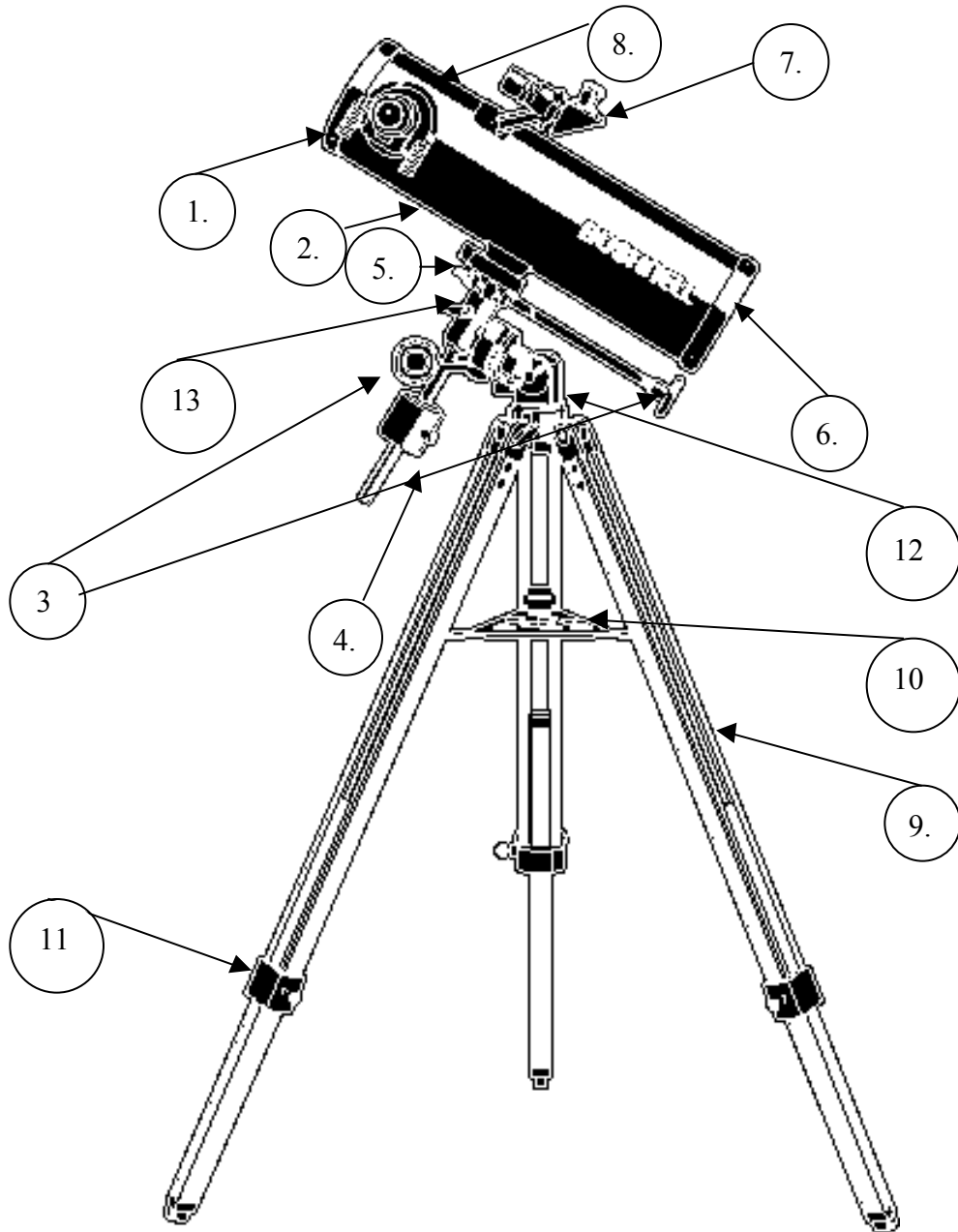




**VOYAGER® 4.5 INCH REFLECTOR TELESCOPE  
MODEL 78-9540**



- 1. Rack & Pinion Focusing System
- 2. Compact Reflector Body
- 3. Fine Adjustment Cables
- 4. Counterweight (on shaft)
- 5. Quick Release Equatorial Mount
- 6. Primary Mirror

- 7. Finderscope
- 8. 1.25" Format Eyepiece
- 9. Variable Height Aluminum Tripod Leg
- 10. Accessory Tray
- 11. Tripod Leg Lock Screw
- 12. Declination Lock Knob
- 13. Horizontal Axis Lock Knob

Thank you for purchasing the Bushnell Voyager Telescope! Your new telescope has been designed and crafted with the highest standards so that you may have years of enjoyment and use out of this wonderful window to the heavens. This product comes complete with everything you'll need to explore your universe including a professional primary mirror, precision rack and pinion focusing mechanism, superior all-metal main telescope tube, and professional quality wide-field 5x24mm finderscope. Whether you are just starting out in astronomy or you are an avid astronomer we wish you all the best with your telescope.

Please utilize this manual to its fullest potential by reading it completely before you attempt to assemble and use your new telescope. Once assembled, we've included a basic guide on how to get started in astronomy at the end of this manual. While this is not a complete guide, it will give you some initial pointers. As you advance in ability, we would highly recommend a supplemental star atlas, beginning astronomy guide, moon map, or any other guide as you travel on your journey through the universe.

## READ THROUGH ASSEMBLY INSTRUCTION BEFORE YOU ASSEMBLE YOUR TELESCOPE

### TELESCOPE ASSEMBLY

1. **Remove all components from the carton and identify all components.**
2. **Set-Up Tripod**
  - Select one tripod leg. Loosen *Tripod Leg Lock Screw (11)* and extend the *Tripod Leg Middle Section*. Tighten the *Tripod Leg lock Screw* so that the *Middle Section* is securely in place. Repeat for the remaining two legs.
3. **Attach Mount, Telescope and Finderscope**
  - Locate the *Equatorial Mount (5)*. **Note: Before assembling tripod legs to Equatorial Mount, make sure the Accessory Tray Braces face inward.** Loosen long bolts at the top of *Tripod Leg (9)*. Attach the mount to the *Tripod Leg* as shown (fig. 2). and secure *Equatorial Mount* to *Tripod Leg*. Repeat on the remaining two *Tripod Legs*. Once you have attached all *Tripod Legs* to the mount, securely tighten all tripod bolts.
  - Locate the *Finderscope (7)* with pre-assembled *Finderscope Mount*. Remove the two nuts located near the front of the telescope (closest to the rack and pinion focuser) and place the *Finderscope* and *Finderscope Mount* over the exposed screws. Replace the nuts, and securely tighten the *Finderscope* and *Finderscope Mount* in place.
1. **Attach Accessory Tray**
  - Locate the *Accessory Tray (10)*. Using the accessory tray bolts, wingnuts and washers connect the *Accessory Tray* to the *Accessory Tray Braces*. Start with one tripod leg and attach wingnuts. Wingnuts should be positioned beneath the accessory tray. Do not tighten wingnuts until all *Accessory Tray Braces* are attached as some adjustments may be required.
2. **Attach Control Cables, Counterweight and Eyepieces**
  - Locate the *Fine Adjustment Cables (3)*. Loosen the silver screws located at the end of the *Fine Adjustment Cables* and attach the *Fine Adjustment Cables* to the two silver posts found on the *Equatorial Mount (5)*.
3. Locate the *Counterweight (4)* and *Counterweight Shaft*. Loosen the thumb screw located on the *Counterweight* and slide the *Counterweight* onto the *Counterweight Shaft*, then and tighten thumb screw to secure the *Counterweight*. Thread the *Counterweight Shaft* into the hole located at the bottom of the "L" shaped bend in the *Equatorial Mount*. Make sure that the shaft is securely locked into mount.

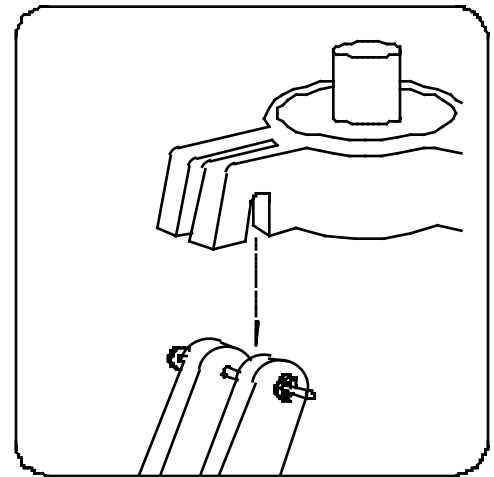


fig. 2

4. Insert **Eyepiece (8)** into focusing tube to begin viewing.

*Your Bushnell Voyager Telescope is now ready to be used. To obtain the fullest enjoyment from your telescope, please refer to the additional information below.*

## **HOW TO USE YOUR NEW TELESCOPE**

*Astronomical telescopes are designed in such a way that the image you will see appear **UPSIDE DOWN and REVERSED**, this is acceptable for viewing celestial bodies.*

### **Selecting an Eyepiece:**

1. You should always start viewing with the lowest power eyepiece, which in this case is the 20 mm lens. Note: the base power of each eyepiece is determined by the focal length of the telescope objective lens, which for this model is 540 mm. A formula can be used to determine the power of each eyepiece: **telescope OBJECTIVE lens focal length ÷ EYEPIECE focal length = MAGNIFICATION** (e.g. Using the 20 mm lens, the calculation would look like this: 540 mm ÷ 20mm = 27x or 27 power.)
2. Included with this telescope is a Barlow lens. Barlow lenses are used to double or triple the power of your telescope. Place your Barlow between the focusing tube and the eyepiece. Using the example above, your 3x Barlow lens would give you a total power of 81x or 81 power. (27 x 3 = 81x or 81 power)

### **Focusing Telescope:**

1. After selecting the desired eyepiece, aim main telescope tube at a land-based target at least 200 yards away (e.g. A telephone pole or building). Fully extend focusing tube by turning **Rack and Pinion Focusing Mechanism (1)**.
2. While looking through selected eyepiece (in this case the 20 mm), slowly retract focusing tube by turning **Rack and Pinion Focusing Mechanism** until object comes into focus.

### **Aligning Finderscope:**

1. Look through **Eyepiece (8)** and establish a well-defined target. (see focusing telescope section) Tighten all lock knobs (Declination, Latitude, Right Ascension, and Horizontal Axis) so that telescope's aim is not disturbed.
2. Looking through **Finderscope (7)**, alternate tightening each **Finderscope Adjustment Screw** until crosshairs of **Finderscope** are precisely centered on the same object already centered in the **Eyepiece (8)** field of view.
3. Now, objects located first with the **Finderscope (7)** will be centered in the field of view of the main telescope.

## UNDERSTANDING THE EQUATORIAL MOUNT

The **Equatorial Mount (5)** is designed to move in any direction. It can be set to allow manual controls to track the movements of celestial bodies across the sky. This is referred to as diurnal movement; movement of celestial bodies in the direction opposite to that of the earth's rotation and is around the earth's axis.

By aligning the telescope's polar axis at celestial North, you will place the telescope in parallel with the earth's axis and thus be able to locate stars in the sky based on star atlas information. To compensate for your position on earth, the polar axis is set in one of three ways:

- Set up the telescope at night. Loosen the **Declination Lock Knob (12)** and rotate the telescope around the declination axis until the arrow on the declination scale points to 90 degrees. Tighten the **Declination Lock Knob**. The telescope is now roughly in parallel with the polar axis.
- Loosen the **Horizontal Axis Lock Knob (13)** and turn the telescope until the objective end faces due north. This can be done by approximating the location of the pole star (Polaris or North Star) or by the use of a compass. True North is then found by directing the telescope at Polaris, as magnetic North is slightly away from true North.
- Look up the latitude of your area in any geographical atlas. Loosen the **Latitude Lock Knob** and set the latitude scale to the correct latitude for your area. Aim the **Finderscope (7)** at Polaris. You will probably notice that Polaris is not dead center in the **Finderscope's** field of view. This is probably because your telescope is not absolutely level with the ground. Loosen the **Horizontal Axis Lock Knob (13)** again and turn the telescope so that it is directly aimed at Polaris. Tighten both the **Horizontal Axis Lock Knob** and **Latitude Lock Knob**. Polaris is 1 degree from the North celestial pole. Therefore, the sighting of stars will have to be slightly adjusted as you locate them in the heavens.

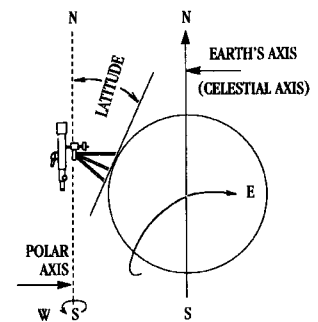


Fig. 1  
POLAR AXIS AND EARTH'S AXIS

***Never Look Directly At The Sun With Your Telescope  
Permanent Damage To Your Eyes May Occur***

### **Enjoying Your New Telescope**

1. First determine your targeted object. Any bright object in the night sky is a good starting point. One of the favorite starting points in astronomy is the moon. This is an object sure to please any budding astronomer or experienced veteran. When you have developed proficiency at this level, other objects become good targets. Saturn, Mars, Jupiter, and Venus are good second steps to take.
2. The first thing you need to do after assembling the telescope as planned is center the desired object in the finderscope's cross hairs. Provided you did a reasonable job aligning the finderscope, a quick look through the main telescope tube at low power should reveal the same image. With the lowest power eyepiece (the one with the largest number printed on it) you should be able to focus the same image that you saw through the finderscope. Avoid the temptation to move directly to the highest power. The low power eyepiece will give you a wider field of view, and brighter image--thus making it very easy to find your target object. At this point with a focused image in both scopes, you've passed the first obstacle. If you don't see an image after attempting to focus it in, you might consider aligning your finderscope again. Once you pass this step, you'll will enjoy the time spent ensuring a good alignment. Every object you center in the finderscope will be easily found in the main telescope tube, which is important for continuing your exploration of the night sky.
3. The low power eyepieces are perfect for viewing the full moon, planets, star clusters, nebulae, and even constellations. These should build your foundation. However, for more detail, try bumping up in magnification to higher power eyepieces on some of these objects. During calm and crisp nights, the light/dark separation line on the moon (called the "Terminator") is marvelous at high power. You can see mountains, ridges and craters jump out at you due to the highlights. Similarly, you can move up to higher magnifications on the planets and nebulae. Star clusters and stars are best viewed through the low power no matter what.

4. The recurring astronomical theater we call the night sky is an ever-changing billboard. In other words, not the same movie plays all the time. Rather, the positions of the stars change not only hourly as they seem to rise and set, but also throughout the year. As the earth orbits the sun our perspective on the stars changes on a yearly cycle about that orbit. The reason the sky seems to move daily just as the sun and the moon "move" across our sky, is that the earth is rotating about its axis. As a result you may notice that after a few minutes or a few seconds depending on what power you are viewing at, the objects in your telescope will move. At higher magnifications especially, you will notice that the moon or Jupiter will "race" right out of the field of view. To compensate, just move the fine adjustment controls on your telescope to "track" it in the necessary path.

### Helpful Hints

1. Your telescope is a very sensitive instrument. For best results and fewer vibrations set your telescope up on a level location on the ground rather than your concrete driveway or your wooden deck. This will provide a more stable foundation for viewing, especially if you've drawn a crowd with your new telescope.
2. If possible view from a location that has relatively few lights. This will allow you to see much fainter objects. You'd be surprised how much more you'll see from your local lake or park when compared to a backyard in the city.
3. Using your telescope out a window is NEVER recommended.
4. View objects that are high in the sky if possible. Waiting until the object rises well above the horizon will provide a brighter and crisper image. Objects on the horizon are viewed through several layers of earth's atmosphere. Ever wonder why the moon appears orange as it sets on the horizon. It's because you are looking through a considerable more amount of atmosphere than you would directly overhead. (Note: If objects high in the sky are distorted or wavy, you are probably viewing on a very humid night.) During nights of unstable atmosphere, viewing through a telescope can be frustrating if not impossible. Astronomers refer to crisp, clear nights as nights of "good seeing."

### Where do I start?

Your Bushnell telescope can bring the wonders of the universe to your eye. While this manual is intended to assist you in the set-up and basic use of this instrument, it does not cover everything you might like to know about astronomy. The first thing you need to do is get a very simple star chart and a flashlight with a red bulb or red cellophane over the end. For objects other than stars and constellations, a basic guide to astronomy is a must. Some recommended sources appear on our website at [www.bushnell.com](http://www.bushnell.com). Also on our website will be current events in the sky for suggested viewing. But, some of the standbys that you can see are:

The Moon--a wonderful view of our lunar neighbor can be enjoyed with any magnification. Try viewing at different phases of the moon. Lunar highlands, lunar maria (lowlands called "seas" for their dark coloration), craters, ridges and mountains will astound you.

Saturn--even at the lowest power you should be able to see Saturn's rings and moons. This is one of the most satisfying objects in the sky to see simply because it looks like it does in pictures. Imagine seeing what you've seen in textbooks or NASA images from your backyard!

Jupiter--the largest planet in our solar system is spectacular. Most noted features are its dark stripes or bands both above and below its equator. These are the north and south equatorial belts. Also interesting are Jupiter's four major moons. Pay close attention to their positions from night to night. They appear to be lined up on either side of Jupiter.

Mars--The Great Red Planet appears as a reddish-orange disk. Look at different times of the year and try to catch a glimpse of the white polar ice caps.

Venus--just like the moon, Venus changed phases from month to month. Some views of brilliant Venus appear as if you were looking at a distant crescent moon.

Nebulae--The Great Orion Nebula is a very well known night sky object. This and many others are brought to you by this telescope.

Star Clusters--View millions of stars densely packed in a cluster that resembles a ball.

Galaxies--One of the greatest and most interesting galaxies is our neighbor the Andromeda Galaxy. Enjoy this and many others. Much, much, more!

[www.bushnell.com](http://www.bushnell.com)

### ANSWERS TO COMMONLY ASKED QUESTIONS

1. The image I see in the telescope is upside down and reversed from right to left ?	<ul style="list-style-type: none"> <li>An upside-down and reversed image is a common characteristic of most astronomical telescopes. Since telescopes are used for astronomical viewing orientation is not important. The image in the finderscope will also be reversed.</li> </ul>
2. How do I determine the power my telescope ?	<ul style="list-style-type: none"> <li>The power of your telescope can be determine by dividing the focal length of the objective lens by the focal length of the eyepiece. The eyepiece focal length is the number printed on the eyepiece. (For example: <math>1000 \div 25 = 40X</math>)</li> </ul>
3. Where do I find the Telescope Focal Length	<ul style="list-style-type: none"> <li>The telescope focal length is the same focal length as the objective focal length. For this telescope it is 540mm. Telescope focal lengths range from 540mm to 900mm on Bausch &amp; Lomb and Bushnell telescopes.</li> </ul>
4. What can I see with my telescope ?	<ul style="list-style-type: none"> <li>Telescopes with power ranging from 25X to 50X can be used to view Star Clusters and Nebulae. 90X to 120X telescope can view galaxies. Most planets can be seen at any magnification.</li> </ul>
5. What do the numbers on the eyepiece mean ?	<ul style="list-style-type: none"> <li>The numbers on the eyepiece represents the “focal Length” of the eyepiece.</li> </ul>

### TROUBLESHOOTING GUIDE

<p><i>If after you have set-up your new telescope you are unable to see any objects, use this Quick Reference guide to help you to understand the cause of the problem and quickly determine a remedy</i></p>	
1. I've completed the set-up yet I cannot see anything	<ul style="list-style-type: none"> <li>Check to see if objective lens cover has been removed.</li> <li>Try to view an object that is 200 or more yards away.</li> <li>If there is more than one eyepiece included with the telescope, use the lowest power (highest number) eyepiece to begin viewing.</li> <li>Use the <b>Rack &amp; Pinion Focusing Mechanism (3)</b> to bring the object you are trying to view into focus</li> </ul>

## **Telescope LIFETIME LIMITED WARRANTY**

Your telescope is warranted to be free of defects in materials and workmanship for the lifetime of the original owner. The Lifetime Limited Warranty is an expression of our confidence in the materials and mechanical workmanship of our products and is your assurance of a lifetime of dependable service.

If your telescope contains electrical components the electronic components are warranted to be free of defects in materials and workmanship for one year after the date of purchase.

In the event of a defect under this warranty, we will, at our option, repair or replace the product, provided that you return the product postage prepaid. This warranty does not cover damages caused by misuse or improper handling, installation or maintenance of the product. Any return made under this warranty must be accompanied by the items listed below:

- 1) A check in the amount of \$15.00 to cover the cost of handling
- 2) Name and address for product return
- 3) An explanation of the defect
- 4) Product should be well packed in a sturdy outside shipping carton to prevent damage in transit and return postage prepaid to the address listed below:

IN U.S.A. Send To:

Bushnell \* 8500 Marshall Drive \* Lenexa, Kansas 66214

IN CANADA Send To:

Bushnell \* 25A East Pearce Street, Unit 1 \* Richmond Hill, Ontario L4B 2M9

For products purchased outside the United States and Canada please contact your local dealer for applicable warranty information. This warranty gives you specific legal rights. You may have other rights which vary from country to country.

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