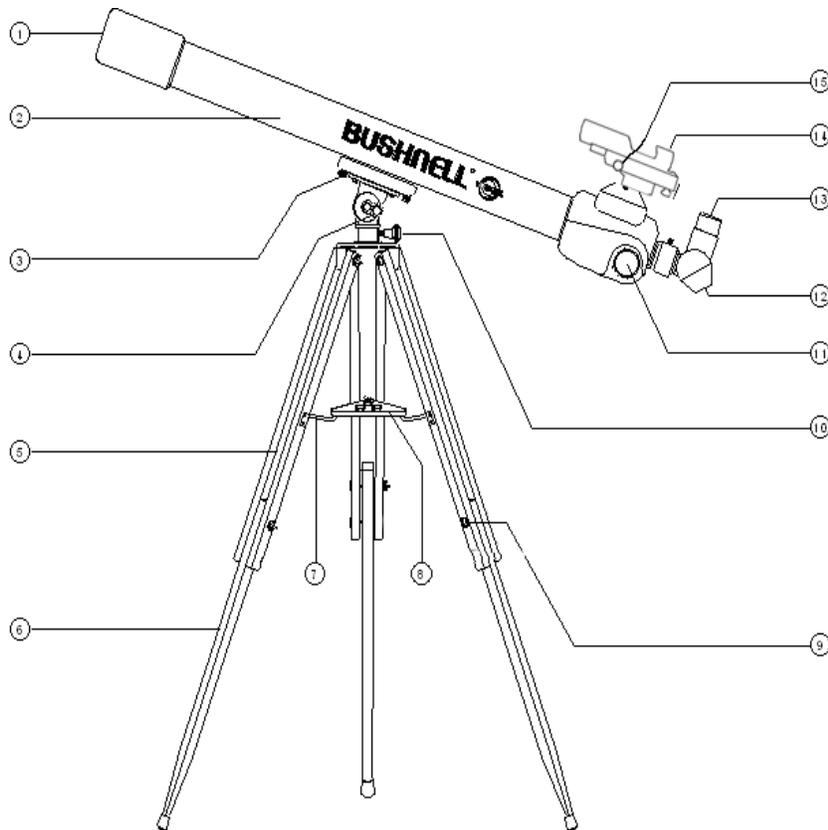


BUSHNELL®



440 x 60 Refractor Telescope Model 78-9440



- | | |
|------------------------------|--------------------------------------|
| 1. Objective Lens | 9. Tripod Leg - Lock Screws |
| 2. Main Telescope Tube | 10. Horizontal Axis Lock |
| 3. Mounting Screws (2) | 11. Rack & Pinion Focusing Mechanism |
| 4. Vertical Adjustment Lock | 12. Penta Mirror |
| 5. Tripod Leg | 13. Eyepiece |
| 6. Tripod Leg Middle Section | 14. Finderscope |
| 7. Accessory Tray Brace | 15. Finderscope Adjustment Screws |
| 8. Accessory Tray | |

STANDARD EQUIPMENT

- Refractor Telescope Assembly
- Exclusive Metal Easy Track® Mount
- Variable Height-Aluminum Tripod
- Exclusive Penta Mirror Assembly
- 8mm, and 12.5mm focal length - Eyepieces.
- Red Dot Finderscope
- Accessory Tray
- 1.5x Erecting Lens
- 2.5x Barlow
- Hardware Packet—(3) Tripod Bolts with Wing Nuts, (3) Short Accessory Tray Bolts with Wing Nuts, (3) Tripod Leg Lock Screws

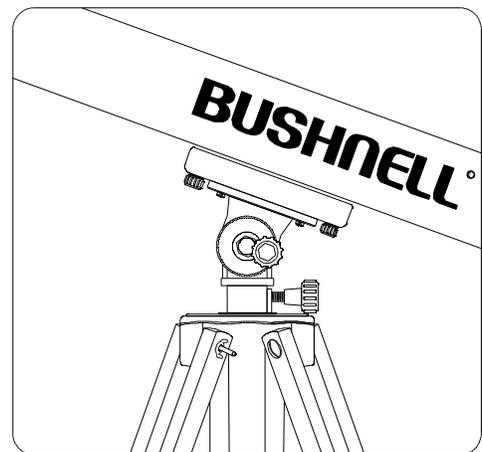


Fig. 1

TELESCOPE ASSEMBLY

1. Remove all components from the carton and identify all components. It is a good idea to lay all the parts out in front of you before assembly. READ THROUGH ASSEMBLY INSTRUCTION BEFORE YOU ASSEMBLE YOUR TELESCOPE. The only tool required in setting up your telescope is a slotted or Phillips blade screwdriver. Since your telescope is a precision optical system the parts require careful handling--particularly the telescope, eyepieces, and various accessory lenses.

2. Set-Up Tripod

Select one tripod leg. Loosen *Tripod Leg Lock Screw (9)* and extend the *Tripod Leg Middle Section (6)*. For a moment, do not extend the leg fully...a shorter leg is less awkward to work with during set-up. Tighten the *Tripod Leg lock Screw* so that the *Middle Section* is securely in place. Repeat for the remaining two legs.

3. Attach Telescope and Finderscope

- Note: Before assembling tripod legs to Easy Track® Mount, make sure the Accessory Tray Braces (7) face inward. Loosen long bolts at the top of *Tripod Leg (5)*. Position the mount over the *Tripod Leg* as shown (fig. 2). and secure *Easy Track® Mount* to *Tripod Leg*. Repeat on the remaining two *Tripod Legs*. Once you have attached all *Tripod Legs* to the mount, securely tighten all wing nuts in place.



Fig. 2

- Locate the pre-assembled *Telescope Main Tube (2)*. Remove *Main Tube Locking Nuts (3)* from screws extending from bottom of *Telescope Main Tube (2)*. Insert extended screws into holes in cradle of *Easy Track® Mounting System*. Re-fasten *Main Tube Locking Nuts (3)*.
- Remove plastic insert on bottom side of finderscope to allow battery to make connection with battery contact for power. Turn power switch on. *See finderscope page.*
- Look through main telescope tube at low power and establish a well-defined stationary target. Looking through red dot finderscope, alternate tightening each adjustment wheel (at rear and left side of finderscope) until the red dot of finderscope is precisely aligned and centered on the same object being viewed in main telescope tube. *See finderscope page.*

4. **Attach Accessory Tray**

Locate the **Accessory Tray (8)**. Using the accessory tray bolts, wingnuts and washers connect the **Accessory Tray** to the **Accessory Tray Braces (7)**. 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.

5. **Attach Eyepiece Accessories**

Attach accessories as suggested in Intended Use Diagram. For example insert penta mirror assembly into focusing tube, then insert desired eyepiece into penta mirror assembly.

6. **Remove Lens Cover** from **60mm Objective Lens(1)**.

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

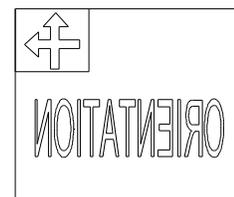
Using the Penta Mirror Assembly:

1. **A Basic Description:** Bushnell is proud to present the Exclusive Penta Mirror Technology. This Penta Mirror Assembly provides the benefit of a convenient 90-degree viewing angle commonly associated with diagonal mirrors. However, the Penta Mirror provides something that diagonal mirrors cannot provide--right to left correct views of the any object viewed through the telescope. Unlike traditional diagonal mirrors that provide backward images of objects seen on land and in the night sky, the Penta Mirror allows correct images to be viewed. The groundbreaking benefit of this technology is that when viewing and locating objects through the telescope, when you want to move to the left, you move it to the left intuitively instead of fumbling around the sky becoming increasingly frustrated that you can't move the telescope the way your intuition tells you that you need to move it. Objects on land at great distances can be seen naturally (and readable) as if you were many times closer to the object. Objects in the sky appear as they appear in most star charts. For the first time ever, you will be able to see what you would expect resulting in excellent viewing satisfaction. In addition, the penta mirror has a special insert that is easily removed by backing out the eyepiece set screw and removing the insert to yield an 1.25" optical format receiver.

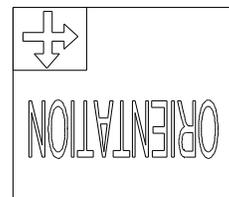
2. **How-To-Use:** Just like any traditional diagonal mirror, place the eyepieces directly into the rear of the Penta Mirror Assembly then place the Penta Mirror directly into the back of the telescope focusing tube, erecting lens or Barlow lens (See Intended Configuration Diagram).



Fully Correct Image



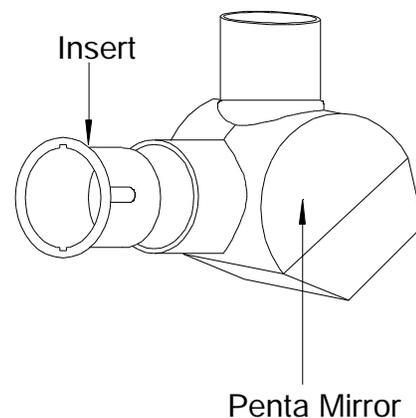
Reversed Image



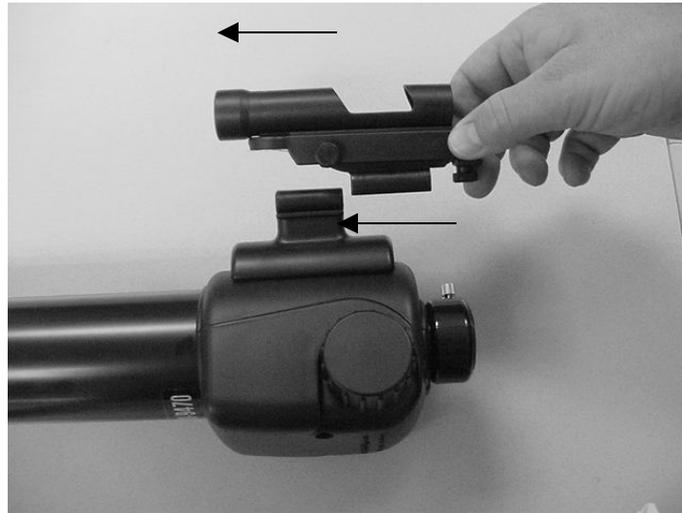
Upside-Down Image



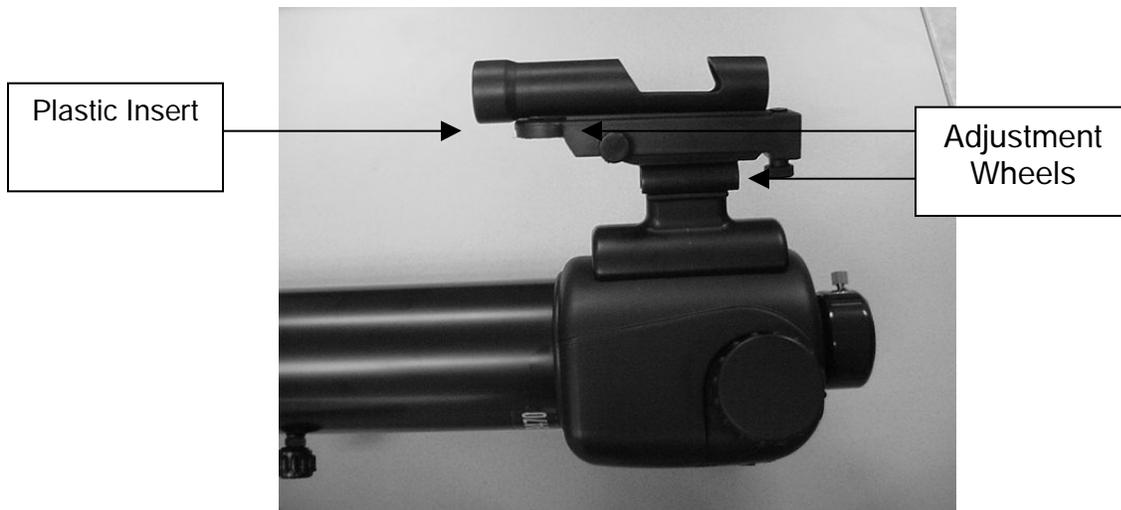
Upside-Down & Reversed Image



Please find below an image depicting how to attach the red dot finderscope and an image depicting a fully-attached unit.



How-To-Attach: Place Finderscope Cylindrical Groove over Cylindrical Finderscope Mount Post until it clicks into place.



Aligning and Using Red Dot Finderscope

Remove plastic insert on bottom side of finderscope to allow battery to make connection with battery contact for power. Turn power switch on.

Look through main telescope tube at low power and establish a well-defined stationary target. Looking through red dot finderscope, alternate tightening each adjustment wheel (at rear and left side of finderscope) until the red dot of finderscope is precisely aligned and centered on the same object being viewed in main telescope tube.

Selecting an Eyepiece:

1. You should always start viewing with the lowest power eyepiece, which in this case is the 12.5mm lens. Note: the base power of each eyepiece is determined by the focal length of the telescope objective lens, which for this model is 700 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 12.5 mm lens, the calculation would look like this: $700 \text{ mm} \div 12.5\text{mm} = 56\text{x}$ or 56 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 penta mirror. **Note: The Penta Mirror Assembly when used in conjunction with the Barlow Lens and Eyepiece as shown in the Intended Configuration Diagram will yield an effective doubling power of the magnification already achieved with the Barlow and Eyepiece configuration alone.** The magnification calculation would look like this: $700 \text{ mm} \div 12.5\text{mm} = 56 \text{ power}$. $56 \text{ power} \times 2.5 = 140 \text{ power}$. $56 \times 2.5 \times 2 = 280 \text{ power}$. (See Intended Configuration Diagram).

Focusing Telescope:

1. After selecting the desired eyepiece, aim main telescope tube at a land-based target at least 200 yards away (e.g. telephone pole or building). Fully extend focusing tube by turning ***Rack and Pinion Focusing Mechanism (11)***.
2. While looking through selected eyepiece (in this case the 12.5 mm), slowly retract focusing tube by turning Rack and Pinion Focusing Mechanism until object comes into focus.

Viewing Land-Based Objects:

1. As described above, the Erecting Lens will correct the normally upside down and reversed image so that you can easily enjoy observing land-based objects through your telescope.
2. Simply insert the Erecting Lens into the focusing tube of the telescope, penta mirror into erecting lens, then insert an eyepiece into the erecting lens. (See Intended Configuration Diagram).
3. Repeat focusing directions as described above except that you will be looking through the Erecting Lens and eyepiece instead of just the eyepiece.

Aligning Finderscope:

Look through main telescope tube at low power and establish a well-defined stationary target. Looking through red dot finderscope, alternate tightening each adjustment wheel (at rear and left side of finderscope) until the red dot of finderscope is precisely aligned and centered on the same object being viewed in main telescope tube. *See finderscope page.*

Now, objects located first with the wide field ***Finderscope (14)*** will be centered in the field of view of the main telescope.

***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. The moon is a starting point that is sure to please the budding astronomer as well as the 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 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. 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!

For further questions or additional information please contact:

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ANSWERS TO COMMONLY ASKED QUESTIONS

| | |
|---|---|
| 1. The image I see in the telescope is upside down? | <ul style="list-style-type: none"> An upside-down image is a common characteristic of most astronomical telescopes. However, as described above, the Erecting Eyepiece will provide erect images allowing objects that you see to be right-side-up. |
| 2. How do I determine the power my telescope? | <ul style="list-style-type: none"> The power of your telescope can be determined 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: $1000 \div 25 = 40X$) |
| 3. Where do I find the Telescope Focal Length? | <ul style="list-style-type: none"> The telescope focal length is the same focal length as the objective focal length. For this telescope it is 700mm. Telescope focal lengths range from 600mm to 910mm on Bushnell telescopes. |
| 4. What can I see with my telescope? | <ul style="list-style-type: none"> Telescopes with power ranging from 25X to 50X can be used to view Star Clusters and Nebulae. 90X to 120X telescopes can view galaxies. Most planets can be seen at 150X and higher. |
| 5. What do the numbers on the eyepiece mean? | <ul style="list-style-type: none"> The numbers on the eyepiece represents the "focal Length" of the eyepiece. |

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"> Check to see if objective lens cover has been removed. Try to view an object that is 200 or more yards away. If there is more than one eyepiece included with the telescope, use the lowest power (highest number) eyepiece to begin viewing. Use the Rack & Pinion Focusing Mechanism (3) to bring the object you are trying to view into focus |

Intended Configuration Diagram

1. Eyepieces
2. 90 degree penta mirror
3. Erector
4. Barlow

