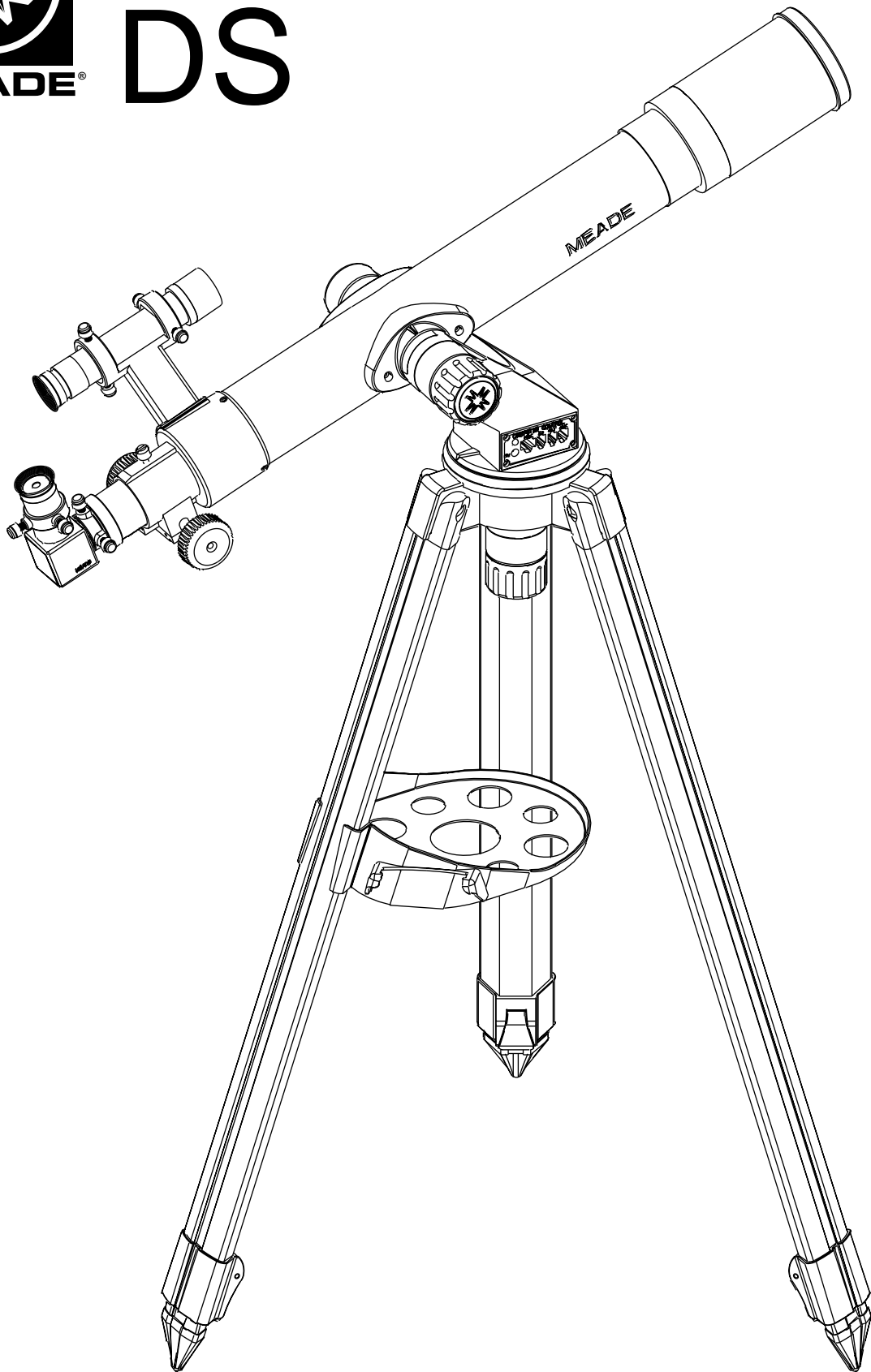




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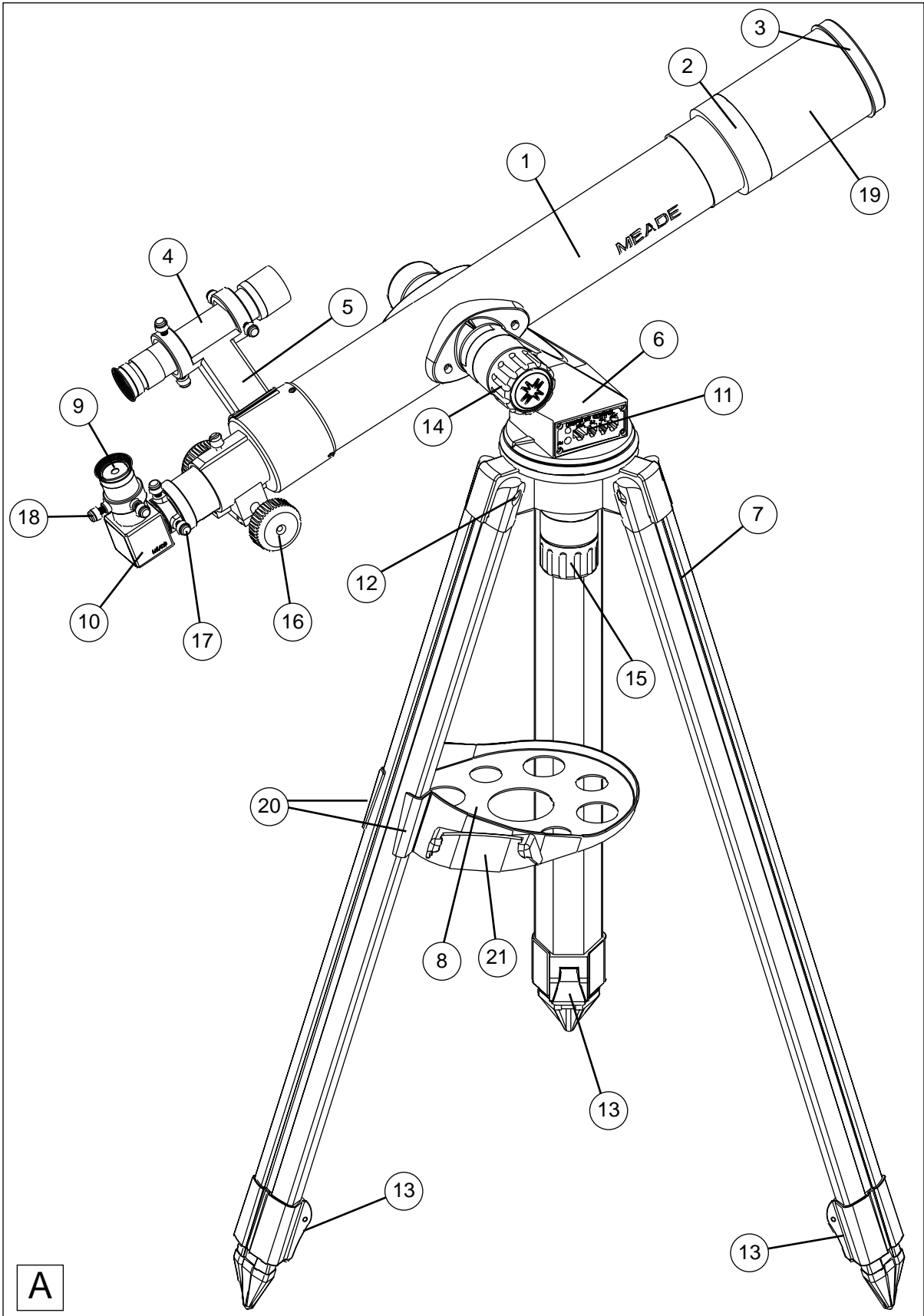


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Assembly and Operating Instructions for Meade® Digital Electronic Telescope Series

60mm (2.4"), 70mm (2.8"), 80mm (3.1"), 90mm (3.5") Refracting Telescopes; 114mm (4.5"), and 127mm (5") Reflecting Telescopes

Numbered references are to the figures on the pages of this manual. Example: "D-4" refers to item 4 of Fig. D.



WARNING! Never use a Meade® DS Telescope to look at the Sun! Looking at or near the Sun will cause *instant* and *irreversible* damage to your eye. Eye damage is often painless, so there is no warning to the observer that damage has occurred until it is too late. Do not point the telescope or its viewfinder at or near the sun. Do not look through the telescope or its viewfinder as it is moving. Children should always have adult supervision while observing.

CAUTION: Use care to install batteries as indicated by the battery compartment. Follow battery manufacturers' precautions. Do not install batteries backward or mix new and used batteries. Do not mix battery types. If these precautions are not followed, batteries may explode, catch fire, or leak. Improperly installed batteries void your Meade warranty.

Introduction: Meade Digital Electronic Telescope Series (DS) models are illustrated in the following figures: **Fig. A** — 60mm and 70mm refracting telescopes; **Fig. B** — 80mm and 90mm refracting telescopes; **Fig. C** — 114mm and 127mm reflecting telescopes. Telescope optical specifications (diameter, D, and focal length, F) are printed on a foil plate affixed to the optical tube. *Example:* 60mm models have a diameter D = 60mm and a focal length F = 700mm.

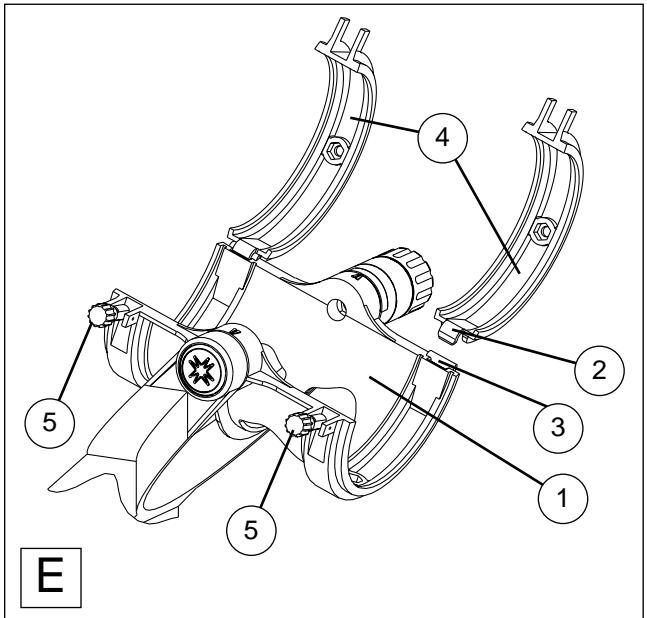
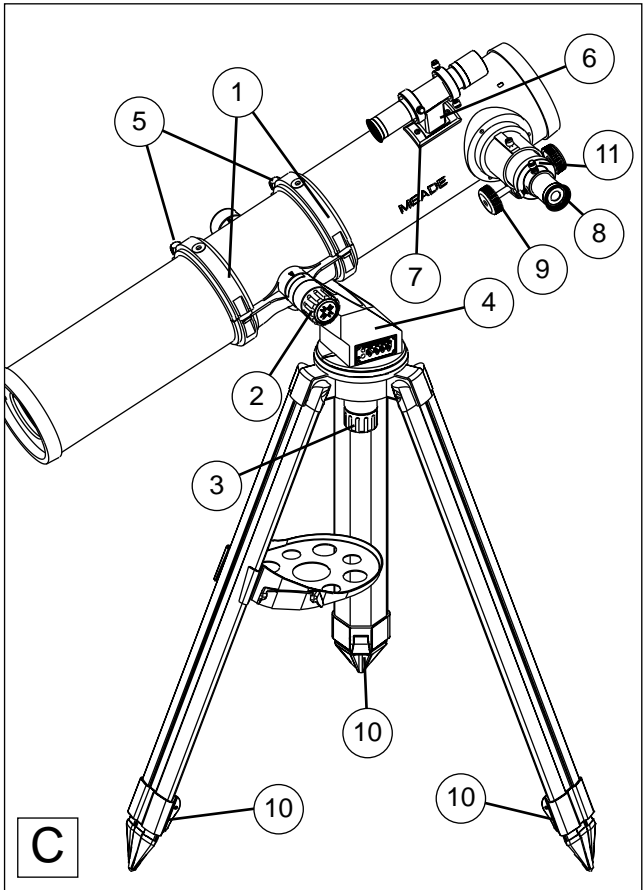
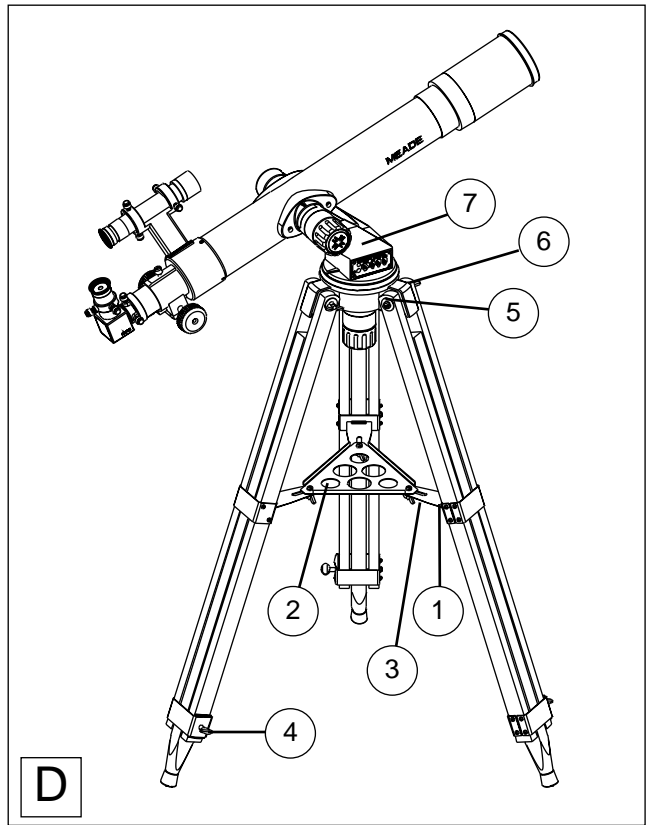
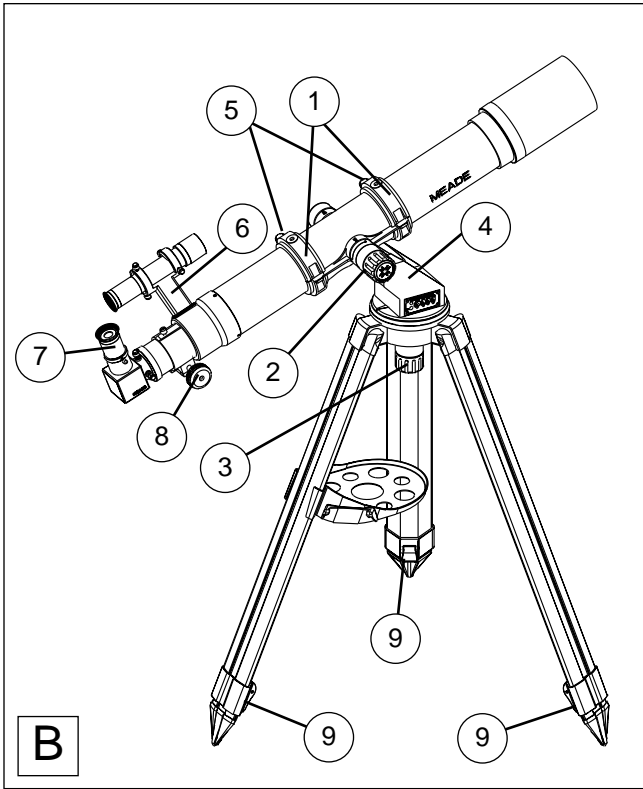
Meade DS instruments are available in a variety of trade names (Polaris, Saturn, TeleStar, etc.), with different levels and types of accessorization. All of these telescopes, however, share the same basic optical tube assemblies, mechanical mountings, tripods, and other features. The instructions provided here apply equally well to all DS trade names.

All Meade DS telescopes are similar in assembly and operation. **Fig. A is used in these instructions for most references where assembly or operation is identical among all the models.** Differences among the models, where these differences affect assembly or operation, are pointed out below.

Users of DS models which include (either as part of the original telescope or purchased separately as an optional feature) an additional telescope control system (such as the #490 Manual Slow-Motion Control Set, the #492 Dual-Motor Electronic Control System, or the #493 Autostar Computer Control System) should first assemble the basic telescope; instructions for adding one of these optional control systems are given in Appendix 2 of this manual.

Unpacking: Locate and remove the following components and parts from the packing box: optical tube (**A-1**); viewfinder (**A-4**) and viewfinder bracket (**A-5**); yoke mount (**A-6**); tripod legs (**A-7**); poly bag with 3 bolts and nuts for attaching the tripod to the yoke (60mm and 70mm models only); accessory shelf (**A-8**); one or more eyepieces (**A-9**); diagonal mirror (**A-10**, not included with 114mm and 127mm models). On 60mm and 70mm models the optical tube is factory-attached to the yoke mount and the tripod legs are packed separately in the packing box. On all other models the yoke mount is factory-attached to the three tripod legs and the optical tube is packed separately in the packing box.

Assembly: 60mm and 70mm Models — Attach the three (aluminum) tripod legs to the base of the yoke mount, as shown in **Fig. A**. In attaching each leg, slide one of the bolts through the hole (**A-12**) at the top of the leg, thread the hex nut on to the opposite end of the bolt, and



use a “+” (Phillips-head) screwdriver to tighten the bolt to a “firm feel.” Do not overtighten. Note that each tripod leg includes a flip-lock (A-13) for adjusting the overall length of the tripod. These flip-locks should all face *inward* as the legs are attached to the yoke mount.

With the tripod legs attached to the yoke mount and sitting on a flat surface, spread the legs out gently until all legs are fully spread out. Attach the accessory shelf (A-8) to one of the tripod legs by placing one of the shelf’s flanges (A-20) at one edge of a tripod leg and then pulling the shelf around the leg until the other shelf flange snaps into place. (To remove the accessory shelf, push one of the flanges with both thumbs from the outside surface of the tripod leg.) The accessory shelf can be pushed up or down the tripod leg to a convenient height. The telescope should now appear as in **Fig. A**, except that the viewfinder (A-4) has not yet been attached.

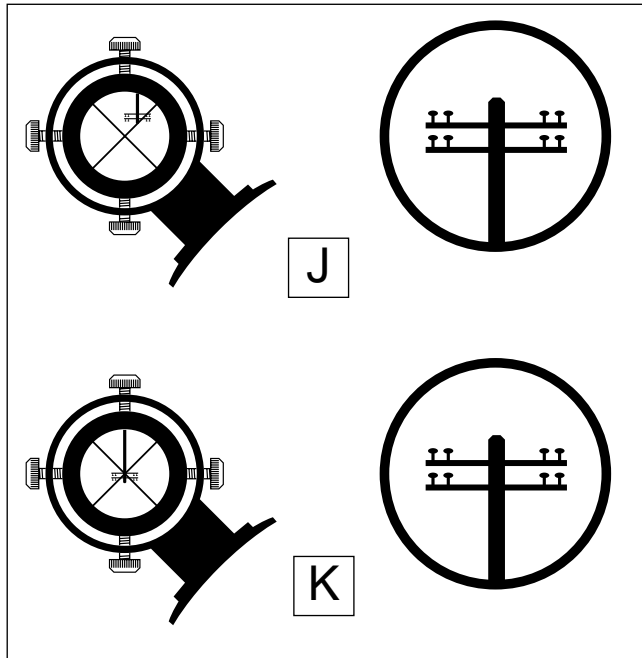
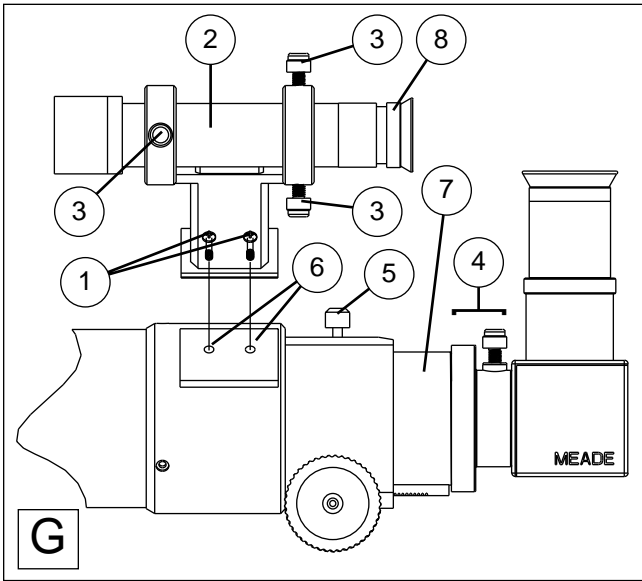
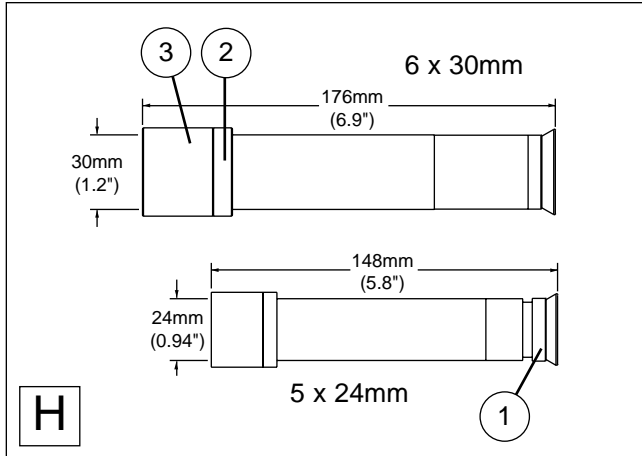
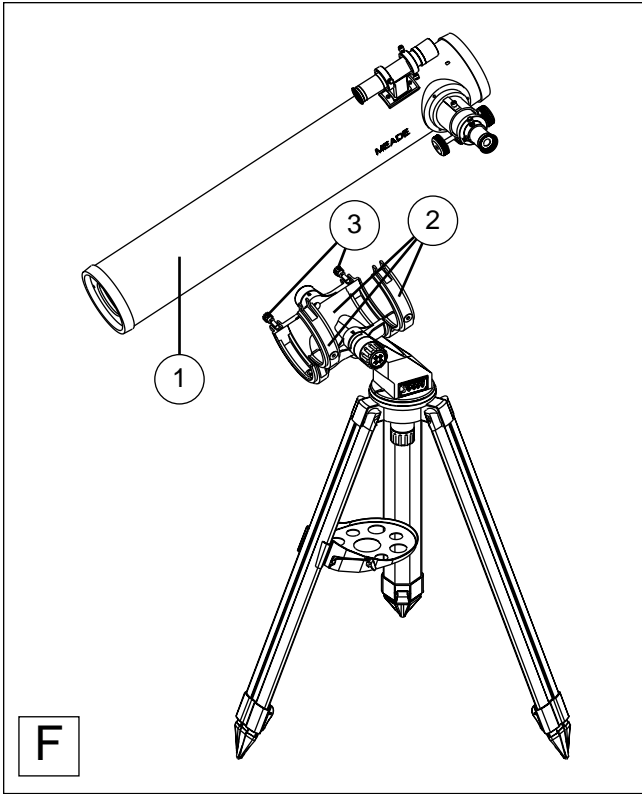
Note: *Assembly of 60mm and 70mm models supplied with hardwood tripods is similar to the assembly described above. Each tripod leg attaches with one of the supplied bolts (D-5) through holes at the top of the leg; a washer and wing nut (D-6) fasten each leg to the base of the yoke mount (D-7). The metal flange (D-1) of each wood tripod leg should face inward. Attach the metal, triangle-shaped accessory shelf (D-2) to each of the three tripod legs using the thumbscrews (D-3) and wing nuts provided. To adjust tripod height, slide the inner section of each tripod leg up or down, securing it in position with firm-feel tightening (do not overtighten) of the thumbscrew (D-4).*

Assembly: 80mm, 90mm, 114mm, and 127mm Models — Place the tripod (with yoke mount attached) on a flat surface and gently spread the three tripod legs outward until they are fully spread out. Each of these models includes a cradle ring system (B-1 or C-1), permitting the optical tube to be moved upward or downward within the cradle rings for proper balancing of the tube on the yoke mount. As the yoke mount/tripod assembly is removed from the packing box, only the lower-half (E-1) of each cradle ring is present. Locate the upper half (E-4) of each cradle ring in the packing box and connect each upper-half ring to its respective lower-half ring by inserting the flange (E-2) of each upper-half ring into the slot (E-3) located at the top of the lower-half ring. Be certain that each flange (E-2) is firmly seated into the corresponding slot. Each upper-half ring should now close down to form a complete circular ring *without undue pressure being required*. Open the upper-half rings and place the optical tube into the cradle rings. See **Fig. F**. Close the rings and tighten (to a firm-feel only) the latches (E-5). The telescope should now appear as in **Figs. B** or **C**, except that the viewfinder (B-6) or (C-6) has not yet been attached. The flip-lock (B-9 or C-10) on each tripod leg permits adjustment of tripod height.

Balancing the Tube in the Mount (80mm, 90mm, 114mm, and 127mm models only): Loosen slightly (by rotating half a turn counterclockwise) the vertical lock (B-2 or C-2). Placing your hand on the upper end of the optical tube, move the tube up and down in a vertical direction within the U-shape yoke mount (B-4 or C-4). The tube should move easily and be well-balanced about the vertical axis of motion; if not, slightly loosen the cradle ring latches (E-5), move the optical tube up-or-down within the cradle rings to achieve good balance, and re-tighten the latches (E-5).

Attaching the Viewfinder: Because the main telescope has a fairly narrow field of view, locating objects directly in the main telescope can sometimes be difficult. The viewfinder (A-4) is a small, wide-field telescope with crosshairs that permits easy object location. With the viewfinder and main telescope aligned to each other, so that both point to the same position in the sky, the observer first locates an object in the viewfinder; the object is then also positioned within the field of the main telescope.

The viewfinder bracket (A-5) attaches to the focuser housing at the position shown in **Figs. A, B, or C**. (On 114mm and 127mm models the viewfinder bracket attaches to the mounting block (C-7) located on the main telescope tube, near the focuser.) Using a “+” (Phillips-head)



screwdriver, secure the bracket in position by tightening the two attachment screws (**G-1**) inside the bracket (these screws are placed inside the bracket at the factory) into the mating threads (**G-6**) located on the focuser housing, or (in the cases of 114mm and 127mm models) located on the mounting block (**C-7**).

Slide the viewfinder (**G-2**), eyepiece-end (**G-8**) first, into the viewfinder bracket. (Remove the rubber eyecup (**G-8**) from the viewfinder before sliding the viewfinder into the bracket. Replace this rubber eyecup after the viewfinder is positioned in the bracket.) Tighten (to a firm-feel only) the four alignment thumbscrews (**G-3**) to hold the viewfinder in the bracket.

Focusing the Viewfinder: Each Meade DS telescope is supplied with one of two viewfinder models, 5 x 24mm or a larger 6 x 30mm. Identify the viewfinder of your telescope from **Fig. H**. Focusing the 5 x 24mm viewfinder is accomplished by turning the viewfinder eyepiece (**H-1**) on its internal thread. Generally a few turns are sufficient to achieve proper focus. The 6 x 30mm viewfinder is locked into permanent focus at infinity. Look through the 6 x 30mm viewfinder at a distant land object; if the focus is not sharp, then follow this procedure: (a) loosen the focus lock ring (**H-2**) a few turns, permitting the lens cell (**H-3**) to be rotated; (b) looking through the viewfinder at a distant land object, rotate the lens cell until the object is sharply focused; (c) tighten the focus lock ring (**H-2**) up against the lens cell.

Important Note: *Objects appear upside-down and reversed left-for-right when observed in the viewfinder. With refracting telescope Models DS-60, DS-70, DS-80, and DS-90, objects viewed through the main telescope with the diagonal mirror (**A-10**) in place are seen right-side-up, but reversed left-for-right. This image inversion is of no consequence when observing astronomical objects, and in fact all astronomical telescopes yield inverted images. During terrestrial observing, where a fully-correctly-oriented image (right-side up and correct left-for-right) is desirable, an optional Meade 45° Erecting Prism (available in either 0.965" or 1.25" format to suit the appropriate Meade telescope model) is available. See the optional accessories sheet which accompanies the telescope or consult the Meade Telescope Catalog. Note that for reflecting telescopes, including Meade Models DS-114 and DS-127, no means of image inversion is available; while these telescopes may be used for terrestrial observing, the image will not be correctly oriented in either right-side-up or left-for-right orientations.*

Aligning the Viewfinder: Loosen the vertical (**A-14**) and horizontal (**A-15**) locks, by turning the lock knobs about one turn counterclockwise, permitting the telescope to move freely on both axes. Place a low-power (e.g., 25mm) eyepiece in the focuser of the main telescope and point the telescope at an easy-to-find land object (e.g., the top of a telephone pole). Turn the focuser knob (**A-16**) so that the image is sharply focused, and center the object precisely in the main telescope's field of view. Re-tighten the lock-knobs (**A-14**) and (**A-15**). Then, looking through the viewfinder, turn the viewfinder's four alignment screws (**G-3**) until the viewfinder's crosshairs point precisely at the same object as centered in the main telescope. The viewfinder is now aligned to the main telescope. The right-hand image in **Fig. J** shows an object centered in the main telescope before the viewfinder (the left-hand image) has been aligned to the main telescope. **Fig. K** shows these same images after the viewfinder and main telescope are aligned.

Assembly of the basic telescope is now complete. If your telescope includes one of the DS optional features, continue to Appendix 2 to complete the assembly of the optional feature before observing.

Observing Through the Telescope: Place the diagonal mirror (**A-10**) in the telescope's eyepiece-holder (**A-17**) and tighten the thumbscrews of the eyepiece-holder to secure the diagonal mirror in place. (Note that DS 114mm and 127mm reflecting telescope models do not include, and do not require, a diagonal mirror.) Place a low-power (e.g., 25mm) eyepiece into the diagonal mirror (or, with DS 114mm and 127mm models, directly into the eyepiece-holder), and tighten the eyepiece in place with the thumbscrews (**A-18**) provided.

The diagonal mirror permits a comfortable 90° angle for observing sky objects with DS 60mm through 90mm refracting telescopes; in addition the diagonal mirror results in an upright, but reversed left-for-right, image through the telescope during terrestrial observations. Loosen the vertical (**A-14**) and horizontal (**A-15**) locks, by turning the lock knobs about one turn counter-clockwise. The telescope's main tube now moves easily in either vertical or horizontal directions. Alternately, "partially-locking" these locks provides a comfortable "drag", neither too loose nor too tight, in the motion of the telescope tube about the vertical and horizontal axes. Experiment to find the best lock-knob tensions.

Begin by observing easy-to-find land objects. Obtain a sharp image by turning the focuser knob (**A-16**). Use the viewfinder to locate objects before observing them in the main telescope. Start the observation of *any* object, astronomical or terrestrial, with a low-power eyepiece (see *Eyepieces and Magnification*, below), stepping up to higher power eyepieces, if desired, after the image is centered and focused in the main telescope.

The Focuser and Eyepiece-Holder: Depending on the telescope model, Meade DS telescopes are supplied with an eyepiece-holder (**G-4**) that accepts eyepieces of either .965" (24.5mm) or 1.25" (31.7mm) barrel-diameter. DS models of 70mm and larger also include a separate eyepiece-holder that accepts giant, wide-field eyepieces of 2" (50.8mm) barrel-diameter, such as the optional Meade MH50mm eyepiece. This 2" eyepiece-holder ring threads on to the end of the focuser drawtube and replaces the standard eyepiece-holder (**G-4**) when 2" eyepieces are employed. The focuser drawtube lock (**G-5**) helps to prevent focuser slippage when heavier accessories are added to the eyepiece end of the telescope.

Astronomical Observing: With the telescope focused on a celestial object such as the Moon, a planet, or a deep-space galaxy or nebula, the object is seen to move quite rapidly through the telescopic field of view. This apparent motion is caused by the Earth's rotation on its axis once every 24 hours. To follow, or "track," the object, place a hand on the main telescope tube and move the telescope on one or both of its vertical and horizontal axes. Tracking astronomical objects, particularly at higher powers, is greatly facilitated with the addition of a manual or electronic telescope control system. See Appendix 2.

Eyepieces and Magnification: The magnification, or power, of a telescope is determined by two factors: the focal length, *F*, of the main telescope (this focal length is printed on a label affixed to the telescope tube or *focuser*), and the focal length of the eyepiece employed. Each Meade telescope is supplied with one or more eyepieces; some models also include a Barlow lens, described below, which doubles or triples eyepiece power. To calculate the power at which the telescope is operating, use this formula:

$$\text{Power} = \frac{\text{Focal Length of Main Telescope}}{\text{Focal Length of Eyepiece}}$$

Example: Meade 60mm DS telescopes have a focal length of 700mm. The power obtained with a 25mm eyepiece is calculated as:

$$\text{Power} = \frac{700\text{mm}}{25\text{mm}} = 28 \text{ times (written as "28X")}$$

The optical type of an eyepiece (e.g., SR, H, MA, MH, etc.) has no bearing on power, but does affect such characteristics as field of view and image corrections.

The Barlow Lens: Some Meade telescopes include a power multiplier called a Barlow lens. Consisting of a lens mounted in a 4" (10cm)-long tube, the Barlow doubles or triples the power

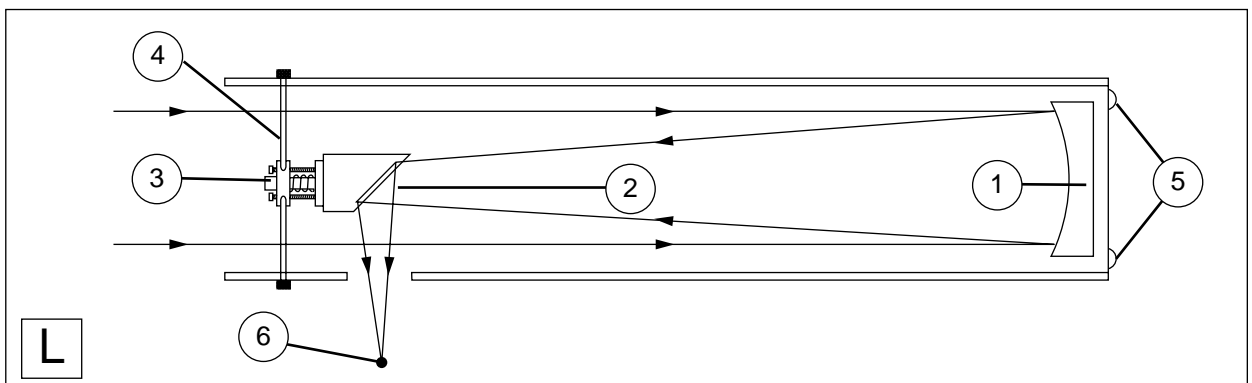
obtained when an eyepiece is used alone. In the example above a 25mm eyepiece results in 28X magnification with the Meade 60mm DS telescope; when this same eyepiece is used in conjunction with a 2x Barlow lens, power is doubled to 56X. To use the Barlow, insert it into the telescope's focuser/eyepiece-holder (**A-17**), followed by the diagonal mirror and an eyepiece. (With Meade 114mm and 127mm DS telescopes, insert the Barlow into the telescope's focuser/eyepiece-holder, followed directly by an eyepiece.)

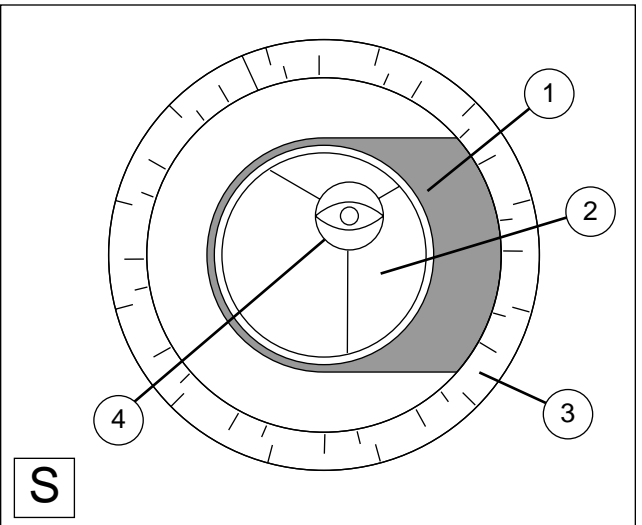
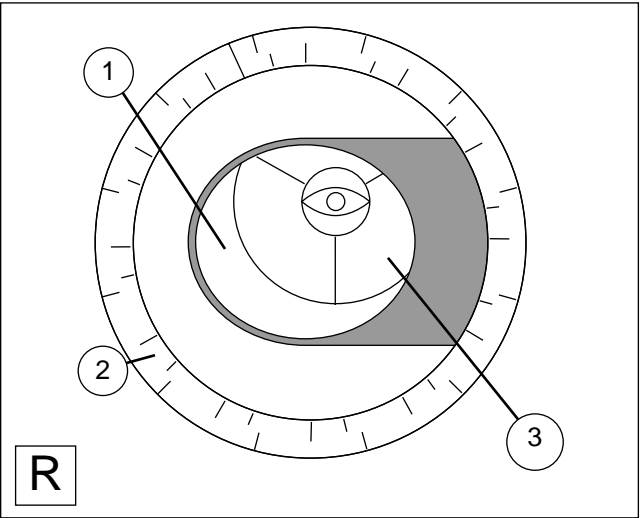
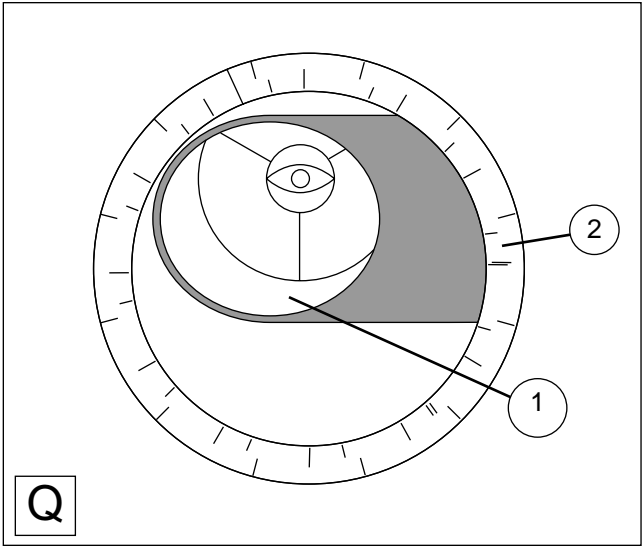
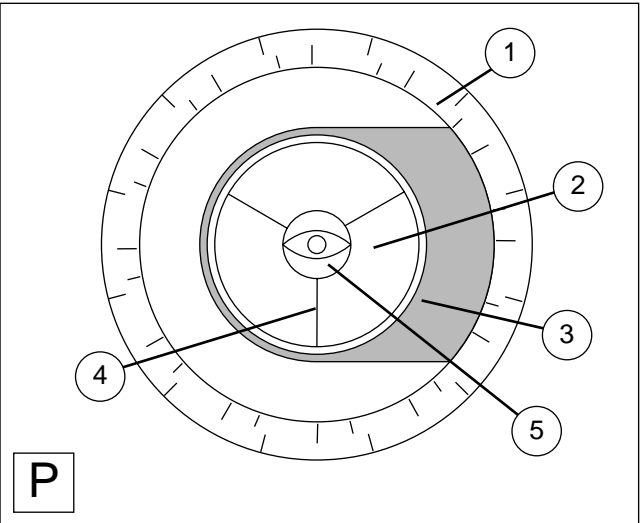
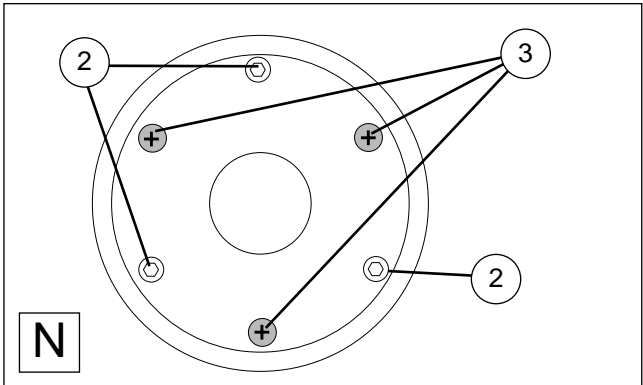
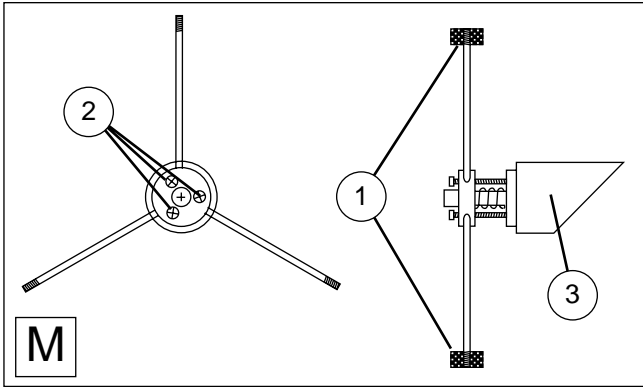
A Note About Power: The most common mistake of the beginning observer is to use powers which the telescope's aperture (diameter) and typical atmospheric conditions cannot reasonably support. The result is an image which is fuzzy, ill-defined, and poorly resolved, through no fault of the telescope. Keep in mind that a smaller, lower-power but brighter and well-resolved image is far superior to a large, high-power, but dim and poorly-resolved one. Most commonly, Meade DS telescopes are best used at powers from about 30X (for land observing and for extended astronomical objects such as diffuse nebulae and star clusters) to about 150X (for more detailed study of the Moon and planets). Use higher powers only when the air is steady and when such powers actually increase the level of visible detail.

Collimation of the Telescope's Optical System: The optical systems of Meade 60mm through 90mm refractors are collimated (aligned) at the factory and never require adjustment. Similarly, it is unlikely that the user of a Meade DS 114mm or 127mm reflecting telescope will need to adjust the factory-aligned optics of either of these models. Users of 114mm and 127mm models should, however, read Appendix 1 to confirm this point.

Maintenance: The objective lenses of Meade DS 60mm through 90mm refracting telescopes and the primary and secondary mirrors of DS 114mm and 127mm reflecting telescopes should be cleaned as infrequently as possible. A little dust on a lens or mirror causes negligible loss of image quality and should not be considered as reason to clean it. If the telescope's dust cover (**A-3**) is replaced after each observing session, cleaning the optics will rarely be required. When cleaning a lens or mirror does become necessary, use a camel's hair brush or compressed air *gently* to remove dust. The dew shield (**A-19**) of 60mm through 90mm refracting telescopes should be removed to access the lens prior to cleaning.

Questions and Repairs: In the U.S.A. questions concerning any Meade DS telescope, accessories, or optional systems should be directed to: Customer Service Dept., Meade Instruments Corp., 6001 Oak Canyon, Irvine, California 92618; FAX: (949) 451-1460; Telephone: (949) 451-1450. **Do not return a telescope or telescope part to Meade Instruments before calling or writing us first**, the great majority of repair situations can be handled without requiring return of the telescope to us. Outside the U.S.A. please contact the Meade international distributor in your country. A listing of Meade international distributors is included in the Meade website www.meade.com.





Appendix 1: Optical Alignment of 114mm and 127mm Models

Meade DS 60mm, 70mm, 80mm, and 90mm refracting telescopes are optically aligned (collimated) at the factory prior to shipment, and it is never necessary to re-collimate the optics of these models. Meade DS 114mm and 127mm reflecting telescope models are also factory-aligned, but may occasionally require re-alignment, particularly if the telescope has received rough handling in shipment. Before using one of these models for the first time, check the alignment of the optics as outlined in this appendix. Good optical alignment is essential for telescope performance, and in any case the alignment procedure is not difficult to follow. Refer to **Figs. L** through **S**:

The optical systems of Meade DS reflecting telescopes include the following parts: primary mirror (**L-1**); secondary mirror (**L-2**); secondary mirror-holder (**L-3**); secondary mirror-vanes (**L-4** and **M1**); primary mirror-tilt screws (**L-5**). The telescope's image is brought to a focus at (**L-6**).

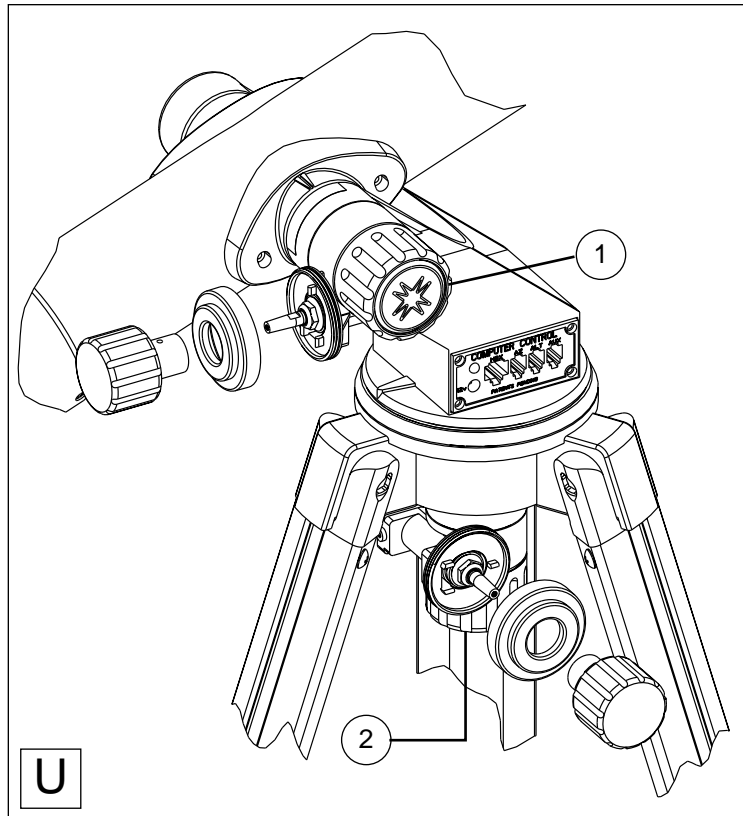
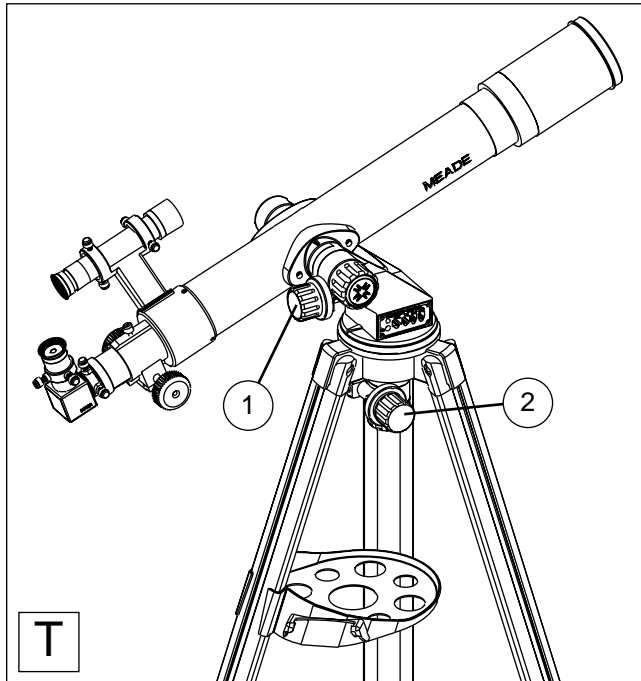
1. *Confirm alignment.* To confirm optical alignment look down the focuser drawtube (**C-11** and **P-1**) with the eyepiece removed. The edge of the focuser drawtube frames reflections of the primary mirror (**P-2**), the secondary mirror (**P-3**), the three ("spider") vanes (**P-4**) holding the secondary mirror, and the observer's eye (**P-5**). With the optics properly aligned, all of these reflections appear concentric (centered), as shown in **Fig. P**. Any deviation from concentricity of any of these telescope parts with the eye requires adjustments to the secondary mirror-holder (**Fig. M**) and/or the primary mirror cell (**Fig. N**), as described below.

2. *Secondary mirror-vane adjustments:* If the secondary mirror (**Q-1**) is left or right of center within the drawtube (**Q-2**), slightly loosen the 3-vane adjustment/lock knobs (**M-1**) located on the outside surface of the main tube and slide the entire secondary mirror-holder system up or down in the slotted holes of the main tube until the secondary mirror is centered in the drawtube. If the secondary mirror (**Q-1**) is above- or below-center within the drawtube, thread inward one of the adjustment/lock knobs (**M-1**) while unthreading another of these knobs. Only make adjustments to two knobs at a time until the secondary mirror appears as in **Fig. R**.

3. *Secondary mirror-holder adjustments:* If the secondary mirror (**R-1**) is centered in the focuser drawtube (**R-2**), but the primary mirror is only partially visible in the reflection (**R-3**), the three "+" (Phillips head) secondary mirror-tilt screws (**M-2**) should be slightly unthreaded to the point where the secondary mirror-holder (**M-3**) can rotate about its axis parallel to the main tube. Grasp the secondary mirror-holder (avoid touching the mirror surface!) with your hand and rotate it until, looking through the drawtube, you can see the primary mirror centered as well as possible in the reflection of the secondary mirror. With the rotation of the secondary mirror-holder at this best-possible position, thread in the three Phillips-head screws (**M-2**) to lock the rotational position. Then, if necessary, make adjustments to these three Phillips-head screws to refine the tilt-angle of the secondary mirror, until the entire primary mirror can be seen centered within the secondary mirror's reflection. With the secondary mirror thus aligned the image through the drawtube appears as in **Fig. S**.

4. *Primary mirror adjustments:* If the secondary mirror (**S-1**) and the reflection of the primary mirror (**S-2**) appear centered within the drawtube (**S-3**), but the reflection of your eye and the reflection of the secondary mirror (**S-4**) appear off-center, then the primary mirror-tilt requires adjusting, using the Phillips-head screws of the primary mirror cell (**N-3**). These primary mirror-tilt screws are located behind the primary mirror, at the lower end of the main tube. See **Fig. N**. Before adjusting the primary mirror-tilt screws, first unscrew by several turns (use either a hex wrench or pliers) the three hex-head primary mirror lock screws (**N-2**) which are also located on the rear surface of the primary mirror cell and which alternate around the cell's circumference with the three Phillips-head screws. Then by trial and error turn the primary mirror Phillips-head tilt screws (**N-3**) until you develop a feel for which way to turn each screw to center the reflection of your eye in the drawtube. (An assistant is helpful in this operation.) With your eye centered as shown in **Fig. P**, turn the three hex head primary mirror lock screws (**N-2**) to re-lock the tilt-angle of the primary mirror.

The telescope's optical system is now aligned, or collimated. This collimation should be re-checked from time to time, with small adjustments (per steps 1, 2, and/or 3, above) effected as required to keep the optics well-aligned.



Appendix 2: Telescope Control Systems

Depending on the Meade DS telescope model, one of the following manual or electronic control systems may be included in the telescope's standard specifications. (Telescope specifications are generally listed on the box in which the telescope is packed.) Alternately, any of these control systems may be purchased separately as an optional feature.

#490 Manual Slow-Motion Control Set: The #490 Control Set permits manual tracking of astronomical and terrestrial objects through the telescope, by turning one or both of the manual control knobs; one slow-motion control is attached to each of the vertical and horizontal axes of the telescope, as shown in **Figs. T and U**.

If purchased as an option, the instructions for mounting the #490 are included with the control set itself. If this feature is standard on your telescope, the control set is preassembled on the telescope, except the control knobs (**T-1** and **T-2**). Attach these knobs with the provided hex key. Be sure to align the set screw with the flat on the shaft.

With the lock-knobs (**U-1**) and (**U-2**) in their locked positions, the observer may track, or follow, any object, astronomical or terrestrial, by turning one or both of the control knobs (**T-1**) and (**T-2**). To move the telescope rapidly from one point in the sky to another, unlock the lock-knobs (**U-1**) and (**U-2**), relocking them once the desired object has been placed in the telescopic field.

Note that placing each of the two lock-knobs in a "partially-locked" position creates a comfortable drag in moving the telescope. Experiment with the lock-knobs to find the optimum lock tensions for your applications.

#492 Dual-Motor Electronic Control System: With the #492 Electronic Control System attached to any Meade DS telescope, all motions of the telescope, including moving the telescope to an object, centering it in the field of view, and tracking it (in the case of an astronomical object) to compensate for the Earth's rotation, may be effected through the pushbutton Electronic Controller (**Fig. X**).

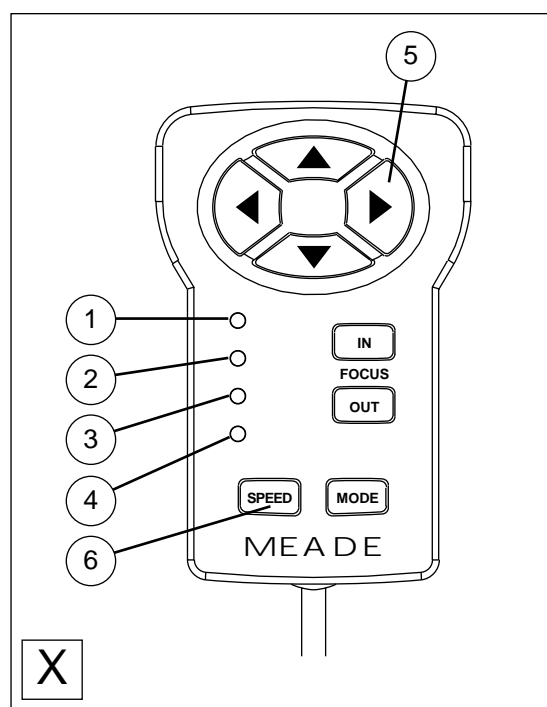
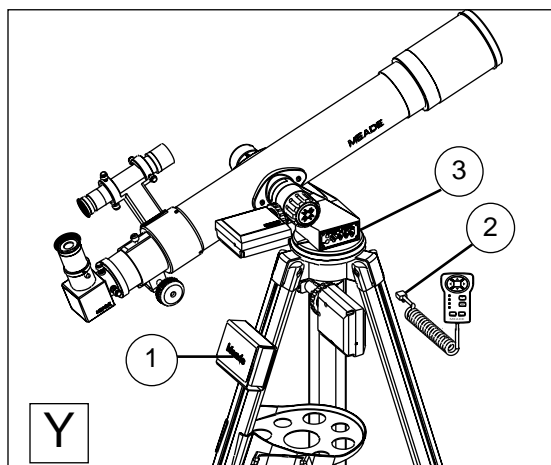
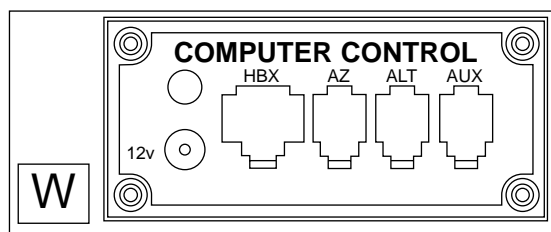
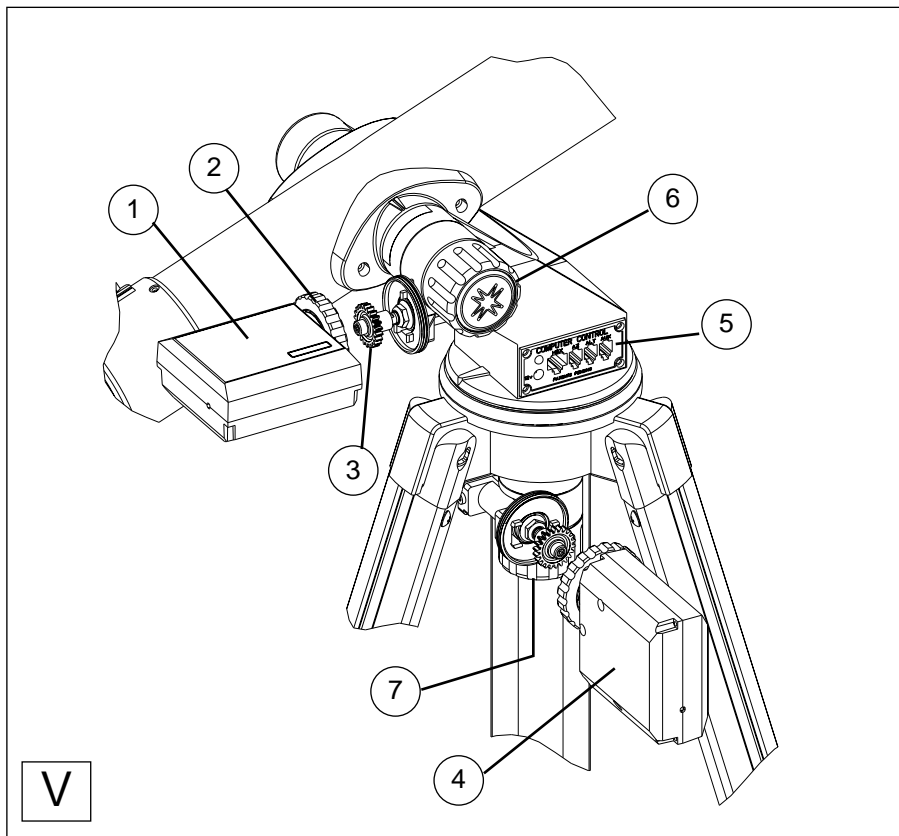
If purchased as an option, the instructions for mounting the #492 are included with the control system itself. If this feature is standard on your telescope, the user needs to attach the motor assemblies to the telescope, as described below.

The #492 System consists of the following components, each of which should be located in the packing before installation to the telescope is attempted (see **Figs. V and Y**): battery pack (**Y-1**); accepts ten AA-size user-supplied batteries) with cord; two small hex wrenches; two (identical and interchangeable) motor assemblies (**V-1**) and (**V-4**) with cords; one Electronic Controller handbox (**Fig. X**). (Note that for clarity cords attached to the motor assemblies and battery pack are not shown in the accompanying **Figs. V and Y** of the #492 Control System.)

To install the #492 System:

1. Place ten AA-size batteries inside the battery pack (**Y-1**), with correct battery orientation as indicated on the battery pack's internal holder; attach the battery pack to one of the tripod legs using the Velcro fastener as shown in **Fig. Y**, or set it on the accessory shelf (**Fig. Y**).

2. Attach the vertical motor assembly (**V-1**) to the vertical control unit by placing the knurled ring (**V-2**) of the motor assembly over the reduction gear (**V-3**). Note that three small plastic tabs project outward about 3mm (1/8") from the face of the threaded ring near the reduction gear (**V-3**). These "locator" tabs must fit into mating slots located just-inside the knurled ring (**V-2**). Wiggle the motor assembly (**V-1**) to engage the reduction gear (**V-3**) with the internal gears of the motor assembly (**V-1**). The knurled ring (**V-2**) locks into position by threading it to a mating thread located on the vertical control unit. *Turn the knurled ring to a firm-feel only; do not overtighten.*



3. Attach the horizontal motor assembly (V-4) to the telescope by following the same procedure outlined in step 2, above.

Note: *With both the vertical and horizontal motor assemblies attached, the telescope now appears as in Fig. Y. (Note that cords have been omitted from Fig. Y for clarity.)*

4. Plug in the following cords to the control panel (V-5 and Fig. W):
 - a. Cord from the vertical motor assembly (V-1) plugs into the ALT (*altitude*, or vertical) jack (Fig. W).
 - b. Cord from the horizontal motor assembly (V-4) plugs into the AZ (*azimuth*, or horizontal) jack (Fig. W).
 - c. Cord from the Electronic Controller (Y-2) plugs into the HBX (*handbox*) jack (Fig. W).
5. Finally, plug the cord from the battery pack (Y-1) into the "12v" jack (Fig. W).
6. As soon as the battery pack is connected to the "12v" jack on the control panel, all four indicator lights on the Electronic Controller (Fig. X) start blinking rapidly. Press the SPEED key on the Electronic Controller and the telescope slews (moves) momentarily in the vertical and horizontal directions to test the motors. When the test is complete, Light 1 (see Fig. X) comes on steady; Lights 2, 3, and 4 turn off.
7. The #492 Dual-Axis Electronic Control System is now operational. Use the four arrow keys (X-5) to slew the telescope to the desired object. To change speeds, press the SPEED key (X-6) on the Electronic Controller. Depressing this key consecutively causes telescope speed to cycle through all of the four available speeds, from fast to very slow.

The speed in operation is indicated by the four indicator lights (1, 2, 3, and 4, Fig. X) on the Electronic Controller, as follows:

- Light 1: 5°/second (fast). Use this speed to move the telescope across the sky rapidly from one object to another.
- Light 2: 0.75°/second (moderate). Use to center objects in the field of the viewfinder.
- Light 3: 8 arc-minutes/per second (slow). Use to center objects in the field of view or to track objects at lower powers.
- Light 4: 2 arc-minutes/sec. (very slow). Use to center objects in the field of view or to track objects at higher powers (e.g., above magnifications of about 80X).

Operating Notes on the #492 Dual-Motor Electronic Control System:

1. For the motors of the #492 System to be operational, the vertical and horizontal lock-knobs (V-6) and (V-7) must be in their locked positions. *Firm-feel tightening of these locks is sufficient. Do not overtighten.*
2. When setting up the telescope, always plug in the battery pack to the control panel last, after plugging in the two motors and the Electronic Controller. Connecting the battery pack to the control panel before the motors and Electronic Controller are connected may result in false electrical signals being sent to the motors, causing them to malfunction. In this case unplug the battery pack from the control panel, wait a few seconds, and plug the battery pack back into the control panel. This operation clears the motors of any false signals.
3. When using the arrow keys (X-5) to reverse the direction of motion of the telescope (e.g., when changing the telescope's direction of motion from horizontal-right to horizontal-left), there may be a brief pause before the telescope begins moving. This pause is caused by the internal gears of the motor assemblies.
4. The MODE key of the Electronic Controller (Fig. X) is inoperative on the #492 System; pressing this key has no effect. (The MODE key is used in certain specialized operations on other Meade telescope models where equatorial (polar) alignment of the telescope is desired.)

5. The IN and OUT keys are used in conjunction with the optional Meade #1240 Electric Focuser. With the #1240 unit attached to the telescope's focuser, precise focusing of the telescopic image may be accomplished directly from the Electronic Controller. Detailed instructions are included with the #1240 Electric Focuser.
6. Note that the telescope's accessory shelf (**A-8**) includes a holder (**A-21**) for the Electronic Controller.
7. When using the #492 System, take care that cords do not become wrapped around the telescope; keep the cords "loose" at all times. Do not allow the telescope to slew into the tripod or other fixed object. Do not touch or hold the telescope tube while it is moving.
8. If the motors stall or do not have sufficient power to move the telescope, place fresh batteries in the battery pack. Long-life alkaline batteries are recommended.

#493 Autostar Computer Control System: Attached to any Meade DS telescope, the #493 Autostar Computer Control System permits fully *automatic* motorized location (at 5°/second on both telescope axes) of more than 1400 celestial objects, including the major planets from Mercury to Pluto; all 110 deep-space Messier objects; the finest galaxies, diffuse nebulae, planetary nebulae, and star clusters from the New General Catalog (NGC), the Index Catalog (IC), and the Caldwell catalog; hundreds of stars (double stars, variable stars, SAO stars); 15 periodic comets; 50 earth-orbiting satellites; and more. In addition the Autostar System can perform an automatic GO TO function to any object of known celestial coordinates (Right Ascension and Declination). Enter any of the preceding objects into the Autostar display, press GO TO, and the telescope moves to the object and places it in the telescopic field of view.

To install the #493 system:

Installation of the #493 system is identical to the procedure described in "To Install the #492 System," page 15, except for step 4c. In this step, the cord from the #493 Autostar Computer Control System plugs into the HBX (*handbox*) jack (**Fig. W**).

Instructions for the operation of the #493 Autostar Computer Control System are included with the System itself.

Important Note: *The first time Autostar initializes, it calibrates the motors. If you remove the motors after a viewing session, mark one of the motors so that you remember the orientation of the motors. Use the same orientation in subsequent observing sessions; otherwise Autostar detects what appears to be a motor failure. If this occurs and a motor failure message is displayed, the motors have to be recalibrated.*

Appendix 3: Optional Electronic and Computer Drive Systems Available for Your Meade Digital Electronic Series Telescope

Your Meade DS telescope can be equipped with the latest in high-technology electronic drive systems. These systems attach to Meade DS telescopes in minutes and greatly extend the usefulness and excitement of telescope operation.

#490 Manual Slow-Motion Control Set

Use the Manual Slow Motion Control Set to manually track astronomical and terrestrial objects through the telescope by turning one or both of the manual control knobs attached to the vertical and horizontal axes of the telescope. Allows manual micrometric slow-motions of the telescope.

#492 Dual-Motor Electronic Control System

Use the Electronic Control System for pushbutton motions of the telescope on both telescope axes, simultaneously, at any of the drive speeds; very slow, slow, moderate, and fast. Track astronomical and terrestrial objects at the push of a button. The #492 system operates from a small battery pack included with the system, that accepts ten AA-size (user supplied) batteries.

#493 Autostar Computer Control System

With the Meade Autostar system attached to your telescope, fully automatic astronomical object-location becomes a reality. Bring up the object you want to observe from Autostar's 1400-object database on to the Autostar display, press GO TO, and the telescope *automatically* moves to the object and places it in the telescope field of view! In addition, Autostar enables the telescope to track the object automatically, fully compensating for the earth's rotation. Objects seem to "stand still" as the telescope follows their motions across the sky.

Supplied with 2 control motors, battery pack and Autostar #495 handbox.

#495 Autostar Handbox

Owners of DS telescopes already equipped with the #492 EC System (see above) need only purchase the #495 handbox to convert their telescopes to full Autostar operation. See the description of the #493 Autostar System above for more details.

#497 Autostar Handbox

Includes all the features of the #495 handbox, but offers a database of over 14,000 objects, including over 5,000 objects from the Index Catalog (IC), 7800 objects from the New General Catalog (NGC), 109 objects from the Caldwell catalog and over 900 stars from the Smithsonian Astrophysical Observatory (SAO). The database also includes all 110 Messier objects, 50 earth-orbiting satellites, 26 asteroids, and 15 periodic comets.

For more information on these electronic features, contact your Meade dealer, or send \$3.00 to Meade Instruments for a copy of the Meade General Catalog,

Information on Meade dealers located near you can be obtained by calling toll-free: 1-800-62-MEADE.



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