

I. OPENING UP THE OBSERVATORY

- 1) Lestrade should always be left running. LOGIN to the **Observer** account on Lestrade (or **Imager** or **Spectrometer** if you are using those instruments). **Do NOT change any settings or install any software on this computer!**
- 2) READ the Announcements and Updates on the observatory web page, and CONFIRM that telescope is available for your use. Begin your entry in the log sheet (including start time, instrument, etc).
- 3) Check the front panel of the “big blue box”. With two exceptions, the correct switch positions are “away” from the black or blue tape. The only two you will operate should initially be set as...
 - *Mtr Driver Chassis* switch **OFF**
 - *HALT MOTORS* button **IN**
- 4) *Go upstairs*. TURN OFF the dehumidifier. PLUG IN dome slit power. OPEN top slit. Return SWITCH to “off” position. UNPLUG dome slit power. RE-COIL the cord. OPEN lower slit manually (counterclockwise) if you plan to look close to the horizon.
- 5) REMOVE the yellow cover from the top of the telescope. REMOVE cover from eyepiece drawtube and insert an eyepiece. REMOVE covers from keyboard and monitor. Place all covers under the desk. POWER ON the upstairs monitor if you plan to use it.
- 6) CONFIRM that telescope is pointing to zenith and CONFIRM that dome slit is pointing north. (check bubble levels on the telescope; white mark on the dome aligned with mark on the wall).
- 7) *Go downstairs*. If it has not already been done by the startup script, START the telescope control system by double clicking the TCS icon on the desktop or single clicking the icon on the taskbar. START TheSky6. In TheSKy under the **Telescope** menu do **Link->Establish**.
- 8) On the control box, set the
 - *Mtr Driver Chassis* switch **ON (up)**
 - *HALT MOTORS* button **OUT**
- 9) Start dome control in TCS: **Telescope/Misc.../Switches** Auto Dome ON & Dome TRACK. **Apply. Close**. Status lights should be green in TCS display and Dome should read "Track"
- 10) Set the **Telescope/Rates/TrackRate** R.A. rate to 15.02 arcsec/sec. Dec rate to 0. **Apply. Close**. Telescope should now be tracking. RA should be constant and HA should be ticking 1 sec per second, and track rate should read 15.02.

II. MOVING THE TELESCOPE

Using the Handpaddles:

There are two identical handpaddles, one in the dome and one in the control room. Both are active at all times whenever the MDC is on and the Halt Motors button is out. Pressing a direction button moves the telescope at the "guide" (or slowest) rate. Holding down the "set" and a direction simultaneously will move it at the intermediate speed, and holding down the "slew" button and a direction simultaneously moves it at the fastest speed. The top two buttons control the focus, and the bottom two buttons rotate the dome (but beware that the automatic dome control might override).

Using TCS:

- 1) The **Telescope/Movement** menu provides 4 ways to tell the telescope where to move.
 - a) *Slew Position....* Use this to enter coordinates manually. You can get coordinates from catalogs, your memory, or TheSky on LeStrade.
 - b) *Offset/Zenith.* This has an option for slewing to zenith (set the RA track rate to 0 before you stow the telescope).
 - c) *DFM library object....* Enter the number of any object in the DFM catalog. A listing of this catalog is kept in the telescope manual notebook. All Messier objects, most bright stars, and several interesting items can be found in this catalog. Messier object numbers or just their M number (e.g. M51 = 051).
 - d) *Mark/Move table entry....* For advanced users
- 2) Once you have selected an object, hit **Apply** and its coordinates will appear as NEXT OBJECT. Choose option **Start Slew** to tell the telescope to move. The slew should stop with a beep when the telescope arrives at the object. Hit **CLOSE**. To stop the slew prematurely or if it gets stuck in a loop (at the object but taking forever to center it), choose option **"Stop"**.

Using TheSky:

- 1) A rather detailed chart shows you what is up in the sky at the moment. The crosshairs indicate the telescope's position.
- 2) To move the telescope to an object, click on the object. A data box will appear on the screen. (To find an object, press **F**.)
- 3) Select **"Slew to"** icon (it looks like a little telescope). This step sends the coordinates of the object to the NEXT OBJECT line in TCS.
- 4) TheSky asks whether to go ahead with the slew. If you choose to go ahead, TheSky will move the telescope and center the dome slit. The slew should stop with a beep when the telescope arrives at the object. To stop the slew prematurely or if it gets stuck in a loop (at the object but taking forever to center it), click the **"Cancel"** button.

III. INITIALIZING THE TELESCOPE

Before you start observing, you ALWAYS have to initialize the pointing on a bright star!

To initialize the telescope pointing:

1. This is a good time to check the time/date indicators to make sure they make sense (should be 4 hours ahead of eastern daylight or 5 hours ahead of eastern standard time; date might be tomorrow if it's after 7 or 8 pm).
2. Use the DFM catalog, "The Sky", or hand-entered coordinates to move the telescope to a bright star, preferably near the zenith. You can't just find the star with the handpaddle, because the TCS program needs to know the star's coordinates.
3. Use the handpaddle to center the star in the field of view of the main eyepiece.
4. Make sure the star is also centered in the Telrad. If not, you can adjust the Telrad so the star is in the bullseye (but only if you know what you are doing!). TURN OFF the Telrad when not in use.
5. Go to the **Telescope/Initialization/Telescope Position**. Click on USE NEXT OBJECT POSITION and CONFIRM that the RA and Dec values in the initialization menu correspond to those in the next object line on the TCS display. Click **Apply** then **Close**.
6. Confirm that the coordinates for "telescope" and "next object" are now identical (if they have a different epoch, they won't be exactly the same). If not, go to step 5.

The telescope should now point accurately no matter what method you use. However, each time you reposition the telescope, you introduce a small error into the position of the telescope known to the computer. The further you move, and the more frequently, the greater the drift. Periodically, it may be necessary to repeat this procedure. It is best to use a bright star near the zenith.

To initialize the dome pointing:

So long as the dome was pointing north when you started TCS, it should track the telescope position. This is still under development, so if you have problems, refer to the Troubleshooting section.

IV. CLOSING DOWN THE OBSERVATORY

- 1) **Telescope/Rates/Track Rates** set RA rate to 0, **Apply**, **Close**.
- 2) **Telescope/Misc/Switches** click AutoDome OFF and Dome HOME; **Apply** and wait for dome to finish moving; it should be pointing due north. **Close**.
- 3) Under the **Telescope/Movement/Offset/Zenith** menu on TCS, click Apply in the **Set Zenith** box. Then Click **Start Slew**; The telescope should stop at the zenith, and TCS should beep. When it reaches zenith, click the **Close** button
- 4) *Go upstairs*. Is the telescope is pointing to zenith? If it is not, use the hand paddle to move the telescope to the zenith position. You may use the two bubble levels to find zenith. If you initialized the pointing on a bright star recently, trust the telescope pointing more than the bubble levels.
- 5) Replace all the covers (telescope, monitor, and keyboard) and put the eyepiece away.
- 6) Make sure the **TELRAD** finder is turned **OFF** !!!!
- 7) The dome shutter should be pointing north. If not, use the handpaddle to “park” the dome.
- 8) Close the lower slit completely (crank clockwise) and then close the top part of the slit. Double check that it closed properly, with the top slit overlapping the lower slit. **Unplug** the slit motor when you are finished, and **re-coil** the power cord.
- 9) Hang the handpaddle properly, push chairs, ladders, and any cables out of the way. Turn off upstairs lights. Turn dehumidifier back on.
- 10) *Go downstairs...* Press the
 - *HALT MOTORS* button **IN**
 - Mtr Driver Chassis switch **OFF**
- 11) Terminate any programs you started, including TCS, and LOG OFF (DO NOT SHUT DOWN).
- 12) Complete your entry in the log book.
- 13) Turn off all lights and lock the door as you leave. Set any trash containers in the hallway (janitors do not clean inside the dome). Turn the a/c back on if you turned it off at the beginning of the night.
- 14) Submit a Fault Report or contact **Jim Neff** (office: 953-5325, cell: 364-7689; email: neffj@cofc.edu) or **Chris True** (office: 953-2031, cell: 303-6603; email: truec@cofc.edu) if you encounter any serious problems. Campus Security: 3-5611 (emergency) 3-5609 (routine).

VI. TROUBLESHOOTING

- 1) When the controller computer is turned on, it automatically assumes that the telescope is pointing to zenith. If it is NOT
 - a) Make sure the *HALT MOTORS* button on the control box is **out**.
 - b) Use the hand paddle and the bubble levels to point the telescope to zenith.
 - c) Push the *HALT MOTORS* button **in** .
 - d) Terminate and restart TCS.

- 2) If you can't find anything, or TCS says it's below the horizon (but you know it's not), then you almost certainly entered the wrong time or date. Bring up the UT Display to Set the TCS computer. Compare this with the UT time on the TCS display. If they don't match, repeat the procedure for initializing the time and date.

- 3) Both TCS and TheSky have horizon limits built in. These limits prevent the telescope from being damaged by moving to a nearly horizontal position. If you choose an object in a forbidden region, you should get an "Out Of Range" message and the telescope should not move. **If you receive an "Out of Range" message but the telescope moves anyway, use the HALT MOTORS button to turn off power to the motors immediately.** If you accidentally drive the telescope into its horizon limit, there is a mercury switch that will shut off power to the motors. It is possible to manually push the telescope up away from its horizon limit. If you are not comfortable with this, call for help. Otherwise, shut down the telescope and replace the covers and submit a fault report.

- 4) The telescope has no gears; it's driven by friction between 2 wheels on each axis. It is possible (quite easy, actually) to bump the telescope. If the encoders noted the change, the "Telescope" and "Next Object" fields on the TCS display will differ. You can move back by making these numbers the same (or by starting a slew). If your object is not centered, it will be necessary to repeat the procedure in Section III.

- 5) Sometimes when you hit "Start Slew" in TCS it seems like nothing is happening. Usually the problem is that you hit the "Start Trail" button right next to it. You will see "Trailing" displayed in red letters on the right side of the TCS window. Hit the red STOP button on the TCS window and it will exit this mode and allow you to move the telescope again.

- 6) If you are using the offset/zenith dialog box to move the telescope to zenith, make sure you use the "Apply" button in the middle (zenith section). If you click "Apply" in the "offset" section, strange coordinates might get loaded into the Next Object buffer, and the telescope will not slew to zenith.

