

# Operating the Schommer Observatory 0.5-m Telescope

## Weather

The telescope must not be exposed to inclement weather; it is an expensive precision instrument that can be damaged by thoughtless use. In the following conditions the dome may not be opened, or must be closed immediately if it is open.

- Rain, snow, fog, or threat of precipitation
- High humidity, indicated by moisture beginning to condense on metal surfaces in the dome
- High winds, indicated by vibration of the dome
- Blowing dust, sand, or grit

## Before Observing

If the air in the dome is at a temperature different from the outside, convection currents will arise that significantly degrade the seeing. The exhaust fan on the dome can quickly exchange the air in the dome with the outside air and help minimize this problem. Plug the fan in and turn it on high. Be careful to keep hands, hair, clothing, etc. out of the fan blades! Also make sure that there are no loose papers or other articles that can be blown around the dome. Make sure that you turn the fan off, unplug it, and store the power cable inside the fan enclosure before you attempt to rotate the dome.

## Starting Up

1. Power up: Turn on the the Coordinate I controller and the focus encoder readout above it. Log into the PC as user “ph344” (password orion).
2. Open the dome: Raise the dome slit cover with the left lever on the control box. Let the cover open all of the way, until it shuts off automatically, then return the left lever to the vertical position. Unplug the cable for the dome slit cover motor and hang it through the cable tie on the dome. The dome rotation is interlocked with this cable so that the dome will not rotate until this cable is unplugged. If you have not yet done so, unplug the exhaust fan power cable and store it in the fan enclosure. The lower dome slit drop-out may be opened with the manual crank; this is only essential if you are observing objects near the horizon, but opening it may help move more air through the dome to equilibrate temperatures. (On the other hand, if it is moderately windy, you may want to keep the lower slit closed for comfort.)
3. Uncover the telescope: Manually bring the telescope horizontal and remove the cover (carefully). You will need to release the two clips holding the cover on. Store the cover along the dome wall. Be aware that the telescope is somewhat unbalanced with the cover on and may topple if displaced significantly from the vertical, potentially causing damage. While the telescope is horizontal, remove the cover from the finder also.

4. There is an instrument mode selector knob on the bottom of the black instrument box attached to the back of the mirror cell. Make sure that the instrument selector is in “visual” mode for looking through the telescope or in “instrument” model for taking pictures or spectra with the CCD cameras. If the mode is not correct, do the following:
  - (a) Point the telescope to the zenith.
  - (b) Remove the two thumb screws on either side of the eyepiece tube.
  - (c) Carefully rotate the mode selector knob to the correct position.
  - (d) Re-install the two thumb screws. (Tighten snugly, but do not over-tighten)
5. Start the telescope control program: Double click on “The Sky” icon on the Windows desktop. From the “Telescope” pull-down menu, issue the command “Establish Link” (or push the green telescope button on the top-right side of the window).
6. From the same pull-down menu, select “other” and “terminal”. In the terminal window that appears, type KD (must be in capitals) – joystick disable – and return. Then erase this and type PE – paddle enable. Finally, erase this and issue the command AA if the telescope is west of the pier or AB if it is east of the pier.

## Observing

1. Dome Rotation: The rotation motor is interlocked and will not operate while the dome slit cable is plugged in. Note that the dome rotation control is the right-hand lever on the control box and that it works backwards (push right for dome left, etc.) Be very careful when rotating the dome not to injure people or hit the observing ladder with the protruding crank handle or fan enclosures! Also keep hands, hair, and clothing away from the dome rotation motor.
2. Coordinates: The telescope has no encoders on its axes, so the controller cannot sense where the telescope is pointing (this is an open-loop control system). To initialize the controller, point the telescope (manually) to a bright star, identify and click on the star in the computer display, and press the “Sync Scope” button on the window that pops up (you will need to select the telescope tab). Thereafter, do not slew the telescope by hand, or you will have to re-initialize the coordinates. Note that the telescope must be tracking (green light on the hand paddle) in order for the Sync command to work. It is a good idea to immediately slew to another bright nearby star to check that everything is working. In particular, if the telescope slews in the wrong direction, you have told the computer that the telescope is on the wrong side of the pole - select “Other Commands” from the “Telescope” menu and issue the AA or AB command, as appropriate. Then re-sync.
3. Pointing: Once the coordinates are initialized, it is easiest to point the telescope to new objects by using the computer. Click on the desired object on the display (or use the “Find” menu). When the window for that object pops up, click on the “green telescope” (slew) button at the bottom and the computer will move the telescope to the object. Do not use the hand paddle until the telescope starts tracking on the object. When slewing over a large distance, or looking for a faint object, it is wise to first set on a nearby bright star and re-synchronize the coordinates. To stop a slew in progress, issue an “E” command in the “Other/terminal” window of the “Telescope” menu.

4. Hand Paddle: The telescope pointing is adjusted with a multi-button hand paddle. The four buttons arrayed in a cross pattern control NSEW motions. The button closest to the wire will turn off tracking and allow the NSEW buttons move the telescope very rapidly.
5. Focusing: The telescope is focussed by moving the secondary mirror. The focus control is the box with the red LED displays. Set the On/Off switch to “On” and the Enable/Disable switch to “Enable”. Use the CW/CCW switch to select the direction of focus motion, and the Run switch to move the focus in that direction. The Speed knob controls the rate of focus motion. Low to intermediate rates work best. High rates make the motor stall. The numeric display on the box is useless. Instead, look at the readout of the encoder (green LED numbers) which measures the position of the secondary. This is on top of the box that controls the dome motion. The best focus for visual observing is near zero on the encoder readout. The best focus for the CCD camera and spectrograph is in the vicinity of +8 mm.
6. Software: The Sky program has a large number of options, settings and display modes. Most are relatively obvious in their operation. Most importantly, note that you can limit the brightness of objects displayed; for effective use in our skies, set the stellar magnitude limit to 3 or 4. If all else fails, read the manual! The Sky program sometimes crashes (a little windows pop up forcing you to kill the program). In this case you need to exit and restart the program. You will need to go through the usual program startup and “re-sync” your coordinates.

### Shutting Down

1. Bring the telescope to the horizontal position and cover the telescope and finder. Then return the telescope to the vertical on the west side of the pier. Beware that the telescope is unbalanced with its cover on!
2. Close the lower dome slit dropout if it is open.
3. Rotate the dome until the slit motor cable is near the control box. Plug in the slit motor and close the dome slit. Make sure that the outer lip of the slit cover comes down over the dropout. It may be necessary to use the hand crank to keep the dropout snugged up as the cover finishes closing. If you cannot turn the lever in the correct direction to close the dome, slide the metal locking plate at the front of the lever until you can.
4. Shut down all running programs on the control computer. Turn off the Coordinate I controller (and the CCD power supplies, if you were using them – that is covered in an additional handout, however). We usually keep the computer running. If you do shut it down, be sure to do so correctly – don’t just hit the power switch!
5. Fill out the observing log! Note any problems that you had with the equipment.
6. Please be sure the dome lights are out and the door is locked when you leave.