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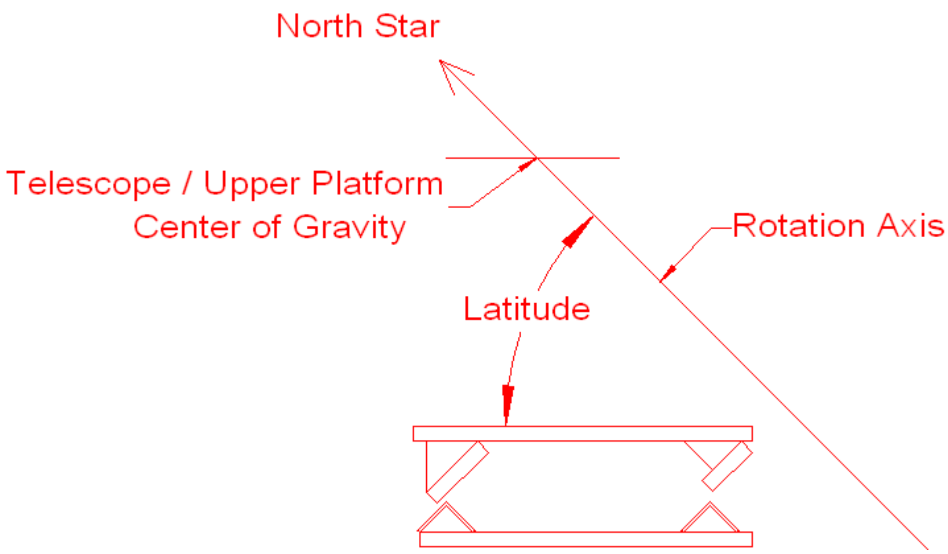
Here is an overview of my equatorial platform. If you are already familiar with the theory behind equatorial platforms, skip the theory.

Theory

I like to think of the rotation of an equatorial platform as similar to the rotation of a Ferris Wheel passenger compartment. The Ferris Wheel rotates on its horizontal axis, but the passenger compartments are always level. Each time the Ferris Wheel turns 360 degrees on its axis, each passenger compartment rotates 360 degrees in the opposite direction, on an axis that is parallel to the Ferris Wheel axis.

Imagine that the earth is like the Ferris Wheel. The earth rotates about an axis that goes from the North Star through the center of the earth. The equatorial platform is like the Ferris Wheel passenger compartment. The equatorial platform must rotate about an axis parallel to the earth's rotational axis, and must rotate at the same rate but opposite direction to the earth's rotation. The equatorial platform rotation axis is at an angle equal to the latitude where you observe.

I have an image in my mind of all the equatorial platforms worldwide rotating in unison like the all the passenger compartments of a Ferris Wheel.



From the figure above note that the rotation axis for an equatorial platform is on a line from the North Star through the center of gravity of your telescope. More precisely, the axis would go through the center of gravity of the combination of your telescope mass and the mass of the upper (rotational) part of the equatorial platform.

The closer the rotation axis is to the actual center of gravity, the more even the load on your stepper motor.

My Equatorial Platform

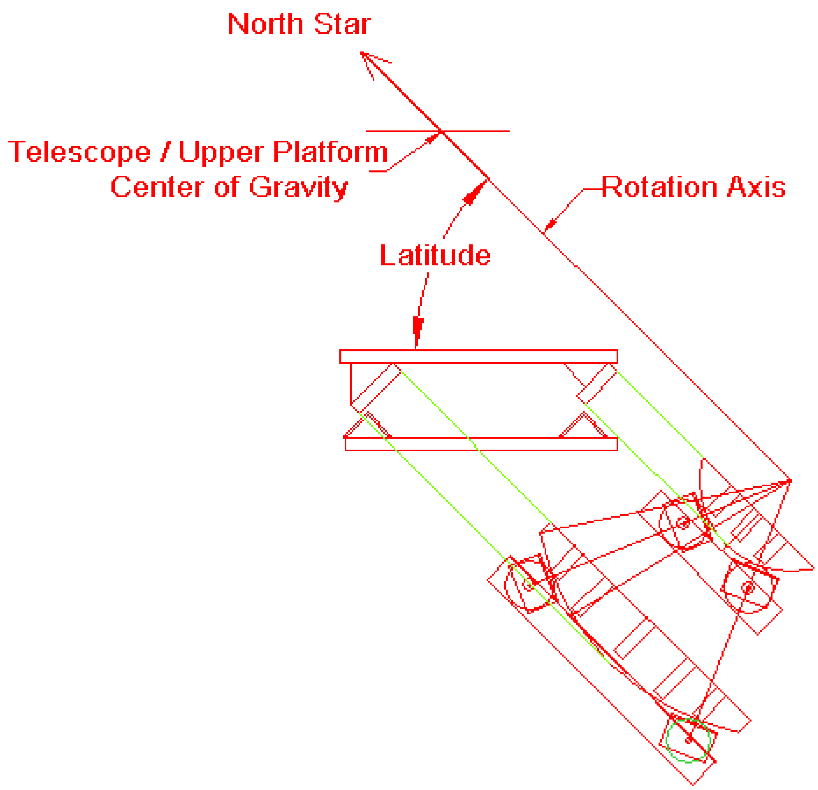
I based my equatorial platform design, in part, on the limited tools I have. I have a jig saw, router and electric drill.

I chose the two cylinder platform because I can accurately cut the curved bearing surfaces with a router.

I chose a direct drive with roller blade wheels because the drive is simpler than a worm-screw drive. The additional height due to using roller blade wheels vs. using bearings is not a disadvantage for me (may be a disadvantage for you) because I have a 12.5" (318 mm) F4.5 scope. When my scope is mounted on my equatorial platform, the eyepiece is about 2" (50 mm) below eye level with the scope at zenith.

The geometry of the upper platform determines how well the platform tracks. With my equatorial platform, the north angle/wheel assembly is rigidly attached to the lower platform, but the south angle/wheel assembly is only constrained to a horizontal plane to compensate for minor misalignment between the north and south bearings.

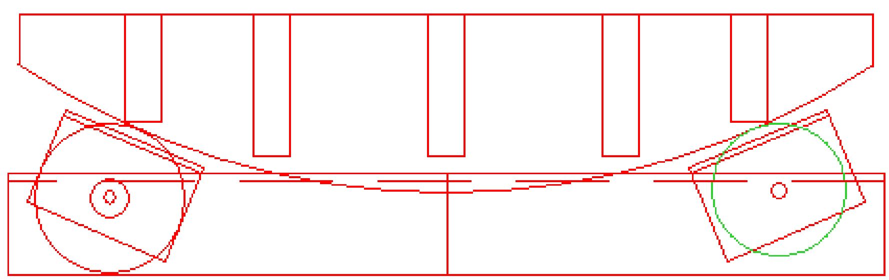
The following figure shows the relationship between the bearings, wheels and aluminum angles.



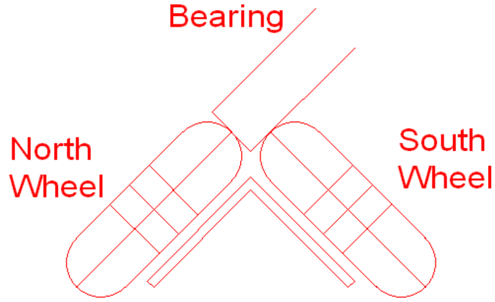
The goal in orienting the wheels is to have contact between the wheels and the bearings at all times, while keeping friction, due to scuffing, to a minimum.

I used 2”x2”x1/8” (50x50x3mm) aluminum angle to mount the roller blade wheels for a few of reasons:

- The aluminum angle is readily available.
- The aluminum angle assures good wheel alignment between east and west wheels, thus wheels contact the diameter of the bearings with no scuffing.
- Wheel alignment is not critical.

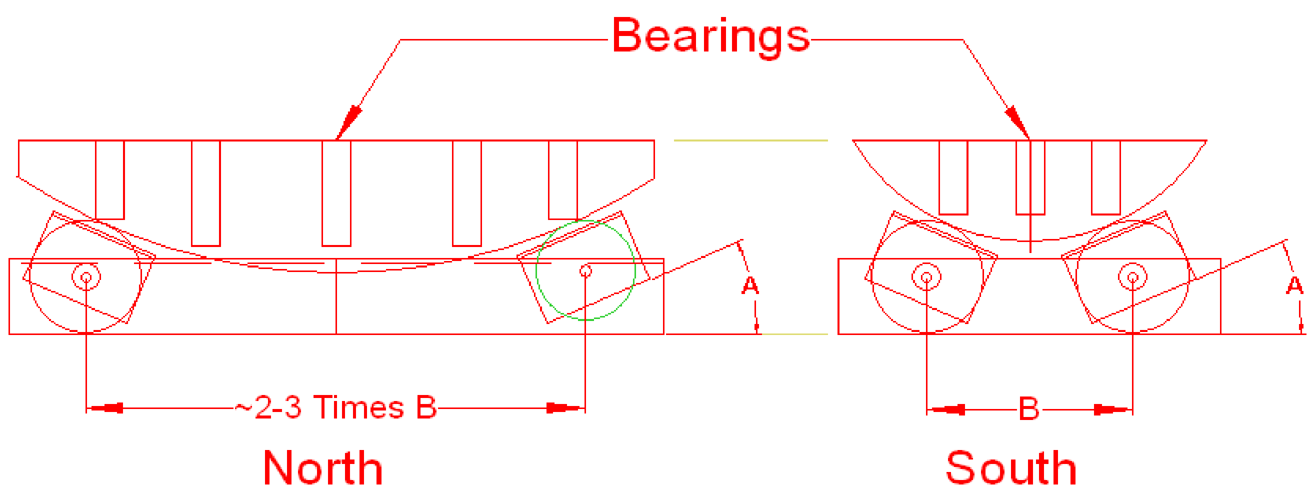


- The aluminum angle assures good alignment between the north wheel and south wheel.



I bought a pair of used roller blade skates at Goodwill for $15. I kept the wheels and threw away the rest. Used roller blade wheels work just fine and are a lot less expensive than new wheels.

Note that the distance from the top (straight edge) of the bearings, to the bottom of the aluminum angle must be the same for both the north and south bearings. The spacing for the <u>north</u> wheels is the maximum allowed by the width of my platform (controlled by the width of my scope). I used the same angle (A) for both the north and south wheels for no particular reason except that it simplified the design.



The north angle/wheel assembly is rigidly attached to the lower platform. The south angle/wheel assembly is free to slide on the lower platform. Its location is controlled by the upper platform.

The wheels on the north angle/wheel assembly control both the north-south and east-west positions of the upper platform. This occurs because the north angle/wheel assembly supports twice the weigh of the south angle/wheel assembly, and north assembly wheels are spaced two to three times farther apart than the spacing of the south assembly wheels (see dimension B above).

The south angle/wheel assembly locates the upper platform vertically. It is not otherwise constrained so is self-aligning with the south bearing. This allows contact between all wheels and their respective bearing even if there is minor misalignment between the north and south bearings.

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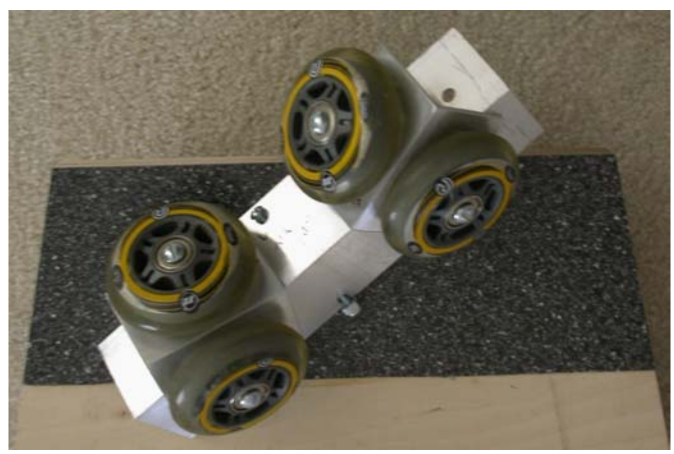
Here are some photos:

I bought the stepper motor with gear reducer from John Reagan. See John's equatorial platforms on the Internet.

The north angle/wheel assembly is at the front of this photo and the south angle/wheel assembly is the small one at the back.

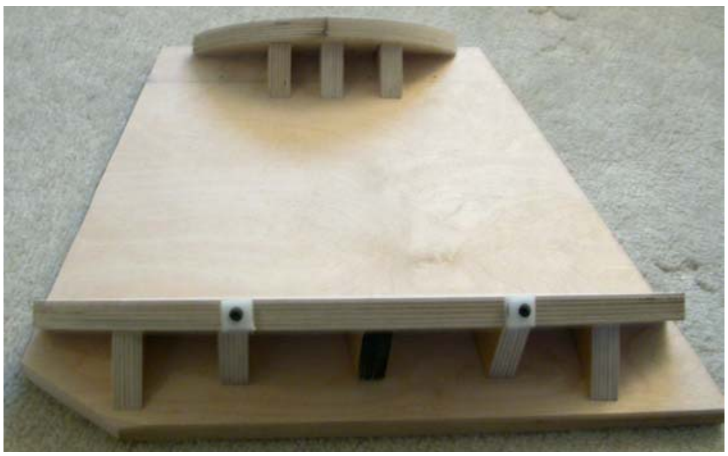
This is the south angle/wheel assembly. Notice that it is mounted on ebony star Formica so it is free to move horizontally. This photo shows that the wheels are mounted to a small 3" (75 mm) angle that corresponds to the contact angle with the bearing. I used the same angle for the wheels on the north and south wheels.



South angle/wheel assembly rotated counterclockwise.

South angle/wheel assembly rotated clockwise.

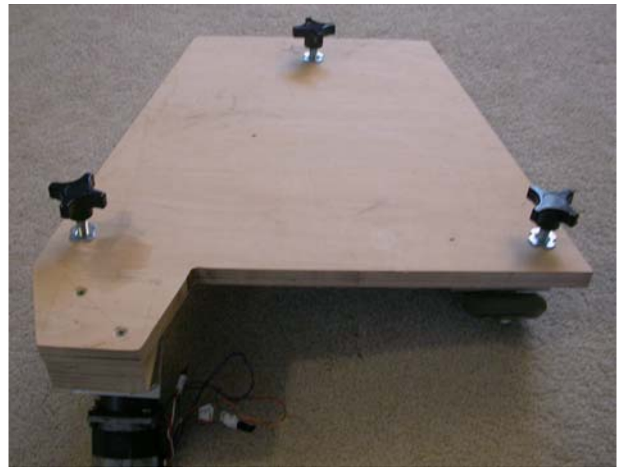
This is the back side of the south angle/wheel assembly. Notice that I used carriage bolts to support the back side of the angles that mount the wheels.



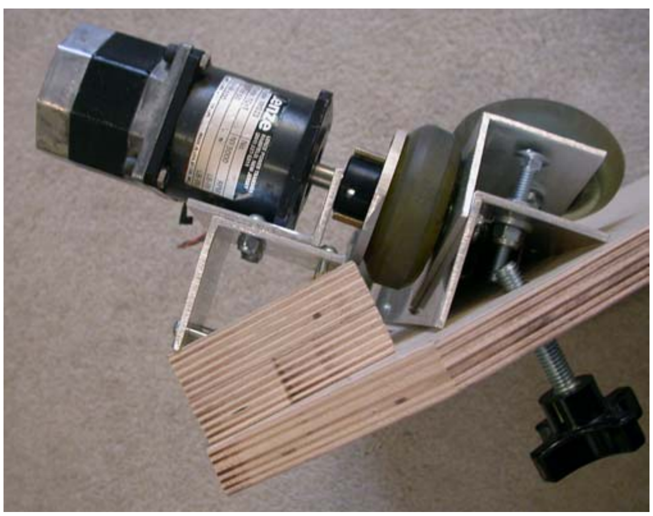
Here is a view of the bottom side of the upper platform. The north bearing is at the front of the photo and the south bearing is at the back of the photo.

I'm fortunate to live at 45.78 degrees north latitude so both bearings are mounted on 45 degree angles.

Notice that the diameters of the two bearings are concentric. The center of radius for both bearings is the axis the platform rotates about, the axis that points to the North Star.



This photo shows the bottom of the lower platform. I used 3/8" knobs to level the platform. The adjusting knobs are below the centerlines of the north and south angle/wheel assemblies. In the next photo you can see the adjustment knob below the angle.



Here is the motor mounting detail. The motor is supported by the drive wheel, and also by the mounting bracket.