

Telescope Image Orientation - Why Is Everything Upside-Down?

One of the most surprising discoveries first-time telescope owners will find is that images may appear upside-down or backwards depending on the type of telescope. The first thought is the telescope is broken - when in fact it is working perfectly normal. Depending on the type of telescope, images may appear correct, upside-down, rotated, or inversed from left to right.

Why is this? Why would you want to see everything incorrectly? All telescopes, refractors, reflectors, and catadioptrics, as well as all cameras, have inverted images because that's the way all lenses and mirrors work. Even the lenses in your eyes invert the images of the world, and your brain erects them. Astronomers usually don't bother adding the optics needed for an erect image because extra optics reduce light throughput and introduce aberrations. Who cares what's up or down in space anyway? For astronomical viewing, it is not important whether an object is shown correctly. In space there is no up or down!

The orientation of the observed image is dependent upon the type of telescope that you are using, and there are ways that you may be able to **correct** it for land (terrestrial) use.

Refractor and Cassegrain telescopes will produce an image that is upside-down when used without a **diagonal**. When a “star diagonal” is used, the image will be corrected right-side up, but it will remain **backwards** from left to right. It will look like trying to read a sign in a **mirror**. There are special diagonals called “Erect-Image Prism diagonals” that can correct the backwards image for land use.

Newtonian Reflectors will produce an image that is **upside-down** and are not recommended for land use. There are **limited ways** to correct this with a Newtonian Reflector. When using a star chart with a Newtonian Reflector, just turn the chart upside-down, and then it will be oriented as the star field appears in your eyepiece.

