600EGTO Lubrication/Maintenance Guide

Lubrication Guidelines for the following Astro-Physics equatorial mounting:

600EGTO and 600ESMD with Servo Motor Drive

For other 600E models please review other postings as they become available.

The 600E mount, in the above version, used plane-bearings in a number of locations. If the lubrication on these surfaces requires replacement, the following instruction guidelines should be followed.

The bearing surfaces engaged in manual rotation of the mount are not always the same as those used in motorized rotation. Manual movement is where the stiffening of rotation is normally first found. These instructions however cover all the plane bearing surfaces for both manual and motor rotation. It is best to do the full lubrication job at one time. Ball bearings on the mount are sealed and require no lubrication.

Lubrication of the 600E requires that the worms of both axes be removed from the worm wheels and that bearing pre-load rings be removed. If you do not feel comfortable meshing the gears or setting the bearing pre-loads after reviewing these instructions, the mount can be sent back to Astro-Physics after consultation with customer service. If the mount is returned, a return authorization number must be obtained.

Before beginning this procedure, review your 600E mount. Note how the worm housings are positioned to be square on the flat side and roughly centered on the radiused side against the declination/motor housing.

Helpful web sites:
Please note that if your 600E mount has the encoder option, their removal is not detailed in this guide. See the following document, pages 10 and 11 for information on these components. (http://www.astro-physics.com/tech_support/previous/600e_mounts/600EQMD.pdf) You will also find it useful to review the backlash removal guidelines as they will be used in the lubrication procedure. (http://www.astro-physics.com/tech_support/mounts/600gto/600ebacklash.htm)

If you wish to grease the teeth of the worm wheel gears during the following procedure you may do so with Lubriplate 105 motor assembly grease. This lubricant can be obtained at most automotive supply shops.

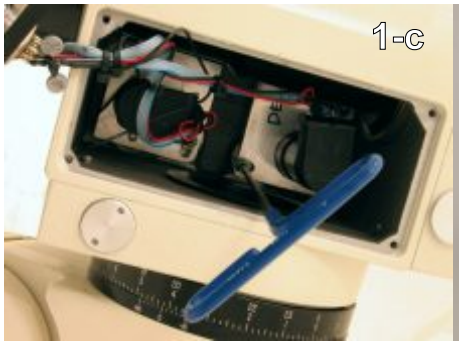
To perform these operations you will need to do and acquire the following:

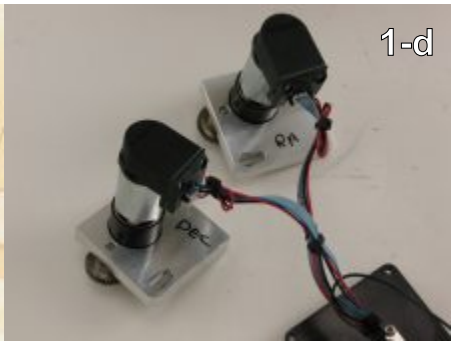
Attach the mount to a tripod or pedestal.
Remove the cradle plate from the declination axis.

Lubriplate No.105 Motor assembly grease (obtained at automotive supply stores)
2mm hex key
5mm hex key
2.5mm hex key
Phillips head screw driver
3mm hex key with 6 inch long “T” handle
Rags and paper towels
Light degreasing agent if needed like “Simple Green” etc. (obtained at Menards, Home Depot)
Small artists paint brush

Right-Ascension Axis:

Step1 - Remove the mount nameplate using a Phillips-head screwdriver. (1-a,1-b)



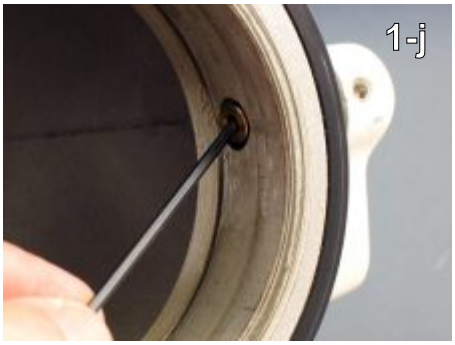


Step 2 - Remove the right-ascension and declination motor using the 3 mm “T” handle hex key. Mark each motor as to their position or axis. Take note of the ground wire on the top side of the right-ascension motor bracket. (Black wire with mounting tab.) (1-c, 1-d)

Step 3 - Using a 2mm hex key, back off all three of the M4x6mm brass tipped socket set screws retaining the pre-load ring. Please note that several rotations of the screw will be necessary as the brass tip of the screw is in a groove cut into the shaft approximately 1mm deep. (1-e)

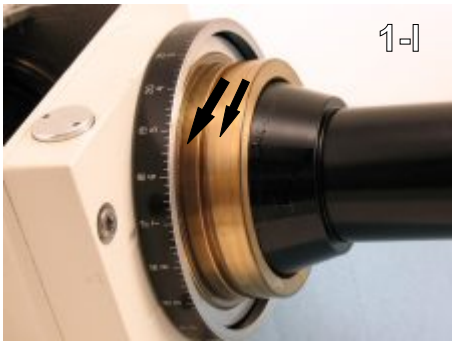
Step 4 - Remove the pre-load ring. (1-f)

Step 5 - Release the tension on the clutch knob. It is not necessary to undo any of the screws in the knob.(1-g)

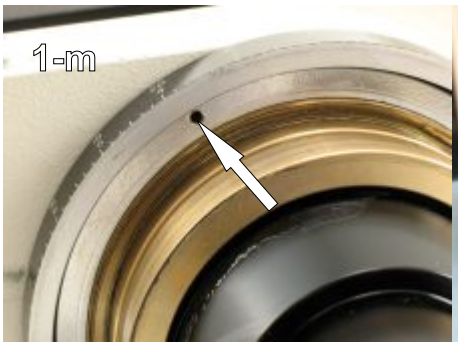


Step 6 - Grab the declination axis/motor housing assembly and pull the right-ascension shaft out of the right-ascension housing. Place the assembly on a clean rag or towel and immediately look into the right-ascension housing for a small hole under the clutch knob. The small brass disk should be fished out with the 2mm key before it falls out. Do not clean it as the grease is used to hold it in place for reassembly. (1-h, 1-l, 1j)

Step 7 - The exposed plain-bearing surface machined into the aluminum casting is used in manual rotation. Wipe clean and grease with Lubriplate No 105. (1-k)

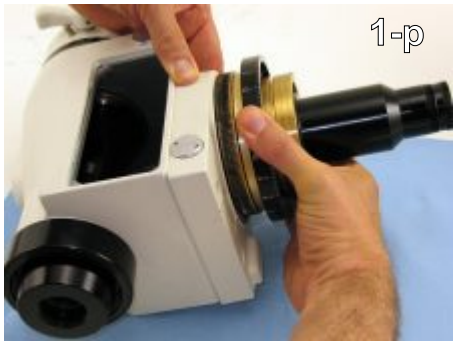


Step 8 - The matching surface on the outside diameter of the worm wheel should be wiped clean and greased with Lubriplate 105. (1-l)

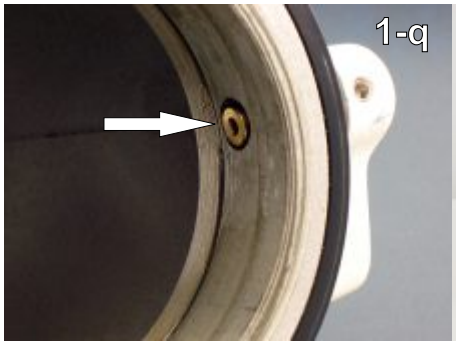


Step 8A -Since the right-ascension circle retaining ring is exposed, this is a good time to check that it has not backed off. Simply insert your 2mm hex key into one of the two holes provided and use it to rotate the retaining ring clockwise until tight. (1-m, 1-n)

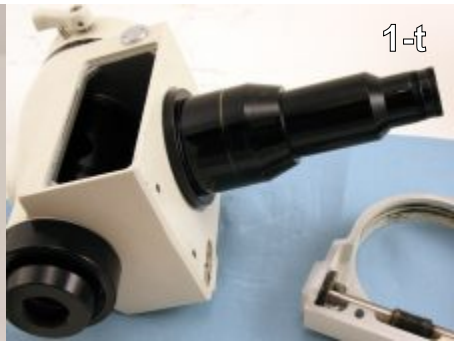
Step 9 - With the 5mm hex key, remove the two M6 x30mm socket head cap screws (SHCS) and washers from the worm housing. (1-o)



Step 10 - Push the worm housing down (towards the counterweight shaft connection). Pull the worm wheel off the right-ascension shaft. If you have a problem, go to step 10A. (1-p)



Step 10A - If step10 proves to be difficult, you can avoid damage by placing the small brass disk back under the clutch knob and putting the assembly back into place. Now the clutch knob can be tightened to hold the worm wheel and you can pull the shaft out of it. (1-q, 1-r)



Step 11 - Remove the worm housing. (1-s, 1-t)

Step 12 - Once apart, the inside bore of the worm wheel can be cleaned and greased with Lubriplate 105. (1-u, 1-v)

Step 13 - Do the same with the exposed right ascension shaft. (1-w)

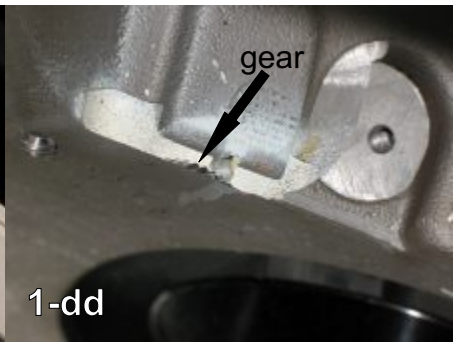
Step 14 - When you are ready to reassemble, put the worm wheel back in the housing if not already there. Don't forget the brass ring! Place the worm housing onto the wheel as shown, fully engaging the teeth. (1-x,1-y)

Step 15 - Put the right-ascension shaft back in place. (1-z)

Step 16 - Put the two M6 x 30mm SHCS and washers back in the worm housing and tighten lightly. (1-aa)

Step 17 - Return the pre-load ring to the rear of the RA shaft and rotate it until it makes contact with the rear bearing. Then, back it off approximately 1/8 turn or 15-20 degrees. Lock down all 3 screws as evenly as you can. (1-bb)

NOTE: Go to www. astro-physics.com and review the document “600EGTO-Adjustments to Remove Worm Gear Backlash” in the Technical Support section. This will provide you with the basics of the worm engagement procedure.



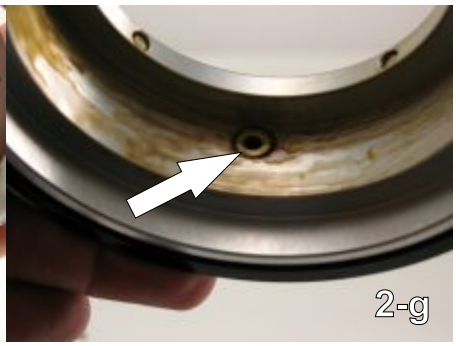
Step 18 - Since you have disassembled everything, you will need to align the worm housing so that it is squared up with the declination/motor housing. Apply some pressure to the worm and lock down the two mounting screws. With no motors in place, adjust the tightness by placing your hand into the housing and rotating the right ascension worm spur with your fingertip. Once no backlash is present and the spur gear turns with your finger, you are done. (1-cc, 1-dd)

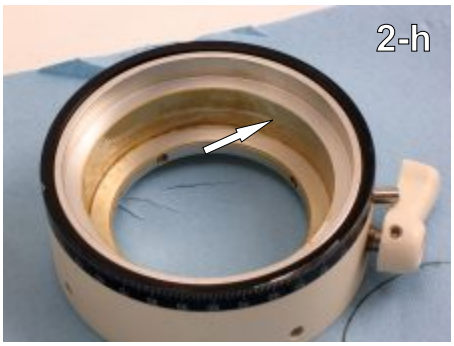
Declination Axis:

Step 19 - Before beginning work on the declination axis, take note of the orientation of the clutch plug knob in relation to the four-hole pattern for cradle plate mounting at the end of the shaft. You will want to return it to this position upon reassembly. (2-a)

Step 20 - Remove the thin ring at the top of the declination shaft by rotating it. Use a 2mm hex key in one of the two holes provided. (2-b,2-c)

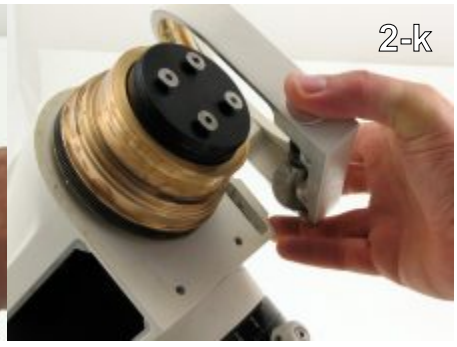
Step 21 - Release the tension on the declination clutch knob. Using a 2.5mm hex key, back off the 4 brass tipped set screws in the painted ring. The declination setting circle is attached to the ring. Lift the ring off the top of the declination shaft.
The small brass disk should be fished out with the 2mm key before it falls out. Do not clean it as the grease is used to hold it in place for reassembly.
(2-d, 2-e, 2-f, 2-g)





Step 22 Clean the old grease from inside the painted ring and replace with Lubriplate 105. (2-h)

Step 23 Remove the old grease from the outside diameter of the worm wheel and replace with the Lubriplate 105. (2-l)



Step 24 - With the 5mm hex key, remove the two M6 x30mm SHCS and washers from the worm housing. Carefully remove the worm housing from the assembly. (2-j, 2-k)

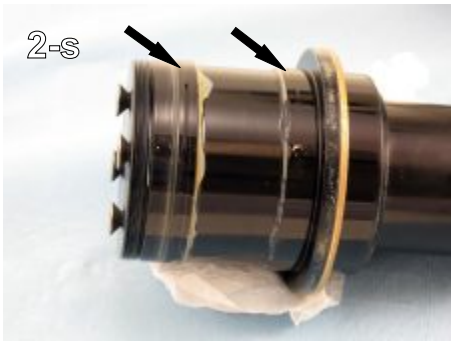
Step 25 - Unscrew the encoder adapter ring from the declination/motor housing. (2-l)

Step 26 - Using a 2mm hex key, back off all three of the M4x6mm brass tipped socket set screws retaining the pre-load ring. Please note that several rotations of the screw will be necessary, as the brass tip of the screw is in a groove cut into the shaft, approximately 1mm deep. Remove the pre-load ring. (2-m, 2-n)

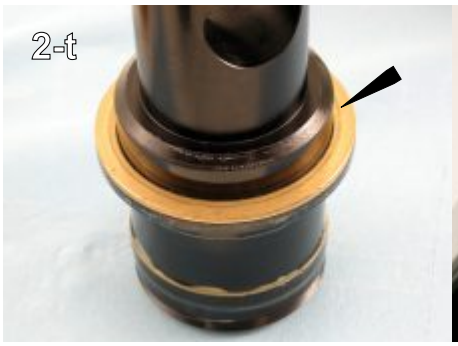
Step 27 - Push up from the bottom, (counterweight side) to remove the declination shaft and worm wheel from the housing. (2-o, 2-p)

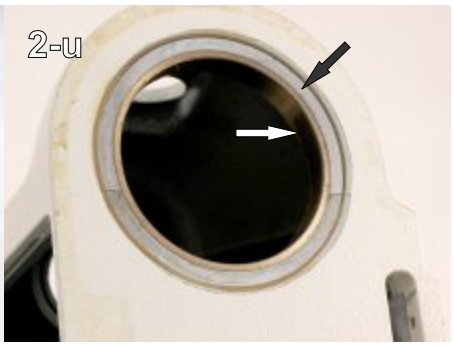
Step 28 - Turn the shaft upside down and let gravity release the worm wheel from the shaft, if possible. (2-q)

Step 29 - Once separated from the shaft, clear the old grease from the bore of the gear and lubricate with Lubriplate No. 105. (2-r)



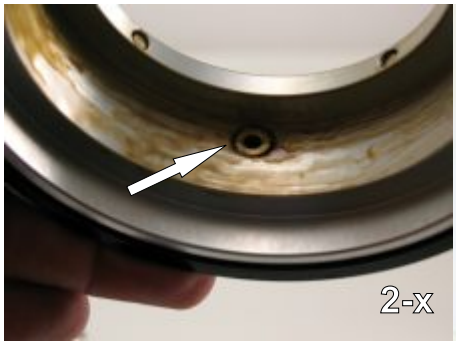
Step 30 - The same is done for the contact surfaces of the shaft. (2-s)





Step 31 - Clean and lubricate the counterweight side of the shaft and ring, plus the bearing surface machined on the top of the declination/motor housing. (2-t, 2-u)

Step 32 - Stand the declination shaft on the counterweight end. Place the worm wheel gear back on the declination shaft and give it a few rotations. (2-v, 2-w)



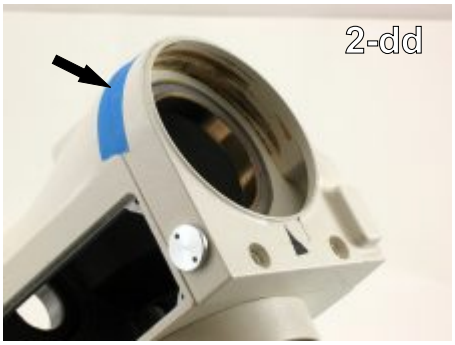
Step 33 - Make certain that you put the small brass disk back in the painted clutch knob ring before mounting it onto the worm wheel. Rotate the ring to place the clutch knob in the same orientation that it was in before disassembly. (2-x, 2-y)

Step 34 - Place the thin ring, removed back in step 20, into place and rotate it down to a stop. Tighten very lightly. (2-z)

Step 35 - Make certain that the clutch knob is loose. Use the 2.5mm hex key to tighten up all four of the socket set screws in the painted clutch ring. It is important that the torque applied to each screw be even. The thin ring will hold the clutch ring in place to keep it from lifting up. (2-aa)

Step 36 - To check that you have assembled this part correctly, hold the shaft and rotate the worm wheel gear. It should turn easily with a little more drag than when the gear was first put in place in step 32. If not, back off the 4 screws from Step 35 and re-tighten evenly or go back to step 34 and back off the pressure on the ring. (2-bb)

Step 37 Firm up the torque on the 4 set screws and tighten the thin ring. (2-cc)

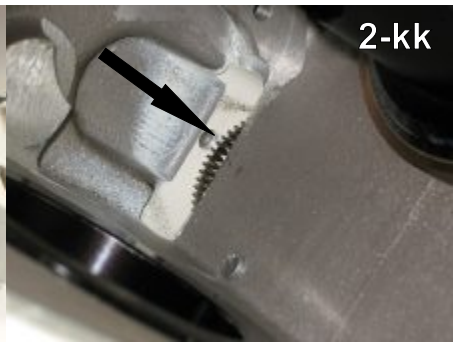


Step 38 Engage the right-ascension clutch knob to keep this axis from moving. Place the worm housing on the declination/motor housing.
Use some painters masking tape to keep in place if you like, but don't put any screws in yet. (2-dd)

Step 39 Return the finished declination shaft assembly to the declination/motor housing. (2-ee, 2-ff)

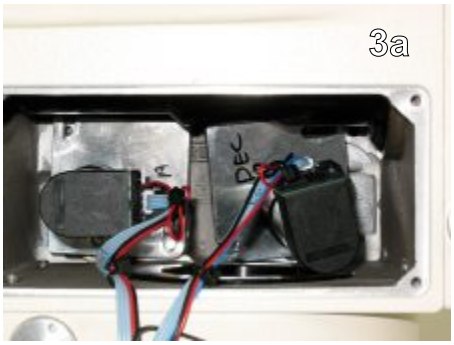
Step 40 Push the worm housing up against the worm wheel and put the two M6 SHCS and washers back into place. Tighten lightly. (2-gg)

Step 41 - Return the pre-load ring to the rear of the declination shaft and rotate it until it makes contact with the rear bearing. Then, back it off approximately 1/8 turn or 15 - 20 degrees. Lock all 3 screws down as evenly as you can. (2-hh, 2-ii)



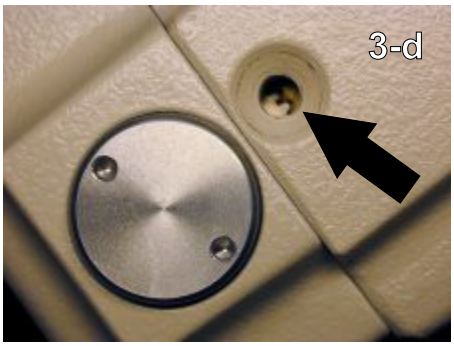
Step 42 - Set the worm /worm wheel engagement. Since you have disassembled everything, you will need to align the worm housing so that it is square with the declination/motor housing. Apply some pressure to the worm and lock down the two mounting SHCS . With no motors in place, adjust the tightness by placing your hand into the housing and rotating the worm spur with your fingertip. Once no backlash is present and the spur gear turns with your finger, you are done. (2-jj, 2-kk)

Step 43 - Screw the encoder adaptor back onto the declination/motor housing. (2-ll)



Step 44 - Place the motors back into the declination/motor housing. The right ascension motor is in the bottom position and the declination is on top. If you failed to mark which is which, plug them into your controller and the right-ascension motor will be the one in continuous rotation. (3a)

Step 45 - Position the motors so that the brass idler gear contacts the stainless worm spur gear that you turned with your fingertip earlier. Using the 3mm “T” handle hex key, lightly engage all four mounting screws and washers. Don't forget to engage the ground wire under one of the right ascension mounting screws. (3-b, 3-c)



Step 46 - You can verify that engagement has been made by removing the slotted screw on the opposite side of the declination /motor housing. (3-d) This opens a sight hole providing visual proof of gear tooth engagement. There is one for each axis.

Step 47 - There is no need to press the motor spur gears tight against each other before applying final torque to the screws. Light finger pressure is all that is required. (3-e)

Step 48 - Put the name plate back in place. Position the wires so that they do not block the use of your polar scope. Return the two sight hole screws, if you removed them in step 46. (3-f)

Step 49 - Move your mount by hand in both axes. If all above steps were followed correctly, everything should now be in like-new factory specifications. If not, call Astro-Physics, Inc. technical support for addition instruction.
(3-g, 3-h)