

Hubble Optics Ultra Portable UP 12 Dobsonian instruction manual

Revision: 1.1 10-07-2018

Please read these instructions thoroughly before beginning assembly and subsequent use of the telescope.

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WARNING: Never look at the sun with your telescope without a professionally made solar filter. Permanent eye damage or blindness could result. Eye damage is often painless, so there is no warning until it is too late. Children should not be allowed to handle the telescope. Avoid using the type of solar filter that screws into an eyepiece. They are susceptible to cracking under the intense heat that builds up near the focus point, and could cause severe retinal damage. Use only the type of solar filter that covers the front of the telescope. Also, be sure to leave the cover caps on the finder scope when solar observing. Better yet, remove the finder scope altogether when viewing the sun.

1. Unpacking

The telescope is packed in two shipping boxes, as described below. We recommend keeping the original packaging for the future usage.

Make sure all the parts in the Parts List are present. Be sure to check carefully, as some parts are very small. If anything appears to be missing or broken, immediately email Hubble Optics for assistance.

Box #1, The UP12 main structure

| Quantity | Description |
|----------|---|
| 1 | Mirror Box/Rocker/Ground board |
| 1 | Upper Cage with Focuser L bracket (with 2 M5 x 16 screws) |
| 1 | Secondary mirror with the diagonal holder |
| 1 | Safety Cage Ring |
| 1 | 2" 10:1 dual speed focuser |
| 3 | Plastic feet with wing nuts |
| 4 | M6 knob screws (20mm long) with wingnuts for the truss tube and upper ring connection |
| 8 | M6 knob screws for the truss tube and mirror box connection |
| 1 | Magic nylon tape to hold the sling |
| 3 | Brass wire to evenly separate cell support bars |
| 1 | Stainless Steel Cable Sling |
| 6 | Mirror Cell Protection Pad |
| 4 | Nylon Strip to tie the mirror box to the rocker when needed |
| 2 | M5 x40 Socket Head bolts and nuts for the virtual balance |
| 1 | M6 plastic wrapped anchoring bolt |
| 2 | Rubber Bands for the virtual counter balance |
| 8 | Truss Tubes (16 half sections) |
| 1 | Teflon Pad for the ASM Tension Spring |

Box #2: The primary mirror

| Qty. | Description |
|------|----------------|
| 1 | Primary Mirror |

If the optional reusable foams is purchased, the UP12 will packaged as shown in the following pictures.

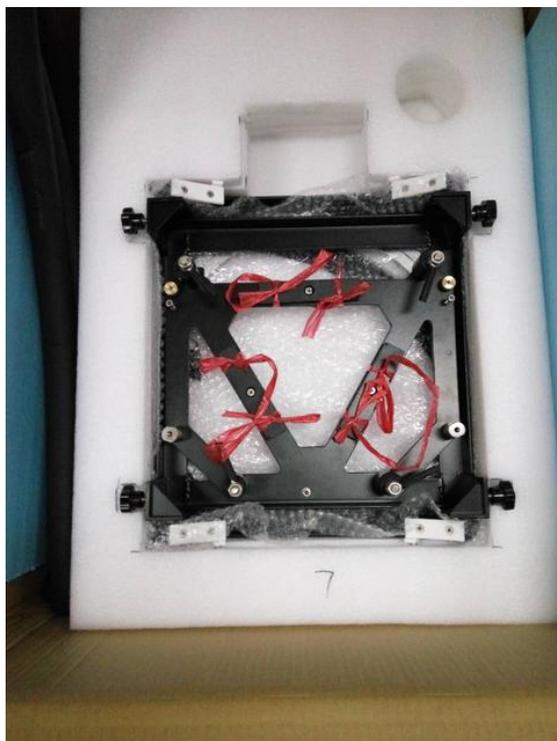
- There are 11 layers of foam, each is 50x70x2 cm in size.
- From the bottom up, Layer 1&2 are whole piece of foams
- Layer 3 is for the two ALT bearings
- Layer 4 and 5 are for the ground board and Rocker
- Layer 6-9 are for the mirror box
- Layer 10 is for the upper cage
- The truss tubes are placed between layer 10 and 11
- The Layer 11 is the top piece
- You can cut off some foam to make room for your other accessories, such as eyepiece, finder scope etc.
- You will need to cut and trim the foams around if you want to use the foam to store the scope in a luggage case. A 28" Aluminum frame luggage case, one similar to the pictured (with an outside dimension of about 65 x 47 x 26 cm, handle and wheels are not included in the dimension) is recommended.











The Mirror Box Protection Ring is bolted to the mirror box by the knobs. The secondary mirror safe container is at the up right corner in the above picture. The protection ring is not used to assemble the scope, and is only used to pack the scope.





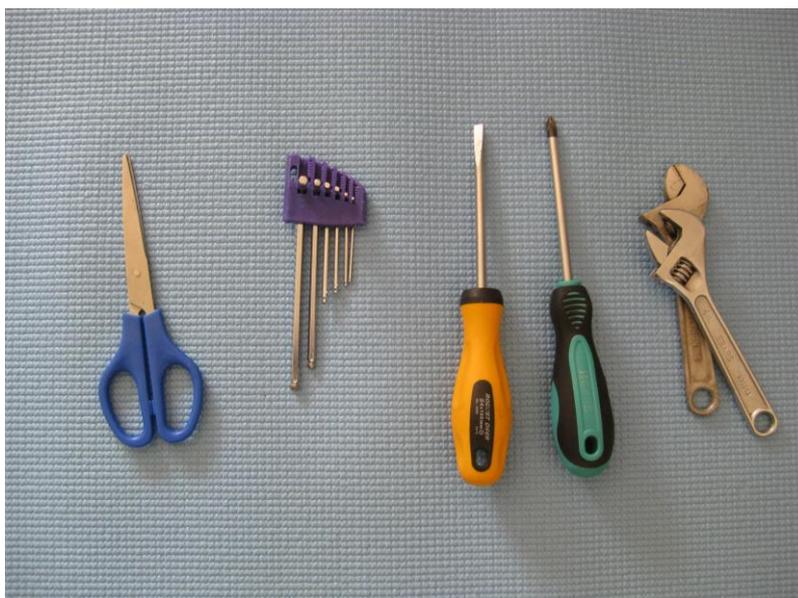
Truss Tube between Layer 10 and 11



Layer 11

2. Assembly

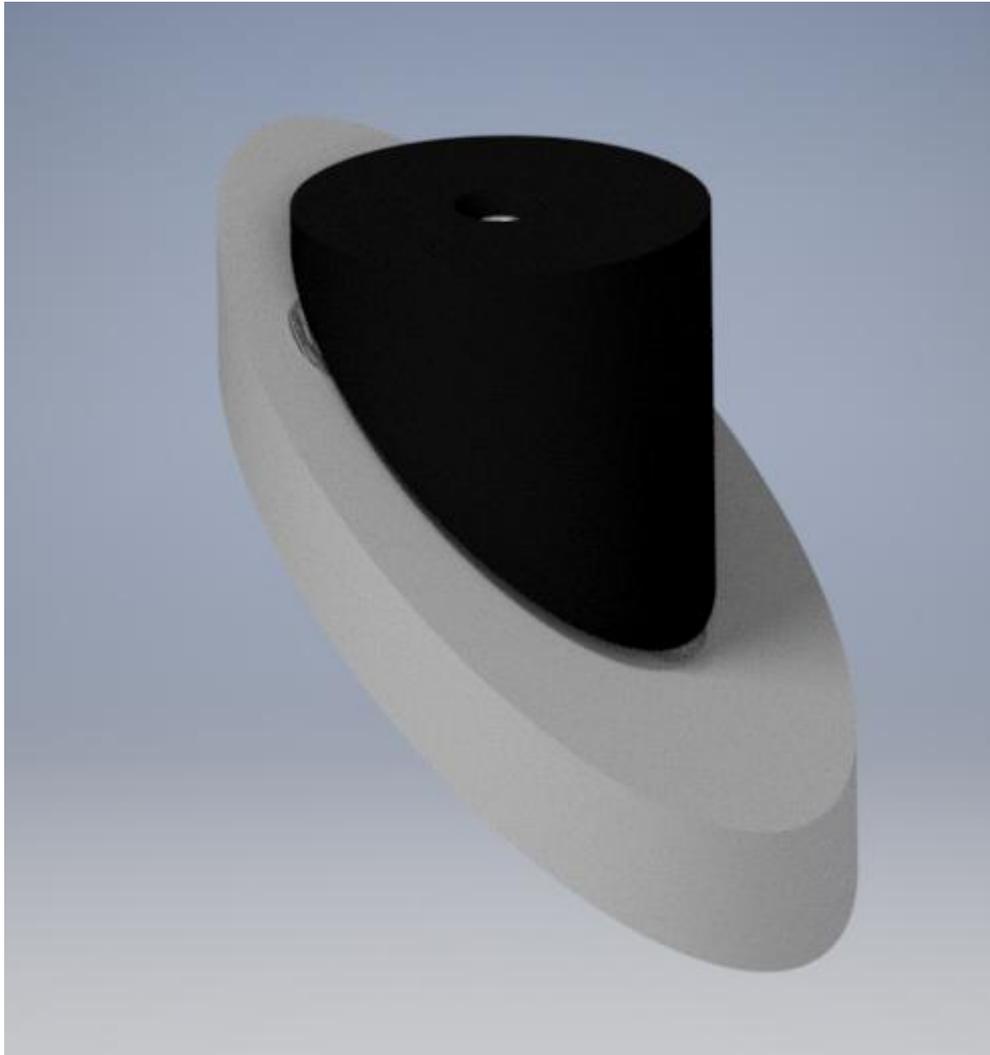
Now that you have unpacked the boxes and familiarized yourself with all of the parts in front of you, it's time to begin assembly. You'll need a regular screwdriver, a Phillips screwdriver, a set of metric hex keys (1.5, 2, 2.5, 3, 4, and 5mm), one 6-inch (150mm or smaller) adjustable crescent wrenches.



Tools Required (Not provided)

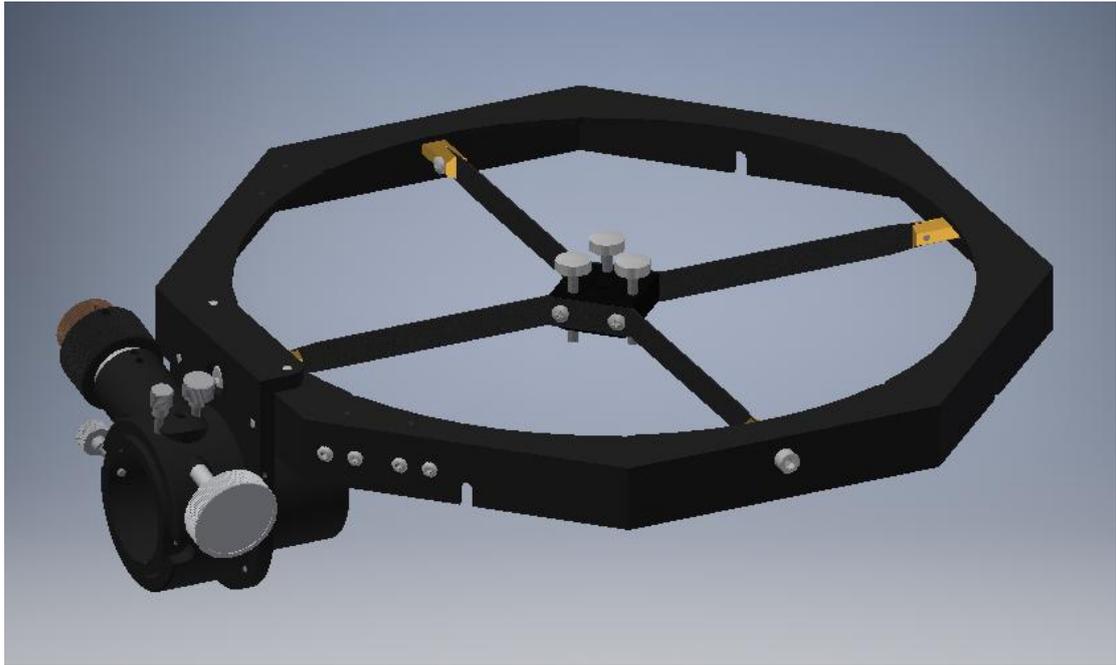
2.1 Install the Secondary Mirror

The secondary mirror is glued to the diagonal holder in the factory, and is stored inside a plastic container for protection. You should remove the secondary with the holder from the scope after each usage and store it back to the container for protection.

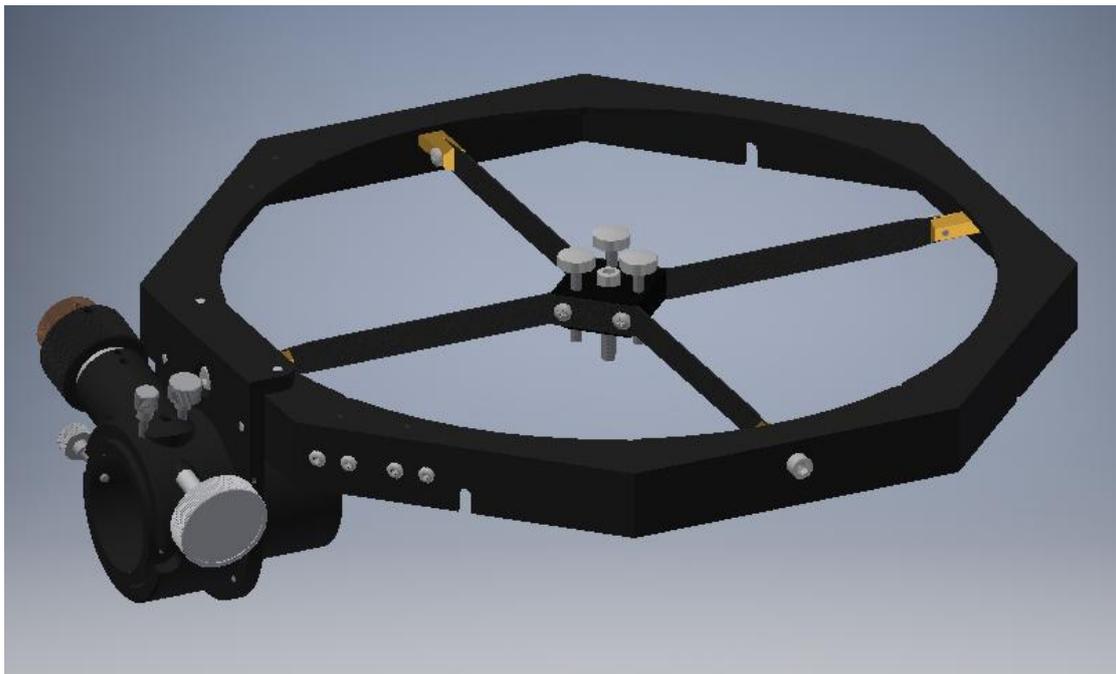


To install the secondary mirror:

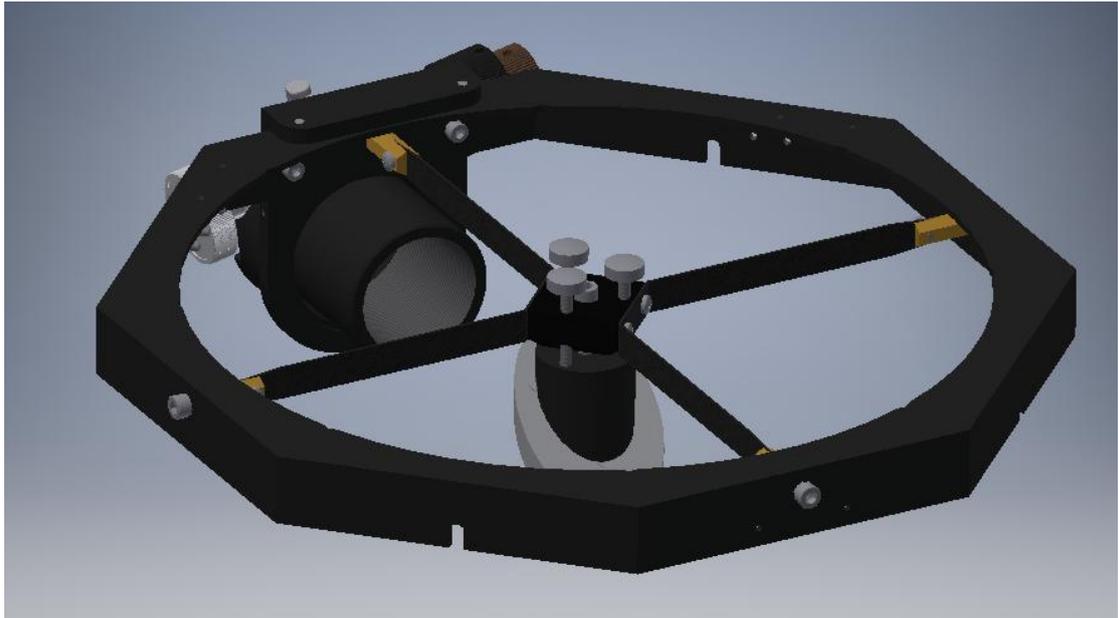
- Insert the M6 (35mm long) socket head screw into the spider stud
- Attach the secondary holder to the M6 screw
- Roughly adjust the center bolt (up and down), the spider wing pulling screws (left and right), and turn around the holder and/or adjust the collimation screws until the secondary mirror is centered by being viewed from the focuser draw tube
- Tighten the three collimation screws and all 4 spider wing pulling screws.



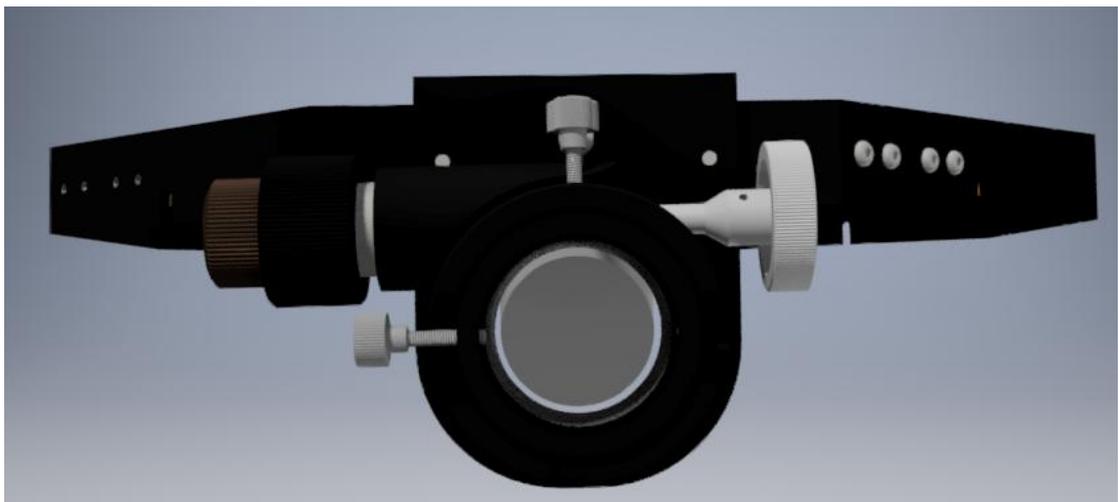
The upper cage without the Secondary Mirror



Insert the M6 central bolt is inserted



Attach the secondary mirror holder to the central bolt



Center the Secondary Mirror in the focuser drawtube

2.2 Assembly of the Dobsonian Rocker

The UP12 base is shipped assembled. The only thing you need to do is to install the three plastic feet each time before usage. Make sure to use the wing nuts to lock the three feet firmly, and make sure do not thread the foot too much to block the rotation of the Rocker.



2.3 Assembly of the Mirror Box

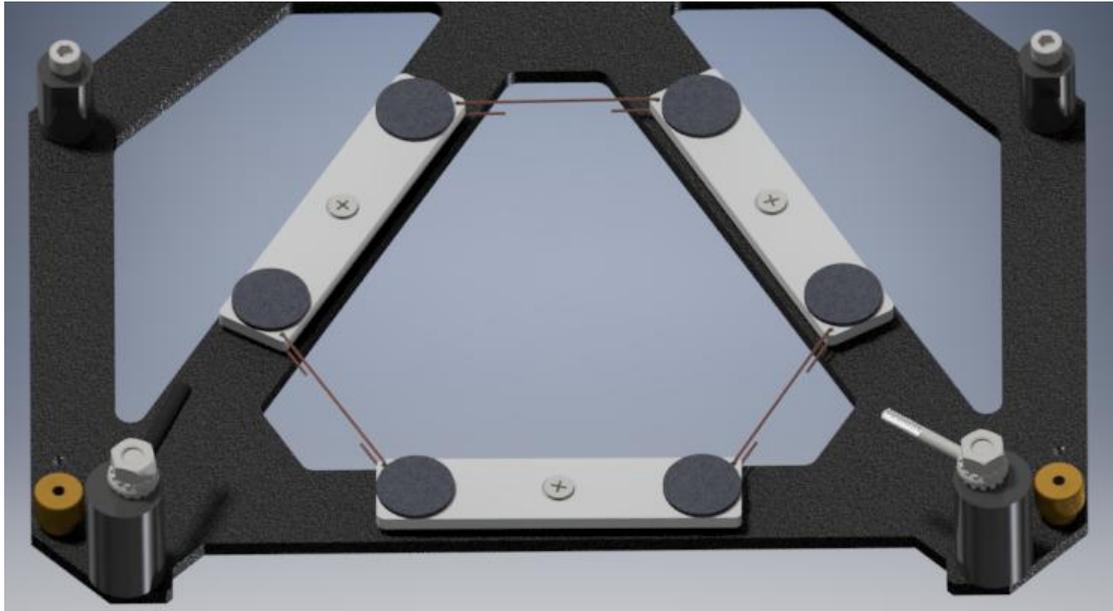
The primary mirror is shipped in its own box. Once the primary mirror is installed in the mirror box, there will be no need to remove it until cleaning is necessary. However, for shipping and long-term storage, the primary mirror should be packed tightly in its original packing.

The mirror box is mostly assembled already, but you do need to place the primary mirror into the mirror box.

2.3.1 Installation of the Pads and Brass Wires

Before installing the primary mirror, you need to perform the following tasks:

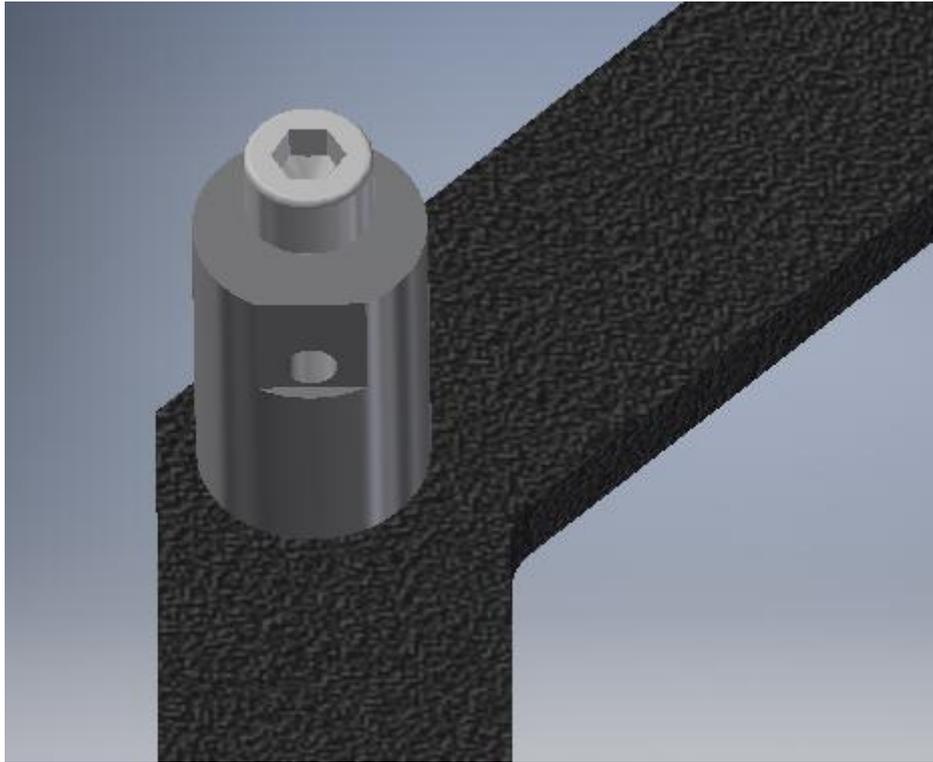
- Attach the 6 adhesive scratch protectors to the three support bars
- Attach the three brass wires to regulate the support bars



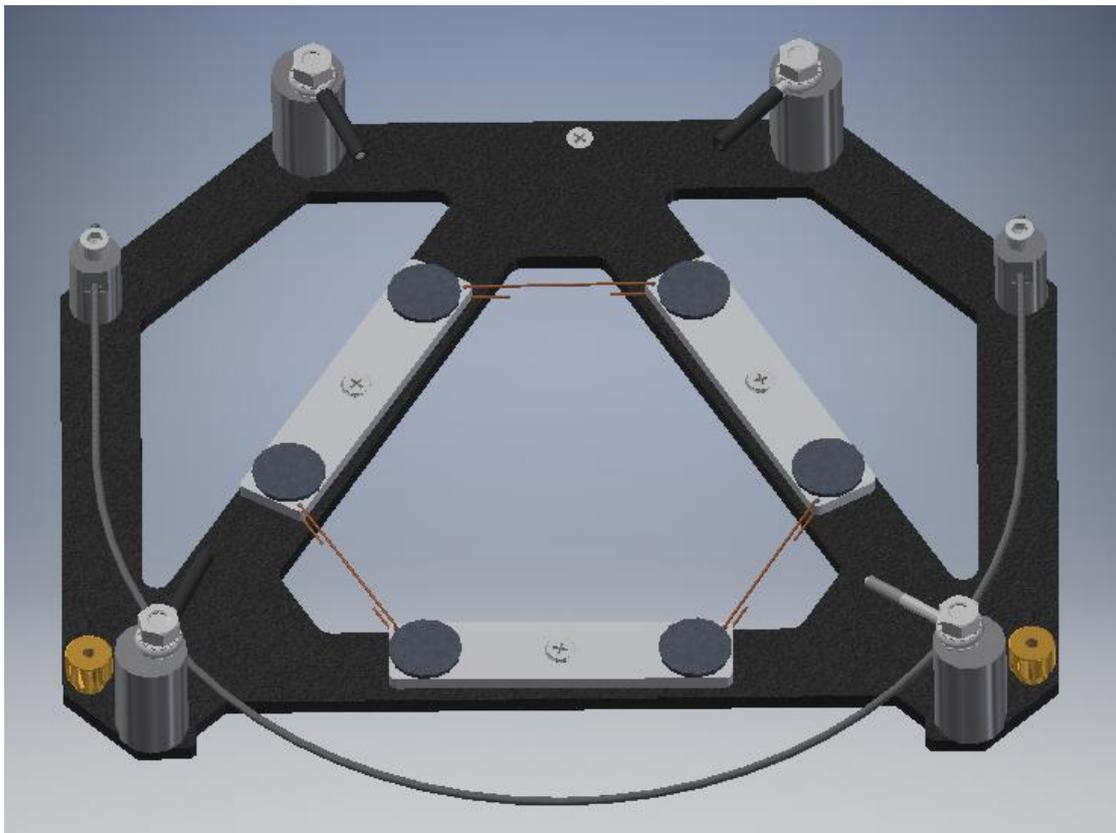
First bend the three brass wires into U shape, with the center portion about 55 mm (a bit longer is OK, but all three should be the same length, as much as possible).

Insert the brass wires into the small holes on the support bars, and then bend brass and twist the head portions to lock the cell bars in the position.

Push the brass wires outward into a slight curve to keep the support bars in position if needed.



The stainless steel cable anchor post and the top locking screw



- Loose the two cable sling locking screws, and insert stainless cable sling into the anchor post feed hole and temperately tighten the locking screw to keep the cable sling in place.

2.3.2 Installation of the ALT Bearing

Rest the Mirror Box on a safe place, for example, the packing foam; and then install the two ALT bearing one at a time using the provided M6 blots (25 mm and 40 mm long each) as shown in the following pictures:

Note that you need place the left bearing on the left side and right bearing on the right side of the mirror box, with the side of the bearing with the welted spacers attached to the mirror box.





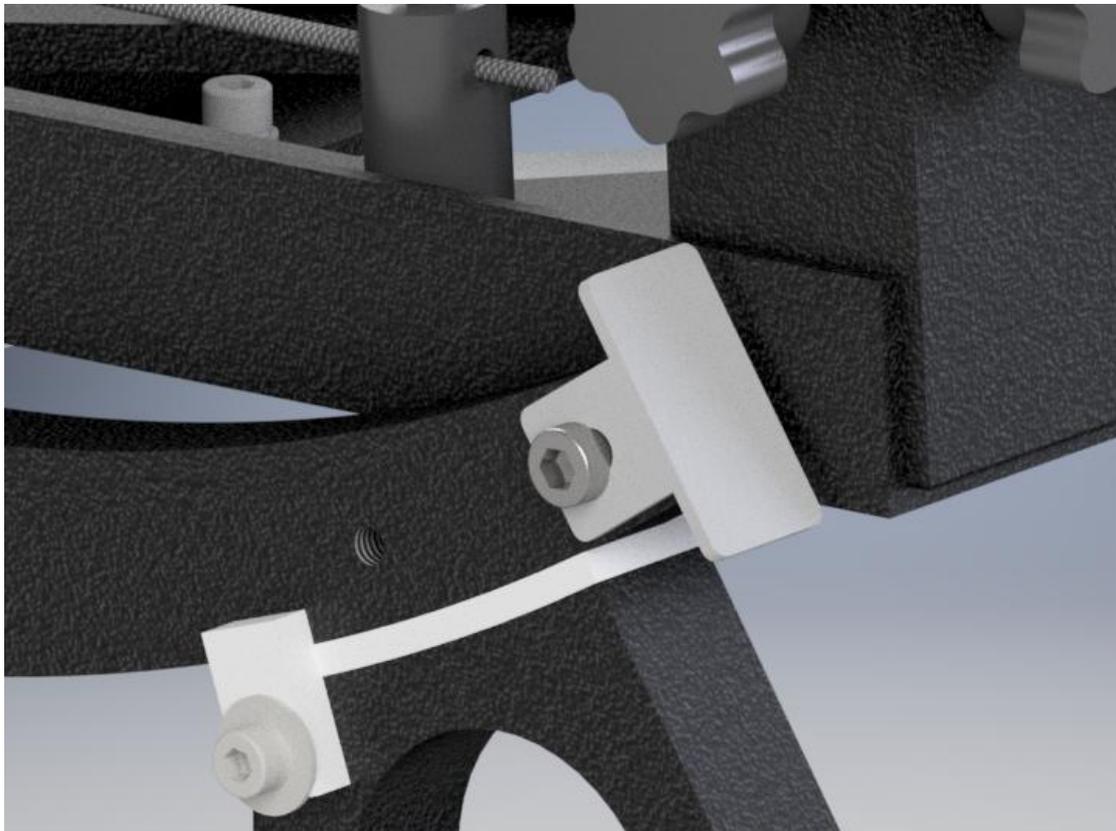
- Then rest the mirror box on the Rocker, and install the two ALT bearing limit blocks on one of the bearing.







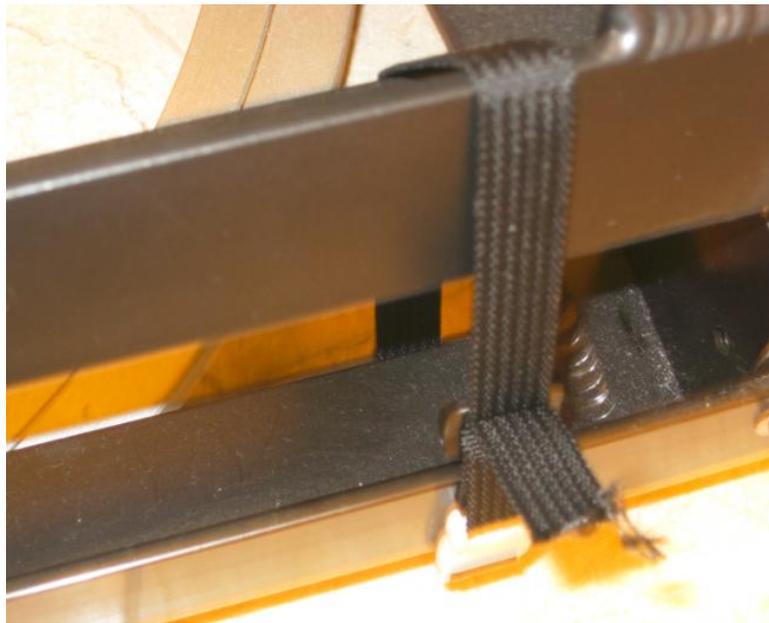
The top ALT Bearing Limit Block



The Bottom ALT bearing limit block

2.3.3 Installation of the Primary Mirror

Rotate the two eccentric side pins and arrange the cable sling to make room for the primary mirror. Loosen the locknuts on the top of the mirror clips and turn them aside.



Tie the mirror box to the rocker with nylon strips for the safety

You may tie the mirror box to the rocker with the provided strips for the safety for now.

Rotate the four eccentric side pin outwards to make room for the mirror. Make sure that the three mirror support bars are evenly placed in the cell. Pick up the mirror and place it into the mirror cell. Check that the mirror is centered in the cell. Wiggle it a bit to insure that the cell parts are moving freely and adjusted to the float of the mirror.

Next, lose the sling locking screw to adjust the length of the cable sling between the sling post to make sure the sling snugly supports the mirror when the mirror is centered in the mirror cell; then tighten the locking screws to lock the sling.

The four side pins should not contact the mirror during observation.

The mirror-protecting clips should not contact the mirror at all. Keep the clips about 3-6mm above the mirror surface. Place the mirror clips over the mirror and tighten the top lock nuts.

On the lowest part of the mirror, which will rest in the bottom of the sling, place a short piece of the provided Velcro (Magic Nylon tape)

Make sure the sling is in the middle of the mirror, so there is equal amount of glass above and below it. The magic tape will prevent the sling from slipping off the mirror when the telescope is pointed straight up. Now, leave the sling loose, you will adjust it after the telescope is fully assembled.

- 1. Secure the mirror box to the Rocker with four supplied nylon strips**
- 2. Make sure the 3 support bars are evenly positioned**
- 3. Load the mirror into the cell**

Once the mirror is installed, you should use the square mirror cover (provided) to cover the mirror box to protect the mirror.



2.3.4 Glue the Primary Mirror For The Air Travel

If you plan to travel with your scope via airline flight, then you are strongly recommended to glue the mirror to the mirror cell using Silicone (The clear GE Silicone II or equivalent is recommended)

- Use 95% or higher grade alcohol to clean the back of the primary mirror and mirror cell support bars (remove the pads first)
- Once they are dried completely after the cleaning, apply silicone to the floatation points on the pivoting bars. Make your best effort to place six blobs of equal amount of Silicone on the floatation points. Each blob is about 20mm in diameter and 10mm thick.
- Place 6 coins (about 1.5mm thick) on the pivoting bars as the spacers. You can use a few strips of hard cardboard, or even the wooden handles of the ice cream bars as spacers. These spacers should be removed once the silicone is cured. Make sure to leave enough space between the coin and the Silicone blobs, so you don't glue the coins to the cell.
- Make sure the mirror cell is perfectly leveled.
- Carefully place the mirror onto the mirror cell. Make sure that the mirror is perfectly centered in the cell; and make your best effort to not move the mirror once it is placed onto the Silicone.
- Make sure all the pivoting bars are well positioned, minor adjustment might be required if you moved the mirror.
- Again, to make sure the mirror cell and mirror are still leveled.
- Cover the mirror cover and wait for 24 hours to remove all the spacers, and then wait another 48 hours or until the Silicone is completely cured before move or use the scope.



Use 6 coins as the spacers

2.4 Install the Truss Tubes and Secondary Cage

Each full truss tube is made of two half sections, top and bottom sections. You should first thread connect each pair into a full truss tube. After each pair is firmly connected, you should loose the bottom truss angle to align the orientation of the angle with top of the truss tube.

Once each pair of the truss tubes has been aligned, there will be no need to align it again if the same pair is connected. Just to place the truss tube pairs to each other in the truss tube organizer to make sure the same pair will be used the next time.

You can put the truss tube on a table to check and do the alignment.



Truss tube aligned



Truss tube misaligned

2.4.1 Installation of the Truss Tubes

The truss tube ends have an asymmetric shape, so they can be connected in the following way to avoid interference with each other.



- Make sure that the primary mirror is fully protected with a mirror box cover.
- Connect two truss tubes with an M6 knob screw (35mm long) and an M6 wing nut on the multiple-hole side of the top end. The multiple holes are used for optimizing the OTA length for slight variations in focal length of the primary mirror.
- Then connect each pair of truss tubes to the mirror box with two M6 knob screws (15mm long)



Figure 1: Tighten the knob screws

2.4.2 Installation of the Secondary Mirror Cage

Here is the installation procedure:

- Make sure that the primary mirror is fully protected with a mirror cover.
- Loosen the wing nuts on all the knob screw as much as possible, but make sure they are still fully engaged on the bolts.

- Hold the secondary cage up, and slide one of the slots on the upper ring into the top knob bolt of one truss pair. Make sure you slide the slot into the space between wing nut and the truss tube ends.
- Then slide an adjacent slot into the knob bolt of the corresponding truss pair.
- Then slide the remaining two slots into the rest two knobs bolts at the same time
- Finally tighten all knobs & wing nuts.

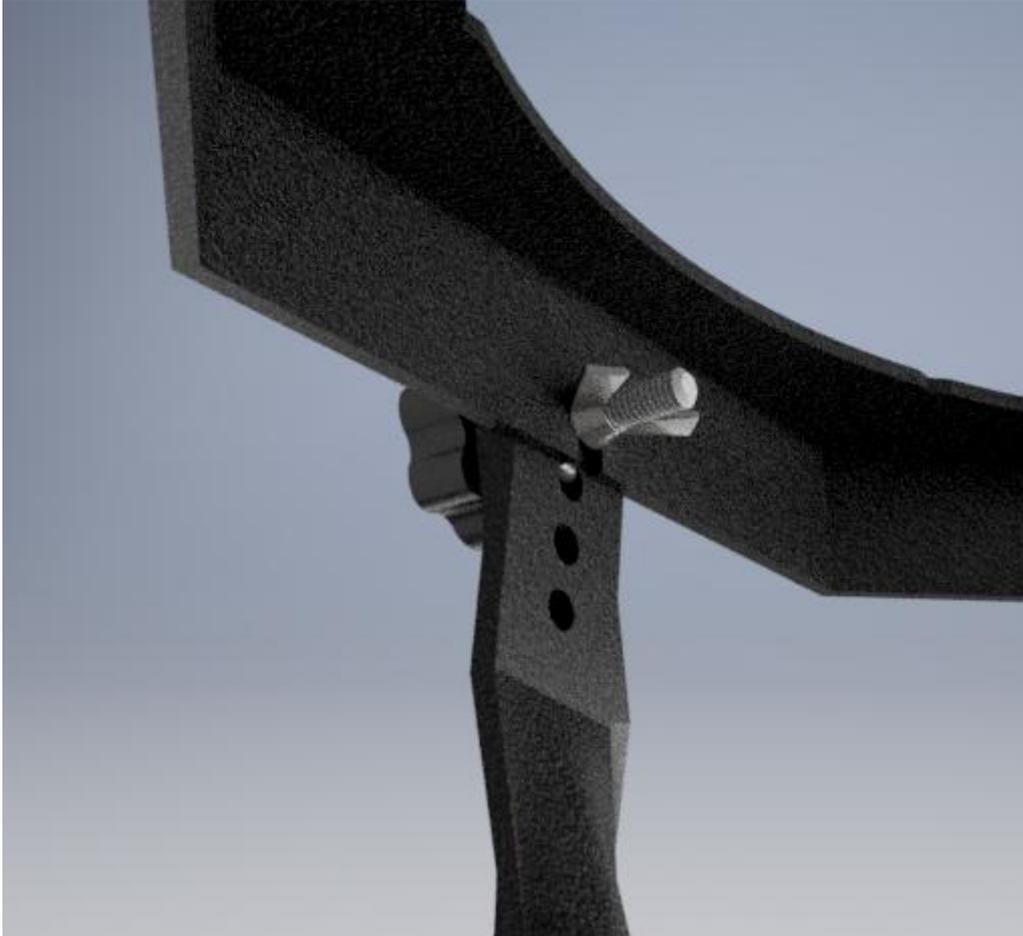




Figure 2:Slide in one slot first (a picture of an UL14)



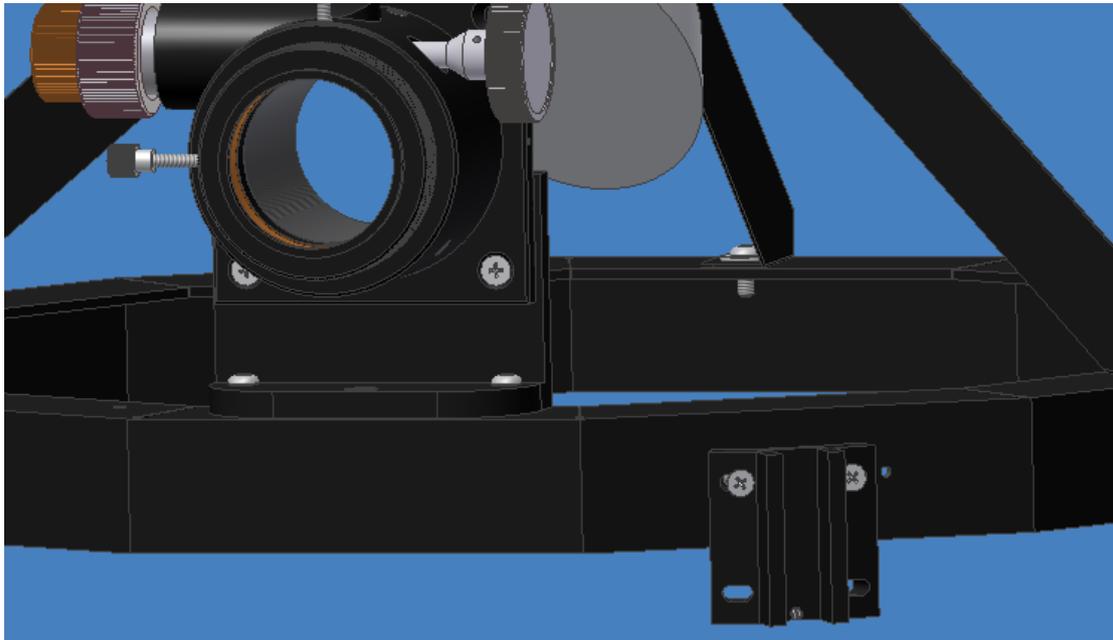
Figure 3:Then slide in one adjacent slot (a picture of an UL14)

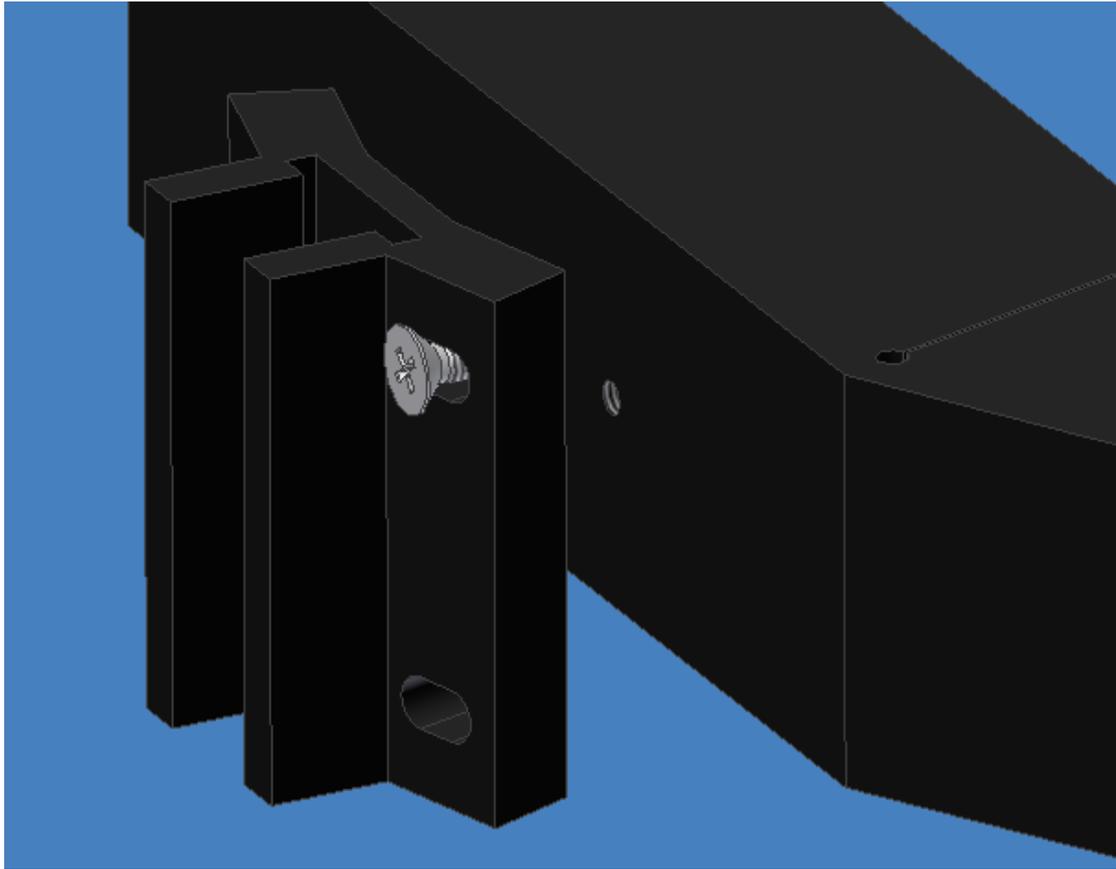


Figure 4:Then slide in other two slots at the same time (a picture of an UL14)

2.4.3 Installation of the Optional Finder Scope

Use 2 provided (hexagon or cross) socket sunk head screws to mount the finder scope via two of the four finder base mounting holes.





2.5 Adjust the Sling

After the UP12 is fully assembled, the sling must be adjusted if you have not done it already.

2.6 Balancing The Scope

To maximizing the portability, the ALT bearing of UP12 is designed to be smaller than the size required to balance the scope by default; you will need to add about 4 kgs counter weight (not provided) on the mirror box to balance scope.

The best to attach the counter weight is on the side of mirror box opposite of the focuser shown in the following picture.

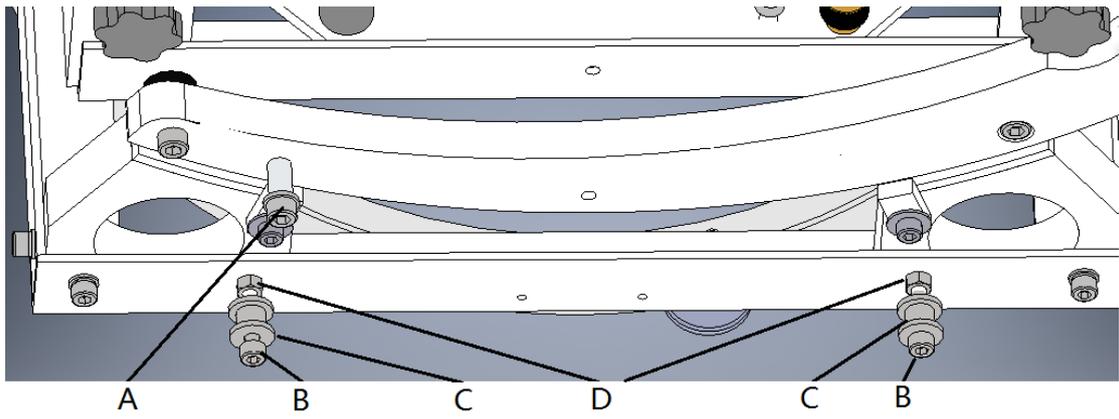


UP12 with real counter weight

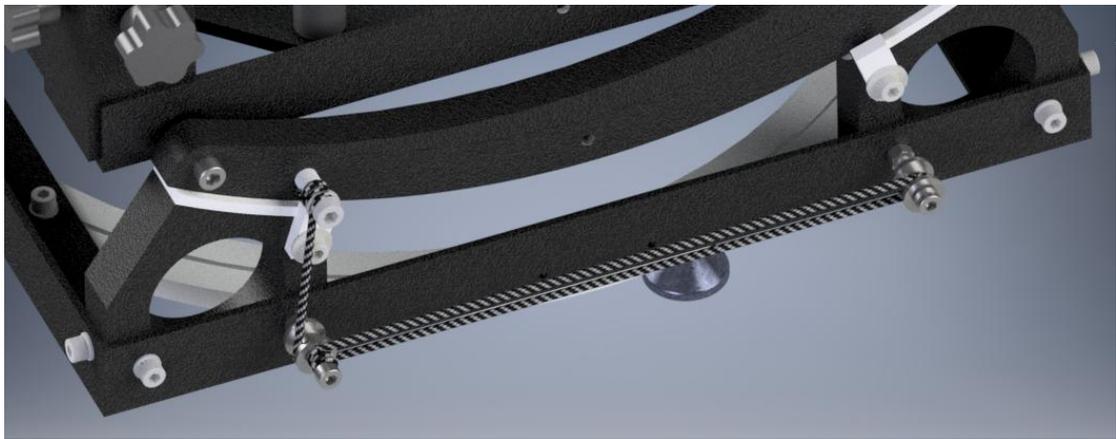
As an alternative to use inconvenient real counter weight, we have provided a simple rubber band based virtual spring load counter balance system for probability.

First, you will need to install an M6 plastic wrapped anchor screw on one of the ALT bearing. Then you will install 2 Roller on the Rocker using two long M5 screws provided.

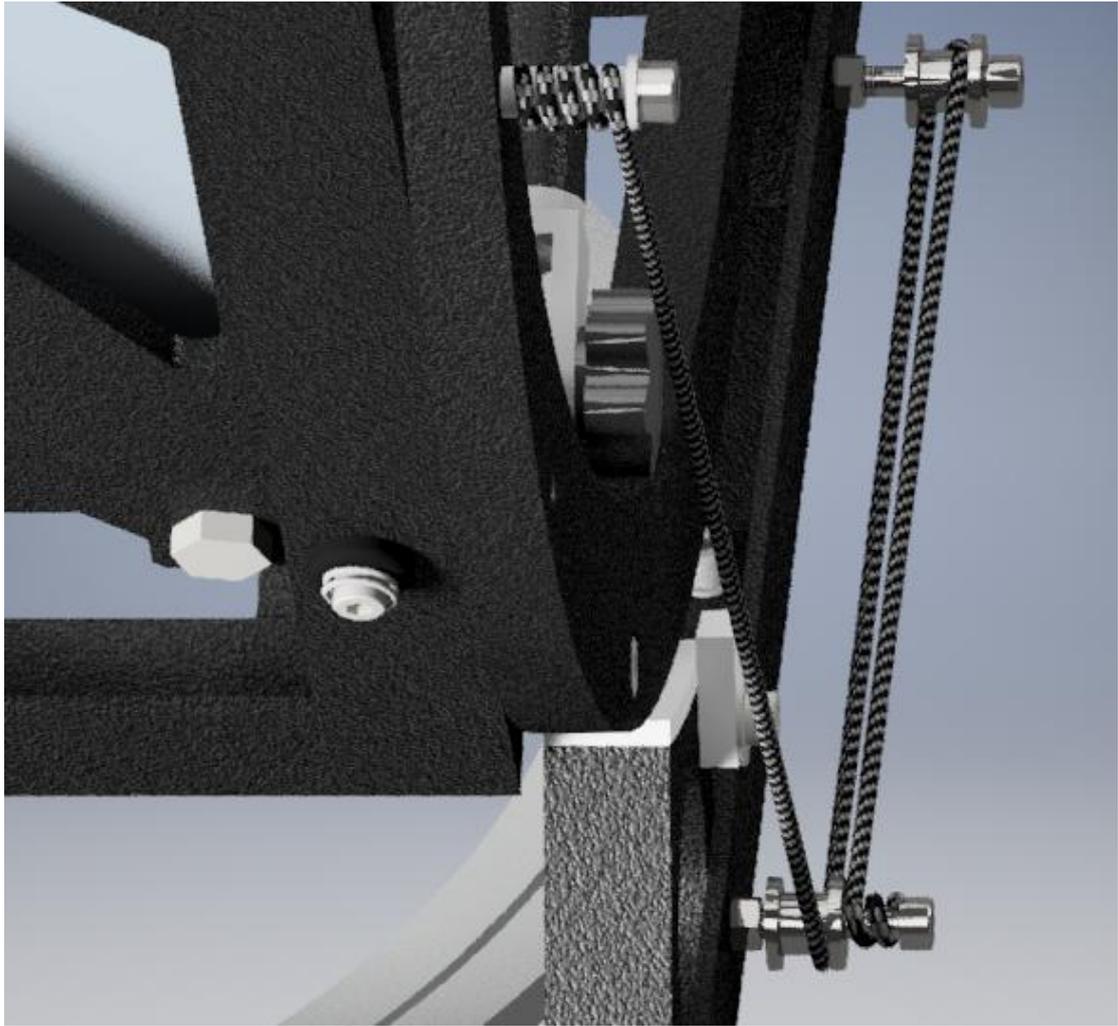
Then attach a piece of the thin rubber band to the system; you may start with a piece of rubber band of around 0.5 meter long, and adjust via trial and error for your specific load. You may have a few set of rubber bands of different lengths for different work loads for the convenience.



M6 plastic wrapped anchor screw (A) M5 x 40 screws (B), rollers (C), and locking nuts.



UP12 rubber band based virtual counter weight system

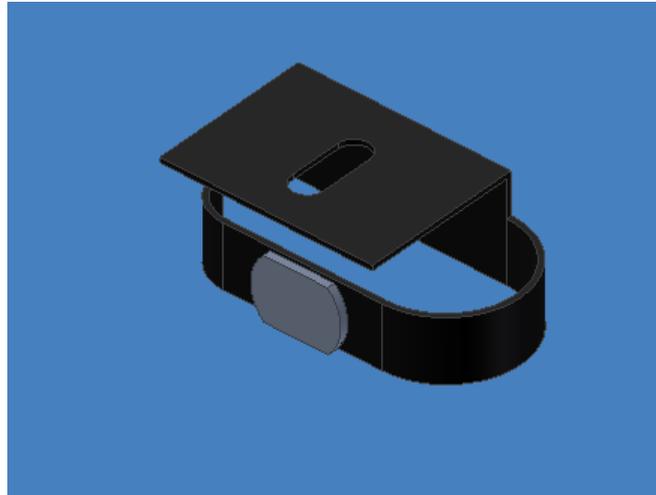


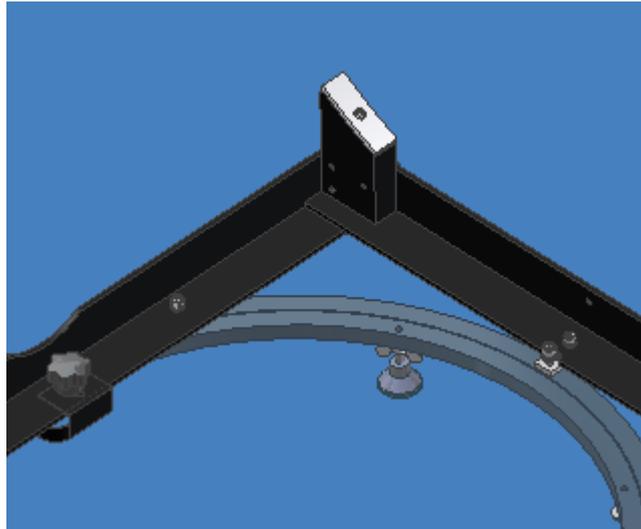
UP12 rubber band based virtual counter weight system

2.7 AZM Tension Spring

A tension adjustable spring has been installed to suit the personal preference of each observer with a simple tension adjustment bolt.

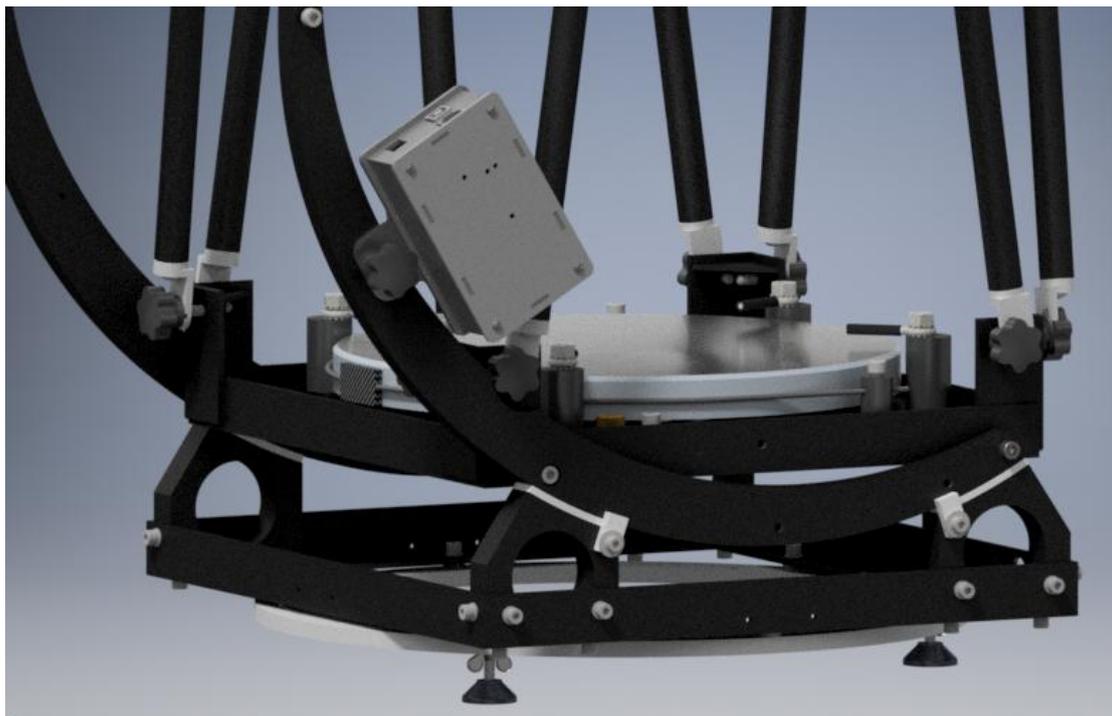
You may attach the Teflon pad to the spring for smoother operation.





2.8 Install the iSkyHub-B Digital Setting Circle

You can attach the iSkyHub-B on one of the ALT bearing as pictured bellow. Refer to the iSkyHub-B manual for detailed instruction.



3. Collimate the Optics.

Keep the primary mirror covered during step 1. Point the telescope at vertical during the collimation step 1-3.

You need to make sure that UP12's collimation will not shift when it is pointed at different altitudes by tightening all locking nuts and screws properly along the entire optical path:

- Make sure the focuser is tighten firmly in its base
- Make sure the focuser base is tighten firmly onto the upper ring
- Make sure all four spider vanes are tighten firmly onto the spider hub and the upper ring
- The three collimation screws for the secondary mirror need to be properly tightened after collimation
- All knob screws for all the truss tubes need to be tightened properly
- The three primary mirror cell lock screws need to be tightened properly

Step 1: Center the secondary mirror on the axis of the focuser drawtube.

Use a simple collimation cap (or sight tube) for this step. Insert the cap into the focuser, and look through the peephole of the sight tube at the secondary mirror. If you do not have a collimation cap or sight tube, then simply eyeball it from a distance away from the center of drawtube.

The secondary mirror should appear round and exactly centered in the sight tube. If is, then Step 1 is done. If not, either the secondary holder or the focuser (or both) needs adjustment.

You should check and adjust the secondary holder first. If the error is up or down, you can move it up or down by adjusting the center bolt that connect the holder to the spider hub.

If the error is toward either side of the focuser (90° to the optical axis), then check to find out if the secondary holder is well centered in the upper ring. If it isn't, adjust the spider wing's pulling screws until it is.

Step 2: Here you adjust the tilt of the secondary mirror to aim the focuser's axis at the center of the primary. First, remove the primary mirror cover.

A laser collimator will be used for this step: just insert a laser collimator into the focuser tube and center the laser beam on the primary's center spot by adjusting three secondary mirror collimation screws.

A small error in secondary alignment is usually not a problem. As long as the pointing error is no more than 1 or 2 percent of the main mirror's diameter, it makes no visible difference.

You will need to repeat Step 2 each time you reassemble the UP12.

Step 3: In this final and most critical step, you need to tilt the main mirror to center the returning laser beam to spot at the laser collimator.

Just adjust the three primary collimation screws to center the laser's returning beam on the collimator's faceplate.



Figure 5: The primary mirror is not yet collimated.



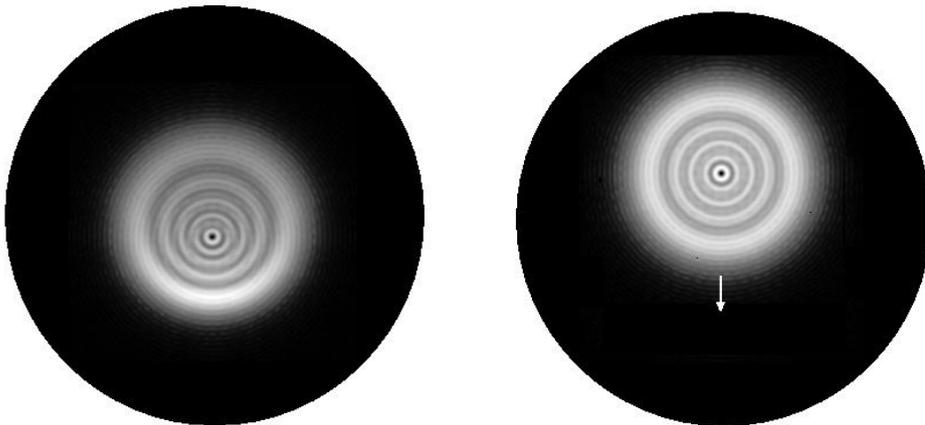
Figure 6: The primary mirror is perfectly collimated by laser collimator.

Step 4: Star-Testing Your Collimation

You may use an artificial star or a real star to verify the collimation of your scope.

First you should check if the scope is in rough collimation by observing a strongly defocused star image (move focuser in or out until seeing about 5-10 rings). Start this process with a medium magnification eyepiece, but end with a high magnification eyepiece. Center the star image at the center of the eyepiece. All rings and shadows should be concentric. If not, perform the collimation by adjusting the three primary mirror collimation screws until all rings and shadows are concentric.

If the scope is already in rough but not perfect collimation, you may find the location of the collimated field — the part of the focal plane in your eyepiece where the out-of-focus star is symmetric — and adjust the primary mirror's collimation to bring the collimated field into the center of your eyepiece's field of view. You may repeat it a few times until the scope is in an excellent collimation.



This procedure should be done at the beginning of each observing session and checked occasionally during the night, since temperature changes or routine handling may cause your telescope's components to shift enough to change collimation.

4. Care and Maintenance

4.1 Mirror Storage

The UP12 should be stored in a clean, dry, dust-free place, safe from rapid changes in temperature and humidity. Do not store the telescope outdoors. Your garage and shed might be OK, but is not recommended. We highly recommended storing the

secondary cage and the mirror box in our optional waterproof Nylon storage bag. Although big enough, do not store the rocker/ground board with the mirrors in the bag for a long time; the potential evaporation from the lubricating material used by the AZ bearing under high temperature will be harmful to the mirror coating.

4.2 Mirror Cleaning

You should not have to clean the mirror often. The best thing you can do to keep your mirror is to prevent it from getting dirty in the first place! A simple air-blow cleaning, using an optical air dust blower is the next best thing you can do.

The following instructions tell how to clean a telescope mirror that is very dirty. Your new mirror should not be cleaned this way in any case.

You'll need

- **Clean towels**
- **Non-alkaline liquid detergent, such as Draft, Basic H, Safe Suds - NO OTHERS. Skip step 2 if you cannot find the appropriate detergent.**
- **A bottle of distilled or de-ionized water**
- **A package of sterile cotton.**

Remove the primary mirror from the mirror box:

- Loosen the sling by loosening the lock nuts on the right split bolts with two wrenches.
- Carefully loosen the three retaining clips, and rotate all clips away from the mirror to clear the way for the mirror.
- Rotate the eccentric pins around to make as much room as possible for the mirror.

To clean the secondary mirror, you will need to remove it from the telescope and clean it with the diagonal holder. Hold the secondary holder stationary while loosening the center hex screw. You do not need to remove the secondary mirror from its holder when cleaning.

Do not touch the surface of the mirror with your fingers. Lift it carefully by its edge.

Step 1:

Wash out the sink with detergent thoroughly, rinse it well with plenty of water, and lay a folded clean towel on the bottom. Remove any jewelry from your hands and wrists. Put the mirror (aluminized face up) on the towel, and with the drain open, ply the mirror's surface with a gentle stream of room-temperature water for a few minutes. This will remove most dust and grit safely. Next, rinse the surface with a gentle stream of *distilled* water. Do not let the mirror dry.

Step 2:

Plug the sink, and fill the sink halfway with room temperature water. Add a few drops of the liquid detergent and let the mirror soak for 5 or 10 minutes.

Then use a cotton ball, starting at one edge, swab the mirror in one direction, applying no pressure beyond the weight of the cotton itself. Grit is less abrasive wet than dry, so do this step under water if you can. Don't let the surface dry.

Turn the cotton over in a backward-rolling motion as you go, so that as soon as a part of it rubs the surface, that part is carried up and away from the glass. Throw out the cotton ball when it has been turned completely. Keep a very small stream of tap water flowing as you swab to rinse away detergent. Do not let the mirror surface dry or water marks will form. Keep the stream of tap water going.

Drain the sink and run room-temperature water over the mirror for a few minute.

Step 3:

Finally, rinse the mirror surface with distilled water. Hold the mirror nearly upright so the water runs off, leaving only small droplets behind. Your final rinse should be with distilled water.

Repeat the process with the small secondary mirror.

5. Specifications

Optical design : Reflector

Optical diameter : 304.8mm

Focal length : 1372mm

Focal ratio : f/4.5

Optics type : Parabolic

Eyepieces: Not included

Optical quality : Diffraction limited++ (Strehl 0.95+ for the Primary, 1/10 lambda or for the secondary mirror)

Focuser : 2" low profile 10:1 dual-speed linear bearing Crayford focuser

Secondary mirror obstruction : 60 mm

Secondary mirror obstruction by diameter : 19.7%

Secondary mirror obstruction by area : 3.9%

Mirror coatings/over-coatings : 96% Semi-Enhanced Aluminum coating on the primary and 96% Enhanced coating on the secondary mirror

Materials : Aluminum Alloy (T6063-T6) tube with black knob screws, T6061-T6 structure.

Weight, fully assembled : 30 lbs.

Optional accessories : 8x50 Illuminated Finder Scope, Red Dot Finder Scope, Shroud, Vinyl foam Cushioned Grips

Other features : Stainless Steel Cable Sling lateral support and deluxe push-pull brass knob collimation screws, two of them are front accessible.

6. Limited Warranty

Hubble Optics (Optel Engineering Group Inc.), Seller, warrants to the original purchaser only, that goods sold will be free of material defects in design, materials and workmanship for a period of one year following the date of shipment by Seller to Buyer. Seller will repair or replace, or refund the purchase price as to, goods that do not conform to the foregoing warranty, provided the cause of the nonconformity does not arise from or relate to modification, misuse, or abuse by the customer, and provided a warranty claim, stating in writing and with reasonable particularity the claimed nonconformity, and the goods, are delivered to Seller within the one year period. Repair or replacement of the product or refund of the purchase price, at Seller's sole option, shall be the Buyer's exclusive remedies. Seller shall not be responsible for any indirect, special or consequential damages arising from use of the products. This warranty is given in lieu of any other warranties, express or implied, including of performance, merchantability, fitness for particular purpose, or arising from course of dealing or usage of trade. Goods subject to this warranty must be shipped postage pre-paid by Buyer to the Seller. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

7. Technical Support

Hubble Optics (Optel Engineering Group Inc.) will provide the support for the basic operations outlined in this document by email. You will receive a response, generally within 24 hours.