

# Hubble GOTO Installation Instruction(1.3, 04/15/2020)

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## 1. Preparation

Before starting your installation, please make sure that you have all the required tools and all the parts in the Parts List.

This manual only covers the mechanical installation of the GOTO system. For the software installation, wiring and configuration of SiTech controller, please refer to **SiTech Quick Start Guide for Hubble Optics ULs**.

### 1.1 Tools required

- Philips screw drivers
- Tape measure
- Crescent wrench
- Hex key set

### 1.2 ALT GOTO Drive Parts List

1. ALT Geared Motor with mounting plate
2. ALT bearing extension and ALT quick release clamp
3. ALT bearing extension M6 mounting screw
4. 2m long 1mm thick SS strand cable and lock accessory
5. ALT 12mm tension springs (1, the strongest one)
6. 2 Slotted Teflon pads
7. 2 M5 ALT Motor assembly mounting screw
8. 1 M4x15 cable anchor screw
9. ALT encoder and RJ11 connector
10. ALT encoder holding bracket
11. ALT encoder holding bracket mounting knob screws (2)
12. ALT encoder pivoting screw (M6 screw with plastic tube)

### 1.3 AZ GOTO Drive Parts List

13. AZM Geared Motor with mounting plate
14. AZM M6 mounting screw and spacers
15. AZM tension spring (2, the two weaker ones)
16. 14"-20" AZM encoder mounting arms and hub assembly

- 17. 14"-20" AZM encoder assembly
- 18. AZM tension adjusting eye bolt assembly
- 19. AZM encoder pivoting screw (M6 screw with plastic tube)
- 20. 3 M6 Mounting Screw and nuts
- 21. Quick Release Clamp

#### **1.4 Controller**

- 22. SiTech Controller
- 23. SiTech Hadpad
- 25. SiTech Cables:
  - a. Motor Encoder Y cable,
  - b. Scope Encoder Y cable
  - c. Handpad cable
  - d. Controller power cable (and connectors, not connected)
  - e. Serial Cable
- 26. 12-24V converter
- 27. 12V battery holder



1: ALT Geared Motor with mounting plate



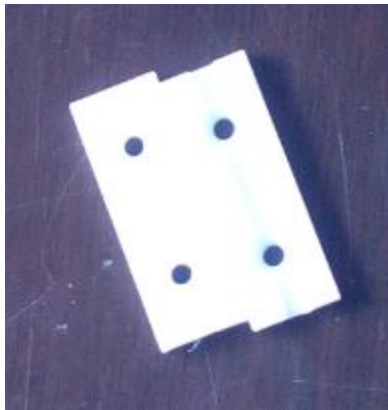
2, 3 : ALT bearing extension and ALT quick release clamp



4: 2m long 1mm thick SS strand cable and lock accessory



5: ALT 12mm tension springs (the strongest one)



6: Two (2) Slotted Teflon pads



7: Two(2) M5 ALT Motor assembly mounting screw



8: One (1) M4x15 cable anchor screw



9: ALT encoder and RJ11 connector



10: ALT encoder holding bracket



12,19: ALT, AZM encoder pivoting screw (M6 screw with plastic tube)



13: AZM Geared Motor with mounting plate



14: AZM M6 mounting screw and spacers



15: AZM tension spring (2, the two weaker ones)



16: UL14/UL16 (short one), UL18/UL20 (long one)  
AZM encoder mounting arms and hub assembly





17: AZM encoder assembly



18: AZM tension adjusting eye bolt assembly



20: Three (3) M6 Mounting Screw and nuts



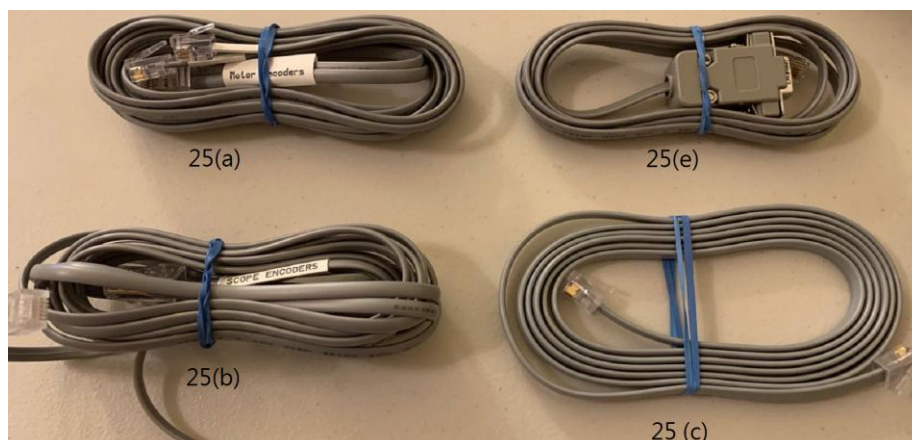
21: Quick Release Clamp



22: Sitech controller



23: Sitech Handpad





25(d): Sitech controller power cables



26: 12-24V converter

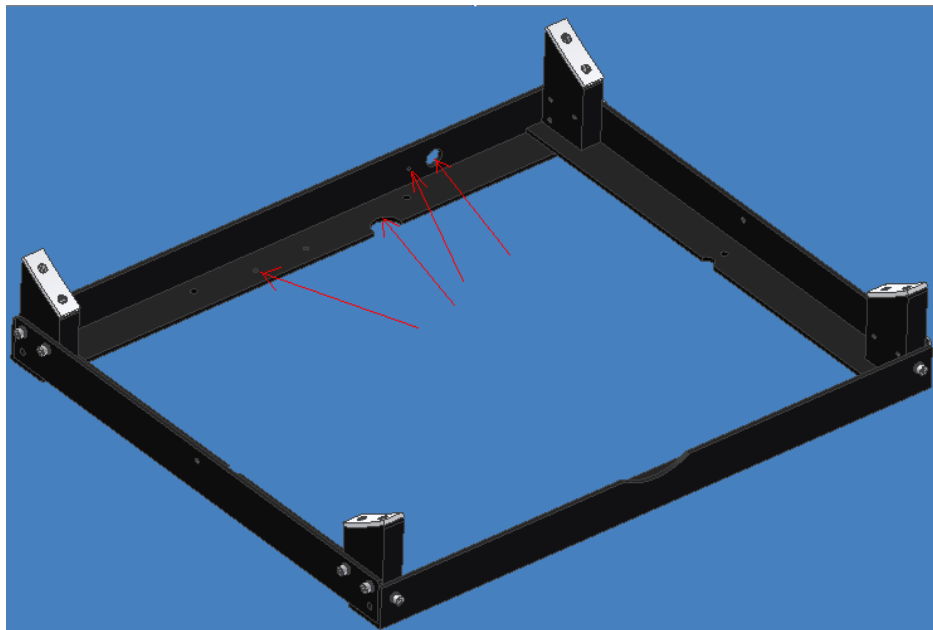


27: Battery Holder (optional)

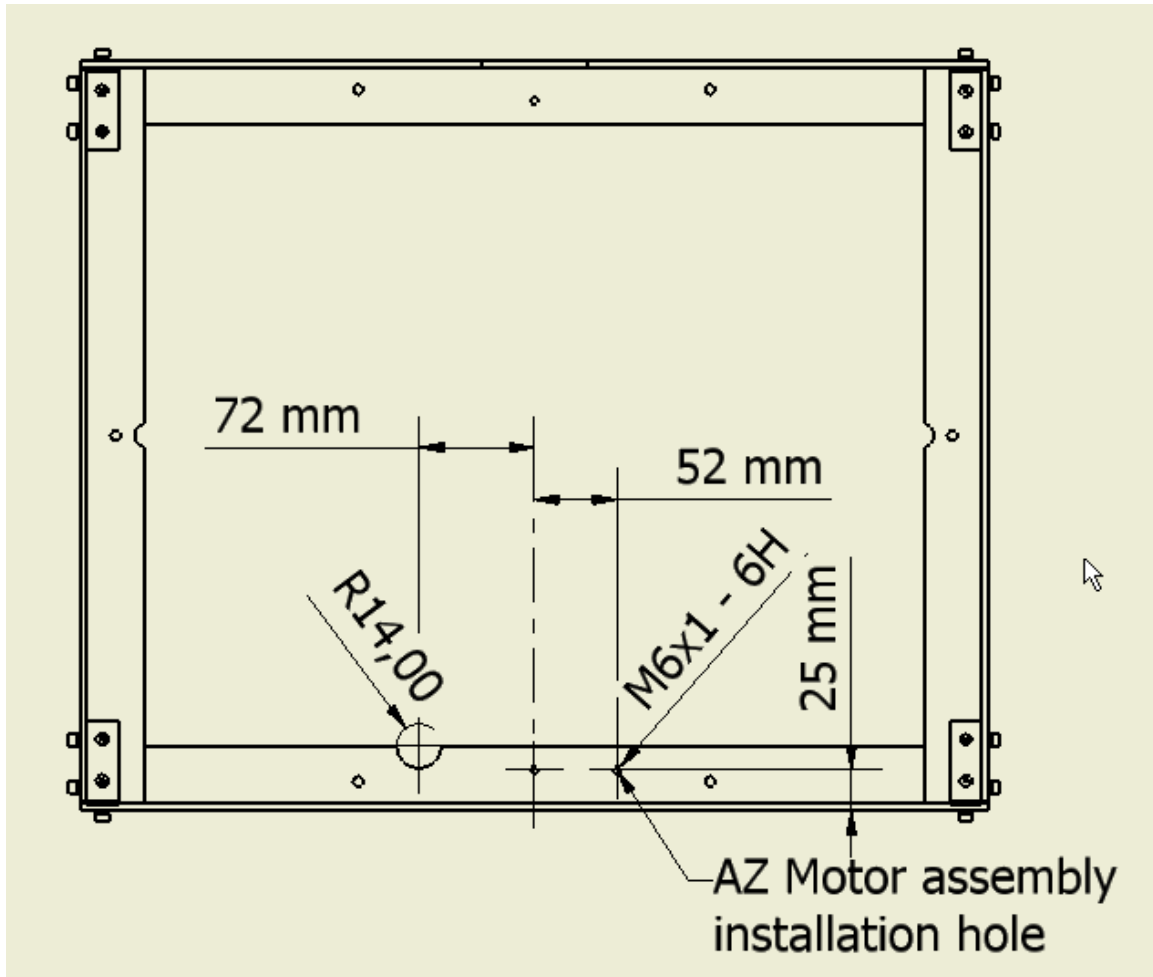
There are total of 3 tension springs. The strongest one is for the ALT axis, while the two weaker ones are for the AZ bearing axis.

## 2. The Azimuth motor drive installation

1. Remove the secondary cage and all truss tubes from the OTA. Then carefully remove the mirror from the mirror box and place the mirror in a safe place.
2. Lift the mirror box off the rocker and rest it on the side. Please do not rest the mirror box on the ALT bearing surface; you may damage the laminate surface.
3. **This step is only needed for the system without the GOTO ready option.** You need to drill 3 holes, a 4mm and a 16.5mm through holes and a M6 threaded hole, as shown in the following drawings. For the 16.5mm hole, please drill a small 4mm diameter pilot hole first; then enlarge it with the 10mm pit and finally use a round steel file to further enlarge it to the required 16.5mm diameter. For the 25mm diameter half circle at the bottom of the rocker frame, it will be much easier to use a metal saw to cut a triangle open first, and then use a steel file to round it to the required half circle. **To avoid causing any damage to the AZ bearing, you must remove the AZ bearing from the Rocker before doing the drilling!**



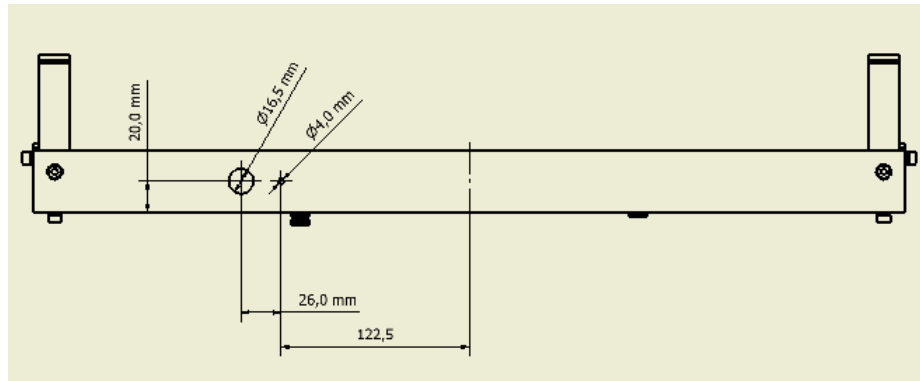
**Figure 1: Drilling positions**



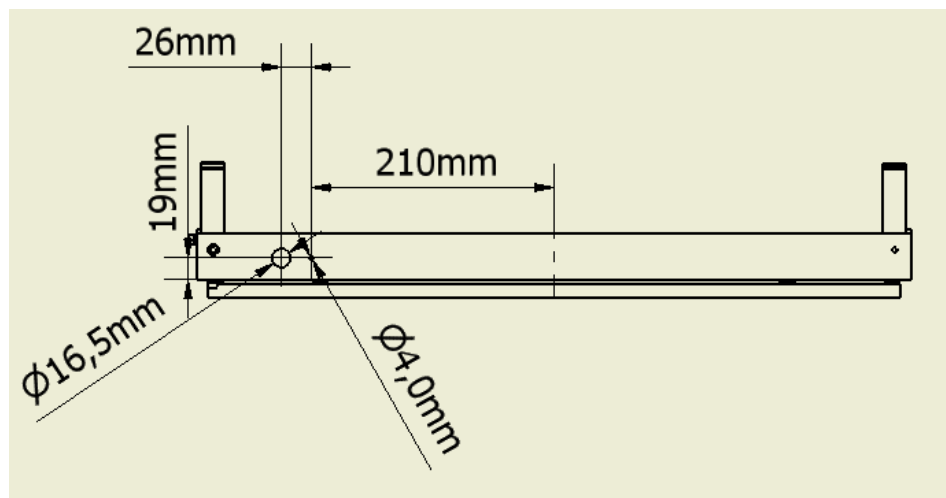
**Figure 2: UL14 and UL16 drilling positions**

Please note the center of the half circle is 72 mm from the centerline for UL14 and UL16, and 160mm for UL18 and UL20.

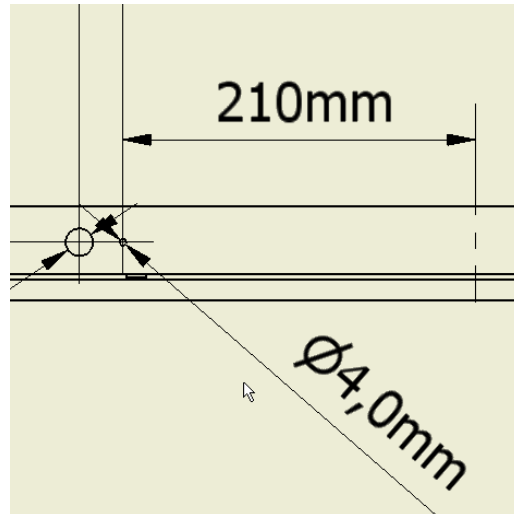




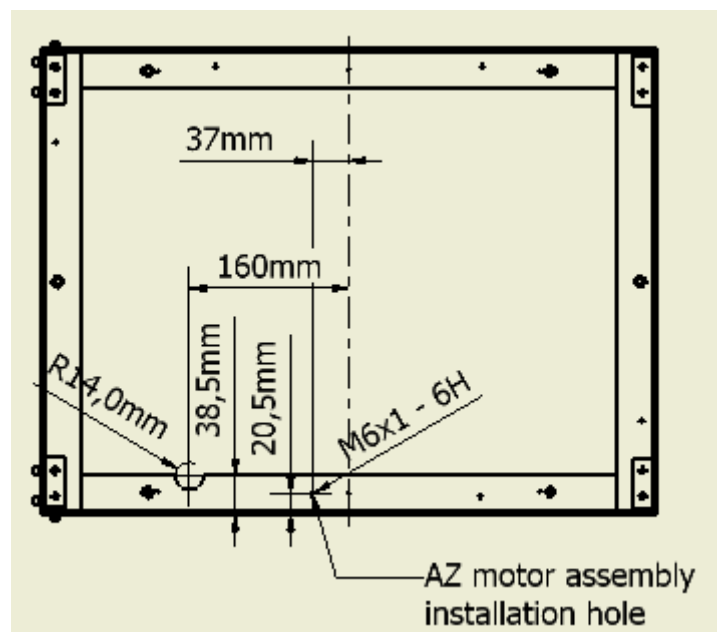
**Figure 3: UL14 and UL16 drilling positions**



**Figure 4: UL18 and UL20 drilling positions**



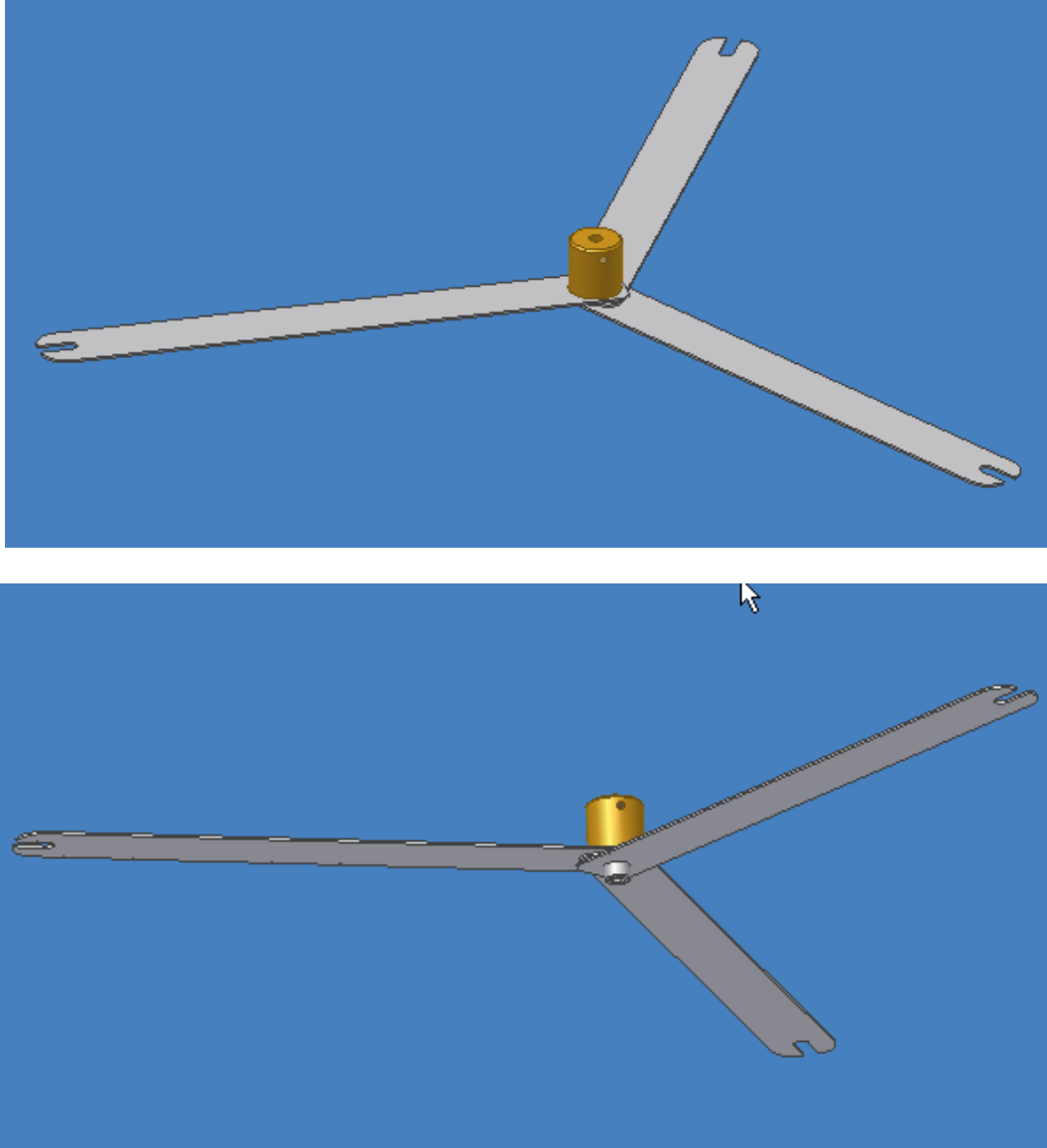
**Figure 5: UL18 and UL20 drilling positions**



**Figure 6: UL18 and UL20 drilling positions**

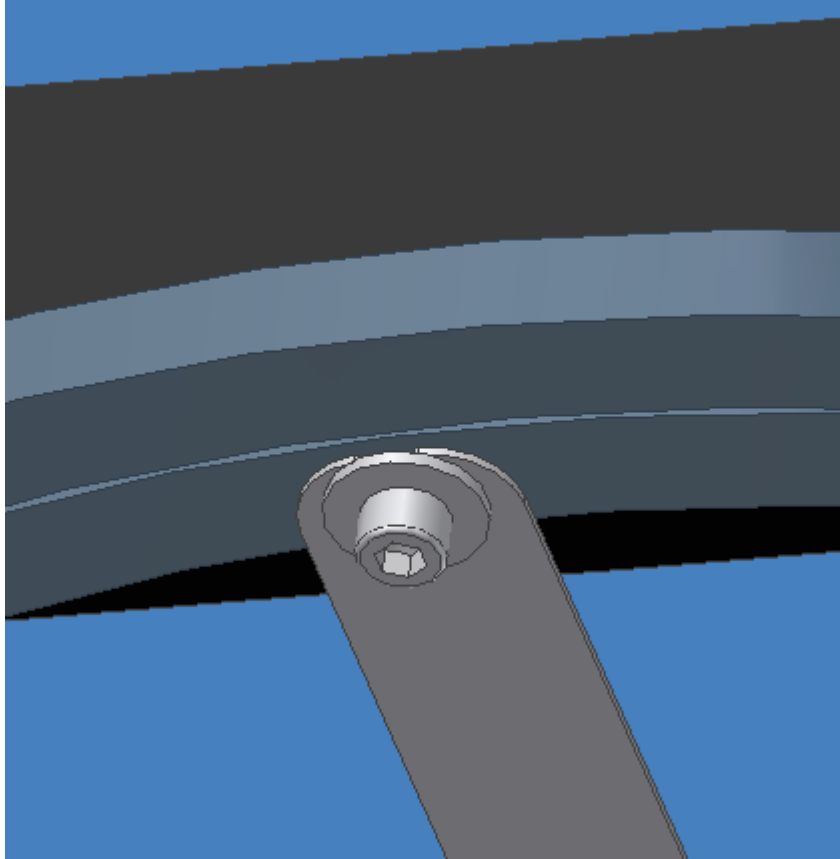
4. Install the 1" diameter brass AZ encoder housing into the center holes of the three stainless steel Azimuth spoke arms as shown below using a M6 x10 hex screw. Do not tighten them too tightly yet.





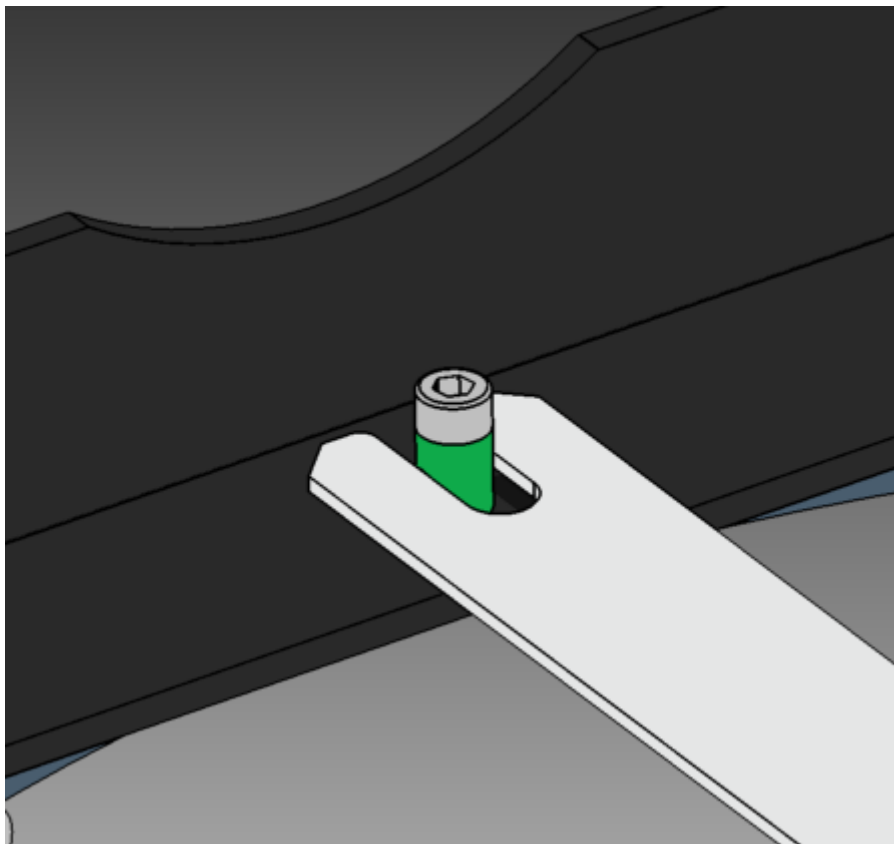
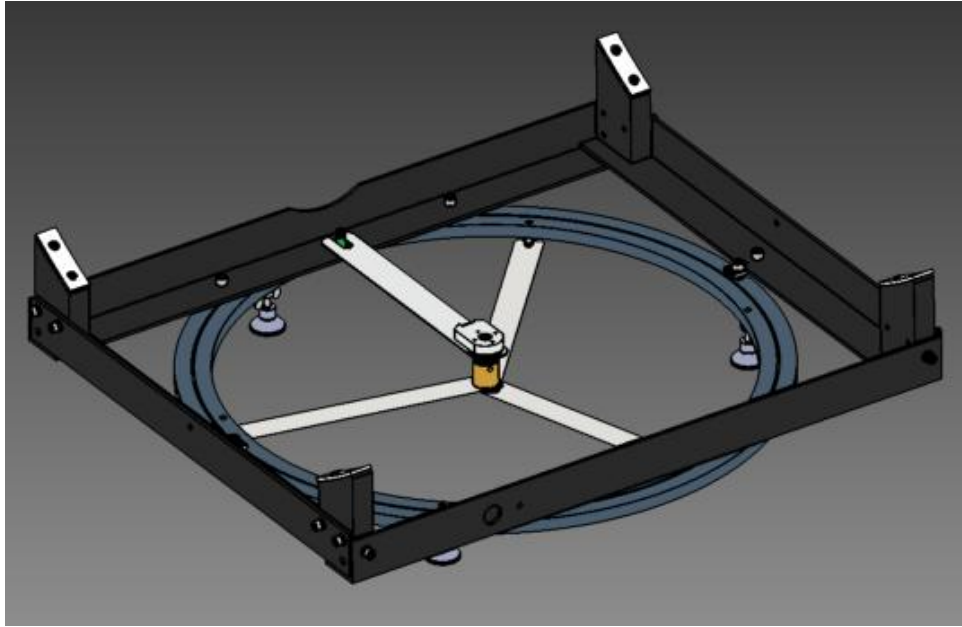
**Figure 7: AZ Spoke Arms**

5. Install the three stainless steel Azimuth spoke arms to the inner AZ bearing ring with three M6 screws (You may have to drill and tap three roughly evenly spaced M6 holes on the inner AZ bearing ring if they are not pre-drilled and tapped). Please make sure the encoder housing is precisely placed at the AZ bearing center by making sure the scale readings on all three AZ spoke arms are exactly the same at the edge of the AZ inner bearing. Tighten three M6 screws and the center screw to lock the encoder housing to the AZ arms tightly. **You can install the AZ spoke arms in the same three holes used by the three footers, and use the same wing nuts to lock the spoke arms.**



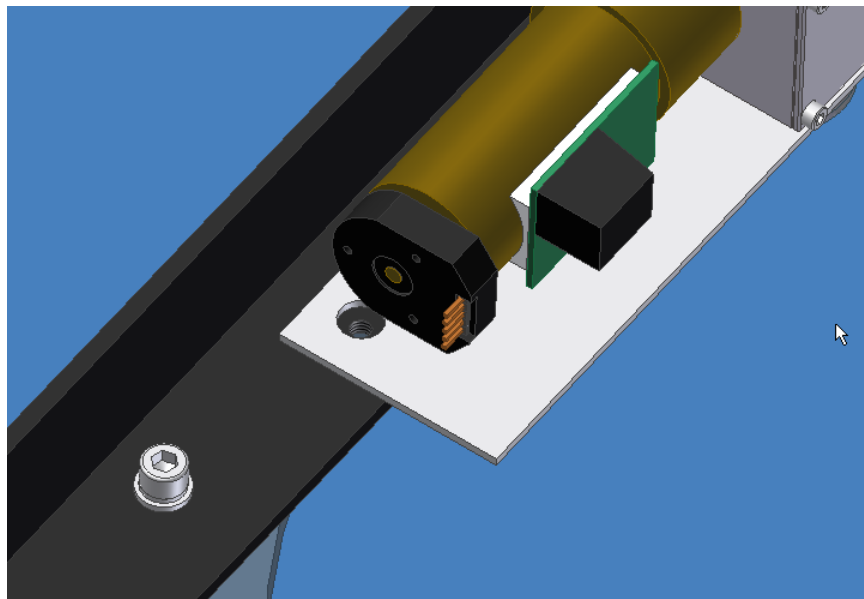
**Figure 8: AZ Spoke Arm Installation**

6. Install the AZ encoder arm assembly by carefully inserting the encoder shaft into the center hole of the brass encoder housing. Adjust the depth so the threaded shank of the encoder does not, but just about to touch the housing; a 0.5-1.0mm gap is fine. Tighten the Nylon setscrew on side of the brass housing onto the shaft.

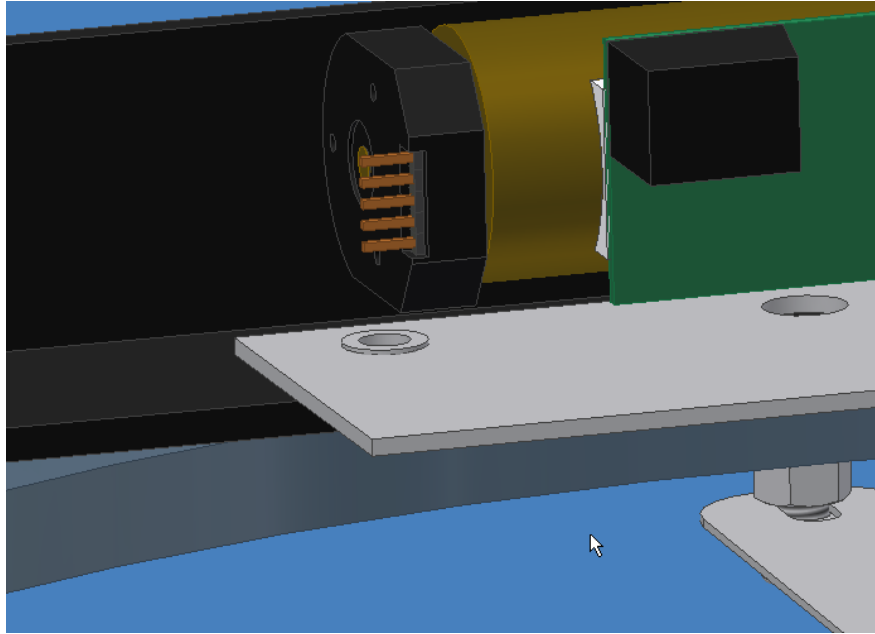


**Figure 9: AZ encoder Arm Installation**

7. Center the AZ encoder arm anchor slot with the anchor hole on the Rocker frame. Then install the provided M5 screw into the anchor hole and tighten firmly. You may want to wrap a few layer of tape around the head of anchor screw if the anchor slot is a bit larger than the screw head. Make sure the slot is snugly fit with screw head.
8. Now install the AZ motor assembly. First, center the installation hole on the AZ motor assembly plate with the installation hole on the rocker frame. Then, insert the provided 10mm diameter spacer into the AZ motor assembly installation hole.

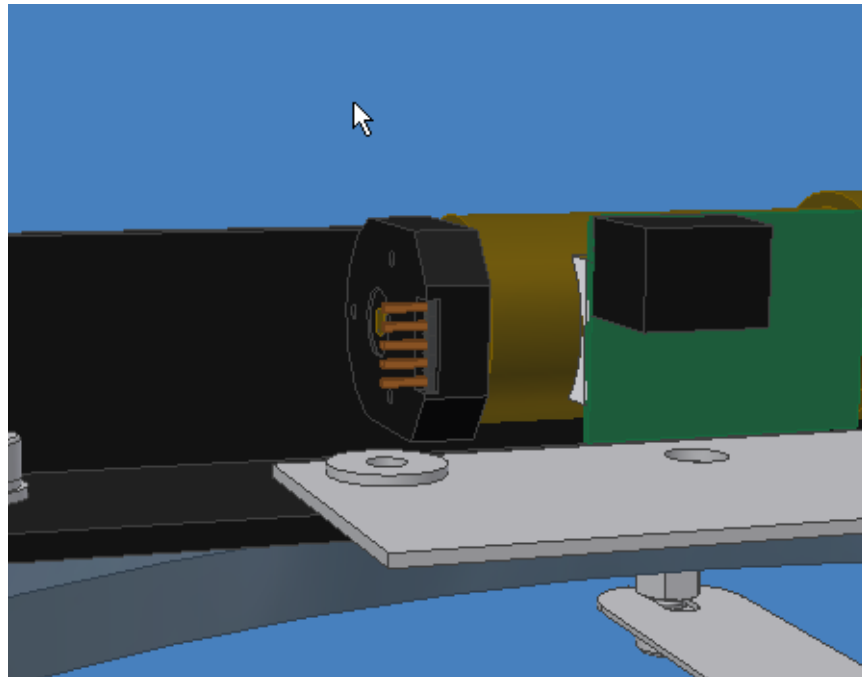


**Figure 10: Center the installation holes**



**Figure 11: Insert the provided 10mm diameter spacer**

Then place a larger spacer on top of the 10mm spacer on the AZ motor assembly plate.

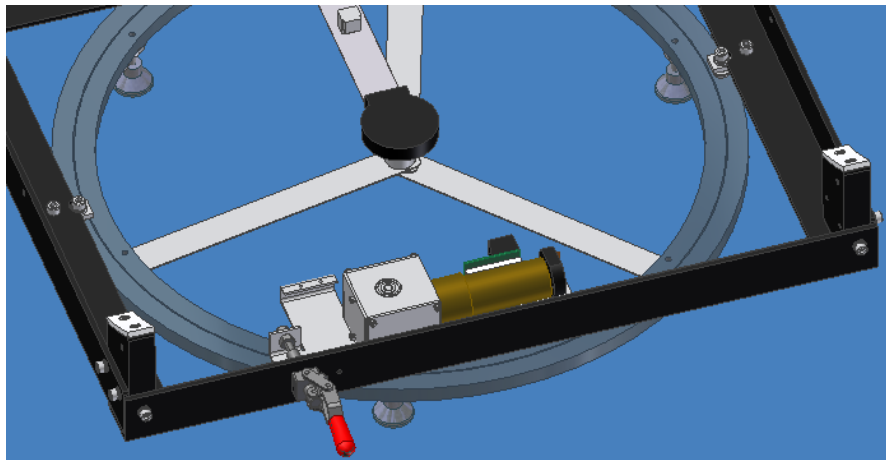


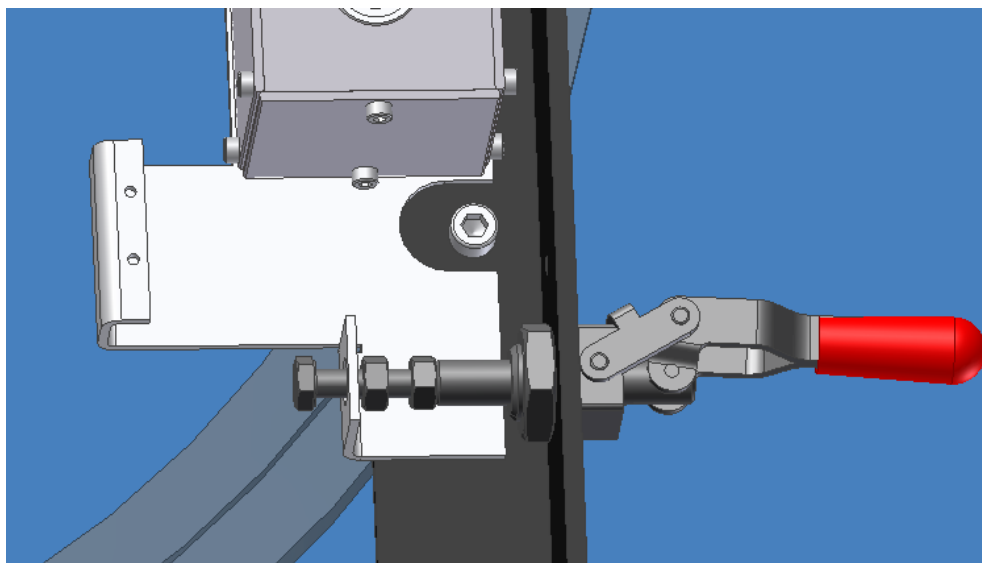
**Figure 12: Installation of the AZ motor assembly**

Finally insert a hex head screw into the installation hole, and tighten it with a wrench. **You may need to add more spacers to make sure the screw does not touch the AZ inner bearing ring.**

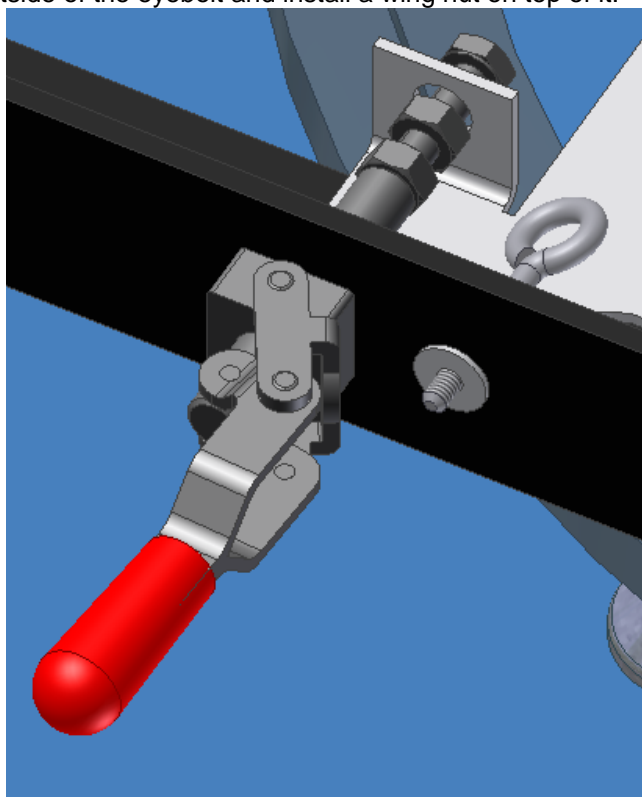


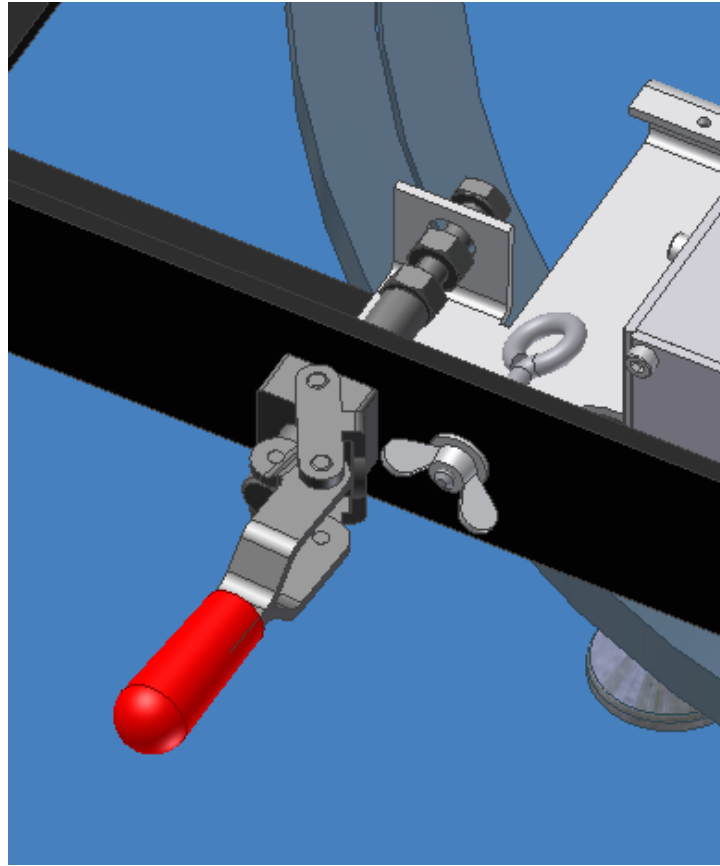
9. Install the AZ quick release clamp.



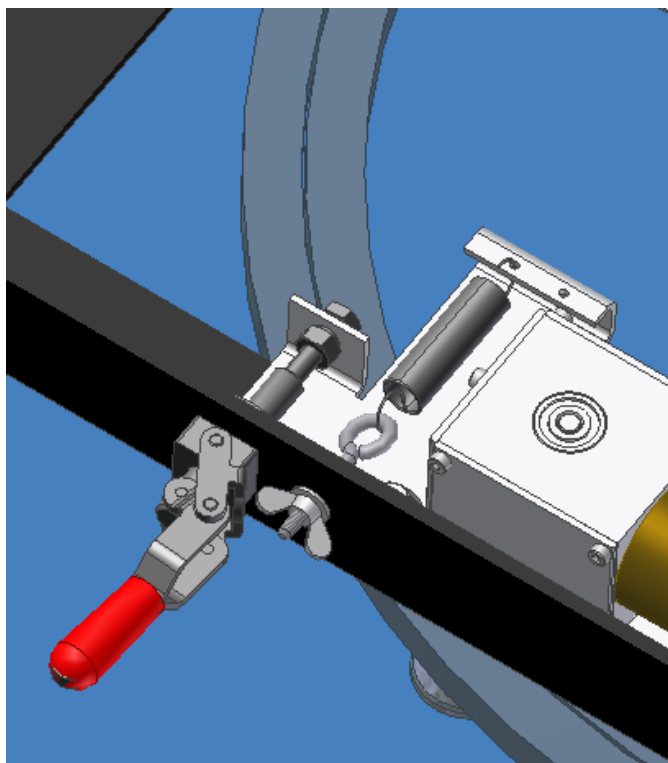


10. Insert the provided M4 eyebolt into the hole next to the AZ quick release clamp. Then add a spacer on the outside of the eyebolt and install a wing nut on top of it.







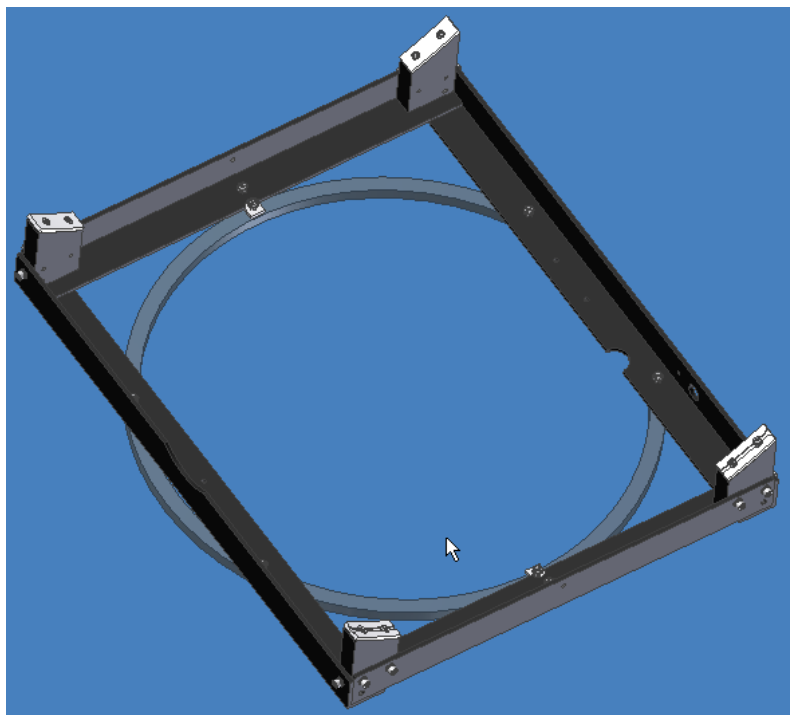
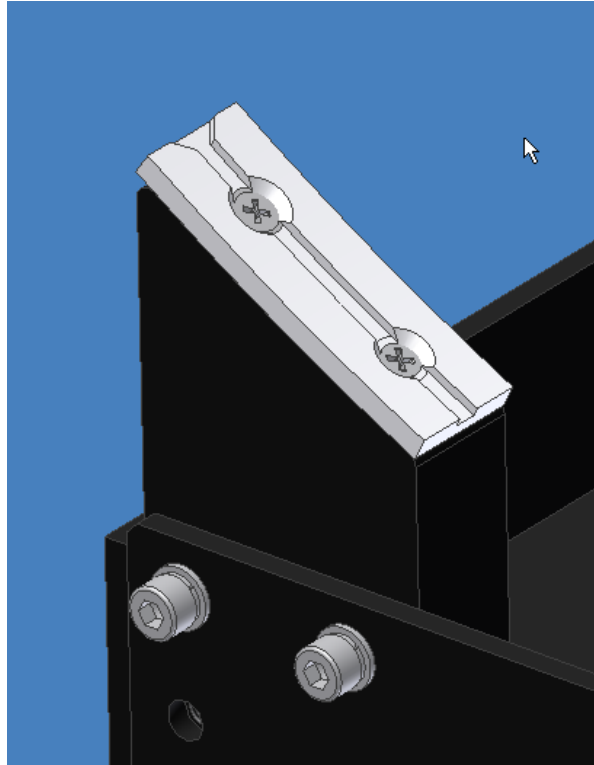


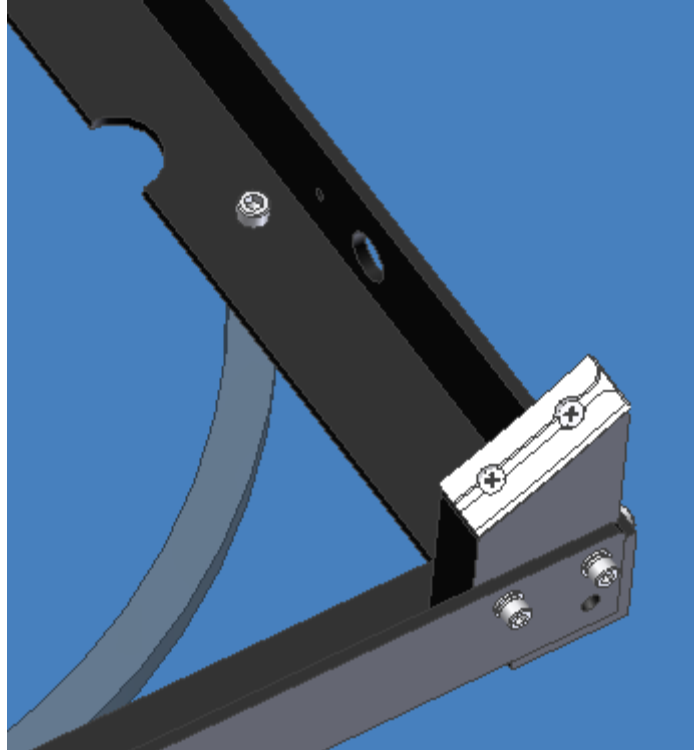
Then install the 12mm spring as shown above, and adjust the wing nut to apply the tension. **You may want to hook two springs for more tension.**

11. Install all AZ motor and encoder cables as shown in Appendix A of SiTech GOTO Quick Start Guide

### 3. The ALT motor drive installation

1. Make sure to complete the AZ motor installation first before doing the ALT motor installation
2. Replace 2 of the regular Teflon pads with 2 new grooved Teflon pads. **Make sure the top of the crosshead screws are lower than the bottom of the grooves.**





3. Remove the upper section of the ALT bearing. Drill and tap a M4 hole on the front tip of the left altitude bearing as shown below.

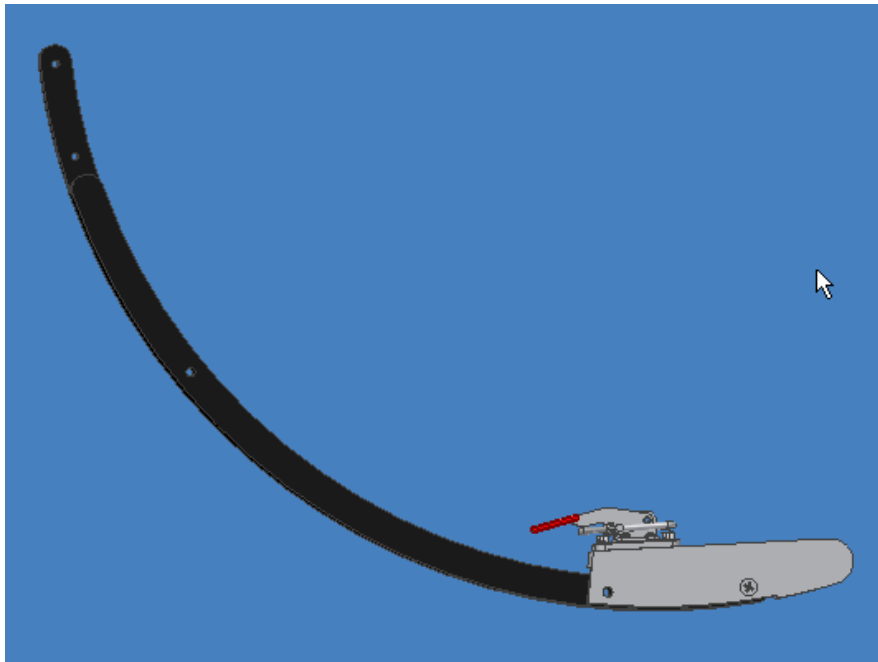




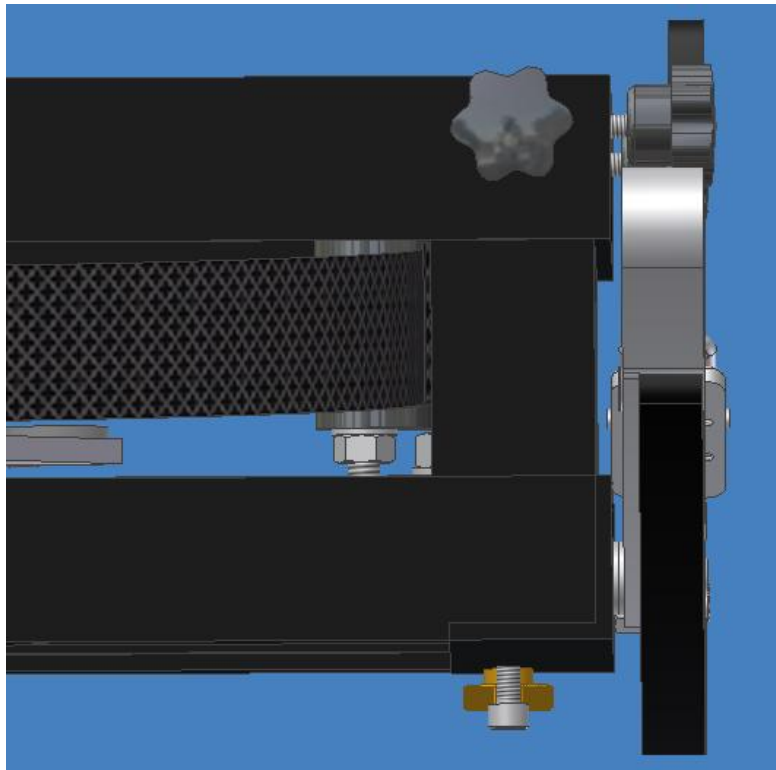
4. Place the mirror box on the side and remove the lower left ALT bearing from the mirror box



5. Install the ALT GOTO extension module to the lower left ALT bearing with one M6 cross head screw. You will need to use a socket head screw and nut if the hole on the bearing is not tapped. Center another hole with the corresponding hole on the bearing, but leave it open.



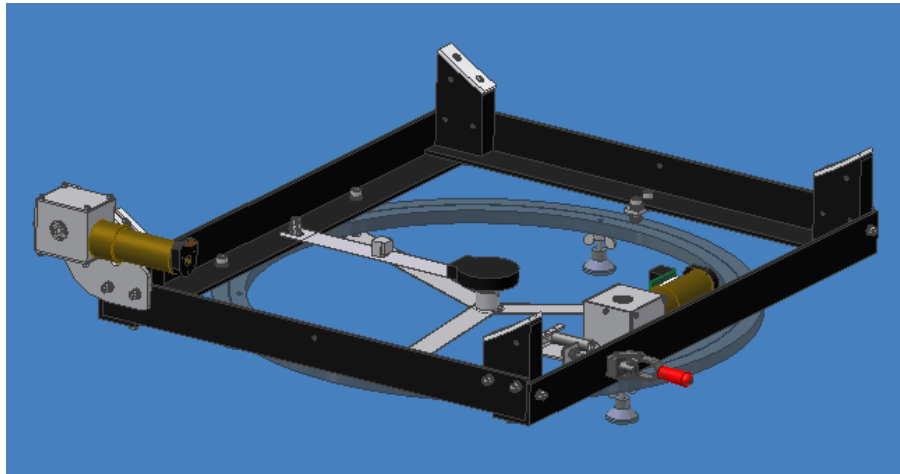
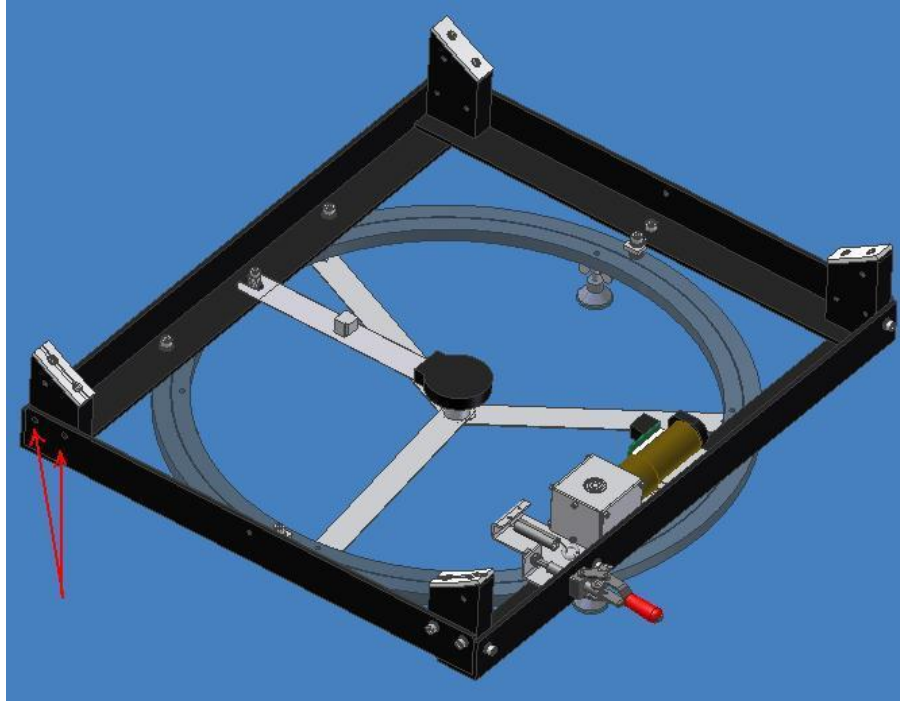
6. Re-install the ALT bearing back to the mirror box. Please note that you will need to remove or replace one of the spacer with a thinner spacer to compensate the thickness of the extension block.



7. Re-install the ALT upper bearing section back to the mirror box



8. Remove two of screws on the rocker as shown below, and install the ALT motor assembly in these two holes.

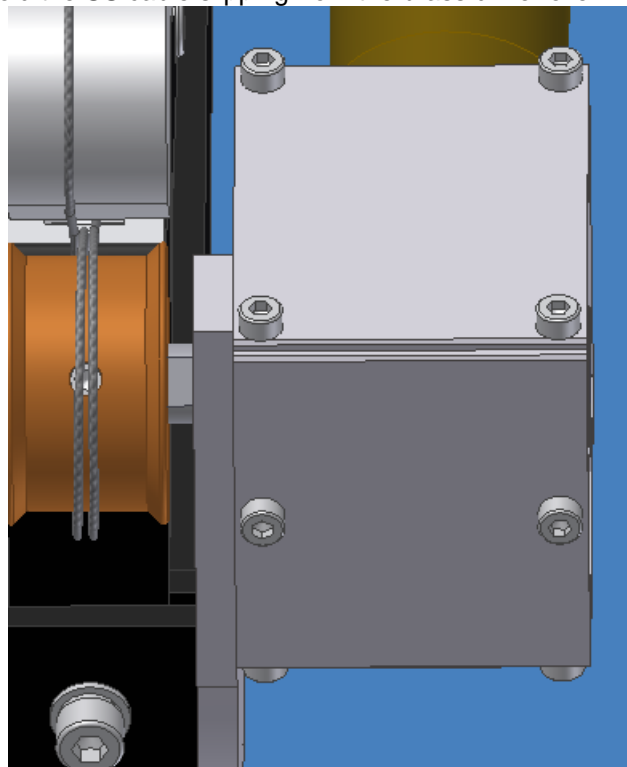


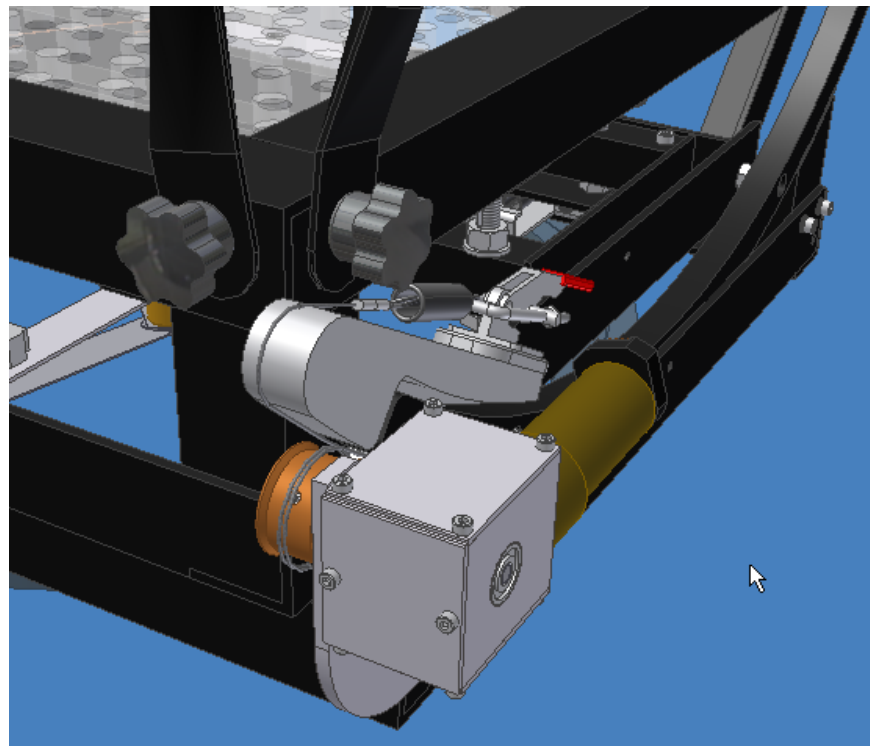
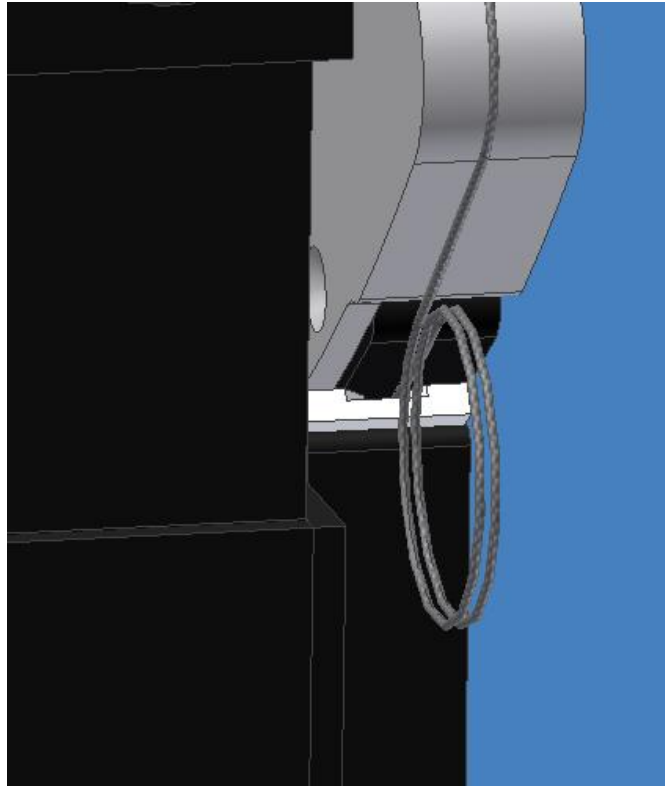
9. Place the SS cable along grooved ALT Teflon pads; make sure that the SS cable rests in the groove on the Teflon pads. You can use some small pieces of scotch tape to keep the cable in place. But do not put the tape on the Teflon pads! You may not be able to completely remove the tape!
10. Carefully place the mirror box back on the rocker, and tighten the mirror box to rocker with the provided Nylon strips to avoid any mirror box movement (You must un-tighten these strips before operating the GOTO). Make sure the SS cable is restricted in the grooves on the Teflon pads.
11. Lock the upper end loop of the SS cable with the screw as shown in the following picture.

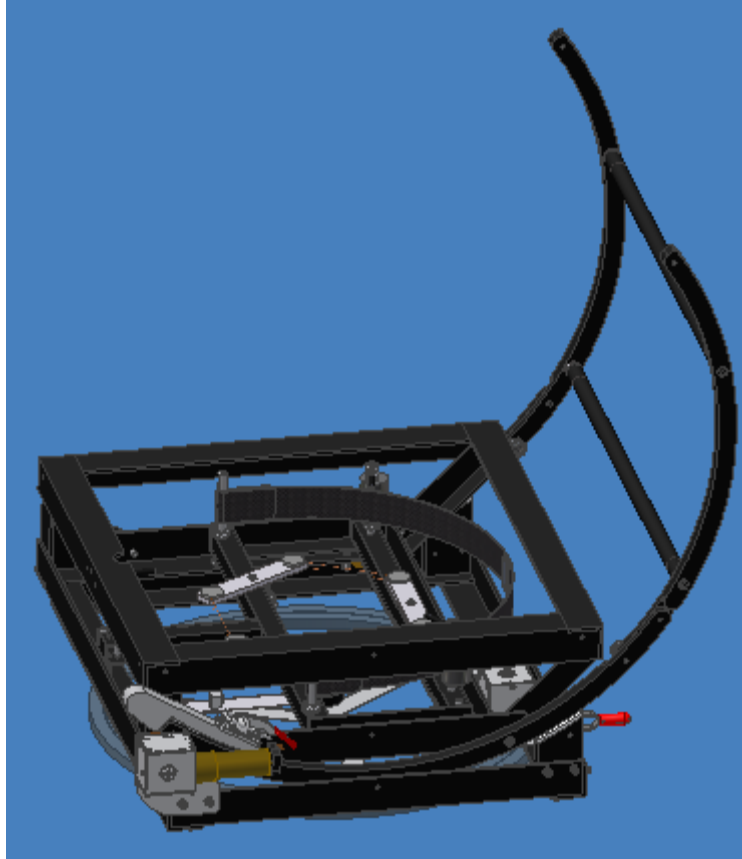




12. Hold the SS cable and wrap it around the AZ drive roller twice, and then hook the SS cable to the end of the tension spring. Make sure to release the clamp when doing so, and then push the clamp back to the "engaged" position. You can adjust the end nuts on the clamp "U" bracket to adjust the tension when needed. Make sure the tension is no more and no less, just enough to avoid the SS cable slipping from the brass drive roller.

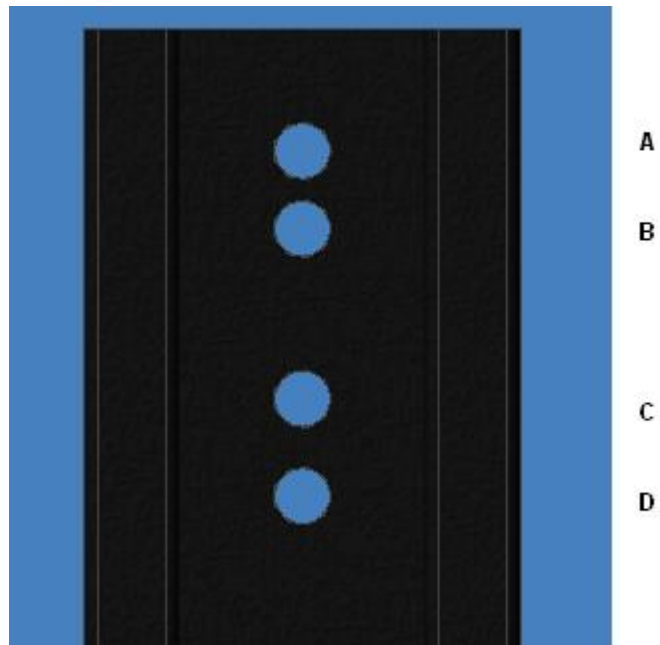






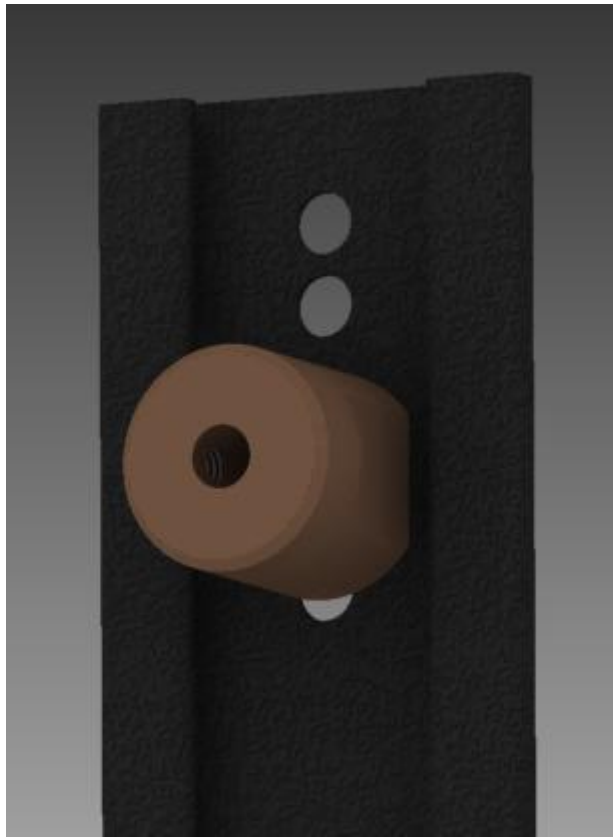
### 13. ALT Encoder Installation

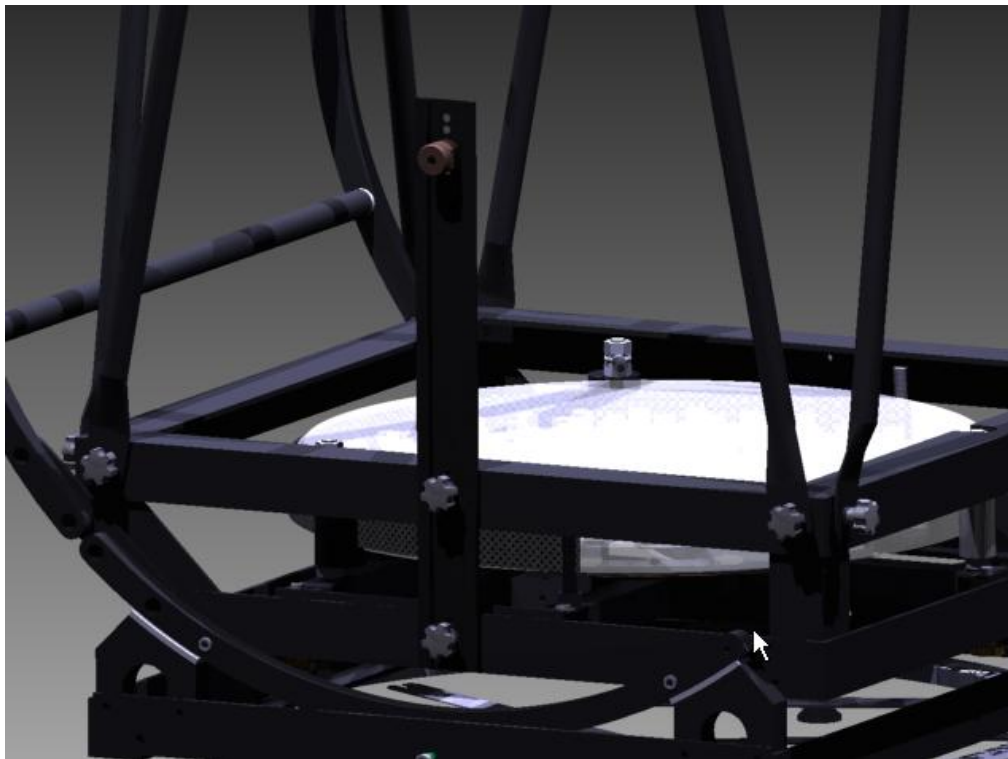
- Install the 1" diameter brass AZ encoder housing into the one of center holes of the ALT encoder holder bracket as shown below using a M6 x10 hex screw.



**A: for UL14**  
**B: for UL16**  
**C: for UL18**  
**D: for UL20**

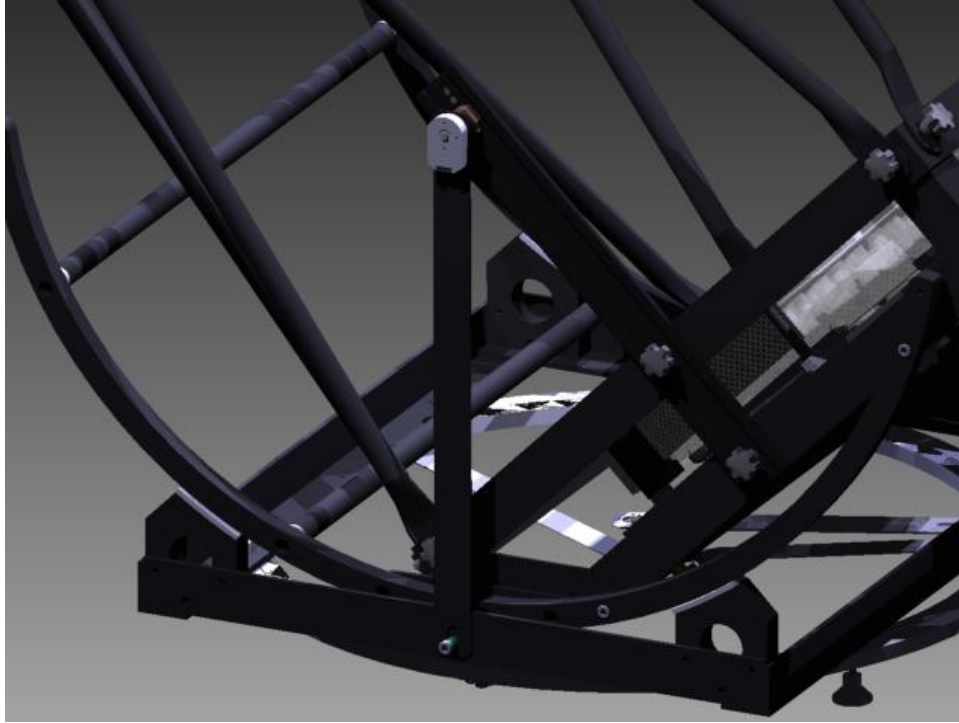
Recommended positions; however you may use different position for your scope to make sure that the encoder is indeed centered.





**Install the ALT encoder holder to the mirror box with the M6 knob screws**

Install the ALT encoder and arm assembly by carefully inserting the encoder shaft into the center hole of the brass encoder housing. Adjust the depth so the threaded shank of the encoder does not touch the housing. **Tighten the Nylon setscrew on side of the brass housing onto the shaft.**



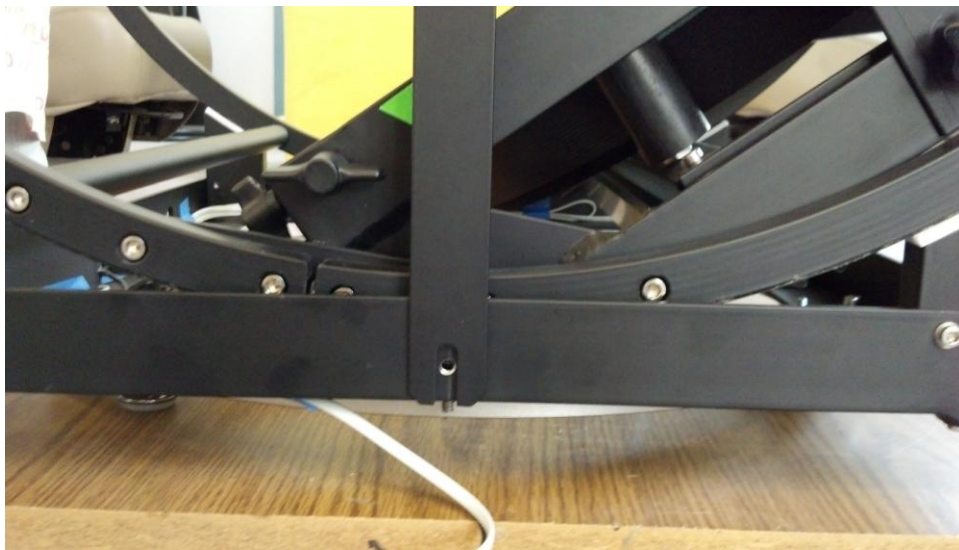
**Adjust the ALT encoder bracket to make sure the encoder housing is centered at the ALT bearing axis:**

Once the encoder is centered, then turn the mirror box to zenith, 45 degree, and then 90 degree, you should see the pivoting screw hole at the bottom remain at the same location relative to the ALT encoder bracket

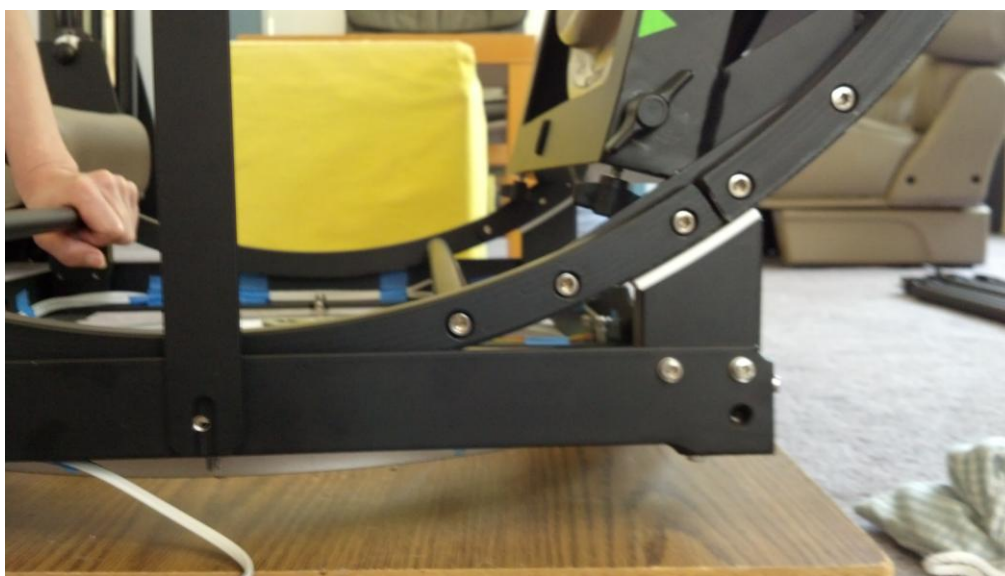
If the encoder brackets moves up and down when the mirror box at different positions, then the encoder housing is not precisely centered, and you should adjust the encoder bracket until the housing and the encoder is centered as precisely as you can.



Mirror Box at Zenith



Mirror Box at 45 degree



Mirror Box at 90 degree

14. Follow the UL SiTech Quick Start Guide to connect the motor and encoder wiring and configure the SiTech controller



**WARNING! Your scope should be well balanced before GOTO operation. Otherwise, the motor will get into blinking mode (manual mode) and the gearbox may be damaged**