LIBRARY TELESCOPE PROGRAM™

Telescope User Guide

"The best thing that we're put here for's to see; The strongest thing that's given us to see with's a telescope. Someone in every town seems to me owes it to the town to keep one."*

(Please thank your librarian for being that "someone"!)

*From the Robert Frost poem *"The Star Splitter"*

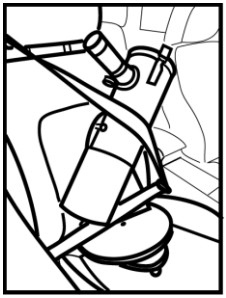
(see page 15 to learn about "star splitting")

Meet the Library Telescope!

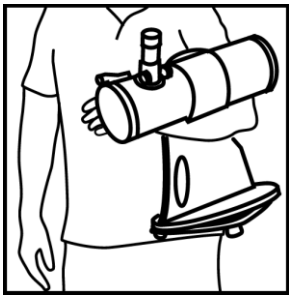
These are short focal length 4.5" diameter reflecting telescopes with good optics. They are user friendly with a stable mount, a simple sight, and a zoom eyepiece that adjust from around 20 power to 60 power. This makes it easy to find and observe the Moon, planets, and other astronomical objects.

NOTE: The telescope you receive may differ in color and styling but they all function the same.

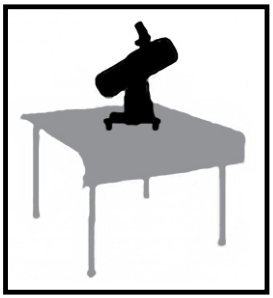
Transporting, Setup, and Care



The telescope can travel belted in a car



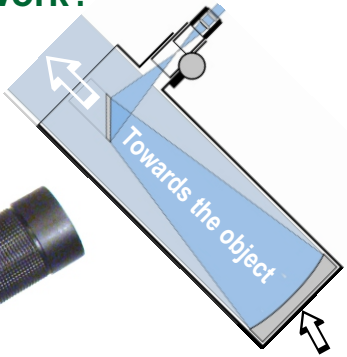
Wrap your arm around the mount to carry it



To use, place it on any table, stool, or bench

- Try not to bump the zoom eyepiece or the sight.
- Dropping anything into the telescope tube may cause serious damage.
- Avoid touching the mirrors inside the telescope tube or the eyepiece lens glass.
- Contact your librarian if the optics seem cloudy or dirty, please don't attempt to clean them.
- Please put the dust cap on the barrel and the cap or cloth bag over the eyepiece when not in use.
- Children should use this telescope only with adult supervision.
- Never aim the telescope at the Sun, it will damage eyesight and melt parts.

Fun Fact: How does it work?



Isaac Newton's 1668 reflecting telescope, look familiar?

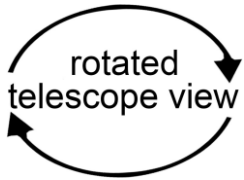
The Library Telescope is a **reflecting telescope**. It uses a curved mirror to reflect and focus light to create an image. Its a design that has been around for hundreds of years. The first telescope of this type was created by **Isaac Newton** in 1668 so you will also see this design called a "**Newtonian Reflector**".

Getting Started

It's a good idea to read the instructions and practice with the telescope during the day or inside before you take it out in the dark.

This is a **"Push-to"** telescope on what's called an **"altitude-azimuth mount"** (it goes up / down and left / right). Because the Earth is turning, objects in the night sky will look in the telescope like they are moving in the opposite direction. You will have to reposition the telescope to keep objects in the center of the eyepiece. Depending on the bearing tension, you may need to grasp the front and back of the telescope to move it smoothly.

Like many telescopes, **the image in the eyepiece is upside-down**. When looking at star charts and moving the telescope you will have to keep this in mind. You may see Moon, planet, or star maps that are rotated or "flipped" to match what you see in the eyepiece of a telescope.



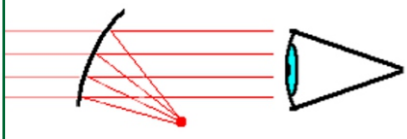
Do you wear eyeglasses? If you are nearsighted or farsighted, you will probably be able to observe with your glasses off. If your eyes are astigmatic, images will probably appear best with glasses on.

Aiming the Telescope

This telescope has a **Sight** to help you aim it at objects. It projects a red dot.

- To turn on, rotate the power knob until you hear a "click".
- From behind, look through the sight to see the red dot.
- Center the dot on the object you wish to observe.
- Intensity of the dot can be adjusted by turning the power knob.
- Turn down brightness to the lowest possible setting.

Fun Fact: It's (mostly) mirrors again!



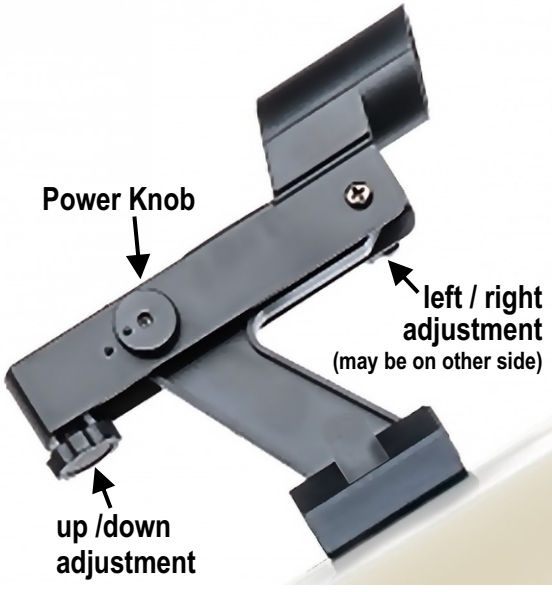
The Red Dot Sight uses a curved window, acting as a mirror, focusing the light from a small red LED light bulb back at you. This causes all the light to travel in one direction, making the red dot appear to float in space out in front of you.

Adjusting the Sight (if needed)

The Red Dot Sight should be in alignment when you receive the telescope.

To check, (best done in the daytime) with the eyepiece at low magnification, aim the telescope at a distant object and center it in the telescope's eyepiece. Turn the Red Dot Sight on and look to see if the object is near or under the red dot.

If not: Use the Red Dot Sight's left/right (azimuth) and up/down (altitude) adjustment knobs to position the red dot on the object. When the object is centered in the telescope and the red dot is centered on the object, you're done!



Red Dot Sight details

Magnification and Focusing

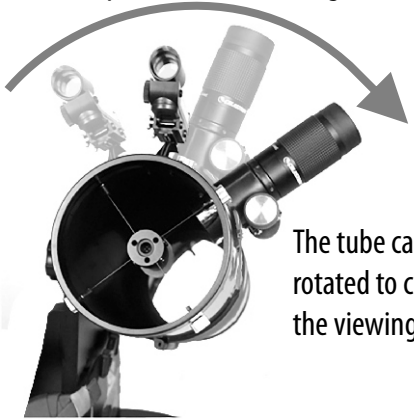
The telescope has a **Zoom eyepiece** (operated by turning the **Zoom Ring**) to give a range of magnification. It's a variable power magnifying glass (focal length given in millimeters) so the larger number is low magnification and the smaller number is high magnification. The advantage of the zoom eyepiece is that you can turn the Zoom Ring to a low magnification (wide field) so you can find and center an object easily. You can then zoom to higher magnifications as needed.

To focus, slowly rotate the **Focus Knobs** . When it's "in-focus," rotate the knob to either side of your "in-focus point" just to make sure you've hit the sharpest image for your eyes. When focusing on stars, bring them to as small a point as possible. Each user may have to re-focus to match their eyesight.

When you change magnification you will have to refocus the telescope.

If the telescope tube is hard to move up-down or does not stay in place, use the **Altitude Clamp** knob to set the right level of tension.

If you find that it's awkward for you (or a child) to look through the eyepiece, you can loosen the **knob** on the **Tube Clamp** and rotate the telescope tube until the eyepiece is in a more convenient position. Be sure to tighten it again!



The tube can be rotated to change the viewing position

The accessories pack strapped to the telescope mount contains a *User Guide*, night sky navigation charts or booklets, and a red light.

When observing at night (especially when viewing detail in dim objects) **it can take 20 minutes or more for your eyes to become adapted to the dark.** Red light doesn't affect this so you can use it to read the Guide, navigation chart, or to make adjustments to the telescope.

When in a group of people, other observers will appreciate it if you use a red light.

Observing Hint:

You will find when star gazing that dew forms on pretty much everything (and everyone). The big mirror is tucked safely down at the bottom of the telescope and generally it stays dry. The eyepiece, however, can get covered in dew, making it useless until it warms up and drys out. One way to dry it is to wrap your hands around it for a few moments. As it warms up, the fog should disappear. The telescope can also be taken inside to warm up. Please don't wipe the lens with a tissue or cloth as it has special coatings on it that could be damaged if you do.

We mentioned this before, but its worth repeating

WARNING: Never look directly at the **Sun** through your telescope — **even for an instant** — as permanent eye damage could result. Do not point the telescope at the Sun, as parts will melt!

Observing the Moon

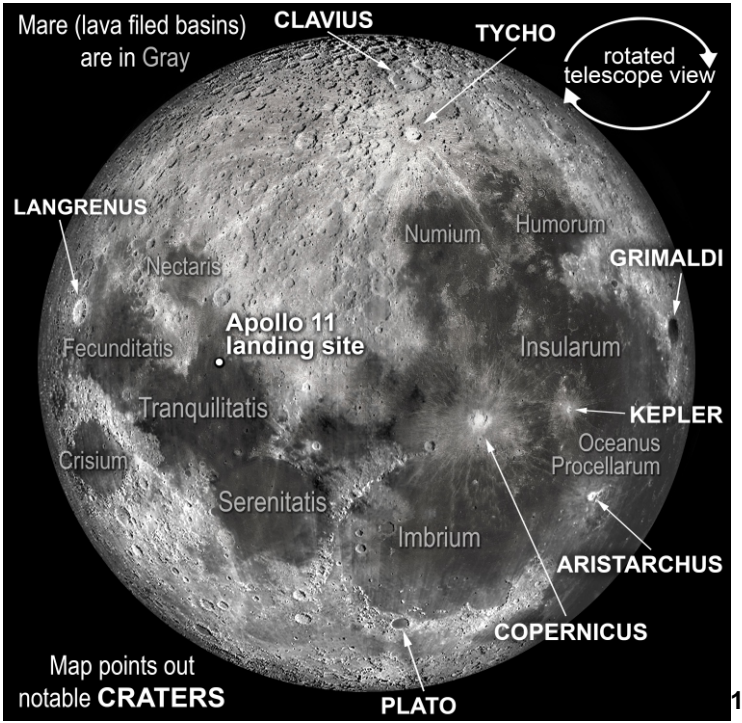
The Moon is one of the easiest and most interesting targets to view with your telescope. Lunar craters, "seas", and mountain ranges can all be clearly seen from a distance of 238,000 miles away! With its changing phases, you'll get a new view of the Moon every night it's up. The best time to observe is during a partial phase, that is, when the Moon is not full. During Full Moon the surface looks flat. During partial phases, shadows are cast on the surface which reveals more detail, especially right along the border between the dark and light portions of the disk (called the "terminator").

Observing Hint:

If the Moon is too bright, or you want a bit more contrast, put the dust cover on the telescope and remove the small plastic cap(s) **(called a Moon Port**) to reduce or "stop down" the light entering the telescope.

Full Moon looks flat!

In a partial phase, shadows show more detail



Observing Planets

The planets do not stay at "fixed" locations so to find them you should refer to print or online publications such as *Astronomy* or *Sky & Telescope*, other astronomy websites, or planetarium apps. **Venus**, **Jupiter**, and **Saturn** are some of the brightest objects in the night sky. **Mars** and **Mercury** are also bright but usually appear small in the telescope. Avoid observing from inside through a window or outside over hot surfaces (roofs, asphalt paving), these will distort the image.

Venus changes phase and size as it orbits around the Sun

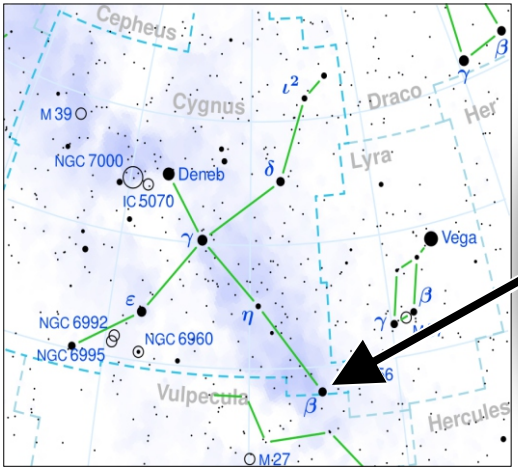
Jupiter and its moons

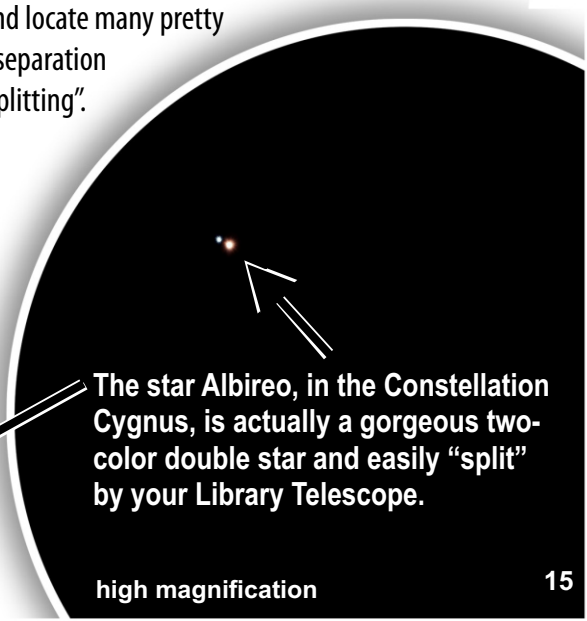
Websites like Astronomy.com have up-to-date night sky charts.

Saturn

Observing Stars

Even powerful telescopes cannot magnify a star to appear as more than a point of light. You can, however, enjoy the different colors of the stars and locate many pretty double and multiple stars. Being able to see the separation between two stars in a telescope is called "Star Splitting".





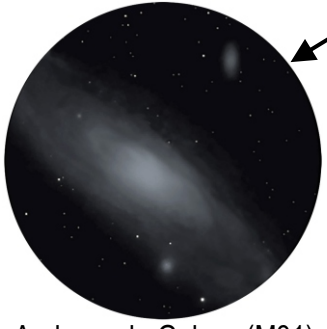
The star Albireo, in the Constellation Cygnus, is actually a gorgeous two-color double star and easily "split" by your Library Telescope.

high magnification

Observing Deep-Sky Objects

Most **"Deep-Sky Objects"** (the name star-gazers give to nebulae, star clusters, and galaxies) are very faint, so observe them well away from light pollution (travel to a dark sky location if possible) and pick a time when there is no moonlight (what astronomers call "**Dark Time**"). Take time to let your eyes adjust to the darkness. Often called "dim-fuzzes", do not expect "Hubble images"; many will look like dim gray smudges. As you become more experienced you will be able to see more subtle details.

Observing Hints:



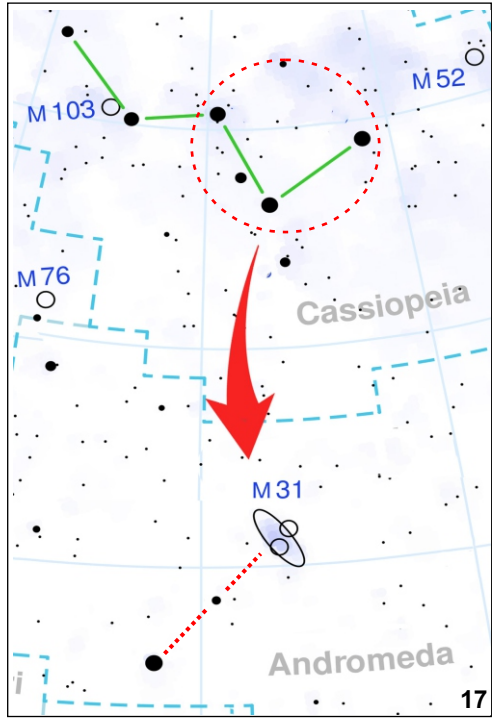
Andromeda Galaxy (M31)

Deep-Sky Objects can be big and dim. Use a low magnification (wide field) setting to find them. Your eye is not as light sensitive at its center so instead of looking right at objects, try to look off to one side. This is called "**Averted Vision**" and works well when looking at dim objects.

To find deep-sky objects, look through the sky chart provided with the telescope and/or use one of the smart phone planetarium apps. Constellations have many objects hidden within them that are only visible with a telescope or binoculars. Some of the brightest, deep-sky objects are those cataloged by **Charles Messier** in 1774. These objects are labeled with a "**M**essier Number," such as **M11** or **M45**.

To locate objects, look for a pattern of stars on a star chart that can act as landmarks to find them (a technique called **"Star Hopping"**).

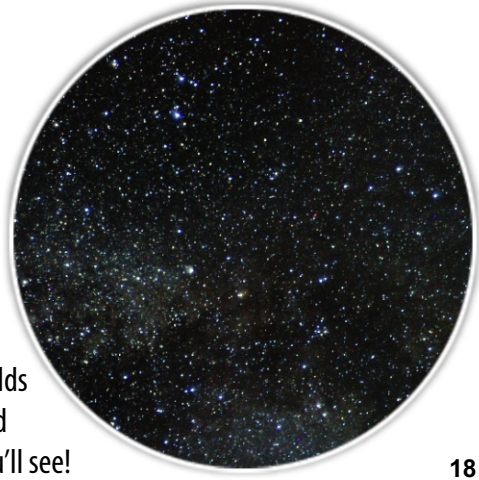
For example: to find the **Andromeda Galaxy (M31)**, three stars on one side of Cassiopeia form a triangle "pointing" --> to a brighter star and two dimmer "stars", all in a row. The end one is the Andromeda Galaxy.



The Milky Way

The Milky Way at a dark sky location

The Milky Way is our galaxy. It shows up as a fuzzy band across the sky because we live within it. If you are somewhere where you can make out the Milky Way (even faintly), try low magnification scanning along its length: just cruise through the "star clouds" of our galaxy.



You'll be amazed at the rich fields of stars and objects you'll see!

Observing Pointers

The **Moon**, **planets**, and **double stars** can be observed from urban areas, nearby lights or a few clouds will not affect them. With planets, the unsteady skies will make them "wobble" in and out of focus. Take time to "study" them, wait for those moments when they seem to pop into sharp focus.

Deep-Sky Objects need clear dark skies with little or no moonlight . You may want to take the telescope to a dark location. These objects are dim and require patience to find them.

A web search for "dark sky map" will bring up several interactive maps that show you where you can find less light pollution.

This **Library Telescope** is brought to you by the local librarians, amateur astronomers and organizations who help to purchase, modify and maintain it.

The Library Telescope Program™ was originally conceived by the New Hampshire Astronomical society (*nhastro.com/ltp.php*). Further information on the program can be found at *librarytelescope.org.*

This **User Guide** was produced by the Library Telescope Program™. Text, graphics, and images by Robert Stack, Library Telescope Program, The New Hampshire Astronomical Society, The St. Louis Astronomical Society, Warren Astronomical Society/Grosse Point Public Library (Warren, Michigan) and Wikipedia.

Guide layout, text, and select images
© 2024-2026 Library Telescope Program™
REV 12

More help Online

Need more information on your Library Telescope and Astronomy? Helpful videos, apps, star charts, and more are available, just scan the QR code above.