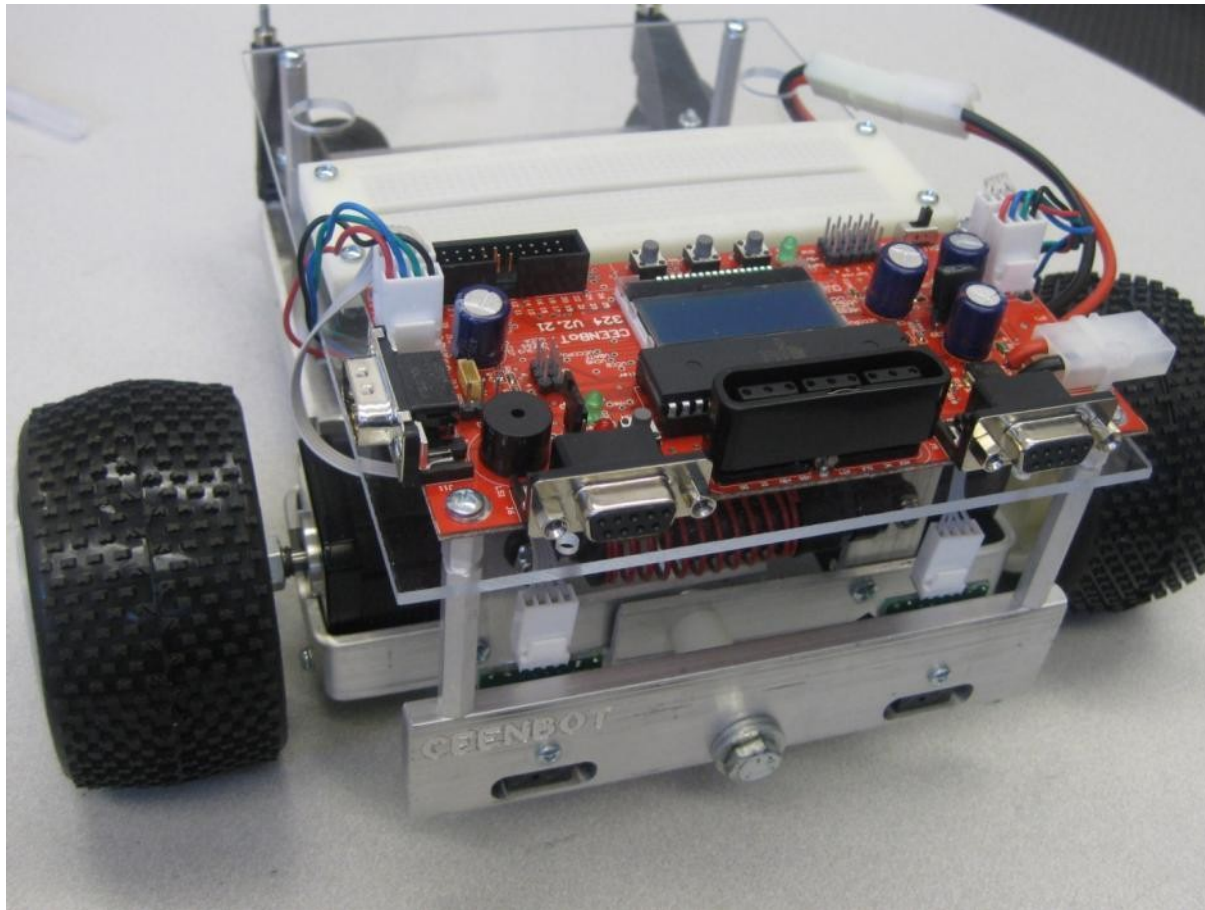


CEENBoT 324 Chassis



Introduction

While operating, the CEENBot stepper motors will cause some vibration. The hardware must be securely tightened to prevent parts from vibrating loose and to ensure quiet operation. Recommended tools for assembly are:

- #1 Phillips screwdriver for 4-40 screws.
- #2 Phillips screwdriver for 6-32 screws.
- ¼" socket or nut driver for the 4-40 nuts.
- 5/16" socket or nut driver for the 6-32 nuts.
- ½" socket or nut driver for the wheel nuts.
- 7/16" socket or nut driver for the kingpin assembly.
- Pliers
- Ruler

Screw and Nut Descriptors

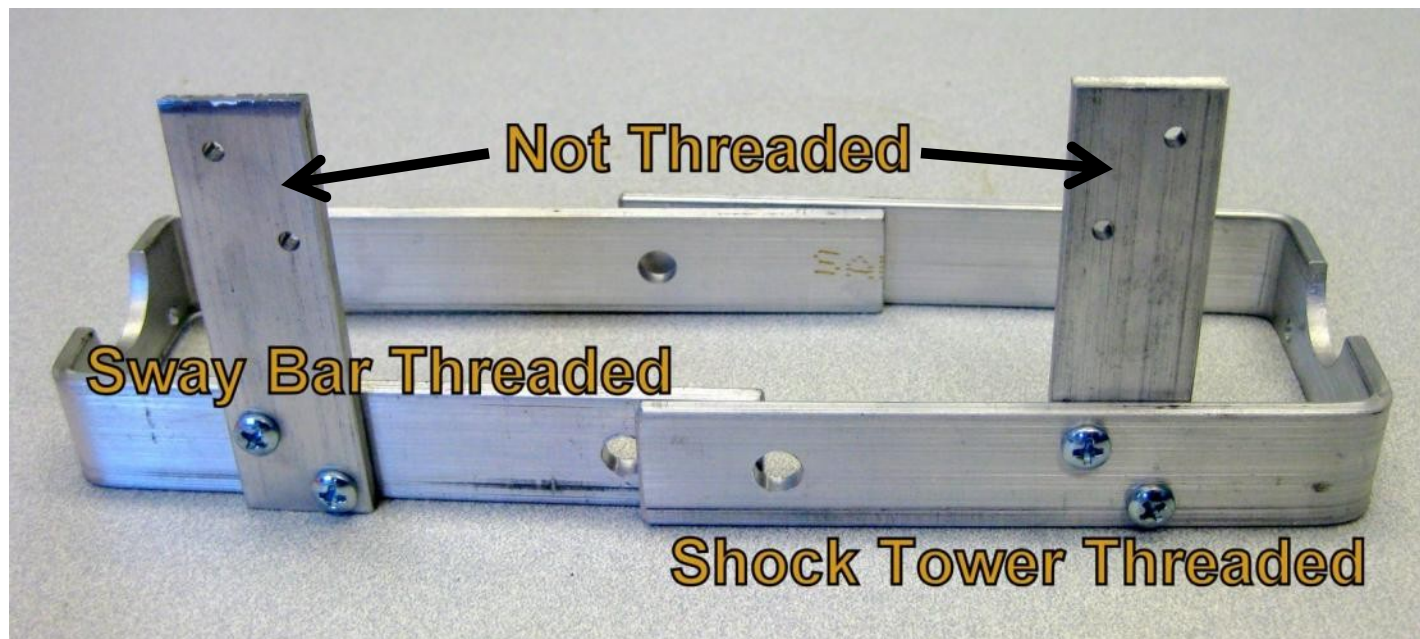
The screws and nuts are specified by their diameter, the number of threads per inch, and the length of the screw. The two diameters of screws and nuts are #4 and #6. The #4 is smaller than the #6. The #4 screws have 40 threads per inch and the #6 screws have 32 threads per inch. The designation 4-40 x ½" means a #4 screw with 40 threads per inch that is ½" long.

Most of the nuts used have a nylon insert which prevents them from loosening from vibrations. You will need a nut driver or pliers to hold the nut when tightening it. This type nut is called a nylon lock nut in this document.

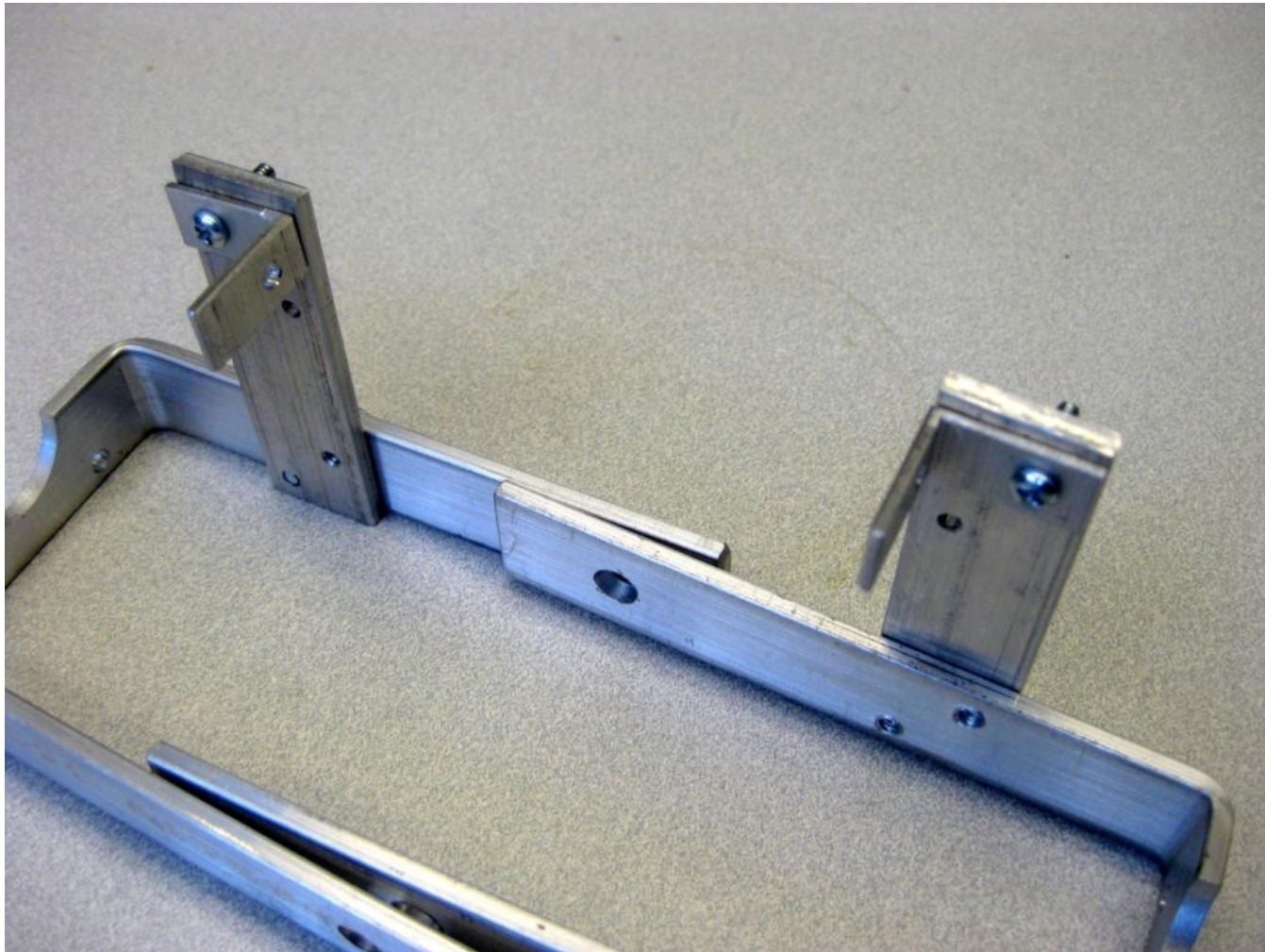
Standoff

A standoff is a spacer used to provide adequate space between circuit boards. A standoff is specified by its length and the type of threads it has. It could have tapped holes (female) on one or both ends or it could have male threads on one or both ends. Those with female threads on both ends are listed as Female – Female (F – F) and those with one female and one male end are listed as Female – Male (F – M)

Shock Towers: Mount the shock towers to the sway bars as shown. The view is from the front of the CEENBot. The half-moon cut-outs of the sway bars are to the top. The right shock tower (on the left side of the photo) is mounted by screwing two 6x32x1/4" screws into the threaded sway bar. The left shock tower (on the right side of the photo) is placed on the inside of the sway bar and mounted by screwing the 6x32x1/4" screws into the threaded shock tower. These parts will only go together one way. They are not interchangeable left to right, top to bottom or front to back. Many people think they have defective or wrong parts when they really are putting them in the wrong place. Pay particular attention to the location of the holes and whether they are tapped (threaded) or just drilled.



Mount the 3/8" angle aluminum to the tops of the shock towers using 4-40 x 1/2" screws and nylon lock nuts.



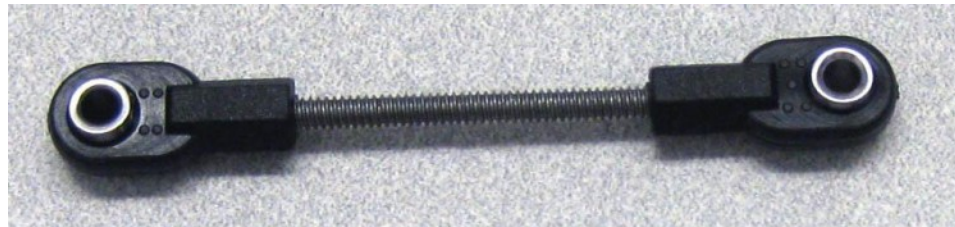
Mount the motors to the sway arms using the 4-40 x 5/16" screws and split lock washers. The lock washers go between the screw head and the sway arm.



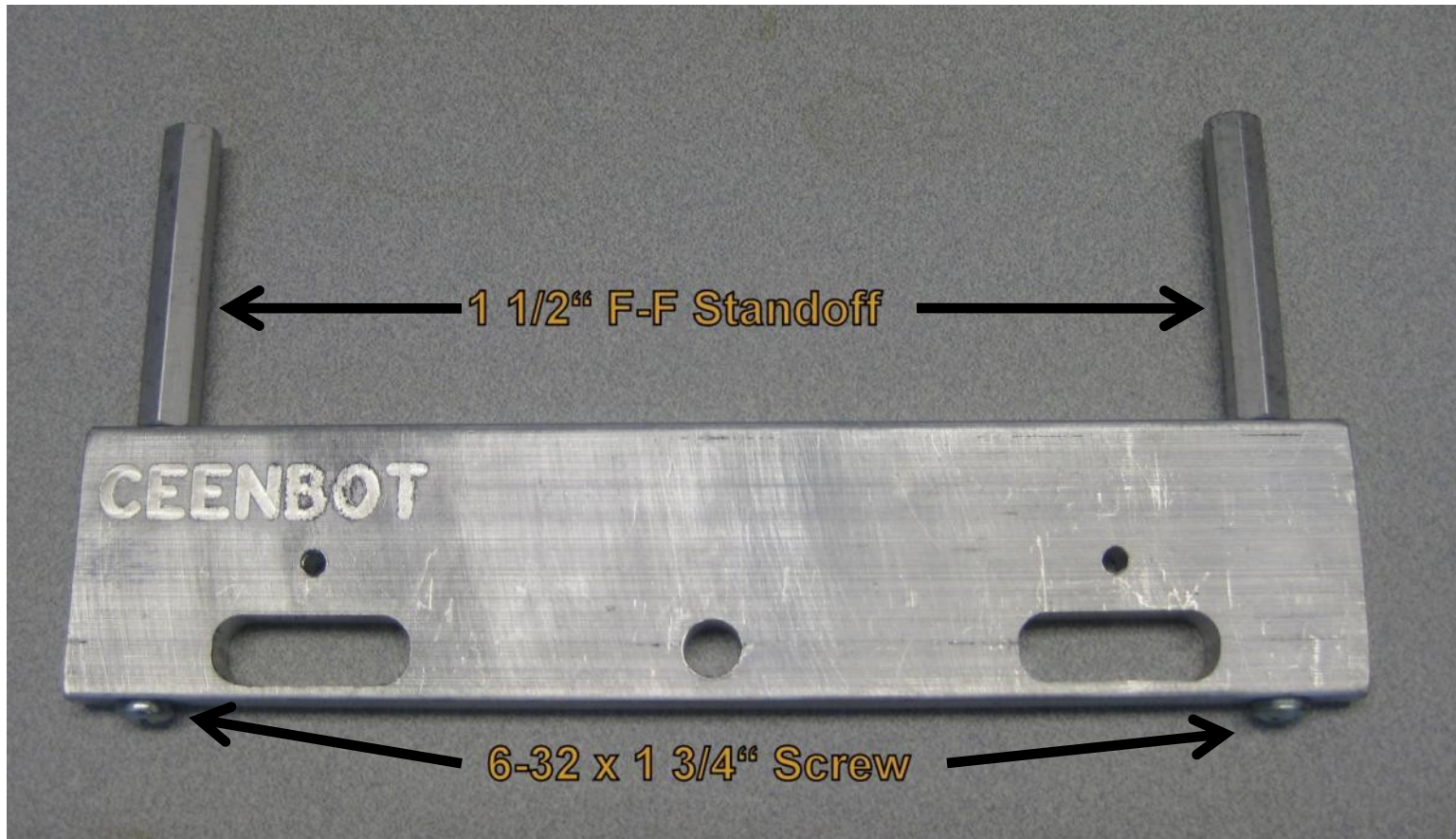
Press the metal inserts into the end hole of the plastic ends. Use a nut driver over the plastic to apply even pressure on the plastic or use a pair of pliers to force the insert.



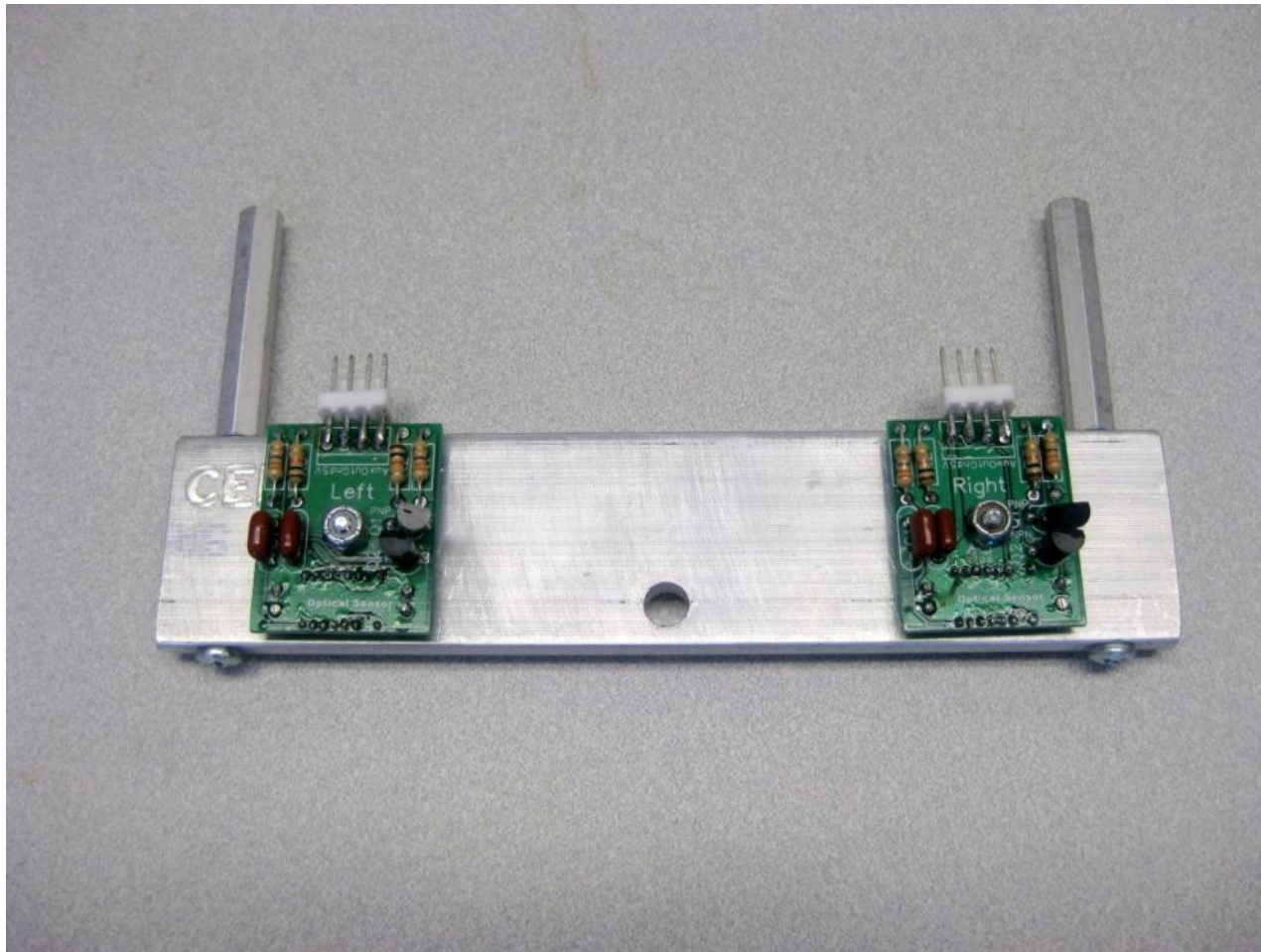
Thread the stabilizer bar ends onto the 4x40 allthread. Screw both ends until 1 1/4" allthread remains visible. You may need to cut about 1/4" from the allthread to get this distance. The lab instructor has a cutting cutting tool to do this.



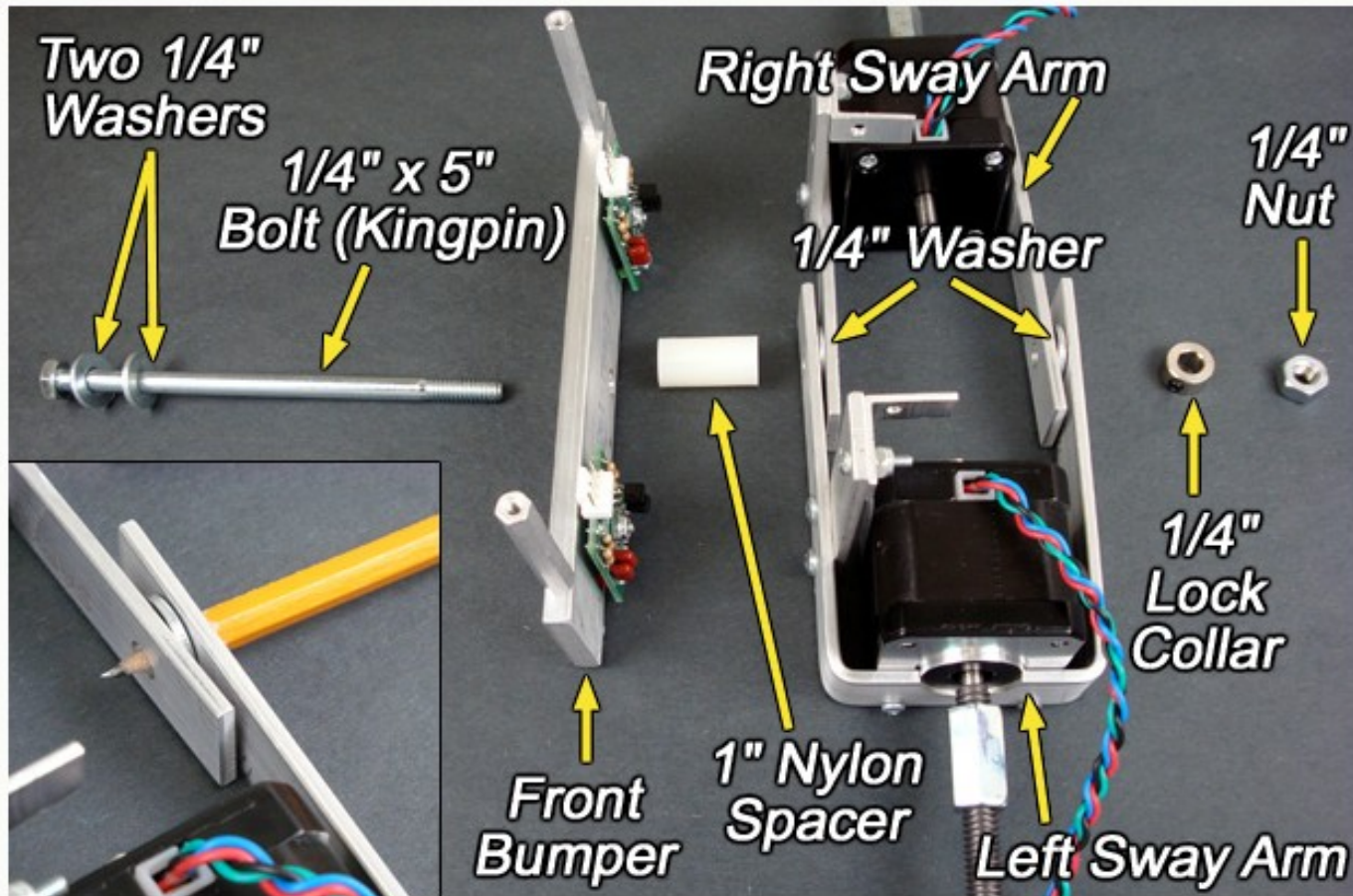
Mount the 1 ½” F-F standoffs on the front bumper using 6-32x1 ¾” screws.



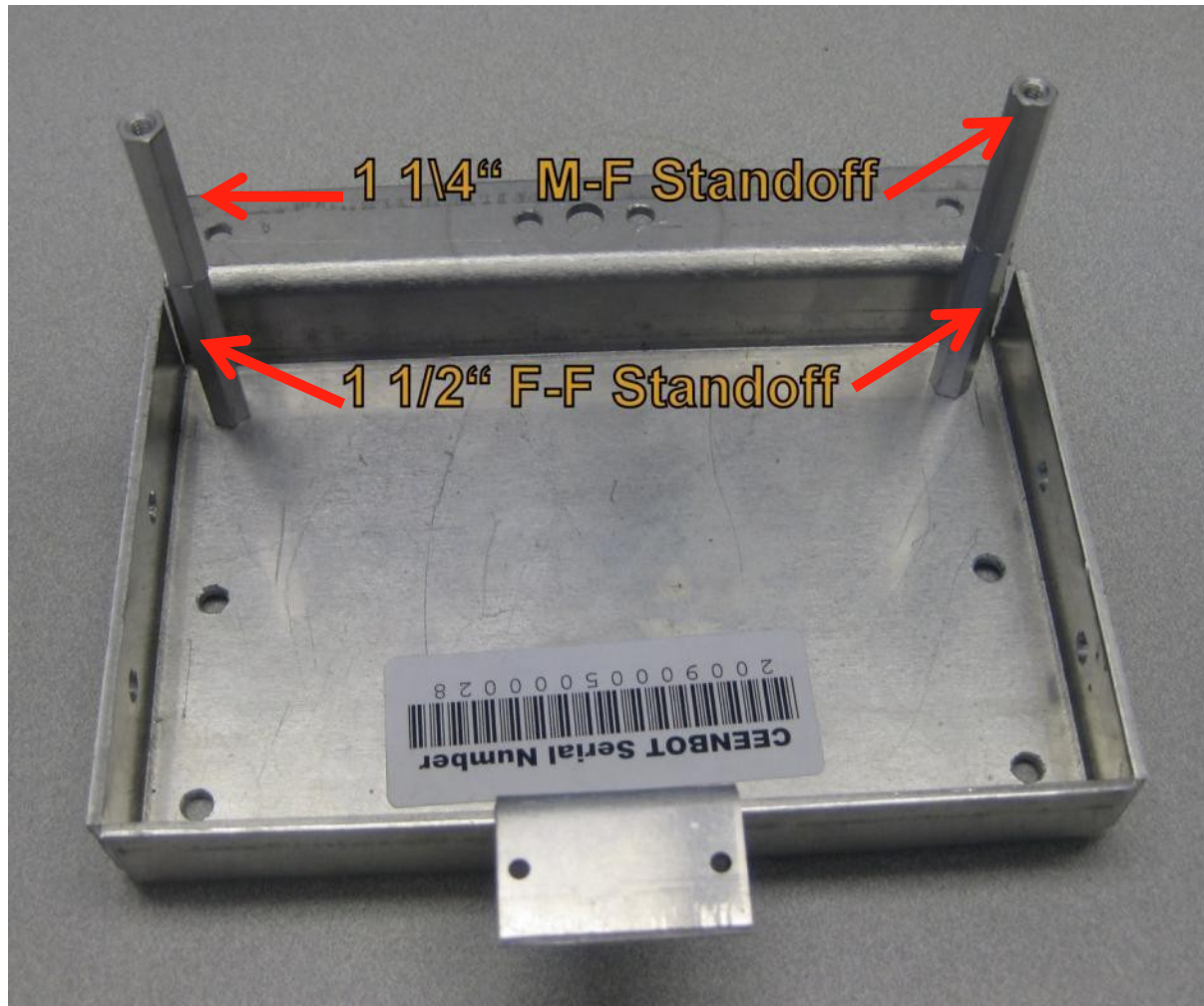
Mount the two Sensor boards on the bumper using the 4 – 40 x 5/8” screws and nylon lock nuts. The bumper in the photo has the CEENBOT engraving on both sides. If yours has only one engraving, ensure that it is on the opposite side as the sensor boards. **Put two fiber washers between the bumper and each board.** This prevents the board from touching the metal bumper and shorting out.



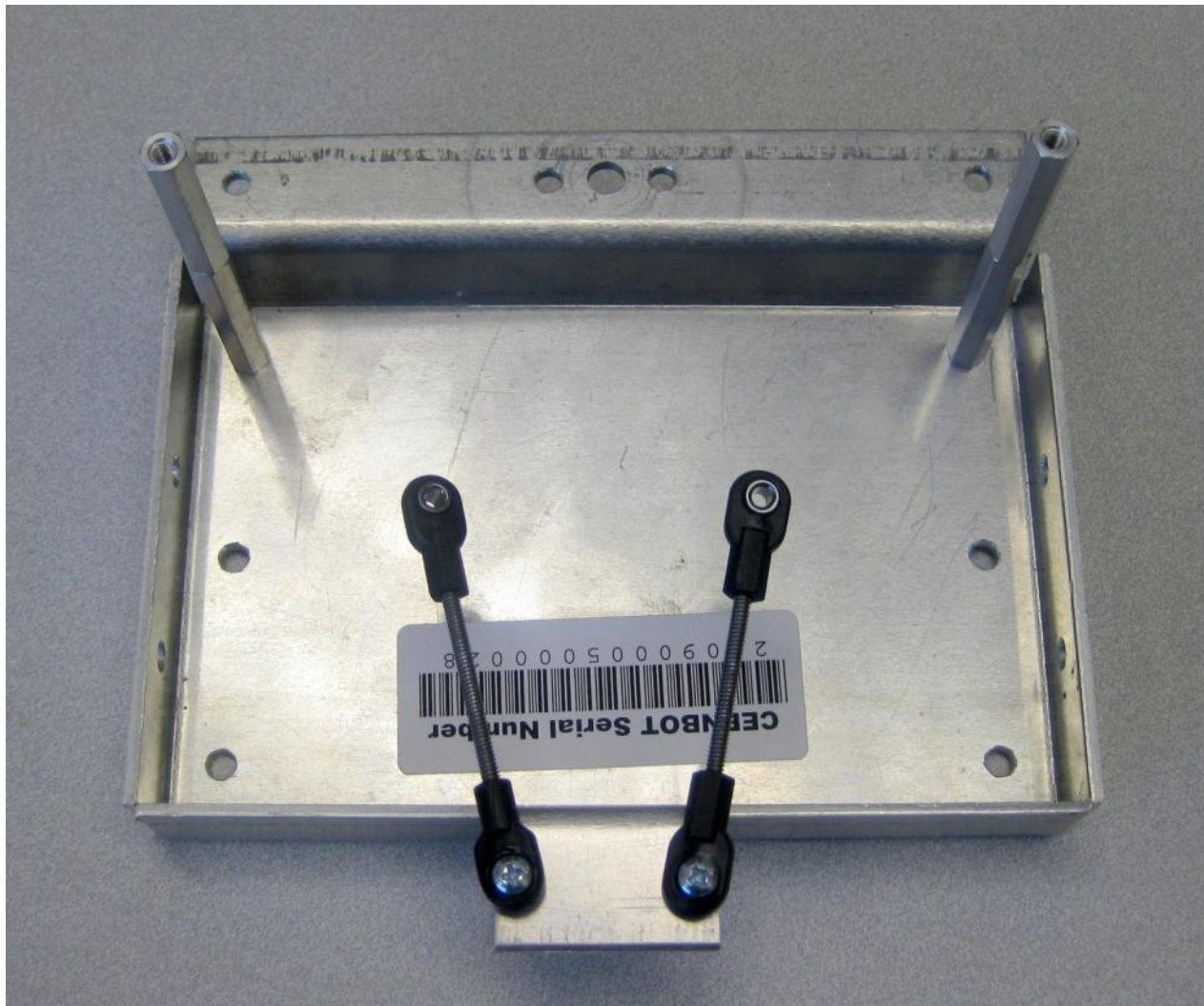
Assemble the parts for the Kingpin unit. Place two ¼" flat washers on the bolt between the bolt head and the front bumper. Assemble kingpin parts. Tighten nut so that it is snug but the sway bars still can move freely. You can use a tapered punch or pencil to align the parts to ease assembly.



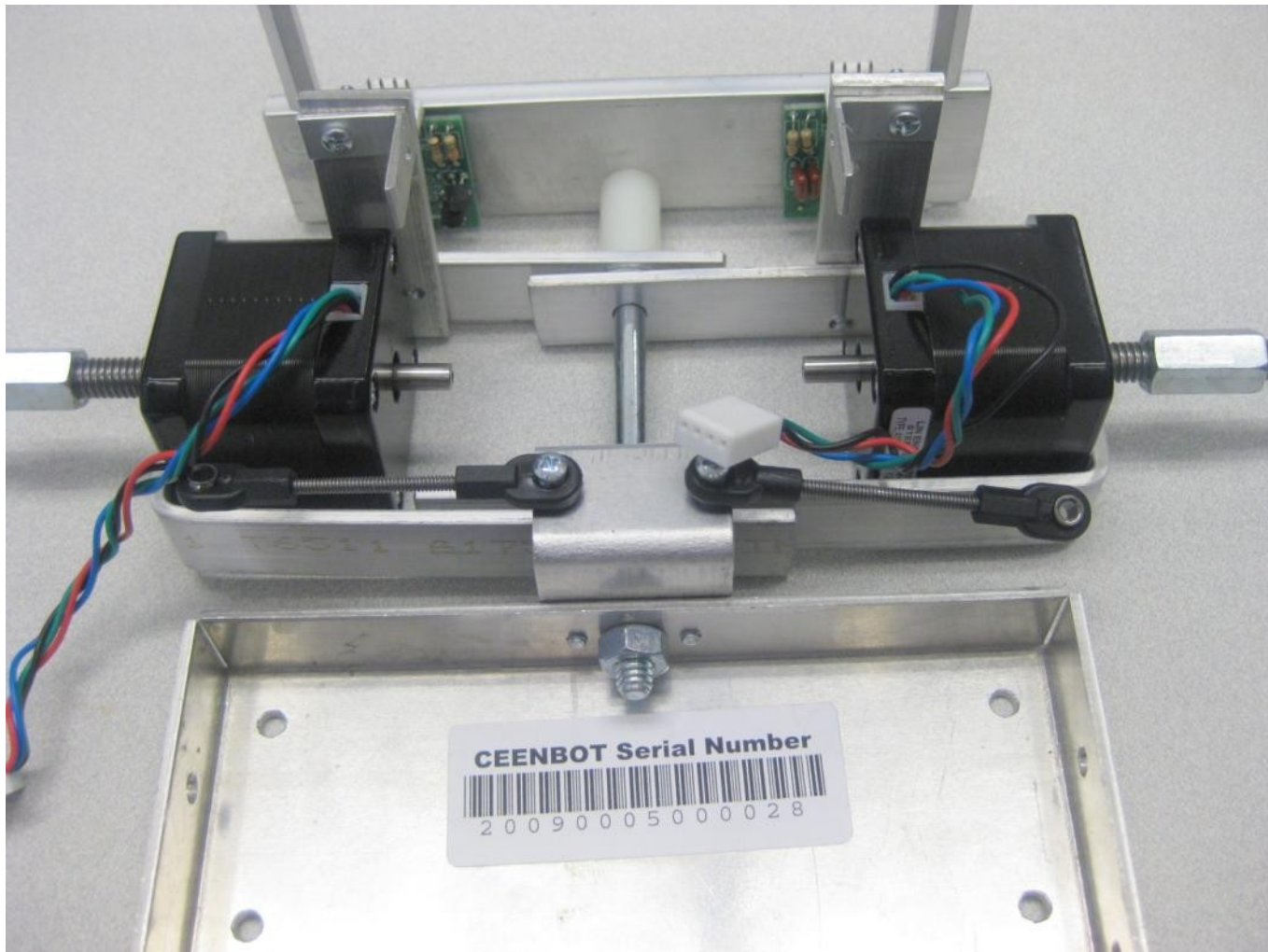
Place standoffs on aluminum tray as shown in the photograph. Use 6 – 32 x 1/2" screws. The 1 1/2" F-F standoffs will have 1 1/4" M-F standoffs screwed into them.



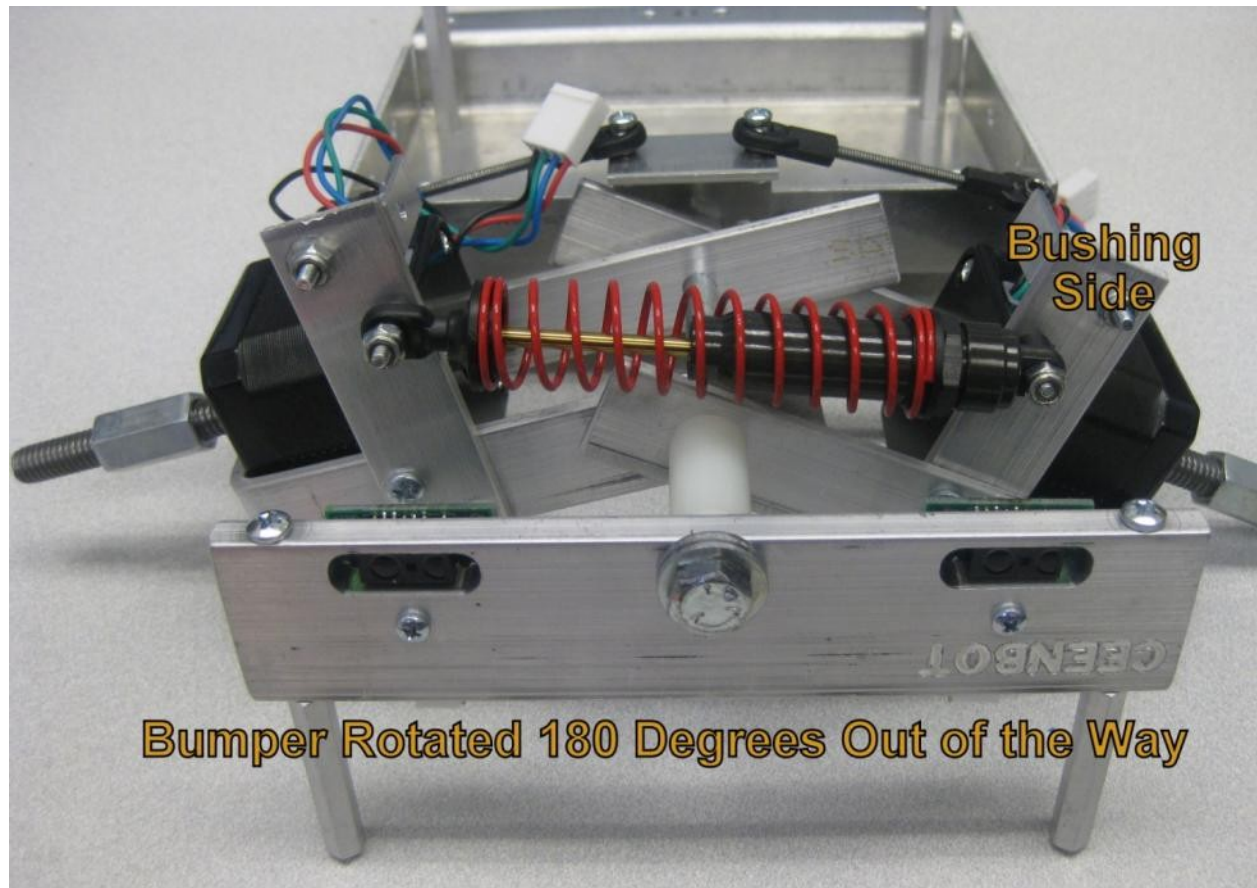
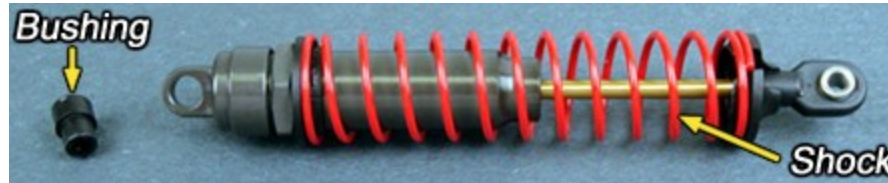
Attach the stabilizers to the tray as shown using 4x40x1/2" screws and locking nylon nuts.



Attach the tray to the Kingpin with the ¼" hex nut. Tighten securely.



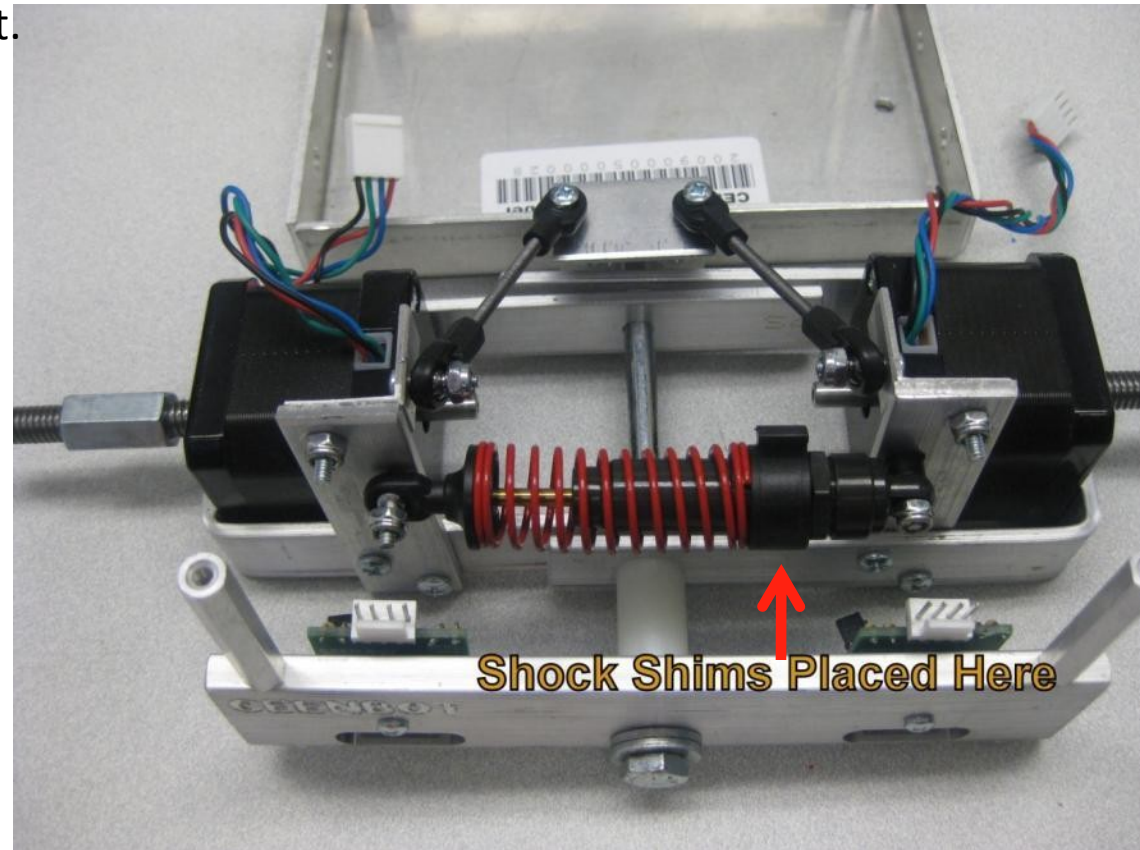
Press the bushing into the plastic hole of the shock. Attach the shock to the shock towers with 4 – 40 x 5/8" screws and nylon lock nuts.



Attach the end of each stabilizer to its bracket on the shock tower. Use 4 – 40 x ½” screws and nylon lock nuts.

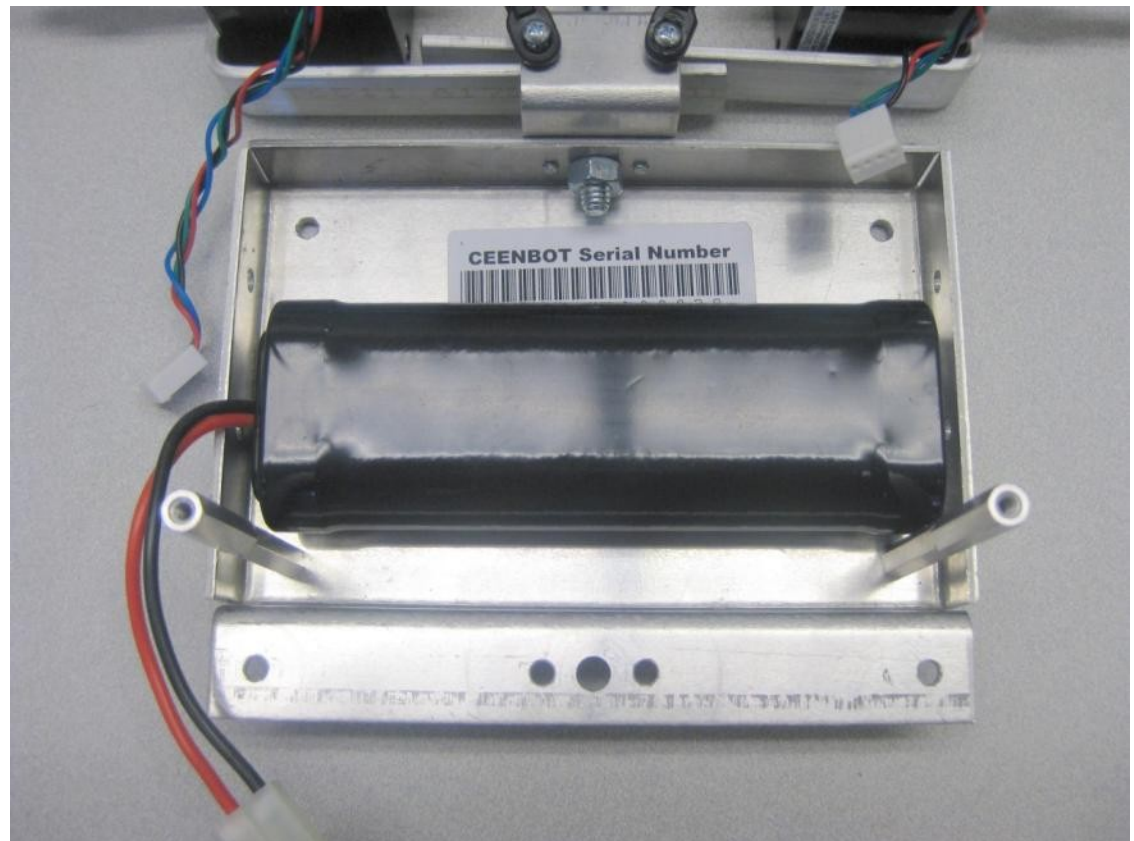
There are a variety of shims which can be placed on the barrel of the shock to adjust the stiffness of the suspension. Compress the spring and insert one of the larger shims over the barrel of the shock. There is a plastic collar that the spring presses against.

Shim goes between this collar and the plastic end of the shock. Keep the remaining shims for future modifications of the suspension.

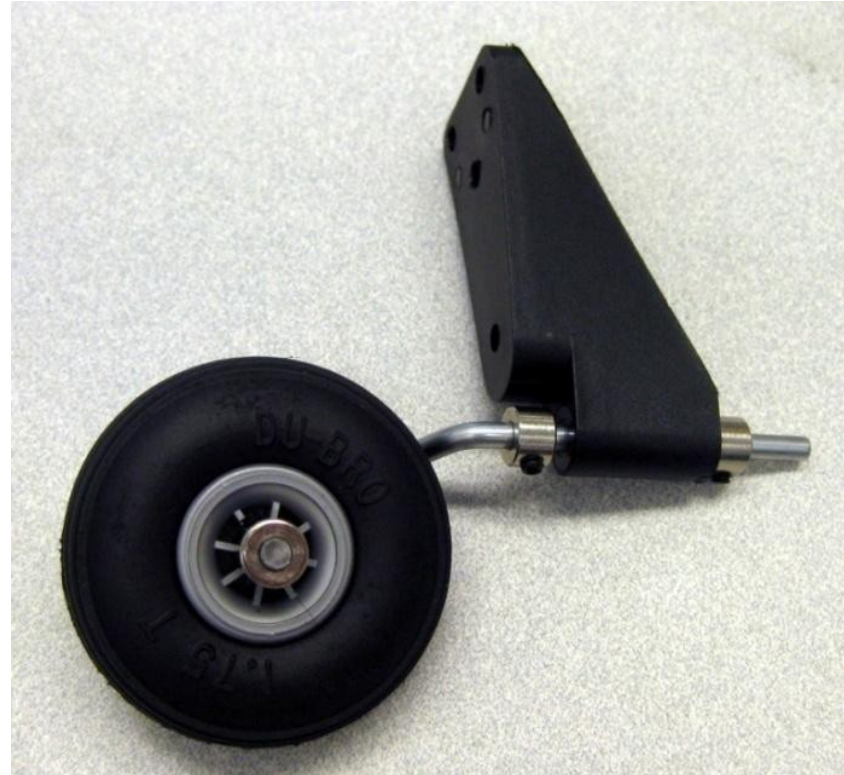


Remove the protective strip from adhesive on the “fuzzy” piece of Velcro. Press it onto the flat side of the battery. Attach the mating (hook) Velcro strip to the fuzzy strip. Remove the protective strip from the hook side of the Velcro. Carefully place the battery with the exposed adhesive into tray leaving the serial number visible.

Remove the battery and the Velcro will separate leaving the hook piece adhered to the tray. Press the hook piece so that it is fully adhered to the tray.



The bag with the tail wheel assembly has some very tiny set screws. **Be careful when opening the bag that you don't lose them.** Thread all of the set screws into the collars. Don't insert so far that they protrude into the center. Assemble as shown in the picture and tighten the set screws.



Mount the tail wheels to the tail ledge with 6 – 32 x 1/2" screws and nylon lock nuts. Install with the lock nuts on the top.



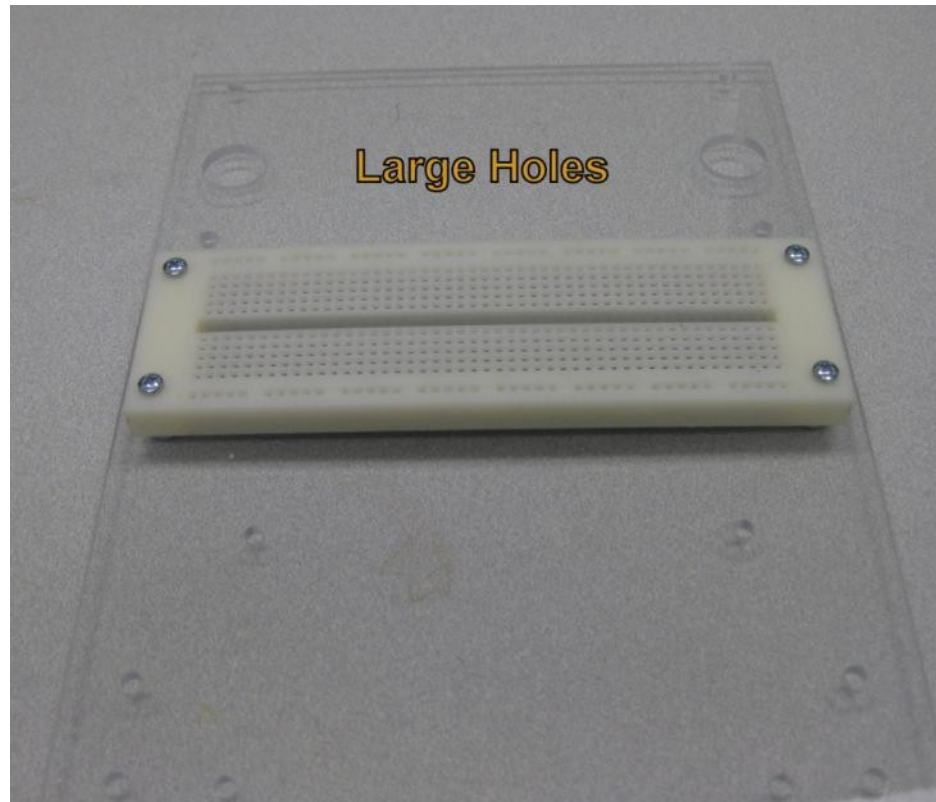
Tire Assembly: Place the foam which came with the tires in the center of the tire and arrange such that there is a hole in the center. Work the tire over the wheel and adjust so that the tire bead is adjacent to the outer flange of the wheel.

Position the elongated inner bolt on the motor shaft such that it does not touch the frame when the motor turns. The exact position is not important. Attach the wheels to the motors using the hex nut. The molded hex depression in the wheel goes towards the motor.

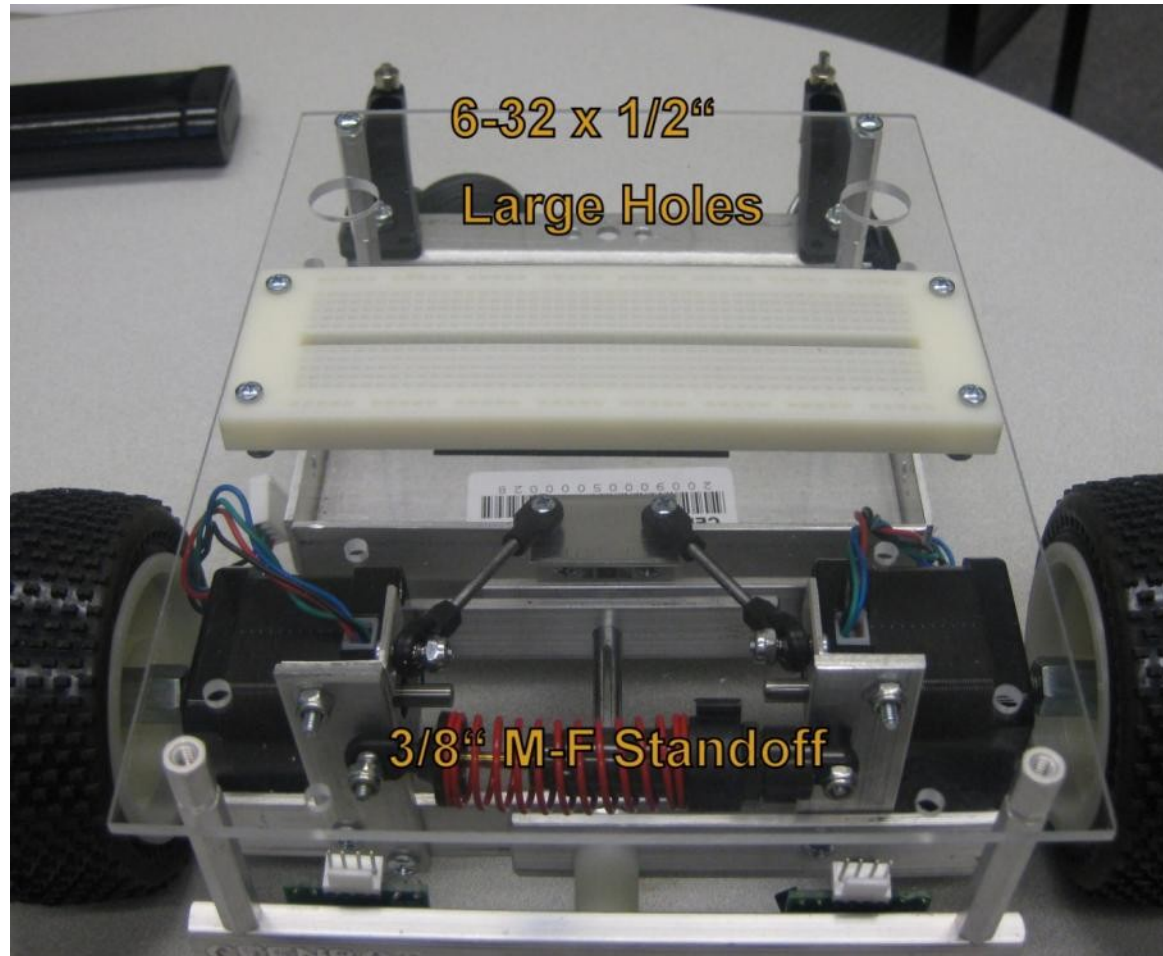
Use a socket wrench to tighten the nut. Do not over tighten or the plastic wheel may crack.



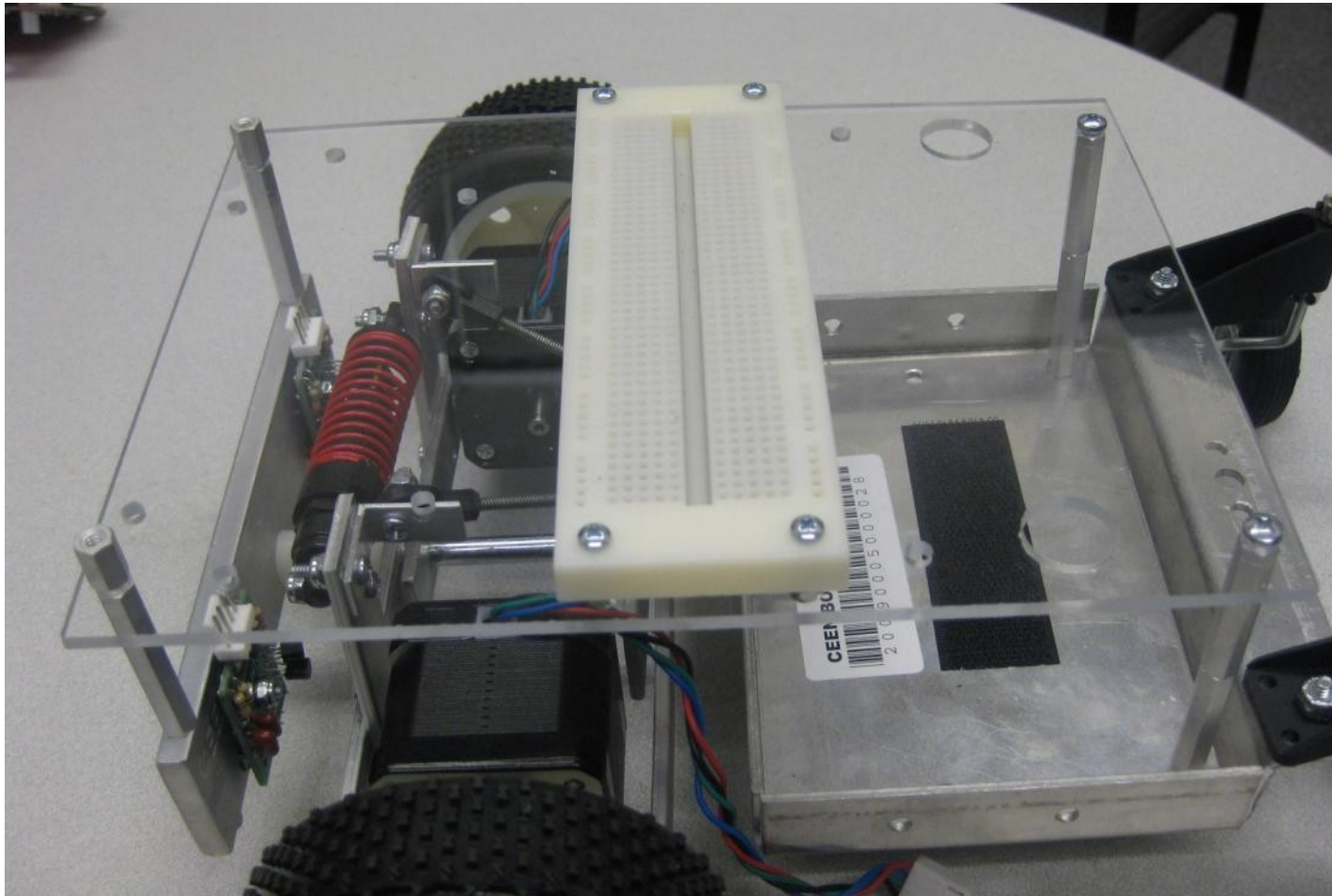
Remove the protective film from the Plexiglas. Mount the prototyping board using 4 – 40 x 5/8” screws and nylon lock nuts. Observe the photo to make sure you are using the correct holes. Note the position of the large diameter holes.



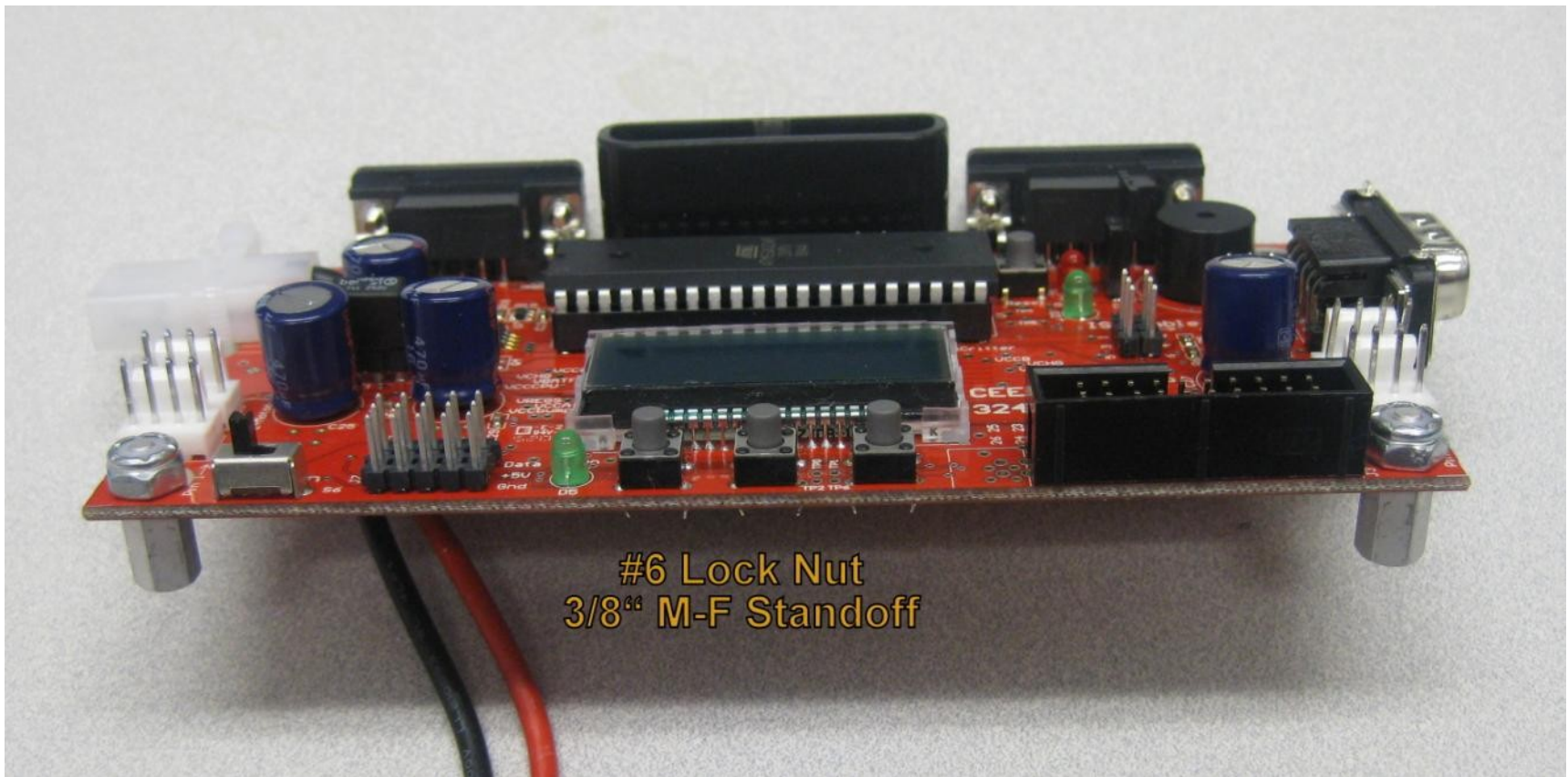
Attach the Plexiglas with 6 – 32 x 1/2" screws on one end and 3/8" M-F standoffs on the other. Note position of large holes.



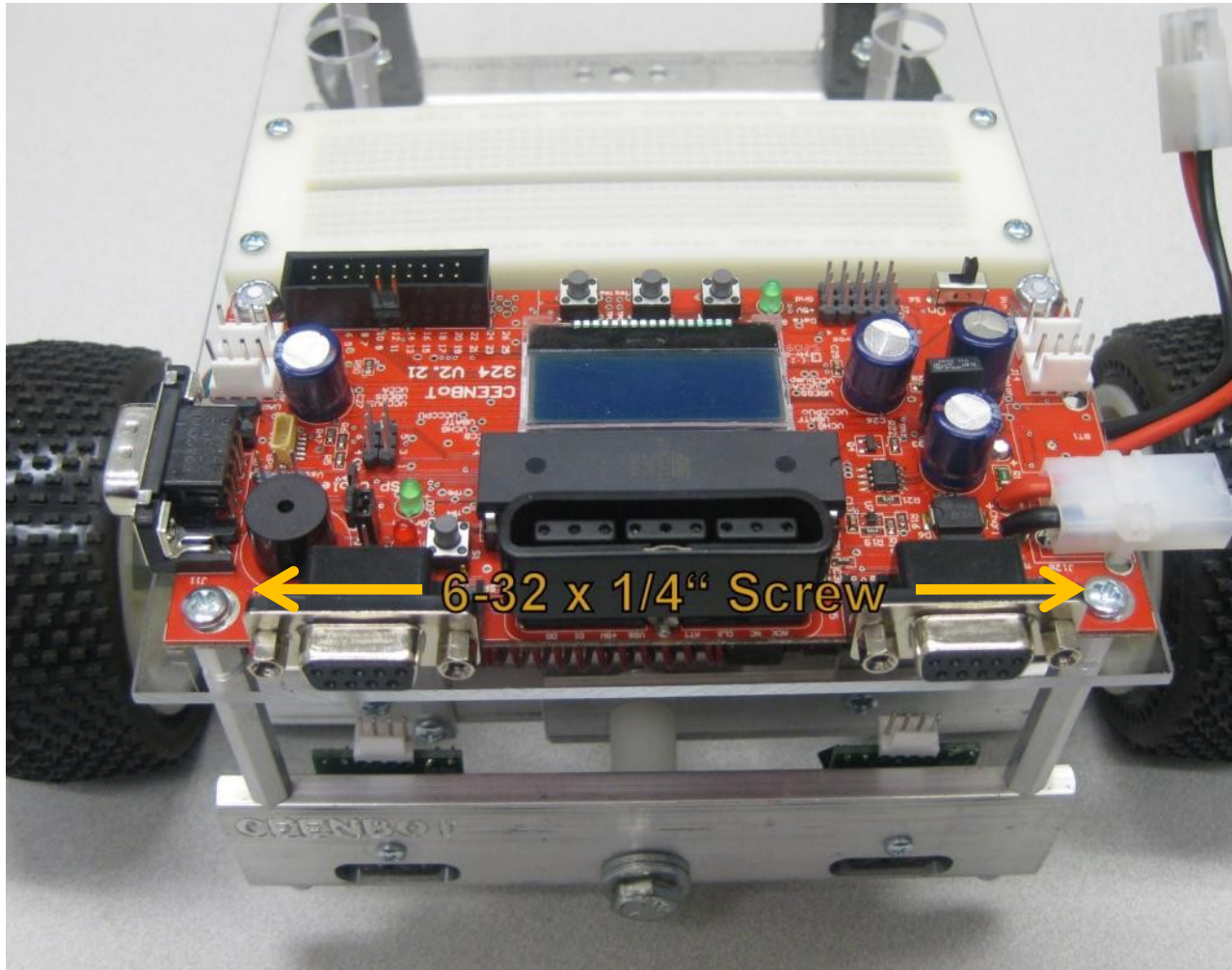
Alternate view of previous slide.



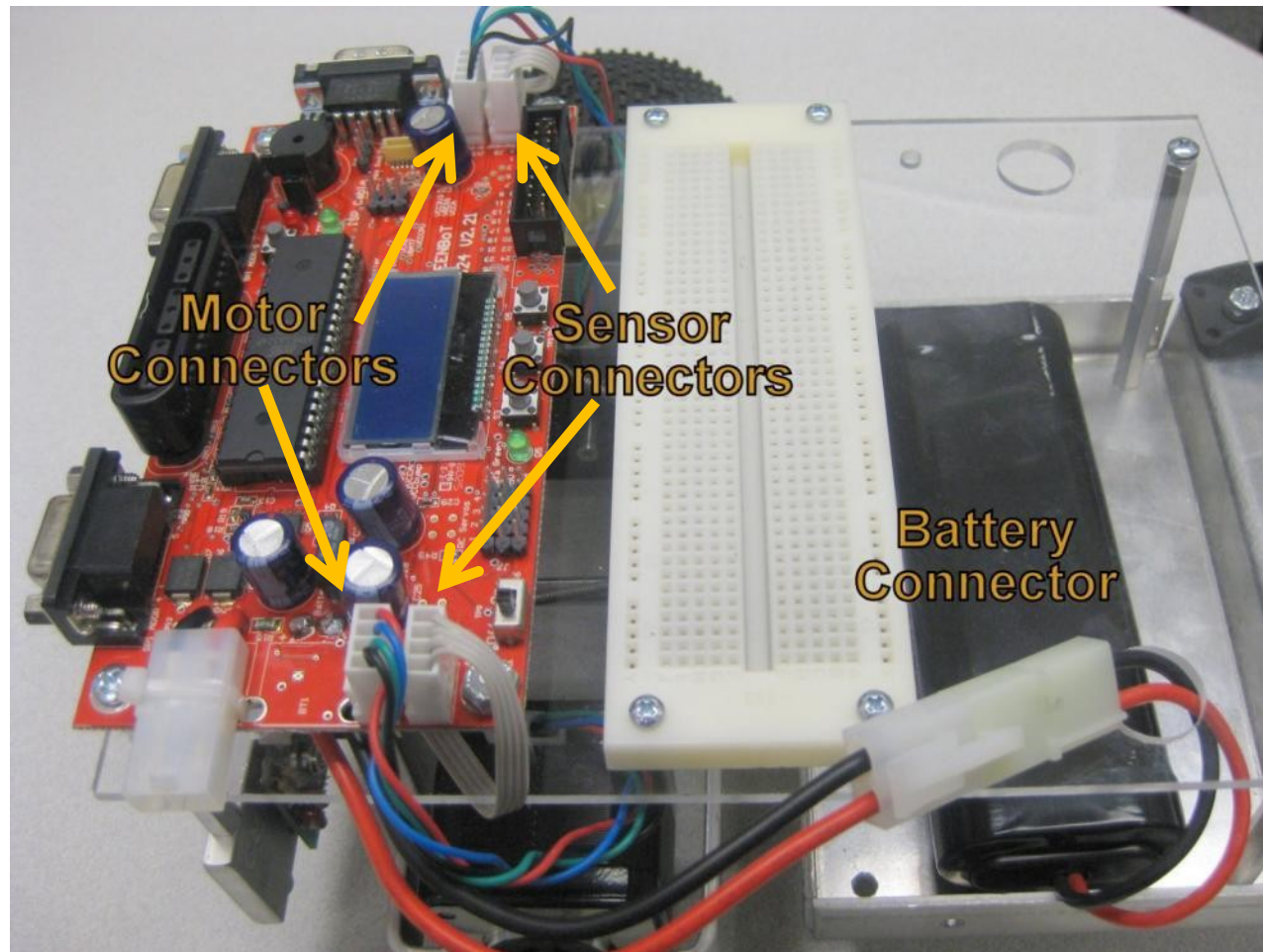
Attach two 3/8" M-F standoffs to the bottom side of the circuit board using two #6 lock nuts. Position as shown in the photograph.



Mount the circuit board with two 6-32 x 1/4" screws



Connect the motor and sensor cables. **Verify that the back side of the sensor boards do not touch metal.** Connect the battery cables.



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