



STRIPPING/REBUILDING THE SYNTA HEQ5 MOUNT

by Astro Baby



There seems to be a lack of manuals for the HEQ5 online as regards stripping the mount down, cleaning and lubricating etc. This is my effort at providing a comprehensive and easy to follow guide for the HEQ5. The HEQ5, HEQ5-Pro and Sirius EQ-G are the same basic mount - the only difference is the GoTo versions with the motors, the power board, the main board, the handcontroller and the cosmetics. The strip down procedure will be identical.

I found on strip down mine had a reasonable quantity of manufacturing debris left inside - this became noticeable after a GoTo upgrade with the motors stalling and the mount sticking.

If your mount performs relatively well but suffers only from motor stall then before stripping down the mount you should try the 'adjusting the worm engagement' part of this guide.

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STRIPPING/REBUILDING THE SYNTA HEQ5 MOUNT

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1 - Synta HEQ5 - Stripping & Cleaning the Declination (DEC) Axis

This procedure will guide you in stripping down and cleaning the HEQ5 Declination axis. Re-assembly of the Declination axis is covered [HERE](#).

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. Its 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 2 hours from top to bottom unless you are very confident of what you are doing and have exactly the right tools. Its 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 dont 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.

Stage 1 - Stripping the Dec Axis



Remove the silver Phillips screw in the declination lock lever.



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



Remove the brass declination lock bolt. You may need to use a small spanner or pliers to loosen it.



Remove the small 'button' if this didn't come out with the lock bolt. If you cant get this out don't worry it can be removed at a later stage.



Unscrew the 6 Phillips screws around the plastic motor cover.



Remove the motor cover and lay it aside with its screws.



Loosen the 3 set screws in the dovetail carrier. These are located closest to the dovetail.



Remove the dovetail carrier. You may have to twist it back and forth and gently rock it off.
Note: You can at this point remove the counterweight bar by pushing it up and out of the DEC axis after removing the knurled safety nut on the end.



Loosen the deep set screws in the Declination barrel. On my mount these screws do not hold anything as the barrel is a single piece of machined metal. But some mounts are two piece.



Unscrew and Remove the round 'nut' at the top of the Declinationshaft. You can use either a pair of Allen keys, two small Phillips drivers or a pair of strong snipe nosed pliers as shown here. At this stage you may be able to remove the Declination barrel if its in two pieces (mine appears to be a single piece) . If not don't worry and carry on - it will be freed up later.



Loosen the three set screws in the counterweight collar.



Unscrew the counterweight collar. It may be quite tight.



Remove the tapered bearing behind the counterweight collar. Mine showed very little lubrication as can be seen here.



Remove the Declination scale from the counterweight collar. If the mount is to be GoTo apply a small smear of grease otherwise clear any grease from the collar.



Loosen the worm adjustment set screw located just in front of the power panel. This will need to be loosened a lot.



Loosen the opposing worm adjustment set screw opposite the screw on the previous step - as shown above. This will also need to be slackened off a lot.



Remove the three cap head bolts. They are usually silver coloured located on the top of the worm carrier.



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.



Slide out the Declination shaft and set it aside. On my unit the Declination barrel refused to budge from the main shaft - this isn't important.

Note: If you had been unable to get the lock lever 'brass button' earlier - it will now be easy to remove from inside the Dec barrel.

Remove the brass Declination gear carefully.

Take care to note and remove the small clear washer and remember to replace it later.



Remove the worm drive carrier.



Remove the roller bearing from the main housing. My bearings showed poor lubrication from the factory.



Remove the two roller bearings from the Declination gear. The gear showed swarf contamination from the manufacturing process in my mount.

Stage 2 - Stripping the Worm Carrier



Remove the brass drive gear from the end of the worm. This has two set screws and may need to be pulled off using some blunt nosed pliers on its central raised area NOT on the teeth.

Do not lever this off as it can be easily damaged.



The worm is held into the carrier by two 'float' adjusters. These require a special tool BUT can be removed by using a pair of small screwdrivers. Insert the drivers into the small slot and rotate using even pressure. Remove only ONE of the float adjusters.



Remove the worm itself. You will notice it has two small bearings, these can be removed. One of the bearings is shown in the picture in the bottom right hand corner.

Note the worm adjustment set screws. You will need to adjust these at the end of re-assembly.

Stage 3 - Cleaning & Lubrication



With a clean lint free cloth now wipe all the oil from the components. On my 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 relubricated 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 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 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 picture to the left shows all of the gears and bearings cleaned and awaiting lubrication and re-assembly.

That completes strip down of the Declination Axis. If you wish to go to the re-assembly guide click [HERE](#) or go back to the main page [HERE](#)





STRIPPING/REBUILDING THE SYNTA HEQ5 MOUNT

by Astro Baby

2 - Synta HEQ5 - Lubrication & Re-Assembling the Declination (DEC) Axis

This procedure will guide you in re-assembling the HEQ5 Declination axis and follows on from the stripping down and cleaning guide [HERE](#).

NOTE 1: 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 2: 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.

Stage 4 - Re-assembling the Worm Carrier



Lubricate the small roller bearings and replace them

on the worm, then replace the worm in its carrier.

Note: the worm has a longer spindle one end than the other. The longer end goes to the motor gear.



Replace the float adjuster and tighten down. The adjuster should be just tight enough to stop the worm moving from left to right in the carrier but not over tightened. If its too loose there will be 'play' in the mount, if too tight the mount may 'bind'.



Here is the assembled worm carrier. Its been cleaned and loose flaky paint removed.

You can see the worm now has a thin coat of lithium grease.

Note: The motor gear can be reattached now or left until later. The motor gear must have one of its set screws on the flat portion of the worm spindle.

Stage 5 - Re-assembling the Declination Axis



Replace the bearing in the main housing. Apply a thin layer of lithium grease to its surface.



Reassemble the brass worm gear with its bearings (you may need to tap these in with a nylon mallet) and replace the assembly onto the Declination barrel and shaft. Apply a thin layer of lithium grease to the gear and all bearing faces.

You can also see in this pic the main housing bearing has had lithium grease applied to its bearing face.



Replace the round nut in the Declination barrel. Tighten down using the long nosed pliers or a pair of small screwdrivers.



Tighten down the 3 deep set screws on the Declination barrel.



Replace the worm carrier onto the Declination shaft. Replace the clear washer on top of the brass gear. Its almost invisible in the picture above.



Slide the declination shaft back into the main housing.



Replace the tapered bearing at the bottom of the main housing after lubricating it with lithium grease. **Note** If this wont push all the way in dont worry. As long as there is some thread showing on the Dec shaft for the counterweight collar.



Replace the Declination scale on the counterweight collar.



Replace the counterweight collar. Tighten this down using only hand pressure. Tighten it as far as it will go and then back off until the counter-weight lock lever is in line with the Declination lock lever.

Note: The threads on this part of the mount can be very stiff - I applied a small squirt of WD40 to ease the threads a little.



Tighten the 3 set screws in the counterweight collar.



Replace the cap head bolts (normally silver coloured) with just enough pressure to hold the worm carrier in place. Make sure the carrier is lined up with the mount.

Note: The worm engagment will need to be adjusted this is covered in the guide [HERE](#).



Replace the Declination lock 'brass button'.



Replace the Declination lock bolt. Apply a coat of lithium grease and hand tighten down.



Replace the counterweight bar into the Declination axis.

Replace the Declination lock lever and make sure it is free to move to both lock and release the declination axis.



Replace the dovetail mounting. Make sure the locking screws for the telescope dovetail bar are opposite the Declination lock lever.

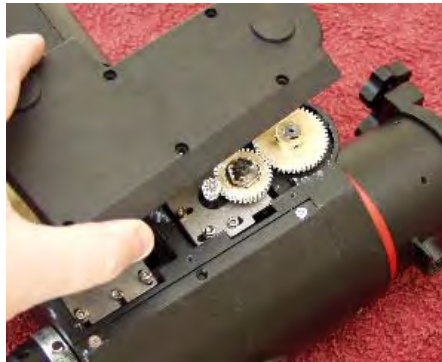
Replace the silver Phillips screw in the Declination lock lever.



Tighten down the dovetail holders 3 set screws.

At this point you will need to adjust the worm/motor engagement. This procedure is covered [HERE](#).

When worm/motor engagement has been completed proceed to the final step of replacing the motor covers.



Replace the plastic motor cover.



Replace the 6 Phillips screws in the motor cover.

The Declination axis is now completed. If you wish to strip and adjust the Right Ascension axis go back to the main page [HERE](#)





STRIPPING/REBUILDING THE SYNTA HEQ5 MOUNT

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3 - Synta HEQ5 - Stripping & Cleaning the Right Ascension (RA) Axis

This procedure will guide you in stripping down and cleaning the HEQ5 Right Ascension axis. Re-assembly of the RA axis is covered [HERE](#).

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. Its 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 2 hours from top to bottom unless you are very confident of what you are doing and have exactly the right tools. Its 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 dont 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.

Stage 1 - Stripping the RA Axis



Remove the polar scope cover.



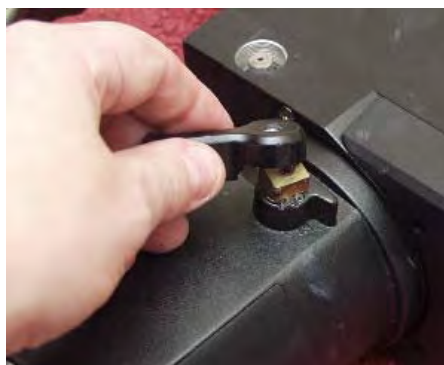
Remove the polar scope. You may need to grip it with a wrench - if so wrap a cloth around the polar scope to protect it. Alternately use some masking tape to protect the scope.



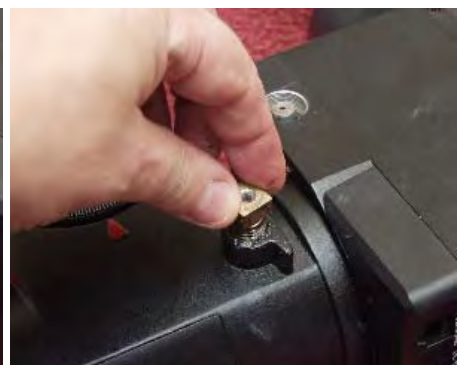
Once loosened simply unscrew the polar scope and place it somewhere safe.



Remove the silver Phillips screw in the RA lock lever.



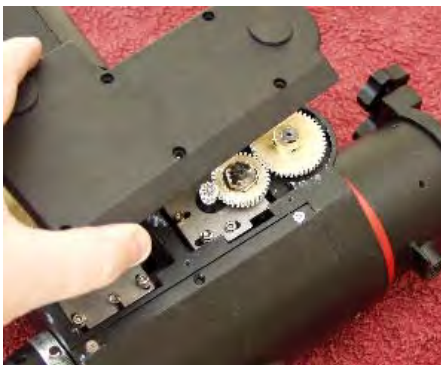
Remove the lock lever. You may need to prise this up by using the tip of a flat bladed screwdriver and gently twisting the tip - see the Declination strip down procedure for a picture of this.



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.



Unscrew the 6 Phillips screws around the plastic motor cover.



Remove the motor cover and lay it aside with its screws.



Slacken the two lock screws on the polarscope mounting plate.



Now remove the polarscope mounting plate by unscrewing it. You can use either some snipe nosed pliers to locate into the holes OR a pair of small/medium Phillips screw drivers or similar OR a pair of small Allen keys.



Loosen and remove the RA setting circles lock nut.



Now remove the RA setting circle. It should just slip off.



Loosen the three lock screws set around the large circular aluminium nut.



Unscrew and remove the circular nut. You may need a wrench to do this - if so be careful of the polar-scope mounting plate threads. Alternately use a pair of flat bladed screwdrivers or similar to apply even pressure using the slots in the nut - **do this with care**. Once removed observe the tapered bearing. It may come out at this point - if not it can be removed easily after the following step.



Remove the main RA Unit (right) from the base (left).

The Alt-Az base contains a bearing which will most likely not remove easily. Leave it *in-situ* but clean the bearing and the Alt-Az internal area and grease the bearing face with lithium grease.

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.



Remove the tapered bearing from the polarscope end of the RA axis.



Here's the RA axis removed - naturally it also has the DEC axis as part of it. Note the red washer on top of the worm gear. Make sure this is kept safe and is replaced during re-assembly.



Unscrew the power panel. Its attached using two Phillips screws.



Shift the power panel slightly. Be careful not to pull too hard as it has wires which connect to the main board inside the RA main housing.



Loosen the worm engagement set-screw located behind the power panel.



Loosen the worm engagement set screw opposite the power panel and above the Declination scale.



Remove the 3 cap headed bolts (silve coloured) from the worm carrier.



Remove the worm carrier..



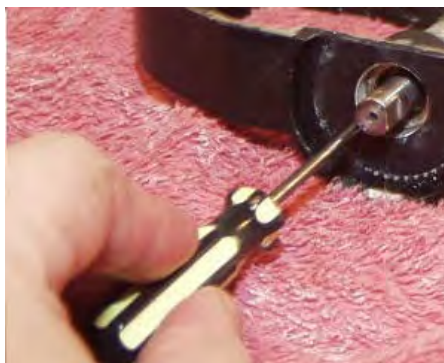
Remove the brass worm gear making sure the small red washer is kept aside.



Remove the roller bearings from the brass worm gear. They should slip out easily.



Stage 2 - Stripping the Worm Carrier



Remove the brass drive gear from the end of the worm. This has two set screws and may need to be pulled off using some blunt nosed pliers.

Do not lever this off as it can be easily damaged.

The worm is held into the carrier by two 'float' adjusters. These require a special tool BUT can be removed by using a pair of small screwdrivers. Insert the drivers into the small slot and rotate using even pressure. Remove only ONE of the float adjusters.

Remove the worm itself. You will notice it has two small bearings, these can be removed. One of the bearings is shown in the picture in the bottom right hand corner.

Note the worm adjustment set screws. You will need to adjust these at the end of re-assembly.

Stage 3 - Cleaning & Lubrication



With a clean lint free cloth wipe all of the oil from the components. On my 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 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.

The picture to the left shows the brass worm gear and its roller bearings and the steel worm. The motor gear, brass RA lock nut and small roller bearings from the worm assembly aren't shown.

That completes strip down of the Right Ascension axis. If you wish to go to the re-assembly guide click [HERE](#) or go back to the main page [HERE](#)





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4 - Synta HEQ5 - Lubrication & Re-Assembling the Right Ascension (RA) Axis

This procedure will guide you in re-assembling the HEQ5 Right Ascension axis and follows on from the stripping down and cleaning guide [HERE](#).

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 2: 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 syntehtic like Teflon or PTFE. It is best to consult the manufacturer on the quality of the product.

Stage 4 - Re-assembling the Worm Carrier



Lubricate the small roller bearings and replace them on the worm, then replace the worm in its carrier.

Note: the worm has a longer spindle one end than the other. The longer end goes to the motor gear.



Replace the float adjuster and tighten down. The adjuster should be just tight enough to stop the worm moving from left to right in the carrier but not over tightened. If its too loose there will be 'play' in the mount, if too tight the mount may 'bind'.



Here is the assembled worm carrier. Its been cleaned and loose flaky paint removed. You can see the worm now has a thin coat of lithium grease.

Note: The motor gear can be reattached now or left until later. The motor gear must have one of its set screws on the flat portion of the worm spindle.

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. Apply lubrication to the brass gears.



Place the brass gear back onto the RA shaft and place the washer back to the top. Note the brass gear has a layer of lubrication on its gears and on the bearing face.



Replace the assembled worm carrier and replace cap headed screws but only just tight enough to hold the worm carrier in place.



Remount the Alt-Az base of the mount to the RA axis - make sure the roller bearings faces are given a smear of lithium grease.



Replace the tapered bearing after making sure it is clean and has been well greased with the lithium grease.



Replace the round slotted nut and tighten. This needs to be not much more than hand tight. Make sure that it is compressing the tapered bearing into place. Check slack in the RA axis and if it binds too much then slightly then loosen this nut.



Tighten down the locking screws located in the slots of the round nut.



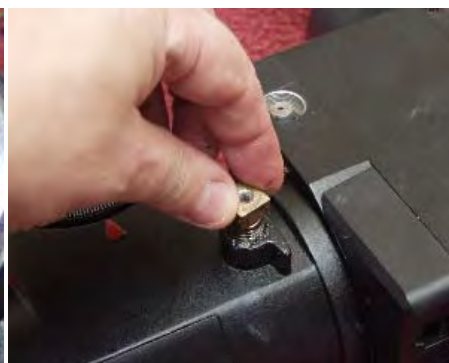
Replace the Right Ascension scale and set-screw.



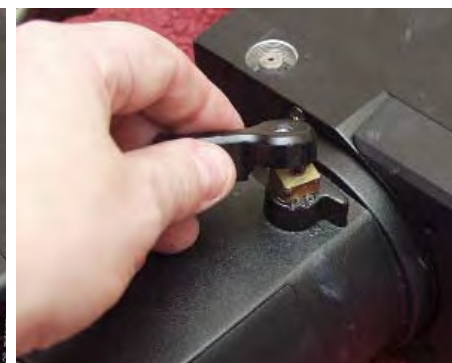
Replace the polarscope base plate. Don't over-tighten.



Tighten down the small set screws in the polarscope mounting plate.



Replace the RA brass button and lock nut and make sure its has been lubricated with lithium grease.



Replace the RA locking lever and make sure it is free to lock and release the axis.



Replace the RA lock lever screw.

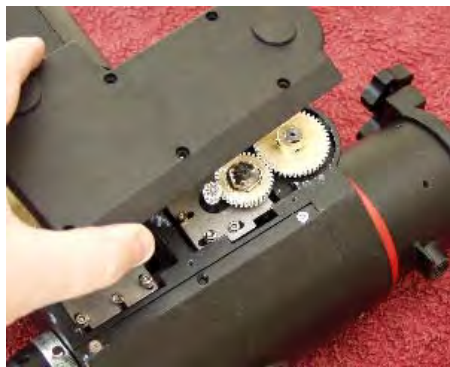


Replace the polarscope.

You will now need to replace the motor gear on the worm spindle if you omitted that step earlier.

The power cover has not been replaced as you will need it off to carry out the adjustment to the worm/motor engagement. This procedure is covered [HERE](#).

When worm/motor engagement has been completed proceed to the final step of replacing the motor and power covers.



Replace the plastic motor cover.



Replace the 6 Phillips screws in the motor cover.



Replace the polarscope cover.
The polarscope will require recalibrating.
See my polar alignment guide [HERE](#)

The Right Ascension axis is now completed. If you wish to strip and adjust the Declination axis go back to the main page [HERE](#)





STRIPPING/REBUILDING THE SYNTA HEQ5 MOUNT

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5 - Synta HEQ5 -Worm / Motor Engagement for RA and DEC Axis

This procedure will guide you in setting up the HEQ5 worm engagement and also aligning the motor gears after the Declination and Right Ascension reassembly. These steps are best carried out with the HEQ5 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 times 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.

Worm Engagement for DEC Axis



Loosen the DEC axis worm carrier three 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.



Remove the motor cover and check that the motor gears can easily move the axis by manually turning them by hand or using the mounts motors.



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

At this point return to the [DEC Assembly Guide](#) or simply replace the Motor Cover.

smooth motor running.

Worm Engagement for RA Axis



Loosen the RA worm carriers three 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.....

Note: You will have to remove the power panel to get axis to the upper RA set screw. The panel is retained by two Phillips screws.



.....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



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 tighting a little each time until fully tight.



Remove the motor cover and check that the motor gears can easily move the axis by manually turning them by hand or using the mounts motors.



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.

At this point return to the [RA Assembly Guide](#) or simply replace the motor cover and the power panel using the Phillips screws.

Take care when replacing the power panel not to trap any wires.

End Float Adjustment



Remove the soft rubber covers to reveal the end of the worm shaft and float adjuster.



Loosen the float adjusted using either a small jewellers screwdriver or a small allen key to locate into the adjusters slots. You should feel the some play in the axis. Now tighten the float adjuster down until any play disappears. The float adjuster should be in contact with the worm bearing but not overtight or else the axis will 'bind'



Replace the rubber worm float covers

Motor Gear Adjustment



The HEQ5 Motor gears should all be flush with each other as shown in the picture to the left. The gears should be closely fitted but not pressed together too tight to prevent excessive gear wear.

REMEMBER one of the gear set screws must be against the flat of the worm spindle.

The gears in my mount are liberally coated with Lithium grease to reduce wear and also to muffle running noise.

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6 - Synta HEQ5 -Adjusting the Altitude Motion

My own HEQ5 suffered from excessive play in the altitude bearings. Even with the altitude bolts done up tight the mount could still rock slightly to and fro. Heres how to eliminate play the altitude bearings of the HEQ5/Sirius mount.

Setting the altitude thrust bearings



Remove the latitude scale from the mount. This can be removed using a sharp craft knife to prise it away from the mount, Mine came away quite easily but they can be very tough to remove.

Behind the RA scale you will see a large bolt which holds the mount to the altitude unit. Around the bolt are three Allen headed set screws. Turn each of these a 1/4 turn until the play in the altitude goes away.

Replace the RA scale using a few small drops of Superglue. You may want to use a spirit level to ensure the scale is as accurate as possible.

WARNING - you can easily damage this beyond repair so exercise judgement and due caution.

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EQ6 / NEQ6 / HEQ5 Development & Software Release History *by Astro Baby*

1-Introduction

The Synta/Skywatcher/Orion Series of Equatorial Mounts have been around a considerable period of time. In an effort to capture a little of the history I have created this potted history from web research. Dates where unknown are stated as such. Information was gleaned from Syntas own history and various web research.

As far as I know dates given are accurate but there may be discrepancies especially between country release dates for earlier mounts.

2-Release Dates and Versions of Mount Hardware

Below is a potted history of the EQ6 and the HEQ5. You should note that due to the long supply chains and local stock situations some older mounts were being shipped at various times and also some versions appear slightly different even from the factory.

The most easily visible differences in the mounts are the polar scope illuminators. No two mounts ever seem to be the same with some having very bright LEDs and some having very dim ones. Some of the earlier versions have a dimmer control (EQ6 Only) set into the side panel.

Mounts manufactured after 2008 are, based on my own experience, better in many respects. The overall Quality Control (QC) seems better. Older mounts were often loaded with a dreadful lubricant. Even later mounts may suffer under lubrication and poor overall tuning. All mounts can be improved by careful tuning and older ones improved by cleaning out the factory lubricants and replacing with a modern lithium grease.

The EQ6/NEQ6 and HEQ5 broadly comprise of three main units; The motors; the motor control board and the handset (the HEQ5 has two internal boards one for the motors control and one for the power input the two boards are identical in function to the single board in the EQ6).

All of these are replaceable. The GoTo and Syntrek versions are identical as far as the mount hardware goes the only difference being the hand controller while the non-GoTo versions use different motors and motor control boards. These are removed and replaced during a GoTo upgrade.

Early version mounts up to Early 2006 were shipped with version 1 or 2 handsets. These are non software upgradeable.

2001 (Spring)	First version of EQ6 Released. Tracking motors only. Rated payload for the EQ6 is 25kg.
2001 (Fall)	First version of HEQ5 released. Tracking motors only. Rated payload for the HEQ5 is 15kg.
2004	First version of Synscan released. Version 1 and 2 handsets are non-upgradeable.
Early 2006	First version 3 handsets start to ship with GoTo (Pro) models. These feature flash upgrade options. A full listing of software updates is given below.
Dates unknown	Across the mounts development period some mounts feature slightly different features. Users had complained that early mounts had too bright an LED in the polar scope. Some mounts were supplied with a very reduced power LED while some other mounts feature a small rotary control that allows for variable LED power/dimming.
Date Unknown	Syntrek versions appear. These have the same mount internals as the GoTo (Pro) version mounts but are not supplied with the GoTo handset. The GoTo functionality can be supplied via PC with third party add-ons. The Syntrek version may have only become available in 2008 with the roll out of Synscan Version 3.21 which allowed support for external serial commands to the Motor Control Board.
2008 (May)	First NEQ6 versions of the EQ6 start to appear. These are initially supplied ONLY with the 300P telescope tube. First versions feature only an extended weight bar to help balance the 300P tube. Internals are identical to EQ6 versions. No data on Motor Board and some NEQ6s reported to have Version 1 MCBs (this is not validated).
2009	Some mounts appear using an upgraded Motor Control Board (version 2). Version 2 Motor Control Boards allow for software dimming of the polar scope LED via the GoTo handset which combined with version 3.27 Software.
2010/2011	NEQ6 Mounts start to appear sold as EQ6s. Most have just the extended weight bar, a few start to appear with dual saddle plates which can be swapped out between a Vixen and a Losmandy Plate - this is a physical changeover rather than a dual plate and requires the user to remove the plate from the mount and replace it with the alternate plate.
Various	Across this period NEQ6 and EQ6 are often identical in everything but name plate although the NEQ6 always ships with a longer weight bar. All internals are identical. Some mounts ship with just a Vixen saddle, some with the kit which allows the saddles to be swapped and others with dual saddle plates which can accommodate either dovetails style.
Mid 2011	All EQ6 Shipments are now of the NEQ6 version. This version features a single saddle plate which can accommodate either a Vixen or a Losmandy dovetail. All other specifications identical to later EQ6s.



An EQ6 / NEQ6 Pro alongside a standard HEQ5. Pro versions with GoTo are mostly white while the non-GoTo versions are most usually black. Weights for the mount head are given.

Note: This applies only to European versions. American versions with the Orion Brand are often black even when GoTo equipped.

3-Synscan Software Releases (most recent first)

Version 3.28 BETA - Release Date circa 31st March, 2012

BETA TEST VERSION OF 3.28 **NOT** the official SynScan EQ official firmware release.

A new feature of Polar Re-alignment is added under Alignment sub-menu of the hand control in the firmware.

This is an 'any star' polar alignment routine.

Version 3.27 - Release Date 6th January, 2010

1. Fix the bug in the SAO catalog regarding disabling the key- pressed slewing

Problem: Unable to drive and slew the telescope with the directional keys after browsing the SAO catalog.

Result: The directional keys are properly activated after browsing the SAO catalog.

2. Fix the bug in the User Object coordinate editing.

Problem: In the User Object function, under RA-Dec format, when the user enters an object with a declination angle between 0 and -1 degree the value becomes positive after the coordinates are saved. This causes GoTo pointing inaccuracy.

Result: The user-entered coordinates are saved properly.

3. Fix the error in the database of NGC, IC catalogs.

Problem: In the NGC and IC catalogs, the coordinates of the objects located between 0 and -1 degree in declination always read as positive. This causes GoTo pointing inaccuracy.

Result: The coordinates are read as their true values.

3.27 also supports a polar scope dimming feature from the UTILITIES menus of the handset if the mounts Motor Control Board is version 2 or above.

**** This was not in the Synscan documentation.**

Version 3.25 - Release Date 24th June, 2009

1. Fix the bug existed in the Time Zone Setting

Problem: Unable to save the data entered by using the scroll-down key.

Result: Now the user is able to enter the data by pressing either the scroll-down and scroll-up key.

2. Fix the bug existed in the PAE Function

Problem: Incorrect data calculation occurred when the RA axis of the telescope (AX2) was pointed at a negative angle.

Solution: Now the PAE functions properly when the RA axis (AZ2) is pointed at a negative angle.

Version 3.24 - Release Date 26th January, 2009

1). Fix bugs in firmware version 3.23

Now the hand control setting will remain upon power up, after the PAE function was performed.

2). Improve LED and LCD backlight performance.

Version 3.23 - Release Date 30th July, 2008

1. Fix bugs existed in firmware version 3.22

Now tracking mode is deactivated automatically when the goto object selected is an user-defined alt-azimuth position.

2. Fix bugs existed in firmware version 3.22

Now the hand control will not lock up when the user chooses to advance directly to the Show Position option, skipping the initial alignment procedure.

Version 3.22 - Release Date 5th June, 2008

1. Add SAO submenu in Object Catalog.

The total number of objects in database increased to 42,900.

2. Enhance Show Position Function: display telescope current position by RA/Dec, AZ/ALT or motor drive readings of both axes.

The data display is accurate to one arc seconds.

3. Add precession compensation in coordinates calculation.

4. Additional information such as the rise, transit and set time of an object is available when browsing the information for an object.

If a selected catalogue object is currently below horizon, the hand control will prompt "Below horizon!" for two seconds to notify user.

5. Improve "PC Direct Mode" function and fix the directional key lock out problem in "PC Direct Mode".

Version 3.21 - Release Date 4th January, 2008

1. Smoother response to manual guiding and PC based autoguiding command.

2. "PC Direct Mode" added.

It allows the PC to communicate directly with the motor controller via RS-232C connection.

The RS-232C port of the PC should be configured as 9600bps, 1 start bit, 8 data bits, 1 stop bit, no parity check and no flow control.

Activate "PC Direct Mode" under "Utility\PC Direct Mode>".

Press the "ESC" key to exit. The 4 direction buttons and rate controlling function operate as usual under this mode.

This feature is also designed for future applications.

Version 3.20 - Release Date 16th November 2007

Improved the planet orbital calculation and fixed the inconsistent Double Star and Variable Star Catalogs.

1. The time zone setting has been changed to more precise in minutes for locations with half hour definition.

For example, if you live in a region with -3.5 hours of time zone, the setting will be -03:30, indicating minus three hour and thirty minutes.

2. The planets' orbital calculations have been enhanced

based on "Keplerian Elements for Approximate Positions of the Major Planets",

published by NASA Jet Propulsion Laboratory. The calculation data are available and reliable from 1800 AD to 2050 AD.

Most of the calculation precision will be within one arc minute and others such as Jupiter and Saturn will be within a few arc minutes.

3. The Identify function has been improved to be able to identify planets.

4. The inconsistency in Double Star and Variable Star database while scrolling the list has been corrected.

5. In the SETUP menu, we add a Factory Setting function under the SETUP menu.

You may choose to reset the settings to the default settings. Restarting the mount (switching off the power and turning it back on) is required afterward.

Note: All the settings of Longitude, Latitude, time zone, daylight saving, backlash, PEC data, PAE data and previous alignment data will be deleted, except for the user defined object coordinates.

Version 3.12 - Release Date 13th March, 2007

1). More options available for alignment star selection

Auto select or manual select, and alignment stars sorted by magnitude or alphabet. See "Alignment Stars" under submenu "SETUP".

2). "Clear PAE data" added under "Utility".

3). Three parking positions available:

a. HOME +90 degrees (Northern Hemisphere) or -90 degrees (Southern Hemisphere) in DEC.

b. Current Position Park the scope at currently position.

c. Custom Position Slew and park the scope to the previously saved parking position.

To save a parking position, choose one of the above parking positions under Utility-Park Scope, then turn off the power.

(ESC to cancel and escape from the Utility menu.) If there is a parking position stored in the system, SynScan will prompt "Start from park position?" at power up.

4). IMPORTANT!! Re-enter the Time Zone data on your hand control after installing the V3.12 firmware.**Version 3.11 - Release Date 17th January, 2007**

1. Firmware version and warning message displayed at power up, before the Initializing message.
2. Daylight saving setup required throughout the year instead of just in summer.
3. The hand control displays hour angle and clock position of Polaris after location, date and time are entered.
4. Fix default backlash retrieving bug and set the default backlash as 0°02'00" when the hand control is powered up for the first time.
5. Fix bugs in PEC Training and PEC replaying.

Version 3.10 - Release Date 15th November, 2006 (First version for the V3.0 Handcontroller)

1. **GPS function added.**
The SynScan hand control automatically retrieves Longitude, Latitude, and Universal Time for initial setup when the SynScan GPS is in use.
2. **Criteria for alignment star selection implemented in the software.**
The star alignment list contains only the appropriate stars for the time, location, and star alignment method selected.
3. **Automatic backlash compensation when under PC control or slewing using directional keys.**
4. **Adjustable beeper volume under SETUP menu -- HANDSET SETTING.**
5. **PAE function accessible from the UTILITY menu.**
6. **Temperature and Power Voltage display under UTILITY menu -- SHOW INFORMATION.**
7. **Bugs reported in the 3.01 firmware fixed.**

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