

SWANSON TELESCOPE

Mount Balancing Instructions



Wes Swift
Spring 2011

SWANSON TELESCOPE

Mount Balancing Instructions

Wesley Swift
Spring 2011

Forewords and Cautions

The Swanson 21" Newtonian reflector is mounted using a custom German-Equatorial Mount (GEM) fixed to a concrete pier. The scope-mount system is balanced around two axes: the Right Ascension (R.A.) axis bearings are fixed to the pier and the axis is aligned to the celestial poles, parallel to the Earth rotation axis; the Declination (Dec.) axis is mounted across the R.A. axis. The whole complex (Telescope and Mount) weight in excess of several thousands pounds and extreme precautions should be exercise to avoid severe injuries and damages to the equipment.



Images Courtesy of VBAS

Due to the size and weight of the telescope and mount, balancing is a two persons job, particularly if the balance is poor.

It is assumed that the user of these instructions is familiar with the Swanson Telescope and has received the Basic and Advanced training for operating the scope.

R.A Balancing

R.A. Balancing adjustment is achieved by disconnecting the R.A. Clutch and adjusting the counterweight disks located along the Dec. Axes.



Picture 1: R.A. Clutch Adjustment Knob

1. Locate the R.A. Clutch. It is on the west side of the pier and it is shown in Picture 1
2. Put the scope in the home position with the DEC axis horizontal and the counterweight on the West side of the pier. Hold the counterweight steady and if the system is extremely out of balance use help and / or sturdy blocking. **If the scope swings out of control severe damage can occur to people or instrument.**
3. Locate the big aluminum knob (see arrow in Picture 1) and carefully unscrew it. IMPORTANT the knob hold the clutch spring in tension.
4. Remove the knob and set aside the clutch spring. One or more clutch disks may slip off center. Do not worry about them for now, just pay attention to avoid damaging them.
5. Replace the knob on the axis to avoid the disks and the clutch to slip out of place. Do not tight the knob. The scope is now free to rotate around the R.A. axis.
6. Rotate the balancing counterweight disks (silver disks pointed by the red arrow in Picture 2) until achieve scope balancing. Note that the disks are lock into position by each other friction (counter screw)



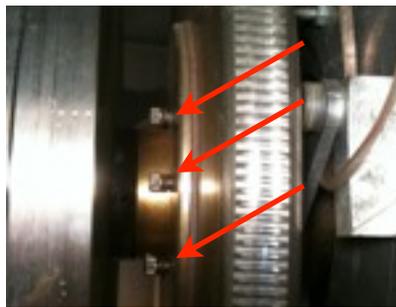
Picture 2: R.A. Balancing Counterweights

7. Once achieved R.A. Balance, lock the counterweight disks against each other. This operation may require some try and error.

8. Remove the Clutch knob, re-insert the clutch spring and carefully screw back in the knob. Pay attention to realign the clutch disks that may have slipped off center.
9. The clutch tension should be such to avoid slippage during motor operations but allowing manual slewing.

Dec. Balancing

Dec. Balancing adjustment require two people cooperating. It is achieved by loosening the Dec. clutch, allowing some play in the Dec worm gear and finally adjusting the counterweight blocks located along the two steel bars that run parallel to the telescope primary optical axis.



Picture 3: Dec. Clutch Adjustment Screws

Tools needed:

[XX/XX Hex \(Allen\) key for clutch adjustment \(Picture 3\)](#)

[3/8" open wrench for the worm gear lock nut \(Picture 4\)](#)

[3/32" Hex \(Allen\) key for the worm gear adjustment \(Picture 4\)](#)

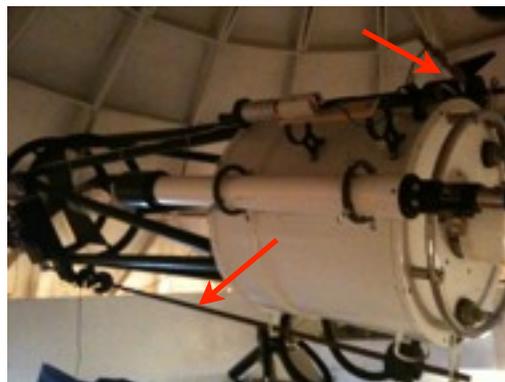
1. Place the scope in the home position with the DEC axis horizontal and the scope on the East side of the pier. Turn on the home position laser pointer and align to a target so as to observe the motion of the nose of the scope. With one finger, push the nose of the scope up and down and observe the action. For example, if the nose pops up after a gentle downward push then the scope is tail heavy.
2. Locate the Dec. Clutch and the adjustment screw. The clutch is at the end of the R.A. counterweight disks toward the scope (see Picture 3)
3. Observe the DEC clutch screws (see arrows in Picture 3). They should be partially backed off evenly as in the picture. Normally, NO adjustment of these screws is re-

quired by this procedure. If they are screwed down tight, back all screws evenly as shown. The DEC axis should manually slew with a firm push but not slip otherwise. DO NOT remove the screws. They are spring loaded and given the location it will be very hard to re-assemble.



Picture 4: Dec. Worm Gear Adjustment Allen Screw

- Carefully loosen the Declination worm gear adjustment screw and lock nut shown in Picture 4. An allen wrench is needed for the screw and small open end or box wrench is required for the lock nut. Do not use pliers since this will round off the lock nut. This will allow enough play in declination to "feel" the unbalance by alternatively pushing the scope up or down.
- Locate the two counterweights bars along the principal optic axis of the telescope (see Picture 5)



Picture 5: Dec. counterweights bars

- By alternatively pushing the scope up and down, balance the Dec axis. A correct balance is achieved when the scopes travels up and down of the same amount when "pushed"
- NOTE: Position the counterweights the same on BOTH Bars to maintain balance about the optical axis. To confirm that the axial balance is correct, point the scope to the ze-

nith and check it does not tend to fall north or south. This is a small effect but affects pointing north and south of the zenith.

8. Once achieved balancing and locked the counterweights and placed the scope in horizontal position, one person shall start to gently rock the scope up down. The play in the worm gear will produce a typical Ta-Da, Ta-Da rattling.
9. The second person shall slowly tight the worm gear allen screw in Picture 4 until the rattling sound changes from Ta-Da, Ta-Da to a Ta,Ta,Ta. The change is VERY noticeable. This is the signal for a proper tighten worm gear allen screw. Use the allen wrench to hold the screw and gently tighten the lock nut.
10. Turn off the home position laser pointer to preserve battery power. Recheck the RA balance if weights have been added or removed.