CMUcam 2/2+/3 Aluminum Turret Assembly Instructions

NOTE: Our new turret works with the CMUcam2, CMUcam2+, and CMUcam3.

Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

Please use the list below to ensure that your turret kit came will all of the proper hardware and parts:

- Turret Pivot (1)
- Sensor Shell (1)
- Cam Plate (1)
- Rear Plate (1)
- Servos (2)
- 4-40 x ¼ Pan Head Phillips screws (2)
- 4-40 x 3/8 Pan Head Phillips screws (8)
- 4-40 x ½" Pan Head Phillips screws (4)
- 4-40 x 3/8 Flat Head Phillips screws (14)
- 4-40 x ½ Flat Head Phillips screws (2)
- 4-40 Nuts (30)
- 4-40 Nylon Lock Nuts (2)
- 4-40 x ¼ Aluminum Standoffs (4)
- #2 x 5/16 Flat head Phillips screws (2)
- Plastic Linkage Clevis (2)
- Threaded linkage rod (1)
- #4 Flat Washer (4)
- Plastic Tubing (1)

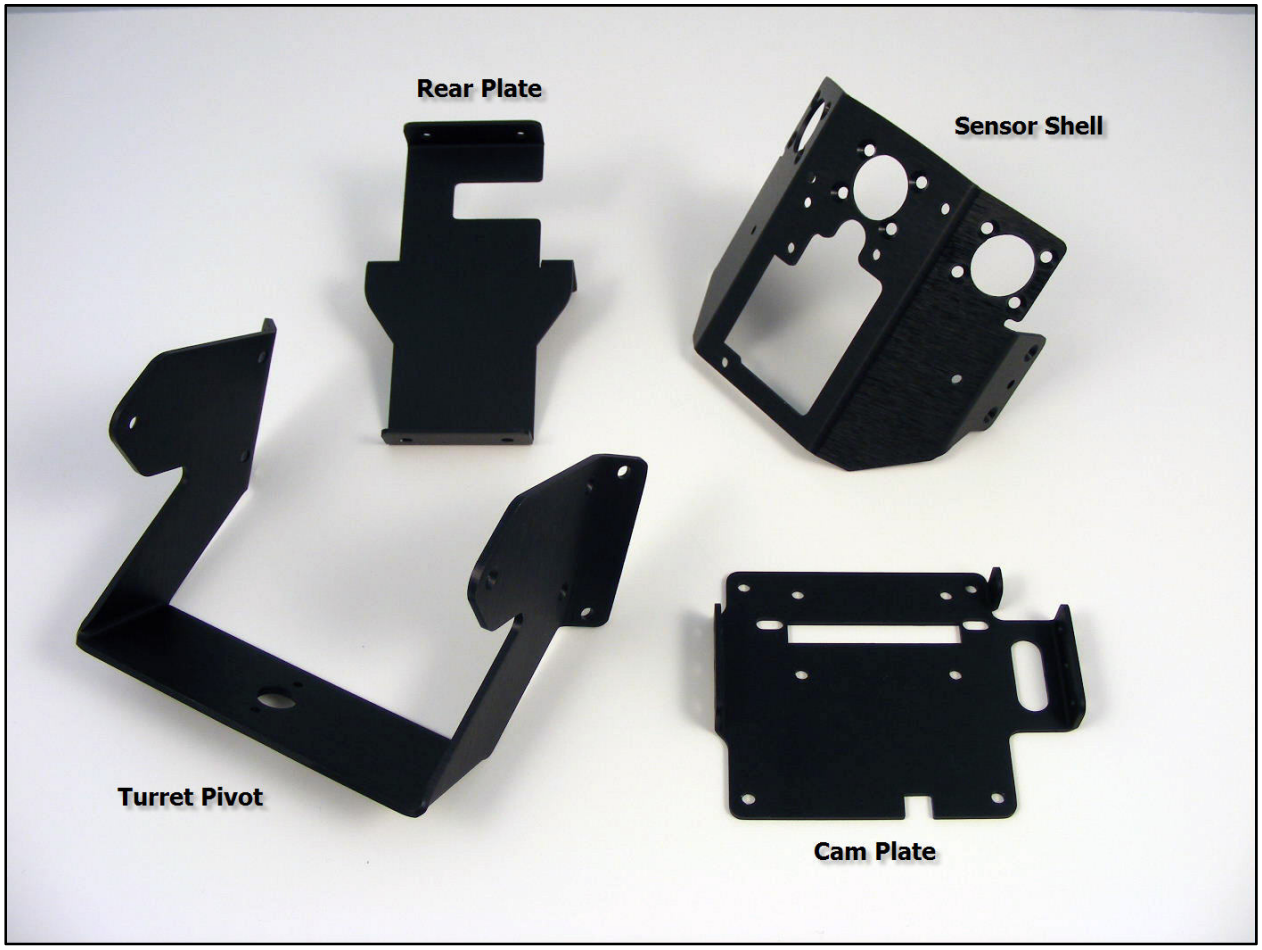

Figure 1 - Aluminum Turret Parts

Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

Figure 1 – Stainless Steel Bolt Bag

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

1.) Bolt rear plate to turret pivot using four 4-40 x 3/8” Flat Head screws and nuts as shown in Figure 3 and 4 below, with the bent tabs facing rearward.

Figure 3

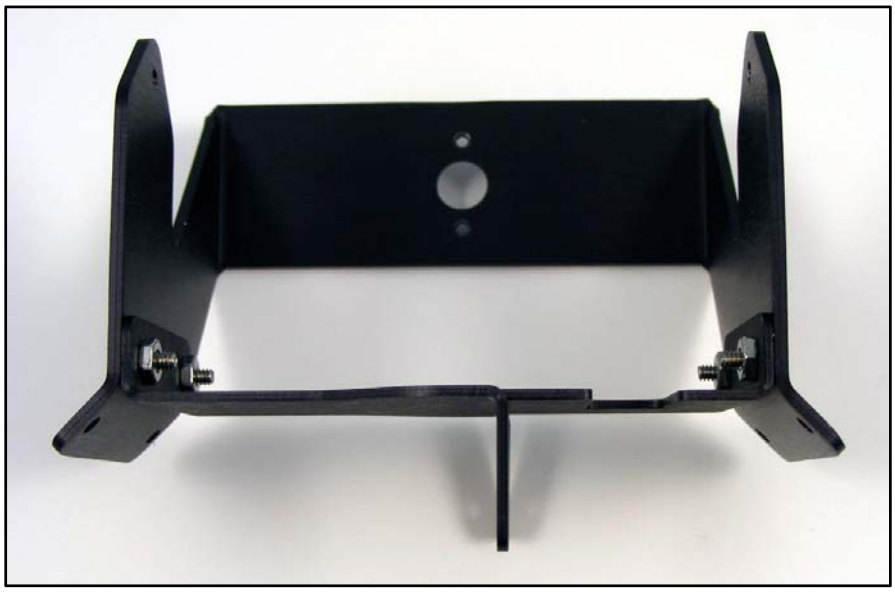

Figure 4

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

2.) If you are using a CMUcam2 or CMUcam3, cut two 1/8" long spacers from the included tubing. If you are using a CMUcam2+, then cut four 1/8" long spacers from the included tubing.

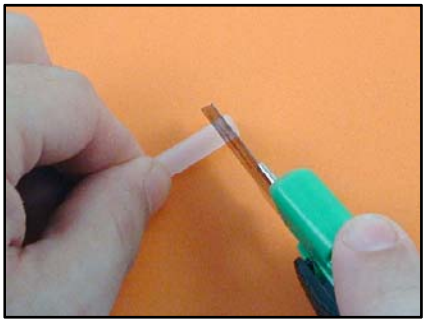

Figure 5

3.) If you are using a CMUcam2 or CMUcam3, bolt the camera onto the back of the Cam Plate using two 4-40 x 3/8" Pan Head screws as shown in figures 6 and 7 below. Make sure to place a plastic spacer (you cut in the prior step) between the camera board, and the back of the Cam Plate, so that the electronics don't touch the aluminum Camp Plate. NOTE: You will have to remove the camera module from the camera board first.

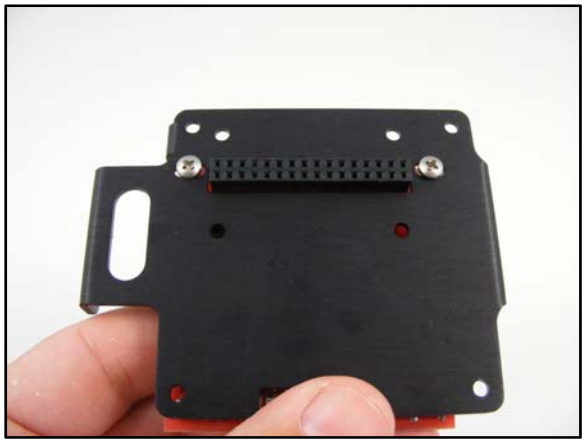

Figure 6

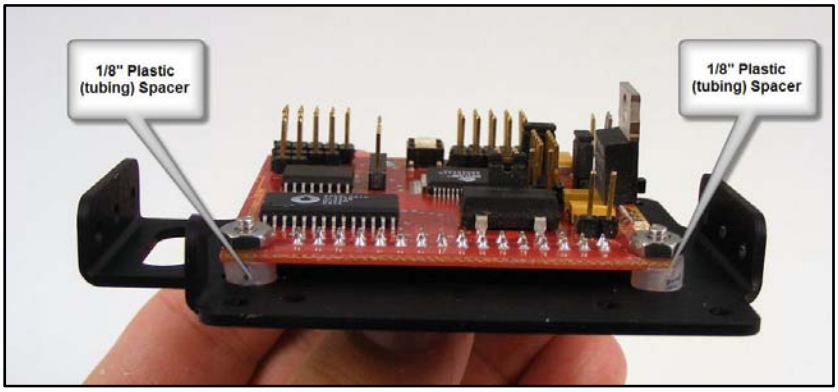

Figure 7

Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

4.) Once you have bolted the main camera board onto the back of the Cam Plate, you can plug the camera module back into the camera module socket as shown in Figure 7 and 8.

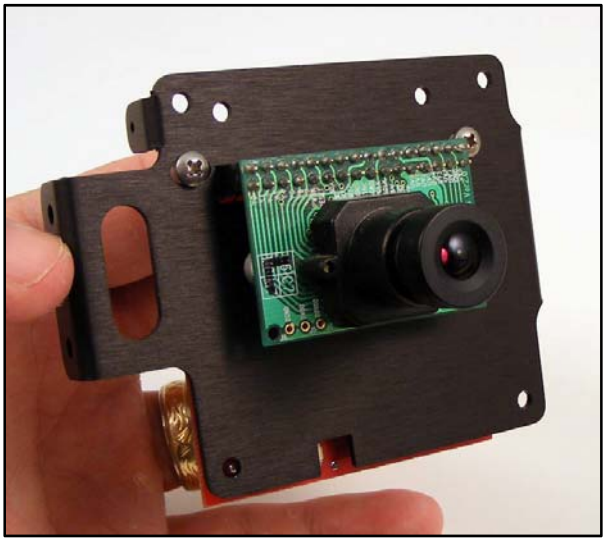

Figure 7

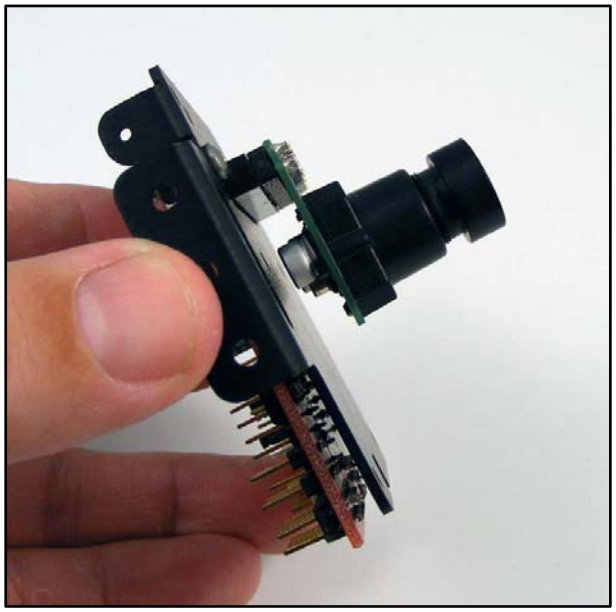

Figure 8

Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

5.) If you are using a CMUcam2+, then bolt the camera on the front of the Cam Plate using four 4-40 x 3/8" Pan Head screws, 4-40 nuts, and four plastic tubing spacers, as shown in figure 9.

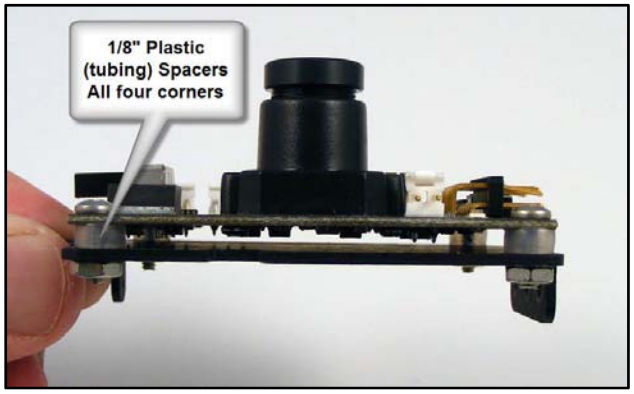

Figure 9

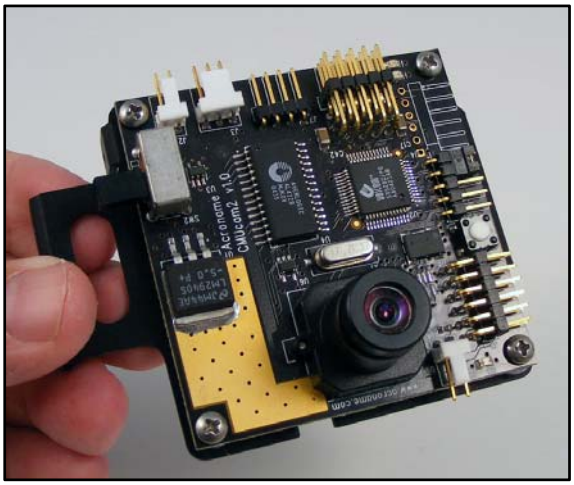

Figure 10

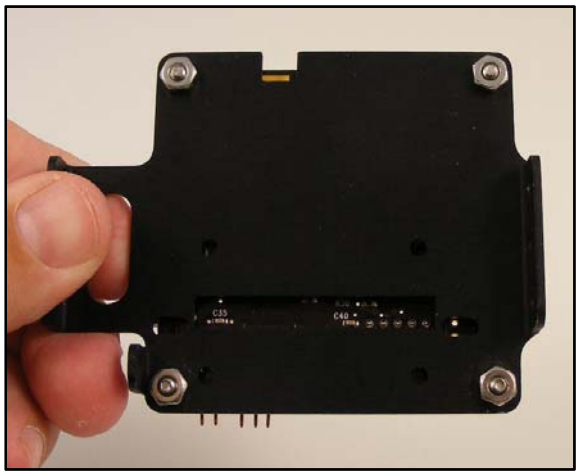

Figure 11

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

6.) Remove a servo from the packaging, and insert four of the included rubber grommet mounts as shown in Figure 12.

Figure 12

7.) Attach servo to rear plate mounts using four 4-40 x ½ Pan Head screws and 4-40 nuts as shown in Figure 13, 14, and 15.

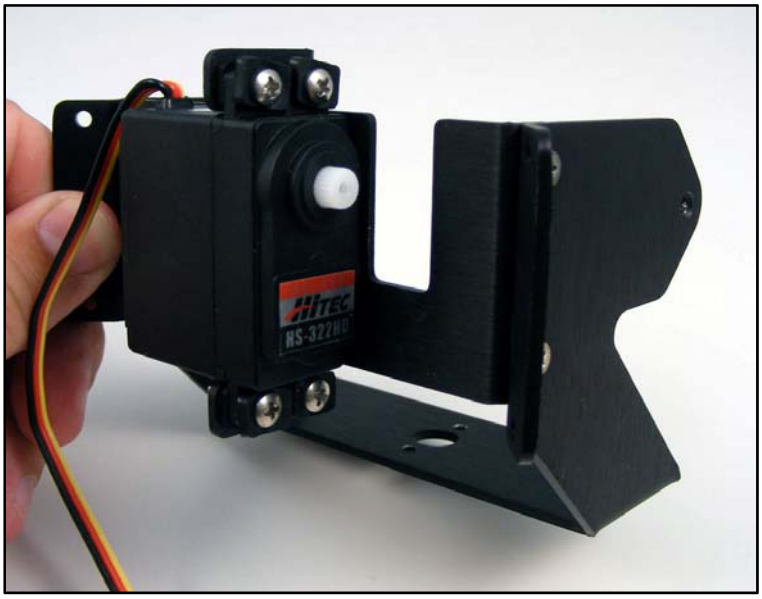

Figure 13

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

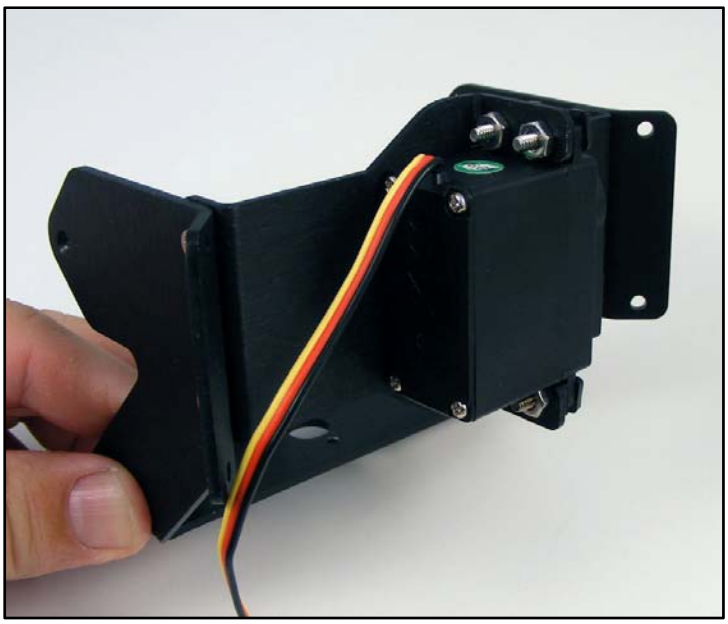

Figure 14

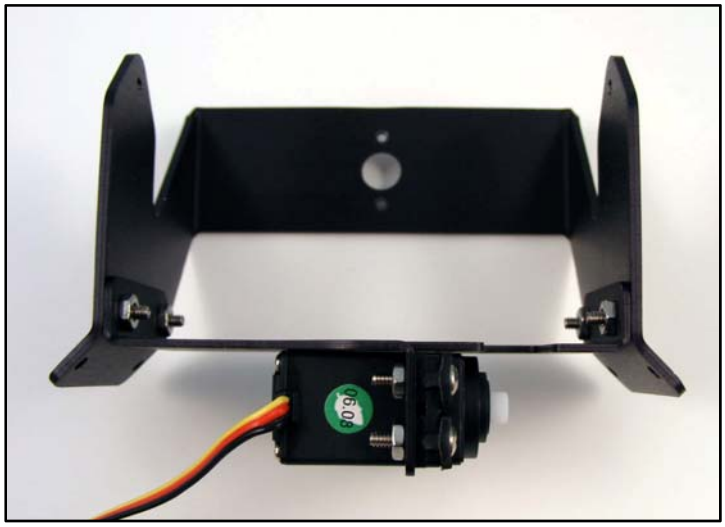

Figure 15

Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

8.) If you're planning on using the Devantech SRF02, or Maxbotix MaxSonar-EZ1 sonars with the turret, it's time to mount them to the Sensor Shell.

First of all, cut six 1/16" tubing spacers to be used to space the sensor boards away from the Sensor Shell.

Then bolt each sensor in using two 4-40 x 3/8" Flat Head screws and 4-40 nuts. PLEASE NOTE: Two sets of holes match the SRF02 sensors, and the other set matches the MaxSonar-EZ1s, so you may have to rotate your sensor to get the holes to match. **PLEASE NOTE: DO NOT OVERTIGHTEN THE SCREWS; OTHERWISE DAMAGE MAY OCCUR TO THE SENSORS!!!**

Figure 16 – MaxSonar-EZ1 mounting

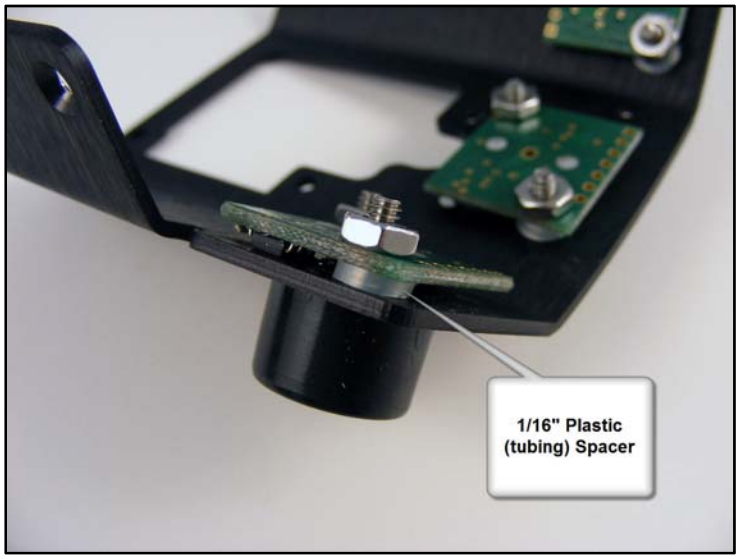

Figure 17 – Plastic Tubing Spacers

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

9.) If you're planning on using a Sharp Infrared Sensor on the Sensor Shell, it's time to bolt it in. Start by attaching four of the ¼" Aluminum Standoffs (2 per side) to the Sharp IR Sensor using two 4-40 nuts as shown in Figure 18.

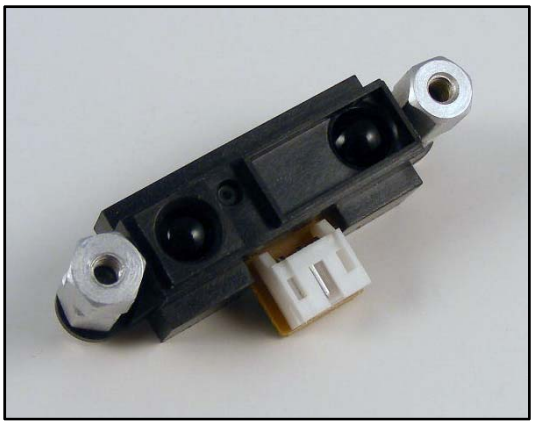

Figure 18

10.) Now, attach the IR sensor to the Sensor Shell using two 4-40 x ¼" Pan Head screws as shown in Figure 19.

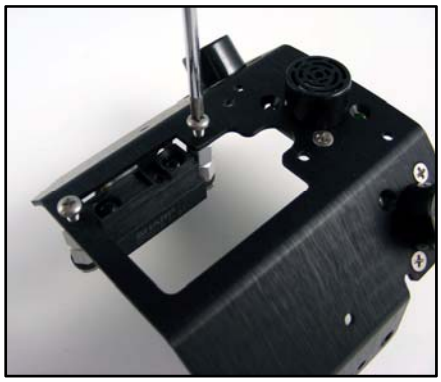

Figure 19

Figure 20 – Attached Sharp IR Sensor

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

11.) Now, insert your Sharp IR cable into the sensor as shown in Figure 21.

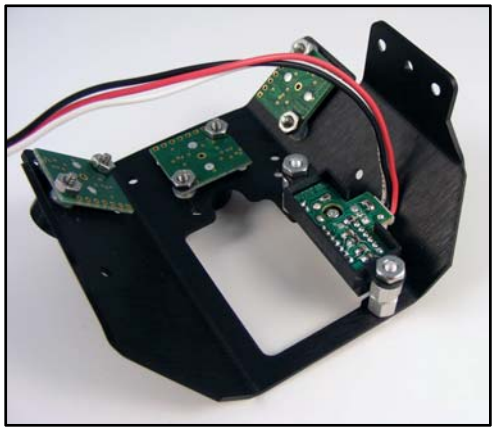

Figure 21

12.) If you're planning on using a Devantech TPA81 Thermopile sensor, now is the time to mount it. You will need a spacer around ½" in length (two 4-40 x ¼" Aluminum Standoffs work well), and appropriate hardware (not included in kit) to space it behind the SRF02 or MaxSonar-EZ1 sensors (if attached).

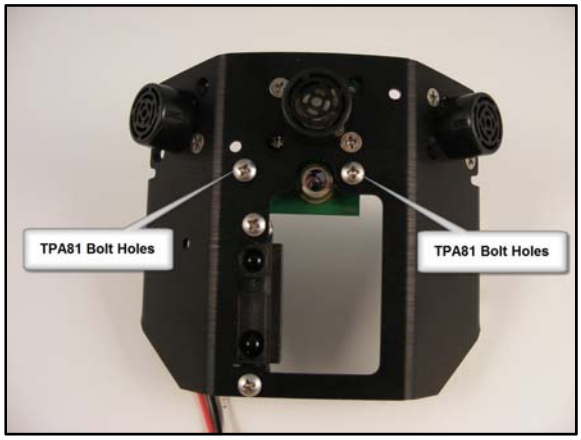

Figure 22

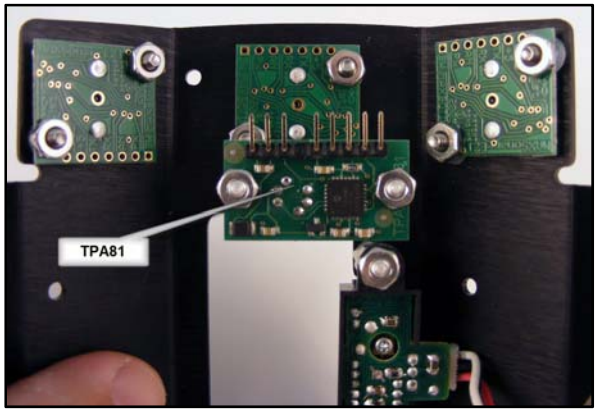

Figure 23

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

13.) Now it's time to attach the Cam Plate to the Sensor Shell using four 4-40 x 3/8" Flat Head screw and 4-40 nuts as shown in Figure 24 (CMUcam2/3) and 25 (CMUcam2+). You'll want to route the front Sharp infrared sensor cable thru the oblong hole in the Cam Plate while attaching the two pieces.

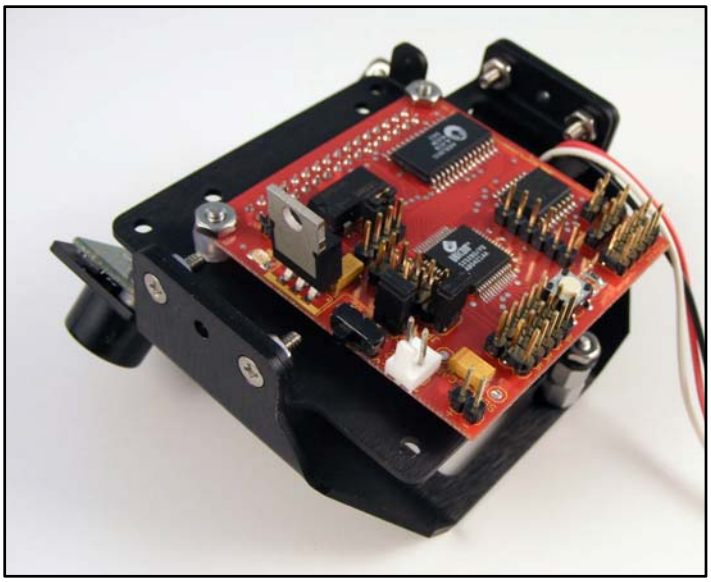

Figure 24 – CMUcam2 or CMUcam3

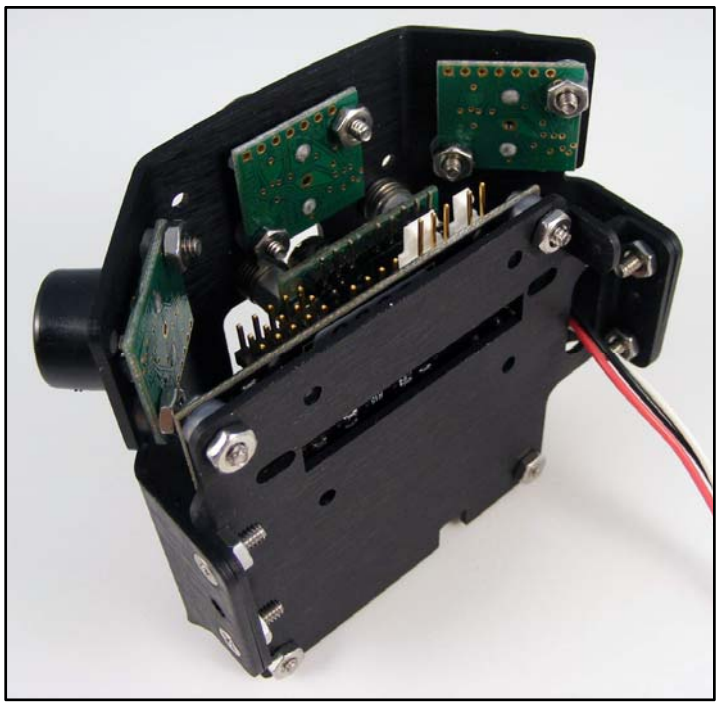

Figure 25 – CMUcam2+

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

Figure 26 – CMUcam2 or CMUcam3 front view

Figure 27 – CMUcam2+ front view

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

14.) Attach a round servo horn, from one of the included servos, to the bottom of the turret pivot using two #2 x 5/16” screws as shown in Figure 5 and 6 below.

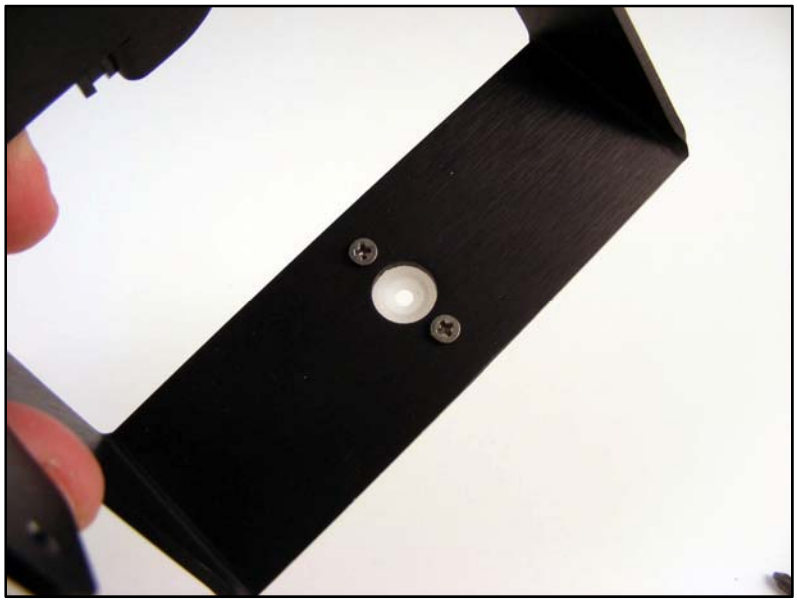

Figure 28

Figure 29

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

15.) Place two 4-40 x ½" Flat Head screws in the Pivot holes as shown in Figure 30 below, and then place two #4 washers on the ends (each side). The washers will serve as spacers and help reduce pivoting friction between the Sensor Shell and the Turret Pivot.

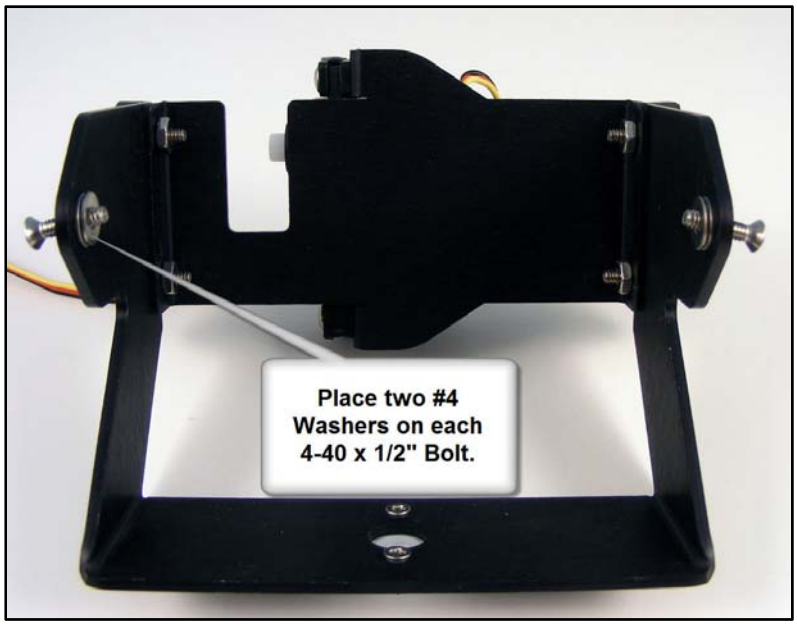

Figure 30

16.) Now attach the Sensor Shell to the Turret Pivot as showin in Figure 31 below using the two 4-40 x ½" bolts you just inserted into the Pivot above, and two 4-40 Nylock nuts, with the #4 washers sandwiched between the Sensor Shell and the Pivot. **Make sure you tighten down the locknuts all the way, then back off a little to ensure easy and smooth tilting operation.**

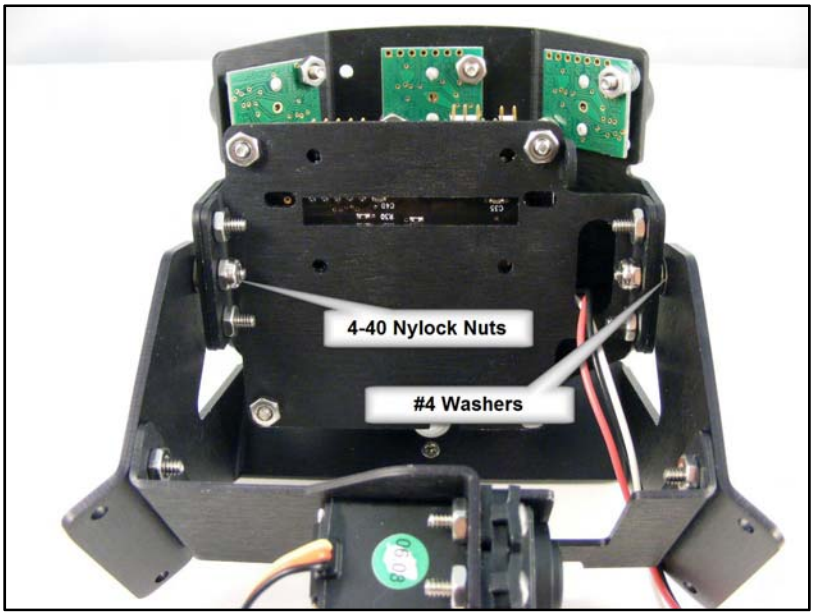

Figure 31

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

17.) Assemble the pivot linkage by screwing in the threaded rod into each pivot clevis as shown in Figure 32, and adjusting it's length to about 2.5" (or about 64mm).

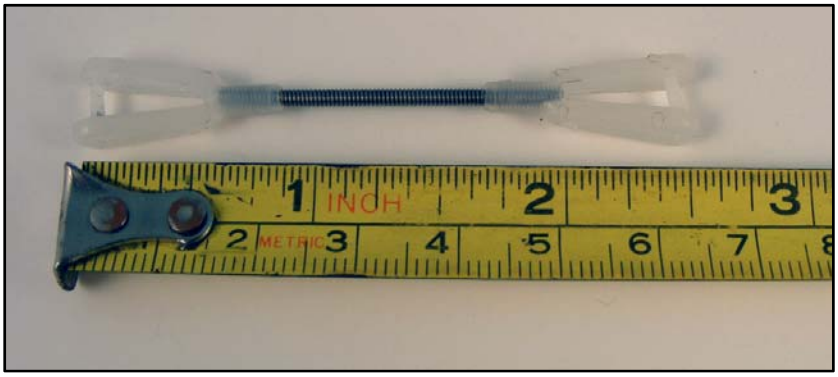

Figure 32

18.) Attach one end of the linkage to the Cam Plate as shown in Figure 33.

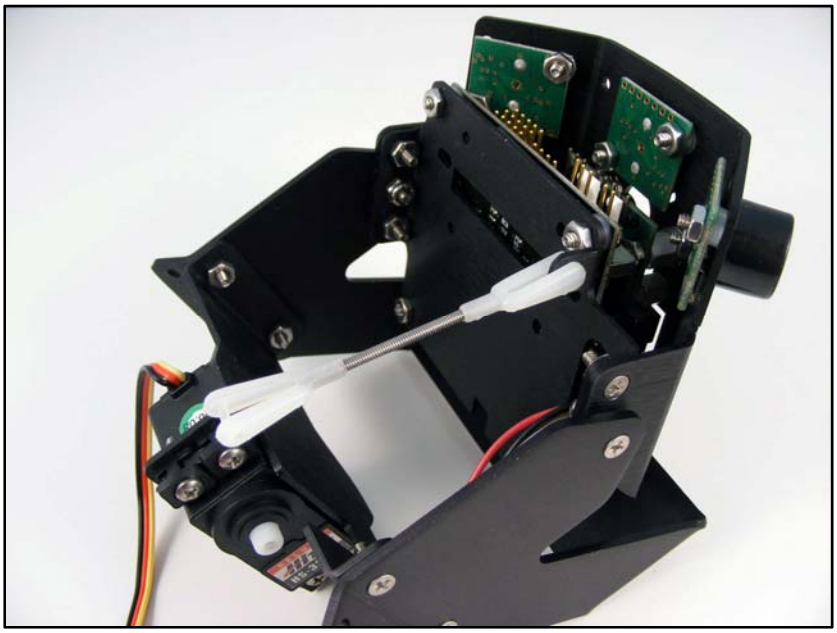

Figure 33

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

19.) Attach an adjustable servo arm to the pivot servo (found in parts bag that came with servo), and attach the other end of the pivot linkage to the outermost hole in the arm as shown in Figure 34 and 35.

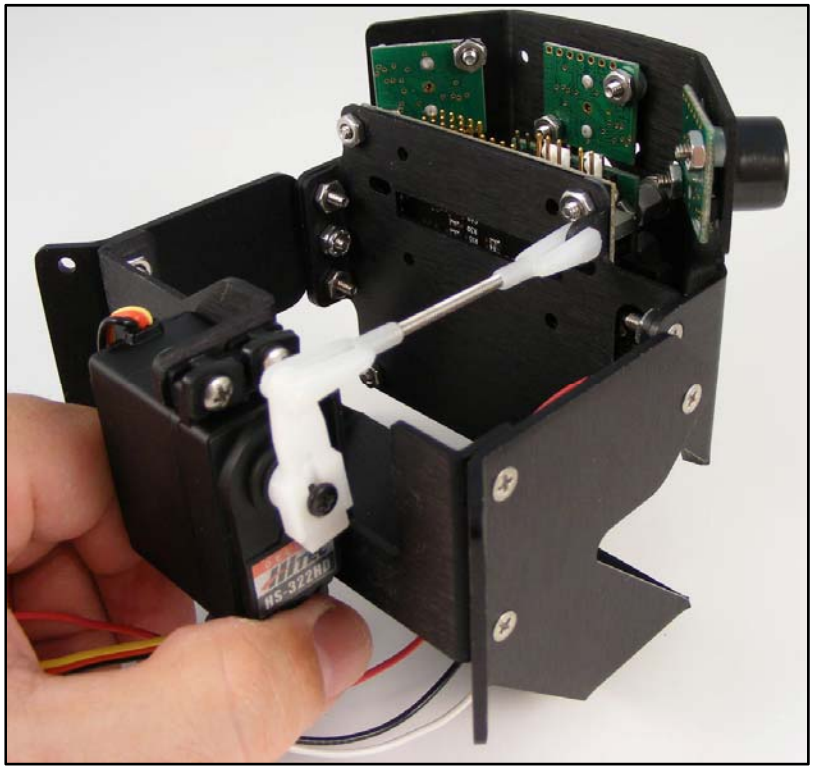

Figure 34

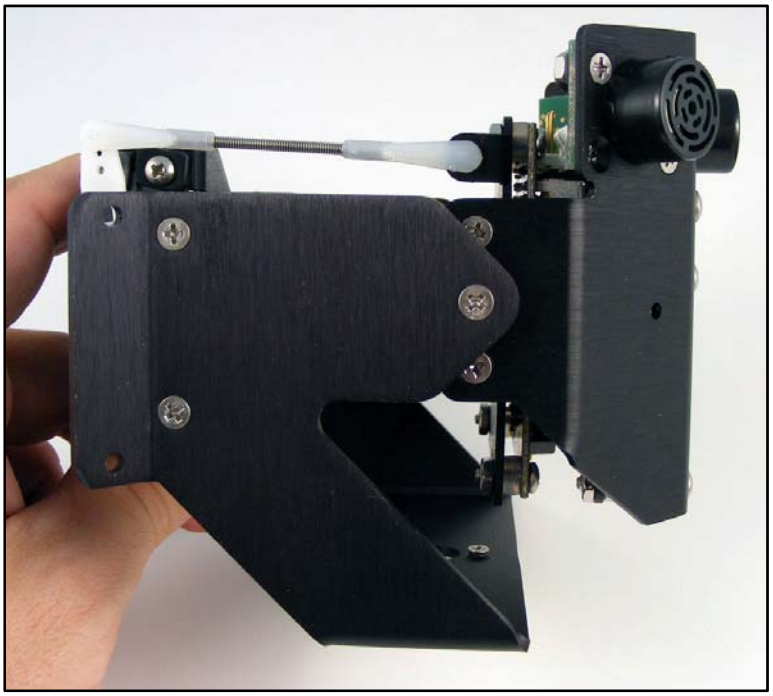

Figure 35

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

20.) Attach additional Sharp Infrared Sensors to the left and right tabs on the turret pivot as shown in Figure 36 and 37 using two 4-40 x 3/8" Pan Head screws and 4-40 nuts (per sensor).

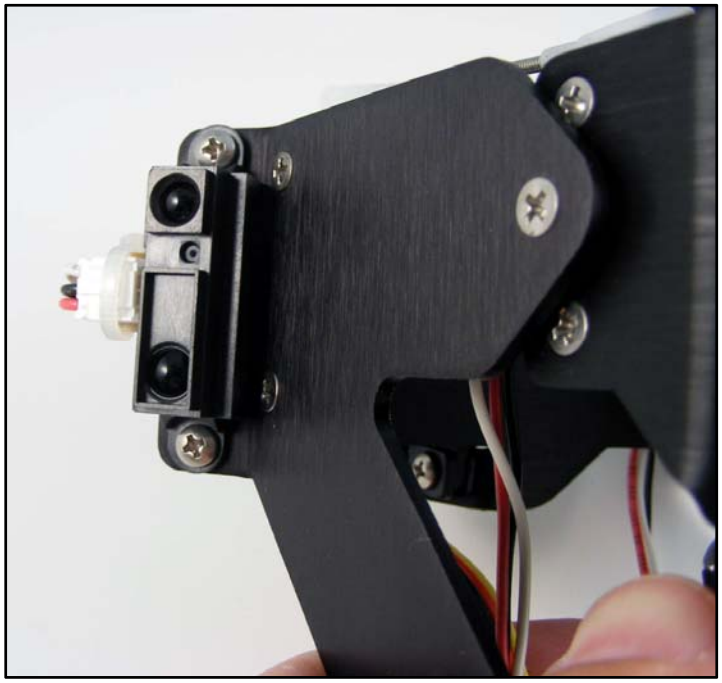

Figure 36

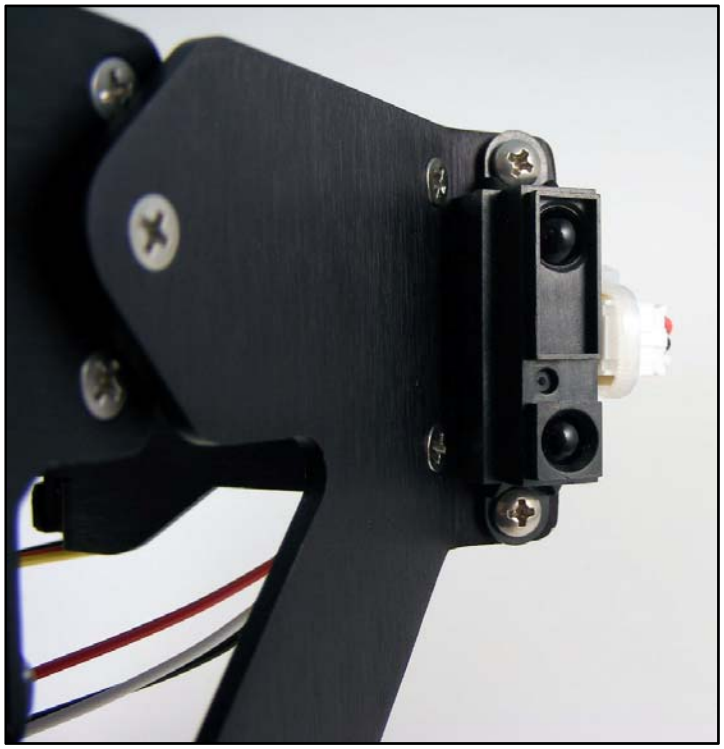

Figure 37

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

21.) Now attach the Sharp IR sensor cables to each sensor, as well as any Sonar cables, and bundle them together using zip-ties (not included) as shown below to keep the cables tidy.

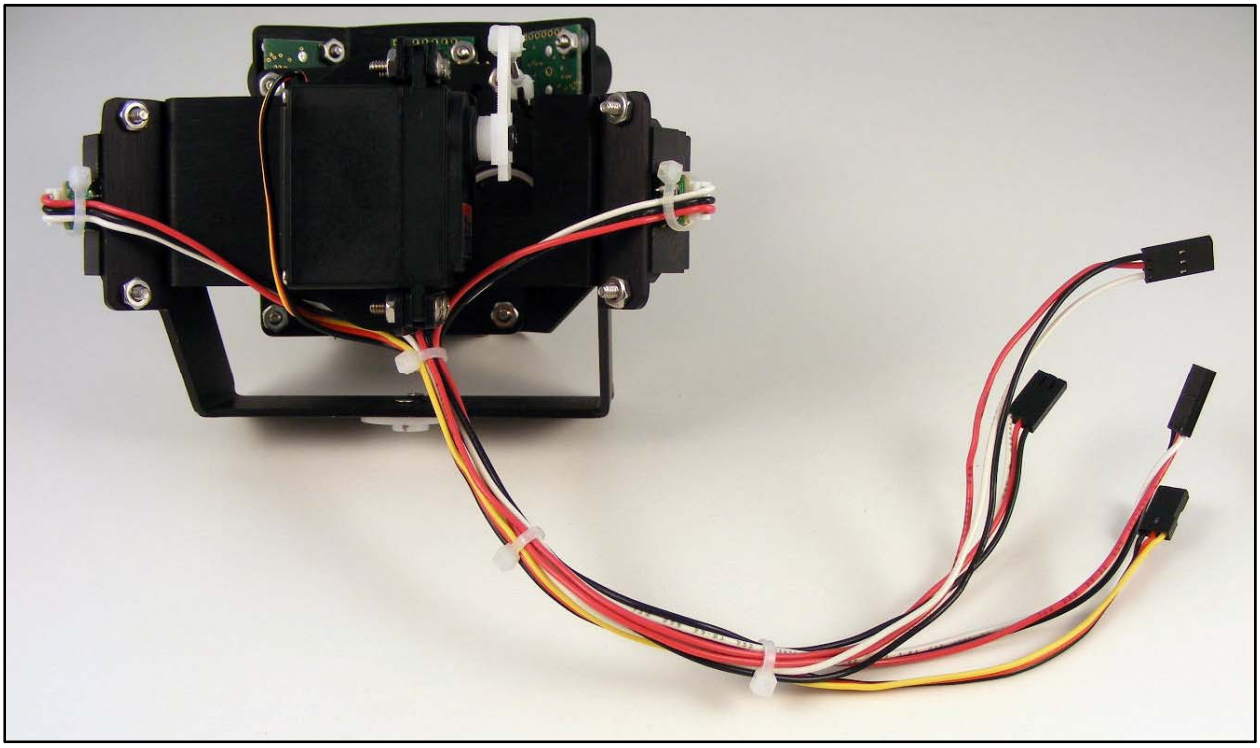

Figure 38

22.) Attach the turret to the pivot servo to finalize assembly.

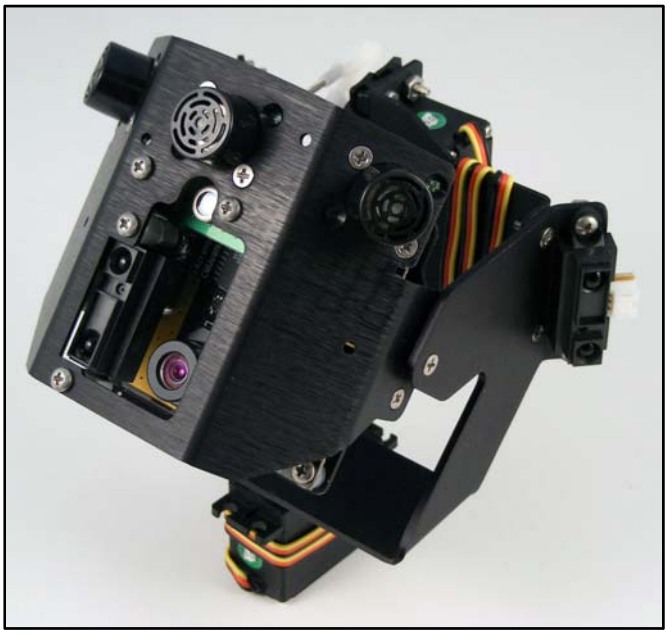

Figure 39

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)

23.) Ensure the tilt range of the turret matches the images below.

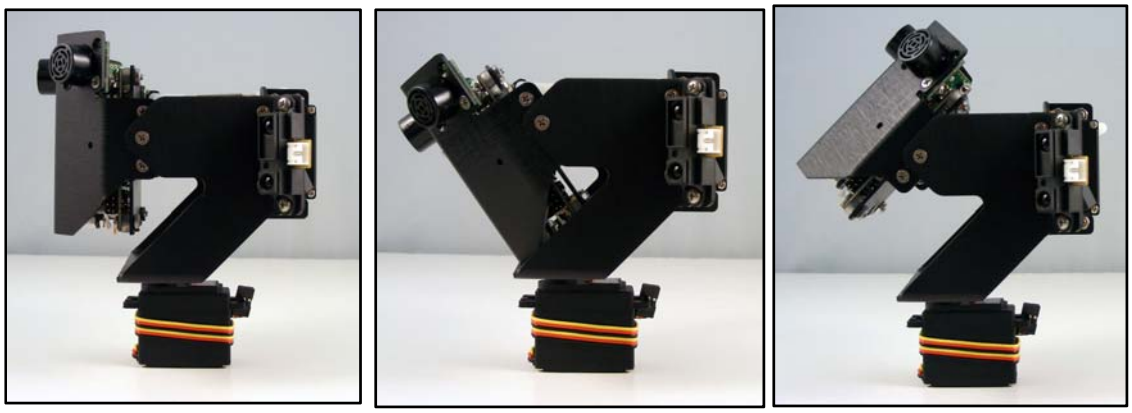

Figure 40 – Turret Tilt Range

24.) Congratulations!!! You're finished.

 Copyright 2004-2007 Summerour Robotics Corporation (www.roboticsconnection.com)