



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



The EQ6, EQ6 Syntrek and EQ6 Pro along with the NEQ6 and Orion Atlas versions are all the same basic mount - the only difference in the Syntrek/GoTo versions is the motors, the power board, the main board, the hand controller and the cosmetics. The strip down procedure will be identical.

I would advise you read through all of the sections a few times before starting work to familiarize yourself with the process. The case study contains useful information for mounts which may require replacement of their shim washers.

**CAUTION** - The EQ6 is a very tough challenge and unless you have a fair degree of technical ability, I would advise against attempting a rebuild. However, you can with a modicum of tools and some patience tune the worm gear to reduce play in the mount's axis.

<a href="#">1 Stripping &amp; Cleaning the Declination (DEC) Axis</a>	2
<a href="#">2 Lubrication &amp; Re-Assembling the Declination (DEC) Axis</a>	8
<a href="#">3 Stripping &amp; Cleaning the Right Ascension (RA Axis)</a>	13
<a href="#">4 Lubrication &amp; Re-Assembling the Right Ascension (RA) Axis</a>	18
<a href="#">5 Motor Engagement for RA and DEC Axis</a>	24
<a href="#">6 Super tuning the Synta / Skywatcher EQ6 / Orion Atlas</a>	29



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby

## 1 Stripping & Cleaning the Declination (DEC) Axis

To carry out this procedure you will need a good assortment of tools including cross head and Phillips screwdrivers, a rubber or nylon mallet, a soft toothbrush, degreasing agent, metric Allen keys, long nosed pliers, lots of lint free cloths and lithium grease. I found commercial degreasing agents somewhat ineffective and resorted to using good old hot soapy water. Lithium grease is easily available from shops selling bicycles. It's also advisable to have a large soft towel or similar to lay the mount on while working on it to protect its external finish.

I would strongly advise you do not attempt this procedure without reading it through a few times in advance to understand the process. The procedure takes around 4 hours from top to bottom (but read the observations at the bottom of this page) unless you are very confident of what you are doing and have exactly the right tools.

It's definitely best to have someone around to help you with some elements of it - remember take your time and when in doubt **STOP** and **THINK**.

Take a break when tired because you don't want to bodge anything.

The DEC and RA worm gear adjustment process required after re-assembly can be quite lengthy as its very much trial and error so bear this in mind before starting and allow plenty of time to carry out the procedure - it will pay dividends in terms of smooth and precise running and longevity of the mount.

### 1.1 Stage 1 - Stripping the Dec Axis



Place the mount on a flat surface with some soft toweling to protect the external finish



Using an Allen key loosen the three Allen headed grub screws around the dovetail holder.



Remove the dovetail holder. This may need to be rocked a little to remove it. This can be placed to one side.



Use a Phillips screwdriver to undo the screw holding the DEC clutch lever. This may be very tight so be careful not to strip the head from the retaining screw.



Remove the DEC clutch lever. You may need to pry this away carefully using a wide tipped screwdriver.



Remove the DEC clutch bolt. This may be quite tight and you may need to use a spanner.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

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Fully remove the DEC clutch bolt from the mount along with the small brass button. If the button cannot be removed easily then ignore it. It can be extracted easily later in the procedure.



Remove the safety nut from the declination weight bar.



Now remove the weight bar from the mount by pushing it up and through the mount towards the dovetail holder end. Place the weight bar aside.



Using an Allen key slacken the three grub screws around the weight bar retaining collar.



Unscrew the retaining collar.  
**Note:** This fitting can be VERY tight.



Here is the counterweight collar being fully removed. Be careful not to lose the small brass button on the back of the weight bar lock lever. This may well stay with the collar but it may, now that the weight bar has been removed, fall out easily. This item can now be put aside.



Now lightly tap the end of the declination shaft which is exposed (after removing the counterweight collar) with a rubber mallet or block of wood. In this picture I am using the large plastic handle of a screwdriver to act as a buffer for the mallet.



The declination shaft will now slide free of the mount.



Here is the declination shaft removed. At this stage you can remove the small brass lock button from the clutch lever if it wasn't removed earlier.  
**Note:** You can see in this picture the almost invisible Teflon washer at the end of the shaft.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Unlock and remove the DEC scale from the declination collar.



Carefully extract the Teflon washer from the rear of the declination shaft and place it aside. Make sure it is not confused with other washers that will be removed later.



The cone/taper bearing at the base of the mount will now drop free. Remove this and check that the bearing surfaces of the mount are clean and free from corrosion or paint.



Slacken off the upper worm gear set screw adjuster using an Allen key. This will need to be slackened off a lot.



Slacken off the lower worm gear set screw. This will need to be slackened off a lot.



Remove the worm carrier cap headed bolts. These may be very tight on the EQ6 and you may need a socket set type wrench to remove them.



Remove the worm drive carrier. It may stick if the set screws have not been slackened off enough.



Here is the base of the worm carrier. You can see another thin Teflon washer here. This may be stuck to the mounts bearing or the worm carrier so take care. Set this washer aside and make sure it is not confused with the washer from the base of the declination shaft removed earlier.

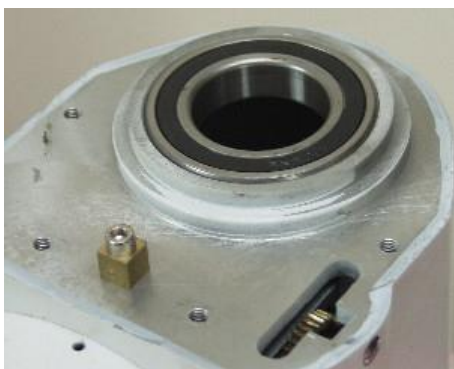


Remove the two roller bearings from the Declination gear. These may simply slide out or they may need to be tapped out using a wooden pole and a mallet as a driver. On this mount the bearing simply pushed free without much effort.



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Here is the top of the mount with the DEC worm carrier removed. You can see over-sprayed paint both on the edges of the mount and also on the bearing and the edges. In fact, it looked worse than the picture suggests. The paint should be scrapped away carefully and a very fine emery cloth applied to remove paint and imperfections.

You can also see here the motor gear. At this stage in the strip down I removed the motors. You can see this process [HERE](#)



Before cleaning up the top of the DEC assembly the facing bearing shown in the previous picture was removed. You can remove this using a wooden pole/spline through the mount. This needs to be done very carefully by applying a few taps at a time around the bearing. Be careful not to damage the bearings dust seals.



Here is the face bearing being removed from the mount.



Now ensure that the bearing faces in the DEC axis are clean and free of paint, corrosion etc. Here is the bearing face for the taper bearing at the base of the DEC axis.



Here is the top of the DEC axis cleaned up. This picture was actually taken after the bearing was reinstalled. Note the absence of paint from the bearing faces and the edge of the mount.



## 1.2 Stage 2 - Stripping the Worm Carrier



Here's the worm carrier as it was removed from the mount. First remove the large brass gear and place it somewhere safe.



Remove the worm roller end-caps. These can be removed using either a pair of circlip pliers or a pair of fine snipe nosed pliers or a pair of small Allen keys.

**Note:** *These were incredibly difficult to shift on this mount and in the end it required two of us. One to hold the circlip pliers into the holes and one to insert a large screwdriver between the tips of the pliers to act as a lever.*



Now remove the slotted bolt fitting from the worm carrier. This can be removed using circlip pliers or a pair of small Allen keys or a pair of very fine tipped screwdrivers.



Loosen the Allen headed grub screws on the worm / motor gear.



The worm will now slide free from the carrier.



The worm end roller bearing will simply slide free from the worm. Remember also to remove the other bearing from the carrier. This should simply push out but you may need to tap it out using the handle of a small screwdriver as a pusher.



## 1.3 Stage 3 - Cleaning & Lubrication



*The brass worm gear, its roller bearings, the tapered bearing plus the worm and its end bearings and motor gear all cleaned and awaiting greasing and reassembly.*

With a clean lint free cloth now wipe all the excess oil from the components. On this mount the roller bearings and the worm roller bearings were sealed and appeared to be well lubricated so were left alone.

The tapered bearing had almost no lubrication and so was cleaned and re-lubricated with lithium grease. To lubricate bearings put a blob of grease onto the palm of your hand and press the bearing into it and then rotate the bearing around forcing the grease into the inside of the bearing.

The brass worm gears and steel worm along with the worm carrier casting should all be cleaned in a degreasing agent. I personally find really hot water and a basic detergent works best. These items were then cleaned with a soft toothbrush and then rinsed and left to dry. All of the gears showed either little lubrication and/or engineering swarf though none of the legendary black 'goop' that is supposed to be used in Synta mounts.

The worm carrier had its edges cleaned by the gentle application of some emery cloth to remove the loose flakey paint and to smooth the facing edges to the mount. You should do this by placing the emery cloth flat on a perfectly smooth surface such as glass and gently, with a rotating motion rub the work carrier around the cloth.

### Observations:

The declination (DEC) axis prior to strip down showed a fair amount of play. On strip down the DEC assembly came to pieces rather easily. The cap headed bolts on the worm carrier were extremely tight and, in the end, I required a socket set with a long tommy bar to remove them. Similarly, the worm gear roller bearing covers were also done up extremely tightly.

The top of the DEC assembly showed a large amount of paint flecks on the bearings and their faces as well as something that resembled ground up sand in the lubrication. I suspect this was paint. If you look at the worm carrier you can see two areas inside the carrier immediately next to the worm that have no paint. The RA worm carrier had paint in these areas. My HEQ5 showed the same and in fact had retained one of the pieces of paint which was like a large shard of very hard enamel. I can only speculate that on this EQ6 the paint flakes had, over time, been ground up in the worm gears.

The worm and its associated gears showed very little lubrication as did the taper bearing at the base of the DEC axis. In fact, the worm gear appeared resistant to grease when first removed rather as if it had been in contact with some kind of de-greasing agent. After cleaning it was fine.

Paint spray was removed from the top of the RA axis and its bearing and bearing faces and components re-lubricated. The main roller bearings were well lubricated inside their dust caps and apart from cleaning the exteriors of any contamination were left alone.



## 2 Lubrication & Re-Assembling the Declination (DEC) Axis

This procedure will guide you in re-assembling the EQ6/Atlas Declination axis and follows on from the stripping down and cleaning guide in Section 1.

**GENERAL NOTE:** Very little of the mount assembly requires brute force on tightening down components. They need to be firm but not so tight the threads pop. Generally, a light touch is required rather than brute force. Remember this is a precision piece of engineering and many of the fittings are aluminum so threads can be easily stripped and ruined. As with the strip down process if you hit problems **STOP** and **THINK**. If something won't fit there's a reason.

**NOTE ON LUBRICATION:** When this guide was originally written the accepted wisdom was that white lithium grease was an overall good lubricant. However, it would appear that standard white lithium grease may cause problems under some extremes of damp/temperature. All of the mounts I have rebuilt have been done with white lithium that is stable and often mixed with a synthetic like Teflon or PTFE. It is best to consult the manufacturer on the quality of the product. I find TF2 White Lithium grease with Teflon to work well.

Also, I have seen questions asked about the density of grease used in packing the bearings. The grease should be forced into the bearings and should provide good all-round lubrication. You don't need to pack the bearings solidly with grease.

### 2.1 Stage 4 - Re-assembling the Worm Carrier



Lubricate the small worm roller bearings and insert one of them into the motor side of the worm carrier.

**Note:** You may need to use a driver to do this so use a small plastic handles screwdriver as shown in the picture. You can lightly tap the tip of the screwdriver with a hammer if the bearing is tight.

**Note:** It has been reported that some mounts will only accept the worm roller bearing from one direction (i.e. from the outside OR the inside of the carrier). If you're having problems getting the worm into the carrier try coming from the other side.



Replace the motor gear and the worm into the carrier. Take note that on the motor gear side it has a flat. Align the flat with the Allen headed grub screws on the motor gear.



Tighten the grub screws on the motor gear to the worm.

**Note:** The motor gear must have one of its grub screws against the flat on the worm. One of the grub screws may be longer than the other. The long one goes against the flat. Both grub screws should be almost flush with the motor gear spindle when finished.

**Note:** There is a space between the motor gear and the widest part of the worm. It does not fit flush to the wide part of the worm gear.





# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



After lubricating install the other worm roller bearing.



Install the slotted nut onto the worm assembly. Do not over tighten this as this will need to be adjusted later. A light pressure is enough at this stage.



Screw on and make tight the black metal cap that covers the worm end on the motor side of the assembly.

**Note:** The metal cap for the other end of the worm gear is left off at this stage as it will require tuning later.



Here is the worm carrier reassembled and lubricated with lithium grease. Its edges have been cleaned up from any excess paint.

## 2.2 Stage 5 - Re-assembling the Declination Axis



Reinsert the main roller bearings into the DEC worm gear. You can use a small smear of lithium grease to help them seat into the worm.



You may need to use a wooden or rubber mallet to gently tap the roller bearings into place. This is the bottom roller bearing being inserted using a wooden handle and is being hand tapped into place.



I install the DEC main housing roller bearing onto the top of the DEC axis. This may need to be tapped into place using a wood or rubber mallet. Lightly lubricate the top of the bearing.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Replace the worm gear Teflon washer making sure this is the same one you removed earlier. Use a small dab of grease to secure it to the worm gear and make sure it stays centered during the rest of this procedure.

**Note:** If you wish to carry out super tuning with replacement shim washers read the super tune guide in Section 6



Replace the declination worm gear onto the DEC main housing and lubricate the teeth at the base of the DEC gear. Also apply a small smear of grease to the face of the top roller bearing. Keep the main barrel element free of grease as this will impair the ability of the DEC scale to be locked when in use.



Replace the worm carrier onto the mount. Make sure that the worms motor gear is aligned properly with the slot for the motors running gear.



After cleaning out any grease or debris from the declination collar/spindle assembly replace the Teflon washer.



Replace the DEC scale making sure it is correctly orientated to the mount (ie make sure it is the right way up for the mount when assembled)



Replace the DEC lock 'brass button'. **Note:** Check with your own mount whether it needs to be installed from the inside.



Here is the declination lock button installed into the DEC collar assembly.



Gently insert the declination collar and spindle assembly into the mount main housing. Take care that the Teflon washer between the DEC gear and the DEC housing is not damaged during this step and that the brass lock button does not fall out.



Replace the cap headed screws on the DEC worm carrier.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Do not tighten the DEC worm carrier down. Just apply enough pressure to stop it moving about but not too hard. It will need adjusting later.



Wind the upper set screw for the worm carrier back into the mount but do not tighten it. It just needs to be put back so that it is not proud of the mount.



Wind the lower set screw for the worm carrier back into the mount but do not tighten it. It just needs to be put back so that it is not proud of the mount.



Pack the taper bearing with lithium grease and wipe off any excess. The easiest way to pack the bearing is apply a blob of lithium grease on the palm of your hand and then force the bearing into the grease. This will force grease inside the bearing.



Now reinstall the taper bearing into the bottom of the DEC axis housing. Do not worry if it will not go all the way. So long as a few threads from the DEC spindle are showing that is enough.



Replace the weight bar collar and screw it down. Tighten it as far as it will go by hand and then back off until the weight bar collar locking lever is in line with the DEC clutch lever.



Tighten down the weight bar collar Allen headed grub screws.



Apply some lithium grease to the declination clutch locking bolt and then replace the bolt. Screw this in until it is tight and the declination axis is locked.



Replace the DEC clutch lever and test that you can both lock and free the DEC axis before replacing the screw and tightening it down.



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Replace the weight bar by sliding it back into the DEC spindle through the top of DEC axis.



Replace the weight bar safety nut.



Replace the dovetail carrier. The locking bolts for the dovetail carrier should be opposite the DEC clutch lever.



Replace the dovetail carrier grub screws and tighten down.



When tuning is completed for the worm gear (see Section 5) the remaining worm carrier cover can be replaced.



## 3 Stripping & Cleaning the Right Ascension (RA Axis)

This procedure will guide you in stripping down and cleaning the EQ6 / Atlas Right Ascension axis. Re-assembly of the RA axis is covered in Section 4.

To carry out this procedure you will need a good assortment of tools including cross head and Phillips screwdrivers, a rubber or nylon mallet, a soft toothbrush, degreasing agent, metric Allen keys, long nosed pliers, lots of lint free cloths and lithium grease. I found commercial degreasing agents somewhat ineffective and resorted to using good old hot soapy water. Lithium grease is easily available from shops selling bicycles. It's also advised to have a large soft towel or similar to lay the mount on while working on it to protect its external finish.

I would strongly advise you do not attempt this procedure without reading it through a few times in advance to understand the process. The procedure takes around 4 hours from top to bottom (but read the observations at the bottom of this page) unless you are very confident of what you are doing and have exactly the right tools.

It's definitely best to have someone around to help you with some elements of it - remember take your time and when in doubt **STOP** and **THINK**.

Take a break when tired because you don't want to bodge anything.

The DEC and RA worm gear adjustment process required after re-assembly can be quite lengthy as its very much trial and error so bear this in mind before starting and allow plenty of time to carry out the procedure - it will pay dividends in terms of smooth and precise running and longevity of the mount.

### 3.1 Stage 1 - Stripping the RA Axis



Remove the polar scope cover.



Remove the polar scope. You may need to grip it with a wrench - if so, wrap a cloth around the polar scope to protect it. Alternately use some masking tape to protect the scope.



Once loosened simply unscrew the polar scope and place it somewhere safe.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Place the mount on an even surface covered with some towels to protect its external finish.



Remove the silver Phillips screw in the RA lock lever.



Remove the lock lever. You may need to pry this up by using the tip of a flat bladed screwdriver and gently twisting the tip.



Remove the brass RA lock bolt. You may need to use a small spanner or pliers. Also remove the small brass button beneath the lock bolt. If this is hard to do leave it - it can be removed easily later in the procedure.



Undo the three screws around the polar scope index ring/cover.



Remove the polar scope index ring/cover. **Note:** Some older EQ6 mounts do not contain an index marker on this component. If your mount does have this marker be careful - it's VERY sharp.



Slacken the three hex headed grub screws around the polar scope mounting plate. This large component is also the main nut for the RA spindle.



Removing the RA main nut using an oil filter wrench. **Note:** This bolt is completely smooth and it's VERY hard to remove see the observations below.



The RA main nut being removed exposing the RA spindle and the tapered bearing.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Tap the RA main spindle to drive it out. It should move easily but if not then tap it gently with a wooden or rubber mallet. **DO NOT** use a hammer as shown in the picture above. This was used only for photographic purposes.

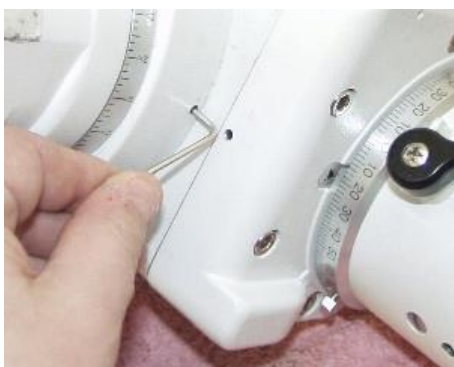


Remove the main RA Axis assembly from the base of the mount.

**Note:** At this point the small brass button for the RA locking lever will be easy to push out if you were unable to extract it earlier.



With the RA main axis removed the tapered bearing at the base of the RA block will simply drop out.



Loosen the upper RA worm carrier set screw.



Loosen the lower RA worm carrier set screw.



Remove the worm carrier cap headed bolts. These were so tight on this mount that a socket set was required.



Remove the RA scale. This may remove with the main RA block or be left behind on the worm carrier.



Remove the worm carrier from the mount.



Remove the worm gear from the RA block - the picture shows the RA worm gear with its top bearing removed. Take care to look out for the Teflon washers. The mount may have one or two of these. They may be stuck together with grease so exercise care. Place the Teflon washer(s) aside and keep them separate from any other washers.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Beneath the RA worm gear will be another Teflon washer. Make sure this is removed and set aside and kept separate from all other washers.



With the RA worm gear removed a fair amount of corrosion was observed on the RA spindle along with some rough machining. Its doesn't show well in the photograph above



Remove the bearing from the mount base. This can be tapped out using a wooden pole and a mallet in the same way as the DEC housing main bearing shown in the DEC strip down module.

## 3.2 Stage 2 - Stripping the Worm Carrier



The picture above shows the worm carrier as removed from the mount. Note the position of the motor gear on the worm - it is not flat against the worms' widest point. This is correct.



Remove the worm end-caps using some circlip pliers or snipe nosed pliers. You may also be able to remove these with two small Allen keys inserted. On this EQ6 these were VERY tight.



Remove the slotted nut from the worm carrier using circlip pliers, snipe nosed pliers, two small Allen keys or two fine tipped screwdrivers.



The slotted nut is shown here removed from the worm carrier.



Loosen the motor gear set screws using an Allen key.



The worm will now simply pull free from the worm carrier.





## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Remove the motor gear from the carrier



Remove the worm roller bearing from the worm carrier.



Remove the worm roller bearing from the worm.

### 3.3 Stage 3 - Cleaning & Lubrication



*All of the components from the RA axis removed, cleaned and lubricated*

With a clean lint free cloth wipe all of the oil from the components. On this mount the roller bearings were sealed and appeared to be well lubricated so were left alone. The tapered bearing had almost no lubrication and so was cleaned and re-lubricated with lithium grease.

To lubricate bearings put a blob of grease onto the palm of your hand and press the bearing into it and then rotate the bearings around forcing the grease into the inside of the bearing.

The brass worm gears and steel worm along with the carrier should all be cleaned in a degreasing agent. I personally find really hot water and a basic detergent works best. These were cleaned with a soft toothbrush and the rinsed and left to dry. All of the gears showed either little lubrication and/or engineering swarf present.

#### Observations:

The RA element of the mount was very hard work to disassemble. The primary problems were removing the main RA nut behind the polar scope I tried some band grips, mole grips etc. and none of them worked. The bolt should have been protected with a cloth but it was impossible to remove with a cloth on it due to the tools slipping. In the end the bolt was removed with an oil filter wrench which marked the finish. This was touched up during reassembly with some good quality enamel paint.

Further problems were encountered removing the RA main bearings from the RA spindle. Due to some corrosion and lack of lubrication these were virtually seized onto the shaft and it took over 2 hours work to gently tap and drift them loose. As with the DEC axis the bearings, although well lubricated behind their dust shields were almost dry in contact with the mount. The main RA casting bearing was jammed to the RA spindle on removal rather than staying seated in the block. The RA spindle showed signs of rough machining and this was rubbed down using fine emery cloth and wet and dry paper.

The brass RA worm gear also showed signs of damage on its lower face. This was carefully ground out. Although it had no impact on running it looked unsightly. The RA showed little over-painting problem or debris but there was some corrosion along the main RA spindle along with a chalky type of deposit which may have been corrosion or scale of some kind. This was polished off with some very fine emery cloth and wet and dry paper.

Unlike the DEC axis the RA worm interface was clean on the worm carrier but the whole top of the RA block was painted. It was felt better, as the paint was sound, to leave this alone.



## 4 Lubrication & Re-Assembling the Right Ascension (RA) Axis

This procedure will guide you in re-assembling the EQ6/Atlas Right Ascension axis and follows on from the stripping down and cleaning guide in Section 3.

**NOTE:** Very little of the mount assembly requires brute force on tightening down components. They need to be firm but not so tight the threads pop. Generally, a light touch is required rather than brute force. Remember this is a precision piece of engineering and many of the fittings are aluminium so threads can be easily stripped and ruined.

**NOTE ON LUBRICATION:** When this guide was originally written the accepted wisdom was that white lithium grease was an overall good lubricant. However, it would appear that standard white lithium grease may cause problems under some extremes of damp/temperature. All of the mounts I have rebuilt have been done with white lithium that is stable and often mixed with a synthetic like Teflon or PTFE. It is best to consult the manufacturer on the quality of the product. I find TF2 White Lithium grease with Teflon to work well.

Also, I have seen questions asked about the density of grease used in packing the bearings. The grease should be forced into the bearings and should provide good all-round lubrication. You don't need to pack the bearings solidly with grease.

### 4.1 Stage 4 - Re-assembling the Worm Carrier



Lubricate the small roller bearing and replace it.

**Note:** *It has been reported that some mounts will only accept the worm roller bearing from one direction (i.e. from the outside OR the inside of the carrier). If you're having problems getting the worm into the carrier try coming from the other side.*



The small roller bearing may need to be tapped into place. This can be done using a small plastic handled screwdriver as shown above.



Replace the motor gear sprocket and insert the worm into the worm carrier.



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Tighten the grub screws on the motor gear to the worm.

**Note:** The motor gear must have one of its grub screws against the flat on the worm. One of the grub screws may be longer than the other. The long one goes against the flat. Both grub screws should be almost flush with the motor gear spindle when finished.

**Note:** There is a space between the motor gear and the widest part of the worm. It does not fit flush to the wide part of the worm gear.



Screw on and make tight the black metal cap that covers the worm end on the motor side of the assembly.

**Note:** The metal cap for the other end of the worm gear is left off at this stage as it will require tuning later.



After lubricating install the other worm roller bearing.



Install the slotted nut onto the worm assembly. Do not over tighten as this will need to be adjusted later. It only needs to be under slight pressure at this stage.



Here is the worm carrier reassembled and lubricated with lithium grease. Its edges have been cleaned up from any excess paint.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby

## 4.2 Stage 5 - Re-assembling the Right Ascension Axis



Replace the roller bearings into the brass worm gear - apply a small amount of grease to the edges. These may have to be tapped into place using a nylon hammer or a block of wood.



Here is the base of the RA worm gear with its bottom roller bearing in place



Replace the Teflon washer onto the RA spindle making sure this is the same washer that was removed in the strip down stage

**Note:** If you wish to carry out super tuning with replacement shim washers read the super tune guide in Section 6



Replace the brass worm gear and its roller bearings onto the RA Axis spindle.



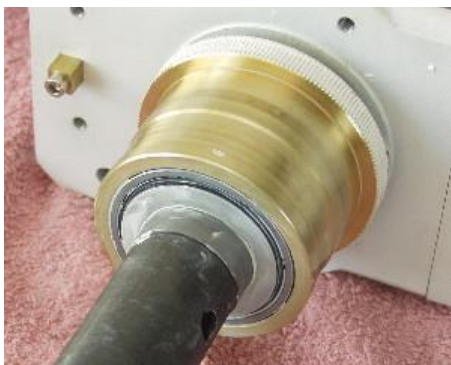
Apply lubrication to the teeth of the RA worm gear. Shown here as white lithium grease. Avoid the main part of the barrel getting grease on it as this will impair the ability of the RA scale to be locked when in use.



Replace the Teflon washer(s) to the top of the brass worm gear.



This picture shows the second of two Teflon washers in this EQ6 being replaced.



RA worm gear and washers in place. Add a smear of lithium grease to the top surface.



Replace the assembled worm carrier.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Assembled worm carrier installed onto the RA axis main block.



Replace the cap headed screws into the RA worm carrier.



Tighten the cap headed screws down but not too tight. Allow some small movement to take place in the worm carrier.



Tighten the upper set screw enough so that it is no longer proud of the casing.



Tighten the lower set screw enough so that it is no longer proud of the casing.



Replace the EQ6 mount base main bearing.



The mount base bearing may require to be tapped into place using a wooden driver. In this case the handle from an old hammer.



Replace the RA scale to the mount. Ensure that this is correctly orientated.



Install the mount base on to the RA axis.





# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby

Pack the taper bearing with lithium grease and wipe off any excess. The bearing can be easily packed by applying a large blob of grease to the palm of your hand and then forcing the bearing into the grease. Now reinstall the taper bearing into the bottom of the RA axis housing. Do not worry if it won't go all the way. So long as a few threads from the RA spindle are showing that is enough.

Tighten the main RA nut down. This doesn't have to be put down with a huge amount of pressure, just enough to compress the taper bearing into the mount. test the movement of the RA axis. If it feels over tight then loosen the main nut slightly.



Tighten the main nut set screws using an Allen key.

Replace the polar scope surround...

..and screw it back into place.



Replace the RA clutch lock brass button.

Apply some lithium grease to the RA clutch locking bolt and then replace the bolt. Screw this in until it is tight and the declination axis is locked.

Replace the DEC clutch lever and test that you can both lock and free the DEC axis before replacing the screw and tightening it down.



Replace the RA clutch lever screw.

Replace the polar scope.

Refit the polar scope cover.



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



When tuning is completed for the worm gear (see Section 5) the remaining RA worm carrier cover can be replaced.



## 5 Motor Engagement for RA and DEC Axis

This procedure will guide in setting up the EQ6/Atlas worm engagement and also aligning the motor gears after the Declination and Right Ascension reassembly. These steps are best carried out with the EQ6 head mounted onto its tripod or some other type of stable base.

The worm setting procedure - especially for the RA axis is very hit and miss and you will probably need to go through it several time to find the 'sweet spot' where there is both no play in the mount and the RA motor can turn the mount smoothly with no motor stall or gear binding.

Play / tension in the mount's axis are controlled by three elements. The worm carrier set screws, the end float adjusters and, to a lesser extent, the motor engagement. If you are having problems with a binding motor its best to slacken the motor away altogether. Get a good setting on the worm carrier set screws and only then tighten the motor back down. This symptom will show if all appears well UNTIL the cap headed screws are tightened down. If this happens then the motor is installed too tightly causing the motor gear and the worm gear to bind

### 5.1 EQ6/Atlas Worm Engagement for DEC Axis



Loosen the DEC axis worm carriers four large silver cap screws **JUST ENOUGH** so that the small set screws can move the worm carrier.



Loosen the DEC worm carrier upper set screw and.....



.....Tighten the lower DEC worm carrier set screw just enough so that you can feel some play in the axis.

**Note:** You should loosen and tighten these screws by approximately 1 quarter of a turn each time.



Now loosen the lower set screw and.....



.....Tighten the upper set screw **JUST UNTIL ANY PLAY STOPS.**

**Note:** You should loosen and tighten these screws by approximately 1 quarter of a turn each time.



Now tighten down the DEC worm carrier cap headed screws. Work around the screws clockwise tightening a little each time until fully tight.





# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



The final adjustment is to the worm end float adjuster. This is a slotted nut. It can be turned using circlip pliers, snipe nosed pliers or two small screwdrivers with fine blades. The worm float needs to be tight but not so tight that the mount binds. Generally, I start with the worm float being loose and then gradually tighten it until the mount binds a little and then slacken it off.



Run the mounts DEC motor a full 360° to make sure there is no binding at any point in the cycle. If binding occurs you will need to readjust the set screws. This can be a long process to get the perfect balance between no play in the axis and smooth motor running.



Reinstall the worm end float cover.

## 5.2 EQ6/Atlas Worm Engagement for RA Axis



Loosen the RA worm carriers four large silver cap screws **JUST ENOUGH** so that the small set screws can move the worm carrier.



Loosen the RA worm carrier upper set screw and.....



.....tighten the RA worm carrier lower set screw just enough so that you can feel some play in the axis.

**Note:** You should loosen and tighten these screws by approximately 1 quarter of a turn each time



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



Now loosen the lower set screw and.....



.....tighten the upper set screw  
**JUST UNTIL ANY PLAY STOPS.**

*Note: You should loosen and tighten these screws by approximately 1 quarter of a turn each time*



Now tighten down the RA worm carrier cap headed screws. Work around the screws clockwise tightening a little each time until fully tight.



The final adjustment is to the worm end float adjuster. This is a slotted nut. It can be turned using circlip pliers, snipe nosed pliers or two small screwdrivers with fine blades. The worm float needs to be tight but not so tight that the mount binds. Generally, I start with the worm float being loose and then gradually tighten it until the mount binds a little and then slacken it off.



Run the mounts RA motor a full 360° to make sure there is no binding at any point in the cycle. If binding occurs you will need to readjust the set screws. This can be a long process to get the perfect balance between no play in the axis and smooth motor running.

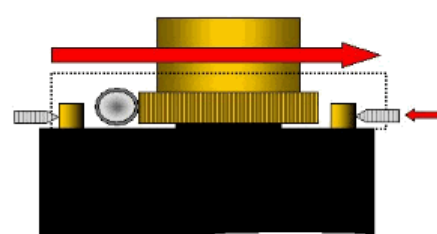
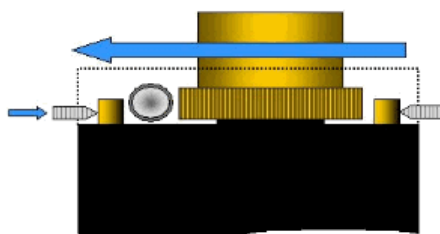
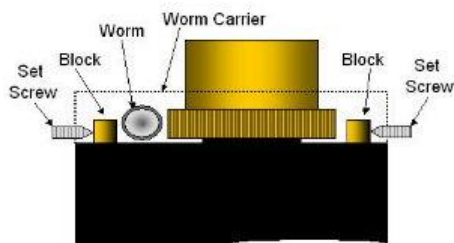


Reinstall the worm end float cover.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



If you are only adjusting the worms on the EQ6 and are curious about how they work these diagrams may help. The set screws that you adjust bear against two brass blocks inside the mount under the worm carriers. The diagram above shows the layout of the running gear inside the worm carrier.

As you tighten the lower set screw the screw pushes against the block that's secured to the mount. The set screw forms part of the worm carrier so as you tighten the set screw (small blue arrow) the carrier is forced towards the block (large blue arrow). In this case as you tighten the lower set screw the worm is pulled away from the ring gear. This is the first step in tuning the worm gear.

As you tighten the upper set screw (small red arrow) the same process occurs. The worm carrier is forced backwards towards the set screw (large red arrow) and as you can see the worm itself is now pulled into contact with the ring gear. **It's essential when you play with the set screws that you always slacken the opposing set screw off to prevent damage to the mount.**

## 5.3 EQ6/Atlas Motor Gear Removal and Adjustment

As part of the complete strip down guide I removed the motors and the motor control board from this mount. This isn't really necessary for a conventional strip down but given the mounts history of poor periodic error performance I needed to make sure the motor gear was OK and that there were no problems.

In fact, the motor gear, like the rest of the mount, was suffering almost no lubrication. This step can be necessary after a rebuild to reseat the motors. Cleaning up the over painting on the worm carriers can reduce the distance between the gears enough to cause the gear works to become too tight with the result that the motors will bind and stall



Remove the 4 outer screws around the EQ6/Atlas control panel.



Gently pull the control panel away, revealing the motor control board. You can either disconnect the motors from the main board or leave alone and extract all of the motors and control board as one unit.

**CAUTION** Take suitable static precautions as the motor boards on these mounts are reputed to be very fragile.



Remove the two screws from each motor and be careful not to lose the washers.



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

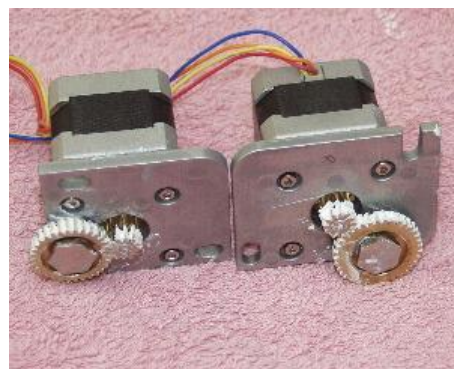
by Astro Baby



Gently ease the motor away and extract it. You will need to do this for each motor.



Using a fine bladed screwdriver pry the polar scope illuminator away from the mount.



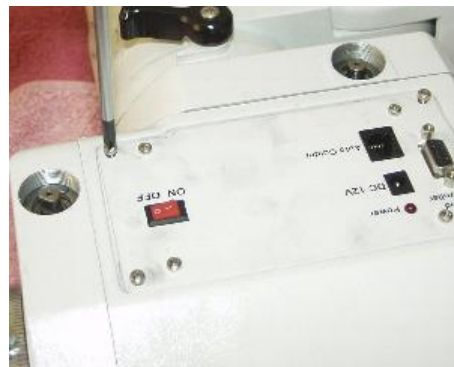
The motors on this mount showed little lubrication. Their gears were cleaned with a little alcohol on a cotton bud and then regreased using white lithium grease.



Reinstall the motors. Because the gear works are hidden in the EQ6 at this stage it's not possible to gauge pressure on the motors. I would advise gentle pressure against the motor towards the worm gear as you replace the fixing screws for the motor.



Replace the polar scope illuminator.



Replace the motor control board/control panel and replace the outer screws.

### 5.4 EQ6/Atlas Altitude Movement

The mount used for the rebuild in this guide had no problems with its altitude bearings. Altitude how tight the altitude adjusters are locked down.

As the process of adjusting these can be destructive to the mounts trim and no problems were observed with this mount these were left alone. Consult the HEQ5 guide for instructions as to how to adjust these. The HEQ5 and EQ6 are similar in this respect.



## 6 Super tuning the Synta / Skywatcher EQ6 / Orion Atlas

This procedure is an addendum to the main strip down guide in Sections 1 to 5 and will guide you towards Super-tuning the mount to get better results. This guide needs to be read in conjunction with the main strip down guide and shows how to get better tuning with the RA and DEC worm gears by using additional shims to set the worm gear to worm roller more accurately.

This guide also includes a shim calculator so you can automatically calculate the shim sizes required when rebuilding.

**Notes:** I am going to break with convention for super tuning in this guide and **NOT** replace the main bearings. Much discussion about these has taken place in various guides and forums but the fact is the main bearings are perfectly adequately engineered for a mount like the EQ6. The only bearings I changed in this guide were worm roller end shaft bearings because these are generally pretty poor quality from the factory. The other bearings are more than adequate as the mount does not need high speed bearings and ceramic bearings are prone to potential problems in cold weather.

The super tuning element is concerned with the setting of more accurate worm gear alignment. Its assumed if you are carrying out this process you will have carried out all steps for improving the mount in the strip down and rebuild guide with regards to cleaning and deburring components and replacing the factory lubricant with a lithium type grease.

The EQ6 mount used for this guide was a new model and was probably manufactured around 2009. The overall machining was far better than on the earlier mount used for the strip down guide and engineering tolerances were significantly better. The mount showed a better-quality lubrication although it was almost dry in places and a generally 'cleaner' level of engineering with none of the swarf and dreck found in the earlier generation Synta mounts I have disassembled.

### Replacement parts required for this guide:

The only parts acquired for this guide were the worm roller end shaft bearings and some additional shims. Details of these are as follows along with a complete bearing list if you find any of your bearings have been damaged or are unfit for use.

### **Shims**

Pack of Delrin shims in assorted sizes. These can be acquired from;  
[skygazer@kennaquhair.com](mailto:skygazer@kennaquhair.com)

### **Bearings**

These are fairly standard bearings and can be acquired almost anywhere. Mine were acquired from ebay relatively cheaply. A complete list is supplied for your information although for tuning only the worm roller end shaft bearings are worth replacing in my opinion. There are very many manufacturers of bearings, SKF bearings are relatively common in the market place and these were used. Other manufacturers part codes may differ slightly - if in doubt check with your supplier.

Qty	Application	Manufacturer	Product Code	Replaced in this Guide
4	Worm Roller End Shaft Bearings	SKF	608 2RSH	YES
6	Main Shaft Bearings (3 per axis)	SKF	6008 2RSH	NO
1	DEC Shaft Taper Bearing	SKF	30206 J2/Q	NO
1	RA Shaft Taper Bearing	SKF	32208 J2/Q	NO

### Tools required for this guide:

In addition to the tools required to do the mount strip down for super tuning you will also require the use of digital callipers. These can be acquired readily at reasonable prices from sources such as Ebay for around £20.



# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby

## 6.1 Shim Setting/Calculations



Here is all the equipment ready for work. Emery cloth, replacement bearings, Delrin shims, digital caliper and of course lithium grease.



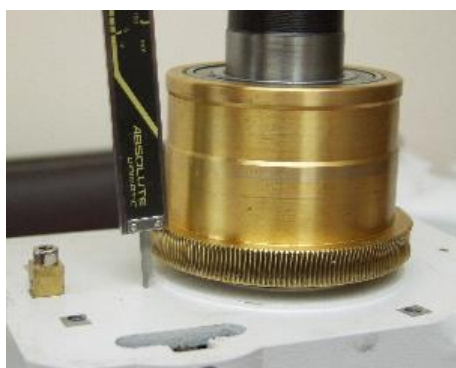
This is a picture of the replacement worm roller end shaft bearings. These are superior quality to the ones that the factory fit to the mount.

**Note:** These are supplied un-lubricated so require the seals to be gently pried away with a very thin screwdriver and the bearing to be lubricated with the lithium grease before replacing the seals.



During rebuilding of the DEC and RA axis before reassembly commences place the original factory Teflon washer onto the face plate and then place the worm gear onto the main shaft as in this picture.

**Note:** This is the same procedure for both the DEC and RA axis. Measure the distance from the top of the worms gears face to the face of the mount.....



.....Here is the measurement in close up. From the top of the gear teeth of the worm bearing to the face of the mount. Obviously when you do this the digital caliper must be square to all faces. Make a note of this measurement which we shall call 'A'



Now measure the depth of the worm gears machined teeth and make a note - this is 'B'



MEASUREMENT 'A'

MEASUREMENT 'B'

Centre of Worm Gear from Mount Face is 'F'  
Calculated by:-  $F = A - (B / 2)$

Measurements 'A' and 'B' are used to calculate the center of the worm gears teeth from the mount face. This is achieved using the simple calculation above. The result of this calculation is measurement 'F'.





# STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby

Replace the worm roller end shaft bearing into the worm carrier having first made sure it is suitably lubricated with lithium grease.

Measure the distance between the edge of the worm carrier and the inside of the worm shaft end bearing. This will be a measurement 'C' make a note of this.

Finally measure the width of the worm roller end shaft, this will be measurement 'D'. Make a note of this.



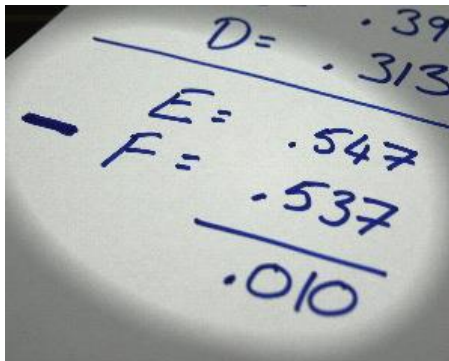
MEASUREMENT 'C'



MEASUREMENT 'D'

Centre of Worm Roller End Shaft to Edge of Worm Gear Carrier is 'E'

Calculated by:-  $E = C + (D / 2)$



Measurement	Values
A	0.000
B	0.000
C	0.000
D	0.000
E	0.000
F	0.000
SHIM	0.000

Measurements 'C' and 'D' are used to calculate the center of the worm rollers teeth from the base of the worm carrier. This is achieved using the simple calculation above. The result of this calculation is measurement 'E'.

Now Simply Subtract **F** from **E** and you have the shim size required.

**Note:** Sample data from 2 other EQ6 Mounts is given in the tables below to give you some idea of what sorts of numbers you should be seeing.

Enter your **A, B, C, D** measurements into this table to calculate the correct shim to place between the worm gear and the bearing face.

**Note:** When you click **SUBMIT** the page will reload and you will need to scroll down to the table to see the result.



Replace the gear ready for assembly with the correct sized shim washer from your calculations.

**Note:** If the original Teflon washer from the factory is badly worn you can replace it with a similar sized washer **OR** simply carry out your measurements with **NO** washer in place and then use the appropriately sized Delrin shim washer from the measurements and calculations

### POINTS ARISING....

You **MAY** find after rebuilding that the DEC is either loose and can be pushed up and down **OR** that there is a gap between the DEC scale/collar and the mount. This is a possible sign that you either have too much shim or not enough. Read the notes below for more detail. You should also refer to the EQ6 Case Study guide for shim washer considerations at the bottom of the page [HERE](#)

Finally, you need to carry out worm tuning as per the EQ6 Strip Down and Rebuild Guide, Section 5

### Observations:

The EQ6 used to create this guide actually needed no shims applied to the RA axis as it was perfectly well set-up, the large amount of play in the RA axis was tuned out just through a rebuild and re-lubrication and careful setting of the worm gear during the worm tuning stage.

The DEC axis however was rather challenging and this is described with pictures below.....



## STRIPPING/REBUILDING THE SYNTA EQ6 MOUNT

by Astro Baby



The DEC shim size for the mount rebuilt in this guide was actually a negative number. Even the factory shim was (at least by calculation) too large. The mount was originally rebuilt with no shim at all however this produced a problem whereby pressing on the weight bar collar as in the picture above.....



Produced a noticeable rise in the DEC axis visible by a gap appearing in the area indicated by the point of the pencil in the photograph. Successive rebuilding of the DEC axis produced variable results including a .010 space opening in the DEC collar where the pencil is pointing.



In the end I settled for a .010 shim which although technically too large did, with sufficient tuning produced a mount which would run without motor stall or play.

What this problem indicated to me was that to some extent these mounts need a sympathetic tune rather than a strictly scientific one. It can often be an art more than a science and requires a certain 'feel' to weigh up whether a shim is too much or too little. If you are facing this kind of problem after super tuning read the shim washer considerations at the end of the EQ6 Case Study [HERE](#)

The mount used in this guide was over time tuned to a much higher degree than when it left the factory and after the stages described in the EQ6 strip down and rebuild guide and the super tune guide it operates far more quietly with no play in either axis.

### Thanks

My thanks to all the people who have encouraged me to create this guide and who have offered help and support in the making of this guide.

You know who you are and you have my gratitude.