

# **Mt. Stony Brook Meade 14-inch Set Up and Operations Manual**

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This document includes instructions on how to set up and operate the Meade 14-inch telescope atop Mt. Stony Brook.

## **1. Checklist**

Make sure that you have all of the equipment you need to perform observations (e.g., eyepieces).

- Meade's telescope manual
- Eyepieces (if conducting eyepiece observations)

If conducting CCD observations, then also:

- CCD camera briefcase
- laptop running the CCDOps or CCDSoft software
- power supply for laptop

## **2. Start-Up Procedure**

1. DO NOT OPEN THE DOME IF IT IS RAINING, SNOWING, OR IF THERE ARE STRONG WINDS.
2. Open both doors, use rope to keep them open in order to cool down the dome.
3. Switch on the power to the dome drives: big ON / OFF handle on northern inside wall of the dome.
4. Use the dome remote to open the top shutter: press "start", then "open" top shutter.
5. Use the dome remote to open the lower shutter: press "start", then "open" lower shutter.

6. Remove the dust cover from the telescope.
7. After the top shutter has opened completely, remove the cap from the front of the telescope, as well as caps from the finder scope, eyepiece holder etc.
8. Plug in the telescope: the telescope power cable is wrapped around the telescope pillar.
9. R.A. and DEC. locks on the telescope tube must be and **MUST REMAIN** in the **LOCKED** position.
10. **For eyepiece viewing:** round counterweight underneath the telescope tube must be **OFF**.
11. **For eyepiece viewing:** put on your eyepiece of choice; tighten the two screws that secure it to the telescope.
12. **For CCD observing: put on the largest counterweight** underneath the telescope tube. The counterweight slide along the railing underneath the tube. First unscrew the screw at the end of the railing that is near the front end of the telescope. Then slide the counterweight until it reaches the Scotch tape mark on the railing. Tighten the screws on the counterweight. Replace the screw at the end of the railing.
13. **For CCD observing: assemble the mount for the CCD camera.** Remove the CCD camera from its box, gently unscrew its cover, screw on the cylindric attachment that is used to mount it to the telescope. The attachment, the four necessary screws (in a small ziplock bag), and a set of Allen wrenches should all be in the CCD briefcase.
14. **For CCD observing: put on the CCD camera** instead of an eyepiece. Take off the 90° reflecting element. Slide in and rotate the CCD camera so that its body is pointing to the left when viewed from behind the telescope. This is done for balancing purposes. **FIRMLY** tighten the two screws that secure the CCD camera to the telescope. Be sure to put the dust cover onto the end of the 90° reflecting element.
15. **For CCD observing: plug in the CCD** into the telescope pillar. The power cable is in the CCD briefcase.
16. **For CCD observing:** take the table from the south-east corner of the dome and place it next to the telescope pillar. Put the CCD briefcase and the laptop here, as well as any documentation to be used.
17. **For CCD observing: plug in the laptop.**

18. **For CCD observing: plug in the USB cable in the CCD and in the laptop.**  
The USB cable is in the CCD briefcase.
19. Turn the telescope ON.
20. Allow the telescope to get a GPS fix.
21. If necessary, **focus the telescope**. Slew to a bright object, unlock the primary mirror lock, and use the coarse focus knob. Once close to focus, re-lock the primary mirror lock and use the telescope microfocuser (using the Autostar keypad) to complete focusing. Focus for eyepiece observing is attained by rotating the coarse focus knob clockwise, if the previous focus setting was for CCD imaging, and vice versa.  
Focusing with the eyepiece is trivial. For CCD observations, see section 5 below.

### 3. Finder scope alignment

This is done in eyepiece observing mode. Have the scope slew to a bright star in the sky. Use fine motor movements to get the star in the center of the field of view of the telescope. Adjust the screws on the finder scope so that the star lies in the center of the cross-hairs.

### 4. Use of the Autostar Keypad

Some noteworthy facts:

- the “Mode” button is like “Back” on a web browser: it will return you to the previous menu;
- the bottom two arrows are to scroll through the menu you are currently in, whereas the D-Pad on the top is used for manually slewing the scope, focusing, etc;
- the “Enter” key is self explanatory.

#### 4.1. Selecting an Object

##### 4.1.1. Selecting a Named Object

Use keys to select “Object” From here there is a variety of objects to choose from, “Deep Sky, Solar System, Stars, etc..” choose you object by going through the subsequent menus, and then hit “Go To” The scope will slew to the object, however, some fine tuning is required to actually get it in the field of view. A good way to make this easier, is to make sure your finder scope is aligned before you start your observing run (see section 3).

#### 4.1.2. Selecting a New, Unnamed Object

Use keys to select “Object : User”. Give the object a name and then input its coordinates and magnitude through the keypad. Press “Go To” to slew to the new object.

#### 4.2. Finding a Faint Object

Telescope was polar-aligned on Feb 8, 2010. Pointing accuracy is to within 0.2 degrees (NB: the FOV of with the 26mm eyepiece is  $\approx 26'$ ). The finder scope is also very well aligned to the eyepiece ( $\sim 0.1^\circ$ ), and if centered on the cross-hairs, a star should be within the  $25'$  FOV of the CCD camera.

Procedure:

1. If necessary, enter the coordinates of your objects under **Object : User object** (see 4.1.2).
2. Go to a bright (naked-eye) star nearby (within  $5\text{--}10^\circ$ ). The star will be off-center, but should be close to the cross-hairs of the finder scope ( $\sim 1/5$  of the finder scope FOV).
3. Press and hold the “ENTER” button on the keypad for  $>2$  seconds, and then release it. The Autostar display now says “Press ENTER to Sync...”
4. Position the bright star near the center of the CCD camera with the paddle. If your star is very far off, you may need to first find it. To do this efficiently, make sure that your CCD is continuously taking short exposures. All this time, Autostar is recording the telescope motion commands that you are issuing between where it thought the star was, and where you tell it the stars is.

Note that for the recommended CCD mounting procedure (see item 14 in Section 2), North on the CCD is to the left and East is down.

5. Press “ENTER” again. Now the Autostar software has a recorded the pointing correction that you gave it.
6. Slew directly to your science target, by selecting it in the Object list. Your target will now land at the same position on the CCD where the bright star was.

NB: The program *Stellarium* was found to be quite useful as a check of pointing, with star catalogs displaying down to  $\sim 14$  mag stars. In particular, the program shows the size of the selected FOV. Essentially, *Stellarium* was a fancy finder chart, displaying object coordinates.

### 4.3. Telescope (Polar) Alignment

You should not have to align the telescope, if you do make sure to first consult someone who knows the process as it is intensive, slightly confusing, and time consuming. Relevant information is in Appendix A of the Meade manual. Don't forget to set the telescope Park Position.

## 5. Focusing the CCD

*This section has been superseded by the steps described in A Stony Brook Student's Guide to Using CCDSoft (Zajac 2012).*

Make sure you are looking at a star or grouping of stars. To focus the CCD, first unlock the mirror (rotate mirror lock clockwise). Then, click the “focus” button in CCDOps5, set the intervals for exposure and delay to your liking. When the program is running the delay portion, turn the coarse focus knob in and out until you achieve the best possible result (turn the doughnuts into point sources). Then lock the mirror (rotate mirror lock counter-clockwise). Use Fine focus with Meade keypad to achieve more accurate focus. Hitting “Focus” on the keypad will allow you to adjust focus speed using the bottom two arrows. Using the top up and down arrows in this menu will adjust the actual focus. When you are done, simply close the focusing program.

## 6. Using of SBIG CCDOps Software

*This section has been superseded by the steps described in A Stony Brook Student's Guide to Using CCDSoft (Zajac 2012).*

### 6.1. Starting Up

- Turn on the laptop.
- Select DOS as the operating system once it powers up. If you miss this chance (you have 3 seconds), wait for it to fully power up in Linux and then restart it.
- Login to Windows. Username: ccd, password: SBIGCCD
- Start up CCDOps 5; icon is on the Desktop
- Hit the button that says “EstLnk” to establish a link to the CCD.
- Calibrate/Initialize filter wheel. Click the tab that says “Filter” and click “Calibrate/Initialize...”

## 6.2. Taking an image

To take an image using the CCD, hit the “Grab” button in CCDOps5, select the exposure length, and wait. Be sure to take flat field’s at the beginning or at the end of the night so that your data can be reduced. Do not worry about taking dark fields, as they are automatically subtracted during the exposure (make sure the you check the box that refers to taking the dark image).

You can also take a series of images. In the Grab dialog box select “Auto Grab” from the “Signal Processing” pull-down menu. The Auto Grab Setup dialog will pop up. Set up a name and destination directory for the series of images, select the number of exposures that you wish to take, the interval between consecutive exposures, and the number of exposures between consecutive dark frames. The latter is selected in the “Dark interval” pull-down menu; if you selecte the “Series” option, only one dark frame will be taken for the entire series.

## 6.3. Changing filters

To change the filter, click the tab that says “Filter”, and select which one you want. A loading image will pop up, and close when the filter is changed.

## 7. Shut-Down Procedure

1. **PARK THE TELESCOPE! Failure to do so will result in it forgetting where it was pointed and need for re-alignment next time it is powered up.** To park the telescope, go to the ”Utilities” section of the AutoStar controller. If this doesn’t work, use the keypad to move the telescope to point South, with the optical tube app. perpendicular to the fork.
2. **For CCD observing:** Transfer your data on a USB stick; can be done also later.
3. **For CCD observing:** Turn off the computer, disconnect the CCD from the telescope and the computer, remove the mounting bracket from the front of the CCD and replace its screw cap. Put the CCD, all the CCD cabling, and the CCD manual in its briefcase.
4. **For CCD observing:** Remove the counterweight form the telescope tube.
5. **For eyepiece observing:** Remove the eyepiece and put all eyepieces back in the eyepiece case.
6. Power OFF the telescope.

7. Unplug the telescope from the mount and wrap its cable around the telescope mount.
8. Replace the telescope front cap, as well as finderscope and eyepiece caps.
9. Cover the telescope with the grey canvas cover.
10. Rotate the dome so that the dome slit is over the entrance door.
11. Close the lower dome shutter.
12. Close the top dome shutter.
13. Shut off the power to the dome.
14. Fill out the telescope logbook.
15. Collect the CCD, laptop, eyepieces, manuals, your personal belongings, and any trash before leaving.
16. Turn off all lights and close both doors.
17. **If any problems were encountered with the telescope or with the CCD** during the night, notify any of the astronomy faculty in charge of the telescope (von der Linden, Zingale, Calder).