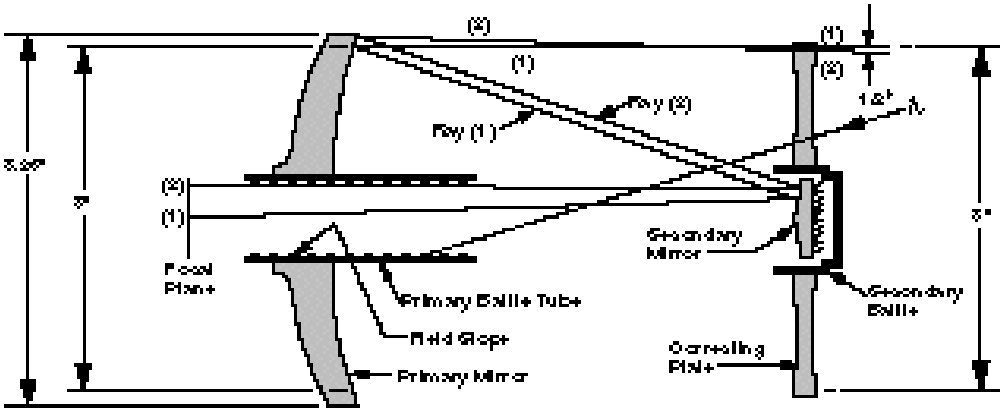
Instruction Manual

8” LX10 Schmidt-Cassegrain Telescope

Meade Instruments Corporation

The Meade Schmidt-Cassegrain Optical System



In the Schmidt-Cassegrain design of the Meade LX10, 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 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 Meade LX10 includes oversize primary mirrors, with the primary mirror of this 8" telescope at 8.25" diameter, 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 Schmidt-Cassegrains having off-axis field illuminations about 10% greater, aperture-for-aperture, than other Schmidt-Cassegrains utilizing standard-size primary mirrors. Field stops machined into the inside-diameter surface of the primary mirror baffle tube significantly increase lunar, planetary, and deep-space image contrast. These field stops effectively block off-axis stray light rays, λ.

WARNING!

Never use the LX10 telescope to look at the Sun! Looking at or near the Sun will cause *instant* and *irreversible* damage to your eye. Eye damage is often painless, so there is no warning to the observer that damage has occurred until it is too late. Do not point the telescope or its viewfinder at or near the Sun. Do not look through the telescope or its viewfinder as it is moving. Children should always have adult supervision while observing.

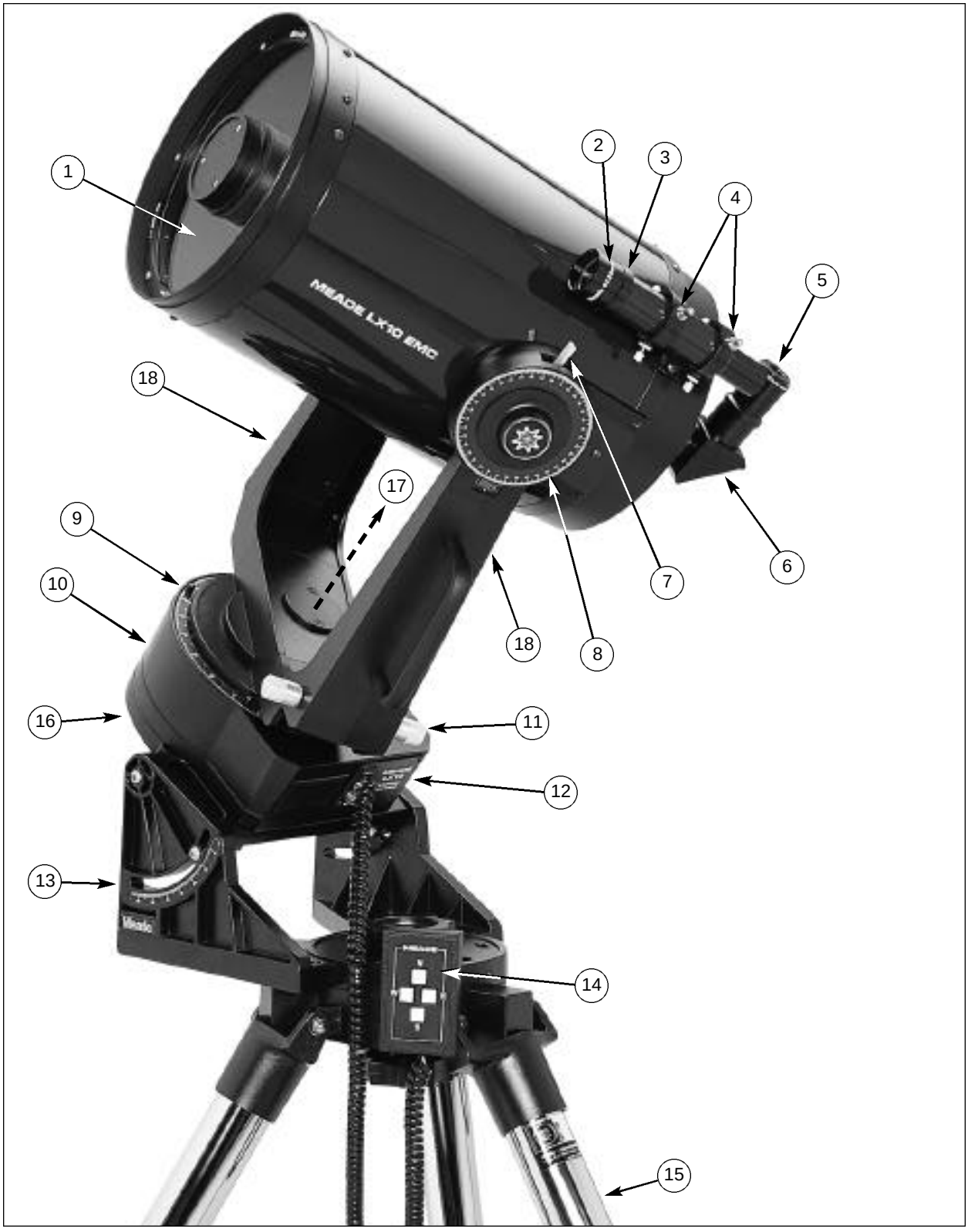


Fig.1: The Meade 8"LX10 Schmidt-Cassegrain Telescope.

Captions for Fig. 1

1. **8" correcting plate/lens**
2. **Viewfinder lens cell**
3. **Viewfinder focus lock ring**
4. **Viewfinder collimation screws**
5. **Eyepiece**
6. **Diagonal prism**
7. **Declination (Dec) lock**
8. **Dec setting circle**
9. **Right Ascension (R.A.) setting circle**
10. **Drive base**
11. **Dec slow-motion control knob**
12. **Power panel**
13. **Equatorial wedge**
14. **Keypad hand controller**
15. **Optional LX10 field tripod**
16. **Tilt plate of equatorial wedge**
17. **Polar axis**
18. **Fork arms**

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8”LX10 Schmidt-Cassegrain Telescope

INTRODUCTION

The Meade 8" LX10 Schmidt-Cassegrain Telescope is a mirror-lens telescope suitable for both astronomical and terrestrial viewing. The LX10 utilizes the exact same optical tube assembly as provided with Meade 8" LX50 and 8" LX200 models and yields optical performance identical to that of these more expensive telescopes.

The Meade LX10 enables the serious amateur astronomer to view fault lines, craters, and pockmarks on the Moon; prominent features of the Martian landscape; the rings of Saturn and several satellites of Saturn; as well as surface phenomena on the planet Jupiter and the four principal satellites of Jupiter. Beyond the Solar System the LX10 permits detailed observations of nebulae, star clusters, galaxies, and thousands of other deep-space objects.

For the astrophotographer the 8" LX10 facilitates long-exposure guided photography with its stable fork mounting, DC electronic worm-gear drive system, and hand controller.

For optimal enjoyment of your Meade telescope please take a few minutes to read this manual thoroughly so that you may become completely familiar with all of the instrument's astronomical and terrestrial observing capabilities.

PARTS LISTING AND ASSEMBLY

Refer to Figs. 1, 2, and 3 to familiarize yourself with the various parts of the telescope:

1. Unpacking and Inspection

The LX10 telescope weighs 26 pounds; take care when removing the telescope from the shipping carton.

As you unpack the telescope, take a moment to confirm that you have all parts and assembly materials listed here:

- Optical tube assembly and fork mount.
- Equatorial wedge, including:
  - — Wedge body with factory-installed fine latitude adjustment mechanism located adjacent to the latitude scale.
  - — Tilt plate.
  - — 5" threaded rod with manual knob, for attachment of the wedge to the optional LX10 Field Tripod.
  - — Separate 3" manual knob.
  - — 4 hex screws (with washers) for attaching tilt plate to wedge body.
  - — 3 star-shaped, black plastic knobs for mounting the telescope's drive base to the tilt plate.

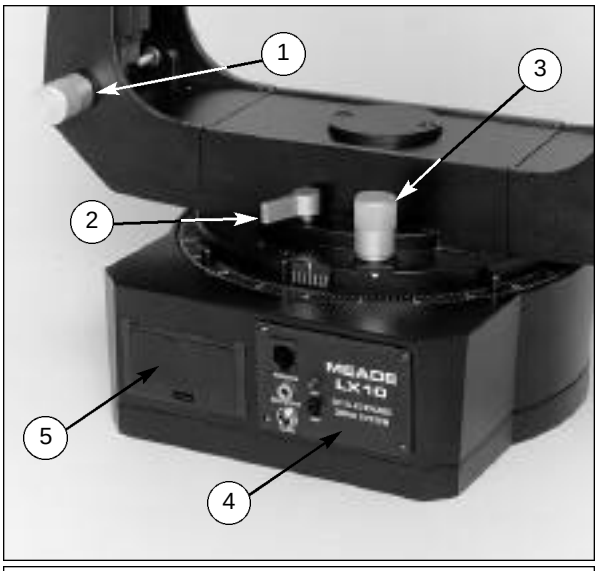


Fig.2: (1) Dec slow-motion control knob; (2) R.A. lock; (3) R.A. slow-motion control knob; (4) Control panel; (5) Battery compartment.

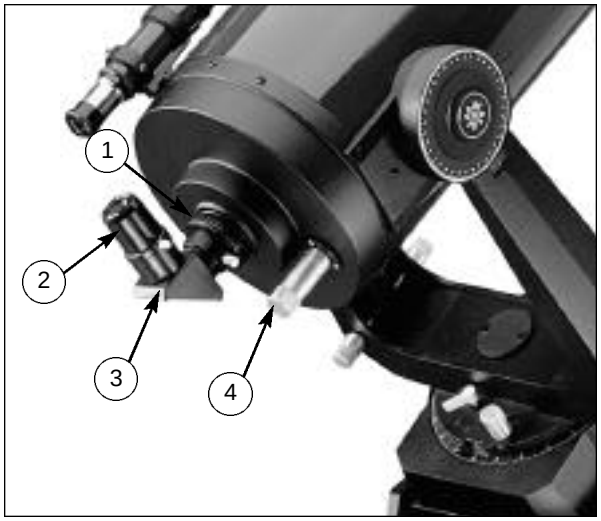


Fig.3: (1) Eyepiece holder; (2) Eyepiece; (3) Diagonal Prism; (4) Focus knob.

- Standard Accessories, including:
  - — 6 x 30mm viewfinder mounted in its bracket with six alignment screws
  - — 25mm eyepiece
  - — Diagonal prism
  - — Eyepiece holder
  - — Keypad hand controller
  - — Hex-wrench set with 4 wrenches

NOTE: It is strongly recommended that you keep the original packaging materials. Should it ever be necessary to return your telescope to Meade Instruments for servicing, commercially shipping the telescope in its original packaging materials will best protect the instrument.

2. User Supplied Materials

Before you can begin to use your LX10, you will need the following user-supplied materials:

- One 9-volt transistor radio battery or 4 AA-size batteries (long-life alkaline batteries are best).
- Field Tripod. The Meade 8" LX10 is supplied as standard equipment without any tripod. If you choose to use a tripod other than the optional Meade LX10 Field Tripod, be certain that the tripod is specifically designed to carry safely and securely the weight of the LX10 telescope. Do not attempt to use an underweight or undersize tripod with the telescope. Check with the manufacturer of your tripod to confirm that the LX10 telescope is appropriate for use with the tripod.

CAUTION: Never attempt to observe through the telescope without the telescope being attached to a suitable tripod, such as by placing the telescope-with-wedge-only on a tabletop. In this case the telescope may become seriously imbalanced, to the point where it may actually tip over.

The following discussion assumes that the LX10 telescope will be used with the optional Meade LX10 Field Tripod (see **OPTIONAL ACCESSORIES**, page 15).

GETTING STARTED

To assemble the telescope, follow these steps:

1. Setting Up the LX10 Field Tripod

To set up the Meade LX10 Field Tripod, remove the tripod from its shipping carton and stand the tripod vertically with the tripod feet down and the tripod still fully collapsed. 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.

CAUTION:Check that the legs are fully extended and that the tripod is placed on a solid, level surface before proceeding.

N*OTE: When tightening the screws and knobs discussed below, note that "firm-feel" tightening is sufficient. It is not necessary, or desirable, that these screws and knobs be overtightened, to the point where, for example, it is difficult to unthread the screws and knobs*.

2. Assembly and Mounting of the Equatorial Wedge

a. The tilt plate (1, Fig. 4) attaches to the equatorial wedge body (2, Fig. 4) by means of four hex-head screws; two of these hex-head screws are located at each side of the wedge body (3 and 4, Fig. 4).

Be sure to slide one of the washers included with the telescope onto each hex-head screw before threading the screw into the wedge body.

Attach the tilt plate to the wedge body by first threading two of the hex screws through the two holes at the top of the wedge body into the corresponding holes on the tilt plate (3, Fig. 4).

Thread the remaining two hex screws through the curved openings on each side of the wedge body and into the lower-end of the tilt plate (4, Fig. 4). Place a steel washer, then a nylon washer, between the hex-head screw and wedge body to prevent scratching. The latitude scale, (5, Fig. 4) appears only on one side of the wedge body; the hex screw on this side of the wedge body should be placed in *front* of the fine latitude adjustment screw (7, Fig. 4, and inset drawing). Using the appropriate hex wrench, tighten the four hex-head screws only until firm.

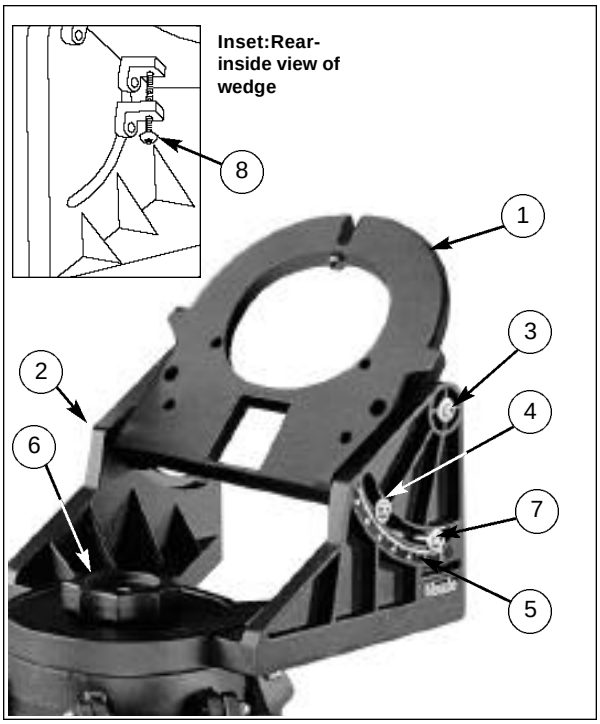


Fig.4: The Equatorial Wedge. (1) Tilt plate; (2) Wedge body; (3) Attachment screw; (4) Tilt angle locking screw; (5) Latitude scale; (6) 3" manual knob; (7) Fine latitude adjustment screw; (8) Fine latitude adjustment screw as seen from inside-surface of wedge.

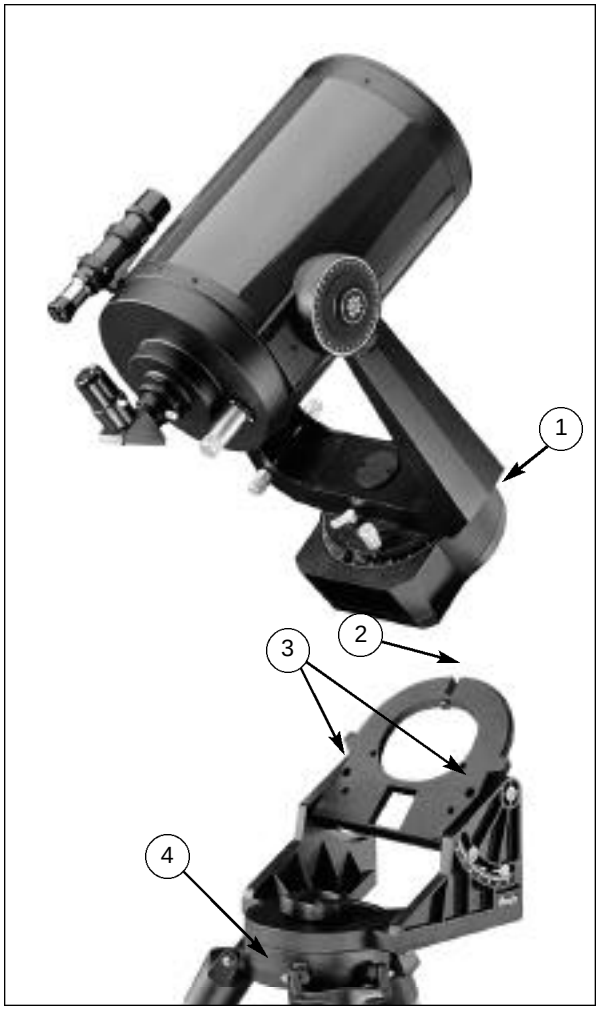


Fig.5: Mounting the telescope's drive base on the Equatorial Wedge. (1) Curved end of motor drive base where first attachment knob is inserted; (2) Slot for first attachment knob; (3) Holes for second and third attachment knobs; (4) Tripod head.

b. Place the equatorial wedge on the tripod, centering the hole in the floor of the wedge on the hole in the head of the tripod (4, Fig. 5). Slide the 5" threaded rod (this rod has a 3" manual knob at one end) down through the holes in the center of the wedge floor and the center of the tripod head. Then, thread the second, separate 3" manual knob on to the threaded rod from the *underside* of the tripod head. Thread this manual knob up the threaded rod until the knob firmly presses up against the under-surface of the tripod head. The equatorial wedge should now be rigidly attached to the LX10 Field Tripod.

3. Mounting on the Equatorial Wedge

CAUTION: Carefully follow instructions a, b, and c, below, before attempting to lift the telescope.

a. Partially thread one of the star-shaped black plastic knobs into the top hole located on the underside of the drive base. This hole is located at the curved end of the drive base (1, Fig. 5). Thread the knob about 3 full turns only; do not fully thread the knob into the hole.

b. Check the equatorial wedge **to ensure that it is securely mounted to the tripod and that all of the adjustment screws (3 and 4,Fig.4) are tightened firmly so there is no movement of the tilt-plate.** Check the tripod for stability and levelness.

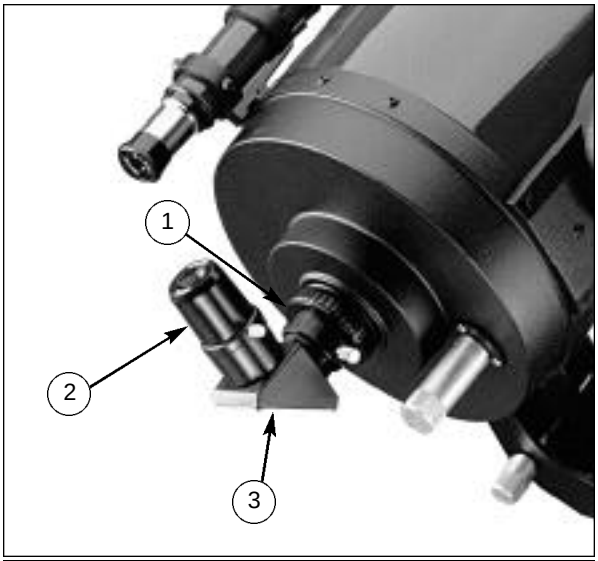


Fig.6: (1) Eyepiece holder; (2) 25mm eyepiece; (3) Diagonal prism.

c. Place the telescope's Declination lock and Right Ascension lock into the "locked" position (3, Fig. 1 and 1, Fig. 10) to prevent movement of the optical tube as you lift the telescope.

d. Once you have completed the steps above, firmly grasp the two fork arms of the telescope with the control panel facing you. Carefully lift the telescope and place it on the tilt-plate by sliding the black plastic knob in (a), above, into the slot at the top of the tilt-plate (2, Fig. 5). Align the motor drive base so that it is flush with the tilt-plate and hand-tighten the black plastic knob to a firm-feel.

e. Looking at the underside of the tilt-plate, locate the remaining two wedge attachment holes (3, Fig. 5). Insert and hand-tighten the remaining two attachment knobs until firm. The telescope is now fully mounted on the equatorial wedge.

4. Attaching the Eyepiece Holder, Diagonal Prism, and Eyepiece

a. Remove the dust cap from the rear-cell thread of the telescope.

b. Thread the eyepiece holder (1, Fig. 6) directly onto the rear-cell thread.

c. Slide the diagonal prism (3, Fig. 6) into the eyepiece holder and lock in place by turning the thumbscrew to a "firm-feel."

d. Slide the included 25mm eyepiece (2, Fig. 6) into the diagonal prism and lock in place by turning the thumbscrew.

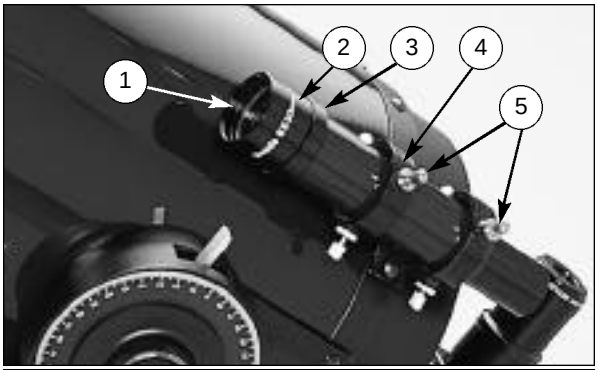


Fig.7: The Viewfinder. (1) Objective lens; (2) Lens cell; (3) Focus lock ring; (4) Viewfinder mounting bracket; (5) Viewfinder collimation (alignment) screws.

NOTE: For astronomical observations the diagonal prism (3, Fig.6) generally provides a comfortable right-angle viewing position. Alternately, an eyepiece may be inserted directly into the eyepiece holder for straight-through observations. With the diagonal prism in place images will be right-side-up but reversed left-for-right. With the eyepiece inserted directly into the (straight-through) eyepiece-holder, images will be upside-down and reversed left-for-right. For astronomical purposes the image orientation is of no importance whatever. For terrestrial observations, where a fully corrected image is highly desirable, the optional Meade #928 45° Erect-Image Diagonal Prism should be ordered separately.

5. Mounting the Viewfinder

a. To attach the standard-equipment 6 x 30mm viewfinder, remove the two viewfinder mounting screws from the rear cell of the telescope using the appropriate hex wrench supplied with the telescope. Place the viewfinder with bracket over these mounting holes and replace the two mounting screws to securely attach the viewfinder bracket to the rear cell. Tighten these screws to a firm-feel only.

b. Do not attempt to focus or align the viewfinder at this time. Instructions for focusing and alignment of the viewfinder are presented later in this manual.

c. Once attached, the viewfinder may be left permanently mounted to the telescope.

6. Powering the Telescope

The LX10 may be powered in any of three ways: (a) by means of one 9-volt (transistor-type) battery; (b) by means of four AA-size batteries; or (c) by means of the optional #607 Power Cord (see **OPTIONAL ACCESSORIES**, page 15). All batteries are supplied by the user and are not included with the telescope. Long-life alkaline batteries are recommended.

To power the telescope from one 9-volt battery: Open the battery compartment on the control panel (5, Fig. 2), flip up the thumb latch, and lift the lid. Inside this compartment is a double-connector attached to two wires. Connect the 9-volt battery to the double connector, place the battery inside the battery compartment, and replace the lid of the battery compartment. The telescope is now ready for operation. With the switch on the control panel turned ON the telescope will automatically track objects in R.A. (see **Locating Astronomical Objects**, p. 13). With the 9-volt battery installed, the telescope can be powered for about 25 hours of normal tracking.

To power the telescope from four AA-size batteries: Use one of the supplied hex wrenches to remove the metal cover panel located *underneath* the control panel on the *bottom* surface of the drive base; four hex-head screws attach this metal cover panel to the drive base. The internal compartment containing the drive motor and the worm gear assembly will now be visible (10, Fig. 8).

The LX10 telescope is shipped with the plastic AA-battery pack (8, Fig. 8) placed in one corner of the motor drive compartment and held in place with a Velcro strip; 2 thin wires and a small plug are wound into one side of this battery pack. Note that the 9-volt battery wires in (a), above, are factory pre-connected to the telescope's control panel by means of a small plastic plug (5, Fig. 8).

To power the telescope from the battery pack of 4 x AA-size batteries:

a. Unplug the small plastic plug (5, Fig 8) that connects the 9-volt battery compartment to the control panel. Pulling the detent lever (4, Fig. 8) *slightly* to the left (see arrow in Fig. 8) facilitates removal of the plug.

b. Remove the AA-size battery pack (8, Fig. 8) from its position in one corner of the motor drive compartment.

Connect the plug from the AA-size battery pack (this plug connects to the battery pack through 2 wires) to the same two pins as the 9-volt battery wires were connected to; take care not to bend these pins when making the connection.

c. Insert four AA-size batteries into the battery pack, orienting the batteries as indicated on the battery pack. Replace the battery pack neatly into one corner of the motor drive compartment, holding it in position with the Velcro strip. The wires leading from the 9-volt battery compartment can be secured in the corner of the drive compartment between the battery compartment (6, Fig. 8) and the AA-size battery pack (8, Fig. 8).

The telescope is now powered from the AA-size battery pack. With the four AA-size batteries thus installed, the telescope can be powered for more than 50 hours of normal tracking.

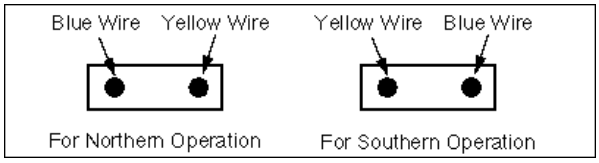
To power the telescope from the optional #607 Power Cord: With the #607 Power Cord the telescope may be powered directly from any 12-volt automobile cigarette lighter plug. One end of the #607 cord plugs in to the telescope control panel connector labeled "12v.DC"; the other end of the cord plugs into any standard automobile cigarette lighter socket. An LX10 may be powered all night in this way without risk of significant car battery drain.

7. North/South Orientation

The LX10 telescope's drive base is shipped preset at the factory for operation in the Northern hemisphere (*e.g.,* North America, Europe, Japan). Users in the Southern hemisphere (South America, Australia, etc.) must re-orient the internal motor connection:

a. With the batteries removed from the telescope, detach the front control panel by unthreading the four small hex-head screws located in each corner of the control panel. A hex-wrench appropriate to these screws is included with the telescope.

b. Carefully turn the panel over so that the back side is visible. Locate the motor connection marked "J1," and re-orient the connector by turning it over. The wires should appear as follows:



c. Then carefully reinstall the front panel and replace all four screws.

FIRST OBSERVATIONS

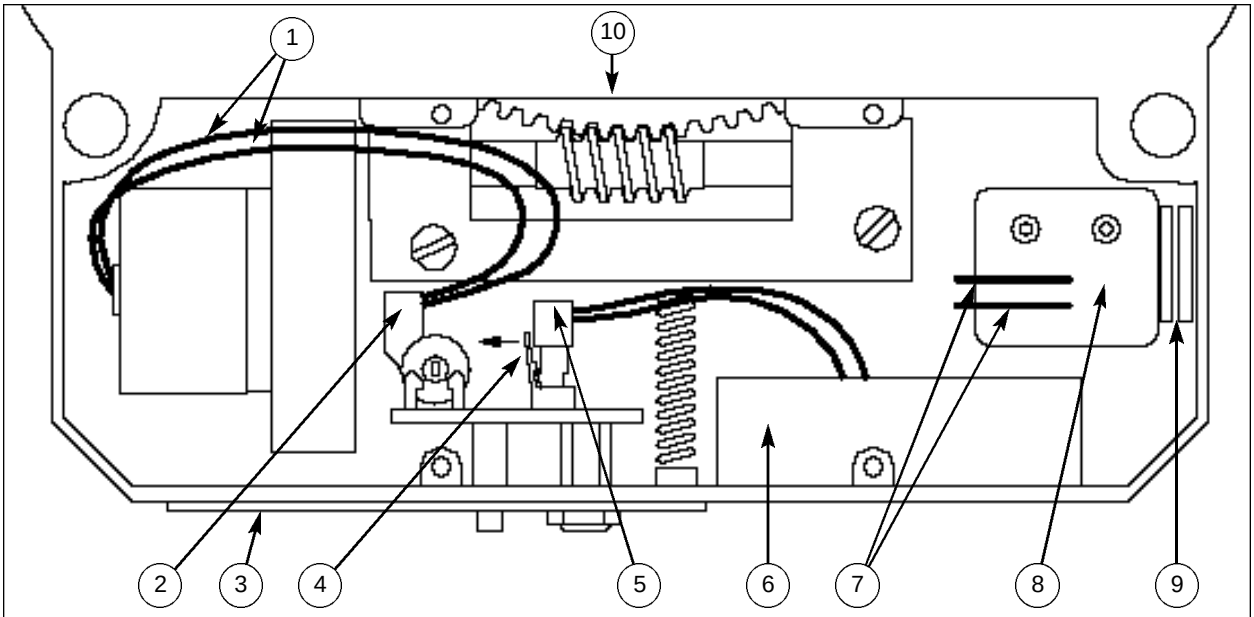
WARNING: Never use the Meade LX10 Telescope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause instant and irreversible damage to your eye as well as physical damage to the telescope itself.

Before proceeding, refer to Fig. 1, Fig. 2 and Fig 3 to confirm that you have assembled your LX10 correctly and to familiarize yourself with the location of the telescope's various controls. Explanations of terminology—such as "Right Ascension" and "Declination"—will be provided later in this manual. Following this brief review, you are ready for your first observations with the LX10.

Using both hands, remove the metal dust cover over the correcting plate (1, Fig. 1) by gently pulling it away from the telescope. Be careful not to touch the correcting plate (see **TELESCOPE MAINTENANCE AND SERVICING**, page 16). To protect the correcting plate, replace the dust cover whenever the telescope is not in use.

CAUTION:Never turn the Right Ascension (R.A.) slow-motion control knob (4,Fig.8),or attempt to move the optical tube manually when the R.A. lock (3, Fig. 9) is in the LOCKED position; such movement may damage the internal gears.

The Declination (Dec) slow-motion control knob (2, Fig. 9) has a fixed travel length. At some point after turning the



1. Wires connecting drive motor to control panel *(do not touch these wires)*
2. Plug for drive motor-control panel connection
3. Telescope control panel
4. Lock-lever for battery plug
5. Plug for 9-volt battery connection to control panel
6. Compartment housing 9-volt battery (if used)
7. Wires leading from AA-size battery pack
8. AA-size battery pack (holds 4 batteries)
9. Velcro to hold AA-battery pack in place
10. Worm gear

Fig.8: The LX10 Motor Drive Compartment, as seen from the underside of the drive base with metal cover removed.

Dec slow-motion control continuously in the same direction, the control will become difficult to turn. Do not attempt to turn the Dec slow-motion control past this point or damage to the internal mechanism will result. Instead, back-off the Dec slow-motion control by turning the control about 50 turns in the opposite direction.Unlock the Dec lock (Fig. 10) and move the telescope manually to center the object;then resume use of the Dec slow-motion control. Never attempt to move the optical tube manually when the Dec lock (1, Fig.10) is in the LOCKED position.

Select an object that is approximately 100 feet distant (*e.g.,* the top of a telephone pole) and sight along the optical tube to "aim" the telescope at the object. Look through the eyepiece of the main telescope and turn the focus knob (1, Fig. 9) clockwise or counterclockwise until the object is in focus.

Once your selected object is in focus, with the R.A. lock UNLOCKED, and the Dec lock LOCKED, use the R.A. slow-motion control knob (4, Fig. 9) and the Dec. slow-motion control knob (2, Fig. 9) to center the object in the field of view.

Objects viewed through the telescope's eyepiece will be correctly oriented up-and-down but will be reversed left-for-right.

1. Telescope Controls

An important array of controls facilitates operation of the LX10 telescope. *Be sure to acquaint yourself with all of these controls before attempting observations through the telescope.*

Focus Knob (1, Fig. 9): Turning this knob causes a finely-controlled internal motion of the telescope's primary mirror to achieve precise focus of the telescopic image. The LX10 can be focused on objects from a distance of about 25 feet to infinity.

Dec Slow-Motion Control (2, Fig. 9): With the Dec lock in the *fully locked* position (with the lever pushed forward towards the front end of the optical tube), the Dec slow-motion control knob permits manual slow-motions of the telescope in Declination.

R.A. Lock (3, Fig. 9): Locking and unlocking the R.A. lock is accomplished by moving the R.A. lock lever all the way to the left for fully locked, to the center for partially locked, and all the way to the right for fully unlocked. Remember: never attempt to move the optical tube manually when the R.A. lock is fully locked.

R.A.Slow-Motion Control (4, Fig. 9): With the R.A. lock either fully unlocked or partially locked, the R.A. slow-motion control knob permits manual slow-motions of the telescope in a horizontal direction.

Dec Lock (1, Fig. 10): Locking and unlocking the Dec movement of the optical tube is accomplished by moving the Dec lock lever all the way forward for fully locked, or by moving the Dec lock lever all the way back (towards the eyepiece) for fully unlocked. *Remember: never attempt to move the optical tube* manually *when the Dec lock is locked.*

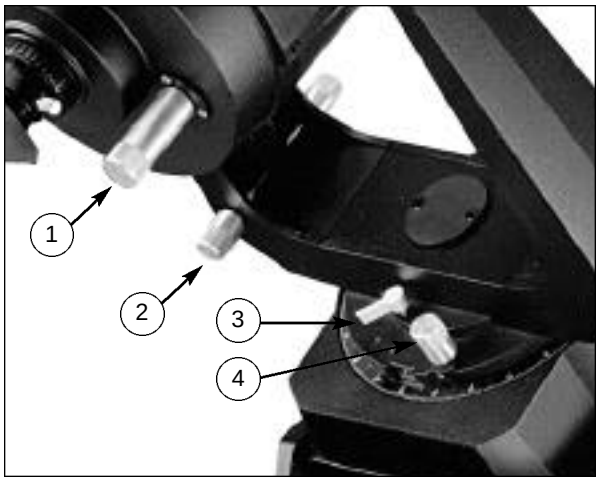


Fig.9: Telescope controls. (1) Focus knob; (2) Dec slow-motion control; (3) R.A. lock; (4) R.A. slow-motion control.

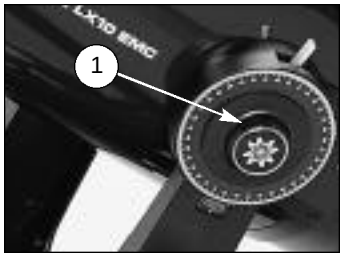


Fig.10: (1) Declination (Dec) Lock.

2. Magnification

The magnification, or power, at which a telescope is operating is determined by two factors: the focal length of the telescope and the the focal length of the eyepiece employed.

The Meade LX10 is supplied with a 25mm eyepiece as standard equipment. Eyepiece focal length, 25mm, is printed on the side of the eyepiece.

The telescope focal length is, roughly speaking, the distance that light travels inside the telescope before reaching a focus. In the mirror-lens design of the LX10, however, this focal length is, in effect, compressed by the telescope's secondary mirror, so that a long effective telescope focal length is housed in the short LX10 optical tube.

The LX10's focal length is 2000mm, or about 80 inches. If the LX10 were a classical refracting-type of telescope, its optical tube would thus be more than 6 feet long instead of the LX10's more compact 16" tube length.

Calculating Magnification: On a given telescope, such as the LX10, different eyepiece focal lengths are used to achieve different magnifications, from low to high. The standard-equipment 25mm eyepiece yields 80X. Optional eyepieces and the #140 2X Barlow Lens are available for powers from 36X to over 500X.

To calculate the magnification obtained with a given eyepiece, use this formula:

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

Example: The power obtained with the ETX with the SP 26mm eyepiece is:

$$\text{Power} = \frac{2000\text{mm}}{25\text{mm}} = 80\text{X}$$

The most common mistake of the beginning observer is to "overpower" the telescope by using high magnifications which the telescope's aperture and typical atmospheric conditions can not reasonably support. Keep in mind that a smaller, but bright and well-resolved image is superior to one that is larger, but dim and poorly resolved. Powers above 300X should be employed with the LX10 only under the steadiest atmospheric conditions.

Most observers will want to have 3 or 4 eyepieces and the #140 2X Barlow Lens to achieve the full range of reasonable magnifications possible with the LX10. (see **OPTIONAL ACCESSORIES**, page 15)

THE VIEWFINDER

The LX10, as with almost all astronomical telescopes, presents a fairly narrow field of view to the observer. As a result it is sometimes difficult to locate and center objects in the telescope's field of view. The viewfinder, by contrast, is a low-power, wide-field sighting scope with crosshairs that enable the easy centering of objects in the main telescope's field. Standard equipment with the LX10 is a viewfinder of 6-power and 30mm aperture, called an "6 x 30mm viewfinder."

The LX10 viewfinder, unlike most telescope viewfinders, presents a correctly oriented image, both up-and-down and left-to-right. This orientation particularly facilitates the location of terrestrial objects. The 6 x 30mm viewfinder is also a tremendous aid in locating faint astronomical objects before their observation in the main telescope.

1. Focusing the Viewfinder

The LX10 viewfinder has been factory pre-focused to objects located at infinity. Individual eye variations, however, may require that the viewfinder be re-focused for your eye. Prior to installing the viewfinder in the viewfinder bracket (4, Fig. 7), check the focus by looking through the viewfinder. Point the viewfinder at a distant object; if the viewfinder image is not sufficiently in focus for your eye, it may be re-focused as follows:

a. Loosen the knurled lock-ring (3, Fig. 7) located near the viewfinder's objective (front) lens (1, Fig. 7). Unthread this ring (*counterclockwise*, as seen from the eyepiece-end of the viewfinder) by several full turns.

b. Focus the viewfinder by rotating the objective lens cell (1,Fig. 7) in one direction or the other, until distant objects observed through the viewfinder appear sharp. One or two rotations of the viewfinder lens have a significant effect on image focus.

c. Once correct focus is reached, lock the focus in place by threading the knurled lock-ring snugly *clockwise* up against the viewfinder's lens cell.

d. Place the viewfinder into the viewfinder bracket (4, Fig. 7) on the main telescope. Gently tighten the six alignment screws (5, Fig. 7), then proceed with alignment of the viewfinder.

2. Alignment of the Viewfinder

In order for the viewfinder to be useful, it must first be aligned with the main telescope, so that both the viewfinder and the main telescope are pointing at precisely the same place. To align the viewfinder follow this procedure:

a. The viewfinder bracket (4, Fig. 7) includes six alignment screws (5, Fig. 7). Turn the 3 *rear-most* alignment screws so that the viewfinder tube is roughly centered within the viewfinder bracket, as viewed from the eyepiece-end of the telescope.

NOTE: Do not overtighten the alignment screws. When tightening one screw it may be necessary to loosen one of the two other screws.

b. Using the 25mm eyepiece, point the main telescope at some easy-to-find, well-defined land object, such as the top of a telephone pole. Center the object precisely in the main telescope's field and engage the R.A. Lock and Dec Lock so that the object can not move in the field.

c. While looking through the viewfinder, turn one or more of the 3 *front-most* viewfinder alignment screws until the crosshairs of the viewfinder point at precisely the same position as the main telescope.

Re-check that the viewfinder's crosshairs and the main telescope are now pointing at precisely the same object. The viewfinder is now aligned to the main telescope. Unless the alignment screws are disturbed, the viewfinder will remain aligned indefinitely.

3. Using the Viewfinder

To locate any object, terrestrial or astronomical, first center the object in the crosshairs of the viewfinder; the object will then also be centered in the field of the main telescope.

*Note:If you intend to use higher observing magnifications, first locate, center, and focus the object using a low-power eyepiece (*e.g., *the 25mm eyepiece). Objects are easier to locate and center at low powers; higher power eyepieces may then be employed simply by changing eyepieces.*

THE EQUATORIAL WEDGE

The standard-equipment equatorial wedge permits the use of the LX10 in an astronomical, or "equatorial", mode. The wedge accepts the drive base of the LX10 fork mount.

CAUTION: Never attempt to observe through the telescope without the telescope being attached to a suitable tripod,such as by placing the telescope-with-wedge-only on a tabletop. In such a case the telescope may become seriously imbalanced, to the point where it may actually tip over.

The Meade equatorial wedge is of modern design, with several important features incorporated to facilitate observations with the LX10.

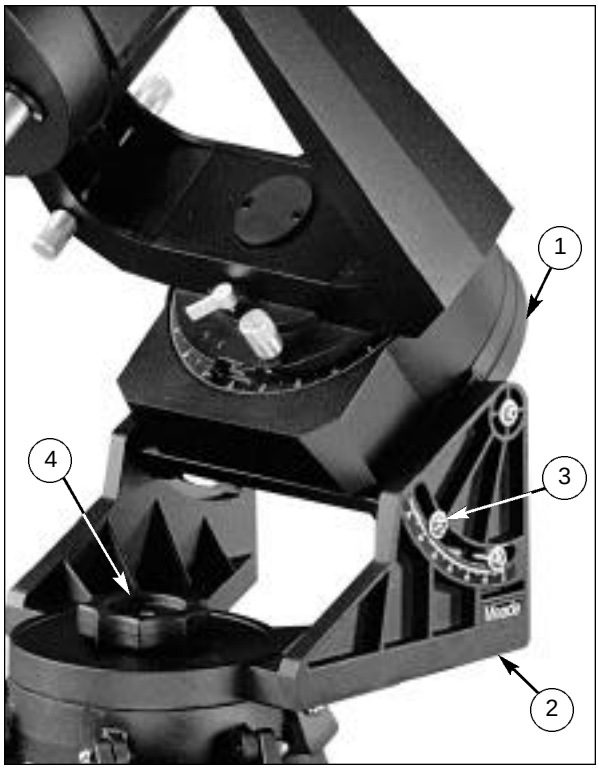


Fig.11: The Equatorial Wedge. (1) Tilt plate; (2) Wedge body; (3) Tilt angle adjustment lock; (4) 3" manual knob.

After you have used the wedge, you will learn how its functional design features enhance your ability to operate the telescope. These design features include:

— Attachment of the wedge to the field tripod by means of only one manual knob (4, Fig. 11).

— Quick azimuth (horizontal) orientation of the telescope, by loosening the 3" manual knob (4, Fig. 11).

— Fast adjustment of latitude angle with the tilt angle adjustment lock (3, Fig. 11).

The importance of these features will be made clear below.

Fig.12: Keypad Hand Controller.

KEYPAD HAND CONTROLLER

The LX10's standard-equipment keypad hand controller (Fig. 11) plugs into the telescope's control panel and is designed for micro-guiding the telescope during long exposure astro-photography, yielding precise corrections in R.A. at 2x speed.

For single-axis 2x corrections in R.A., press and hold either the "W" or "E" key as necessary. Release to resume normal sidereal tracking speed of the telescope's main drive system.

Note: The word "sidereal" refers to the rate at which stars appear to move as the Earth rotates on its axis. Thus, "sidereal-rate tracking" refers to the speed at which the telescope's motor drive moves the telescope, in order that stars appear stationary when viewed through the telescope.

To facilitate long-exposure astrophotography where minor corrections of the telescope's position are required in both R.A. and Dec, the optional Meade LX10 Electric Declination Motor (Fig. 14) permits dual-axis control by activating the "N" (north) and "S" (south) keys of the keypad (see **OPTIONAL ACCESSORIES,** page 15).

With the optional Declination motor attached, making minor corrections in Declination during long-exposure astrophotography is accomplished by pressing and holding either the "N" or "S" keys of the keypad. When you have completed the correction, release the selected key.

ASTRONOMICAL OBSERVING

The LX10's wide range of high-performance standard features make this telescope an excellent observing tool for the serious amateur astronomer. The range of observable astronomical objects is, with minor qualification, limited only by the observer's motivation.

This section provides a basic introduction to the terminology associated with astronomy, and includes instructions for finding, following and photographing celestial objects.

1. Celestial Coordinates

Celestial objects are mapped according to a coordinate system on the Celestial Sphere, the imaginary sphere on which all stars appear to be placed. This celestial object mapping system is analogous to the Earth-based coordinate system of latitude and longitude.

The poles of the celestial coordinate system are defined as those two 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. This point in the sky is located near the North Star, Polaris.

In mapping 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 a projection of the Earth's Equator onto the celestial sphere.

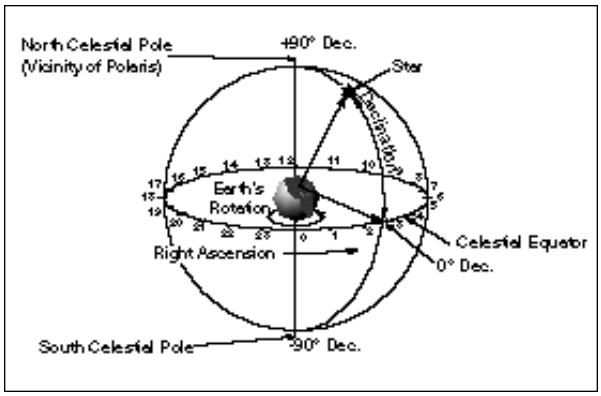


Fig.13: The Celestial Sphere.

Just as on the surface of the Earth, in mapping the celestial sphere, imaginary lines have been drawn to form a coordinate grid. Thus, celestial object positions on the Earth's surface are specified by their latitude and longitude. For example, you could locate Los Angeles, California, by its latitude (+34°) and longitude (118°); similarly, you could locate the constellation Ursa Major (which includes the Big Dipper) by its general position on the celestial sphere:

R.A.: 11hr; Dec: +50°.

1. **Declination:** The celestial analog to Earth latitude is called Declination, or "Dec", and is measured in degrees, minutes and seconds (*e.g.,* 15° 27' 33"). Declination shown as north of the celestial equator is indicated with a "+" sign in front of the measurement (*e.g.,* the Declination of the North Celestial Pole is +90°), with Declination south of the celestial equator indicated with a "–" sign (*e.g.,* the Declination of the South Celestial Pole is –90°). Any point on the celestial equator itself (which, for example, passes through the constellations Orion, Virgo and Aquarius) is specified as having a Declination of zero, shown as 0° 0' 0".
2. **Right Ascension:** The celestial analog to Earth longitude is called "Right Ascension," or "R.A.," and is measured in time on the 24 hour "clock" and shown in hours ("hr"), minutes ("min") and seconds ("sec") from an arbitrarily defined "zero" line of Right Ascension passing through the constellation Pegasus. Right Ascension coordinates range from 0hr 0min 0sec to 23hr 59min 59sec. 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 Right Ascension grid line (0hr 0min 0sec) carry increasing R.A. coordinates.

All celestial objects are specified in position by their celestial coordinates of Right Ascension and Declination. The telescope's R.A. and Dec setting circles (7 and 8, Fig. 7) may be dialed to the coordinates of a specific celestial object, which may then be located without a visual search. However, before you can make use of the telescope's setting circles to locate celestial objects, your telescope must first be polar aligned.

2. Polar Alignment

With the telescope polar aligned two important telescope capabilities are enabled: (a) the motor drive permits the telescope to track any astronomical object, *automatically;* (b) the telescope's setting circles, discussed above, may be used to locate faint celestial objects directly from their catalogued coordinates.

Celestial objects are essentially fixed on the celestial sphere; however, they appear to move across the sky in an arc as the Earth rotates on its axis, with a complete rotation of the Earth occurring once in every 24 hour period. This apparent motion is not obvious to the unaided eye, but viewed through a telescope such as the LX10, this motion is rapid indeed. Objects centered in the telescope move entirely out of the field of view in 15 to 60 seconds, depending upon the magnification employed.

During the 24 hour period of the Earth's rotation, stars make one complete revolution about the Celestial Pole. *By lining up the telescope's polar axis with the North Celestial Pole (or South Celestial Pole if observing from the Earth's Southern Hemisphere), celestial objects may be followed (tracked) by moving the telescope about one axis, the polar axis.*

The following polar alignment procedure assumes that the telescope has been set up on the Equatorial Wedge and LX10 Field Tripod, as shown in Fig. 1.

Polar alignment consists of the following two operations:

a. **Setting the telescope's latitude angle, as read on the wedge's latitude scale (5, Fig. 4), so that the latitude scale reads the latitude of your observing location.** Use the center of the hex-head screw (4, Fig. 4) as an indicator to read latitude angle.

CAUTION: Since the full weight of the telescope is resting on the tilt plate of the equatorial wedge, DO NOT loosen screws (4),Fig.4,without FIRMLY holding the telescope by its fork arms with one hand while loosening the screws (4), Fig. 4 on each side of the wedge, with the other hand. Alternately, enlist the assistance of a second person for this purpose.

Look up the latitude of your observing location. (Most road maps show lines of latitude.) Then, keeping the precautionary note above in mind, loosen the screws (4), Fig. 4, on each side of the wedge, and move the telescope in latitude angle until the hex-head screw reads the latitude of your observing location.

Fig.14: Optional LX10 Electric Declination Motor.

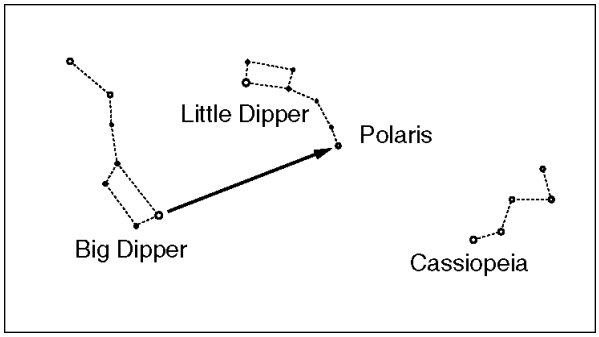


Fig.15: Locating Polaris.

b. **Rotating the telescope-and-wedge as a unit on the tripod head until the telescope's polar axis (17),Fig.1, points due-north.**

Locating due-north by using Polaris, the North Star, is adequate for the purposes discussed here. Polaris can be found in relation to the Big Dipper by projecting a line from the so-called "pointer stars" of the Big Dipper, as shown in Fig. 15.

To rotate the telescope-and-wedge, loosen *slightly* the manual knob (6), Fig. 4; the telescope-and-wedge may then be rotated on top of the field tripod head. Note the telescope's polar axis, as shown in (17, Fig. 1).

Rotate the telescope-and-wedge until the telescope's polar axis points due-north; then re-tighten the manual knob (6, Fig. 4).

With (a) and (b) accomplished the telescope is sufficiently well polar aligned for all visual observing purposes, as well as for photography of the Moon and planets. Long-exposure astrophotography requires more precise polar alignment, a subject discussed in the section "Precise Polar Alignment," below.

With the level of pointing accuracy obtained by the above procedure the telescope's motor drive will accurately track and keep objects in the telescope's field of view for perhaps 20 to 30 minutes.

Once the latitude angle of the equatorial wedge has been set you will not need to realign the latitude angle of the equatorial wedge unless you move to a new observing site that is a considerable distance in latitude away from your original observing site; 70 miles of movement north or south is equivalent to only one degree in latitude change. Removing the equatorial wedge from the tripod will not affect the latitude setting.

After your have polar aligned your telescope for the first time, take a moment to check the calibration of the Declination setting circles (8, Fig. 1). This is accomplished by following these steps:

a. Center Polaris in the telescope's field of view.

b. Slightly loosen the central hub of each of the Declination setting circles. (One circle is on each fork arm.)

c. Use your finger to turn each setting circle until the dial reads 89.2° — the Declination of Polaris; then re-tighten the central hubs of each circle without moving the circle. The Declination setting circles are now calibrated.

3. Precise Polar Alignment

Precise polar alignment is essential for long-exposure astrophotography (typically defined as photo-exposures of 10 minutes or longer). Fewer tracking corrections are required during the duration of the exposure when the telescope is precisely polar aligned.

Precise polar alignment requires the use of a crosshair eyepiece — such as the Meade Illuminated Reticle Eyepiece — and a 2X Barlow lens for increased magnification (see **OPTIONAL ACCESSORIES**, page 15).

The method for precise polar alignment—commonly referred to as the “drift” method—is as follows:

a. Obtain a rough polar alignment as described above. Once approximate alignment has been accomplished, insert the 2x Barlow lens and the illuminated reticle eyepiece into the telescope’s eyepiece holder.

b. With the motor drive running, point the telescope 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° in Dec of the celestial equator. Pointing the telescope at a star that is straight up, and then moving the telescope in Dec to read 0° Dec, will point the telescope to the correct position.

c. Disregarding the drift in R.A., note the star’s drift in Declination:

   1. If the star drifts South (or down), the telescope’s polar axis is pointing too far East (Fig. 16).
   2. If the star drifts North (or up), the telescope’s polar axis is pointing too far West (Fig. 17).

d. Move the wedge in azimuth (horizontal) to change the polar alignment. Reposition the 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.

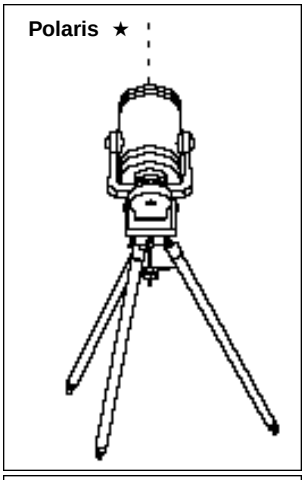


Fig.16: Telescope too far East

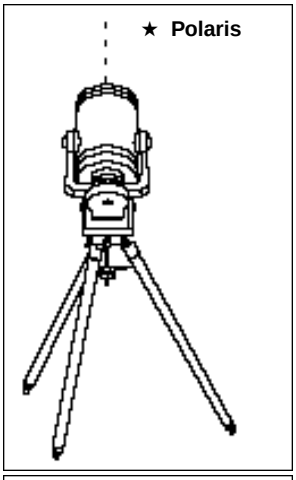


Fig.17: Telescope too far West

e. 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 (*i.e.,* still at about 0° Dec).

f. Once again, note the star’s drift in Declination:

   a. If the star drifts South (or down), the telescope’s polar axis is pointing too low (Fig. 18).
   b. If the star drifts North (or up), the telescope’s polar axis is pointing too high (Fig. 19).

g. Use the fine latitude adjustment on the equatorial wedge (7, Fig. 4) to change the latitude angle based on your observations above. Again, track the star for a period of time to verify that Declination drift has ceased.

After completing these procedures your telescope is precisely polar aligned, minimizing the need for tracking corrections during long-exposure astrophotography.

4. Locating Astronomical Objects

Now that your telescope is fully assembled and polar aligned, you are ready to begin observations.

Note that although the above assembly and polar alignment procedures may seem quite tedious—particularly if the LX10 is your first serious telescope—in fact, assembly and approximate polar alignment (accurate enough for visual observing) will quickly become routine. Once set, the latitude angle of the equatorial wedge need never be changed, unless you move your observing site a considerable distance in latitude, perhaps 150 miles or more.

For the beginning amateur astronomer, the simplest method of locating objects in the night sky—and an excellent way to learn how to operate your telescope—is to look at a celestial object you can clearly see with your own eyes.

Find the desired object in the viewfinder, center the object in the viewfinder’s crosshairs, then observe through the main telescope’s eyepiece and adjust the focus knob until the image is clear and sharp. With the motor drive turned on, observe how the telescope tracks, or follows, the object as it arcs across the sky. Turn the motor drive off for a few seconds, and note how rapidly the objects move through the field of view.

The position of celestial objects changes over the course of the year, so you should obtain a star chart—such as the Meade Star Charts, available from your Meade dealer—or refer to the monthly star charts presented in astronomy magazines, such as *Sky & Telescope* and *Astronomy.*

With these aids and with a little experience at the controls of the LX10, you will soon be exploring the surface of the Moon, the planets of our Solar System and the incredible assortment of star clusters, galaxies, and nebulae that lie beyond.

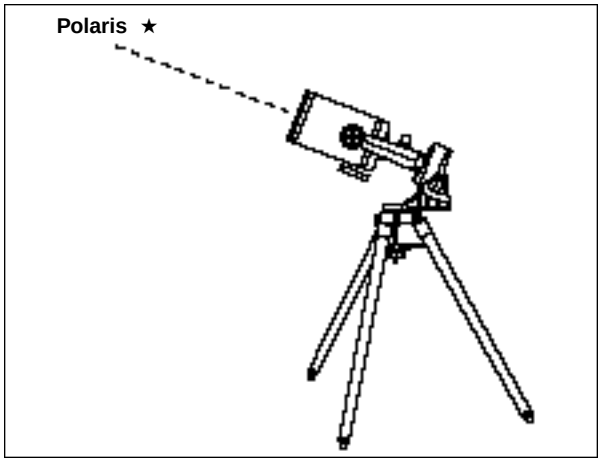


Fig.18: Telescope aligned too low

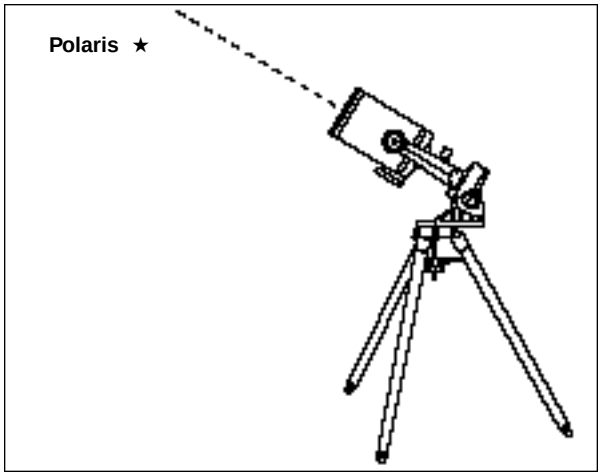


Fig.19: Telescope aligned too high

5. Setting Circles

Setting circles included with the LX10 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 (9, Fig. 1) is 8" in diameter. Declination circles (8, Fig. 1) 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 circle 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 two series of numbers running in opposite directions around the circumference of the R.A. circle). The *outer* series of numbers (increasing counterclockwise) applies to observers located in the Earth's Northern Hemisphere; the *inner* series of numbers (increasing clockwise) applies to observers located in the Earth's Southern Hemisphere.

To use the setting circles to locate an object not easily found by direct visual observation: 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 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 LX10 is about 0.5°. 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 (see **Precise Polar Alignment**, page 12).

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.

6. Observing Tips

To enjoy your LX10 to the fullest, follow these recommendations:

- Always let the telescope "cool down" to the outside temperature before attempting to make serious observations. After moving the telescope from a warm house, the telescope's optics need about 15 to 20 minutes to adjust to the outside temperature before they will perform well.
- Avoid setting up the telescope inside a room and observing through an open window (or worse, a closed window!). In such a case air currents caused by differences in indoor/outdoor temperatures make quality astronomical optical performance impossible.

Note: A practical exception to this rule is the case where your telescope is set up in a living room or den for observing an outdoor terrestrial scene or view through a closed window. At low powers (up to about 60X) the telescope will perform reasonably well in this application, but the observer should understand that the optical performance under these conditions cannot approach the performance that will be realized if the telescope were instead set up outside.

- As discussed in **Magnification** (page 9), avoid "over-powering" your telescope. If the astronomical or terrestrial image becomes fuzzy at high powers, drop down to a lower power. Image degradation at high powers is not due to any fault of the telescope but is caused by heat waves and turbulence in the Earth's atmosphere. Astronomical observations at high powers (above 200X) should be undertaken only when the atmosphere is very steady, as confirmed by an absence of "twinkling" in star images.
- Try not to touch the eyepiece when observing through the telescope. Vibrations in your hand are immediately transferred to the telescopic image.
- If you wear eyeglasses and do not suffer from astigmatism, take your glasses off when using the telescope; the telescope's magnification compensates for near- or far-sightedness. Observers with astigmatism should, however, wear their glasses, since the telescope cannot compensate for this eye defect.
- Allow your eyes to become "dark adapted" before attempting serious astronomical observations through the telescope. Night adaptation normally requires about 10 to 15 minutes.
- As you use your LX10 more and more for astronomical observing, you will find that you are seeing finer and finer detail—on the surface of Jupiter, for example. Observing through a fine optical instrument is to some degree an acquired skill. Celestial observing becomes increasingly rewarding as your eye becomes better trained in the detection of subtle variations of color, contrast, and resolution.

7. Using the LX10 for Astrophotography

As discussed earlier, the LX10 is well suited for the astrophotographer, facilitating both long-exposure guided photography or CCD imaging with its stable fork mounting, DC electronic worm-gear drive system, and hand controller.

Astrophotography of the Moon and planets with a 35mm SLR camera requires the optional #62 T-Adapter (Fig. 20).

Long-exposure, deep-space astrophotography of more than 5 or 10 minutes duration requires two telescope capabilities: (a) a means of monitoring the precise position of the object being photographed throughout the exposure, and (b) a means of changing the telescope position very slightly to keep the object in exactly the same position throughout the exposure.

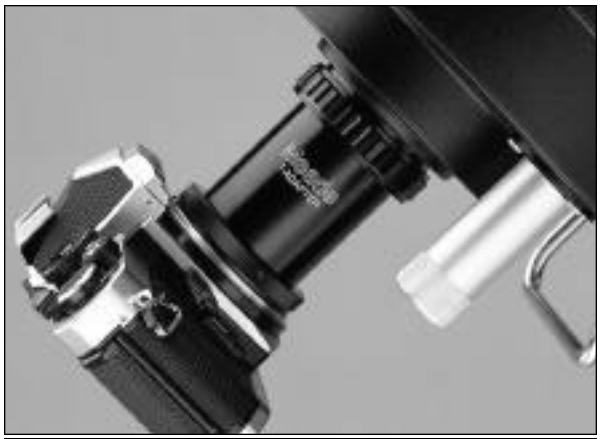


Fig.20: 35mm camera mounted to telescope with T-Adapter.

The Meade Off-Axis Guider and Illuminated Reticle Eyepiece, optional accessories fully described in the Meade General Catalog, fulfill the first requirement above. The LX10's standard-equipment hand controller, when equipped with the optional LX10 Electric Declination Motor, satisfies the second requirement. With the Electric Declination Motor attached, all four correction pushbuttons of the hand controller (N-S-E-W) are actuated, for precise dual-axis corrections during long-exposure astrophotography.

A few tips for basic astrophotography with the LX10:

- The LX10 must be precisely polar aligned, as discussed above.
- The tripod must be on a solid surface and the base of the equatorial wedge must be level.
- Always use a cable-operated shutter release. Using the shutter release on the camera body may cause the camera to vibrate and blur your photograph.
- Focus the image with extreme care. While observing the celestial object through the camera's viewfinder, turn the LX10's focus knob to achieve the sharpest possible focus, then open the camera's shutter to begin your exposure.
- For terrestrial photography with the LX10, be aware that long distance photography is best accomplished in the early morning hours before heat waves begin to rise from the Earth's surface, and distort your photograph.
- Astrophotography is an acquired skill; exercise patience and expect to waste a few rolls of film as you learn the techniques. The rewards of taking a quality astrophotograph, however, will make all your efforts worthwhile.

TERRESTRIAL OBSERVING

Although principally designed for astronomical observing, the LX10 makes an excellent terrestrial observing tool.

The telescope's controls are utilized in the same manner as for astronomical applications, but there are several significant differences in how you will locate and observe terrestrial subjects.

1. Image Orientation

The LX10's viewfinder presents an inverted image; what you see appears upside-down and reversed left-for-right.

With the standard-equipment diagonal prism and 25mm eyepiece in place in the main telescope, terrestrial images will appear right-side-up, but reversed left-for-right. This orientation is usually acceptable for terrestrial observing, except in the case of reading a distant sign or automobile license plate, for example.

Terrestrial image orientation can be fully corrected with the optional Meade #928 45° Erect-Image Diagonal Prism (see **OPTIONAL ACCESSORIES**, opposite).

OPTIONAL ACCESSORIES

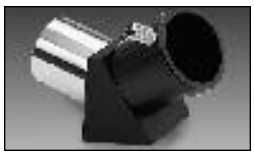
A wide assortment of professional Meade accessories is available for the 8" LX10 telescope. The premium quality of these accessories is well-suited to the quality of the instrument itself. **Consult the Meade General Catalog for complete details on these, and other, accessories.**

Meade Series 4000 Eyepieces:*

Eyepiece	Magnifying Power	With #140 2x Barlow Lens
Super Plössl (4-elements)		
SP 6.4mm	313X	626X
SP 9.7mm	206X	412X
SP 12.4mm	161X	322X
SP 15mm	133X	266X
SP 20mm	100X	200X
SP 26mm	77X	154X
SP 32mm	63X	126X
SP 40mm	50X	100X
SP 56mm	36X	72X
Super Wide Angle (6-elements)		
SWA 13.8 mm	145X	290X
SWA 18mm	111X	222X
SWA 24.5mm	82X	164X
SWA 32mm	63X	126X
SWA 40mm	50X	100X
Ultra Wide Angle (8-elements)		
UWA 4.7mm	426X	852X
UWA 6.7mm	299X	598X
UWA 8.8mm	227X	454X
UWA 14mm	143X	286X

* Refer to **Magnification** (page 9) to determine which optional eyepieces are best-suited to your applications and how to avoid "overpowering" the telescope.

#140 2x Barlow Lens: An amplifying lens, the #140 2x Barlow doubles the power of all eyepieces with which it is used. Insert the #140 into the telescope's eyepiece-holder first, followed by the diagonal prism and eyepiece.



#928 45° Erect-Image Diagonal Prism: Primarily used for terrestrial viewing, this prism presents a correctly-oriented image at a comfortable 45° viewing angle.

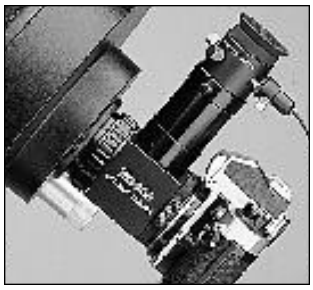
Illuminated Reticle Eyepieces: Meade Illuminated Reticle Eyepieces are used for precise polar alignment of your telescope and, during long-exposure astrophotography, in conjunction with the optional Meade Off-Axis Guider, for through-the-telescope monitoring of the object being photographed while the camera's shutter is open. Two optical designs are available: Series 4000 Plössl 9mm or Modified Achromatic 12mm.

LX10 Field Tripod: The fixed-height LX10 Field Tripod permits an extremely rigid observing platform for the telescope, even at high magnifications. The 32" height is convenient for standing observations. For field use the tripod collapses for easy transport.

LX10 Electric Declination Motor: During long-exposure astrophotography the observer must correct for minor changes in telescope position, in order that the telescope remains precisely pointed at the object being photographed. The standard-equipment LX10 hand controller permits these corrections in Right Ascension; for correction in Declination the optional LX10 Electric Declination Motor plugs into the telescope's control panel and includes a reduction gear system that results in 2x Declination slow-motion speed. The electric Declination Motor attaches in a few minutes to the telescope and may remain permanently affixed thereafter.

Magellan Telescope Computer System: Attached to the 8" LX10 telescope, the Magellan Telescope Computer permits the quick (10 to 15 second) location of any object in the sky from its catalogued coordinates, or call up any of more than 12,000 sky objects in Magellan's database. Specify Model #2014 Magellan for the 8" LX10.

#62 T-Adapter: The T-Adapter is the basic means of prime-focus photography through all Meade Schmidt-Cassegrain models. Thread the T-Adapter on to the rear cell of your telescope, followed by a T-Mount for your 35mm camera, and the camera body is thereby rigidly coupled to the telescope.



Off-Axis Guider: The Off-Axis Guider provides a means during long-exposure astrophotography for the photographer to monitor the tracking of the telescope, to assure that the telescope remains precisely positioned on the object being photographed. Like the T-Adapter, the Off-Axis Guider couples the camera body to the telescope but it also causes a small amount of the guidestar's incoming light to be diverted at a right angle, where the star's position can be examined for tracking errors with an illuminated reticle eyepiece; position corrections can then be effected using the telescope's keypad hand controller.

#541 AC Adapter: The optional #541 AC Adapter permits powering of the telescope via a standard household (115v.AC) electrical outlet. Requires #607 Power Cord.

#607 Power Cord: Powering the LX10 telescope by means of an automobile cigarette lighter plug requires the #607 Power Cord. With this 25 ft. cord the LX10 may be powered for a full night's observing without risk of car-battery drain.

TELESCOPE MAINTENANCE AND SERVICING

1. General Maintenance

The LX10 is a precision optical instrument designed to yield a lifetime of rewarding applications. Given the care and respect due any precision instrument, the LX10 will rarely, if ever, require factory servicing. Maintenance guidelines include:

a. Avoid cleaning the telescope's optics: a little dust on the front surface of the telescope's correcting lens causes virtually no degradation of image quality and should not be considered reason to clean the lens.

b. When absolutely necessary, dust on the front lens should be removed with gentle strokes of a camel hair brush or blown off with an ear syringe (available at any pharmacy). DO NOT use a commercial photographic lens cleaner.

c. Organic materials (*e.g.,* fingerprints) on the front lens may be removed with a solution of 3 parts distilled water to 1 part isopropyl alcohol. You may also add 1 drop of biodegradable dishwashing soap per pint of solution. Use soft, white facial tissues and make short, gentle strokes. Change tissues often.

CAUTION: Do not use scented or lotioned tissues or damage could result to the optics.

d. **Do not, for any reason, 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 will result.Meade Instruments assumes no liability for damage incurred to the telescope in this way.**

e. If the LX10 is used outdoors on a humid night, water condensation on the telescope surfaces will probably result. While such condensation does not normally cause any damage to the telescope, it is recommended that the entire telescope be wiped down with a dry cloth before the telescope is packed away. Do not, however, wipe any of the optical surfaces. Rather, simply allow the telescope to sit for some time in the warm indoor air, so that the wet optical surfaces can dry unattended.

f. If the LX10 is not to be used for an extended period, perhaps for one month or more, it is advisable to remove the batteries from inside the control panel. Batteries left in the power panel for prolonged periods may leak, causing damage to the telescope's electronic circuitry.

g. Do not leave the LX10 inside a sealed car on a warm summer day; excessive ambient temperatures can damage the telescope's internal lubrication and electronic circuitry.

h. A set of four hex wrenches is provided with the LX10 in the following sizes: 1/16", 5/64", 3/32", and 5/32".

2. Collimation

The optical collimation (alignment) of any astronomical telescope used for serious purposes is important, but in the case of the Schmidt-Cassegrain design of the 8" LX10, such collimation is absolutely essential for good performance. Take special care to read and understand this section well so that your LX10 will give you the best optical performance.

As part of final optical testing, every Meade Schmidt-Cassegrain is precisely collimated at the Meade factory before shipment; however, vibrations in shipping can cause the optical system to become misaligned. Re-aligning the optics is, however, a straightforward process.

To check the collimation of your LX10, center a bright star that is overhead, or use a "hot spot" of reflected sunlight from a chrome car bumper, with the supplied 25mm eyepiece. Allow

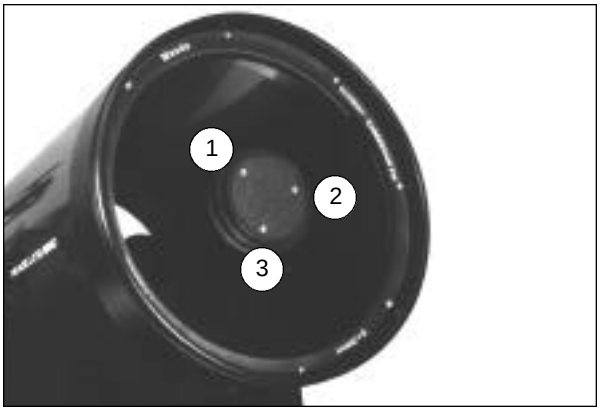


Fig.21: (1), (2), (3) set screws for adjusting collimation.

the telescope to adjust to the temperature of your observation site before proceeding; temperature differences between the optics and the outside air can cause distortion in the images.

With the star or hot spot centered, de-focus the image. You will notice that the out of focus star image looks like a ring of light surrounding a dark central spot; the dark central spot is in fact the shadow of the secondary mirror. Turn the focus knob until the ring of light fills about 10% of the eyepiece field-diameter. If the dark central spot is offset in (*i.e.,* not concentric with) the ring of light, your telescope's optical system is misaligned and requires collimation.

Follow these steps for collimation of the optical system:

a. The only adjustments possible, or necessary, on the LX10 are from the three set screws (Fig. 21) located at the edge of the outer surface of the secondary mirror housing.

CAUTION: Do not force the three collimation screws past their normal travel and do not loosen them more than two full turns in a counterclockwise direction or the secondary mirror may come loose from its support. You will find that the adjustments are very sensitive, usually requiring only one-half turn or less to produce the desired result.

b. While looking at the defocused star image, notice which direction the darker shadow is offset in the ring of light or notice which part of the ring is the thinnest (1, Fig. 22). Place your index finger in front of the telescope so that it touches one of the collimation set screws. You will see the shadow of your finger in the ring of light. Move your finger around the edge of the black plastic secondary mirror support until you see the shadow of the finger crossing the thinnest part of the ring of light. At this point, look at the front of the telescope where your finger is aiming. It will either be pointing directly at a set screw, or it will be between two set screws aiming at the set screw on the far side of the black plastic secondary mirror support. This is the set screw that you will adjust.

c. Using the slow-motion controls, move the defocused image to the edge of the eyepiece field of view (2, Fig. 22), in the same direction as the darker shadow is offset in the ring of light.

d. Turn the set screw that you found with the pointing exercise while looking in the eyepiece. You will notice that the star image will move across the field. If while turning the defocused star image flies out of the eyepiece field, then you are turning the screw the wrong way. Turn the opposite direction and bring the image back to the center of the field.

e. If the screw you are turning becomes very loose, tighten the other two screws by even amounts. If the screw you are turning gets too tight, unthread the other two by even amounts.

f. When you bring the image to center (3, Fig. 22), carefully examine the evenness of the ring of light (concentricity). If you find that the dark center is still off in the same direction, continue to make the adjustment in the original turning direction. If it is now off in the opposite direction, you have turned too far and you need to turn in the opposite direction. Always double check the image in the center of the field of the eyepiece.

g. You may find after your initial adjustment that the dark center is off in a new direction (*e.g.,* instead of being off side-to-side it is now off in an up-and-down direction). In this case repeat steps b through f to find the new adjustment screw.

h. Now try a higher power eyepiece (*e.g.,* 9mm or less) and repeat the above tests. Any lack of collimation at this point will require only very slight adjustments of the three set screws. You now have good collimation of the optics.

i. As a final check on alignment, examine the star image in focus with the higher power eyepiece as suggested above, under good viewing conditions. The star point should appear as a small central dot (commonly referred to as an "Airy disc") with a diffraction ring surrounding it. To give a final precision collimation, make extremely slight adjustments of the three set screws, if necessary, to center the Airy disc in the diffraction ring. You now have the best alignment of the optics possible with this telescope.

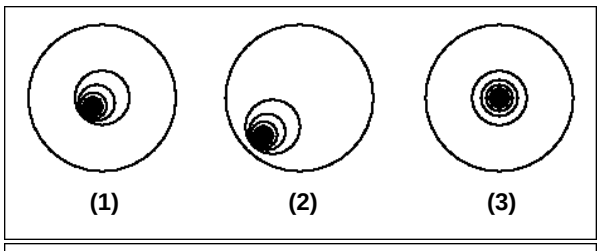


Fig.22: Defocused star images.

3. Inspecting the Optics

A Note About the "Flashlight Test: If a flashlight or other high-intensity light source is pointed down the main telescope tube, the view (depending upon the observer's line of sight and the angle of the light) may reveal what appears to be scratches, dark or bright spots, or just generally uneven coatings, giving the appearance of poor quality optics. These effects are only seen when a high intensity light is transmitted through lenses or reflected off the mirrors, and can be seen on any high quality optical system, including giant research telescopes.

The optical quality of a telescope cannot be judged by the "flashlight" test; the true test of optical quality can only be conducted through careful star testing.

4. Adjusting the Right Ascension Lock

After a period of time, the R.A. lock (3, Fig. 8) may 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 supplied hex wrenches. Then, using a standard pair of pliers, tighten the shaft protruding outward from the drive base until you cannot easily rotate the fork arm in R.A., taking care not to scratch the finish of the telescope mounting. Replace the R.A. lock lever so that its handle points straight out from the crossbar connecting the fork arm.

5. Adjusting the Declination Lock

Continual use of the Declination lock (1, Fig. 10) may cause this lock to loosen. To retighten the lock, first turn the manual Declination slow-motion knob (2, Fig. 8) so that the Declination tangent arm (located inside the left-hand fork mount arm) is about in the middle of its travel. Put the Declination lock lever in the "unlocked" position (toward the eyepiece), and insert a

1/8" hex wrench into the notched-out section of the left-hand fork arm. Tighten the hex-head nut located just inside the notch.

CAUTION:In most instances only *one turn* of this hex-head nut is required to fully retighten the Declination lock.

6. Gauging the Movement of the Telescope

A common complaint of many first-time telescope owners is that they cannot see the telescope "move" when the motor drive is engaged. If fact, when the batteries are installed, the power is on and the R.A. lock engaged, the telescope is moving. However, the movement is at the same speed as the hour hand of a 24-hour clock; as such, the movement is difficult to discern visually.

To check the movement of your telescope, look at an astronomical object through the telescope's eyepiece with the telescope polar aligned and with the motor drive on. If the object remains stationary in the field of view, your telescope is operating properly. If not, check to ensure that you have engaged the R.A. lock and that the power switch on the control panel is on. If the telescope is still not tracking, replace the batteries.

7. Storage and Transport

When not in use, store your LX10 in a cool, dry place. Do not expose the instrument to excessive heat or moisture. In addition when the LX10 is to be stored for more than one month, remove the 4 AA-size batteries from the power panel; battery leakage may damage the telescope's electronic system.

When transporting the telescope, take care not to bump or drop the instrument; this type of abuse can cause the optical system to misalign or cause damage to the electronic components.

8. Meade Customer Service

If you have a question concerning your LX10 telescope, call Meade Instruments Customer Service Department at (949) 451-1450, or fax at (949) 451-1460. Customer Service hours are 8:30AM to 4:30PM, Pacific Time, Monday through Friday. In the unlikely event that your LX10 requires factory servicing or repairs, **write or call the Meade Customer Service Department first,before returning the telescope to the factory**, giving full particulars as to the nature of the problem, as well as your name, address, and daytime telephone number. The great majority of servicing issues can be resolved by telephone, avoiding return of the telescope to the factory.

9. Specifications: 8" LX10Schmidt-Cassegrain Telescope

Optical design . . . . . .Schmidt-Cassegrain
Clear aperture . . . . . .203mm (8")
Primary Mirror Diameter . . . . . .209.6mm (8.25")
Focal length 2000mm
Focal ratio (photographic speed) f/10.0
Near focus . . . . . .25 ft
Resolving power . . . . . .0.56 arc secs
Super multi-coatings . . . . . .standard
Limiting visual stellar magnitude 14.0
Limiting Photographic magnitude (approx) 16.5
Image Scale (degrees/inch) 0.72
Maximum practical visual power 500X
35mm Angular Film Coverage . . . . . .0.68° x 0.97°
Optical tube dimensions . . . . . .9.1" x 16"
Secondary mirror obstruction . . . . . .3.0" - 14.1%
Telescope mounting . . . . . .fork type; double tine
Setting Circle Diameters . . . . . .Dec.: 4"; R.A.:8"
RAMotor Drive System . . . . .Sidereal Rate, DC Servo Motor
Reduction Gear . . . . . .5.75" dia. LX worm gear
Input Power . . .6.0 vDC (batteries), or 12vDC (auto adapter)
Batteries . . . . . .4 x AA-size or 1 x 9v
Hemispheres of operation . . . . . .north and south, switchable
Declination Control System .Manual micrometric tangent arm
Bearings . . . . . .Dec: Nylon; R.A.: ball bearings
Slow-Motion Controls . . . . . .Manual, R.A. and Dec.
Hand Controller . . . . . .2x Sidereal in R.A. (standard)
. . . . . .2x Dec speed (optional)
Materials:
Tube body . . . . . .aluminum
Mounting . . . . . .aluminum
Primary and secondary mirror . . . . . .Pyrex® glass
Correcting lens . . . . . .Clear float glass
Telescope dimensions . . . . . .9.25" x 14" x 23"
Telescope (incl. tripod) net weight . . . . . .49 lbs.
Heaviest Sub-section for Field Assembly . . . . . .26 lbs.
Telescope shipping weight(incl. tripod) . . . . . .74 lbs.
Equatorial Wedge Latitude Range . . . . . .15° - 64°
Field Tripod Height (optional) . . . . . .32"

Meade Instruments Corporation

World's leading manufacturer of astronomical telescopes for the serious amateur.

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