Final NEMbot 5 Assembly
Performed after the microcontroller board has been tested

These detailed instructions are designed to help you do it right the first time
- Please follow them in order for the easiest path to getting your Bot running
- Ask a course conductor if you have any questions or need help
- It is a good idea to check off the steps as you complete them

Turn the page and get started!

Robotics Resources Section (for when you get home)

- **nemrobots.org** – Has this year's project and previous STEM workshop reference files
- www.picaxe.com – Program Editor, cable driver, and programming info
- www.picaxeforum.co.uk/forum - ideas and help
- sparkfun.com – servos, accessories, and robot parts (including AXE-027)
- pololu.com – servos, accessories, and robot parts
- servocity.com – servos, accessories, and robot parts
- parallax.com , futabarc.com , hitecrcd.com – Servo manufacturer websites
- adafruit.com - robotics and other STEM materials
- digikey.com – servos and electronics parts
- jameco.com – servos and electronics parts
- **instructables.com** - Great STEM site with many ideas projects, and general info
- **nationalelectronicsmuseum.org** – The museum website. Check for activities

*Course conductors are there for you. Just ask if you need help !*

❑ Bolt the Two Servos Together

1. Place the servos back-to back with their wires at the same end.
1. Bolt the servos together using only two bolts as shown.
2. Put only a few threads on the nuts at first. The screw lengths are close fit.
3. Alternately snug the nuts taking care not to over-tighten.

bolts   nut
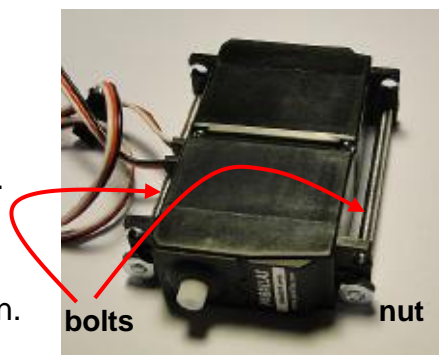
❑ Mount Servos to the Platform

1. Insert cable ties from the platform back side through the four motor mounting holes.
2. Place servos on the platform with bolt side down and leads pointing to the back edge.
3. Thread all four ties between the bolts and the servo bodies.
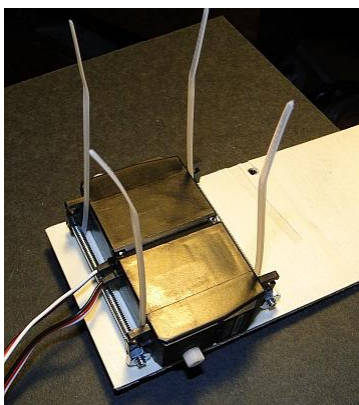
flat side of head

4. Face the flat sides of the tie heads away from the motors (2 towards the front, 2 to back).
5. Loop the ties over the bolts and back through the holes. It's a small space.
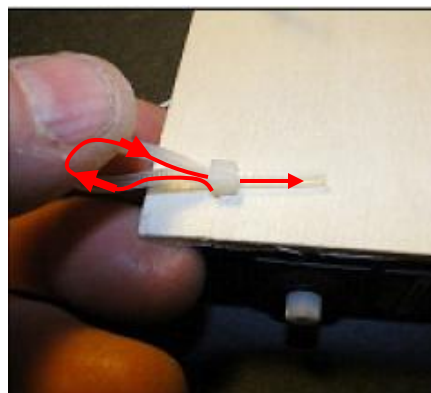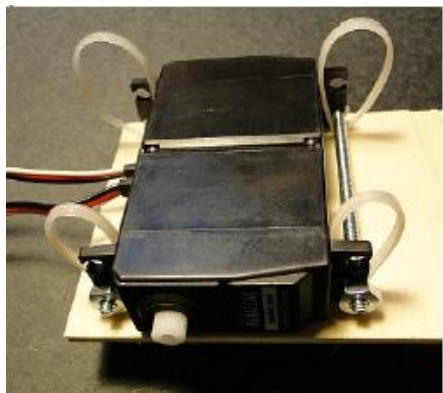
7. Now start closing each tie by pushing it through the flat side of its head.
8. Keep the heads up against the platform as you snug them up. Don't make them tight yet.
9. Finally, pull the ties tight while keeping their heads firmly against the platform.
   • This may require needle noses pliers and three hands ☺
   • Make sure the heads end up firmly against the platform and that the loops are tight. around the bolts. *Ask for help if needed.*
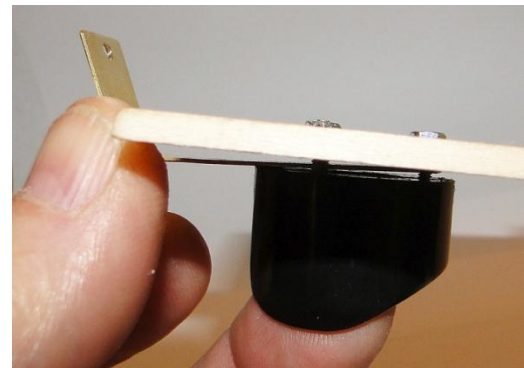
❑ **Mount the Battery Box Cover**

1. Unscrew the battery box cover.
2. Put double sided adhesive foam tape on
   the outside of the cover.
   Don't cover up the screw hole.
3. Peel off the backing and align the screw
   hole with the hole in the platform.
   Sticking something like a cable tie
   Through both holes is helpful in lining
   them up.
4. Press down when you have good
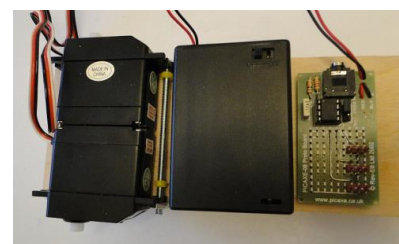   alignment.   You'll slide the battery case onto the cover later.

❑ **Attach the Ball and Sensor Mount**

1. These parts attach to the *bottom of the platform*
   (opposite from the servos).
2. The Sensor bracket is sandwiched between the ball
   holder and the platform, with its "foot" pointing up.
   Be careful not to bend the sensor's pins if it is
   already attached to the bracket.
3. Use the shorter screws from the ball kit. Put them
   in from the inside of the ball base through the platform.
4. Use the centerline screw to hold the sensor bracket.
5. Put the nuts on the screws and snug them down.
   firmly. The sensor mount should point straight forward.
6. Place the three white plastic rollers in their ball
   mount slots and snap in the ball.

**Mount Control Board, Battery Box, and Speaker**

1. Slide the battery case onto its cover
2. Apply double sided adhesive foam tape to
   the back of the control board. Choose an
   area that is the least uneven.
3. Face the connector end as shown and
   mount the board between the battery box
   and the nose wheel screws. Push firmly.
4. Mount the speaker on the front of the platform
   near the ball using double-sided tape.
   Don't push on the black speaker cone!

❑ **Put Wheels on the Servos and Connect**

1. The side of the wheel with the ribbed circle pattern will go towards the servo.

2. Rotate the hub against the servo spline using only a little pressure until you feel them mating, then push the wheel on.

3. With both wheels on, press them on the splines until they bottom out.

4. Insert and snug hub screws (Optional)

5. Push the servo connectors onto the headers, *black wire closest to bottom board edge*.

   Do not use the header at the top side of the board. It is for the sensor cable.
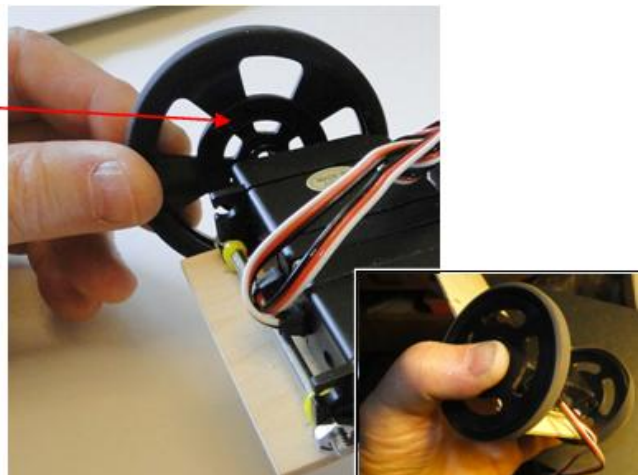
❑ **Attach IR Sensor**
Skip to step 5 if the sensor is already mounted

1. Remove and set aside the small screw and nut attached to the sensor mount

2. Position the IR Sensor on the back of the mounting bracket with the black sensor block pointing forwards.

3. Align the mounting holes. Put the small screw through from the sensor back side.

4. Spin on the nut and tightly secure the sensor.

5. Plug the jumper cable into the sensor with the *Yellow wire to the Left looking from the back of the sensor board* (header side).

6. Plug the jumper cable into the Picaxe board with the *Red wire closest to the control board top edge*.

7. The sensor bracket arm may later be adjusted for detection height by gently bending the arm up or down, being careful not to pull on the sensor board.
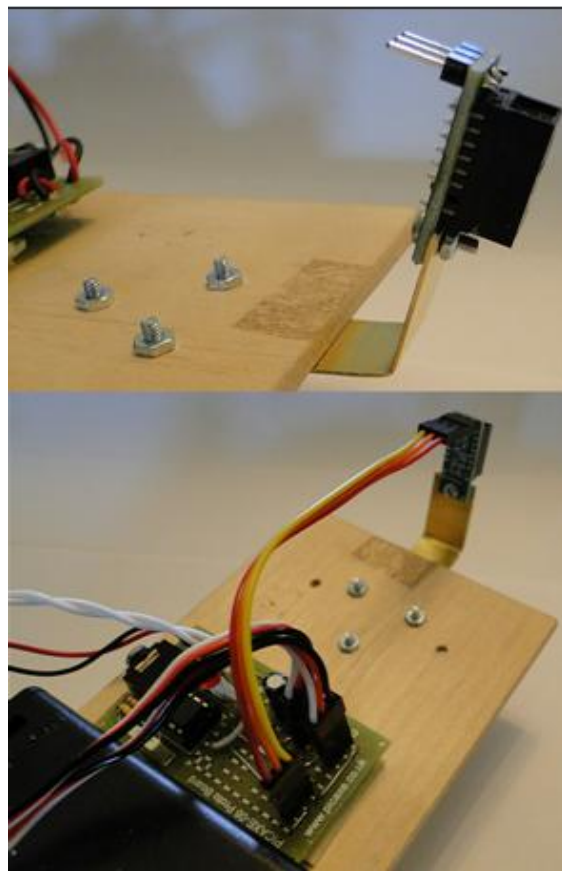
Congratulations!
You have fully assembled your Bot!

Now go see if it works! Remember that there is a 5 second delay from when you turn on the switch until the Bot starts to move and its "heartbeat" blinks

You can change this delay and do more programming of your Bot with Picaxe USB download cable model AXE027. The Picaxe Programming Editor is free to download at
http://www.picaxe.com/Software/PICAXE/PICAXE-Programming-Editor
Your Bot's program and instructions can be found at http://nemrobots.org