

INSTRUCTION MANUAL

Orion 70mm Multi-Use Finder Scope #7220



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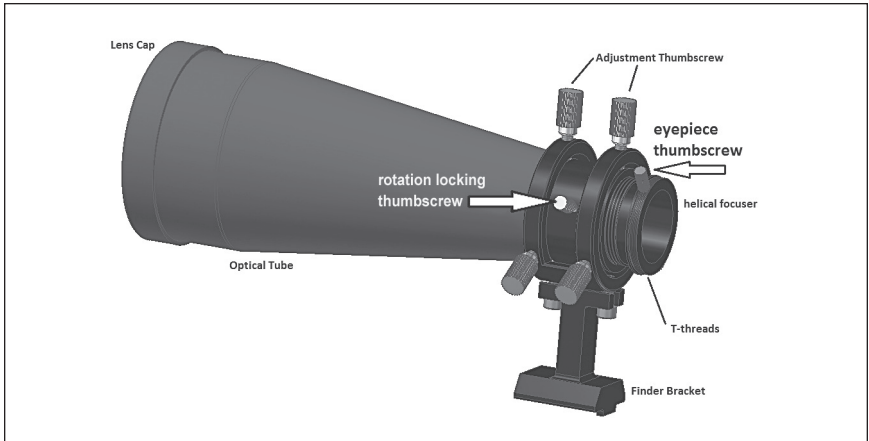


Figure 1. The Orion 70mm Multi-Finder (MF70).

Congratulations on your purchase of the Orion 70mm Multi-Use Finder Scope (MF70).

The finder scope is an invaluable tool for finding objects in the night sky. It is a miniature telescope that mounts onto a larger telescope. Because of its low magnification and wide field of view, it is much easier to first locate and center an object in the finder scope before subsequent viewing through the main telescope. To properly install and use your finder scope, please read this instruction manual.

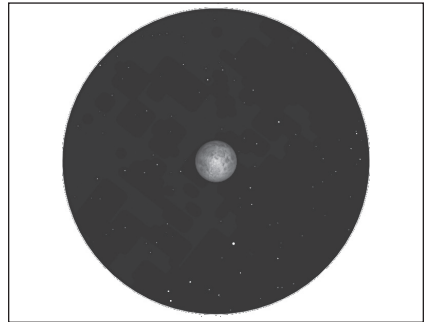


Figure 2. Field of view (FOV) using the MF70 with a 15mm Eyepiece (approximately 4 degrees FOV).

70mm Multi-Use Finder Scope (MF70)

The MF70 is a large aperture finder scope. Its large 70mm aperture captures twice the amount of light than a conventional 50mm finder scope.

The light gathering power can be calculated as follows:

Divide the telescope aperture (in mm) by 7mm (dilated pupil diameter of a young person) and squaring the result.

$$50\text{mm Finder Scope} = (50/7)^2 = 51x$$

$$70\text{mm Multi Finder} = (70/7)^2 = 100x$$

Hence the MF70 captures twice the amount of light than a conventional 50mm finder scope



Figure 3. If more in-focus travel is required a 90 degree Prism Diagonal may be required. A 45 degree Prism Diagonal requires more in-focus than any other diagonal.

With its fast focal ratio (f/4) the MF70 can be used as a wide field of view (FOV) telescope or as a very bright finder scope or guide scope.

Field of View (FOV)

It is important to understand that a wide field of view is what makes a finder scope a special tool. It allows viewing a vast portion of the skies with low magnification.

Use a low power eyepiece to get the best FOV with the Multi-Finder. We recommend an eyepiece focal length of 15mm. This will give about 18x power which is good for resolving faint stars and even to observe some deep sky objects.

| <i>Diagonal Focus Distance Chart</i> | |
|--------------------------------------|----------------------------|
| <i>Brand/Type</i> | <i>Focus Distance (mm)</i> |
| Orion 90 degree prism | 74 |
| Orion 90 degree mirror | 94 |
| Orion 45 degree prism | 102 |
| Vixen 1.25" Prism | 63 |
| Takahashi 1.25" Prism | 64 |
| Baader T2 Prism (Zeis) | 67 |
| Celestron 1.25" Prism | 67 |
| Vernonscope 1.25" Silver mirror | 73 |
| Televue 1.25" Everbrite Dielectric | 78 |
| Astro-Tech 1.25" Dielectric | 94 |

Figure 4. Example diagonal types and their associated focus travel distance.

Reaching Focus With the 70m Multi-Finder

The MF70 has a very limited focus range of approximately 0->15mm. Some eyepiece and diagonal combinations may not come to focus.

The light path distance of the MF70 is approximately 80mm therefore you will need to select an accessory and diagonal combination that is within this required spacing distance in order to achieve focus.

Generally the rule is: if focus cannot be reached with a particular combination of eyepiece and diagonal then it is recommended to change the diagonal for a 90 degree prism diagonal which requires much less focus travel than other diagonals (**Figure 3 & 4**). The eyepiece may also be exchanged for one with a smaller focus travel requirement (**Figure 5**).

When used as a finder scope we recommend using a 90 degree prism diagonal with eyepieces. When used as a guide scope we recommend using a 90 degree

mirror diagonal with guide camera. When used as a terrestrial spotting scope for near objects we recommend using a 45 degree prism diagonal.

Getting Started

The MF70 comes fully assembled. You only need to use a standard 1.25" diagonal prism/mirror (not supplied) and a standard 1.25" low power eyepiece (not supplied) to start using it.

The MF70 can also be used in several configurations.

Start by installing the MF70 into the dovetail base of your telescope (**Figure 6**). Tighten the dovetail base thumbscrew in order to securely attach the MF70 to your telescope.

Insert the diagonal prism/mirror into the helical focuser (**Figure 7**). Use the eyepiece thumbscrew to secure the diagonal.

You are now ready to choose from a variety of accessories such as eyepieces and reticle eyepiece for visual or photography work, or a guide camera such as the Orion StarShoot AutoGuider for guiding.

Focusing the Finder Scope

Loosen the rotation locking thumbscrew so that the helical focuser can rotate to adjust focus.

Loosen the eyepiece thumb screw and hold the diagonal (with eyepiece) with one hand to keep the diagonal in place against the helical focuser. Since adjusting focus rotates the helical focus, the diagonal too would rotate if it was locked down with the eyepiece thumbscrew.

With the other hand rotate the helical focuser until focus is reached. Using one of the included spacers provides a nice grip to turn the helical focuser or the eye-

| <i>Eyepiece Focus Distance Chart</i> | | | |
|--------------------------------------|---------------|--------------------------|----------------------------|
| <i>Brand</i> | <i>Model</i> | <i>Focal Length (mm)</i> | <i>Focus Distance (mm)</i> |
| Orion | Ultrasopic | 35 | -12 |
| Orion | Sirius Plossl | 32 | 21 |
| Orion | Sirius Plossl | 20 | 0 |
| Orion | Sirius Plossl | 10 | 0 |
| Explore Scientific | 82 Degree | 4.7 | 6 |
| Celestron | Plossl | 9 | -8 |
| Meade | SWA | 16 | 5 |
| Meade | SWA | 24 | 3 1/2 |
| Baader | Hyperion | 31 | -17 |
| Pentax | XO | 5.1 | -0 |
| Pentax | XW | 20 | -0 |
| Pentax | XW | 10 | 0 |
| Pentax | XW | 5 | 0 |
| Pentax | XW | 3.5 | 0 |
| Takahashi | LE | 12.5 | -0 |
| Takahashi | LE | 30 | -3 |
| Takahashi | LE | 7.5 | 0 |
| Takahashi | LE | 5 | 1/2 |
| William Optics | UWAN | 16 | 2 1/2 |
| Tele Vue | Ethos | 8 | -5 1/2 |
| Tele Vue | Plossl | 40 | 12 |
| Tele Vue | Plossl | 32 | 4 1/2 |
| Tele Vue | Plossl | 32 | 4 1/2 |
| Tele Vue | Panoptic | 24 | 5 1/2 |
| Tele Vue | Panoptic | 19 | 5 1/2 |
| Tele Vue | Plossl | 15 | 6 |
| Tele Vue | Plossl | 11 | 6 |

Figure 5. Example eyepiece types and their associated focus travel distance.

piece thumbscrew itself can be used as a lever to adjust focus.

When focused is reached lock down the eyepiece thumbscrew. Tiny adjustments can be made before finally locking down the rotation locking thumbscrew to lock the focuser position. The thumbscrew should only be slightly tightened to avoid damage to the internal threads.

Use the Multi-Finder As a Large Aperture Guide Scope

Small aperture finder scopes offer low weight and a low cost solution for guiding with a guide camera. They are however limited by the light gathering capability.

The MF70 boasts a huge 70mm aperture. This will have a dramatic effect on the amount of stars seen by the guide camera, and increases the chance to get a suitable bright star for guiding.

Due to its large aperture, light weight design and ability to be accurately centered, the MF70 makes an excellent guide scope.

Cameras normally have a very small back focus requirement and therefore a long extension/spacer or mirror diagonal should be used in order to reach focus.

This same setup will also work with CCD cameras to turn your MF70 into a wide field astrograph.

Use the Multi-Finder As a Small Astrograph

At f/4 the MF70 provides very bright images. Use a dedicated astrophotography camera, such as the StarShoot G3 camera, with the MF70 to get deep sky images of wide nebulosity or star field of the Milky Way.

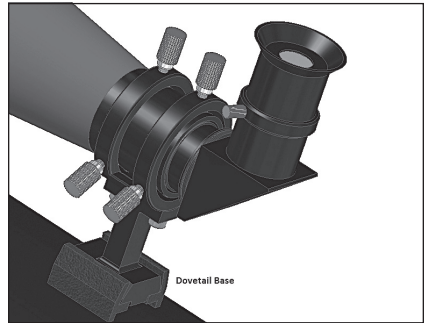


Figure 6. Installing the MF70 in the Dovetail Base.

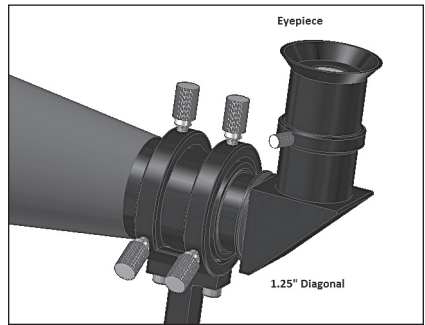


Figure 7. Multi-Finder with a low power Eye-piece.

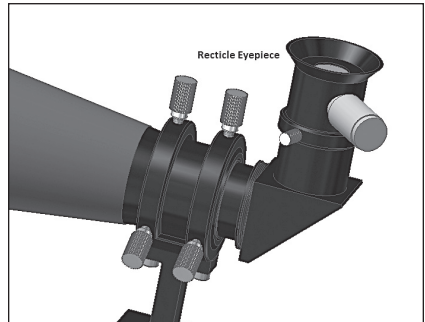


Figure 8. Multi-Finder with a reticle eyepiece for precise centering.

The MF70 can even be used with a DSLR camera by using the T-threads on the MF70 to attach the camera (Figure 10).

The light path distance of the MF70 is approximately 80mm so you need to calculate the required spacing distance in order to achieve focus with the camera.

For a DSLR camera, with T-thread adapter, a 25mm spacer is required (not included).

We recommend using the #05528 Orion T-thread Spacing Ring Kit or the #05326 Orion Variable 12-17mm T-thread Spacer Ring to get the best spacing combination.

For the StarShoot AutoGuider or the StarShoot G3, the required spacing is approximately 70mm. This can be accomplished by using the camera with a mirror diagonal.

How to Use the Provided Spacers (7mm & 15mm)

The spacers are used to add additional spacing. This might be necessary for certain mirror diagonals that require the focuser to be too far out. Adding the spacer provides more stability to the mechanism (Figure 11).

The spacers may also help to provide a grip to adjust the helical focuser.

Remove the eyepiece thumbscrew from the focusing tube (Figure 12).

Thread the spacer to the focuser T-threads and re-insert the eyepiece thumbscrew (Figure 13)

Lock the spacer with the locking thumbscrew (Figure 14). This prevents the spacer from getting loose. If required, combine the two extenders to reach maximum spacing of 22mm.

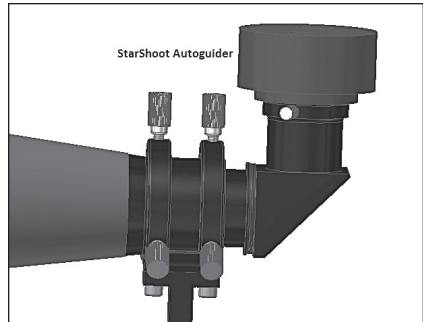


Figure 9. MF70 with StarShoot AutoGuider guide camera.

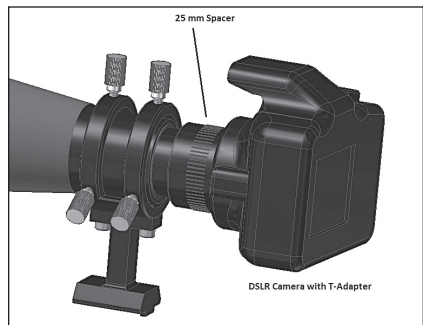


Figure 10. Small Astrograph use with a DSLR (for full frame cameras there may be some vignetting on the frame edge).

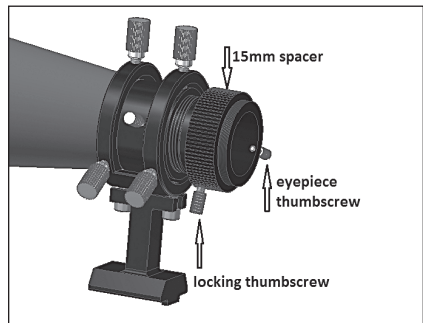


Figure 11. MF70 with 15mm spacer added.

We recommend using the #05528 Orion T-thread Spacing Ring Kit or the #05326 Orion Variable 12-17mm T-thread Spacer Ring to reach other additional spacing combinations.

Weight Balance

The MF70 was designed to be extremely light weight. By adding an optional prism/mirror diagonal and eyepiece, the total weight can increase rapidly. Adjust your telescope rings to balance the telescope.

For Dobsonian telescopes you might need to add some counterweight to the back of the telescope to get perfect balance.

Adjusting the Aim of the MF70

Now that you have your installed the MF70 and chosen one of the configurations that best suits your observing needs, it is time to adjust the aim of your MF70.

The finder scope has a wide field of view to facilitate the location of objects for subsequent viewing through the main telescope, which has a much narrower field of view.

The finder scope and the main telescope must be aligned so they point to exactly the same spot in the sky. Alignment is easiest to do in daylight hours.

First, insert an eyepiece into the main telescope and point the telescope at an object such as the top of a telephone pole or a street sign that is at least a quarter-mile away.

Move the telescope so the target object appears in the very center of the field of view when you look into the eyepiece.

Now look through the MF70. Is the object centered in the finder scope's field of view? If not, hopefully it will be visible somewhere in the field of view (FOV),

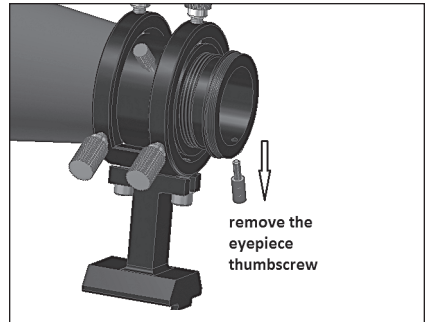


Figure 12. Removing the thumbscrew.

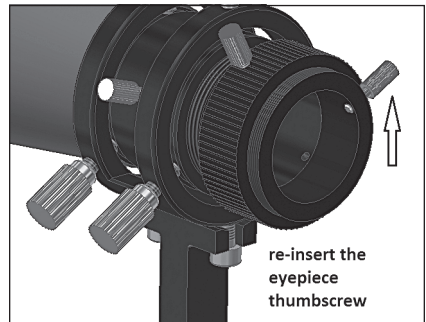


Figure 13. Re-inserting the thumbscrew.

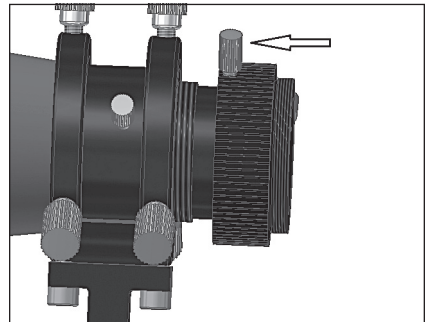


Figure 14. Secure the spacer with the locking thumbscrew.

so that only fine adjustment of the MF70's adjustment screws will be needed to center it on the FOV. Otherwise you'll have to make coarser adjustments to the MF70's adjustment screws to redirect the aim of the MF70.

The best method for adjusting the aim is to loosen one of the adjustment screws while tightening another adjustment screw.

Once the target object is centered in the FOV of the Multi-Finder, look again in the telescope's eyepiece and see if it is still centered there as well. If it isn't, repeat the entire process, making sure not to move the telescope while adjusting the alignment of the finder scope.

When the target object is centered on the FOV of the MF70 and in the telescope's eyepiece, the MF70 is aligned and ready to be used for locating objects. Make sure all the adjustment screws are now locked down tightly so that the MF70's aim will stay the same as the telescope moves from target to target.

The Multi-Finder alignment should be checked before every observing session. This can easily be done at night, before viewing through the telescope. Choose any bright star or planet, center the object in the telescope eyepiece, and then adjust the bracket's adjustment screws until the star or planet is also centered in the MF70's FOV.

The MF70 and bracket can be removed from the dovetail base for storage, and then reinstalled without significantly changing the Multi-Finder's alignment.

Warning: Never look directly at the Sun with the naked eye or with a telescope – unless you have a proper solar filter installed over the front of the telescope! Otherwise, permanent, irreversible eye damage may result.

Caring for the Finder Scope

If you give your Multi-Finder reasonable care, it will last a lifetime. Keep the dust cap on the finder when it is not in use. If you plan to move your telescope any significant distance, you should remove the Multi-Finder and bracket in order to prevent them from getting bumped. You can store the Multi-Finder in any small padded case to protect it from damage.

Cleaning Lenses

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the exposed lenses of your finder scope. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, blow any loose particles off the lens with a blower bulb or compressed air. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the lens gently in a circular motion, then remove any excess fluid with a fresh lens tissue. Oily fingerprints and smudges may be removed using this method. Use caution; rubbing too hard may scratch the lens. For larger lenses, clean only a small area at a time.

Specifications

| | |
|-----------------------------|----------------------------|
| Optical design | Refractor |
| Optical diameter | 70mm |
| Focal length | 279mm |
| Focal ratio | f/4.0 |
| Coatings | Fully coated |
| Glass material | Crown/Flint |
| Resolving power | 1.70arc*sec |
| Lowest useful magnification | 10x |
| Mount type | Optical Tube without Mount |
| Tube material | Aluminum |
| Length of optical tube | 8.2 in. |
| Weight, optical tube | 1.2 lbs. |
| Warranty | One year |

WARNING: *Never look directly at the Sun with the naked eye or with a telescope – unless you have a proper solar filter installed over the front of the telescope! Otherwise, permanent, irreversible eye damage may result.*

One-Year Limited Warranty

This Orion product is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid. Proof of purchase (such as a copy of the original receipt) is required. This warranty is only valid in the country of purchase.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights. It is not intended to remove or restrict your other legal rights under applicable local consumer law; your state or national statutory consumer rights governing the sale of consumer goods remain fully applicable.

For further warranty information, please visit www.OrionTelescopes.com/warranty.

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