

12.409 Hands-On Astronomy, Spring 2002

Handout 3 /week of 2002 February 11

Meade 8” LX200 Set-up

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There will be a second handout covering more advanced use of the telescope and the extra equipment (and cases!) we’ll use. For now, this will cover the topics needed for basic visual observing with the LX200.

Telescope Kit Checklist

Use the following checklists to

1. Alert the instructor or TA about missing pieces before beginning a night’s observing and
2. Ensure that the kit is complete for use by your classmates next time.

A. Items external to the telescope case

1. Tripod with C Clip, threaded rod and tension knob, and spreader bar
2. A Sky Atlas 2000.0, laminated edition, and Atlas Supplement notebook
3. 120VAC power outlet strip
4. Counterweights
5. Flashlights (one red and one white)

B. Items inside the telescope case

Meade 8" LX200 Telescope with 8" dust cover and cap for rear cell

1. Power adapter and cord
2. Handheld electronic control keypad
3. 2 coiled cords (one for keypad w/ 4 pin phone jack connectors and one for the declination motor w/ DB-9 connectors that are slightly wider)

C. Items inside the accessory case

1. Finderscope
2. Visual back (allows connection of an eyepiece or diagonal)
3. Diagonal prism
4. 7 Meade series 4000 Super Plössel eyepieces each in their own plastic case
 - 6.4 mm (313 magnification, 0.17° field of view when used on f/10 Meade 8")
 - 9.7 mm (206 , 0.25°)
 - 12.4 mm (161 , 0.32°)
 - 15 mm (133 , 0.39°)
 - 20 mm (100 , 0.52°)
 - 26 mm (77 , 0.68°)
 - 32 mm (63 , 0.83°)
 - 40 mm (50 , 0.88°)
5. 2 Barlow lens
6. Eyepiece filters (Moon filter and set of color filters)
7. Light Pollution Reduction Filter

Generalized Setup Procedure

1. Attach telescope base to tripod. There's only one screw, and it can be a bit tricky to set it in correctly. When the telescope is screwed to the tripod correctly, there should be no space between the base and tripod and the telescope base should not rotate.
2. Attach finderscope to main telescope (see below)
3. Level telescope (use bubble as guide, hopefully it shouldn't be too far off).
4. Attach cables:
 - Dec motor to main base
 - Paddle to base
 - Plug to converter
 - Converter to base
5. Power up!

FOR EMERGENCY STOP: TURN OFF POWER ON BASE OR PULL POWER PLUG FROM BASE!

When will you need to do this? Hopefully, never. When we attach CCD cameras to the telescopes later in IAP, however, there are situations where you realize in the middle of a long slew that there isn't clearance for the CCD camera to fit where it needs to. While this is not the most elegant solution, it will work. Realize, however, that this will necessitate realigning the telescope (see below). But that's better than wrecking a new telescope and CCD (hint, hint)...

General Usage Hints

1. **When selecting a spot for your tripod** think about how any potential obstructions near your observing area (buildings, trees, etc...) will screen areas of the sky
2. **Tripod adjustments:** The tripod should be stable once you've secured the spreader bar using the threaded rod with the tension knob. The length of the legs can be adjusted using the lock knobs (bolts with star shaped handles) at the ends of the legs. These are also used to level the telescope.
3. **DO NOT EVER force the motion of the telescope;** unlock the clamp first or use the electronic keypad controls.
4. **Finderscope:**
 - The finderscope is located in the accessory case. You will need to mount it on the telescope by sliding its bracket into the base and tightening the thumbscrews.
 - The view is inverted and has a field size of 5.2° .
 - Check the finderscope alignment before you begin observing by centering a bright object at least 1/4 mile distant in a low-power (low magnification) eyepiece and then see how far off this object is from the center of the crosshairs in the finder. It will most likely need adjustment, if you want it to be centered. Ask the instructor or a TA to show you how to use the three thumbscrews on the finder's mount to align it. Or remember where the position of an object that is centered in the eyepiece is located relative to the finder crosshairs. If you choose this second option, make sure you make a note of it in your notebook in case you forget.
5. **Focusing:**
 - The focusing mechanism is designed to allow for very fine adjustment of focus. It takes up to 45 turns of the knob to go from focusing at close distances(which you should not need to do in this class) to infinity.
 - Turning the knob counter clockwise focuses towards infinity.
 - It may be best to choose a partner with similar vision correction (i.e. those with coke bottle glasses should stick together to avoid many focusing adjustments).
 - It is often difficult to focus on dim objects so if you are having trouble, it can be helpful to focus on a bright object and bring the telescope back to aim at your original object.

6. **Never wipe any optics** especially the corrector plate; the anti-reflection coating is very thing and will scratch easily. If your corrector plate becomes covered with dew, alert your instructor or TA and we'll use a heat gun to evaporate it off.

Alignment

The purpose of the following procedure is to allow the telescope drive motor to properly track objects in the sky as the Earth rotates beneath them causing their apparent motion across the sky. The LX200 telescopes are mounted in an altitude/azimuth (called alt-az for short) format meaning that the telescope moves along vertical and horizontal axes. In order for the LX200 to be able to track objects in the night sky properly, it must be able to convert between altitude/azimuth coordinates along which the telescope moves and Declination/Right Ascension coordinates along which celestial objects appear to move.

Thus, the LX200 must “know” its location, and the local date and time should all be pre-programmed (by the instructor or TA). The LX200 will store this information with the power off so there should be no need for you to change this information until we use the telescopes at Wallace and thus need to change the location. In addition, the LX200 must also “know” where certain positions in the sky are located. This is accomplished by pointing the telescope consecutively at two stars with known positions and is called alignment. The procedure is outlined below.

1. Turn on the telescope and after the self-diagnostic start-up test is complete the display will give you two choices (TELESCOPE and OBJECT LIBRARY).
 - Select Telescope (by pressing enter with the arrow pointing at Telescope).
2. Now your choices should be (SITE and ALIGN).
 - Press the Next key to move the arrow to Align and select it using enter.
3. The display should had two choices again (ALTAZ and POLAR).
 - If there is NO checkmark next to ALTAZ, press enter once and the keypad should beep and a checkmark should appear next to ALTAZ. Now press enter again to use the checked mode.
 - If there is a checkmark next to ALTAZ, press enter to use the checked mode.
4. Your choices now should be (1 Star or 2 Star Alignment).
 - Press next to move the arrow to 2 Star Alignment and then press enter to select it.
5. The display should now read (Level Base, then press ENTER)
 - This is good time to double check that the base of the telescope is level and adjust the legs of the tripod if necessary.
 - When you press enter you will see (Press ENTER, then pick align star)

6. Now you will see the beginning of the list of alignment stars contained in the LX200's memory.
 - There are 33 choices in alphabetical order so it may save you time over the course of the semester to learn where some bright stars with names beginning with A and B are in the sky.
 - Before you choose a star find it in the sky and if you are not yet familiar with bright stars and constellations it might be worth double checking that you have the correct star with the instructor or TA.
 - Press the Next key to move the arrow down the list of stars until you get to the one you want (if you go past it use the Previous key to go back up)
 - Select the star by pressing enter
7. The display will read (Center "the star you chose in step 6" and then press ENTER)
 - You may move the telescope manually: UNLOCK the Dec and RA clamps and point the telescope towards the star. Sight along the telescope and adjust the telescope until you can see the star in the finder, then fine tune until it is centered in the finder and then the eyepiece.
 - Or you may move the telescope electronically: Make sure the speed is set to SLEW (this button on the keypad should be lit up). Use the N, S, E, and W buttons to move the telescope until it is aimed at the star. When you can see it in the finder, switch the speed to FIND to center it in the finder. Then change the speed again to CNTR and center the star in the eyepiece.
 - The more carefully you center the star in the eyepiece, the more precisely your telescope will be aligned. Early in the semester when you will be looking at bright objects and not using the telescopes internal object library to find faint objects, it is not important to align the telescope too precisely. Just make sure that the star is somewhere near the center of the eyepiece. Later in the semester, when you may want to rely on the telescope to find very faint objects, a more precise alignment will be necessary.
 - Once you have centered the star in the eyepiece, press enter. Try not to delay too much between centering the star and pressing enter since at this point the telescope is not yet tracking the stars and thus if you wait too long the star will drift out of the center of the eyepiece.
8. Repeat steps 6 and 7 for the second star **EXCEPT FROM THIS POINT ON DO NOT UNLOCK THE RA AND DEC CLAMPS AND ATTEMPT TO MOVE THE TELESCOPE MANUALLY.** This will result in the telescope "forgetting" where it is pointed and you will need to start the alignment process all over. Move the telescope only by using the keypad at speeds SLEW, FIND, or CNTR in directions N, S, E, and W.
9. After you have completed aligning the second star, the display should read (TELESCOPE/OBJECT LIBRARY). You are ready to use the telescope for observation now!

Table 1: Some Bright Stars Available For Alignment

<u>Star</u>	<u>Visible in the evening in which semester?</u>	<u>Constellation</u>	<u>Magnitude (smaller numbers are brighter)</u>
Aldebaran	Spring	Taurus	0.87
Alkaid	Spring or early Fall	Ursa Major (Big Dipper)	1.85
Altair	Fall	Aquila	0.76
Arcturus	Early Fall or late Spring	Bootes	-0.05
Betelgeuse	Spring	Orion	0.45
Capella	Spring	Auriga	0.08
Deneb	Fall	Cygnus	1.25
Dubhe	Fall and Spring	Ursa Major (Big Dipper)	1.81
Vega	Fall	Lyra	0.03

Packing Up

Use the telescope kit checklist to make sure you still have everything you started with (check around the ground nearby, your pockets, and nearby telescope kits if necessary) and that you haven't inherited extra parts from someone else's kit. The LX200 only fits in the case one way so please don't force it in the wrong way. Once in the case, unlock the RA and Dec clamps as this will avoid damaging the drive and clamp mechanisms during transport of the cases. Remember to remove the finderscope from the telescope by loosening the thumbscrews on the quick-release mount. Use the checklist to make sure the accessories get back in the proper case (be it the telescope case or the accessory case). If after you leave class, you discover that you've accidentally walked off with something from class please make sure you contact your instructor by email as soon as possible to arrange for its return. This can be avoided by using the cases as working storage rather than your pockets!