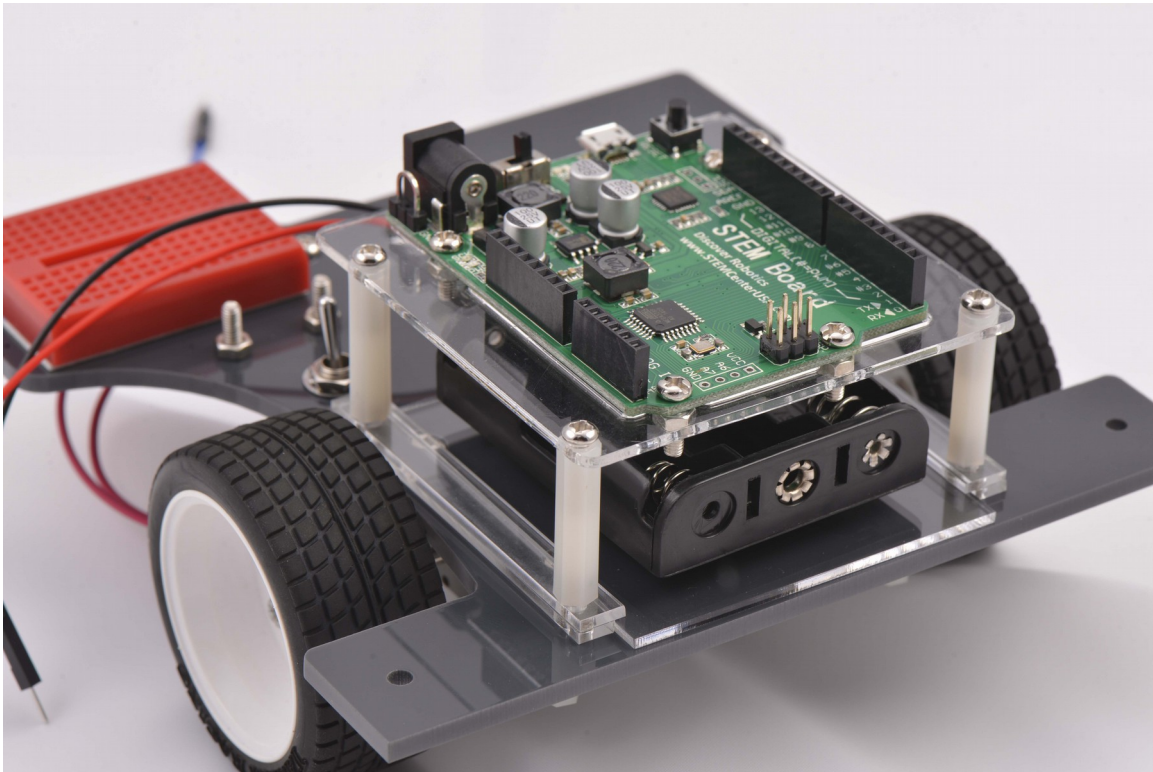


Figure 2.22

To remove the slide for including or replacing batteries, simply loosen the screws slightly.

Next, the ultrasonic sensor should be assembled. Figure 2.23 shows the ultrasonic sensor and mount prior to assembly.

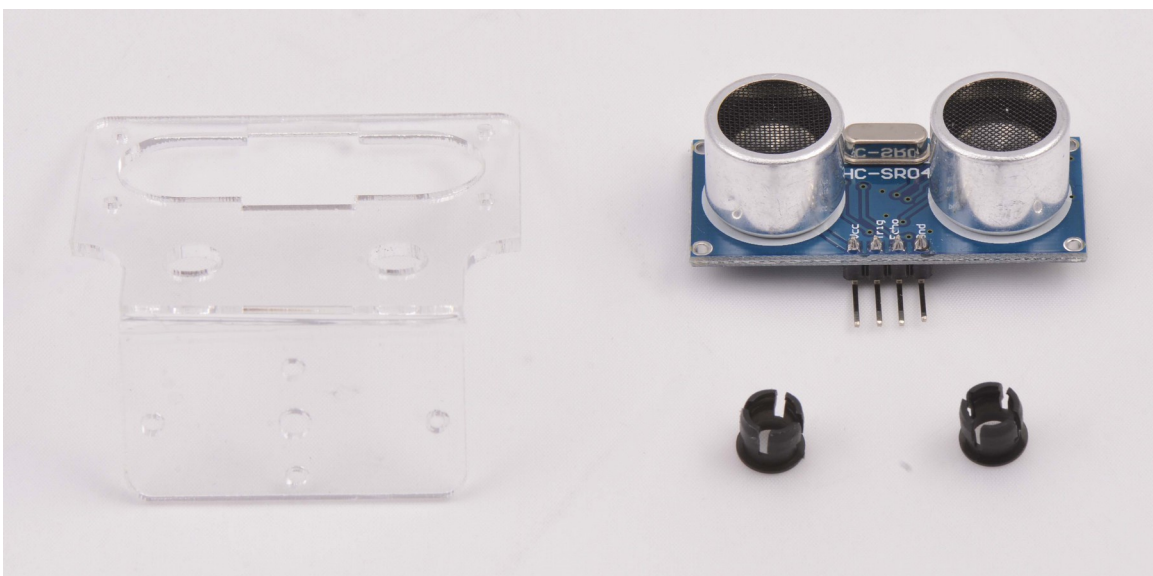


Figure 2.23

Attach the ultrasonic sensor and LEDs into the mount, as shown in figures 2.24, 2.25, and 2.26.

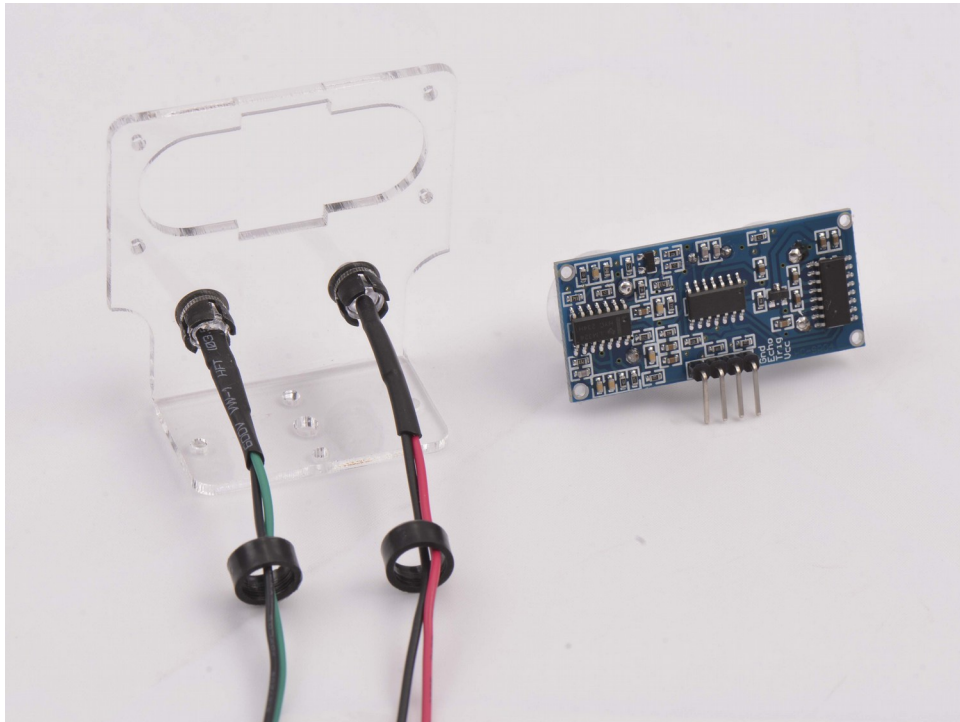


Figure 2.24

Connect four (4) 20cm wires to the ultrasonic sensor as follows:

- VCC – Red
- Trig – Yellow
- Echo – Green
- Gnd – Black

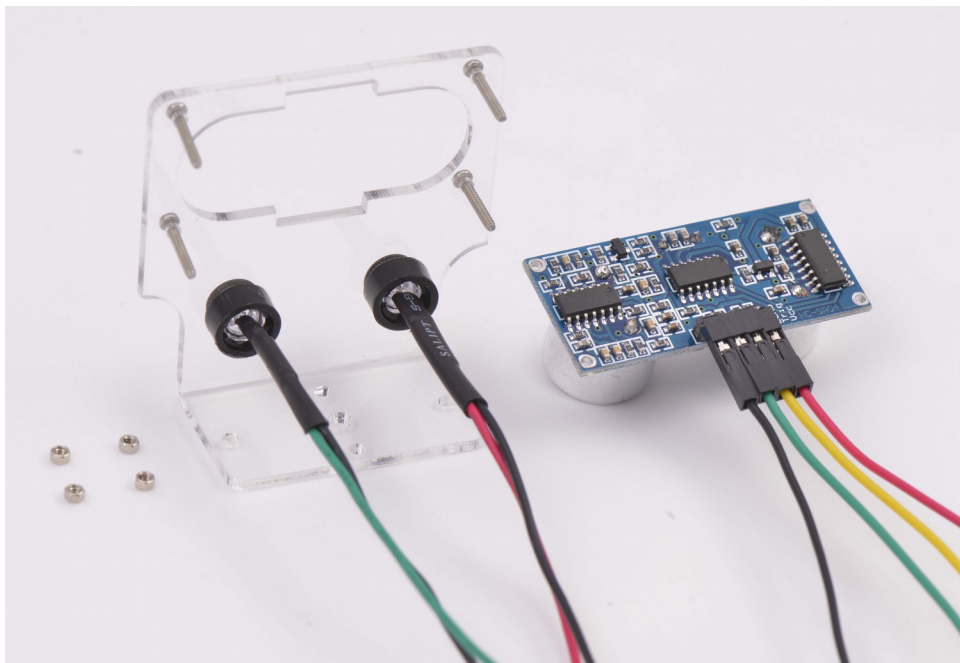


Figure 2.25

CAUTION: Do not force the ultrasonic sensor into the mounting bracket. Do not overtighten the screws. These components are fragile and damage may easily occur.

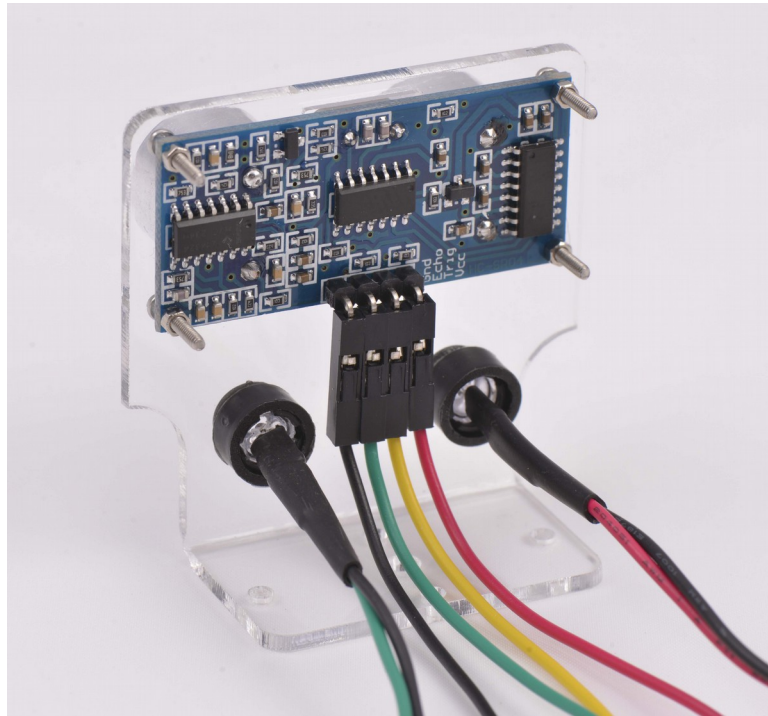


Figure 2.26

Mount the ultrasonic assembly to the left side of the body and route all of the wires underneath the STEM Board microcontroller, as shown in figure 2.27. The wiring connections will be discussed later.

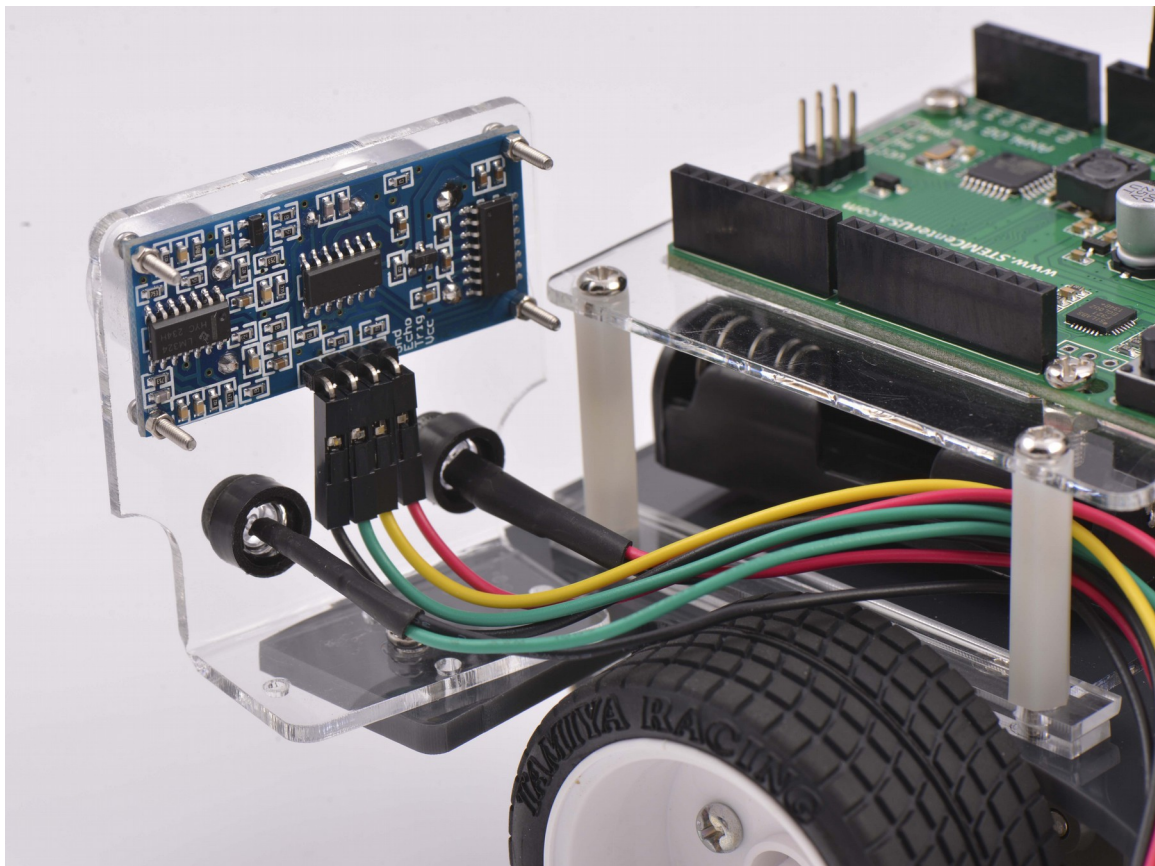


Figure 2.27

The last sensor to be installed is the line sensor as shown in figure 2.28. The mounts for the line sensors were attached in a previous step. Attach the sensor to the standoffs.

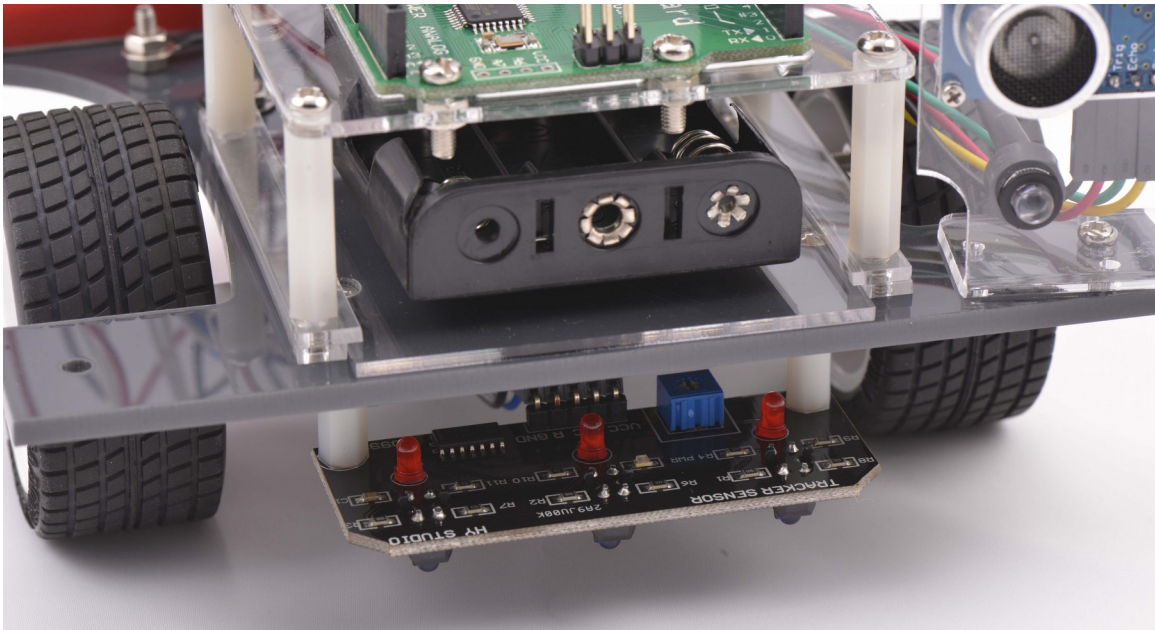


Figure 2.28

Connect five (5) 30cm wires to the line sensor as follows:

- VCC – Red
- L – Yellow
- C – Green
- R – Blue
- Gnd – Black

Note that the line sensor wires point to the rear of the Pi-Bot as shown in figure 2.29.

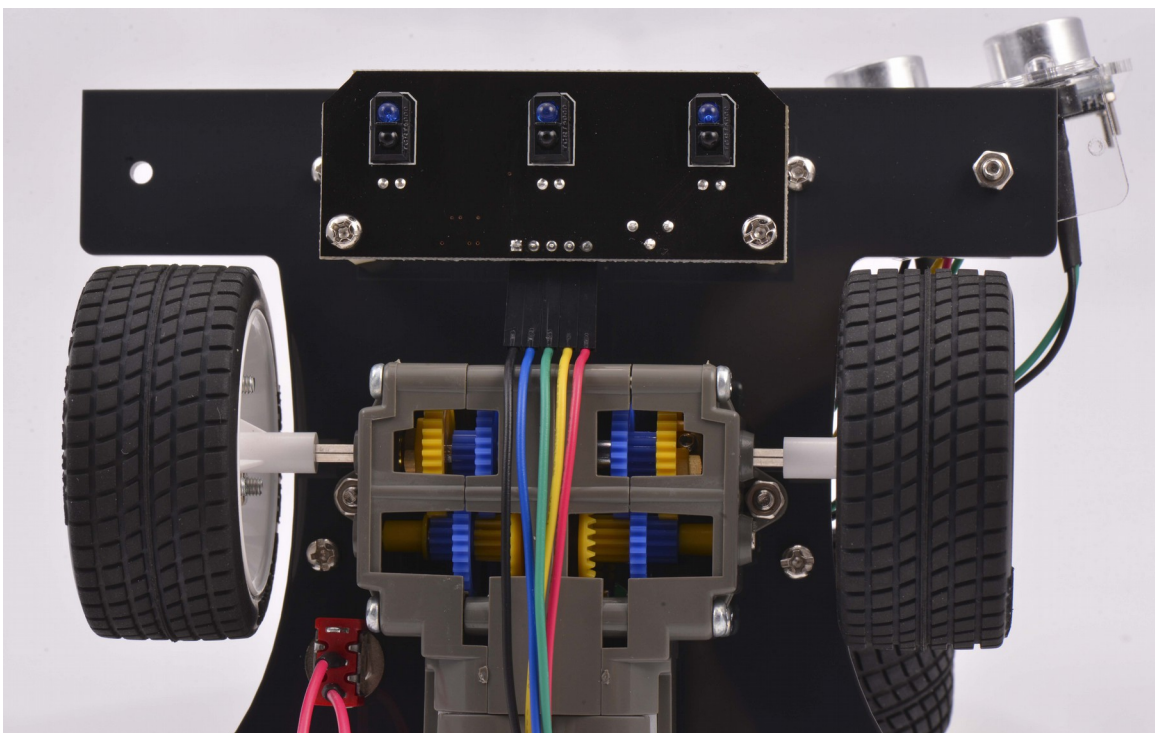


Figure 2.29

Wiring connections will be discussed next.