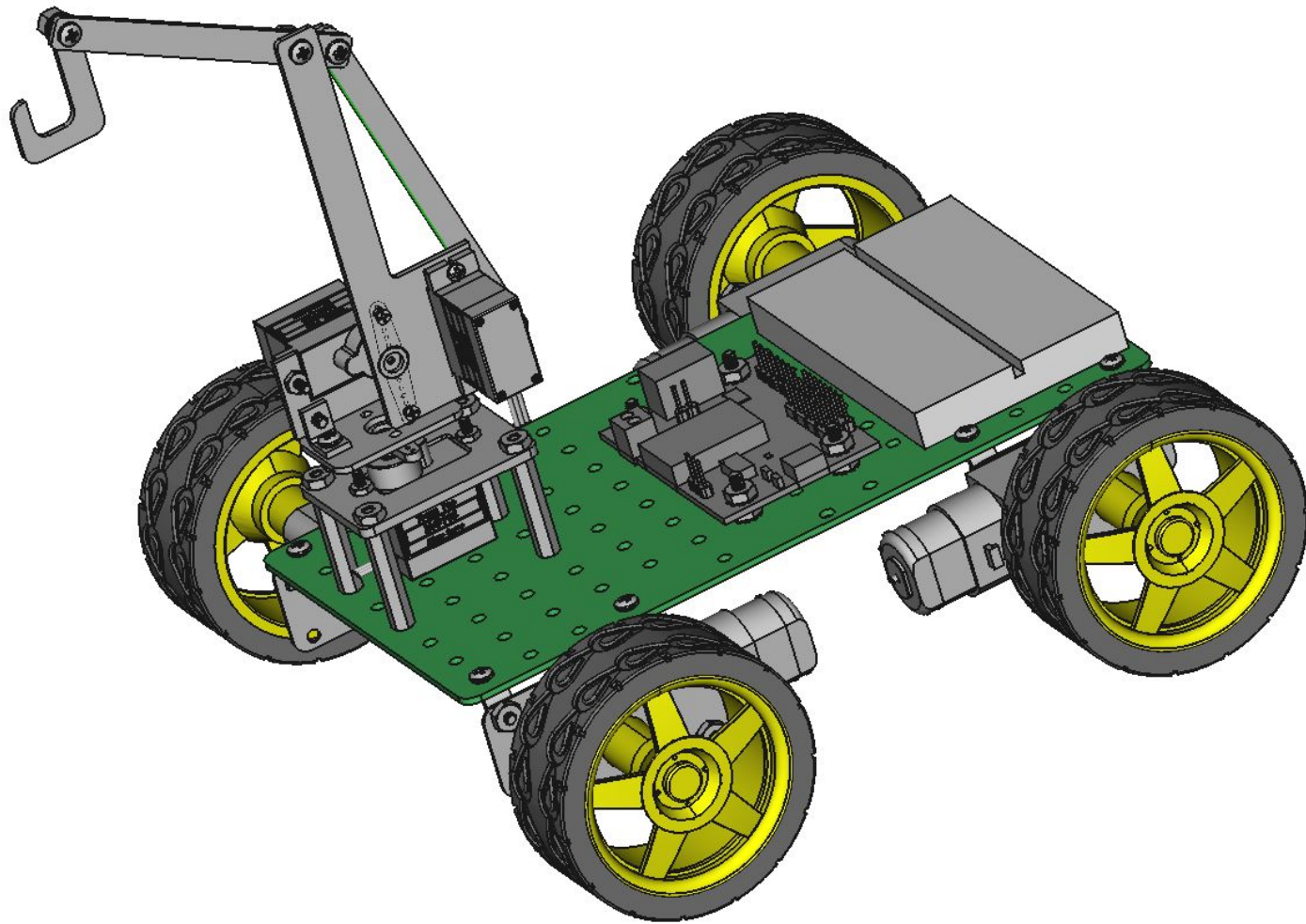


StenBOT Robot Kit



Legal Stuff

- Stensat Group LLC assumes no responsibility and/or liability for the use of the kit and documentation.
- There is a 90 day warranty for the Quad-Bot kit against component defects. Damage caused by the user or owner is not covered.
 - Warranty does not cover such things as over tightening nuts on standoffs to the point of breaking off the standoff threads, breaking wires off the motors, causing shorts to damage components, powering the motor driver backwards, plugging the power input into an AC outlet, applying more than 9 volts to the power input, dropping the kit, kicking the kit, throwing the kit in fits of rage, unforeseen damage caused by the user/owner or any other method of destruction.
- If you do cause damage, we can sell you replacement parts or you can get most replacement parts from online hardware distributors.
- This document can be copied and printed and used by individuals who bought the kit, classroom use, summer camp use, and anywhere the kit is used. Stealing and using this document for profit is not allowed.
- If you need to contact us, go to www.stensat.org and click on contact us.

References

- www.arduino.cc
- <http://esp8266.github.io/Arduino/versions/2.1.0/doc/reference.html>



Overview

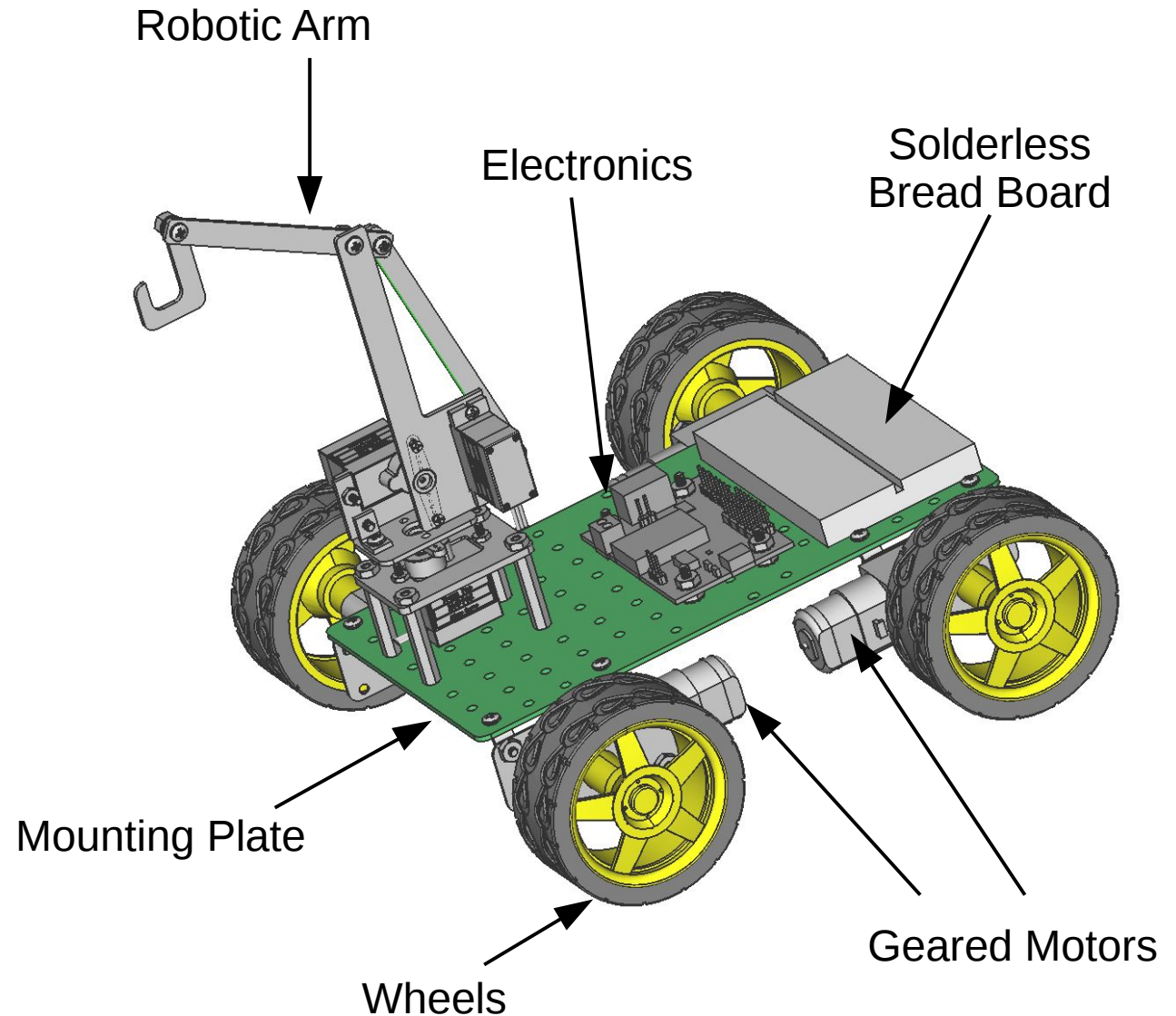


Program Overview

- Assemble Kit
- Programming to move
- Learning how to calibrate the motion
- Running the Maze
- Using sensors for collision avoidance
- Running the Maze using collision avoidance
- Remote control

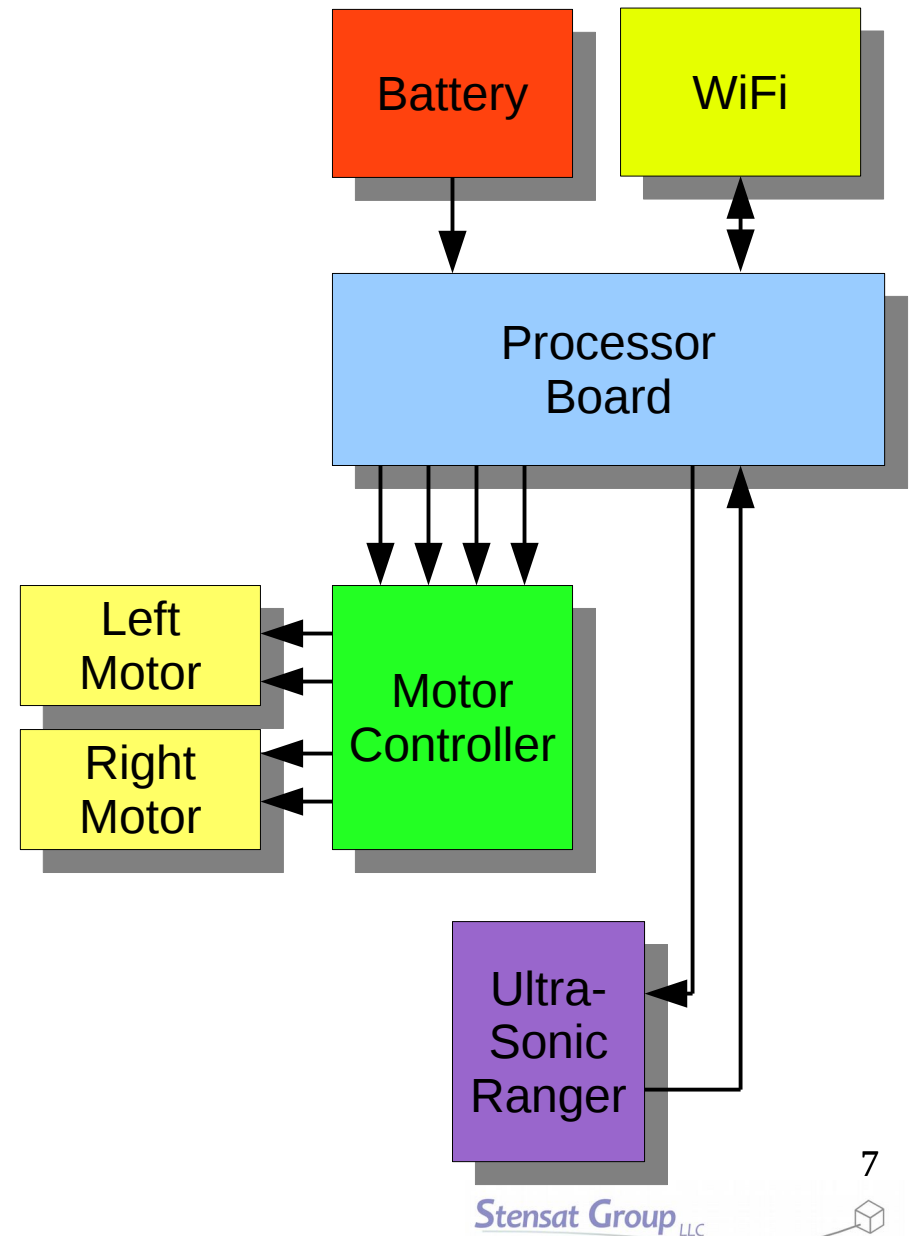
Robot Parts

- The robot is made up structural parts, mechanical parts and electronics.



How the Electronics Works

- The robot electronics controls the operations. It consists of a battery for power, a processor board for the brains, a motor controller to operate the motors and an ultrasonic sensor for detecting obstacles.
- The diagram to the right shows how the electrical components are interconnected.
- The battery powers everything.
- The processor board is the brains and controls everything.
- The motor controller provides the proper interfaces to the motors for the processor board to control the motors.
- The WiFi provides a method for remote control.



End of Section

- In this section, you learned the parts of the robot and how they all tie together.

Assembly



Robot Kit Parts List

- 12 – 1/4" 4-40 screws
- 4 – 1/2" 4-40 screws
- 8 – 1" 4-40 screws
- 20 – 4-40 Kep nuts
- 1 – Fiberglass base plate
- 4 – Motor mount plates
- 4 – geared motors with wheels
- Dual H-Bridge driver module
- 1 – solderless bread board
- 1 – 6 cell battery holder
- 8 – right angle brackets
- 1 – SLATE processor board
- 20 – jumpers
- 1 – ultrasonic range sensor
- 3 – LED
- 3 – 270 ohm resistor
- 1 – Photoresistor
- 1 – 100K ohm resistor
- 1 – 1K ohm resistor
- 1 - speaker
- 1 – USB cable



Robot Arm Parts List

- 4 – 1.5 inch standoffs
- 6 – #4 nuts
- 14 – ¼ inch 4-40 screws
- 3 – 3/8 inch 4-40 screws
- 3 – 4-40 nylon lock nuts
- 2 - right angle brackets
- 3 – servos with horns and screws
- Acrylic pieces for structure



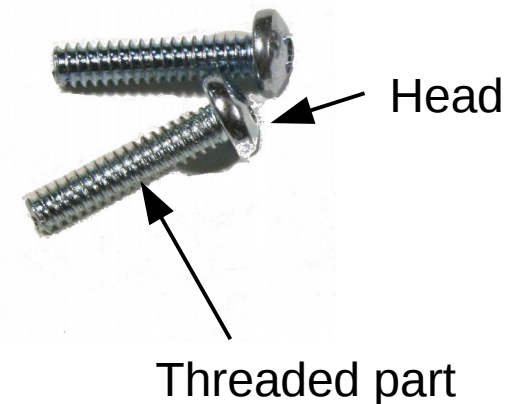
Tools Needed

- Phillips screw driver
- 1/4 inch nut driver



Definition of Components

- Screw – A cylindrical device with a raised helical thread running around it used to join things together.
 - Sizes
 - 4-40 means it is a #4 size screw with threads that wrap around 40 times per inch length.
 - #4 size is .112 inches diameter
 - #6 is .138 inches diameter
 - #8 is .164 inches diameter
 - Length is how long the threaded part of screw is.
 - The screw pictured at the right is a machine screw.
 - Screws with a pointy end are wood screws or sheet metal screws.



Definition of Components

- Nut – A device that mates to a screw to secure things together. The sizing is specified the same way, ie 4-40 or 6-32.
- Kep nut is a nut with an integrated lock washer.
- A nylon lock nut is a nut with a piece of nylon material inserted to keep the nut from spinning freely. It is used to join things together but let them move against each other.



Kep Nut



Nylon Lock Nut



Definition of Components

- Right angle bracket – A device that allows two things to be attached at right angles to each other.
- Standoff – A device that allows things to be attached to each other at a distance. Allows stacking. One end can be threaded like a screw and the other hollowed and threaded to be like a nut. They are made in different lengths. The robot uses 1.5 inch standoffs to mount the robotic arm.



Standoff

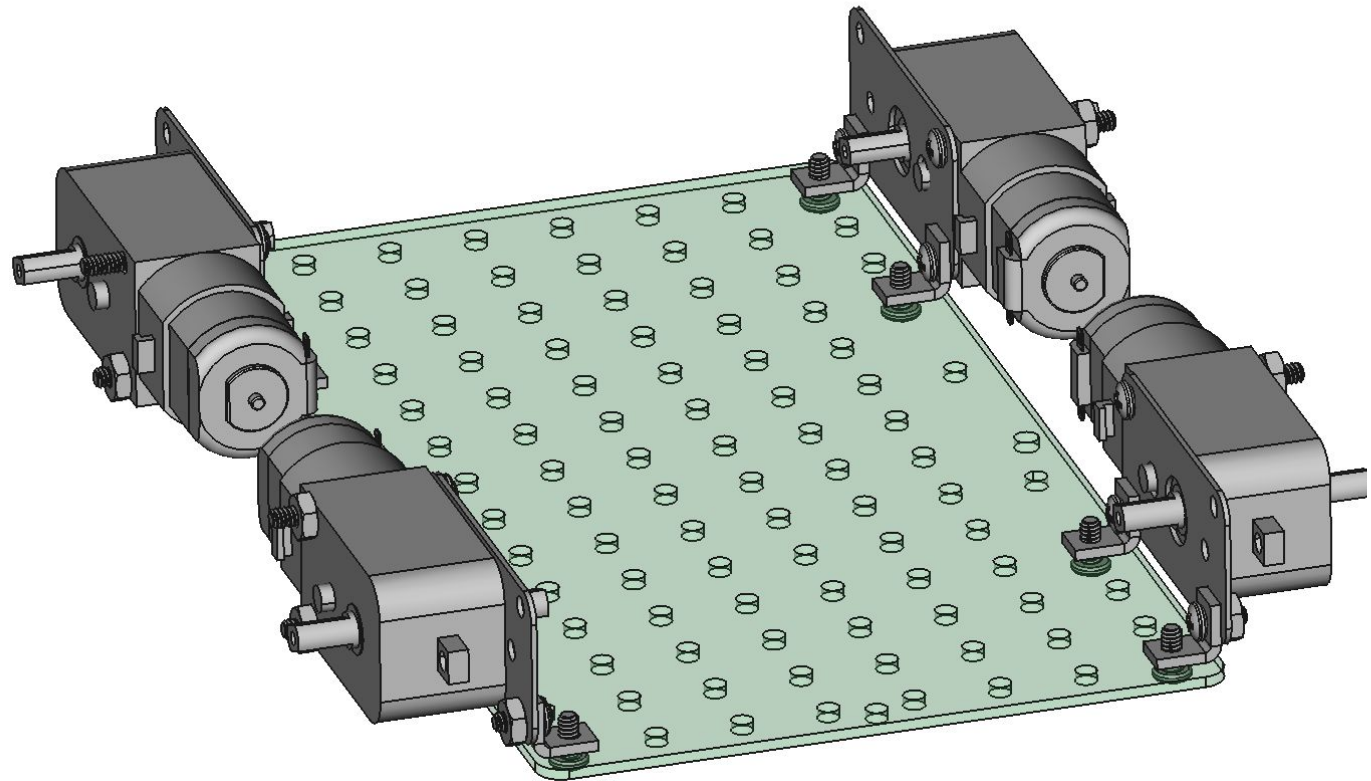


Right Angle Bracket



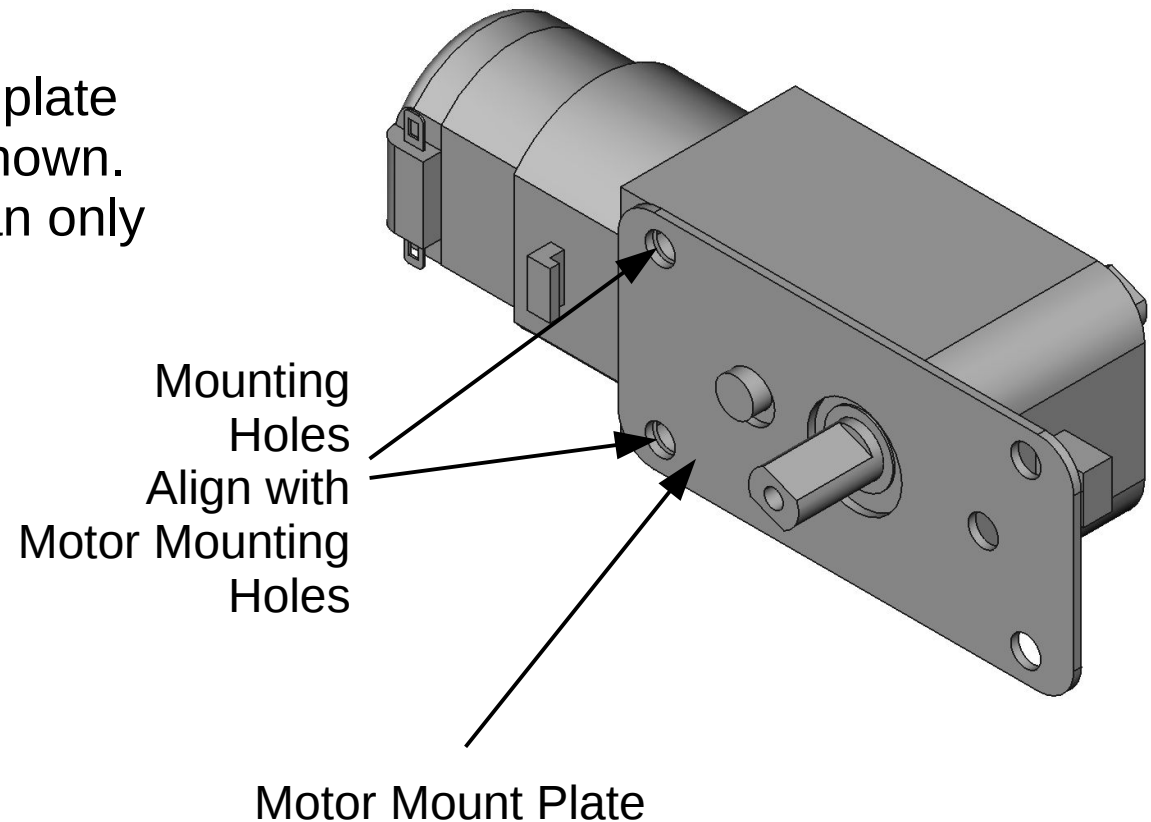
Motor Assembly

- Below is how the motor assemblies are to be positioned. The view is from the bottom side.



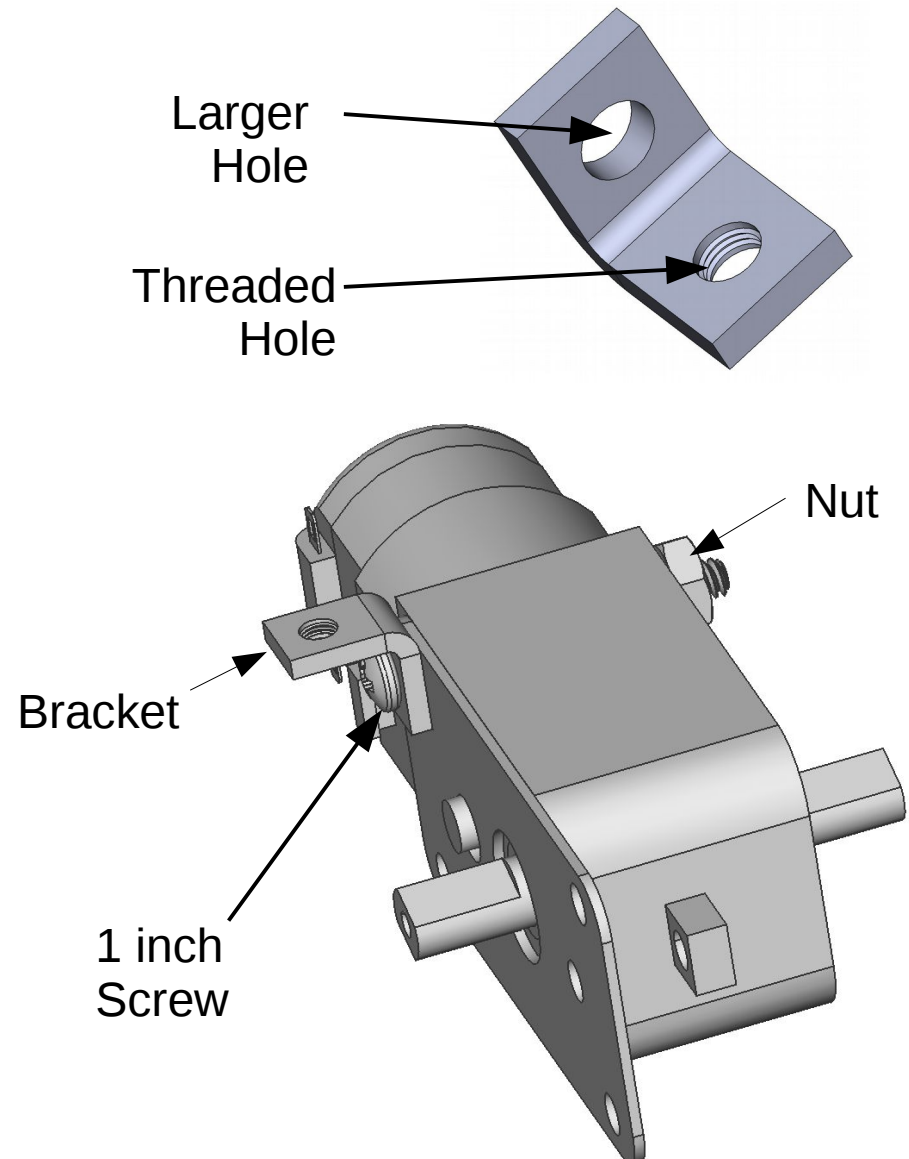
Start of the Assembly

- The assembly will start with the geared motors.
- Position the motor mount plate over the motor shaft as shown. The motor mount plate can only be oriented one way.



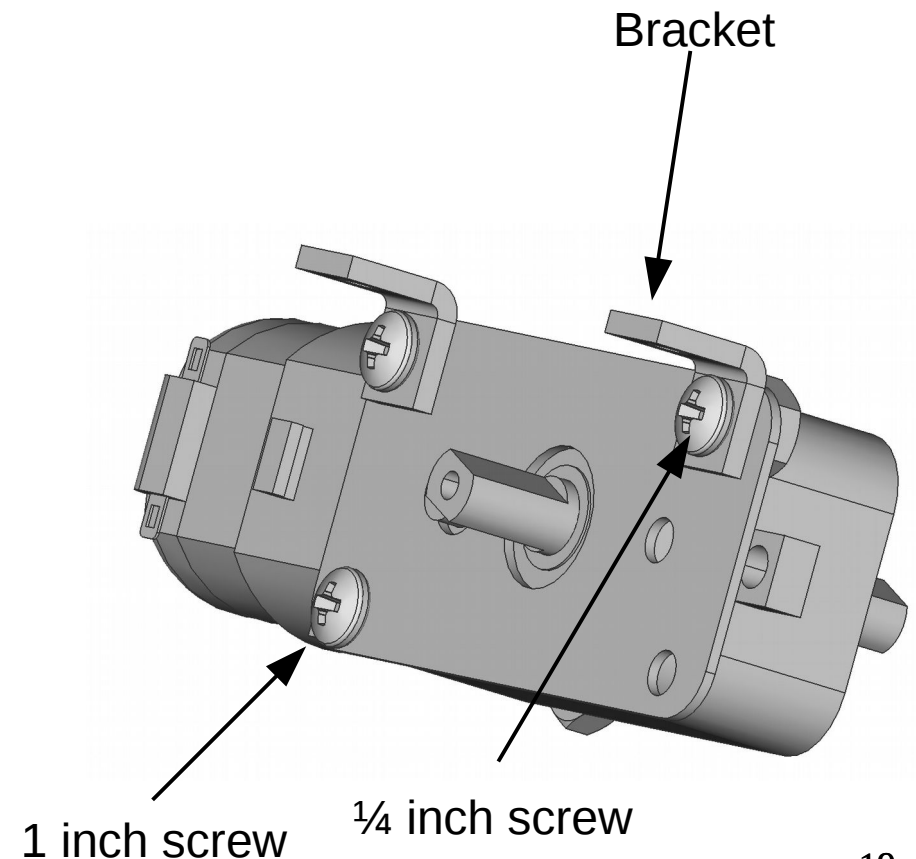
Motor Mount Assembly

- The bracket has two holes, one is threaded and the other is not. The hole that is not threaded looks larger.
- Position one right angle bracket with the larger hole over a mounting hole as shown and insert a 1" long screw.
- Secure with a nut on the other side.



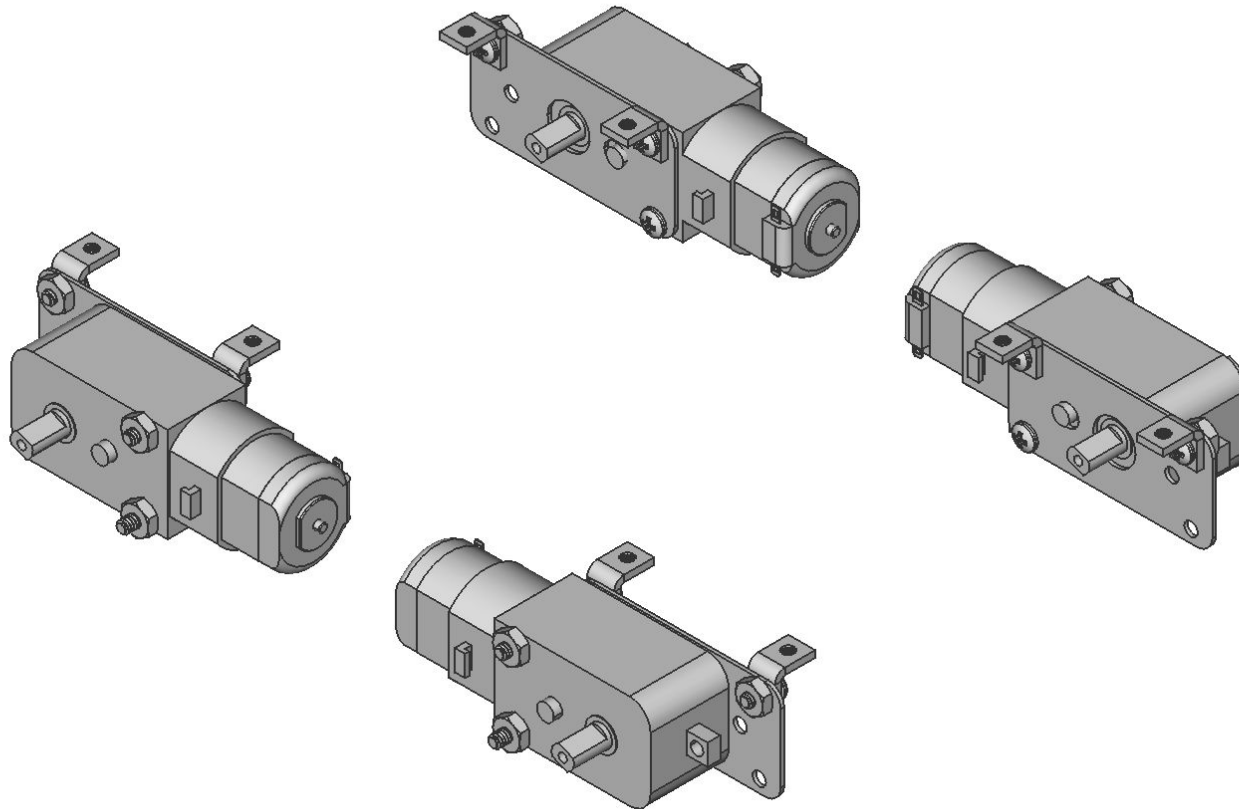
Motor Mount Assembly

- Complete the motor mount assembly as shown.
- Install a second bracket with the large hole against the motor mount plate and secure with a $\frac{1}{4}$ inch screw and nut.
- Insert a second 1 inch screw through the motor mount plate and motor and secure in place with a nut.



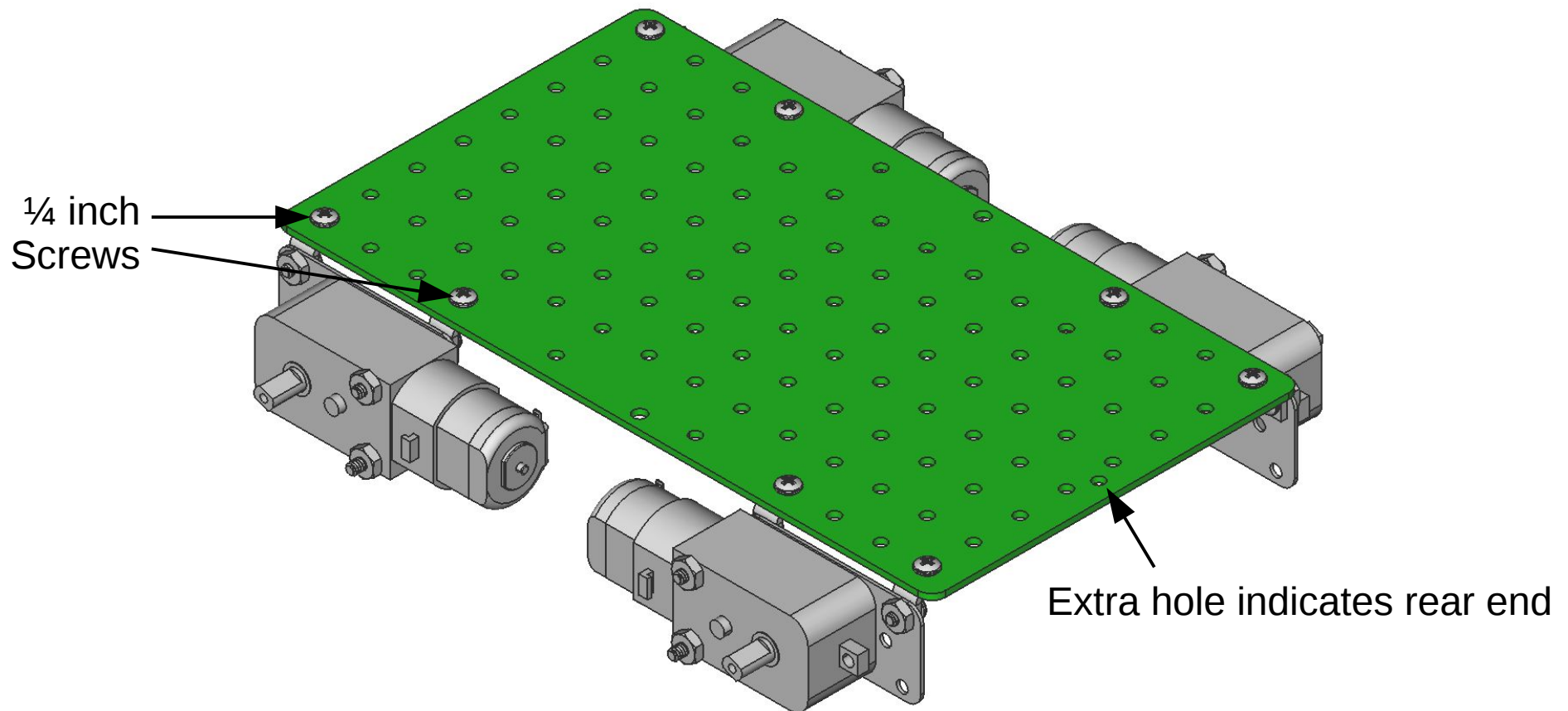
Motor Mount Assembly

- Assemble a second motor assembly the same way as the first.
- For the other two motor assemblies, assemble them as a mirror image of the first two.
- When completed, the motor assemblies should look like below when positioned for mounting.



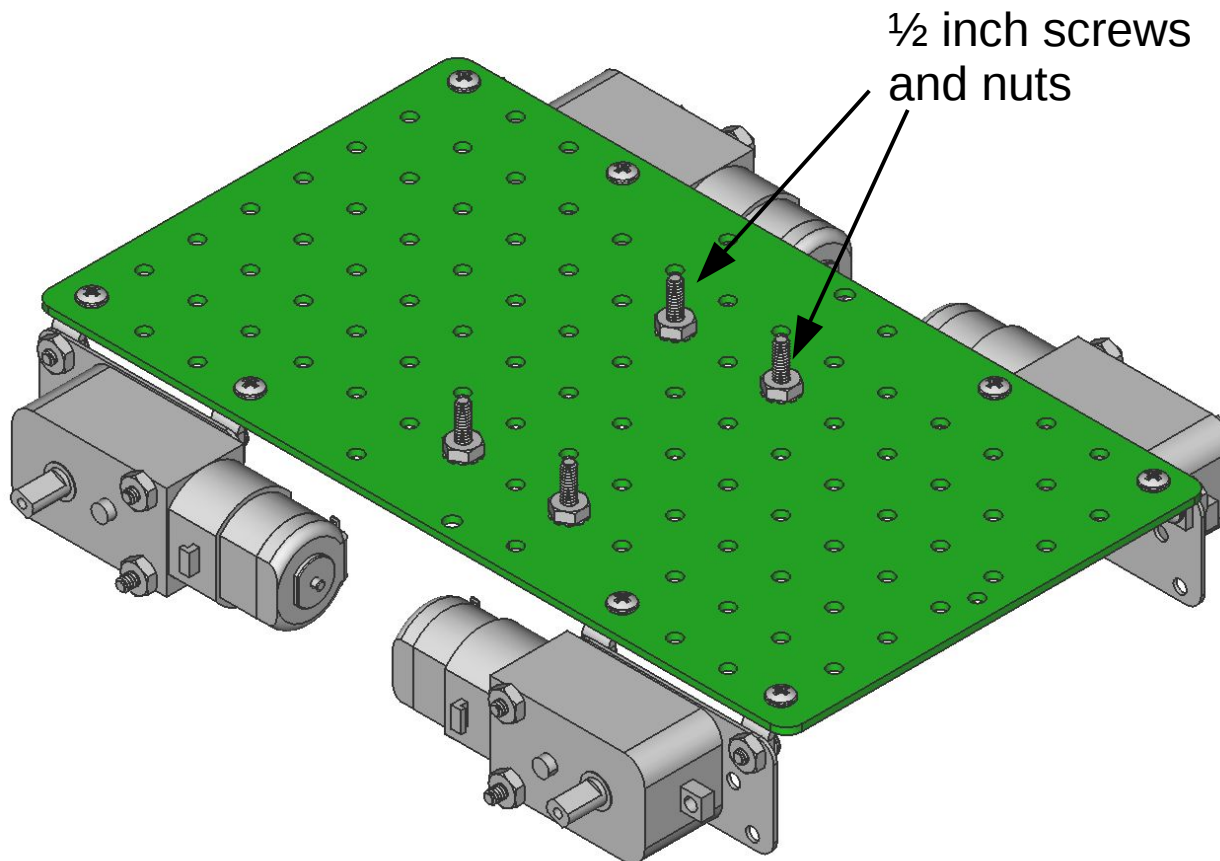
Mounting the Motors

- Secure the motors to the mounting plate. Use eight ¼ inch screws from the top into the threaded holes of the brackets.
- This completes the installation of the motors.



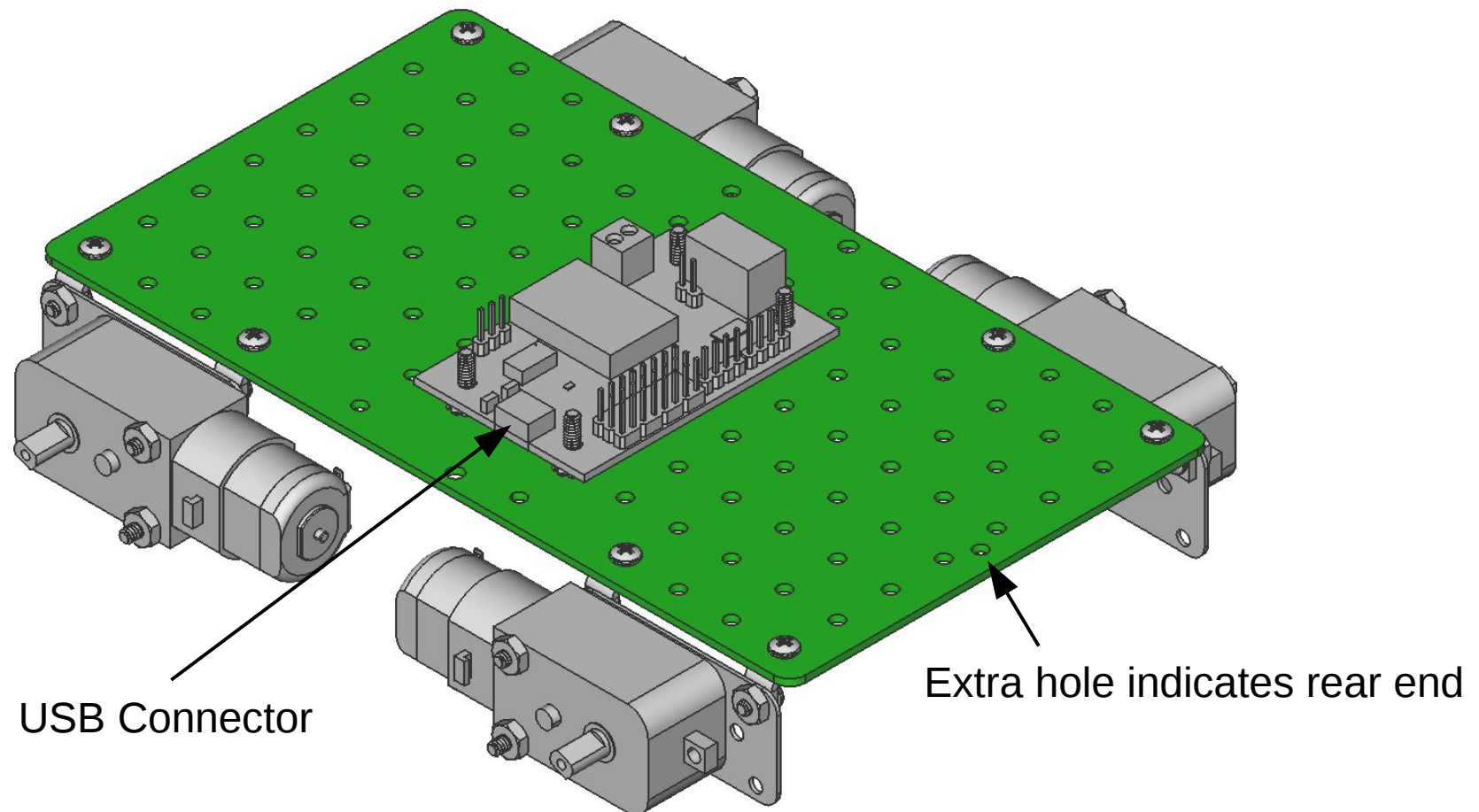
Processor Board Mount

- Insert four ½ inch screws from the bottom of the mounting plate. They must be inserted in the correct holes for everything else to be mounted.
- Secure with four nuts.



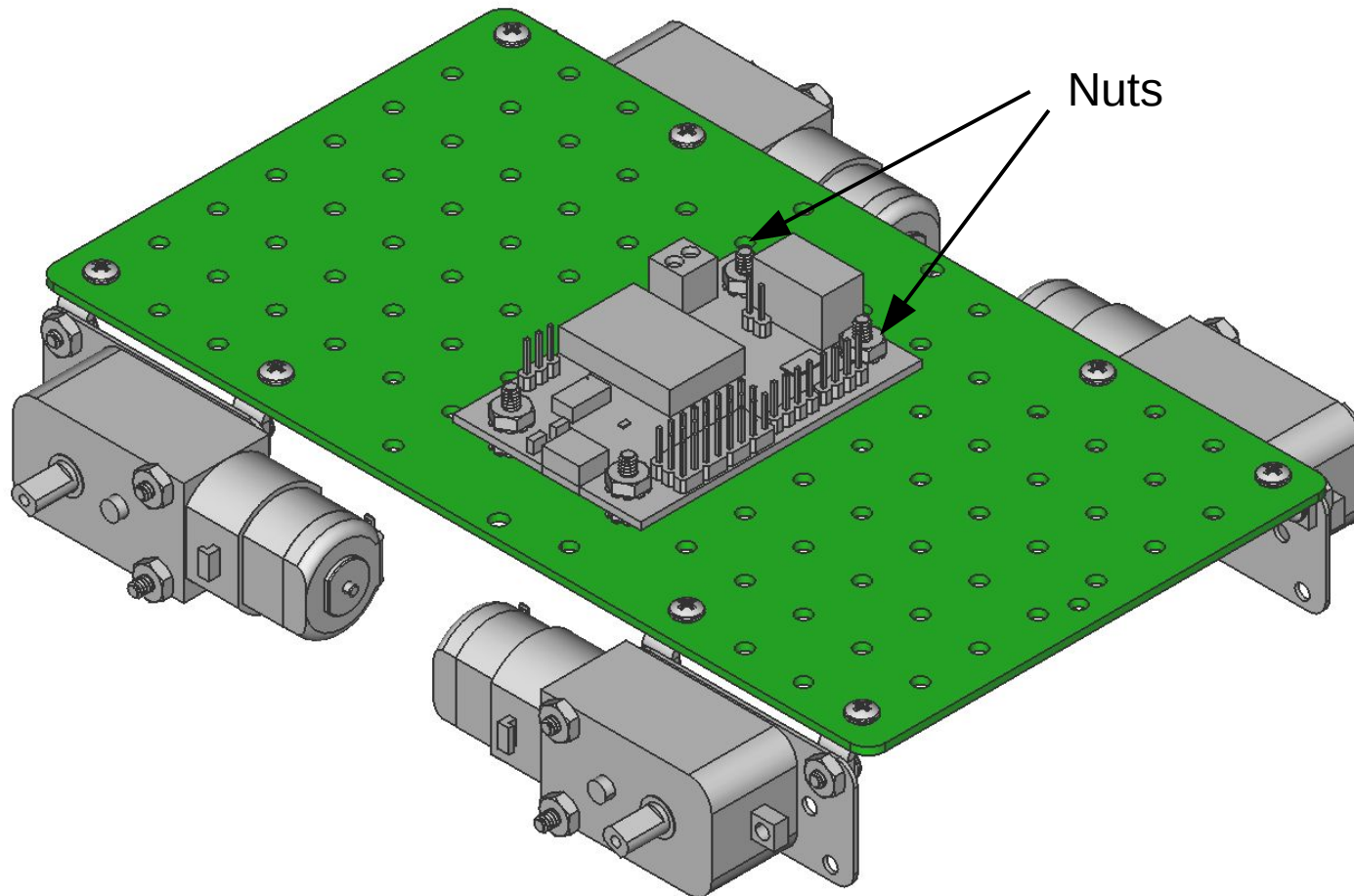
Processor Board Mount

- Insert the processor board as shown. Pay attention to the orientation of the processor board.



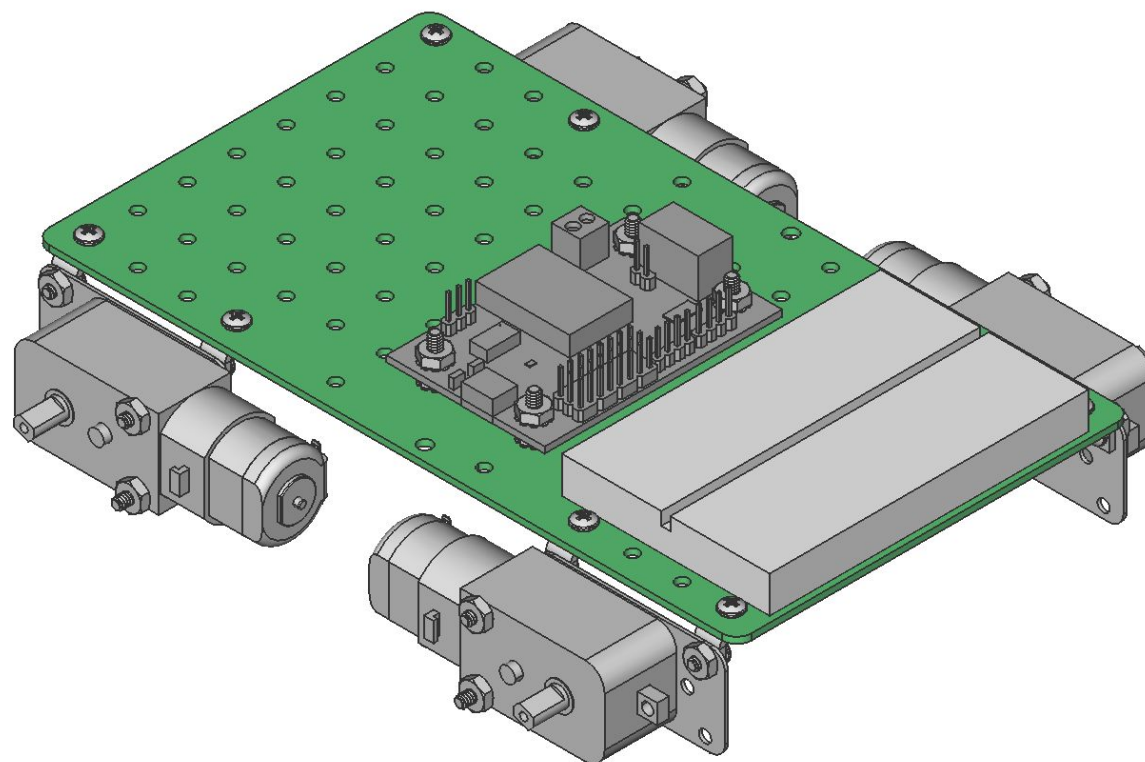
Processor Board Mount

- Secure the processor board with four nuts.



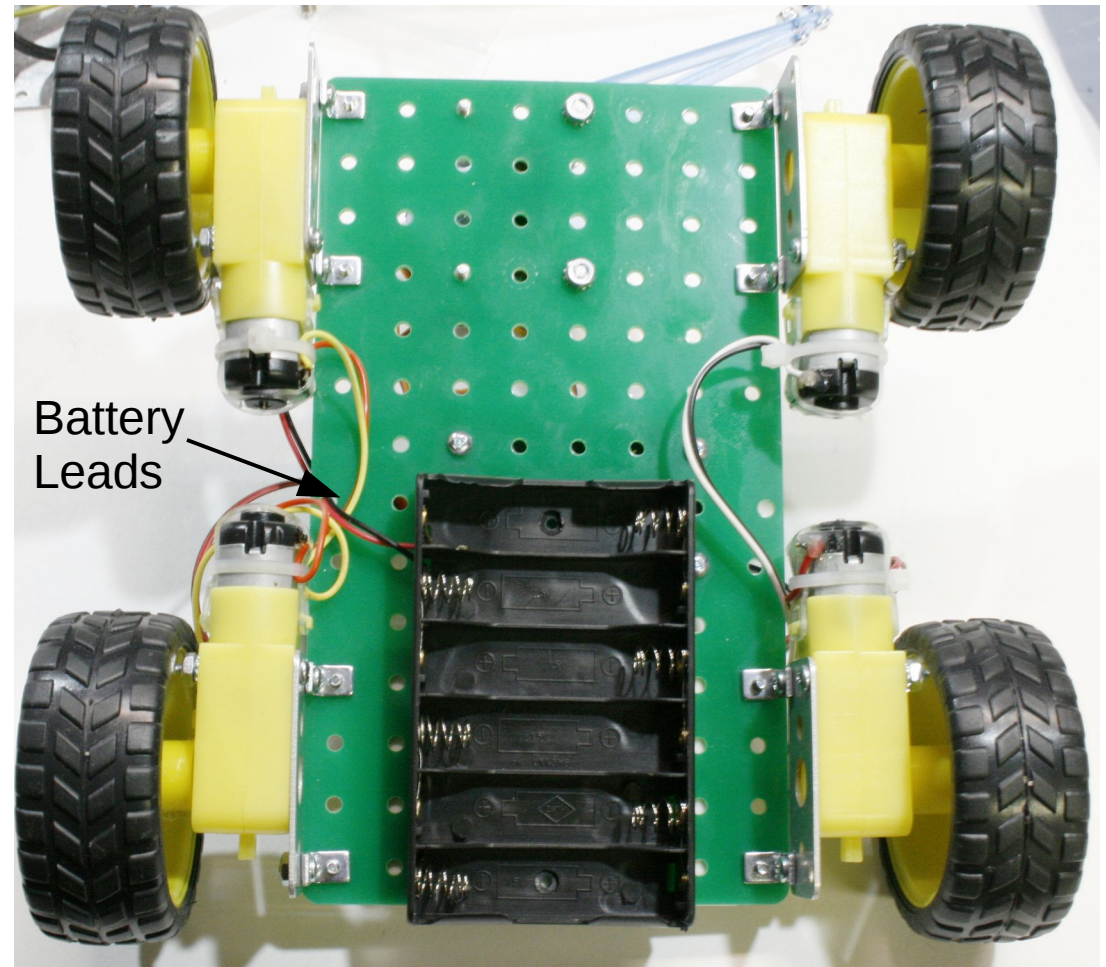
Solderless Bread Board Mount

- Take the solderless bread board and remove the paper cover from the double sided tape on the bottom.
- Position the solderless bread board between the screw heads and press onto the mounting plate.



Battery Holder

- Take the battery holder and remove the paper from the double sided tape.
- Underneath the robot, orient the battery holder so the wires are near the center of the robot.
- Press the battery holder to the underside of the robot just below the solderless bread board. Press firmly so the tape can get a strong grip.

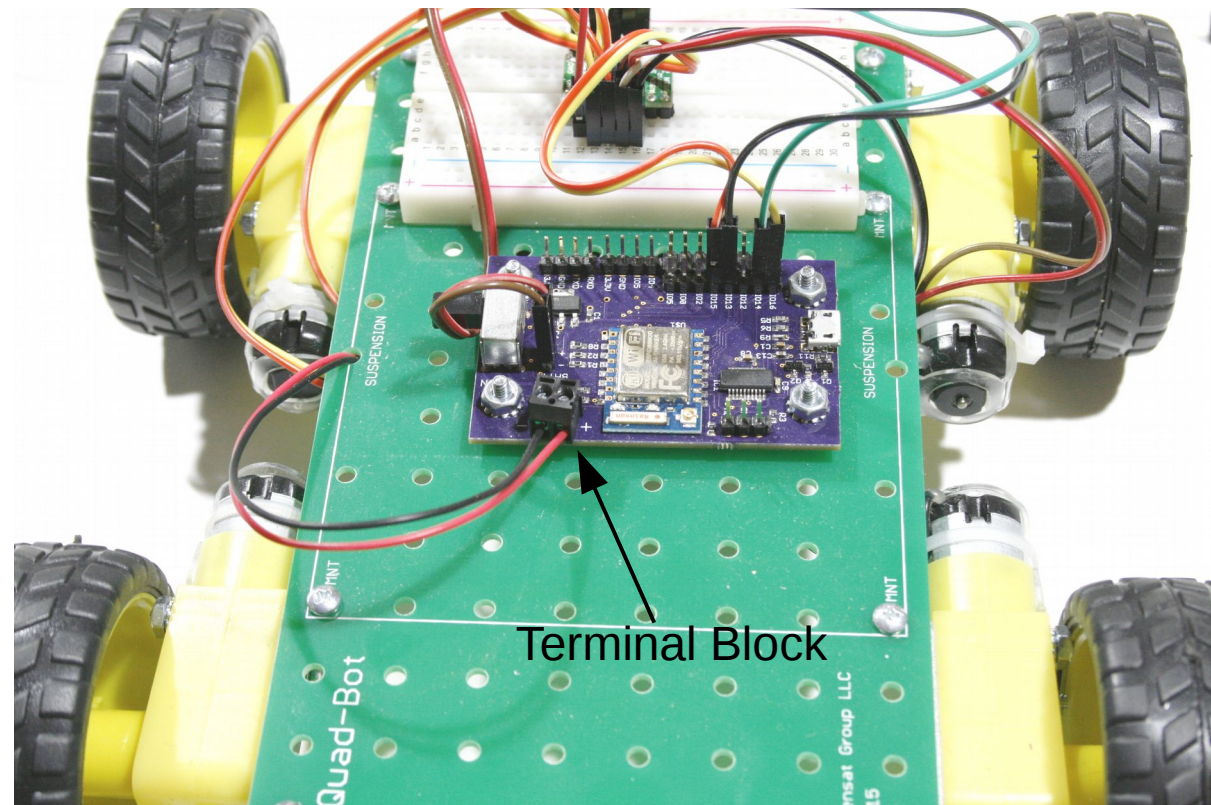


Underside shown



Connect the Battery

- Route the two wires from the battery holder through a hole in the base plate and insert them into the terminal block.
- The black wire is inserted in the left side marked (-).
- The red wire is inserted in the right side marked (+).
- Tighten the terminal block with a screw driver.



End of Section

- At this point, the robot kit is assembled without the robotic arm.

