
Three Major Components of an Astronomical Telescope

Optical Tube

Optical tube is the main component of an astronomical telescope as it contains the lens and mirror that collects light from celestial objects and the eyepiece lens that magnifies the image.

The factors that determine the performance of an optical tube are:

- The effective diameter of objective lens (primary mirror)
- The performance of lens or mirror

An objective lens (primary mirror) with a larger effective diameter size can collect more light and forms a clearer view of faint and hard-to-see objects. The performance is largely affected by the material of the lens or the mirror and precision employed in manufacturing.

Mount

An optical tube is placed on a mount. It plays a significant role in changing the direction of the optical tube to be able to observe a target celestial object. You should always use a stable mount so that your view will not be affected by small vibrations.

Tripod

The part attached below the mount is a tripod with adjustable legs is the tripod. A stable tripod is recommended since views of small objects can be affected by small vibration. However, if it is too heavy, it is hard to carry around and gradually, you may be discouraged to use the telescope. We suggest that you consider how you will use a telescope (the distance that you carry it or frequency of use) when making a selection.



Three Types of Optical Tubes

Refractors

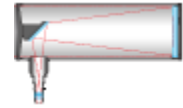
The image formed by the light rays passing through the objective lens is magnified when they pass through the eyepiece lens.

- Constantly stable field of view, suitable for observation of any astronomical object.
- Maintenance during storing is not particularly necessary; It is easily maintained.
- Relatively expensive among other types of optical tubes with the same aperture size.
- Heavier than the other types of optical tubes due to the multiple lenses used.



[» Vixen's refractors](#)

Reflectors (Newtonian)

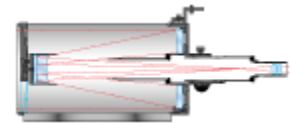


The light reflected off the primary objective mirror (concave mirror) is then reflected off a tilted mirror and finally passes through the eyepiece lens causing the image to be enlarged. The eyepiece lens is placed on the side of the optical tube.

- Sharp central images, no chromatic aberration (no color is seen around the corners of images).
- An optical tube even with a large aperture is moderately priced.
- A large difference in temperatures between outside and the tube could create air turbulence. The tube temperature must be adjusted to outside temperature before making any critical observation.
- Is not usable for observation of the Sun.

[» Vixen's Newtonian reflectors](#)

Catadioptric types



This configuration takes components of both refractors and reflectors.

- Chromatic aberration, coma aberration, spherical aberration, and field curvature are all corrected accurately.
- Compact and lightweight; convenient for carrying and observing.
- A large difference in temperature between outside and inside the tube could create air turbulence. The tube temperature must be adjusted to outside temperature before making any critical observation.
- Not applicable for observation of the Sun.

[» Vixen's catadioptric-type optical tubes](#)

Two Types of Mounts

Altazimuth Mount

Tracks a celestial object constantly by combining both the vertical and horizontal motions.

The altazimuth mount has simple vertical and horizontal motion controls designed to easily point a telescope to the object you wish to view.

- Can be assembled and handled easily due to its simple structure.
- No setting such as polar axis adjustment done for equatorial mounts is necessary. You can quickly prepare for observation.
- Lightweight and portable.
- Can also be used to mount a terrestrial telescope.
- Not recommended for long-term observation at powers higher than 100x.
- Not designed for long exposure astro-photography.

[PORTA II Altazimuth Mount](#)



Vixen's Altazimuth Mounts

[MINIPORTA](#) [PORTA II](#) [SKYPOD](#)

SX Equatorial Mount

Tracks a celestial object in an arc motion just as in diurnal motion.



Equatorial Mount

The direction of the optical tube is adjusted by an arc motion just as the constant diurnal motion of a celestial object. The models with auto-guider functions with an automatic motor drive or by a power source to track an object and change direction automatically.

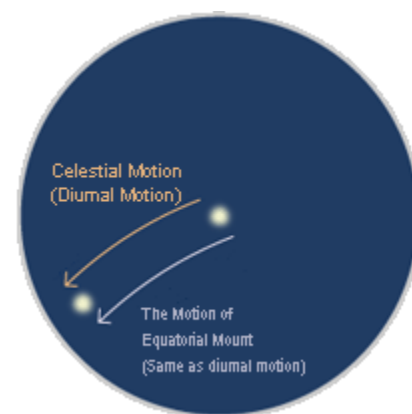
- Allows tracking of an object over an extended period.
- Suitable for long observation at high powers or for astrophotography.
- Mounts with various functions such as automatic object search and automatic tracking are available.
- For beginning observers, usage of equatorial mounts is not as intuitive as that of altazimuth mounts. Beginners should read the manual thoroughly.
- The polar axis must be adjusted before beginning observation.
- Heavier than altazimuth mount.

■ Vixen's Equatorial Mounts

» [SX Equatorial Mounts](#)

» [GP2 Equatorial Mounts](#)

» [GPD2 Equatorial Mounts](#)



Frequently Asked Questions:

Q.

Since I was a child, I have been thinking of buying a telescope. I live in the metropolitan area and the sky may be too bright. If possible, I want to see the moon or Saturn's rings without have to go through a difficult procedure.

A.

Even in the city with a bright sky, you can see decent images of the moon and planets such as Saturn, Jupiter, and Venus. For easy beginning astronomy, an altazimuth mount is recommended. As for the optical tube, if you prefer an ease of use, a refracting type is a recommend. However, if you plan to drive the outskirts of the city for star, a reflecting type optical tube with a large aperture is recommended because it captures nebulas or star clusters that are hard to see in the metropolitan area.

Q.

We are interested in doing astronomical observation with our the family. What type of telescope is suitable for such a group observation?

A.

An astronomical telescope cannot be used by many people at once. Thus, even though an object image is captured, it will go off the field of view quickly. For example, when a father sets the telescope to point at Saturn and it is in the center of field of view, it may be in the corner of the field of view by the time his child looks at it. Therefore, for observing by a large group of people such as a family, a mount with an auto-guider is recommended. In addition, with a Go-To mount, you can decide which object to observe on the controller screen and select it. A reflecting-type optical tube that obtains a high contrast view in a stable field of view is recommended.

Q.

I want to buy a telescope for my child who is in the 1st grade, but I am not familiar with telescopes and I want to become familiar with the basics of observing. If she shows more interest, I would consider upgrading to a more advanced model.

A.

We think that a telescope which your child can move freely and operate on her own would be a good choice. A model that is lightweight overall and simple to handle such as the A70L/Porta II or VMC95/Miniporta packages are recommended. The Porta II can hold many other Vixen telescopes to allow you to purchase a larger scope as your interest grows.

Q.

I am not familiar with celestial objects. Is there any model which allows me to observe easily even if I don't have any knowledge about what stars can be found in what location?

A.

Consider one of the Sphinx mounts for easy Go-To Viewing. The built in star chart shows you the sky and you can select objects to observe from the menus. The Sphinx SXW and Sphinx SXD mounts can be paired with most of Vixen's optical Tubes. Select a package or design one that suits your needs.

Q.

We are looking for an advanced model for use in an educational setting. We are looking for the best performance for our budget.

A.

If performance level is the first condition, the Atlux equatorial mount with the automatic celestial navigation function is recommended. For the optical tube, a refracting type with a large aperture which has an excellent light gathering power and provides a stable field of view and a high-contrast image. Pair the Atlux with the new AX103 or the VMC260 for good quality viewing.

Q.

I am a photographer and have been taking photographs of nature for almost 20 years. I would like to start serious astrophotography. Is there any telescope suitable for it?

A.

There are a few kinds of astro-photographs. Our answer depends on the kind of photography you are interested in taking? If you want to do star-field photography, the GP photo guider is what you need. This is a GP Mount designed only for astrophotography.

If you are interested in doing prime focus photography or eye projection photography by connecting a camera to the telescope, you will need an equatorial mount which will perform auto-tracking of celestial objects. Vixen offers different models of equatorial mounts: The models with auto-guider function are GP2, GPD2, and SX(Sphinx) equatorial mounts. An equatorial mount with a larger size and weight can take photographs due to the stable and high-precision auto-tracking. For the optical tube, consider an ED refractor, R200SS with a large aperture size for reflecting type, or VC200L designed for photography. .