

# OPERATION MANUAL

## MEADE 12" LX200 SCT

Summer 2000

Location

N 45° 34' 31" (34.521')

W 94° 23' 46" (23.785')

= 06<sup>h</sup> 17<sup>m</sup> 35<sup>s</sup>

Garmin 92 GPS 8/6/00

## Accessories

### Visual Backs

#### 1.25" Schmidt-Cassegrain Visual Back

Threads directly to the back of Meade SC telescopes. Accepts 1.25" eyepieces and accessories.  
One thumb set screw.

Required for eyepiece-projection photography with a tele-extender.

Orion, 1997. List \$50 #15048 \$39.50 (2.98)

#### 2" Schmidt-Cassegrain Visual Back

Threads directly to the back of Meade SC telescopes. Accepts 2" eyepieces and accessories.  
Two thumb set screws.

Orion, 1997. List \$45 #5272 \$26.95 (2.43)

### Eyepiece Adaptors

#### 2"-to-1.25" Adapter

Converts any 2" focuser, star diagonal, or holder for 1.25" eyepieces and accessories.

Orion, 1997. List \$36.95 #8768 \$19.95 (2.43)

### Electric Focus Control

#### MOTOFOCUS

Plug in style electric focuser. Attaches over focus knob with a nylon thumb screw. Controlled by the Keypad Hand Controller when plugged into the Power Panel or by a separate hand control into which it may be plugged. Variable speed control on motor unit and/or through Keypad Hand Controller. For Meade LX5, LX6 by Jim's Mobile Inc.

Orion, 1997. #2386 \$124 (3.95)

### Eyepieces (1.25" O.D.)

35mm	87x	34'	0.56°	(49°)	Celestron	Ultima Series
28mm	109x	25'	0.41°	Or (45°)	Meade	Research Grade
26mm	117x	25'	0.43°	Plossl (50°)	Meade	Series 4000
26mm	117x	26'	0.44°	Super Plossl (52°)	Meade	Series 4000
20mm	152x	22'	0.36°	WA	Meade	Research Grade

# Stars for Precision Initialization

8/2/99, 3/9/00, 4/9/00, 5-27-01, 6-17-01

Set LX200 clock  $\pm 5$  sec of CST. Make the last focus adjustment so that  the star shifts to upper right (cw)  the star shifts to lower left (ccw).

Initialize keypad with an alignment star as usual. Read the sidereal time (Mode 3). Enter SAO number of star with RA closest to the sidereal time from Table 1. Press ENTER. Press GOTO. Center the star in the eyepiece. Return to POLAR and select by pressing ENTER. Enter SAO number again. Press and Hold ENTER until keypad beeps. Pressing MODE at any time terminates polar sequence.

Table 1. Stars within  $5^\circ$  of the Celestial Equator

RA	SAO	Star	V	Notes	RA	SAO	Star	V	Notes	
05 59	113 321	60 Ori	5.3		30	121 658	$\lambda$ Oph	3.8	dbl sep 1.5"	
06 24	113 810	8 Mon	4.3		36	141 269	12 Oph	5.8		
48	114 428	18 Mon	4.7		47	121 865	45 Her	5.2		
07 12	134 330	$\delta$ Mon	4.2	$\delta?$ *80	17 01	141 483	30 Oph	4.8	dbl sep 1"	
39	115 756	Procyon	0.3v			16	141 586	41 Oph		4.7
					26	122 387	$\sigma$ Oph	4.3		
08 01	135 380	28 Mon	4.7		43	122 671	$\beta$ Oph	2.8	dbl	
26	135 916	2 Hya	5.6		18 01	123 035	68 Oph	4.5		
43	117 050	$\eta$ Hya	4.3		21	142 241	$\eta$ Ser	3.3		
09 14	117 527	$\theta$ Hya	3.9		30	142 348	60 Ser	5.4	dbl	
40	137 035	$\iota$ Hya	3.9		45	123 879	4 Aql	5.0		
					57	142 838	$\eta$ Sct	4.8		
10 08	137 366	$\alpha$ Sex	4.5		19 14	124 408	21 Aql	5.2	dbl	
30	137 608	$\beta$ Sex	5.1		25	124 603	$\delta$ Aql	3.4		
11 00	118 610	58 Leo	4.9		37	143 597	$\iota$ Aql	4.4		
14	118 731	69 Leo	5.5		52	125 159	$\eta$ Aql	4.3	dbl	
24	118 831	79 Leo	5.4		20 11	144 150	$\theta$ Aql	3.2		
37	138 298	$\nu$ Leo	4.3		38	144 649	71 Aql	4.3		
51	119 076	$\beta$ Vir	3.6		59	126 428	$\epsilon$ Equ	5.2	dbl	
12 20	138 721	$\eta$ Vir	3.9	$6^m * 20' W$	21 16	126 662	$\alpha$ Equ	3.9		
41	138 917	$\gamma$ Vir	3.5	dbl sep 3"	39	126 965	25 Aqr	5.1		
55	119 674	$\delta$ Vir	3.4							
13 17	119 855	$\sigma$ Vir	4.8		22 06	145 862	$\alpha$ Aqr	2.9	dbl	
35	139 420	$\zeta$ Vir	3.4		22	146 044	$\gamma$ Aqr	3.8		
55	139 613	90 Vir	5.2		35	146 181	$\eta$ Aqr	4.0		
14 01	120 238	$\tau$ Vir	4.3	dbl sep 80" $8^m * 11' N$	23 00	127 881	2 Psc	5.4	with 9 Psc	
19	139 866	$\nu$ Vir	4.3			17	128 085	$\gamma$ Psc		3.7
46	120 648	109Vir	3.7			27	128 186	$\kappa$ Psc		5.0
15 03	120 809	110Vir	4.4		42	128 336	$\lambda$ Psc	4.5		
28	121 020	10 Ser	5.2		59	128 513	$\omega$ Psc	4.0		
50	121 215	$\omega$ Ser	5.2							
16 14	141 052	$\delta$ Oph	2.7							
22	121 540	$\sigma$ Ser	4.8							

The Meade database contains SAO stars brighter than 7<sup>th</sup> magnitude from the catalogue. It is accessed through the keypad STAR key, which contains a menu of three options: 351 Meade alignment STARS, 33 stars by NAME, and 15,928 stars from the SAO.

**To select the SAO database** for the STAR key:

Press STAR  
Press ENTER to obtain menu: STAR, NAME, SAO.  
Move arrow to SAO with NEXT key  
Press ENTER to select SAO database  
Press MODE to enter SAO digits  
Press ENTER to obtain SAO star.

**To use SAO star numbers**

Press STAR  
Enter SAO digits  
Press ENTER

**Caution:**

Since there is a discrepancy between the SAO star magnitudes and those commonly listed in other catalogues, stars near the limiting magnitude of 7.0 may not be in the Meade database.

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### Set Clock (Mode 3)

Press and hold ENTER  
(get beep & blinking cursor)  
Enter time digits over cursor  
(use PREV or NEXT key to correct or skip)  
Press ENTER to start clock  
Press MODE to exit

## Eyepieces with 12-inch f/10 SCT

p.47

Focal Len. (App. Field)	Power	True Field	Dbl. Res.	Type	Notes
35mm (49°)	85x	34'	7"	5-el	Celestron Ultima FMC threaded
1-1/8 (45°)	105x	26'	6"	OR	Edmund Scientific (28.6mm)
28mm (45°)	110x	24'	5.5"	OR	Meade Research MC
26.6mm (45°)	115x	23'	5"	OR	Cave Optical Co.
26mm (52°)	115x	26'	5"	SPL	Meade S4000 MC
20mm (60°)	150x	24'	4"	WA	Meade S4000 MC
16.3mm (45°)	185x	14'	3"		Galoc EL-16
12.5mm (50°)	245x	12'	2.5"	PL	Orion MC ill. ret., sep 14", two SR-44
12mm (40°)	254x	8'	2.5"	MA	Meade ill. ret.

Low

Medium

High

Abbr.	Type (App. Field)	Crit Apert.	Eye relief
PL	Plossl (50°)	f / 6	~75% focal length
SPL	Super Plossl (52°)	f / 6	~75% focal length
OR	orthoscopic (45°)	f / 4.5	~80% focal length
WA	wide angle (>55°)		
MA	modified achromat		

All About ... Sam Brown, p.13

C	coated,	at least one air-glass surface
FC	fully coated,	all air-glass surfaces single coated with magnesium fluoride
MC	multi-coated,	at least one air-glass surface multi-coated, others likely single, or none
FMC	fully multi-coated,	all air-glass surfaces

For double star apparent separation of 10 arcmin:

$$\theta = \alpha / M \quad (\text{true field} = \text{apparent field} / \text{magnification})$$

$$\begin{aligned} \text{magnification} &= 600'' / \text{sep}'' \\ \text{eyepiece (mm)} &= 5 \times \text{sep}'' \quad @ \text{ f/10 (F = 3048 mm)} \\ &= 3.2 \times \text{sep}'' \quad @ \text{ f/63 (F = 1920 mm)} \end{aligned}$$

## Eyepieces with 12-inch f/10 SCT

p.47

Focal Length	Power	True Field	Dbl. Res.	Type	App. Field	Notes
						<u>Low Power</u>
<b>35mm</b>	<b>85x</b> 55x	<b>34'</b>	<b>7"</b> 53"	5-el	49°	Celestron Ultima FMC threaded
1-1/8	105x 67x	26' 40"	6"	OR	45°	Edmund Scientific (28.6mm)
28mm	110x 68x		24'	5.5"	OR	45° Meade Research Grade MC
26.6mm	115x 72x		23'	5"	OR	45° Cave Optical Co.
26mm	115x 74x		26'	5"	SPI	52° Mead Series 4000 MC
						<u>Medium Power</u>
<b>20mm</b>	<b>150x</b> 96x		<b>24'</b>	<b>4"</b>	WA	60° Meade S4000 Series MC
16.3mm	185x 118x		14'	3"		45° Galoc EL-16
						<u>High Power</u>
<b>12.5mm</b>	<b>245x</b>		<b>12'</b>	<b>2.5"</b>	PI	50° Orion MC ill. ret., sep 14", two SR-44
12mm	154x 254x 160x		19" 8' 15"	2.5"	MA	40° Meade

PI	Plossl (50°)	critical aperture f/6	eye relief ~75% f
SPI	Super Plossl (52°)	critical aperture f/6	eye relief ~75% f
OR	orthoscopic (45°)	critical aperture f/4.5	eye relief ~80% f
WA	wide angle (>55°)		
MA	modified achromat		

All About ... Sam Brown, p.13

C	coated, at least one air-glass surface
FC	fully coated, all air-glass surfaces single coated with magnesium fluoride
MC	multi-coated, at least one air-glass surface multi-coated, others likely single, or none
FMC	fully multi-coated, all air-glass surfaces

$$\theta = \alpha / M \quad (\text{true field} = \text{apparent field} / \text{magnification})$$

$M = 600'' / \text{sep}''$       Magnification (M) required for an apparent separation of 10 arcmin for double stars:

Eyepiece focal length = 5 x sep''	at f / 10	F = 3048 mm
= 3.2 x sep''	at f / 6.3	F = 1920 mm

Mfg.	Foc. Len.	Power		FOV		Dbl. Res.		Remarks:
		f/10	f/6.3	f/10	f/6.3	f/10	f/6.3	
Celestron	35mm	85x	55x	34'	54'	5.5"	9"	Celestron Ultima FMC threaded
Ed Sci	1-1/8 in	105x	67x	26'	40'	4.5"	7"	Edmund Scientific
Meade	28mm	110x	70x	24'	39'	4.5"	7"	Meade Research MC
Cave Opt.	26.6mm	115x	75x	23'	36'	4"	6.5"	Cave Optical Co.
Meade	26mm	115x	75x	26'	48'	4"	6.5"	Meade S4000 MC
Meade	20mm	150x	95x	24'	38'	2.5"	5"	Meade S4000 MC
Galoc	16.3mm	185x	118x	14'	23'	2"	3"	Galoc EL-16
Orion	12.5mm	245x	154x	12'	19'	1.5"	2.5"	Orion MC ill. ret., sep 14", two SR-44 bat.
Meade	12mm	254x	160x	8'	15'	1.5"	3"	Meade ill. ret.

Eyepiece (App. Field)	Mfg.	SCT f/10		SCT f / 6.3		12.2" Newt. f / 6		Remarks			
		Mag.	FOV	Res.	Mag.	FOV	Res.		Power	FOV	Res.
35mm(49°)	Celestron	85x	34'	5.5"	55x	54'	9"	55x	54'	9"	Ultima Series, 5-elt. FMC critical aperture 4.5
1-1/8	Ed Sci	105x	26'	4.5"	67x	40"	7"				
28mm	Meade	110x	24'	4.5"							
26.6mm(45°)	Cave Opt.	115x	23'	4"	75x	36'	6.5"	72x	38'	7"	

## E. THE LX200 KEYPAD HAND CONTROLLER

Within a few minutes of powering up the LX200 the Keypad becomes warm, which is normal for the system. The electronics utilize a heat sink as a means to provide the right operating environment temperature for the LCD display even in sub-zero weather. Keep the Keypad in a warm area to allow immediate proper display performance.

The LX200 Keypad button as described as follows:

### 1. ENTER Key

The ENTER key (1, Fig. 6) is used to select a menu file, a file option, or to edit a value.

- a. To select a file or an option, press and release the ENTER key.  
The LX200 will give a short beep tone and perform the requested action.
- b. To edit a value, press and hold the ENTER key until a double beep tone is heard and a blinking cursor appears in the display.

## LX200 KEYPAD HAND CONTROLLER

p. 26 #4

ALT LED light is only visible when entering numerical data

p. 26 #5

speed indicator LED's illuminate to show chose slew rate (SLEW, FIND, CNTR, GUIDE)

## MODES

1. TELESCOPE / OBJECT LIBRARY
2. COORDINATES / GOTO
3. CLOCK / CALENDAR
4. TIMER / FREQUENCY
5. KEYPAD OFF / BRIGHTNESS ADJUST

**Mode 1: TELESCOPE / OBJECT LIBRARY**

**Mode 2: COORDINATES / GOTO**

**COORDINATES**

Displays RA and Dec. of current pointing position.

- Press ENTER to toggle between polar and alt-az coordinates.
- Press MODE to exit.

**GOTO**

Press GOTO to enter a new pointing position.

- Enter new coordinates over blinking cursor. Use E and W keys to move cursor.
- Press ENTER to slew to the new coordinates.

**Mode 3: CLOCK / CALENDAR**

**CLOCK**

Displays both the current clock and sidereal times.

To set the clock

- To stop the clock Press-and-Hold ENTER
- Enter time digits over blinking cursor
- Press ENTER to synchronize clock with time signal.
- Press MODE to exit

**CALENDAR**

**Mode 4: TIMER / FREQ**

p.44-45

**Mode 5: KEYPAD OFF / BRIGHTNESS ADJUST**

**Objectives**

1. Polar align the telescope using the equatorial wedge adjustment knobs.
2. Synchronize TELESCOPE with LIBRARY functions.

- Insert guide eyepiece.
  
  - With power off, position the telescope:
    - ☞ Set DEC = 90°. (slow-motion knob may be used only when power is off.)
    - ☞ set H.A. = 00 by rotating fork arms
  
  - Switch power on.
    - Keypad LED's blink four times.
  
  - In TELESCOPE mode move to POLAR option and press ENTER.
    - Keypad responds with a beep.
  
    - Press ENTER again.
      - Telescope will slew to the precise off-set of Polaris.
      - ☞ Center Polaris using the wedge.
  
    - Press ENTER
      - The telescope will slew to an alignment star.
      - ☞ Center the star using the keypad.
  
    - Press ENTER to complete the initialization.
      - Keypad returns to TELESCOPE / LIBRARY mode.
  
  - Telescope is now polar aligned.
    - All keypad functions are available.
-

**Objective**

Refine polar alignment using a variation of the POLAR option.

- Initialize telescope with keypad as usual.
- In TELESCOPE mode move to POLAR option

Press ENTER

Keypad responds with a beep.

Ignore the keypad instruction to set telescope.

Press GOTO

Telescope will point to Polaris.

☞ Use the wedge to center Polaris.

Press ENTER (do not hold)

Telescope will choose and point to an alignment star.

☞ Use keypad to center the star.

- Press ENTER (do not hold)  
To complete alignment routine.  
Keypad returns to TELESCOPE / LIBRARY mode.

Each repetition more accurately polar aligns the telescope.  
Repeat procedure in 15-minute intervals to obtain desired accuracy.

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**Notes**

1. To move star right in field, turn East Azimuth Screw counter clockwise.

**Objective**

Initialize telescope with keypad to use the Object Library functions.

**Reference**

List of alignment stars with their Mead or SAO numbers.

**Equipment**

Orion 12.5mm illuminated reticle guide eyepiece

**Set Up**

- ❶ Align eyepiece reticle in N - S, E- W directions in the field.
- ❷ Set the telescope clock within 5 seconds of CST. (Mode 3).
- ❸ Choose an alignment star nearest the meridian.

**Procedure**

- Center the alignment star with the keypad controls.
- Select POLAR menu option and press ENTER
- Press STAR.
  1. Enter the alignment Star Number and press ENTER  
or
  2. Press ENTER to select name option.  
Scroll to star and press ENTER to select.
- Press and Hold ENTER  
until the display reads "coordinates matched."
- Press MODE  
to return to the Telescope / Library menu.

rev. 4-25-99, 5-9-99, 5-25-99, 6-12-99, 5-19-01

**Objective**

Change STAR key to accept SAO star catalogue numbers.

**Procedure**

- Press STAR. Press ENTER.
- Use Prev and Next keys to point to SAO.
- Press ENTER to select SAO.
- Press MODE to exit.

The STAR key now uses SAO star catalogue numbers.

Press CNGC



47	δ Ori	0°
56	Betelgeusse	+ 7°
67	Sirius	– 7°
78	Castor	+32°
80	Procyon	+ 5°
81	Pollux	+28°
95	α Hya	– 9°
100	Regulus	+12°
114	Denebola	+15°
905	Jupiter	
906	Saturn	

#### Notes

1. To *select* a file or an option means to press and release the Enter key. The LX200 will respond with a short beep tone and perform the action that you have requested (p.25).

2. Moving the LX200 Manually (p.25)

When the **Power is Off**, by unlocking the R.A. Lock the telescope may be turned rapidly through wide angles in right ascension. Fine adjustments are made by turning the R.A. slow motion control while the R.A. lock is in the “unlocked” position. **DO NOT ATTEMPT TO MOVE THE TELESCOPE MANUALLY IN R.A. WHEN THE R.A. LOCK IS IN THE “LOCKED” POSITION.** Do NOT attempt to operate the R.A. slow motion 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 knob permits sweeping the telescope rapidly through wide angles in declination. To use the Manual Slow-Motion Knob, lock the telescope in declination and turn the Declination Slow-Motion Knob.

When the **Power is On**, the LX200 can be moved manually only with the R.A. and Dec. locks released. The manual Slow-Motion Knobs are non-functional when power is supplied to the telescope. **Serious damage can occur to the internal gears of the motor assembly if a Manual Slow-Motion Knob is turned even a slight amount by hand.** (p.18)

## b) INITIAL POLAR ALIGNMENT

You will need:

Illuminated reticle eyepiece.

- 1) From TELESCOPE / LIBRARY menu select  
TELESCOPE  
ALIGN  
POLAR (Instructions will appear on the Keypad display.)
- 2) Slew telescope to 90° in declination on the setting circle
- 3) Release RA lock and manually set HA to 0°  
Engage RA lock.  
Press ENTER. (The telescope will slew to Polaris.)
- 4) Center Polaris by moving Equatorial Wedge in altitude and/or azimuth.  
Press ENTER.
- 5) The telescope will slew to a bright star overhead.  
Center the bright star with the keypad  
Press ENTER. (Keypad returns to TELESCOPE / LIBRARY mode.)

The telescope is now polar aligned with library initialized.

Use ONLY THE KEYPAD to move the telescope.

### **Warning**

Do not move the telescope in RA or Dec. either manually or with  
the slow motion knobs when these locks are engaged.

**Serious damage will result to the drive gears.**

## c) REFINED POLAR ALIGNMENT (p.34)

Use after initial polar alignment.

### Need:

Square diagonal  
Eyepieces:  
Low power illuminated reticle eyepiece  
12.5mm illuminated reticle eyepiece.

### Preparation:

Finder precisely aligned.  
Forks level when telescope is at H.A. =  $0^{\text{h}} 00^{\text{m}}$

### Procedure

- 1) TELESCOPE / LIBRARY  
TELESCOPE  
ALIGN  
POLAR (Instructions appear on Keypad)
  - 2) Ignore Keypad instructions.  
Press GOTO  
(Telescope will slew to the calculated position of Polaris.)
  - 3) Adjust Equatorial Wedge to center Polaris.  
Press ENTER  
(The telescope will again slew to a bright star.)
  - 4) Use keypad to center the bright star.  
Press ENTER.
- Procedure may be aborted at any time by pressing MODE
  - Repeat sequence every 15 minutes until the desired precision is attained.

### Notes

- A precisely aligned finder makes job much easier to find and center Polaris.
- For drift method refer to Instruction Manual, page 61.

# DRIFT METHOD FOR PRECISE POLAR ALIGNMENT

## Discussion.

The accuracy of the drift method for polar alignment is independent of the most common telescope problems: accuracy of the star diagonal, centering of the cross hairs in the reticle eyepiece, intersection of the cross hairs on the optical axis, mirror shift (“flop”) so notorious in SCT scopes, etc.

Another advantage is that adjustment of the polar axis in azimuth is made separately from that in altitude. One adjustment is made at a time; one set of locking bolts is loosened and tightened.

Further, adjustments are always made parallel to the cross hairs, which because of convenience, is less time consuming. This is generally not true of other methods.

Also, the scope is pointed in a direction during observing such that the observer can comfortably look through the eyepiece to assess the results and to make the necessary adjustment.

## SETUP

- Equipment
  - Stopwatch, timer, or clock
  - Star diagonal
  - Orion 12.5mm guide eyepiece
    - at  $f/10$ : mag. = 245x ; true field = 12 arcmin; box size = 14 arcsec.
- Star diagonal:
  - adjust perpendicular to declination axis.
- Guide eyepiece:
  - rotate so stars move parallel to cross hairs when using slow motion control.
- Finder scope:
  - rotate so stars move parallel to the cross hairs when using slow motion control.
  - align so that a star in the guide eyepiece box is on the finder scope cross hairs.

## AZIMUTH

- Choose a star.
  - use a 5-6 mag. star about 30 min. east of the meridian ( $RA = ST + 30^m$ ) and within  $5^\circ$  of the equator.
  - de-focus star image so that the dark center can be easily bisected with a cross hair.
  - bisect dark center with a horizontal cross hair.
- Check drift, ignoring drift in RA.
  - if star drifts **up**: move **star right** in field by turning east wedge knob **clockwise**.
  - if star drifts **down**: move **star left** in field by turning east wedge knob **counter-clockwise**.
- Repeat until no drift is observed for at least 5 minutes (at 250x).
- Secure the wedge in azimuth. Be careful not to change the pointing in azimuth!

## ALTITUDE

### Eastern horizon

- Choose an equatorial star close to the eastern horizon (altitude  $10^\circ +$ ).
- Ignore drift in RA.
  - if star **drifts up**: adjust altitude to move a meridian **star down** in field
  - if star **drifts down**: adjust altitude to move a meridian **star up** in field
- Repeat until no drift is observed for at least 5 minutes.
- Secure the wedge in altitude. Be careful not to change the pointing in altitude or azimuth!

“an altitude error in the polar axis produces an east--west drift for objects which is greatest when they are near the meridian. An azimuth error produces an east--west drift that is greatest for objects at  $6^h$  east and west of the meridian.” *Advanced Amateur Astronomy*, North, Gerald. Edinburgh Univ. Press, 1991. p.56

## NOTES

1. The star should be de-focused so that the dark center can be easily bisected with a cross hair, but not so large that it is difficult to determine precisely the center of the image.
2. If you see drift in less than 5 seconds at 244x, you are more than 10 or more eyepiece fields off in azimuth. Looking in the finder, give the azimuth a husky crank. If you do not see any drift for 30 seconds or so, you may be only 1 or 2 eyepiece fields off.
3. For altitude adjustment, choose an equatorial star close to the eastern horizon (altitude  $10^\circ +$ )
3. "an altitude error in the polar axis produces an east--west drift for objects which is greatest when they are near the meridian. An azimuth error produces an east--west drift that is greatest for objects at  $6^h$  east and west of the meridian."

*Advanced Amateur Astronomy*, North, Gerald. Edinburgh Univ. Press, 1991. p.56

Table 1

H.A.	Dec.	Drift up / down	Drift amount	Elapsed Time

### c') DRIFT METHOD FOR PRECISE POLAR ALIGNMENT

Use only stars within  $5^\circ$  of the celestial equator.

#### AZIMUTH

Choose a star within 30 minutes of the meridian.

If the star drifts south, the axis is too far east.

If the star drifts north, the axis is too far west

#### ALTITUDE

**Eastern** horizon:

use a star  $20^\circ$  to  $30^\circ$  above the horizon, i.e. H.A. =  $-3h$  to  $-4h$

If star drifts south, axis is too low.

If star drifts north, axis is too high.

**Western** horizon:

use a star  $20^\circ$  to  $30^\circ$  above the horizon, i.e. H.A. =  $+3h$  to  $+4h$

If star drifts south, axis is too high.

If star drifts north, axis is too low.

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In refractor or Cassegrain telescopes with standard 90° diagonal inserted at right angles to the declination axis directions in the field are as follows:

N  
W     E  
S

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Mode 3 Clock / Calendar

**READ/SET CLOCK**

(p.20)

The telescope clock should be set as accurately as possible to CST ( $\pm 5$  sec.), using the 24 hour format. Since the local time and date determine the sidereal time, the pointing accuracy of the telescope will depend on the accuracy of the clock.

### **Mode 3 CLOCK / CALENDAR ( p.20)**

#### **To Read the Clock**

- From TELESCOPE / LIBRARY display
  - Press MODE key twiceThe display will show both standard and sidereal times.  
Standard time should be within 5 seconds of CST
- Press MODE key to exit.

#### **To Set the Clock**

- Press and Hold ENTER key until keypad beeps
  - Use the number keys to enter the current time within 5 seconds.Make corrections by moving the flashing cursor with W and E keys.
- Press ENTER key when the time is correct.
- Press MODE key to exit.

---

Telescope Menu

**SET SLEW RATE**

(p.37)

### **Slew Rate (TELESCOPE, option #10)**

A slew rate of 4 deg / sec is convenient for centering an object with CENTER speed.

#### **To Set**

- From TELESCOPE menu
  - Point to → 10) Slew Rate
  - Repeatedly press ENTER key until the digit 4 appears
- Press MODE key to exit

**1 Arcmin Pointing** (p.36)

Normal pointing accuracy (p.36-37) is 5 arc-min or better; with critical alignment, 2 arc-min or better; with high precision pointing, 1 arc-min or better.

**To Activate HP**

- From TELESCOPE menu
  - Move to # 9 High Precision
  - Press ENTER to toggle on / off
    - When activated, “HIGH PRECISION” will appear in all upper case letters.
- Press MODE to continue

**To Use HP**

- Enter object as usual
- Press GOTO
  - Telescope will slew to nearest alignment star
  - Keypad will display “Center star XXXX”
- Center star in reticle eyepiece
  - Press GOTO

Telescope will slew to selected object or position

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**Databases**

1. SAO stars brighter than magnitude 7
2. UGC Uppsala General Catalogue of Galaxies
3. NGC New General Catalogue
4. IC Index Catalogue
5. GCVS General Catalogue of Variable Stars
6. LX200 Alignment Star Catalogue (351 stars)
7. Messier Catalogue
8. 8 Major Planets (accessed through STAR key and 901 through

**Keypad power-up default catalogues:**

- for STAR key is the LX200 alignment star catalogue.
- For CNGC key is the NGC catalogue.

**To change STAR key to enter SAO star numbers:**

Press CNGC  
ENTER  
PREV, NEXT to point to SAO  
ENTER to check (select) database  
MODE to exit  
Press STAR and enter the SAO star number.

**Three ways to use the Object Library:**

1. Direct access by using the M, STAR, or CNGC keys and entering a number.
2. The START FIND option to logically find objects in strips of the sky.
3. The FIELD option to identify objects in the field of the telescope.

**Select the OBJECT LIBRARY menu.**

Move the LCD arrow to the desired menu by using the PREV and NEXT key.

**1) OBJECT INFO**

Press ENTER to read type, brightness, size, and quality of any entered object.  
Press ENTER again to read coordinates  
Press ENTER again to see how far telescope is pointing from the entered object.

**2) START FIND****3) FIELD**

Press FIELD  
Press ENTER to identify objects in the field of the telescope.  
The display will show the number of NCG objects in the field  
and the object centered in the eyepiece field.  
Press ENTER again to read information about the object

The above commands 1 - 3 can be used

- any time you have an object entered in the keypad
- while directly entering objects with the M, STAR, or CNGC keys
- in the START FIND menu selection
- the FIELD menu selection

#### **4) PARAMETERS**

---

□ Keypad Control (p.34)

- Need**
1. Reticle eyepiece
  2. Alignment star library number & DEC.

**Procedure**

- 1) TELESCOPE  
ALIGN  
POLAR (press ENTER to place check)
- 2) Enter library number of alignment star.
- 3) Slew:  
To DEC of star.  
In RA to star.
- 4) Center star on eyepiece reticle.  
Press and hold ENTER key  
until display reads 'Coordinates matched'.

**Exit**

Press MODE 3 times

□ **All functions of telescope are ready for use.**

**Notes**

- The alignment star should be within  $30^m$  of the meridian and  $10^\circ$  of the equator.  
Refer to accompanying SC001 chart to choose a suitable star.
- "Move to" in reference to keypad means use PREV, NEXT keys only.  
"Select" means simply press ENTER key, or press PREV, NEXT keys,  
then press ENTER.

# 12-inch LX200 Journal

22 Oct 90 Thu

Meade Instruments Corporation

6001 Oak Canyon, Irvine, California 92620

(949) 451-1450

FAX: (949) 451-1460

(949) 451-1450 11:30 am CDT

customer service: "One year old 12" LX200 with declination motor control problem.

spoke to John Peiper (spelling?) in charge of LX200

- Moisture probably not the problem. Telescope would have to get really wet.
- Safe to remove declination lock knob by turning in release direction  
Remove "beauty cover"
- Two small pots on 3/4" square circuit board mounted on dec. motor  
May te "tweaked" with blade screwdriver to stop motor running.
- 30-day turn-around time if returned to factory
- Repair kit or swap part arrangement possible

# 12-inch Schmidt-Cassegrain

Meade LX200

## 12-inch SCT

### Meade LX200

→ TELESCOPE  
OBJECT LIBRARY

Dec.	Name	Star #	SAO
+ 19°	Arcturus	147	100 944
+ 27°	Alphecca	165	83 893
+ 09°	Altair	226	125 122
+ 10°	Enif	238	127 029
+ 15°	Markab	249	108 378
+ 23°	Hamal	17	75 151
+ 16°	Aldebaran	33	94 027
+ 07°	Betelgeuse	56	113 271

**ASTR  
211**

**F 04**

**ASTR  
212**

**S 05**

**ASTR  
212**

**S 05**

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SPRING	FALL	FALL	SPRING
2003	2002	2003	2003
LABS	LABS	LABS	LABS

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<b>ASTR</b>	<b>ASTR</b>	<b>ASTR</b>
<b>211</b>	<b>212</b>	<b>212</b>
<b>F 03</b>	<b>S 03</b>	<b>S 03</b>

---

ASTR  
211

- Power up the LX200.
    - Set Clock (Mode 3; p.21)
    - Set Slew Rate (TELESCOPE 10) SLEW RATE: 4 deg. / sec.; p.37)
- Do not use the slow-motion knobs to move the telescope when the power**

**is on. Serious damage can occur to the drive gear system.** (p. 17, p.18)

Manually here means:

- 2) Use N and S keys to slew to 90 degrees declination.
- 3) Release RA lock. Manually set HA to 00. Lock RA.  
Press ENTER  
Telescope will slew to Polaris.

**Magnification** required for an apparent separation of 10 minutes of arc:

$$M = 600 \text{ arcsec} / \text{separation in arcsec}$$

**Focal length eyepiece** for an apparent separation of 10 minutes of arc depends on the focal length of the telescope.

For 12-inch f/10 SCT

$$\text{eyepiece focal length} = 5 \times \text{sep.}''$$

For 12 1/2 -inch Newtonian

$$\text{eyepiece focal length} = 3.2 \times \text{sep.}''$$

7-26-99 Mon

Set clock (within 5 sec CST)

Use LX200 alignment star (named) to initialize keypad (12.5mm ill. ret.)

Last focus:  cw  ccw

Date: CDT: star name: ST:

Check pointing:

to SAO home: SAO

west: Antares Alphecca Arcturus Alcaid Spica Denebola

east: Vega Albireo Altair Deneb Enif Markab

Use SAO home star to initialize keypad (12.5mm ill. ret.)

Last focus:  cw  ccw

Check pointing:

SAO star used:

west: Antares Alphecca Arcturus Alcaid Spica Denebola

east: Vega Albireo Altair Deneb Enif Markab

Nova Aql 1999

## Stars for Initializing Keypad

<b>Dec.</b>	<b>Name</b>	<b>*Star</b>	<b>Con.</b>
+19	Arcturus	*147	Boo
+27	Gemma	*165	CrB
+12	Rasalhague	*200	Oph
+09	Altair	*226	Aql
+10	Enif	*238	Peg
+15	Markab	*249	Peg
+23	Hamal	*17	Ari
+16	Aldebaran	*33	Tau
+07	Betelgeuse	*56	Ori
+05	Procyon	*80	CMi
+12	Regulus	*100	Leo
+14	Denebola	*114	Leo

## Public night list from Bruce Woidyla

### Open Clusters

NGC869/884	Per	4
M 37	Aur	6
M 35	Gem	5
M 67	Cnc	6
M 23	Sgr	7
M 11	Sct	6

### Globular Clusters

M3	Cvn	6
M 5	Ser	6
M 12	Oph	7
M 10	Oph	7
M 92	Her	6
M 22	Sgr	6

### Bright Nebulae

M 42	Ori	?
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### Planetary Nebulae

NGC 2392	Gem	8
NGC 3242	Hya	9
M 57	Lyr	9
M 27	Vul	8

### Galaxies

M 81/82	Uma	8
M 104	Vir	9
M 51	CVn	8

### Double Stars

ξ (Xi)	UMa	*297	4,5	2.5"
γ (Gamma)	Leo	*296	3,4	4.5"
γ (Gamma)	Vir	*303	4,4	5"
24 Com	Com	*302	5,7	20"
α (Alpha)	CVn	*133	3,5	20"
ζ (Zeta)	UMa	*305	2,4	15"
ζ (zeta)	CrB	*318	5,6	6"
16-17	Dra	SAO 30012	6,6,7	90"
ρ (Rho)	Her	*328	5,5	4"
ν (Nu)	Dra	SAO 30447	5, 5	62"
95 Her	Her	*329	5,5	6"
θ (Theta)	Ser	SAO124068	4,5	23"
ε (Epsilon)	Lyr	*334/5	5,5 5,6	
β (Beta)	Cyg	*223	3,5	35"

$\gamma$ (Gamma)	Del	*342	4,5	10"		
61 Cyg	Cyg	*346	6,6	28"		
$\alpha$ (Alpha)	Psc	*265	4,5	3"		
$\gamma$ (Gamma)	Ari	*264	5,5	9"		
32 Eri	Eri	*227	5,6	7"		
$\lambda$ (Lambda)	Ori	*285	4,6	5.5"		
12 Lyn	Lyn	SAO 25939	5,6,8			
$\alpha$ (Alpha)	Gem	*78	2,3,10		60", 2"	blue/white/orange
$\zeta$ (Zeta)	Cnc	*293	6,6,6	6"	each yellow	320x
$\iota$ (iota)	Cnc	SAO 80416	4,7	31"	orange/blue	

Double Stars Labeled on the Map (ST/May2000/p113)

Name	Const.	SAO	Star*	Sep.	Magnitudes
Σ1695	UMa	28 572	3.8"		
78 UMa	UMa	28 601	1.5"		
Σ25	Dra	16 081	179"		
Mizar	UMa	28 737 (*305)		14.7"	
Mizar, Alcor	UMa	28 751 (*305)		708"	
OΣ123 AB	Dra	16 078	69"		
Σ1770	Dra			1.8"	
κ Boo	Boo	28 819	13.4"		
Σ1829	Boo			5.6"	
ι Boo AB	Boo	29 071	38.7"		
Σ1871	Boo	29 246	1.8"		
Σ1878	Dra	16 466	4.1"		
Σ1882 AB	Dra			11.5"	
Σ1927	Dra	16 636	17.3"		
OΣ138 AB	Dra	16 649	152"		
Σ1984 AB	Dra	29691	6.4"		
Σ2006 AC	Dra			46.5"	
Σ2054 Aa-B	Dra	17 073	0.9"		
η Dra AB	Dra	17 074	4.8"		
16 & 17 Dra	Dra	30 012	90"		
17 Dra AB	Dra	30 013	3.2"		
20 Dra AB	Dra	17 285 (*324)		1.1"	

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Celestron 35mm (49°) eye relief 25mm

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Stars for calibrating scope

Arcturus	+19°	*147
100 944		
Gemma	+27°	*165
83 893		
Rasalhague	+12°	*200
102 932		
Altair	+09°	*226
125 122		
Markab	+15°	*249
108 378		
Hamal	+23°	*17
75 151		
Aldebaran	+16°	*33
94 027		

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Remove scope plastic cover  
 Replace finder lens cap with dew shield  
 Replace scope lens cap with dew shield  
 add QuickFocus mask to dew shield  
 Prepare 12.5mm ill ret eyepiece  
 remove diagonal plug and align eyepiece with marks

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Park Stars for LX200 to clear roof

<b>Mead</b>	<b>~ ST</b>	<b>Dec.</b>	<b>Name</b>
*136	13 20	-36°	Iota Cen
*141	13 50	-42°	Mu Cen
*146	14 00	-36°	Pi Hya
*149	14 30	-42°	Eta Cen
*158	15 00	-42°	Kappa Cen
*162	15 20	-40°	Delta Lup
*166	15 35	-41°	Alpha Lup
*171	16 00	-22°	Delta Sco

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