POINTING AN EQUATORIAL TELESCOPE

A German Equatorial mount has an adjustment, sometimes called a wedge, which tilts the mount's polar axis so that it points at the appropriate Celestial Pole (NCP or SCP). Once the mount has been polar aligned, it needs to be rotated around only the polar axis to keep an object centred. This rotation can be done manually or by using an optional drive which can usually be set to run forward (N) or in reverse (S) depending the hemisphere.

> ☞ *Once the mount has been correctly polar-aligned, do not reposition the mount base or change the latitude setting. The mount has already been correctly aligned for your geographical location (ie. Latitude), and all remaining telescope pointing is done by rotating the optical tube around the polar and declination axes.*

A problem for many beginners is recognizing that a polar-aligned, equatorial mount acts like an alt-azimuth mount which has been aligned to a celestial pole. The wedge tilts the mount to an angle equal to the observer's Latitude, and therefore it swivels around a plane which parallels the celestial (and Earth's) equator (Fig.1). This is now its "horizon"; but remember that part of the new horizon is usually blocked by the Earth. This new "azimuth" motion is called Right Ascension (R.A). In addition, the mount swivels North(+) and South(-) from the Celestial Equator towards the celestial poles. This plus or minus "altitude" from the celestial equator is called Declination (Dec).

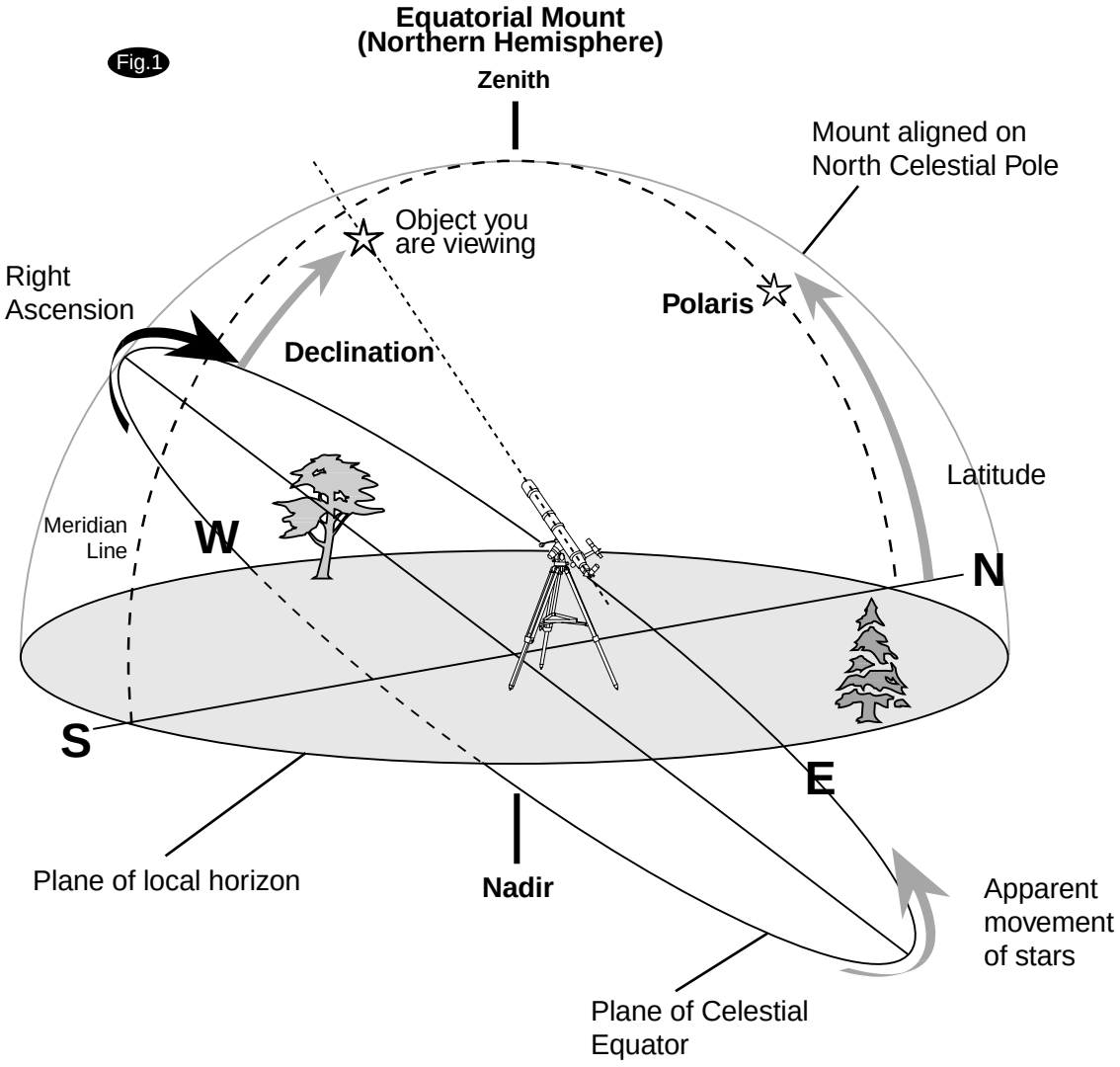
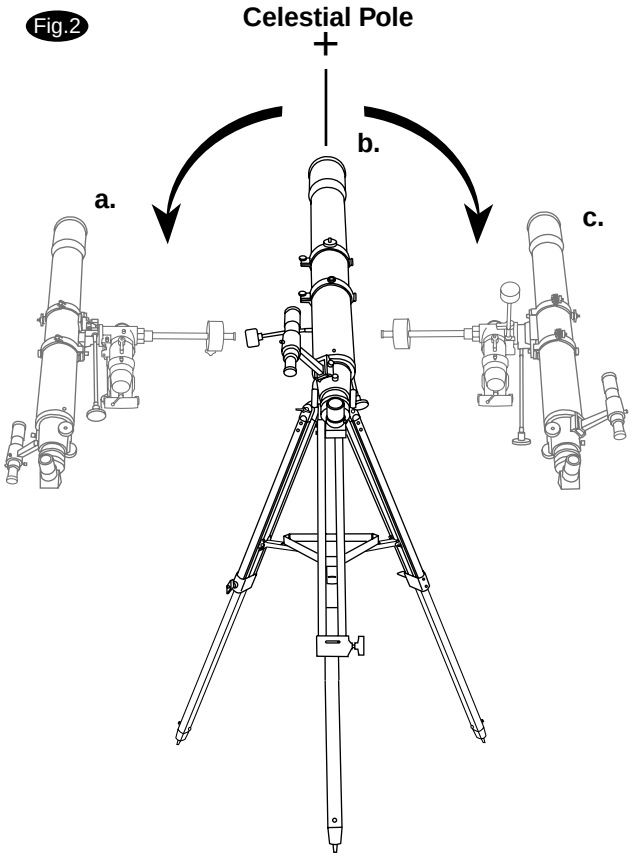


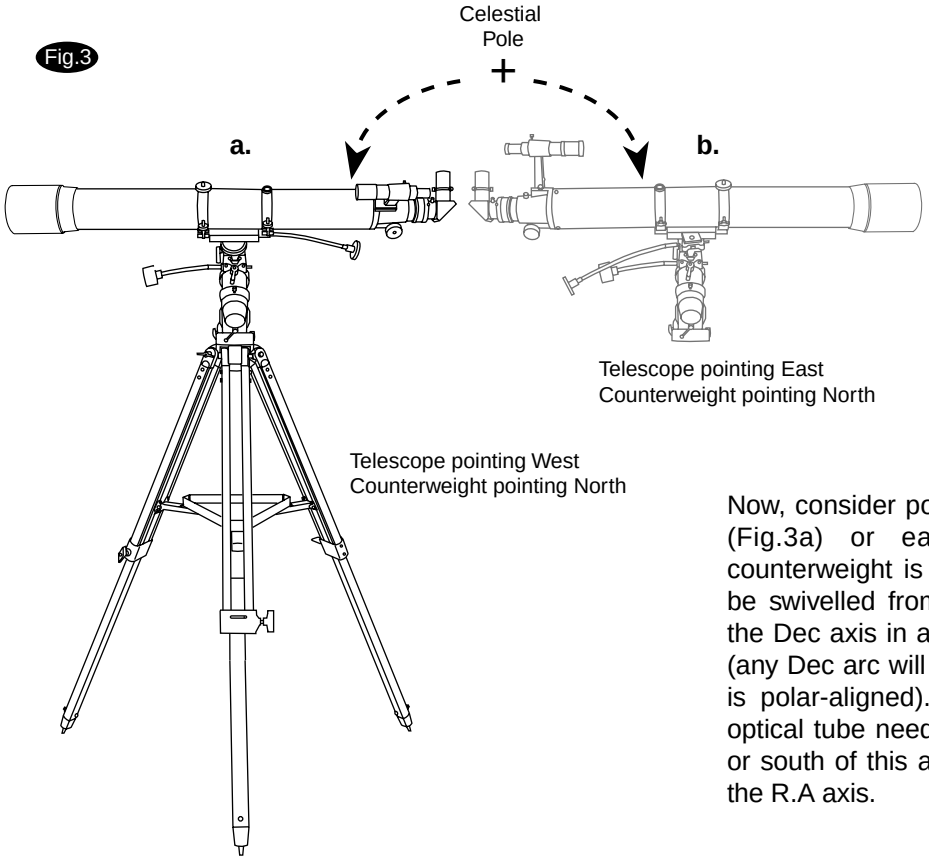
Fig.2



For the following examples, it is assumed that the observing site is in the Northern Hemisphere. In the first case (Fig.2b), the optical tube is pointing to the NCP. This is its probable position following the polar-alignment step. Since the telescope is pointing parallel to the polar axis, it still points to the NCP as it is rotated around that axis counter-clockwise, (Fig.2a) or clockwise (Fig.2c).

There can be a small wedge-shaped "blind spot" near the NCP, because the optical tube's RA movement is blocked by the mount. To observe at high magnifications in this area, the mount must be moved out of alignment (E or W) and the tracking must be turned off. Lack of tracking is not a problem because there is little movement of objects this close to the Celestial Pole. The mount must be polar aligned again before starting to observe other areas of the sky.

Fig.3

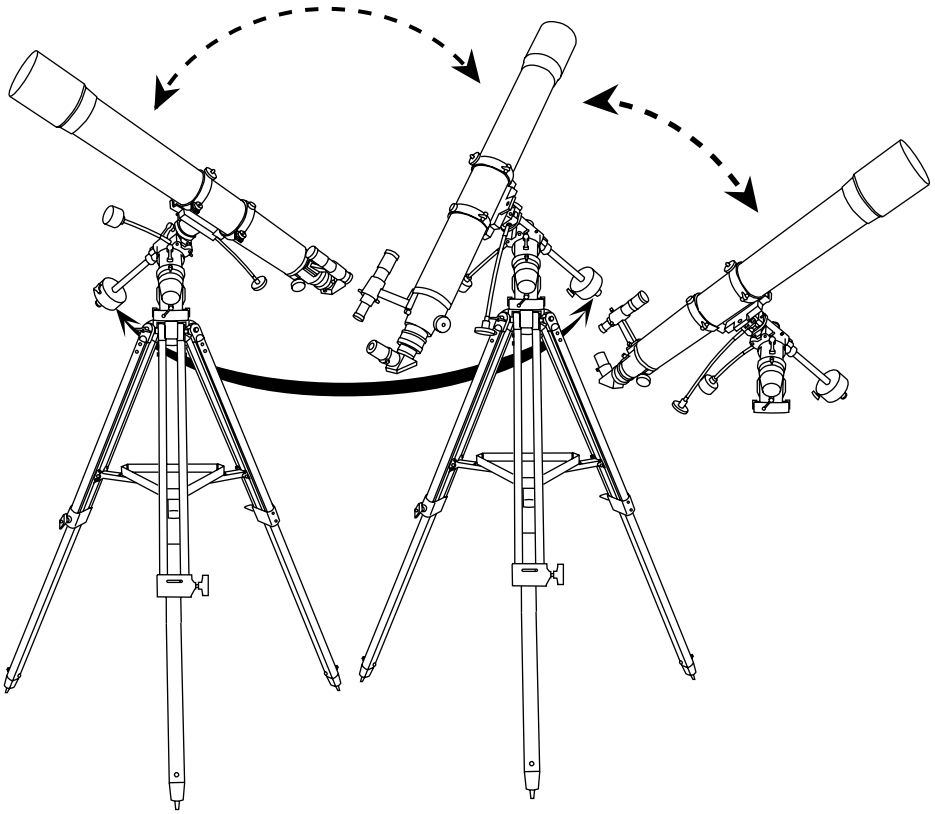


Rotation of the R.A axis
Rotation of the Dec. axis

Now, consider pointing the telescope at the western (Fig.3a) or eastern (Fig.3b) horizon. If the counterweight is pointing North, the telescope can be swivelled from one horizon to the other around the Dec axis in an arc that passes through the NCP (any Dec arc will pass through the NCP if the mount is polar-aligned). It can be seen then that if the optical tube needs to be pointed at an object north or south of this arc, it has to be also rotated around the R.A axis.

Pointing in any direction other than due North requires a combination of R.A and Dec positions (Fig. 4). This can be visualized as a series of Dec arcs, each resulting from the position of rotation of the R.A axis. In practice however, the telescope is usually pointed, with the aid of a finderscope, by loosening both the R.A and Dec locks and swivelling the mount around both axes until the object is centred in the eyepiece field.

Fig.4

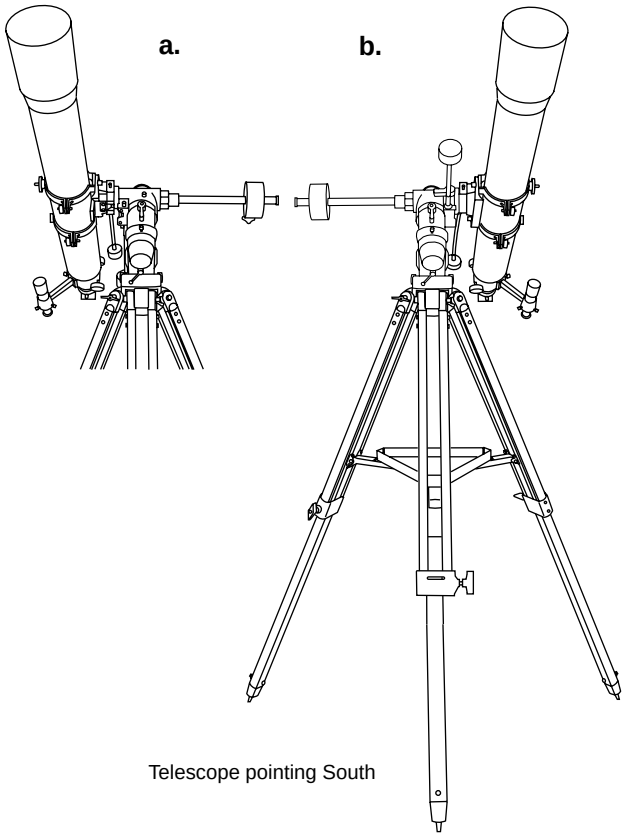


Examples of the telescope moved in R.A. and Dec

The swivelling is best done by placing one hand on the optical tube and the other on the counter-weight bar, so that the movement around both axes is smooth, and no extra lateral force is applied to the axis-bearings. When the object is centred, make sure the R.A and Dec locks are both re-tightened to hold the object in the field and allow tracking by adjusting only in R.A.

Pointing at an object, for example to the South (Fig.5), can often be achieved with the optical tube positioned on either side of the mount. When there is a choice of sides, particularly when there could be a long observing period, the East side (Fig.5b) should be chosen in the Northern Hemisphere because tracking in R.A will move it away from the mount's legs.

Fig.5



Telescope pointing South

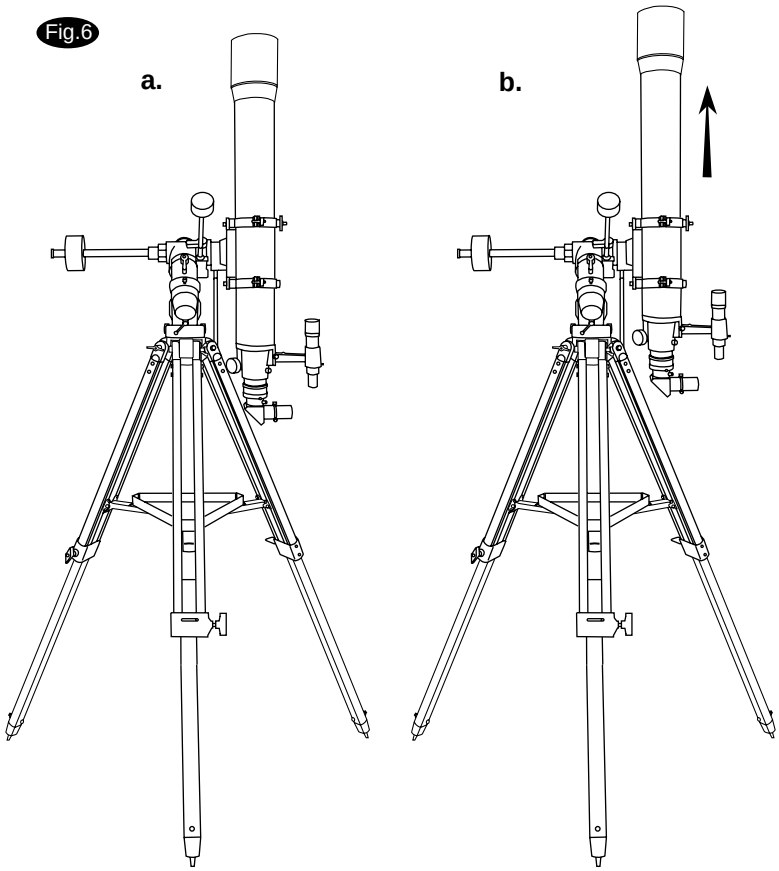
This is particularly important when using an R.A motor, because if the optical tube jambs against the mount's legs, it can result in damage to the motor and/or the gears.

Telescopes with long focal lengths often have a "blind spot" when pointing near the zenith, because the eyepiece-end of the optical tube bumps into the mount's legs (Fig. 6a). To adapt for this, the optical tube can be very carefully slipped up inside the tube rings (Fig. 6b). This can be done safely because the tube is pointing almost vertically, and therefore moving it does not cause a Dec-balance problem. It is very important to move the tube back to the Dec-balanced position before observing other sky areas.

Something which can be a problem is that the optical tube often rotates so that the eyepiece, finderscope and the focussing knobs are in less convenient positions. The diagonal can be rotated to adjust the eyepiece. However, to adjust the positions of the finderscope and focussing knobs, loosen the tube rings holding the optical tube and gently rotate it. Do this when you are going to view an area for while, but it is inconvenient to do every time you briefly go to a new area.

Finally, there are a few things to consider to ensure that you are comfortable during the viewing session. First is setting the height of the mount above the ground by adjusting the tripod legs. You must consider the height that you want your eyepiece to be, and if possible plan on sitting on a comfortable chair or stool. Very long optical tubes need to be mounted higher or you will end up crouching or lying on the ground when looking at objects near the zenith. On the other hand, a short optical tube can be mounted lower so that there is less movement due to vibration sources, such as wind. This is something that should be decided before going through the effort of polar aligning the mount.

Fig.6



Telescope pointing at the Zenith