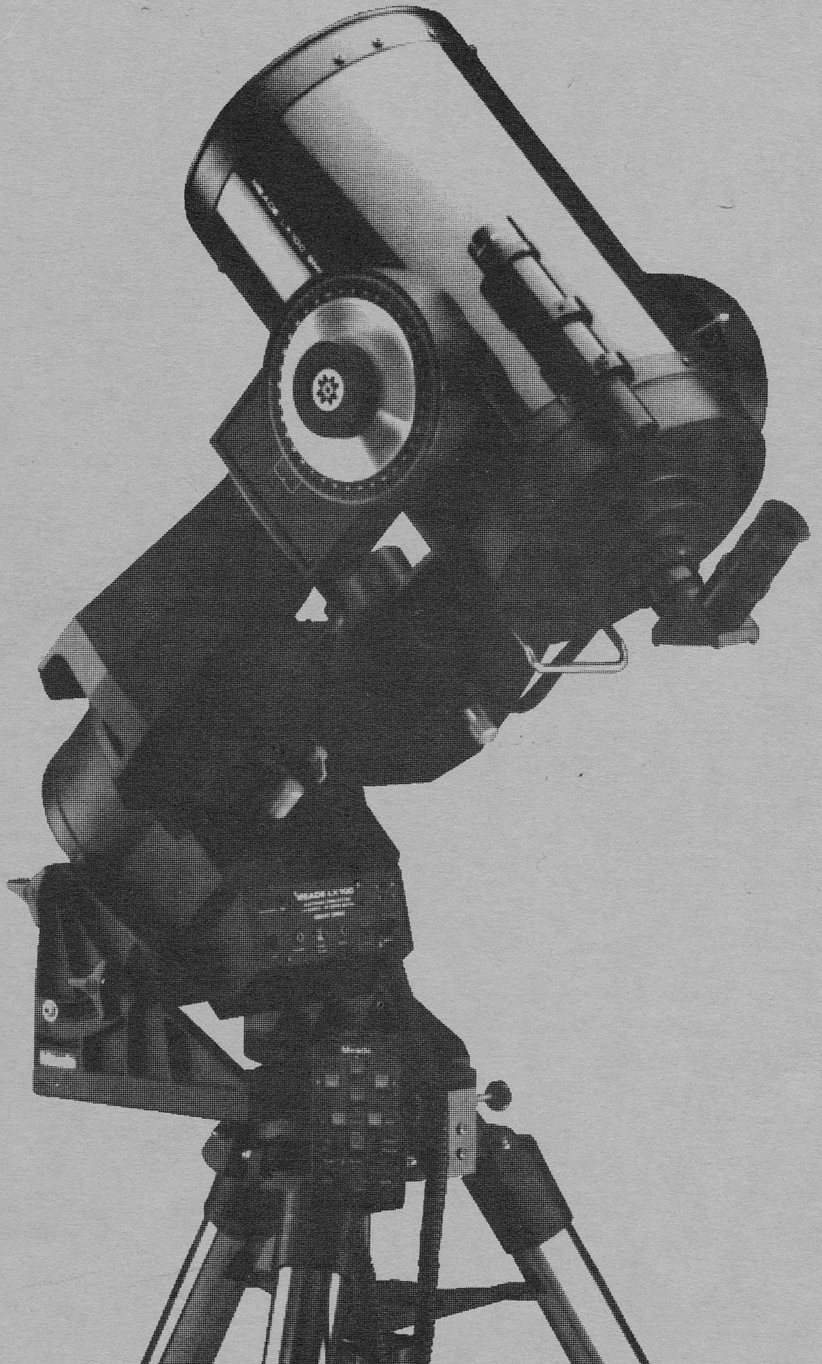
Meade Instruments Corporation
Instruction Manual

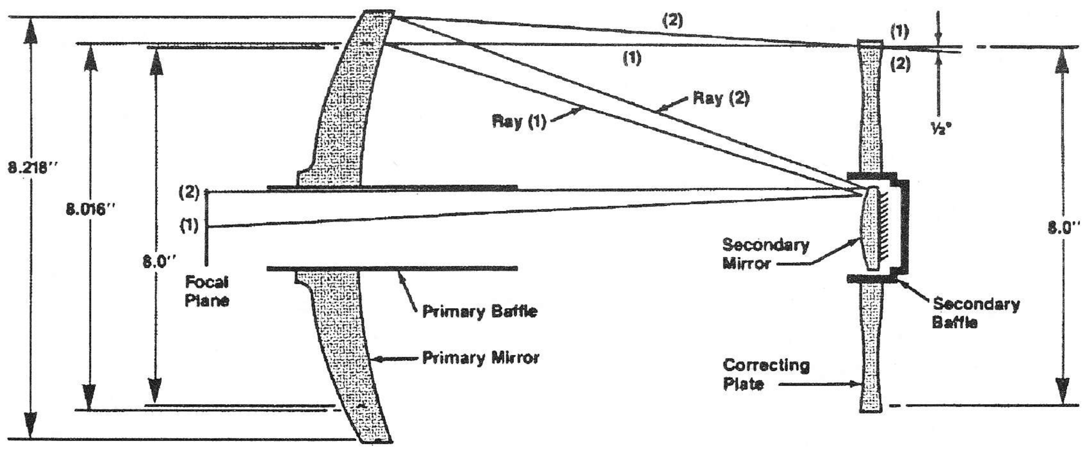
8" LX100 Schmidt-Cassegrain
10" LX100 Schmidt-Cassegrain



Note

Instructions for the use of optional accessories are not included in this manual. For details in this regard, see the Meade General Catalog.

The Meade Schmidt-Cassegrain Optical System (Diagram not to scale)



In the Schmidt-Cassegrain design of the Meade 8" and 10" models, light enters from the right, passes through a thin lens with 2-sided aspheric correction ("correcting plate"), proceeds to a spherical primary mirror, and then to a convex aspheric secondary mirror. The convex secondary mirror multiplies the effective focal length of the primary mirror and results in a focus at the focal plane, with light passing through a central perforation in the primary mirror.

The 8" and 10" models include oversize 8.25" and 10.375" primary mirrors, respectively, yielding fully illuminated fields-of-view significantly wider than is possible with standard-size primary mirrors. Note that light ray (2) in the figure would be lost entirely, except for the oversize primary. It is this phenomenon which results in Meade 8" and 10" Schmidt-Cassegrains having off-axis field illuminations 10% greater, aperture-for-aperture, than other Schmidt-Cassegrains utilizing standard-size primary mirrors. The optical design of the 4" Model 2045D is almost identical but does not include an oversize primary, since the effect in this case is small.

TABLE OF CONTENTS

PRECAUTIONARY WARNING! Be sure to read this manual, or at minimum, the introductory assembly and operational procedures contained herein before attempting to use your telescope.

A. INTRODUCTION

Meade 8" and 10" LX100 Schmidt-Cassegrain Telescopes are instruments of advanced mirror-lens design for astronomical and terrestrial applications. Optically and mechanically, the 8" and 10" telescope models are among the most sophisticated and precisely manufactured telescopes ever made available to the serious amateur. These telescopes enable the visual astronomer to reach out for detailed observations of the Solar System (the planets: Jupiter, Saturn, Mars) and beyond to distant nebulae, star clusters, and galaxies. The astrophotographer will find a virtually limitless range of possibilities since, with the precision Meade worm-gear motor drive system, long exposure guided photography becomes not a distant goal, but an achievable reality. The capabilities of the instrument are essentially limited not by the telescope, but by the acquired skills of the observer and photographer. Do take the time to read this manual thoroughly so that you will be fully acquainted with the many important features of the telescope, as well as with the auxiliary equipment and accessories available for advanced applications.

The 8" and 10" models are, with the exception of a few assembly operations and features, almost identical operationally. Most standard and optional accessories are interchangeable between the two telescopes. The instructions in this manual generally apply to both telescopes; when exceptions to this rule occur, they are clearly pointed out.

1. What is the LX100?

Designed for advanced visual and astrophotographic applications, Meade 8" and 10" LX100's include a dazzling array of standard-equipment features for the serious observer: Wide-field f/6.3 or classical f/10 optical systems, mounted atop the largest, most rigid fork mounts available.

a. Heavy-Duty Fork Mounts

The oversized fork mountings included with Meade LX100's are the largest, most rigid mounts ever offered by a commercial Schmidt-Cassegrain manufacturer. Vibration damping times ar the lowest of any fork mounts currently available, and yet, these 8" and 10" telescopes move effortlessly across the skies on giant 4" sealed, preloaded polar ball bearings.

b. 2-Speed Drive Systems

In addition to the basic quartz-controlled sidereal tracking rate, LX100 models incorporate 2 right-ascension tracking speeds, controllable from the handbox: **2x** sidereal rate for photo-guiding during astrophotography, and **32x** sidereal rate for microslewing, or moving, objects within the field of view of view of the main telescope. Add the optional #39S Declination motor and 2-speed control is actuated on both telescope axes, simultaneously if desired.

c. Permanent Periodic Error Correction (PPEC) Smart Drive

The Meade **Smart Drive** permits the observer to compensate for minor periodic worm gear inaccuracies; this exclusive Meade software package, built into every LX100, is capable of reducing periodic drive rate errors to an incredible 5 arc. sec. or less. The **Smart Drive** only requires user programming once; thereafter the Smart Drive model is forever stored in the telescope's non-volatile memory, even when power is turned off.

d. Display (Power) Panel

The LX100 display panel allows for addition of the Meade #1206 Electric Focuser, operable for the telescope's Electronic Command Center (ECC), and for direct connection of popular CCD autoguiders. Connectors for powering the optional #39S Declination Motor, and illuminated reticle guiding eyepiece and for the ECC are also provided. The bar-type, red LED ammeter permits readout of the telescope's electrical current consumption.

2. Standard Equipment

a. 8" Model LX100

Includes 8" Schmidt-Cassegrain optical tube assembly (specify f/6.3 or f/10) with enhanced multi-coatings (D = 203mm; F = 1280mm f/6.3 or 2000mm f/10); heavy-duty fork mount with 4"-dia. sealed polar ball bearing, 5.75" RA worm gear, quartz-microprocessor-controlled DC servo-motor drive, and multi-function power panel display on the drive base; manual slow-motion controls and setting circles on both axes; handheld pushbutton Electronic Command Center with PPEC Smart Drive and 2-speed (2x, 32x) drive control; 25 ft- power cords for telescope operation from either 12v.DC auto cigarette lighter plug or from 115v.AC outlet; 6 x 30mm viewfinder; eyepiece holder and diagonal prism (1.25"); Series 4000 SP 26mm eyepiece; equatorial wedge with elevation scale, bubble level, and azimith control; variable-height field tripod; deluxe die-cut-foam-fitted carrying case; operating instructions.

b. 10" Model LX100

Includes 10" Schmidt-Cassegrain optical tube assembly (specify f/6.3 or f/10) with enhanced multi-coatings (D = 254mm, F = 1600mm f/6.3 or 2500mm f/10); heavy-duty fork mount with 4"-dia sealed polar ball bearing, 5.75" RA worm gear, quartz-microprocessor-controlled DC servo-motor drive, and multi-function power panel display on the drive base; manual slow-motion controls and setting circles on both axes; handheld pushbutton Electronic Command Center with PPEC Smart Drive and 2-speed (2x, 32x) drive control; 25 ft. power cords for telescope operation from either 115v.DC auto cigarette lighter plug or from 115v.AC outlet; 8 x 50mm viewfinder; eyepiece holder and diagonal prism (1.25"); Series 4000 SP 26mm eyepiece; superwedge with elevation scale, bubble level, and azimuth control; variable-height field tripod; deluxe die-cut-foam-lined carrying case; operating instructions.

B. TELESCOPE ASSEMBLY

Use the following steps to assemble your telescope. Note: Section headings list the specific LX100 model covered under that heading.

1. Unpacking (Both LX100 Models)

Meade 8" and 10" LX100 telescopes are packed differently, depending on the model, to assure safe arrival.

Carefully unpack and remove all the telescope parts from their packing material. Compare the parts to the "Packing Program" (packed with the telescope) to identify each part.

NOTE: We recommend that you keep all packing materials. If it is ever necessary for you to return your telescope to the Meade factory for servicing, these materials will help to assure that no shipping damage will occur.

> **Note to foreign users:** Meade 8" and 10" LX100 Schmidt-Cassegrain models supplied to countries outside the U.S.A. are identical in all respects to the telescopes offered domestically, with the exception of the AC wall adapter. Also included is a set of plug adapters which will allow the wall adapter to be plugged into the standard wall sockets of most countries.

2. The Field Tripod (Both LX100 Models)

The Field Tripods for the Meade 8" and 10" LX100 telescopes are supplied as completely assembled units, except for the spreader bar (#4, Fig. 1) and the 6 lock knobs (2 knobs for each of the 3 tripod legs) used to adjust the height of the tripod. These knobs are packed separately for safety in shipment.

For terrestrial observations, the base of the telescope's fork mount may be attached directly to the field tripod. The telescope in this way is mounted in an "altazimuth" ("altitude-azimuth," or "vertical-horizontal") format, ideal for non-astronomical applications. The telescope in this set-up moves along vertical and horizontal axes, corresponding respectively to the Declination and Right Ascension axes in an astronomical observing mode. The telescope may, of course, be used for astronomical observations when set-up in the altazimuth mode, but the electric motor drive will, in this case, be non-functional from a practical point of view.

Alternately, the field tripod is normally used in conjunction with the appropriate equatorial wedge (see section 3) for serious astronomical applications. The equatorial wedge permits alignment of the telescope's Polar Axis with the Celestial Pole (or North Star), so that the electric motor drive becomes operational.

After removing the field tripod from its shipping carton, stand the tripod vertically, with the tripod feet down and with the tripod still fully collapsed (see Fig. 2). Grasp two of the tripod legs and, with the full weight of the tripod on the third leg, gently pull the legs apart to a fully open position.

Thread in the 6 lock-knobs (2 on each tripod leg) near the foot of each tripod leg. Refer to Fig. 1. These lock-knobs are used to fix the height of the inner, extendable tripod leg sections. Note: **"Firm feel" tightening is sufficient; over-tightening may result in stripping of the knob threads and results in no additional strength.**

The spreader bar (#4, Fig.1) has been removed for shipment. To replace, first remove the hex nut from the top of the threaded rod (#2, Fig.1) and remove the threaded rod from the tripod head (#1, Fig. 1). (Note, the threaded rod has a knob (#3, Fig. 1) permanently attached.) Remove the second hex nut from the threaded rod.

Slide the spreader bar onto the threaded rod (note the correct orientation as shown in Fig. 2) and position the threaded rod back through the tripod head. Place the clip retainer (a "C" clip) into the slot in the threaded rod. This clip holds the threaded rod in place. See Fig. 2.

Position the spreader bar so that the 3 arms of the spreader bar are lined up with the 3 tripod legs.

To attach the equatorial wedge to the field tripod, leave the threaded rod loose for the time being.

To vary the tripod height, loosen the 6 lock-knobs and slide the 3 inner tripod leg sections out to the desired height. A bubble level is included on all equatorial wedges to aid in leveling the field tripod.

To collapse the tripod (after removing the telescope and equatorial wedge) for storage follow these steps:

1. Lower the tripod legs to the lowest position.

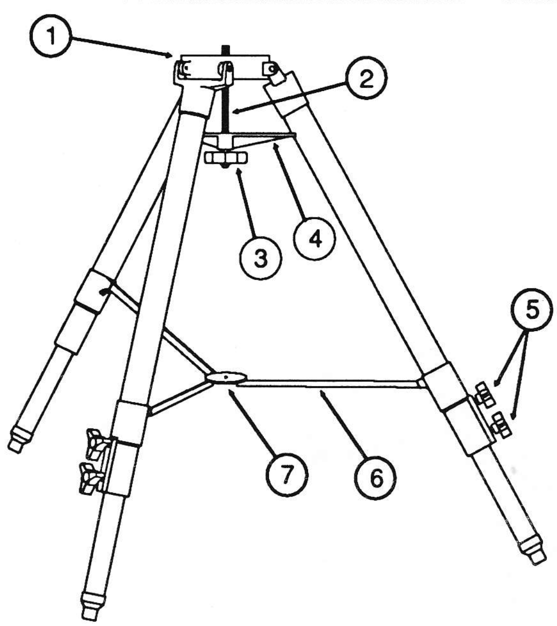
2. Rotate the spreader bar (#4, Fig. 1) 60° from its assembled position, so that one spreader bar arm is located between each adjacent pair of tripod legs.

3. At the base of the tripod is a 3-vane extension strut system, with a circular hub at its center (#7, Fig. 1). To collapse the tripod, grasp the tripod head (#1, Fig. 1) with one hand and, with the other hand, pull directly "up" on the central hub of the extension strut system. This operation will cause the tripod legs to move inward to a collapsed position.

PRECAUTIONARY NOTES

1. If the tripod does not seem to extend or collapse easily, do not force the tripod legs in or out. By following the instructions above, the tripod will function properly, but if you are unclear on the proper procedure, forcing the tripod into an incorrect position may damage the extension strut system.

2. Do not overtighten the 6 lock-knobs used to fix the inner tripod leg sections at various heights. "Firm feel" tightening is sufficient.



(1) Tripod Head
(2) Threaded Rod
(3) Tension Knob
(4) Spreader Bar
(5) Lock Knobs
(6) Extension Strut
(7) Tension Hub

Fig. 1: Field Tripod

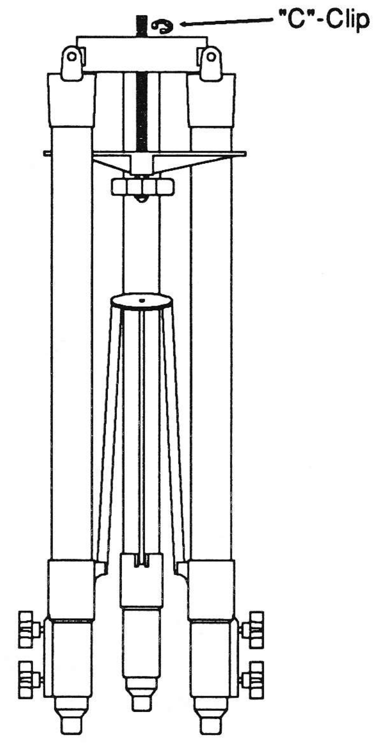


Fig. 2: Field Tripod (collapsed)

3. Equatorial Wedge

There are two equatorial wedges used on Meade LX100 telescopes. Pick the section, below, that applies to your telescope.

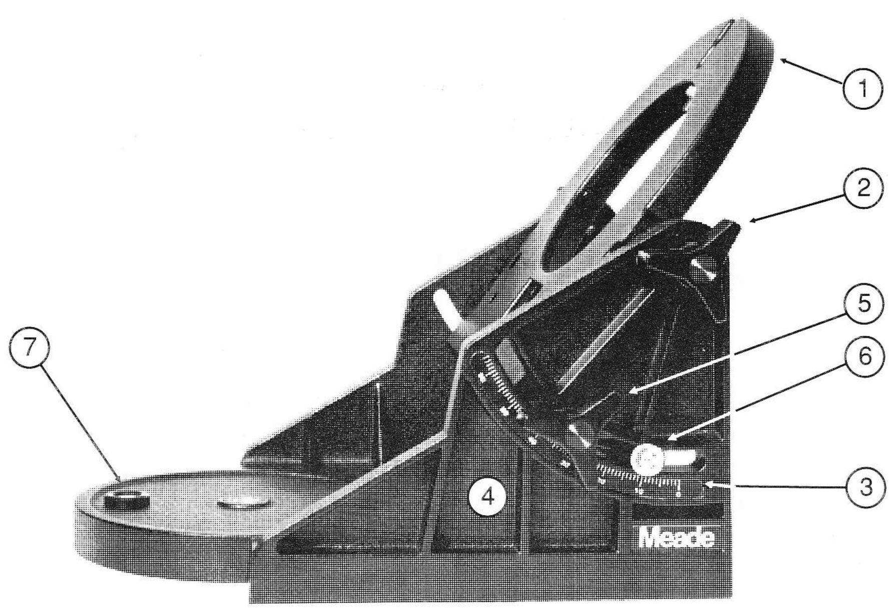
a. 8" EQUATORIAL WEDGE (8" LX100)

The Equatorial Wedge permits use of the 8" LX100 telescope in an astronomical, or "equatorial," mode. The wedge fits onto the field tripod, described below, and accepts the base of the 8" LX100 fork mount. See Fig. 9.

NOTE: The Meade equatorial wedge is designed solely for use in conjunction with the Meade field tripod. The wedge should never be used without the field tripod, *e.g.* by placing the wedge alone on a table top and then mounting the telescope on the wedge. The 8" LX100, placed onto the equatorial wedge alone without the field tripod attached to the wedge may become seriously imbalanced, to the point where the telescope may actually tip over.

The equatorial wedge for the 8" LX100 telescope is of modern design, with several important features incorporated to simplify and facilitate telescope operation. After using the wedge, you will find that the functional design features included are of very significant value in routine telescope operations. Features included are:

1. Attachment of the wedge to the field tripod by means of only one manual knob.
2. Quick azimuth adjustment by loosening the manual knob as described above.
3. Bubble level for rapid tripod/wedge leveling.
4. Etched latitude scale for fast adjustment of the latitude angle.



(1) Tilt-Plate
(2) Attachment Knob
(3) Latitude Scale
(4) Wedge Body
(5) Tilt Angle Adjustment Knob
(6) Fine Latitude Adjuster Crossbar Screws
(7) Bubble Level

Fig. 3: Equatorial Wedge for 8" LX100 Telescopes

To assemble the equatorial wedge, follow this procedure (note that all required wedge hardware and manual knobs are shipped within the wedge carton):

1. The wedge consists of two basic parts: the wedge body and the tilt-plate, as shown in Fig. 3. Attach the tilt-plate to the wedge body by threading in the four knobs provided. Two knobs, with washers, should be used on each side of the wedge body so that a total of 4 knobs attach the tilt plate to the wedge body.

NOTE: When installing the tilt-plate to the wedge, note that it is a tight fit and the sides must generally spread slightly to accept the tilt-plate. If the main crossbar of the Deluxe Latitude Adjuster is already tightened into place this will inhibit your installation of the tilt-plate. You will therefore see that by releasing the screws on the ends of the DLA crossbar (#6, Fig. 3) your installation of the wedge tilt-plate will be facilitated.

2. Place the wedge onto the field tripod with the central threaded rod of the tripod fitting through the center hole in the floor of the wedge. Thread the wedge knob (#9, Fig. 9) onto the threaded rod of the field tripod and firmly tighten the manual knob.

1) Azimuth Control

The Azimuth Control for the Meade Equatorial Wedge and Field Tripod is shipped in a plastic bag and includes the following parts:

- Azimuth Base (large U shaped piece of aluminum)
- Azimuth Arm (small T shaped piece of aluminum)
- 2 - Azimuth Knobs
- 2 - 8-32 x 1/2" flat-head machine screws
- 2 - 8-32 x 1" round-head machine screws

To attach the Azimuth Control to your wedge and tripod, follow these steps:

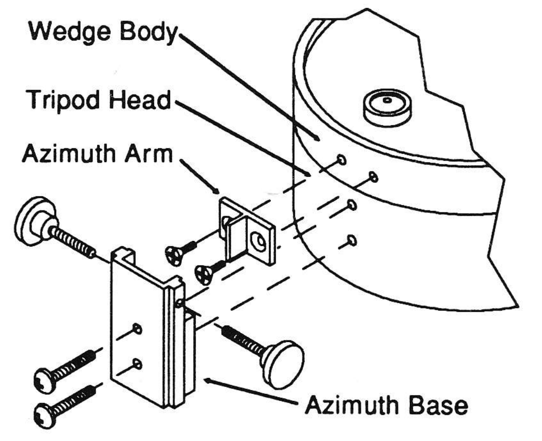


Fig. 4: Azimuth Control

1. Remove the 4 set screws from the wedge and field tripod (which plug the attachment holes) using a screwdriver.
2. Attach the Azimuth Arm to the Equatorial Wedge using the 2 ea. 8-32 x 1/2" flat-head machine screws.
3. Attach the Azimuth Base to the Field Tripod using the 2 ea. 8-32 x 1" round-head machine screws.
4. Thread the two Azimuth Adjustment Knobs into the Azimuth Base, until they just touch the Azimuth Arm.

The Azimuth control is now ready to use. To adjust in azimuth, loosen the wedge knob (#9, Fig. 9). Rotate the wedge by using the two Azimuth knobs in a push-pull manner. After positioning the wedge, tighten the central wedge knob.

2) Deluxe Latitude Adjuster

The Deluxe Latitude Adjuster (DLA) attaches directly to the Equatorial Wedge and permits very precise adjustments in latitude angle by the simple turning of one knob.

The Equatorial Wedge for Meade 8" Schmidt-Cassegrain telescope is shipped with the main crossbar (#5, Fig. 11) of the DLA already installed. Loosen the two socket-head screws that lock the main crossbar in place, to allow the crossbar to rotate slightly if needed. Thread the long adjustment knob (#3, Fig. 11) into the main crossbar and position the end of the adjustment knob into the cavity on the underside of the Equatorial Wedge Tilt-Plate. Tighten the two socket-head screws locking the main crossbar into place.

The DLA is now ready to use. To make fine latitude adjustments, follow this procedure:

1. Slightly loosen the knobs (#5, Fig. 3), on each side of the wedge.

2. Turn the DLA's adjustment knob (pressing against the bottom of the tilt-plate), so that the tilt-plate moves in latitude angle.

3. Re-tighten the two knobs, which were loosened in step 1, above.

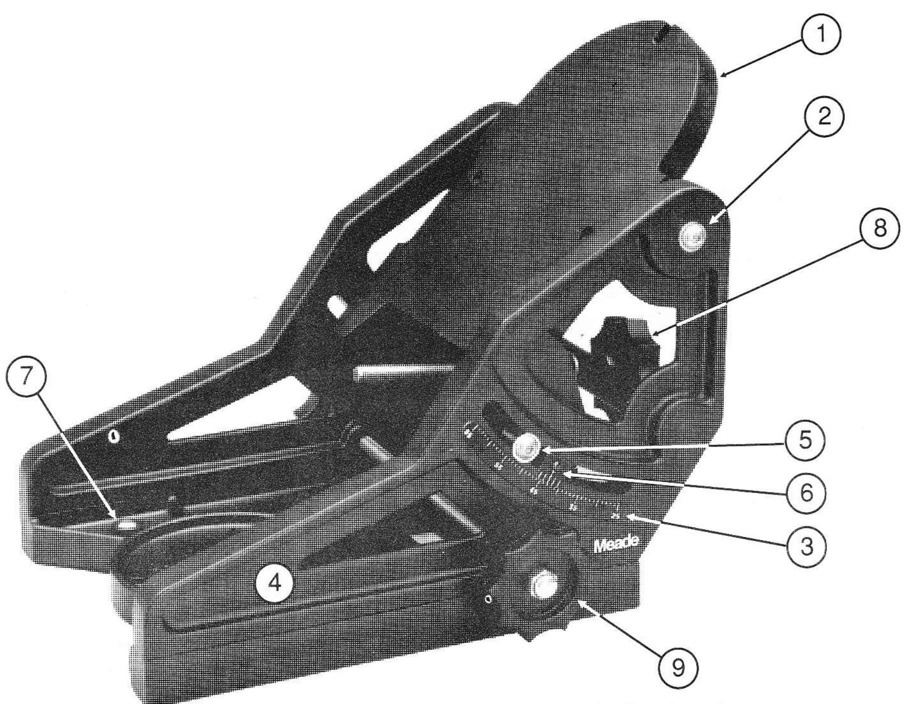
b. SUPERWEDGE (10" LX100)

The Superwedge permits use of the 10" LX100 telescope in an astronomical, or "equatorial," mode. The wedge fits onto the field tripod, described below, and accepts the base of the 10" LX100 fork mount. See Fig. 9.

NOTE: The Meade Superwedge is designed solely for use in conjunction with the Meade field tripod. The Superwedge should never be used without the field tripod, *e.g.* by placing the Superwedge alone on a table top and then mounting the telescope on the wedge. The 10" LX100, placed onto the Superwedge alone without the field tripod attached to the wedge may become seriously imbalanced, to the point where the telescope may actually tip over.

The Superwedge for the 10" LX100 telescope is of modern design, with several important features incorporated to simplify and facilitate telescope operation. After using the Superwedge for your telescope, you will find that the functional design features included are of very significant value in routine telescope operations. Some of these features include:

1. Attachment of the Superwedge to the field tripod by means of only one manual knob. (For photographic applications with the telescope where extreme steadiness is required, 3 additional hex-head screws are provided).
2. Quick azimuth adjustment by loosening the manual knob as described above.
3. Bubble level for rapid tripod/wedge leveling.
4. Etched latitude scale for fast adjustment of the latitude angle.
5. Built-in latitude adjustment control.



(1) Tilt-Plate
(2) Attachment Screw
(3) Latitude Scale
(4) Wedge Body
(5) Tilt Angle Adjustment Screw
(6) Vernier Pointer
(7) Bubble Level
(8) Fine Latitude Control Knob
(9) Azimuth Control Knob

Fig. 5: Superwedge for 10" LX100 Telescope

To assemble the Superwedge, follow this procedure (note that all required wedge hardware and manual knobs are shipped within the wedge carton):

1. Locate the two 8-32 nylon set screws on the rim of the tripod head and remove them. Attach the tangent arm to the tripod using the supplied 8-32 X 1/2" socket cap screws. (See Fig. 6, below.)

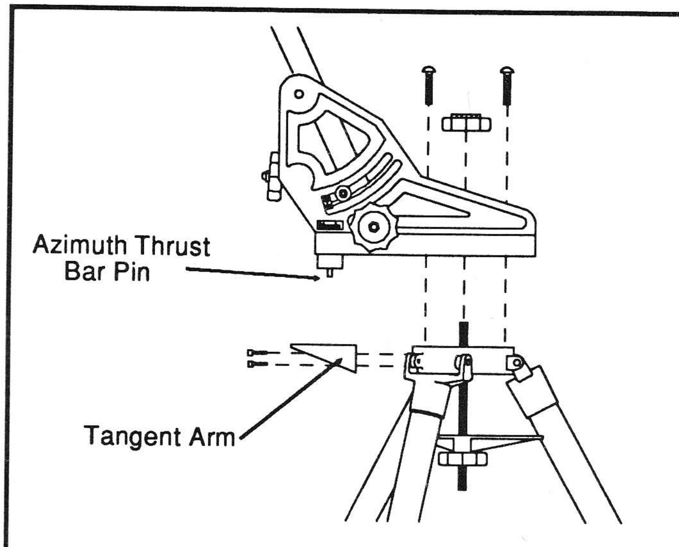


Fig. 6: Mounting Superwedge

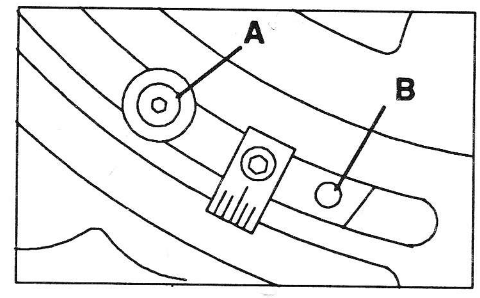


Fig. 7: Latitude Range Holes

2. Push the field tripod threaded rod up so that the threaded rod extends above the top of the tripod head.

3. Holding the threaded rod in position, place the Superwedge on top of the tripod head so that the threaded stud extending from the tripod head passes through the center hole on the wedge floor. Make sure the pin extending from the bottom of the azimuth thrust bar is positioned in the slot on the tangent arm (see Fig. 6, above).

4. Install the large hand knob/compass onto the threaded stud. For additional stability, pass the three 5\16-18 X 1-1/4" button head screws through the clearance slots on the wedge floor and thread them into the tripod head.

5. The lower tilt plate locking screws (see "A", Fig. 7) are installed in the factory to allow the tilt plate to be adjusted for any latitude less than 55 degrees. If viewing in a region with a latitude greater than 55 degrees, move the locking bolts to the lower mounting holes (see "B", Fig. 7).

4. Setting Up The Telescope

a. 8" LX100

The 2080 model telescopes are shipped as completely assembled instruments. Simply remove the telescope from the packing materials.

c. 10" LX100

SEE CAUTION BOX, BELOW. The 10" LX100 model telescopes are shipped as completely assembled instruments. Simply remove the telescope from the packing materials.

C A U T I O N: All 10" LX100 Model Owners

DO NOT ATTEMPT TO TURN THE FOCUSER KNOB OF THE OPTICAL TUBE UNTIL YOU HAVE READ THIS NOTE!

Next to the base of the focuser knob you will see a red-colored slotted head bolt. This bolt is used only for safety in shipment. Remove this bolt before attempting to turn the focuser knob. In its place, insert the rubber plug provided as a dust protector (this rubber plug is included with your hardware package).

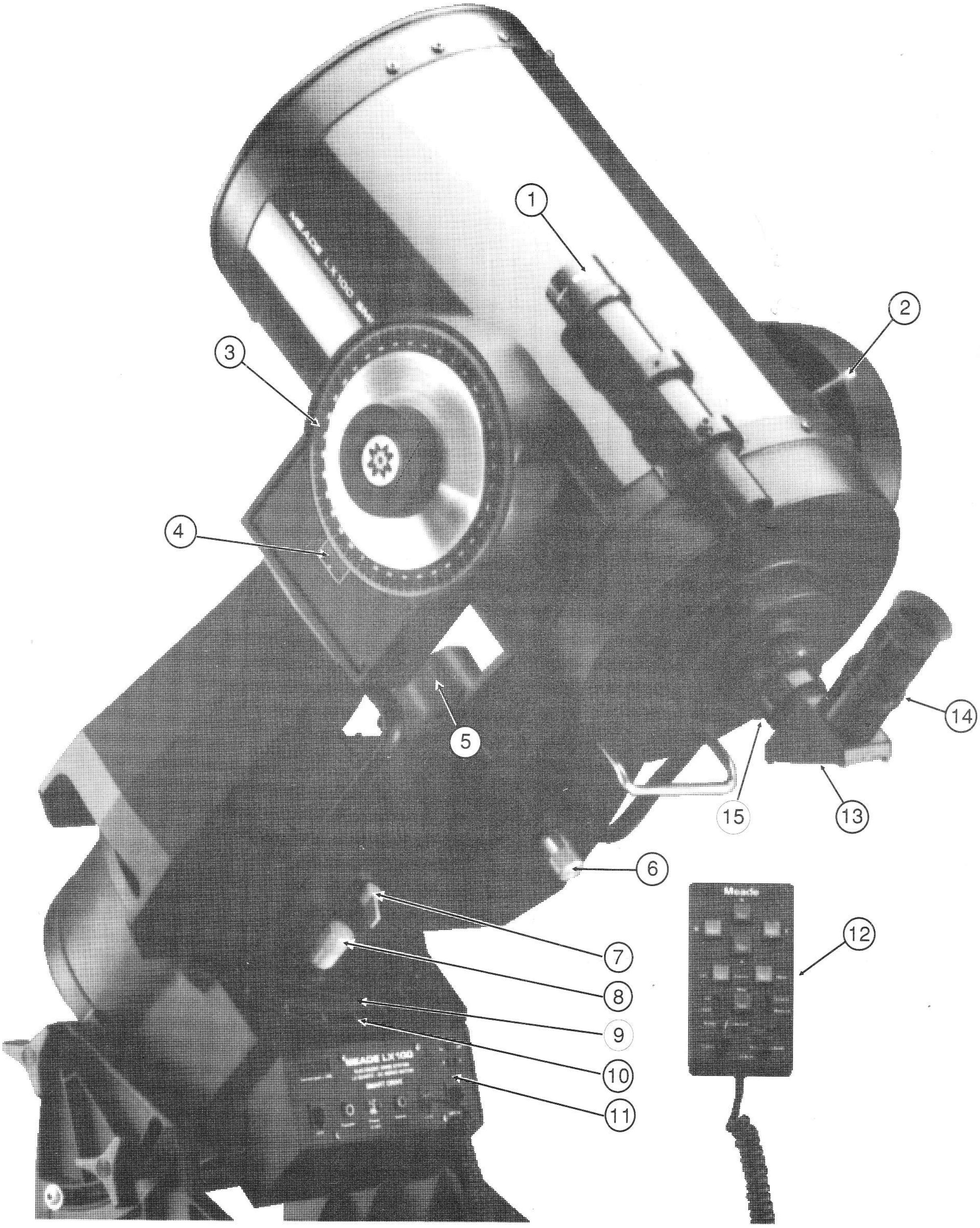
Your focuser is now operational.

Warning! The 10" LX100 should never be commercially shipped without this red-colored head bolt secured in place. This is essential during commercial transport where rough handling may occur. For your personal transport and storage, you will never need to use this bolt again.

TO COMMERCIALLY RE-SHIP THE 10" LX100, BE SURE TO FOLLOW THIS PROCEDURE:

1. Turn the focuser knob clockwise continuously until it stops. This will bring the primary mirror all the way back in the tube.
2. Remove the rubber plug and insert the red-headed bolt. Thread it in to a firm snug feel. Do not overtighten. (If you have misplaced the red-headed bolt, you may use any other bolt that is 1/4-20x1" long).

Please note that commercial shipment of the 10" LX100 telescope without this safety bolt in place is done at owner's risk and your freight insurance may be voided if shipping damage results.



(1) Viewfinder
(2) Declination Lock
(3) Declination Setting Circle
(4) Declination Pointer
(5) Optional Declination Motor
(6) Declination Slow-Motion Control
(7) R.A. Lock
(8) R.A. Slow Motion-Control
(9) R.A. Pointer
(10) R.A. Setting Circle
(11) LX100 Power Panel
(12) Electronic Command Center
(13) Diagonal Prism
(14) Eyepiece
(15) Eyepiece Holder

Fig. 8: 8" LX100 Telescope

5. Mounting The Telescope On The Wedge (Both LX100 Models)

With 8" LX100 model telescopes, three knobs are supplied for mounting the telescope's drive base to the tilt-plate of the equatorial wedge. With the 10" LX100, three socket screws are provided for this purpose.

(1) Tilt Plate
(2) Wedge Body-to-Tilt Plate Attachment Knob
(3) Tilt Angle Adjustment Knob
(4) Knob for Attaching the Telescope to Tilt Plate
(5) Drive Base
(6) Slot for Knob (#4, above)
(7) Holes for Additional Attachment Knobs
(8) Bubble Level
(9) Manual Knob/Compass for Attaching the Wedge to Field Tripod

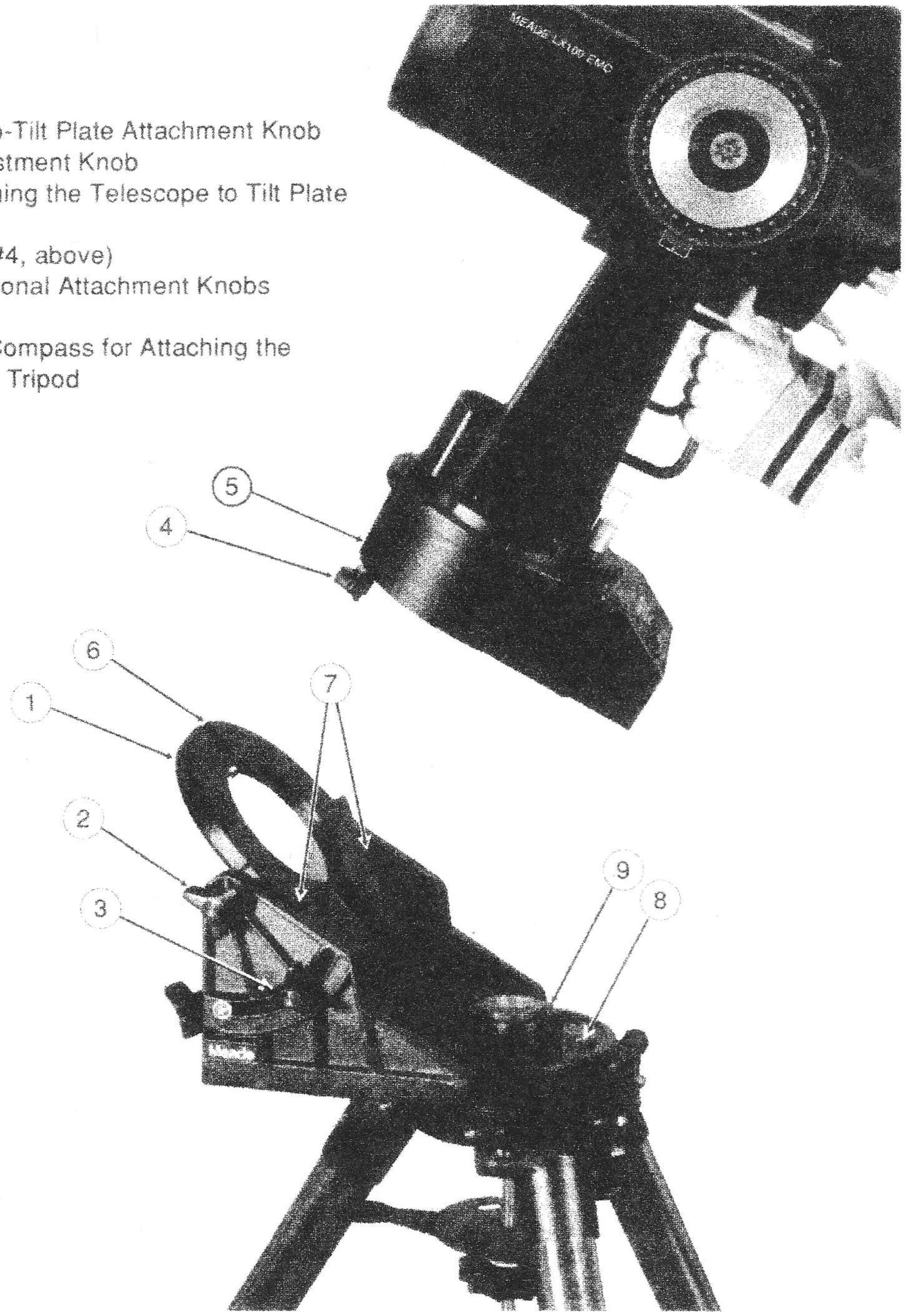
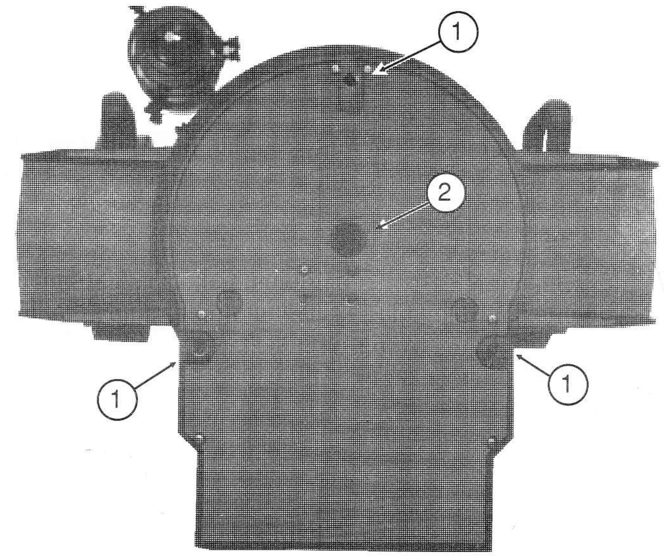


Fig. 9: Placing the Telescope on the Equatorial Wedge

Thread one of these knobs (or screws, as appropriate) partially into the hole on the underside of the drive base, located at the curved-end of the drive base. See #4, Fig. 9. This knob or screw should be threaded in about 3 full turns, not fully threaded into the hole.



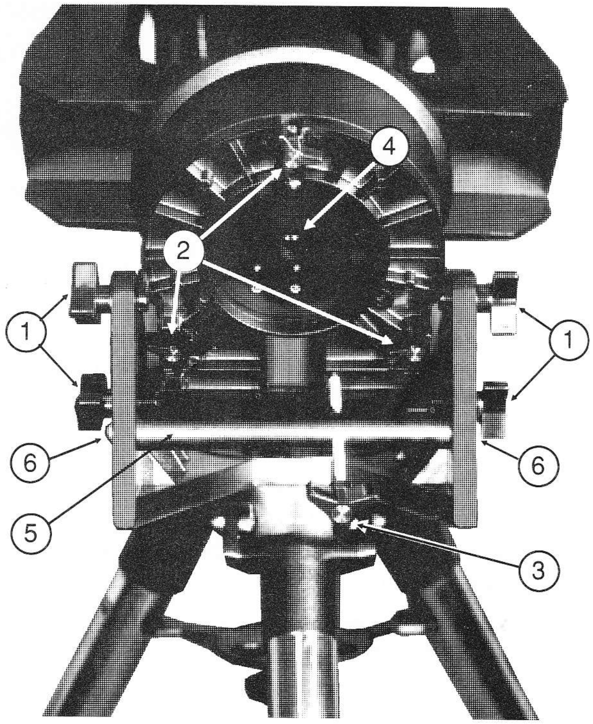
(1) Wedge Attachment Holes
(2) Altazimuth Attachment Hole (1/2-13 thread)

Fig. 10: Underside of the Drive Base

Grasping the 2 fork arms of the telescope firmly, with the power panel towards you, place the telescope onto the tilt plate of the wedge by sliding the knob (8" LX100) or screw (10" LX100) into the slot at the top of the curved-end of the wedge tilt-plate.

Insert the 2 remaining knobs for the 8" LX100, or socket screws for the 10" LX100, through the underside of the tilt plate and into the underside of the drive base. Tighten down all 3 knobs or screws to a firm feel. Extreme force is <u>not</u> necessary in this regard.

The telescope is now fully mounted onto the wedge and field tripod. Adjustments in wedge latitude angle and/or azimuth orientation may be made with the telescope in place. Further details on telescope polar alignment are given below under "Lining Up with the Celestial Pole."



(1) Tilt Plate Attachment Knobs
(2) Telescope-to-Tilt Plate Attachment Knobs
(3) Deluxe Latitude Control (DLC) Knob
(4) 1/2-13 Altazimuth Attachment Hole
(5) Deluxe Latitude Control Main Crossbar
(6) DLC Main Crossbar Attachment Screws

Fig. 11: Telescope On Wedge

6. Mounting The Viewfinder

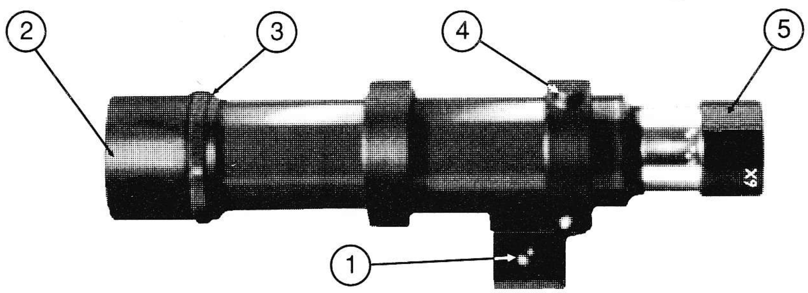
a. 6 x 30 VIEWFINDER (8" LX100)

The standard 6x30mm viewfinder is shipped in its mounting bracket with each 8" LX100 Model telescope. Mounting screws for the viewfinder bracket have been threaded into the top of the main telescope's rear cell, in the hole positions where the viewfinder bracket will be seated. See Fig. 12.

1) Attaching the Viewfinder

To attach the viewfinder, remove the 2 viewfinder mounting screws from the rear cell, using one of the hex wrenches provided with the telescope; place the viewfinder with bracket over these mounting holes and then replace the 2 mounting screws to securely attach the viewfinder bracket to the rear cell. Tightening these mounting screws to a "firm feel" is sufficient; avoid over-tightening, which might cause the rear cell threads to strip.

WARNING: Never use set screws on any part of the optical tube assembly, except those factory-supplied set screws included with the basic telescope or with optional accessories. Longer non-standard set screws may protrude too far into the optical tube and cause serious damage to the primary mirror.



(1) Mounting Screw
(2) Objective Lens Cell
(3) Knurled Collar
(4) Collimation Screws
(5) Eyepiece

Fig. 12: 6x30 Viewfinder for 8" LX100 Telescopes

2) Focusing the Viewfinder

The 6x30mm viewfinder has been factory pre-focused at infinity. Should this focusing need adjustment for your eyes, loosen the knurled collar at the objective lens-end of the viewfinder (#3, FIg. 12), enabling rotation of the objective lens cell forward or backward for precise focusing. Then tighten down the knurled collar against the objective lens cell to lock the focus in place. Note that no focusing is possible or necessary at the eyepiece end of the viewfinder.

3) Collimating the Viewfinder

The viewfinder will require alignment, or collimation, with the main telescope. Using the 25mm eyepiece, point the main telescope at some easy to find land object (*e.g.* the top of a telephone pole or corner of a building) at least 200 yards distant. Center a well-defined object in the main telescope. Then, using one of the hex wrenches provided, tighten or loosen, as appropriate, the viewfinder's 3 collimation screws (#4, Fig. 12) until the crosshairs of the viewfinder are precisely centered on the object already centered in the main telescope. With this collimation accomplished, objects located first in the wide-field viewfinder will then be centered in the main telescope's field of view.

Once attached, the viewfinder may be left permanently mounted onto the telescope's rear cell. The viewfinder need not be removed when storing the telescope in its carrying case.

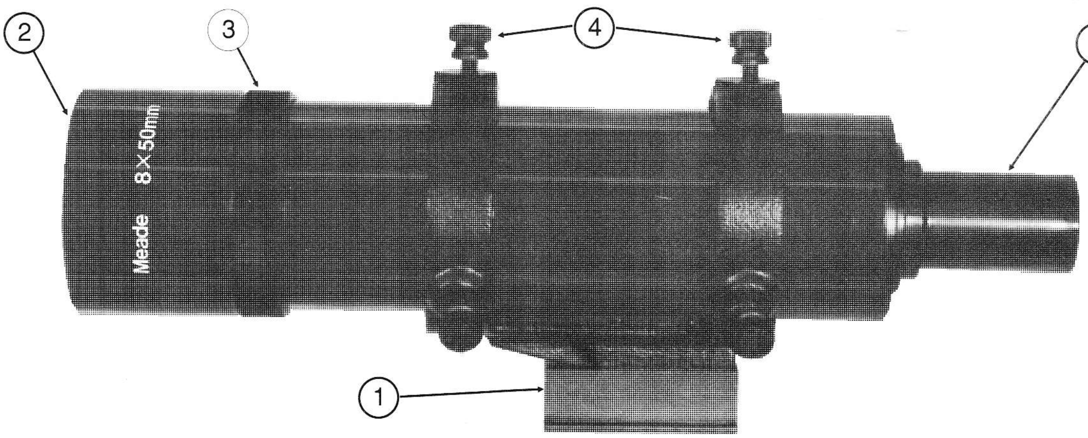
b. 8 x 50 VIEWFINDER (10" LX100)

Each 10" LX100 Model telescope is supplied as standard equipment with an 8x50mm straight-through viewfinder. The bracket for this viewfinder is packed separately from the finder itself, and the 6 nylon thumbscrews for collimation should be threaded into the viewfinder bracket, securing the viewfinder in the bracket. The viewfinder bracket base has been mounted to the main telescope's rear cell, and will accept the viewfinder and bracket directly, allowing quick removal for storage See Fig. 13.

1) Attaching the Viewfinder

To attach the viewfinder, simply slide the viewfinder and bracket into the base and tighten the two thumbscrews to a "firm" feel.

WARNING: Never use set screws on any part of the optical tube assembly, except those factory supplied set screws included with the basic telescope or with optional accessories. Longer, non-standard set screws may protrude too far into the optical tube and cause serious damage to the primary mirror.



(1) Bracket Slide
(2) Objective Lens Cell
(3) Focus Locking Ring
(4) Collimation Screws
(5) Eyepiece

Fig. 13: 8x50 Viewfinder for 10" LX100 Telescopes

2) Focusing the Viewfinder

The 8X50mm viewfinder has been factory pre-focused at infinity. Should this focusing need adjustment for your eyes, loosen the knurled collar at the objective lens-end of the viewfinder (#3, FIg. 13), enabling rotation of the objective lens cell (#2, Fig. 13) forward or backward for precise focusing. Then tighten down the knurled collar against the objective lens cell to lock the focus in place. Note that no focusing is possible or necessary at the eyepiece end of the viewfinder.

3) Collimating the Viewfinder

The viewfinder will require alignment, or collimation, with the main telescope. Using the 25mm eyepiece, point the main telescope at some easy to find land object (*e.g.* the top of a telephone pole or corner of a building) at least 200 yards distant. Center a well-defined object in the main telescope. Then, simply turn the 6 nylon collimation thumbscrews (#4, Fig. 13) until the crosshairs of the viewfinder are precisely centered on the object already centered in the main telescope. With this collimation accomplished, objects located first in the wide-field viewfinder will then be centered in the main telescope's field of view.

7. Attaching Diagonal and Eyepiece

The eyepiece holder (#15, Fig. 8) threads directly onto the rear-cell thread of the 8" and 10" telescopes. The diagonal prism (#13, Fig. 8) slides into the eyepiece holder and, in turn, accepts the supplied 1-1/4" O.D. eyepiece. For astronomical observations, the diagonal prism generally provides a more comfortable right-angle viewing position. Alternately, an eyepiece may be inserted directly into the eyepiece holder for straight-through observations. Note in this case, however, that the image will appear inverted and reversed left-for-right. With the diagonal prism, telescopic images appear correctly oriented up-and-down, but still reversed left-for-right. For terrestrial applications, where a fully corrected image orientation is desired, both up-and-down and left-for-right, the optional #924 Erecting Prism (1-1/4" O.D.) should be ordered separately. Eyepieces and the diagonal prism are held in their respective places on the telescope by a moderate tightening of the thumbscrews on the diagonal prism and eyepiece holder.

8. Magnetic Compass (Both LX100 Models)

The magnetic compass helps the observer to set-up the telescope without actually seeing the pole star Polaris. This allows setting up before dark or in locations where the view of Polaris is obstructed. The magnetic compass has an adjustment to compensate for the local angle of Magnetic Declination. Note: Magnetic Declination is the difference between Magnetic North (which the compass shows) and true north (where the telescope should be pointed). Magnetic Declination should not be confused with the astronomical term "Declination," which, when used with "Right Ascension", describes the celestial coordinate system.

a. SETTING MAGNETIC DECLINATION

In order to obtain an accurate reading using the compass, you must first adjust for the Magnetic Declination for your location.

1. First, determine the Magnetic Declination in your area using the Isogonic Chart (Fig. 14)

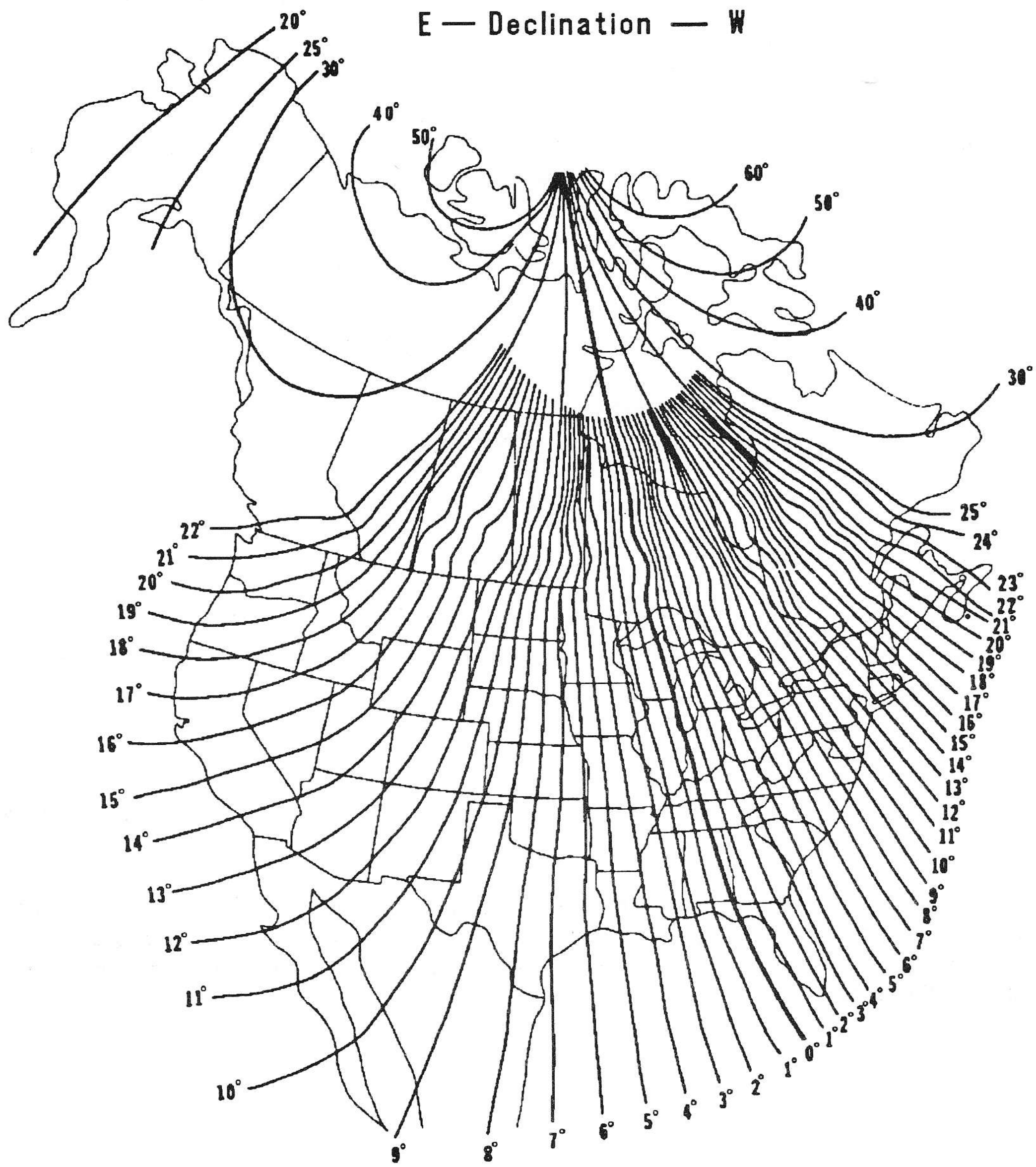


Fig. 14: Magnetic Declination Map

2. Squeeze the clear central vial with thumb and index finger of the left hand.

3. With the right hand, rotate the outer dial until the orienting arrow (the black arrow painted on the inside clear surface) is lined up with the desired Magnetic Declination angle on the declination scale. Notice that East Magnetic Declination is to the right of the "North" position and West Magnetic Declination is left of the "North" position. As an example, Fig. 15 shows the correct setting for 15 degrees west declination, which covers Providence, Rhode Island.

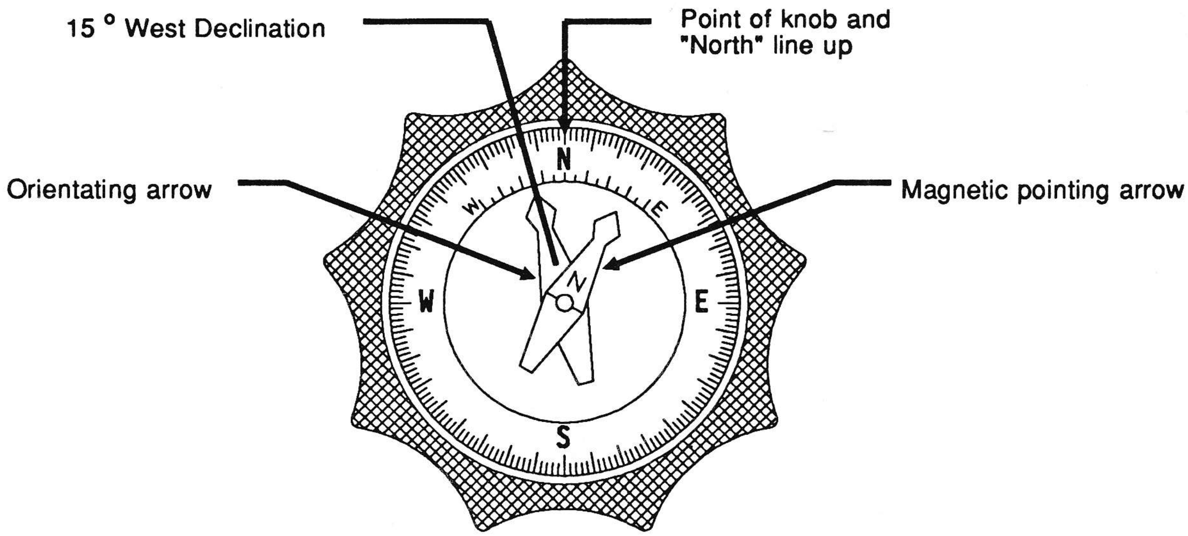


Fig. 15: Magnetic Compass

b. COMPASS INSTALLATION

The Magnetic Compass is now set for the correct declination angle. To attach to the Equatorial Wedge, follow these steps:

1. Snap the Magnetic Compass into the 3" diameter wedge attachment knob (after setting the Magnetic Declination as described above). Position the compass into the knob so that the 360 degree location on the direction scale (the "North" position) lines up with one of the nine points of the knobs. (See Fig. 15.) Press the compass firmly into the knob.

2. Assemble the Equatorial Wedge onto the Field Tripod as described in the Instruction Manual using the knob/compass combination to attach the wedge to the tripod.

c. FINDING TRUE NORTH

The Magnetic Compass is now ready to use. Just follow these simple steps for a quick and easy azimuth alignment:

1. Loosen the knob/compass slightly. This allows for rotation of the Equatorial Wedge under the knob/compass (Fig. 16). The magnetic pointing arrow will point to magnetic north.

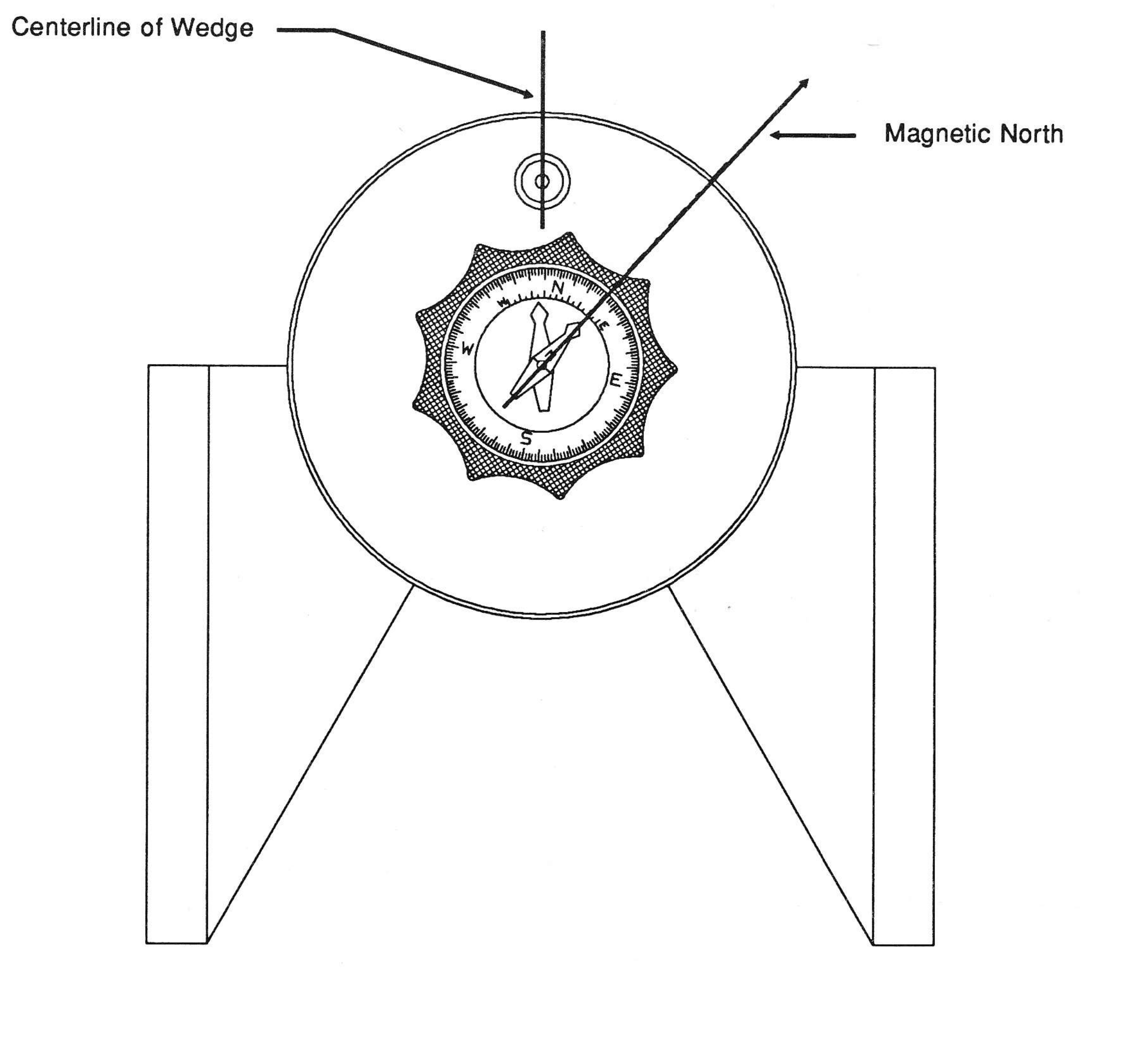


Fig. 16: Equatorial Wedge

2. Rotate the knob/compass so that the magnetic pointing arrow lies directly over the painted black alignment arrow (Fig. 17). The "North" position on the direction scale (and the point on the knob/compass) now point directly north.

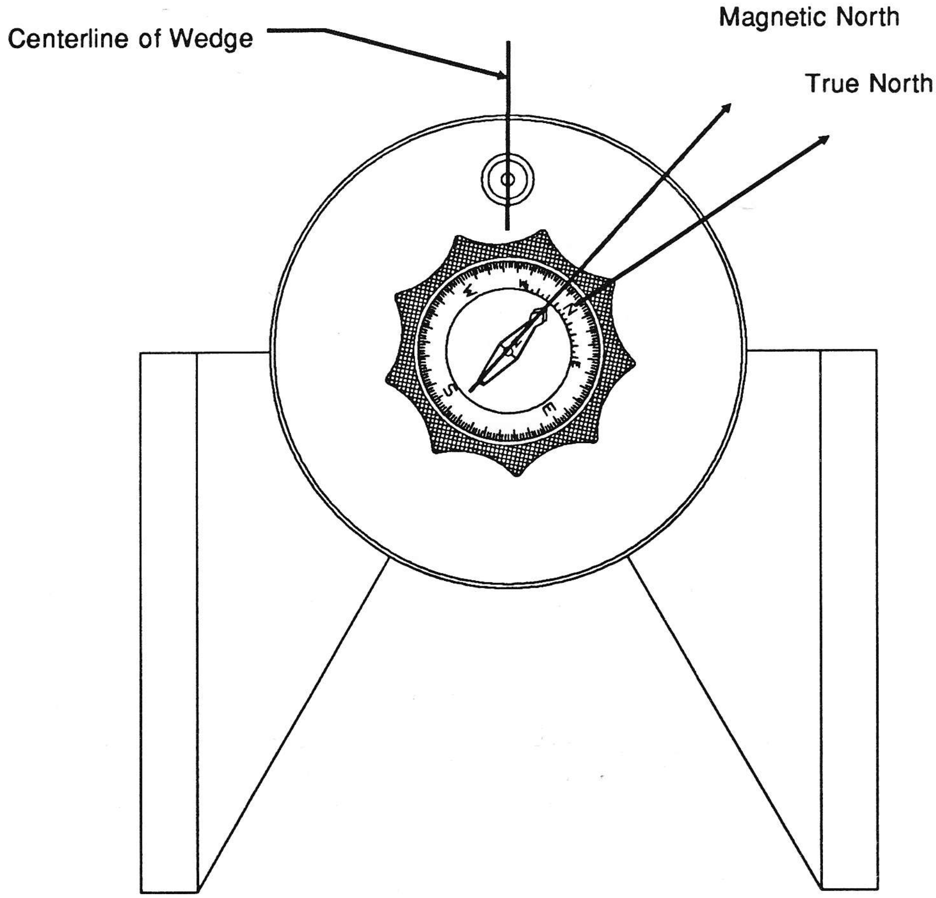


Fig. 17: Equatorial Wedge

3. By rotating the Equatorial Wedge in azimuth, position the point of the knob/compass so that it points directly to the center of the bubble level (Fig. 18). The centerline of the Equatorial Wedge now falls directly on the true north line.

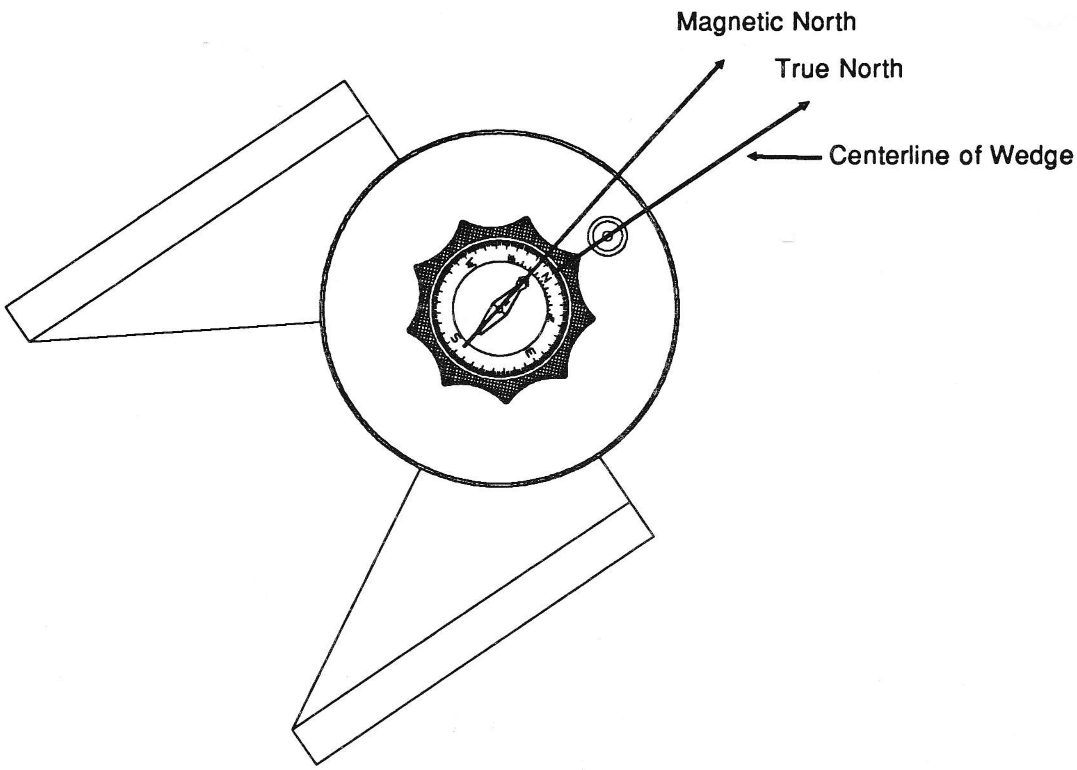


Fig. 18: Equatorial Wedge

4. Tighten the knob/compass, locking the Equatorial Wedge into place.

The Field Tripod and Equatorial Wedge are now pointed directly toward celestial north, without ever having seen the North Star.

C. TELESCOPE FUNCTIONS (Both LX100 Models)

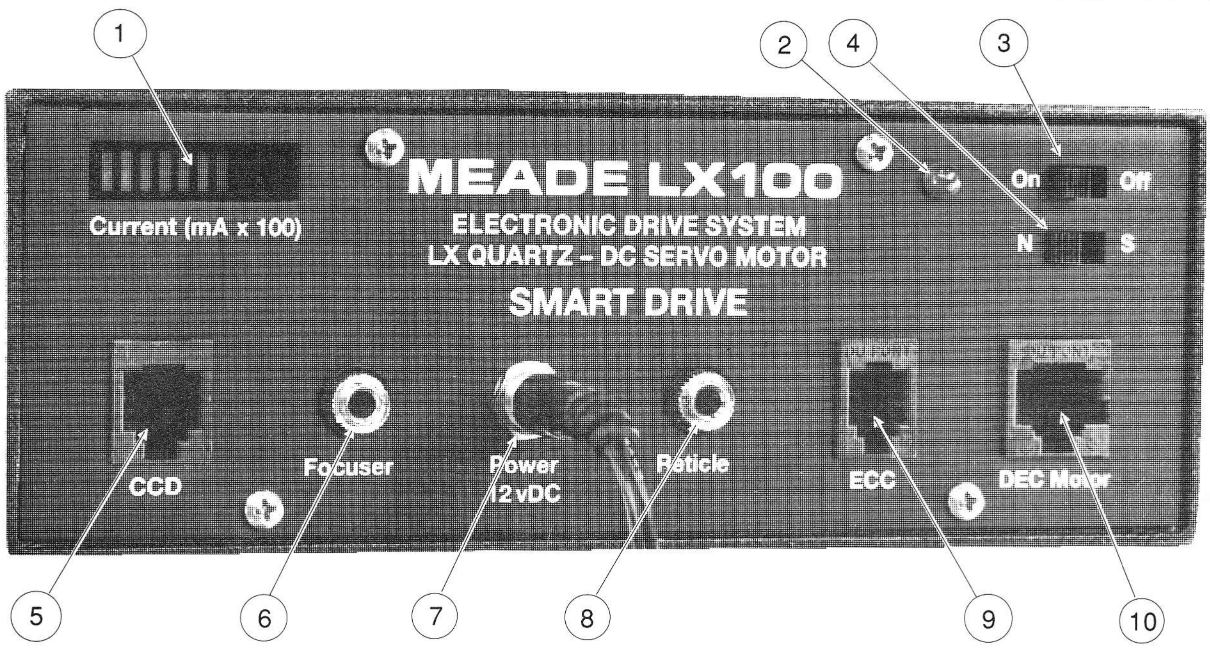
1. LX100 Power Panel

The Meade LX100 Quartz drive system has several built-in features for simplifying the operation of the telescope. Output jacks are provided on the Power Panel for some of the more common accessories, eliminating the need for separate Battery Packs.

a. AMMETER

An important feature on the LX100 telescope is the ammeter. This meter shows the power usage of the telescope. When the telescope is powered from an AC source or a car battery, the amount of current being used is not important because the power available is essentially unlimited. But when the telescope is powered from a small power cell (such as a 12 volt, 5 amp hour video camera battery), the telescope operating time will vary, depending on the power usage.

To estimate the operating time of the telescope, divide the amp hour rating of the power source by the power usage. For example, the ammeter reads from 0 to 1000 mA (0 to 1 amps), with each illuminated bar measuring 100 mA. So if four bars are illuminated, the telescope is using 400 mA or .4 amp. So, the operating time of the telescope (if using a 5 amp hour video camera battery) when the ammeter is showing a power usage of 400 mA would be about 5/.4 = 12.5 hours. Note: Actual operating time will depend on many factors such as the condition of the batteries and outside temperature.



(1) Ammeter
(2) Power Indicator
(3) On/Off Switch
(4) Northern/Southern Switch
(5) CCD Autoguider Socket
(6) Electric Focus Output
(7) Power Input Socket
(8) Illuminated Reticle Output
(9) Electronic Command Center Socket
(10) Dec Motor Output

Fig. 19: LX100 Power Panel

b. POWER INDICATOR

The red Power Indicator light is illuminated anytime the ON/OFF switch is in the ON position, and indicates that power is being supplied to the telescope.

c. ON/OFF SWITCH

This switch turns on and off the power to the telescope.

d. NORTHERN/SOUTHERN SWITCH

The Northern/Southern (N-S) switch supplied on Meade LX100 Schmidt-Cassegrains allows operation of the telescope anywhere in the world. Moving the switch to the Southern (S) position reverses the telescope's tracking direction. Note: Once set, unless the telescope is operated in a different hemisphere, this switch need never be used again.

Note: The N-S switch must be set to the correct position before turning the ON/OFF switch to the ON position. Moving the Northern/Southern switch after the telescope is turned on will result in incorrect tracking.

e. DEC MOTOR OUTPUT

The "Declination Motor" socket is used for the optional #39S Declination motor assembly. The hand-held Electronic Command Center is required for use of the Declination motor and will operate the Declination Motor at the 2X guide correcting speed and the 32X image scanning speed.

f. ELECTRIC FOCUSER OUTPUT

The optional Meade #1206 Electric Focuser may also be plugged directly into the LX100 power panel by using the Electric Focuser jack. The Electronic Command Center may now be used to control the Electric Focuser to achieve very precise focusing of the telescope.

g. ILLUMINATED RETICLE OUTPUT

The optional Illuminated Reticle can be plugged directly into the LX100 power panel reticle jack, eliminating the need for a separate battery box. The Reticle Adjust Knob (located on the Electronic Command Center) controls the brightness of the reticle.

h. ELECTRONIC COMMAND CENTER SOCKET

The Electronic Command Center Socket results in the "plug-in" capability of the LX100. By simply plugging the Electronic Command Center into the socket, the full range of LX100 features are made available. See below for description of the Electronic Command Center features.

i. POWER INPUT SOCKET

Each LX100 includes power cords for two different methods of powering the telescope: Directly from auto cigarette lighter plugs and directly from 115 v.AC home outlets. Both of these power cords plugs into the Power Input socket to supply power to the telescope.

j. CCD AUTOGUIDER SOCKET

This socket directly accepts the output from popular CCD autoguiders. Simply plug in the output cable from the autoguider, and the telescope's tracking motion can be controlled by the CCD autoguider automatically. Note: While not absolutely necessary, the optional #39S Declination Motor is very helpful when using this feature.

2. Electronic Command Center (ECC)

The hand-held Electronic Command Center plugs directly into the LX100 power panel "Command Center" socket (#9, Fig. 19) and is the heart of the LX100 concept. Virtually all telescope functions are put at your fingertips, making separate battery packs and handboxes obsolete. At the same time, if a simple, quick observing session is planned which will not require the sophisticated features of the LX100 , the telescope may be operated without the Electronic Command Center, reducing power consumption. This may be useful if you wish to power the telescope from a small battery pack.

a. MAP LIGHT

The Electronic Command Center (ECC) includes a red L.E.D. located at the top of the handbox. Depressing the "Map" button (#5, Fig. 20) illuminates this light for reading star maps or charts during an observing session.

b. DRIVE CORRECTOR CONTROL BUTTONS

These buttons are used to electronically move the telescope. The "E" and "W" buttons move the telescope in Right Ascension using the main drive motor. The "N" and "S" buttons move the telescope in Declination using the optional #39S Dec Motor. If this motor is not attached, these two buttons are non-functional.

The speed at which the telescope moves when using these buttons is determined by the position of the 2X/32X slide switch (see #4, Fig. 20).

c. ELECTRIC FOCUSER BUTTONS

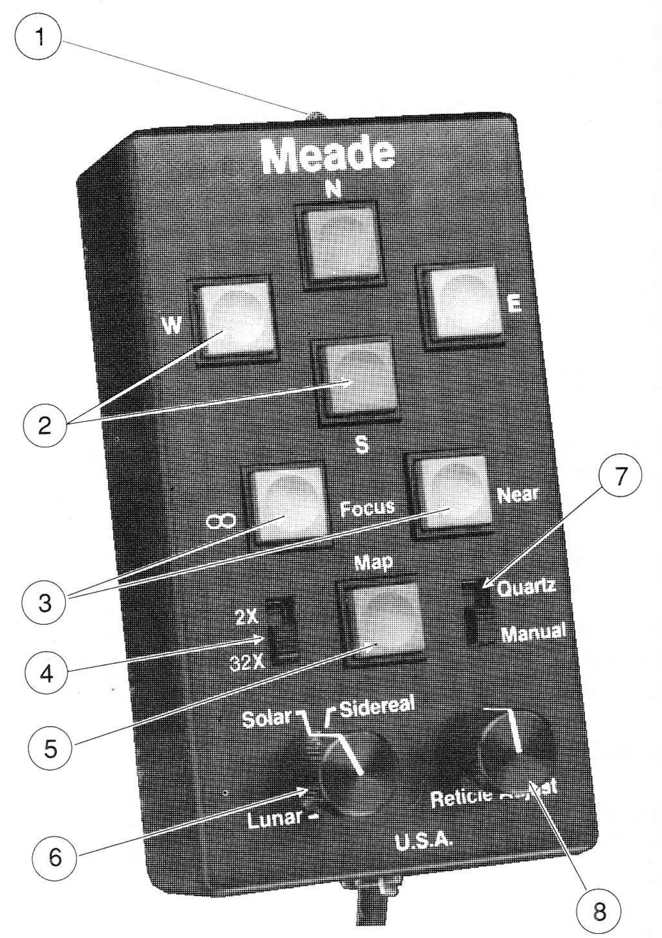
Add the optional Meade #1206 Electric Focuser, and ultraprecise microfocusing is at your fingertips. Simply depress the ECC's focus pushbuttons (#3, Fig. 20) to obtain the sharpest lunar and planetary focus possible. Coarse focusing is accomplished with the telescope's manual focus knob.

d. MAP LIGHT BUTTON

When pushed, this button illuminates the L.E.D. located at the top of the ECC. (See #1, Fig. 20.)

e. 2X/32X SLIDE SWITCH

As described previously, when any one of the four Drive Corrector buttons is pressed, the telescope moves in the labeled direction. The speed at which the telescope moves is determined by the 2X/32X slide switch.



(1) Map Light
(2) Drive Corrector Buttons
(3) Focus Buttons
(4) 2X/32X Slide Switch
(5) Map Light Button
(6) Variable Speed Knob
(7) Quartz/Manual Slide Switch
(8) Reticle Adjust Knob

Fig. 20: Electronic Command Center (ECC)

When in the 2X position, the telescope moves twice the tracking rate in the Right Ascension direction; perfect for critical corrections during long exposure photography or image centering at very high observing powers. Moving to the 32X position results in telescope movement at thirty-two times the tracking speed in the Right Ascension direction. With the Electric Declination Motor, which plugs into the LX100 power panel, you can scan at either speed in any direction, making the manual controls almost superfluous.

Note: When using the 32X speed in the "East" direction, the telescope actually reverses the direction of the drive. When the 32X button is released, the telescope automatically slews in the "West" direction to remove any backlash in the drive system introduced when the direction was first reversed. Should you "tap" the "East" button only momentarily, this automatic slew funtion will engage, even if no backlash was introduced. To avoid this, you can either overshoot with the 32X East and come back with the 32X West, or switch to the 2X speed for final correction.

f. QUARTZ/MANUAL SLIDE SWITCH

When the slide switch is on the "Quartz" position, the Quartz crystal in the LX100 Drive is controlling the telescope's tracking speed. The "E" and "W" buttons override the Quartz crystal to speed up or slow down the tracking speed as long as the button is pressed. When the button is released, the Quartz crystal resumes control. Note: In the "Quartz" mode, the variable speed knob (#, Fig. 24) is non-functional. This mode of operation is best suited for observing or photographing deep-space objects, which move at the sidereal rate.

Moving the slide switch to the "Manual" position transfers the tracking speed control from the Quartz crystal to the variable speed knob (#6, Fig. 20).

g. VARIABLE SPEED KNOB

This knob varies the drive frequency from approximately 57 Hz to 61 Hz, which covers the Lunar, Solar, and Planetary rates. The Lunar and Solar rate positions are marked for reference. As in the "Quartz" mode, the "E" and "W" buttons override the variable knob to speed up and slow down the drive rate.

h. RETICLE ADJUSTMENT KNOB

This knob controls the brightness of the optional Illuminated Reticle eyepieces, which plugs into the main Power Panel.

3. Operation

The 8" and 10" LX100 telescopes incorporate the superb Meade LX Drive System and the latest in state-of-the-art electronics to achieve quartz accuracy coupled with true sidereal rate tracking. The quartz crystal used in the Meade LX100 Quartz Drive provides accurate tracking to within plus or minus .005% of the sidereal frequency, independent of temperature changes or local power line variations.

a. AC OPERATION

Meade LX100 telescopes are supplied with an AC Adapter, which converts 115 v.AC from a wall outlet into the 12 v.DC required by the telescope. The AC Adapter should only be plugged into an indoor home AC outlet. The AC Adapter has a 25 foot cord, which should reach most observing locations from an indoor plug. If the cord is too short to reach the telescope's location, optional extension cords are available from your Meade dealer in 25 foot lengths. Do not plug the AC Adapter into the end of a standard extension cord to extend the observing range of the telescope.

To use the AC Adapter, plug it into a standard indoor AC outlet. Plug the other end of the cord into the power input socket (#7, Fig. 19). Check that the Northern/Southern (N-S) switch (#4, Fig. 19) is set for the hemisphere of the observing location and then turn the "On/Off" switch (#3, Fig. 19) to "On". (Remember: The N-S switch must be correctly set before the telescope is turned on.) The power indicator light (#2, Fig. 19) should now be lit and the telescope tracking. If the Power Light is not working, see "Troubleshooting the LX100 Drive System," page 49.

b. DC OPERATION

The 8" and 10" LX100 telescopes operate on DC current and may be powered directly from a 12 volt battery or power cell. The LX100 drive system normally draws about .5 amp in standard operation with the Electronic Command Center (ECC) in use. Maximum current usage is about .8 amp when all optional accessories are being used. If the telescope is being powered from a fully charged car battery in good condition, the current drain is negligible and the telescope may be used all night without fear of a "dead battery".

The LX100 telescopes are supplied with a DC power cable for use with a car battery. To use the DC power cable, connect the cable to the power socket (#7, Fig. 19) on the power panel of the LX100, and the cigarette plug to your cigarette lighter. Be sure that the N-S switch is correctly set and that the On/Off switch is "On". If the power indicator is not lit, see "Troubleshooting the LX100 Drive System," page 49.

D. TELESCOPE OPERATION (Both LX100 Models)

1. Your First Observations

With the telescope standing upright on its motor drive base, and with the diagonal prism and eyepiece in place, you are ready to make observations through the telescope. Even without the viewfinder (if not yet installed), terrestrial objects will be fairly easy to locate and center in the telescope's field of view with a low power eyepiece, simply by "gunsighting" along the side of the main telescope tube.

IMPORTANT NOTE: NEVER POINT THE TELESCOPE DIRECTLY AT THE SUN, OR ATTEMPT TO OBSERVE THE SUN, EITHER THROUGH THE MAIN TELESCOPE OR THE VIEWFINDER, WITHOUT PROPER PROFESSIONAL EQUIPMENT. INSTANT AND IRREVERSIBLE DAMAGE TO YOUR EYE MAY OTHERWISE RESULT!

By unlocking the R.A. lock (#7, Fig. 8), the telescope may be turned rapidly through wide angles in Right Ascension (R.A.). The reason for the terminology "Right Ascension" and its complementary term, "Declination" will be made clear further on in this manual. For now, "Right Ascension" simply means "horizontal" and "Declination" means "vertical". Fine adjustments in R.A. are made by turning the R.A. control knob (#8, Fig. 8), while the R.A. lock is in the "unlocked" position.

DO NOT ATTEMPT TO MOVE THE TELESCOPE MANUALLY IN A HORIZONTAL DIRECTION WHEN THE R.A. LOCK IS IN THE "LOCKED" POSITION.

The R.A. control knob may be turned, if desired, with the R.A. lock in a "partially locked" position. In this way, a comfortable "drag" in R.A. is created. But do <u>not</u> attempt to operate the R.A. control knob with the telescope fully locked in R.A., as such operation may result in damage to the internal gear system.

Releasing the Declination lock (#2, Fig. 8), permits sweeping the telescope rapidly through wide angles in Declination.

DO NOT ATTEMPT TO MOVE THE TELESCOPE MANUALLY IN A VERTICAL DIRECTION WHEN THE DECLINATION LOCK IS IN THE "LOCKED" POSITION.

To use the Declination fine-adjust, or slow motion control, lock the telescope in Declination using the Declination lock (2, Fig. 8), and turn the Declination slow-motion knob (#6, Fig. 8).

NOTE THAT THIS DECLINATION SLOW-MOTION CONTROL HAS A FIXED TRAVEL LENGTH, LIMITED BY THE MOTION OF A TANGENT ARM (LOCATED INSIDE THE FORK TINE). DO NOT FORCE THE DECLINATION SLOW-MOTION KNOB WHEN THE TANGENT ARM HAS REACHED THE END OF ITS TRAVEL. IN THIS CASE, TURN THE DECLINATION KNOB TO RETURN THE TANGENT ARM TO THE MID-POINT IN ITS TRAVEL RANGE, UNLOCK THE DECLINATION LOCK AND RE-CENTER THE TELESCOPE TUBE MANUALLY.

With the above mechanical operations in mind, select an easy to find terrestrial object as your first telescope subject -- for example, a house or building perhaps one-half mile distant.

Unlock the Dec. lock (#2, Fig. 8), and R.A. lock (#7, Fig. 8), center the object in the telescopic field of view and then re-lock the Dec. and R.A. locks. Precise image centering is accomplished by using the Dec. and R.A. slow motion controls.

2. Focusing

The focus knob is located at the "4 o'clock" position as you face the rear cell of the telescope. Focusing is accomplished internally by a precise motion of the telescope primary mirror so that, as you turn the focus knob, there are no externally moving parts.

Focusing the telescope from its nearest possible focus point (on an object about 25 ft. away with the 8" LX100, or about 50 ft. with the 10" LX100) to an object at infinity requires a fairly large number of rotations of the focus knob. The focuser is designed to provide an extremely sensitive means of bringing an object into precise, sharp focus. After a specific object has been brought into focus, closer objects require turning the focus knob clockwise; more distant objects require turning the focus knob counterclockwise.

It is possible that you may notice a slight shifting of the image as you focus, particularly at high powers. This image shift is caused by very small lateral motions of the primary mirror as it moves toward or away from the secondary mirror during the focusing procedure.

3. Magnifications

The magnification, or power, of the telescope depends on two optional characteristics: the focal length of the main telescope and the focal length of the eyepiece used during a particular observation. For example, the focal length of the 8" f/10 telescope is fixed at 2000mm; the focal length of the 10" f/10 telescope is fixed at 2500mm. To calculate the power in use with a particular eyepiece, divide the focal length of the eyepiece into the focal length of the main telescope. For example, using the SP 26mm eyepiece supplied with the 8" f/10, the power is calculated as follows:

$$\text{Power} = \frac{2000\text{mm}}{26\text{mm}} = 77\text{X}$$

The <u>type</u> of eyepiece (whether "MA" Modified Achromatic, "OR" Orthoscopic, "SP" Super Plossl, etc.) has no bearing on magnifying power but does affect such optical characteristics as field of view, flatness of field and color correction.

The maximum practical magnification is determined by the nature of the object being observed and, most importantly, by the prevailing atmospheric conditions. Under very steady atmospheric "seeing," the 8" LX100 may be used at powers up to about 500X on astronomical objects, the 10" LX100 up to about 600X. Generally, however, lower powers of perhaps 250X to 350X will be the maximum permissible, consistent with high image resolution. When unsteady air conditions prevail (as witnessed by rapid "twinkling" of the stars), extremely high-power eyepieces result in "empty magnification," where the object detail observed is actually <u>diminished</u> by the excessive power.

See page 33 for additional information on eyepieces.

When beginning obsevations on a particular object, start with a low power eyepiece; get the object well-centered in the field of view and sharply focused. Then try the next step up in magnification. If the image starts to become fuzzy as you work into higher magnifications, then back down to a lower power — the atmospheric steadiness is not sufficient to support high powers at the time you are observing. Keep in mind that a bright, clearly resolved but smaller image will show far more detail than a dimmer, poorly resolved larger image.

Because of certain characteristics of the human eye (in particular, eye pupil diameter) and because of optical considerations inherent in the design of a telescope, there exists <u>minimum</u> practical power levels also. Generally speaking, the lowest usable power is approximately 4X per inch of telescope aperture, or about 32X in the case of the 8" telescope, about 40X in the case of the 10" telescope. During the daytime, when human eye pupil diameter is reduced, the minimum practical power with the 8" LX100 is increased to about 60X and to about 75X with the 10" LX100; powers lower than this level should be avoided during daytime observations. A reasonable magnification range for daytime terrestrial observations through the 8" LX100 is from about 80X to 190X; through the 10" LX100 from about 100X to 200X.

Accessories are available both to increase and decrease the operating eyepiece power of the telescope. See your Meade dealer for information on accessories.

4. Apparent Field and Actual Field

Two terms that are often confused and misunderstood are "Apparent Field" and "Actual Field". "Apparent Field" is a function of the eyepiece design and is built into the eyepiece. While not totally accurate (but a very good approximation), "Apparent Field" is usually thought of as the angle your eye sees when looking through an eyepiece. "Actual Field" is the amount of the sky that you actually see and is a function of the eyepiece being used and the telescope.

The "Actual Field" of view of a telescope can be calculated by knowing the "Apparent Field" and power of an eyepiece with a given telescope. The "Actual Field" of a telescope is calculated by taking the "Apparent Field" of the eyepiece and dividing by the power.

The following table lists the most common optional eyepieces available and the "Apparent Field" for each eyepiece. The power and "Actual Field" of view that each eyepiece yields is listed for each basic telescope optical design.

Eyepiece/Apparent Field	8" f/6.3 Power/Actual Field	10" f/6.3 Power/Actual Field	8"f/10 Power/Actual Field	10" f/10 Power/Actual Field
Series 2 Modified Achromatic Eyepieces (3-elements; 1-1/4" O.D.)				
40mm/36°	32/1.13°	40/0.90°	50/0.72°	63/0.57°
Series 2 Orthoscopic Eyepieces (4-elements; 1-1/4" O.D.)				
4mm/45°	320/0.14°	400/0.11°	500/0.09°	625/0.07°
6mm/45°	213/0.21°	267/0.17°	333/0.14°	417/0.11°
9mm/45°	142/0.32°	178/0.25°	222/0.20°	278/0.16°
12.5mm/45°	102/0.44°	128/0.35°	160/0.28°	200/0.23°
18mm/45°	71/0.63°	89/0.51°	111/0.41°	139/0.32°
25mm/45°	51/0.88°	64/0.70°	80/0.56°	100/0.45°
Super Plossl Eyepieces (5-elements; 1-1/4" O.D., except as noted)				
6.4mm/52°	200/0.26°	250/0.21°	313/0.17°	391/0.13°
9.7mm/52°	132/0.39°	165/0.32°	206/0.25°	258/0.20°
12.4mm/52°	103/0.50°	129/0.40°	161/0.32°	202/0.26°
15mm/52°	85/0.61°	107/0.49°	133/0.39°	167/0.31°
20mm/52°	64/0.81°	80/0.65°	100/0.52°	125/0.42°
26mm/52°	49/1.06°	62/0.84°	77/0.68°	96/0.54°
32mm/52°	40/1.30°	50/1.04°	63/0.83°	78/0.67°
40mm/44°	32/1.69°	40/1.35°	50/0.88°	63/0.70°
56mm/52° (2" O.D.)	23/2.27°	29/1.82°	36/1.46°	45/1.16°
Super Wide Angle Eyepieces (6-elements; 1-1/4" O.D., except as noted)				
13.8mm/67°	93/0.72°	116/0.58°	145/0.46°	181/0.37°
18mm/67°	71/0.94°	89/0.75°	111/0.60°	139/0.48°
24.5mm/67°	52/1.28°	65/1.03°	82/0.82°	102/0.66°
32mm/67° (2" O.D.)	40/1.67°	50/1.34°	63/1.07°	78/0.86°
40mm/67° (2" O.D.)	32/2.09°	40/1.67°	50/1.34°	63/1.07°
Ultra Wide Angle Eyepieces (8-elements; 1-1/4" O.D., except as noted)				
4.7mm/84°	272/0.31°	340/0.25°	426/0.20°	532/0.16°
6.7mm/84°	191/0.44°	239/0.35°	299/0.28°	373/0.23°
8.8mm/84° (1-1/4" - 2" O.D.)	145/0.58°	182/0.46°	227/0.37°	284/0.30°
14mm/84° (1-1/4" - 2" O.D.)	91/0.92°	114/0.73°	143/0.59°	179/0.47°

5. Celestial Coordinates: Declination and Right Ascension

Analogous to the Earth-based coordinate system of latitude and longitude, celestial objects are mapped according to a coordinate system on the "celestial sphere," the imaginery sphere on which all stars appear to be placed. The Poles of the celestial coordinate system are defined as those 2 points where the Earth's rotational axis, if extended to infinity, North and South, intersect the celestial sphere. Thus, the North Celestial Pole is that point in the sky where an extension of the Earth's axis through the North Pole intersects the celestial sphere. In fact, this point in the sky is located near the North Star, or Polaris.

On the surface of the Earth, "lines of longitude" are drawn between the North and South Poles. Similarly, "lines of latitude" are drawn in an East-West direction, parallel to the Earth's equator. The celestial equator is simply a projection of the Earth's equator onto the celestial sphere. Just as on the surface of the Earth, imaginary lines have been drawn on the celestial sphere to form a coordinate grid. Celestial object positions on the Earth's surface are specified by their latitude and longitude.

The celestial equivalent to Earth latitude is called "Declination," or simply "Dec," and is measured in degrees, minutes or seconds north ("+") or south ("-") of the celestial equator. Thus any point on the celestial equator (which passes, for example, through the constellations Orion, Virgo and Aquarius) is specified as having 0°0'0" Declination. The Declination of the star Polaris, located very near the North Celestial Pole, is +89.2°.

The celestial equivalent to Earth longitude is called "Right Ascension," or "R.A." and is measured in hours, minutes and seconds from an arbitrarily defined "zero" line of R.A. passing through the constellation Pegasus. Right Ascension coordinates range from $0^{hr}0^{min}0^{sec}$ up to (but not including) $24^{hr}0^{min}0^{sec}$. Thus there are 24 primary lines of R.A., located at 15 degree intervals along the celestial equator. Objects located further and further east of the prime ($0^h0^m0^s$) Right Ascension grid line carry increasing R.A. coordinates.

With all celestial objects therefore capable of being specified in position by their celestial coordinates of Right Ascension and Declination, the task of finding objects (in particular, faint objects) in the telescope is vastly simplified. The setting circles of the 8" and 10" telescopes may be dialed, in effect, to read the object coordinates and the object found without resorting to visual location techniques. However, these setting circles may be used to advantage only if the telescope is first properly aligned with the North Celestial Pole.

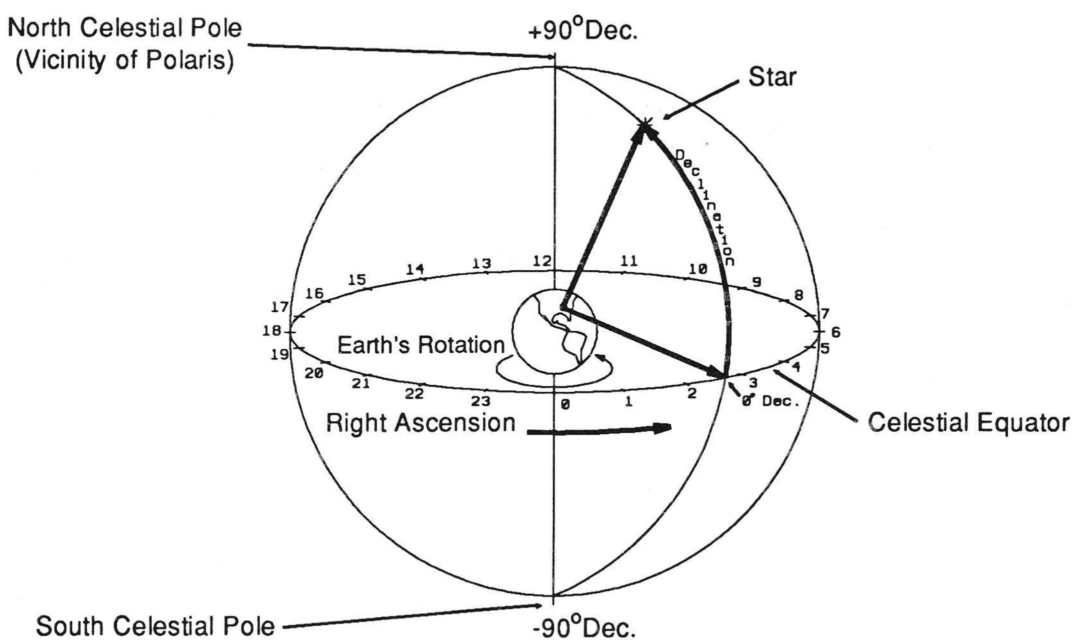


Fig 21: Celestial Sphere

6. Lining Up With The Celestial Pole

Objects in the sky appear to revolve around the celestial pole. (Actually, celestial objects are essentially "fixed," and their apparent motion is caused by the Earth's axial rotation). During any 24 hour period, stars make one complete revolution about the pole, describing concentric circles with the pole at the center. By lining up the telescope's polar axis with the North Celestial Pole (or for observers located in Earth's Southern Hemisphere with the South Celestial Pole) astronomical objects may be followed, or tracked, simply by moving the telescope about one axis, the polar axis. In the case of the Meade 8" and 10" Schmidt-Cassegrain telescopes, this tracking may be accomplished automatically with the electric motor drive.

If the telescope is reasonably well aligned with the pole, therefore, very little use of the telescope's Declination slow motion control is necessary -- virtually all of the required telescope tracking will be in Right Ascension. (If the telescope were perfectly aligned with the pole, no Declination tracking of stellar objects would be required). For the purposes of casual visual telescopic observations, lining up the telescope's polar axis to within a degree or two of the pole is more than sufficient: with this level of pointing accuracy, the telescope's motor drive will track accurately and keep objects in the telescopic field of view for perhaps 20 to 30 minutes.

Begin polar aligning the telescope as soon as you can see Polaris. Finding Polaris is simple. Most people recognize the "Big Dipper." The Big Dipper has two stars that point the way to Polaris (see Fig. 22). Once Polaris is found, it is a straightforward procedure to obtain a rough polar alignment.

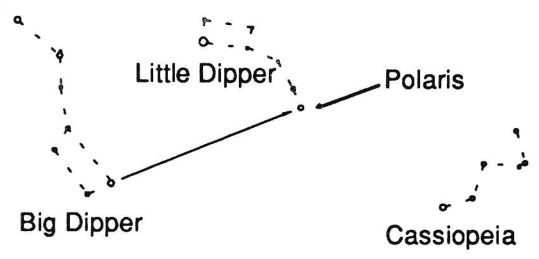


Fig. 22: Finding Polaris

To line up the 8" or 10" LX100 with the Pole, follow this procedure:

1. Using the bubble level located on the floor of the wedge, adjust the tripod legs so that the telescope/wedge/tripod system reads "level."

2. Set the Equatorial Wedge to your observing latitude as described in Section 3.

3. Loosen the Dec. lock (#2, Fig. 8), and rotate the telescope tube in Declination so that the telescope's Declination reads 90°. Tighten the Dec. lock.

4. Using the Azimuth and Latitude controls on the Wedge, center Polaris in the field of view. Do not use the telescope's Declination or Right Ascension controls during this process.

At this point, your polar alignment is good enough for casual observations. There are times, however, when you will need to have precise polar alignment, such as when making fine astrophotographs or when using the setting circles to find new objects.

As an aside procedure, during your first use of the telescope, you should check the calibration of the Declination setting circles (see #3, Fig. 8), located at the top of each fork arm. After performing the polar alignment procedure, center the star Polaris in the telescope field. Loosen slightly the knurled central hub of each Declination setting circle. Now turn each circle until it reads 89.2°, the Declination of Polaris, and then tighten down the knurled knobs, avoiding any motion of the circles.

Once the latitude angle of the wedge has been fixed and locked-in according to the above procedure, it is not necessary to repeat this operation each time the telescope is used, unless you move a considerable distance North or South from your original observing position. (Approximately 70 miles movement in North-South observing position is equivalent to 1° in latitude change). The wedge may be detached from the field tripod and, as long as the latitude angle setting is not altered and the field tripod is leveled, it will retain the correct latitude setting when replaced on the tripod.

7. Precise Polar Alignment

It should be emphasized that precise alignment of the telescope's polar axis to the celestial pole for casual visual observations is not necessary. Don't allow a time-consuming effort at lining up with the pole to interfere with your basic enjoyment of the telescope. For long-exposure photography, however, the ground rules are quite different, and precise polar alignment is not only advisable, but almost essential.

Notwithstanding the precision and sophistication of the drive system supplied with the Meade LX100 telescopes, the fewer tracking corrections required during the course of a long-exposure photograph, the better. (For our purposes, "long-exposure" means any photograph of about 10 minutes duration or longer). In particular, the number of Declination corrections required is a direct function of the precision of polar alignment.

Precise polar alignment requires the use of a crosshair eyepiece. The Meade Model 419 MA 12mm Illuminated Reticle Eyepiece is well-suited in this application, but you will want to increase the effective magnification through the use of a 2X or 3X Barlow lens. Then follow this procedure, sometimes better known as the "Drift" method:

1. Obtain a rough polar alignment as described earlier. Place the illuminated reticle eyepiece (or eyepiece/Barlow combination) into the eyepiece holder of the telescope.

2. Point the telescope, with the motor drive running, at a moderately bright star near where the meridian (the North-South line passing through your local zenith) and the celestial equator intersect. For best results, the star should be located within ± 30 minutes in R.A. of the meridian and within ± 5° of the celestial equator. (Pointing the telescope at a star that is straight up, with the Declination set to 0°, will point the telescope in the right direction.)

3. Note the extent of the star's drift in Declination (disregard drift in Right Ascention):
   a. If the star drifts South (or down), the telescope's polar axis is pointing too far East (Fig. 23).
   b. If the star drifts North (or up), the telescope's polar axis is pointing too far West (Fig. 24).

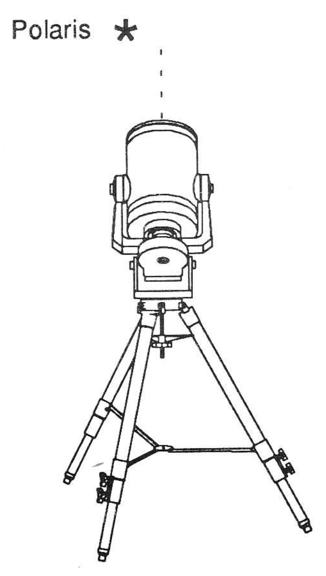


Fig. 23: Mount Too Far East

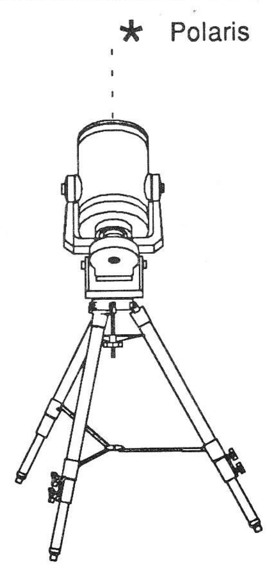


Fig. 24: Mount Too Far West

4. Move the wedge in azimuth (horizontally) to effect the appropriate change in polar alignment. Reposition the telescope's East-West polar axis orientation until there is no further North-South drift by the star. Track the star for a period of time to be certain that its Declination drift has ceased.

5. Next, point the telescope at another moderately bright star near the Eastern horizon, but still near the celestial equator. For best results, the star should be about 20° or 30° above the Eastern horizon and within ± 5° of the celestial equator.

6. Again note the extent of the star's drift in Declination:
   a. If the star drifts South, (or down) the telescope's polar axis is pointing too low (Fig. 25).
   b. If the star drifts North, (or up) the telescope's polar axis is pointing too high (Fig. 26).

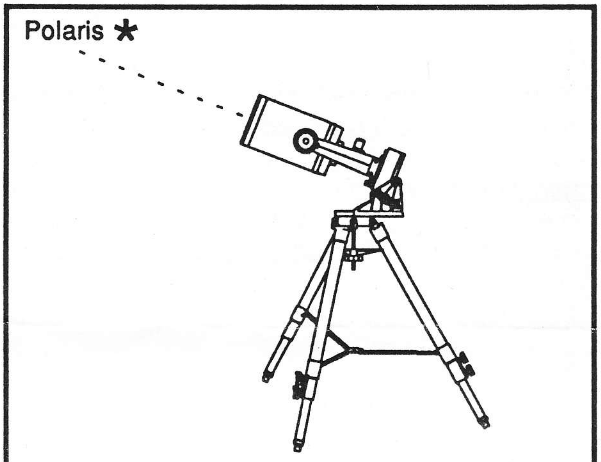


Fig. 25: Mount Too Low

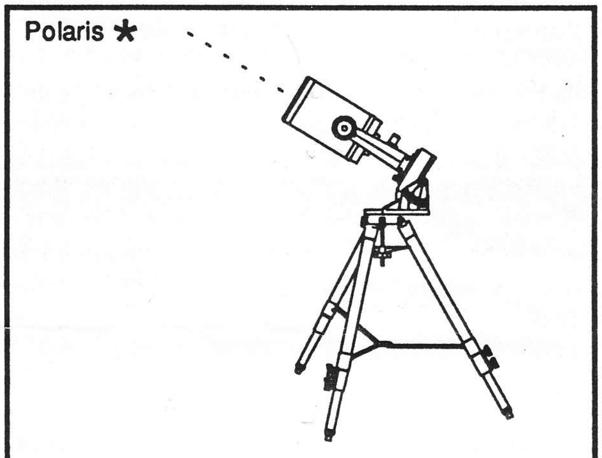


Fig. 26: Mount Too High

7. Use the latitude angle fine-adjust control on the wedge to effect the appropriate change in latitude angle, based on your observations above. Again, track the star for a period of time to be certain that Declination drift has ceased.

The above procedure results in very accurate polar alignment, and minimizes the need for tracking corrections during astrophotography.

8. Electric Motor Drive

With the telescope set up in the equatorial mode (accomplished with the wedge/field tripod combination), plug one of the power sources into the Power socket of the LX100 Power Panel. Slide the On/Off switch to the "On" position. Immediately, if you put your ear to the drive base of the telescope, you will be able to hear the low level noise created by the running motor. The drive system turns the fork mount of the telescope through one complete revolution every 24 hours, and results in the stars "standing still" as you view them through the telescope eyepiece. The motor drive also drives the R.A. setting circle, as described in the next section.

The motion of the telescope caused by the drive system is not obvious if you look at the telescope (in fact, it is not even perceptible), but while observing through the telescope, it is a very significant motion indeed. To check this point, with a star centered in the telescope field and the electric motor drive running, unplug the power cord: the star will immediately begin to drift out of the field of view; at higher powers, the effect is even more pronounced.

To actuate operation of the electric motor drive, the R.A. lock (#7, Fig. 8) must be in the "locked" position. As you move from object to object, unlocking and re-locking the R.A. lock each time, the motor drive automatically re-actuates each time the R.A. lock is locked.

9. Setting Circles

Setting circles included with the LX100 model telescopes permit the location of faint celestial objects not easily found by direct visual observation. Located on the top surface of the telescope's drive base, the R.A. circle (#10, Fig. 8), is 8.75" in diameter. Identical Declination circles (#3, Fig. 8), are located at the top of each fork tine. With the telescope pointed at the North Celestial Pole, the Dec. circle should read 90° (understood to mean +90°). Objects located below the 0-0 line of the Dec. circle carry minus Declination coordinates. Each division of the Dec. represents a 1° increment. The R.A. circle runs from 0^{hr} to (but not including) 24^{hr}, and reads in increments of 5^{min}.

Note that the R.A. circle is double-indexed; i.e., there are 2 series of numbers running in opposite directions around the circumference of the R.A. circle. The <u>outer</u> series of numbers (increasing counterclockwise) applies to observers located in the Earth's <u>Northern</u> Hemisphere; the inner series of numbers (increasing clockwise) applies to observers located in the Earth's <u>Southern</u> Hemisphere.

With the telescope aligned to the pole, center an object of known R.A. in the telescopic field. Then turn the R.A. circle, which can be rotated manually, until the R.A. coordinate of the object is correctly indicated by the R.A. pointer. As long as the telescope's motor drive remains "ON," the R.A. pointer will then correctly indicate the R.A. of any object at which the telescope is pointed throughout the duration of the observing session.

To use the circles to locate a particular object, first look up the celestial coordinates (R.A. and Dec.) of the object in a star atlas. Then loosen the R.A. lock and turn the telescope to read the correct R.A. of the desired object; lock the R.A. lock onto the object. Next, turn the telescope in Declination to read the correct Declination of the object. If the procedure has been followed carefully, and if the telescope was well-aligned with the pole, the desired object should now be in the telescopic field of a low-power eyepiece.

If you do not immediately see the object you are seeking, try searching the adjacent sky area, using the R.A. and Dec. slow-motion controls to scan the surrounding region. Keep in mind that, with the 25mm eyepiece, the field of view of the 8" LX100 is about 1/2° and the field of the 10" LX100 about 0.4°. Because of its much wider field, the viewfinder may be of significant assistance in locating and centering objects, after the setting circles have been used to locate the approximate position of the object.

Pinpoint application of the setting circles requires that the telescope be precisely aligned with the pole. Refer to the preceding section on "Precise Polar Alignment", page 36, for further details.

The setting circles may also be utilized in the absence of a power source for the motor drive. In this case, however, it is necessary to manually reset to the R.A. of the object you are observing just before going to the next object.

10. Observing With The Telescope

Meade LX100 Schmidt-Cassegrain telescopes permit an extremely wide array of serious observational opportunities. Even in normal city conditions, with all of the related air and light pollution, there are a good many interesting celestial objects to observe. But to be sure, there is no substitute for the clear, steady, dark skies generally found only away from urban environments, or on mountaintops: objects previously viewed only in the city take on added detail or are seen in wider extension, or even become visible at all for the first time.

The amateur astronomer is faced typically with two broadly defined problems when viewing astronomical objects through the Earth's atmosphere: first is the clarity, or transparency, of the air and, secondly the steadiness of the air. This latter characteristic is often referred to as the quality of "seeing." Amateur astronomers talk almost constantly about the "seeing conditions," since, perhaps ironically, even the clearest, darkest skies may be almost worthless for serious observations if the air is not steady. This steadiness of the atmosphere is most readily gauged by observing the "twinkling" of the stars: rapid twinkling implies air motion in the Earth's atmosphere, and under these conditions resolution of fine detail (on the surface of Jupiter, for instance) will generally be limited. When the air is steady, stars appear to the naked eye as untwinkling points of unchanging brightness and it is in such a situation that the full potential of the telescope may be realized: higher powers may be used to advantage, closer double stars are resolved as distinct points and fine detail may be observed on the Moon and planets.

Several basic guidelines should be followed for best results in using your telescope:

1. Try not to touch the eyepiece while observing. Any vibrations resulting from such contact will immediately cause the image to move.

2. Allow your eyes to become "dark-adapted" prior to making serious observations. Night adaptation generally requires about 10 to 15 minutes for most people.

3. Let the telescope "cool down" to the outside environmental temperature before making observations. Temperature differentials between a warm house and cold outside air require about 30 minutes for the telescope's optics to regain their true and correct figures. During this period, the telescope will not perform well. A good idea is to take the telescope outside 30 minutes before you want to start observing.

4. If you wear glasses and do not suffer from astigmatism, take your glasses off when observing through the telescope. You can re-focus the image to suit your own eyes. Observers with astigmatism, however, should keep their glasses on since the telescope cannot correct for this eye defect.

5. Avoid setting up the telescope inside a room and observing through an open window (or, worse yet, through a closed window!). The air currents caused by inside/outside temperature differences will make quality optical performance impossible.

6. Perhaps most importantly of all, avoid "overpowering" your telescope. The maximum usable magnification at any given time is governed by the seeing conditions. If the telescopic image starts to become fuzzy as you increase in power, drop down to a reduced magnification. A smaller but brighter and sharper image is far preferable to a larger but fuzzy and indistinct one.

7. As you use your telescope more and more, you will find that you are seeing finer detail: observing through a large aperture telescope is an acquired skill. Celestial observing will become increasingly rewarding as your eye becomes better trained to the detection of subtle nuances of resolution.

E. Smart Drive (Both LX100 Models)

1. Smart Drive Features

- Permanent Periodic Error Correction (PPEC)
- Declination Drift Correction
- Reversible Directions for Declination Correction Buttons
- Two Speed Electric Focus
- Electric Focus Lock-Out

2. What is Smart Drive?

The purpose of a clock drive on any telescope, is to accurately track an astronomical object - keeping it precisely in the center of the field of view. Since the motion of a star is perfectly smooth and consistent, the telescope clock drive should, ideally, also be perfectly smooth and consistent. In attempting to achieve this ideal, telescope makers have gone to great measures to procure the most precise gears and worms. But no matter how accurate the gear and worm, there are always manufacturing tolerances, and these lead to minute, repeatable speed variations in the tracking speed of the telescope - called periodic error.

By far the largest contributor to periodic error is the worm itself. Errors as small as 1/1000" can lead to errors as large as 30 arcsec in the tracking of the telescope, and these errors will repeat every time the worm makes a complete revolution. For astrophotography work, this is the major reason that a long-exposure photo must be "guided"; this much error will ruin a photograph. While even a telescope with zero periodic error (if one existed) would still require "guiding" during a long astrophoto (due to atmospheric turbulence), eliminating as much periodic error as possible greatly increases the odds for a good photograph.

The **Smart Drive** makes a quantum leap forward in the elimination of periodic error. It is "taught" the periodic error due to the worm, so that the microprocessor can make the necessary speed corrections - usually before the errors are even seen. **Smart Drive** is "taught" by "guiding" on a star, as if you were taking an astrophotograph. This is done by tracking on a star and keeping it centered in the field-of-view by using the correction buttons on the ECC hand controller. By monitoring the button pushes, the **Smart Drive** builds, and permanently remembers, a model of the periodic error. This model is then used to vary the frequency to the motor to eliminate the worm periodic error.

3. Operation

a. Accessing Smart Drive Functions

All **Smart Drive** features are accessed by the ECC hand controller buttons, with audible feedback for each step.

There are two basic categories of **Smart Drive** functions. The **Control-Focus** functions are used to turn on and off the electric focuser, and to train and use the worm model feature of the PPEC. The **Control-Dec** functions are used for the Declination drift feature, and to reverse the Declination motor direction buttons.

Note: *Entering a Control mode is only the first step of activating a **Smart Drive** function.* When a Control mode is entered (described below), the ECC buttons are actually being redefined to perform tasks different than what they normally do. Think of the **Control-Focus** and **Control-Dec** as the shift key on a typewriter or function key on a scientific calculator. Once pressed, the next button press will determine the **Smart Drive** function being activated.

To enter the **Control-Focus** mode, hold both Focus buttons (∞ & Near) down at the same time for approximately two seconds. (If you have an electric focuser, it will not move when both buttons are pushed at the same time.) **Smart Drive** will respond with two quick beeps, indicating that it is in the **Control-Focus** mode and ready for the next part of the command.

To enter the **Control-Dec** mode, hold both Declination buttons (N and S) down at the same time for approximately two seconds. (If you have a Declination Motor System, it will not move when both buttons are pushed at the same time.) **Smart Drive** will respond with three quick beeps, indicating that it is in the **Control-Dec** mode and ready for the next part of the command.

Smart Drive Control Mode	Buttons Pushed (2-Sec.)	Audible Response
Control-Focus (CTL-F)	Both Focus (∞ & Near)	2 Quick Beeps
Control-Dec (CTL-D)	Both Dec (N & S)	3 Quick Beeps

Remember, once a Control mode is entered, it must be followed by a **Smart Drive** command. These commands are described in detail, below.

b. Permanent Periodic Error Correction (PPEC)

As described in the Introduction, the main feature of **Smart Drive** is to correct for periodic error due to the worm. In order for **Smart Drive** to do this, it is "taught" a model of the worm, which it then uses to determine the corrections necessary for play back.

Smart Drive will only compensate for periodic error in the Quartz Mode (or if no ECC is present)- when the slide switch (#4, Fig. 20) is in the Quartz position. When in the Manual Mode, the telescope will drive at the uncompensated rate determined by the Variable Speed Knob (#6, Fig. 20).

Before **Smart Drive** can correctly play back the worm model, it first needs to know the angular position of the worm. The worm has a magnetic index pulse which sends a signal to the **Smart Drive** every time it reaches the zero position. This is done automatically the first time each time the telescope is turned ON.

1) Training the **Smart Drive**

The LX100 **Smart Drive** has a model that can be programmed and used by the customer. **When the telescope is shipped from the factory, this worm model is blank, and if used, the telescope will track at the standard uncompensated Sidereal rate.**

The general procedure for building the worm model is to first enter the "train" mode (described below), and then guide on star as if you were taking an astrophotograph. The more accurately you guide on the star, the better the worm model will be.

Guiding on a star requires an Illuminated Reticle Eyepiece (an eyepiece that has a crosshair) and a barlow lens to increase the magnification. After polar aligning the telescope (see Telescope Operation, pages 35-37), center a star (near the Celestial Equator) on the crosshair of the eyepiece. Then, using the Drive Corrector Buttons (#2, Fig.20), keep the star exactly centered on the crosshair of the eyepiece. As you push the Drive Corrector Buttons, **Smart Drive** will monitor the "E" and "W" buttons to build the worm model. When the model is complete, **Smart Drive** will give three long beeps, indicating that the model is built.

a) Building the Worm Model

To build the worm model, follow the following steps:

1) Polar Align the telescope (see Telescope Operation, pages 35-37).
2) Position a star in the center of the field of view of the eyepiece. (Using a crosshair eyepiece helps.) Use as much magnification as possible. The star should be near the Celestial Equator, having a Declination as near 0° as possible.
3) Practice guiding on the star, keeping it exactly centered on the crosshairs by pushing the ECC Drive Corrector Buttons. Note: Make sure the slide switch (#4, Fig. 20) is in the 2X position.
4) Press **CTL-F** until **Smart Drive** gives 2 quick beeps, and release the two focus buttons. You are now in the Control Focus Command mode.
5) Press the "W" button. This puts **Smart Drive** into the "teach" mode, and **Smart Drive** gives 3 long beeps.

At this point, the **Smart Drive** is waiting for a worm index pulse. This may take as long as eight minutes. During this time, keep the star centered on the crosshairs. Note: Smart Drive will start beeping 20 seconds before it reaches the index pulse, giving you time to get ready.

When the worm index pulse is reached, **Smart Drive** will give 3 long beeps. As you guide on the star, **Smart Drive** will give 1 quick beep every 10 seconds to let you know it is in the "train" mode.

When the worm model is complete, **Smart Drive** will give 1 long beep and automatically begin to compensate for periodic error and other telescope function are resumed.

Note: During the training cycle, all other telescope functions are suspended. If any button is pushed (other than the 4 Drive Corrector Buttons) **Smart Drive** will abort the training session, erase what it has done, and give 4 long beeps signifying the end of the train session.

The worm model is permanently remembered by **Smart Drive**, even when power is removed from the telescope.

b) Erasing the Worm Model

If the worm model needs to be erased, do the following:

1) Press CTL-F
2) Press "E"

Smart Drive will respond with 4 long beeps and resume normal telescope functions.

c) Updating the Worm Model

Smart Drive has the ability to modify the worm model. If you build the model several times, it will average the model - thereby creating a model that is more accurate. Follow the steps above for building a worm model. Then, to update (or average) the worm model:

1) Press CTL-F
2) Press "N". This puts **Smart Drive** into the "update" mode, and **Smart Drive** gives 2 long beeps.
3) Follow the same steps used to train the worm model.

c. Electric Focuser Switch

If you have an Electric Focuser installed, there are times when it is advisable to disable it. During a guided astrophoto is a good example - you don't want to accidentally hit the focus button while guiding.

To disable the Electric Focuser buttons:

1) Press CTL-F
2) Press "Near"

To enable the Electric Focuser buttons:

1) Press CTL-F
2) Press ∞

The following table summarizes the above Control Focus commands.

<table>
<tr><th colspan="3">Control Focus Commands</th></tr>
<tr><th>Smart Drive Feature</th><th>Buttons Pushed</th><th>Audible Response</th></tr>
<tr><td>Build Worm Model</td><td>CTL-F (∞ & Near)</td><td>2 Quick Beeps</td></tr>
<tr><td></td><td>"W"</td><td>3 Long Beeps</td></tr>
<tr><td></td><td colspan="2">When worm index pulse is received, guide on star.</td></tr>
<tr><td>To Exit before Complete</td><td>Either Focus</td><td>4 Long Beeps</td></tr>
<tr><td>Erase Worm Model</td><td>CTL-F (∞ & Near)</td><td>2 Quick Beeps</td></tr>
<tr><td></td><td>"E"</td><td>4 Long Beeps</td></tr>
<tr><td>Update Worm Model</td><td>CTL-F (∞ & Near)</td><td>2 Quick Beeps</td></tr>
<tr><td></td><td>"N"</td><td>2 Long Beeps</td></tr>
<tr><td></td><td colspan="2">When worm index pulse is received guide on star.</td></tr>
<tr><td>To Exit before Complete</td><td>Either Focus</td><td>4 Long Beeps</td></tr>
<tr><td>Electric Focuser Disable</td><td>CTL-F (∞ & Near)</td><td>2 Quick Beeps</td></tr>
<tr><td></td><td>"Near"</td><td>1 Quick Beep</td></tr>
<tr><td>Electric Focuser Enable</td><td>CTL-F (∞ & Near)</td><td>2 Quick Beeps</td></tr>
<tr><td></td><td>"∞"</td><td>1 Quick Beep</td></tr>
</table>

d. Declination Drift

Smart Drive has the ability to learn and playback a Declination drift. This is helpful when guiding an astrophotograph when the telescope is not perfectly polar aligned, or when trying to track a Comet or asteroid. Follow these steps to train a Declination drift:

1) Position the object on the crosshairs of the eyepiece. Use as much magnification as possible.
2) Press CTL-D. **Smart Drive** will give 3 quick beeps.
3) Press “S”. **Smart Drive** will give 2 quick beeps.
4) Guide on the object. The longer you guide on the object, the more accurate the Declination drift playback will be.
5) Press either Focus button to end the Declination Drift train mode.

The Declination drift playback will be the most accurate when the training is done with very short, frequent corrections. If the corrections are long and infrequent, the playback will be the same.

To stop the Declination drift playback, follow the above steps without doing any guiding - basically retraining a "0" drift rate.

Note: The Declination drift is averaged to give a smooth playback. When guiding in Declination, if both “N” and “S” buttons are pushed, the resulting playback will be in one direction only, at an averaged speed.

e. Declination Motor Directions

When the telescope is first powered up, the “N” Declination button will move the telescope North, and the “S” Declination button will move the telescope South. It is often desirable to reverse these actions, especially during the guiding of an astrophotograph, where the 4 directional buttons will move the telescope in consistent directions. To reverse the Declination Motor direction, follow these steps:

1) Press CTL-D
2) Press “N”

The CTL-D + “N” is a toggle command and will toggle the Declination motor directions back and forth.

The following table summarizes the Control Dec commands.

Control Dec Commands		
Smart Drive Feature	Buttons Pushed	**Audible Response**
Declination Drift Train	CTL-D ("N" & “S”)	3 Quick Beeps
	“S”	2 Quick Beeps
	Make Declination corrections	
To Exit	Either Focus	1 Quick Beep
Reverse Dec. Directions	CTL-D ("N" & “S”)	3 Quick Beeps
(Toggles Directions)	“N”	1 Quick Beep

f. Two Speed Electric Focus

The Electric Focus buttons now function at two speeds. The 2X/32X slide switch (#4, Fig. 20) is used to change between the high speed (32x position) and slow speed (2X position).

F. MAINTENANCE (Both LX100 Models)

1. Cleaning the Optics

Perhaps the most common telescope maintenance error is cleaning the optics too often. A little dust on the surface of the correcting plate causes negligible degradation of optical performance: don't clean the outside surface of this lens unless really necessary. To remove small particles on the corrector lens surface, use a camel's hair brush (**gently**!) or blow off with an ear syringe (available from a local pharmacy). If further cleaning is required, a photographic lens cleaner may be used. In any case, DO NOT clean the correcting plate by taking strong circular wipes with a piece of cloth or other material: use a white "Kleenex"-type tissue and make short, gentle, radial wipes (from the center outward). Change tissues several times when cleaning the entire plate.

If grease or other organic materials (e.g. fingerprints) are in evidence on the outer surface of the corrector lens, the following homemade cleansing solution works well: 2 parts distilled water, 1 part isopropyl alcohol, and 1 drop of biodegradable liquid dishwashing detergent per pint of solution. Use only a small amount of solution and taken gentle, radial swipes, changing tissues several times to clean the corrector lens. When using this proceedure, take special care in cleaning to avoid scratches.

The aluminized surfaces of the Meade 8" and 10" telescopes will probably never need re-aluminizing, if you are careful to replace the dust caps at the eye-end and corrector-end when the telescope is not in use. These dust caps also serve the important purpose of keeping dust and other contaminants off the surfaces of the corrector lens.

WARNING: Do not, in any case, remove the correcting plate from its machined housing for cleaning or other purposes. You will almost certainly not be able to replace the corrector in its proper rotational orientation and serious degradation of optical performance may result.

2. Alignment (Collimation) Of The Optical System

The optical collimation of any astronomical telescope used for serious purposes is important, but in the cases of the Schmidt-Cassegrain design telescope, such collimation is absolutely essential for good performance. Take special care to read and understand this section well so that your telescope will perform fully to its capabilities.

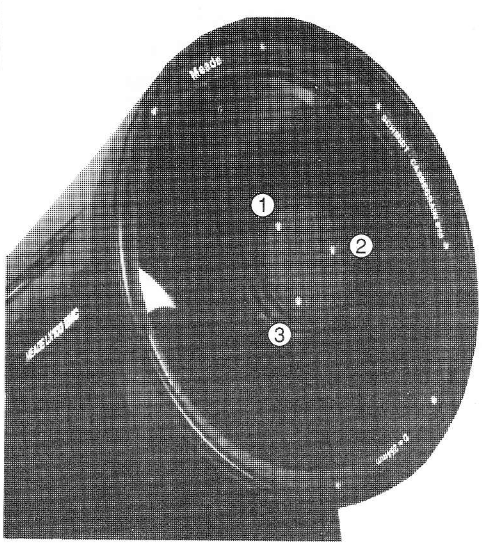


Fig. 27: Collimation of the Optical System
(1), (2), (3) Set screws for adjusting collimation.

All Meade Schmidt-Cassegrains are precisely collimated at the factory before packing and shipment and it is probable that you will not need to make any optical adjustments before making observations. However, if the telescope sustained rough handling in shipment, you may need to recollimate the optical system. Such recollimation is not a difficult procedure, in any case.

To check the collimation of your telescope, locate in the telescope a moderately bright (first or second magnitude) star near the zenith; alternately, a terrestrial "hot spot," such as reflected sunlight from a distant car bumper or telephone pole insulator will suffice. This test is simplified if the telescope is in thermal equilibrium. If the telescope has been moved through temperature extremes (e.g. taken from a warm house into cold outside air), allow 30 to 45 minutes for the telescope to "cool down."

To perform the test, center the point source (e.g. star image) in the telescopic field with a low power eyepiece, such as the 26mm eyepiece normally supplied as standard equipment. Defocus the image to fill about 1/8 of the field of view. You will see in the out-of-focus image a circle of light, with the darker circular shadow of the secondary mirror somewhere within. If the darker shadow is well-centered within the lighter circle, your telescope is well collimated, but continue to read this section for the more sensitive high-power tests to be described below. If the darker shadow is not so centered, follow this procedure:

1. Note that the only optical alignment adjustment of the 8" and 10" Schmidt-Cassegrain models that is ever necessary or possible is the tilt-angle adjustment of the secondary mirror. Adjustment of this tilt-angle is achieved by turning the 3 set screws shown in Fig. 27, located at the edge of the outer surface of the secondary mirror housing.

DO NOT FORCE THE 3 COLLIMATION SCREWS PAST THEIR NORMAL TRAVEL AND DO NOT ROTATE ANY SCREW OR SCREWS MORE THAN 2 TURNS IN A COUNTERCLOCKWISE DIRECTION (i.e. NO MORE THAN 2 FULL TURNS IN THE "LOOSENING" DIRECTION), OR ELSE THE SECONDARY MIRROR MAY BECOME LOOSENED FROM ITS SUPPORT. NOTE THAT THE SECONDARY MIRROR COLLIMATION ADJUSTMENTS ARE VERY SENSITIVE: GENERALLY, TURNING A COLLIMATION SCREW 1/2-TURN WILL HAVE DRAMATIC EFFECTS ON COLLIMATION.

2. While observing the defocused star image, note the direction in which the darker shadow is offset within the lighter circle. Using the telescope's slow-motion controls, move the defocused image to the edge of the field of view, in the same direction as the darker shadow is offset.

3. Tighten the screw or screws in the same direction as the darker shadow is off-center, loosen the other screw or screws. Continue this process until the defocused image is brought back to the center of the telescopic field.

4. Now proceed to a higher power (e.g. 9mm) eyepiece and repeat the above test. Any lack of concentricity at this point will require only extremely slight adjustments of the 3 set screws.

5. As a final check on collimation, examine the star image in-focus with a fairly high-power (9mm or shorter focal length) eyepiece, under good seeing conditions. The star point should appear as a small central dot (the so-called "Airy disc") with one diffraction ring surrrounding it. Make very small adjustments of the 3 set screws, if necessary, to center the Airy disc in the diffraction ring. With this final adjustment performed, your telescope is collimated.

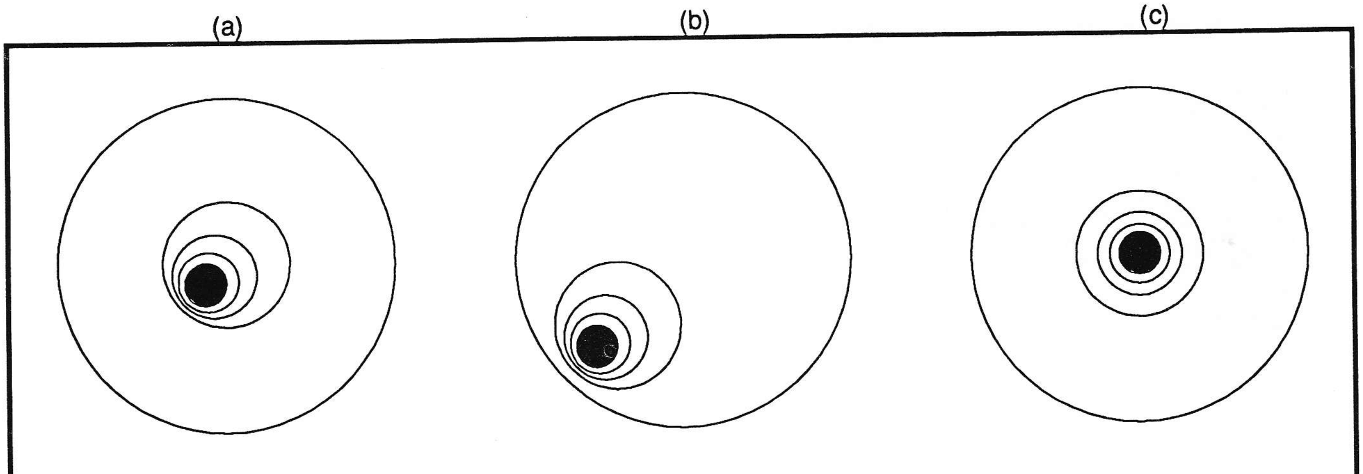


Fig. 28: Collimating The Optics

Summary of the Collimation Procedure: (a) Note if the darker shadow is de-centered, as shown (a, Fig. 28), inside the lighter circles; (b) use the telescope's controls to move the image to the edge of the field (b, Fig. 28), in the same direction as the darker shadow is off-center; (c) tighten and/or loosen, as appropriate, the secondary housing's 3 collimation set screws to bring the image back to the center of the field (c, Fig. 28): repeat (a) and (b) if necessary.

3. Dewing Of The Corrector Plate

Because of the correcting plate's proximity to the open air, it is possible in most climates that dew may form on the outer surface of the glass during observations. One simple remedy for this dewing is to use a portable hair blow-drier; just a few "light" swipes of the warm air will clear the dew for a period of time.

If the above approach is not satisfactory, the correcting plate's outer surface may be hand cleaned. BUT BE CAREFUL! The correcting plate should be completely free of dirt and abrasive particles before wiping the glass. Use only a clean, white Kleenex tissue and wipe radially outward from the center of the lens to the edge. Change tissues often. Avoid using circular motions when wiping and apply only the minimum pressure required to do the job. Hard wiping of the correcing plate will introduce fine scratches into the glass.

If dewing is a continual problem, a Dew Shield (see previous description in this manual) may be required. The Dew Shield effectively recesses the correcting plate from night air, and significantly inhibits dew formation.

If you find that dew has formed on the correcting plate after bringing the telescope indoors from an observing session, allow the warm indoor air to dissipate the dew before placing the telescope back in its carrying case. Do not wipe off the dew in this instance as it will evaporate naturally.

4. Adjusting the Right-Ascension Lock

After a period of time, it is possible that the R.A. lock (#7, Fig. 8) of the telescope will not tighten sufficiently due to internal wear of the clutch mechanism. In such an event, remove the R.A. lock lever using one of the hex wrenches supplied with the telescope. Then, with a pair of pliers, tighten the shaft protruding outward from the motor drive base until you cannot easily rotate the fork mount in R.A. (Take care in this operation not to damage the cosmetic finish of your telescope). Replace the R.A. lock lever so that its handle points straight out from the cross-bar connecting the fork arm.

5. Adjusting The Declination Lock

Continual use of the Declination lock (#2, Fig. 8) may cause this lock to loosen. To retighten the lock, first turn the manual Declination slow motion knob (#6, Fig. 8), so that the Declination tangent arm (located inside the left-hand fork arm) is about in the middle of its travel. Put the Declination lock lever in the "unlocked" position, and insert the appropriate hex wrench into the notched-out section of the left-hand fork arm (see Fig. 29, below). Tighten the hex-head nut located just inside the notch. See Fig. 29. Caution: a little tightening of this nut goes a long way; generally, only one turn of the nut is required to fully retighten the Declination lock.

Fig. 29: Adjusting the Declination Lock.

6. A Note On The "Flashlight" Test

Approximately 94% of the light impinging on the primary mirror of the 8" and 10" LX100 is reflected by the mirror; about 6% of the light is scattered. Similarly, the correcting plate of either model transmits about 98% of the light impinging at each surface; about 2% of the light impinging each surface is scattered.

If a flashlight or other high-intensity light source is pointed down the main telescope tube under dark conditions, the total amount of scattered light will be very considerable. As a result, the optics of the telescope will appear to be of very poor surface quality. This same statement may be made of any high quality optical surfaces when given this grossly misleading "test."

7. Factory Servicing And Repairs

Meade 8" and 10" Schmidt-Cassegrains have been designed and manufactured for years of trouble-free operation and repairs should rarely be necessary. If a problem does occur, first write or call our Customer Service Department. Do not return the telescope for servicing until you have communicated with us in this way, since the great majority of problems can be handled without return of the telescope to us. When telephoning or writing, please explain in detail the exact nature of the problem so that we may offer a prompt remedial procedure. Be sure to include your full name, address and phone number.

8. Troubleshooting the LX100 Drive System

The following list of problems should cover most common problems.

Symptom: Power Indicator (#2, Fig. 19) does not illuminate and/or the Ammeter (#1, Fig. 19) does not show any current.

Problem: The telescope is not receiving power.

Solution: The telescope is not receiving the correct power. If using the AC wall adapter, be sure it is plugged into an active wall receptacle (make sure the wall receptacle is not a switched plug; if it is, make sure the switch is on). If using the DC power cord or battery pack, check the connections, both at the power cell and at the telescope.

If the connections look good, try an alternate power source. This will eliminate the power cord as the source of the problem.

Symptom: When using the ECC, pushing the 32X E or 32X W buttons, the telescope either does not move at all, moves only in one direction, or moves sporadically in one or both directions.

Problem: Telescope not moving at 32X centering speed in Right Ascension.

Solution: This is almost always due to low battery voltage. When the motor is pushed to 32X speeds, that is when it has the least amount of torque and requires the most current to move the telescope. The 32X centering speed will be the first indication of low battery voltage, and should be taken as a warning, especially if the telescope is being operated from your car battery.

Check the telescope operation using the AC Adapter. If the telescope then operates correctly, then check you battery.

Symptom: When the telescope is first turned on, the telescope tracks at the 32X rate for several seconds.

Problem: The telescope is doing a self diagnostics test.

Solution: This is a normal function of the telescope and does not require any action. During the first few seconds of operation, the telescope's microprocessor does a series of tests to determine proper telescope functions.

Symptom: The telescope has power, but the telescope is not moving.

Problem: The telescope's RA Lock (#7, Fig. 8) is not locked.

Solution: Tighten the RA Lock.

Note: The telescope moves very slowly. You will not see the telescope moving by just looking at it - it is like trying to see the hour hand on a 24 hour clock move. Look through the telescope at a land object to make sure the telescope is not moving.

G. SPECIFICATIONS

Telescope	8" LX100 f/6.3	10" LX100 f/6.3	8" LX100 f/10	10" LX100 f/10
Optical Design	Schmidt-Cassregrain Catadioptric	Schmidt-Cassregrain Catadioptric	Schmidt-Cassregrain Catadioptric	Schmidt-Cassregrain Catadioptric
Clear Aperture	203mm (8")	254mm (10")	203mm (8")	254mm (10")
Primary Mirror Diameter	209.6mm (8.25)	263.5mm (10.375)	209.6mm (8.25)	263.5mm (10.375)
Focal Length	1280mm (50.4")	1600mm (63")	2000mm (80")	2500mm (100")
Focal Ratio	f/6.3	f/6.3	f/10	f/10
Resolution	.56 arc sec	.45 arc sec	.56 arc sec	.45 arc sec
Super Multi-Coatings	Standard	Standard	Standard	Standard
Limiting Visual Magnitude (approx)	14.0	14.5	14.0	14.5
Limiting Photographic Magnitude (approx)	16.5	17.0	16.5	17.0
Image Scale (°/inch)	1.14°/inch	0.91°/inch	0.72°/inch	0.57°/inch
Maximum Practical Visual Power	500X	625X	500X	625X
Near Focus	25'	50'	25'	50'
Optical Tube Size	9.1" Dia. x 16" Long	11.75" Dia. x 22" Long	9.1" Dia. x 16" Long	11.75" Dia. x 22" Long
Secondary Mirror Obstruction	3.45" (18.6%)	4.0" (16.0%)	3.0" (14.1%)	3.7" (13.7%)
Telescope Mounting	Heavy-Duty Fork-Type Double Tine	Heavy-Duty Fork-Type Double Tine	Heavy-Duty Fork-Type Double Tine	Heavy-Duty Fork-Type Double Tine
Setting Circle Diameters	Dec.: 6"; R.A.: 8.75"	Dec.: 6"; R.A.: 8.75"	Dec.: 6"; R.A.: 8.75"	Dec.: 6"; R.A.: 8.75"
RA Motor Drive System	2-Speed, microprocessor-controlled 12v. DC servo motor; 5.75" worm gear with Smart Drive	2-Speed, microprocessor-controlled 12v. DC servo motor; 5.75" worm gear with Smart Drive	2-Speed, microprocessor-controlled 12v. DC servo motor; 5.75" worm gear with Smart Drive	2-Speed, microprocessor-controlled 12v. DC servo motor; 5.75" worm gear with Smart Drive
Hemispheres of Operation	North and South - switchable	North and South - switchable	North and South - switchable	North and South - switchable
Declination Control System	Manual Micrometric tangent arm	Manual Micrometric tangent arm	Manual Micrometric tangent arm	Manual Micrometric tangent arm
Motor Drive Gear Diameter	5-3/4" Worm Gear	5-3/4" Worm Gear	5-3/4" Worm Gear	5-3/4" Worm Gear
Manual Slow-Motion Controls	Dec. and R.A.	Dec. and R.A.	Dec. and R.A.	Dec. and R.A.
Hand Controller	Microchip microcontroller; 2 x 8 bit A/D converters; 7 pushbuttons	Microchip microcontroller; 2 x 8 bit A/D converters; 7 pushbuttons	Microchip microcontroller; 2 x 8 bit A/D converters; 7 pushbuttons	Microchip microcontroller; 2 x 8 bit A/D converters; 7 pushbuttons
Main Controller	Motorola 68HC05 microcontroller; 512 byte non-volatile memory (EEPROM)	Motorola 68HC05 microcontroller; 512 byte non-volatile memory (EEPROM)	Motorola 68HC05 microcontroller; 512 byte non-volatile memory (EEPROM)	Motorola 68HC05 microcontroller; 512 byte non-volatile memory (EEPROM)
Telescope Size, Swung Down	9.25" x 16" x 25"	12" x 19" x 31"	9.25" x 16" x 25"	12" x 19" x 31"
35mm Angular Film Coverage	1.55° x 1.08°	1.24° x 0.86°	0.97° x 0.68°	0.78° x 0.54°
35mm Linear Film Coverage @:				
50"	9.7" x 13.6"	7.75" x 10.9"	6.2" x 8.7"	5.0" x 7.0"
500"	9.4" x 13.3"	7.5" x 10.7"	6.0" x 8.5"	4.8" x 6.8"
3000"	56.3' x 79.7'	45.0' x 63.8'	36.0' x 51.0'	28.8' x 40.8'
Tele-Extender Used Without Eyepiece @:				
50'	9.1" x 13.3"	7.3" x 10.6"	6.8 x 8.5"	4.6 x 6.8"
500'	7.7' x 14.1'	6.1' x 9.0'	4.9' x 7.2'	4.0' x 5.8'
3000'	48' x 70'	39' x 56'	31' x 45'	25' x 36'
Carrying Case Dimensions	13" x 20" x 30"	16" x 23" x 36"	13" x 20" x 30"	16" x 23" x 36"
Net Telescope Weights (approx)				
Telescope	35#	59#	35#	59#
Equatorial Wedge	7#	N/A	7#	N/A
Super Wedge	N/A	26#	N/A	26#
Field Tripod	20#	20#	20#	20#
Accessories	8#	8#	8#	8#
Shipping Weights (approx)				
Telescope	58#	70#	58#	70#
Equatorial Wedge	9#	N/A	9#	N/A
Super Wedge	N/A	38#	N/A	38#
Field Tripod	26#	26#	26#	26#
Accessories	10#	10#	10#	10#