CLAWBOT BUILDING INSTRUCTIONS

CLAWBOT WITH SENSORS BUILDING INSTRUCTIONS

USING THE VEX CORTEX
1 Collect the parts and tools from the list below to attach the sensors:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft, 4” Long</td>
<td>1</td>
</tr>
<tr>
<td>Shaft, 5” Long</td>
<td>2</td>
</tr>
<tr>
<td>Screw, 8-32 x 3/8” Long</td>
<td>9</td>
</tr>
<tr>
<td>Screw, 8-32 x 1/2” Long</td>
<td>2</td>
</tr>
<tr>
<td>Screw, 8-32 x 3/4” Long</td>
<td>12</td>
</tr>
<tr>
<td>Nut, 8-32 Keps</td>
<td>19</td>
</tr>
<tr>
<td>Shaft Spacer, Thin (4.6mm)</td>
<td>8</td>
</tr>
<tr>
<td>Shaft Spacer, Thick (8mm)</td>
<td>5</td>
</tr>
<tr>
<td>Standoff, 1” Long</td>
<td>1</td>
</tr>
<tr>
<td>Angle Gusset</td>
<td>2</td>
</tr>
<tr>
<td>Optical Shaft Encoder</td>
<td>2</td>
</tr>
<tr>
<td>Ultrasonic Rangefinder</td>
<td>1</td>
</tr>
<tr>
<td>Potentiometer</td>
<td>1</td>
</tr>
<tr>
<td>Bump Sensor</td>
<td>1</td>
</tr>
<tr>
<td>Limit Switch</td>
<td>1</td>
</tr>
<tr>
<td>Ambient Light Sensor</td>
<td>1</td>
</tr>
<tr>
<td>Yaw Rate Gyroscope</td>
<td>1</td>
</tr>
<tr>
<td>Line Tracker</td>
<td>3</td>
</tr>
<tr>
<td>LCD Display</td>
<td>1</td>
</tr>
<tr>
<td>Integrated Motor Encoder Kit</td>
<td>1</td>
</tr>
<tr>
<td>Allen Wrench 3/32”</td>
<td>1</td>
</tr>
<tr>
<td>Allen Wrench 5/64”</td>
<td>1</td>
</tr>
<tr>
<td>Open End Wrench 1/4”</td>
<td>1</td>
</tr>
<tr>
<td>#1 Phillips Screwdriver</td>
<td>1</td>
</tr>
<tr>
<td>Pliers</td>
<td>1</td>
</tr>
<tr>
<td>Hacksaw</td>
<td>1</td>
</tr>
</tbody>
</table>

Note that this robot can only be built if you have a standard Clawbot already assembled.
2 Attaching the Bumper Sensor

Place screws through the bump sensor and place thin spacers on the opposite side
2 Attaching the Bumper Sensor (continued)

Attach the bump sensor as shown below

Bottom View

Front View
3 Attaching the Ambient Light Sensor

- Claw is hidden for visibility purposes

Front View

Top View
4 Attaching the Potentiometer

To attach the Potentiometer, we first need to reverse the left C-Channel holding the arm.

Remove the arm motor along with the clutch post and shaft coupler.

Next, remove the left, bent bar and its screws and nuts.
4 Attaching the Potentiometer (continued)

This is what the robot should look like after the bar is removed

Remove the shaft collar below
4 Attaching the Potentiometer (continued)

Carefully slide the C-Channel off the arm structure. Keep the bearing blocks intact.

Take the metal bar and remove the bearing blocks and rivets.
Reattach the block on the opposite side of the metal bar.

**Keep the other flat, bearing block and 2 rivets. We will use it later for the limit switch.**
4 Attaching the Potentiometer (continued)

Reattach the bent bar we removed earlier

Re-attach the arm motor along with the clutch post and shaft coupler
Replace the uppermost shaft of the arm with a longer shaft.
Attaching the Potentiometer (continued)

The shaft should be around 4” in length

Place a thick spacer on the shaft
Slide the structure back in place. Both C-Channels should now open to the right.

**Building Tip - Potentiometer Range of Motion**

*At this step, make sure the arm rotates within the potentiometer’s range of motion.*

*Forcing the potentiometer beyond its mechanical stops will damage the sensor.*
4 Attaching the Potentiometer (continued)

Screw the screws and nuts shown below back into place

Finish by putting on the shaft collar we removed earlier

⚠️ **Building Tip - Using Shaft Collars**
Push the arm structure inwards and make sure everything is tight

Make sure the arm moves freely
5 Attaching the Sonar Sensor

Much like the bumper sensor, start with 2 screws and a spacer.
5 Attaching the Sonar Sensor (continued)

Attach the sonar to the front of the robot

The side rail is hidden for visibility purposes
6 Attaching the Limit Switch

The limit switch is also attached using 2 screws and spacers
Place the sensor in between the bent bars on the front of the robot like such.

Front view from a bottom perspective.
Attaching the Limit Switch (continued)

Recover the bearing block you saved earlier from the potentiometer build. Place it underneath the claw as shown below. This will help the claw activate the limit switch 100% of the time.
7 Line Tracking Sensor Construction

Next, attach the line tracking sensors

Make sure the line trackers are centered on the robot
 Attaching the Gyroscope

Attach the gyroscope as close to the center as possible.

Below is the top view.
This robot model features 2 options for motor encoder:

A.) Attaching the external VEX Quadrature Encoders to the shafts connecting the back wheels to the drive train.

B.) Using the Integrated Motor Encoders.

This guide will show you how to build both.
9 Attaching the Left Encoder

Take an angle gusset and an encoder

Option A:
This section covers how to assemble the external Quadrature Encoders. If you would like to use the Integrated Motor Encoders, skip pages 24-31
At the end of the gusset, place a screw and a thin spacer as shown below.
Attaching the Left Encoder (continued)

Now do the same for the right encoder.
Attaching the Left Encoder (continued)

Just like the potentiometer, to build the encoders, we will need to lengthen the shaft.
Attaching the Left Encoder (continued)
9 Attaching the Left Encoder (continued)

Remove these shaft collars and replace them with 2 thick spacers on each side.
9 Attaching the Left Encoder (continued)

Slide the shaft through the encoder and then place the screws as shown below.
8. Attaching the Left Encoder (continued)

Place the shaft collar back in place
Attaching the Integrated Motor Encoders

Option B: This section covers using the Integrated Motor Encoders. If you built the external Quadrature Encoders, then skip pages 32-34.

Detailed instructions can be found at:

First, take out the two motors on the bottom of the robot’s drive train.
Attaching the Integrated Motor Encoders (continued)

Remove the back casing with a #1 Phillips Screwdriver

Remove the first cluster gear and replace it with the black/white encoder gear from the kit
10 Attaching the Integrated Motor Encoders (continued)

Place the new motor cap on to the 393 motor as shown

Reattach the motors to the drive train
11 Attaching the LCD Display

Connect the left side of the LCD to the left C-Channel
11 Attaching the LCD Display (continued)

Use a standoff to mount the display on the opposite side.
Your Clawbot with sensors is complete!