

Use of Kirkwood Observatory

Emergency procedures: Emergency procedures are described in the Emergency Action Plan located on the windowsill by the main entrance door.

- A phone is located in the "transit room" on the first floor.
- Call 911 in case of an emergency involving an accident or injury or if Campus Police are needed for any reason. (Of course, evacuate the building in case of fire and call from elsewhere!).
- In case of equipment failure, call someone in the department for help if it is an emergency (dome is stuck open and rain is threatening...). If you can't find anyone, call Physical Plant (the number is in the EAP). If it is not an emergency (e.g. weather is good and stable), leave an email for Brenda, Stu, Caty, Brice, and Bill describing the problem.

The maximum number of people allowed in the building at one time is 45. If more than 45 people come to an open night, ask some to wait outside until others are done.

Using the 12" Refractor

To open the door to the Observatory (but keep it locked), turn the key to the left. Turning it to the right unlocks the door.

Turn off the exterior lights using the switches to the left of the door. (Make sure to turn them on again later before you leave). One of the switches closes the shutters of the windows at the Law School (open these when you are done!).

If the Observatory is open to the public, turn on the light on the terminator map on the south side of the hall. The controls are on the right under the map. If you need to reset the time, use the setting knob on the bottom. The terminator map needs to be reset whenever the power has been off. Pull the knob down to engage it.

Open the dome shutter by pulling on the rope. Opening and closing the shutter should use all the rope.

To remove the lens cover, lock the telescope in HA using the knurled clamp (its on one of the long poles between the telescope and the mount). Unlock the dec clamp (the smooth knob), move the telescope to a horizontal position, lock the dec clamp, and use the ladder to reach the cover to remove it. Don't forget the finder cover. Store the covers on the cabinet.

Turn on the master power switch located on the panel on the telescope pier. The master switch also turns on the telescope drive. Also located on this panel are a switch for the light and buttons for dome rotation.

To move the telescope to the other side of the pier

- Unlock the dec clamp
- Point the telescope to the pole
- Clamp the dec
- Release the HA clamp
- Use the wheel to take the telescope over the top of the pier
- Lock the HA
- Release the dec clamp to bring the telescope back to the zenith.

The telescope tracks better when the HA drive is lifting the weight of the telescope (that is, what is on the east side). The counterweights may need to be adjusted to make the east side heavy. The counterweights are adjusted by rotating them about the shaft.

The handpaddle has motions for the dome (cc and ccw) and for the cardinal directions. If the telescope is at the end of the tangent arm, you may need to reset the telescope to the center of the tangent arm. Use the slow motion to move the telescope to the middle of the tangent arm, unclamp the HA or dec, reacquire the object, and reclamp the HA or dec.

The HA and declination can be read from the setting circles. With the Vernier scales, the setting circles are usually accurate to a degree or better. It's common to set right on target with the Verniers, so take a good look in the eyepiece before starting to wander around the sky.

To set the RA dial (on the pier), set on a bright star whose RA you know at the beginning of the night. Slide the outer ring of the RA dial to read the correct RA. There are two dials for when the telescope is reversed.

Focus the eyepiece by loosening the locking screws, and the eyepiece knob can then be used to slide the eyepiece up and down.

The finder should be aligned with the 12". If it is not, let someone know.

Checklist for the end of the night:

- Stow the telescope vertically on either side of the pier. Turn off telescope.
- Put the covers on the telescope and finder.
- **Close the shutter** with the slit to the south.
- Fill out the log book whenever the telescope is used. Include your name, the date, time open and closed, any problems noted, and estimate the number of visitors.
- Be sure the lights in the dome are off.
- Use all your senses (listen, look, smell...) to be sure everything is safe.
- Turn on the outside lights and open the shutters in the Law School.
- Be sure all doors are closed and locked.

Notes:

Tracking problems: Make sure the E-W parts of the telescope are in balance. Adjust the weights and make sure that the telescope “pulls down” on the east side of the pier.

Dome – When you rotate the dome, don't rapidly switch directions. The circuitry has a built-in delay for the dome to coast to a stop. The dome motor will occasionally make a terrifying noise and bounce up and down on its plank, and then continue turning. This is routine, and everything is okay.

Keep your keys with you. The catwalk door cannot be reopened without a key.

Try to avoid reversing the telescope during public viewing. It takes a lot of space and is awkward with lots of people in the dome.

Other eyepieces are available (see Kent), but the one normally on the telescope should be used for open nights.

Factoids (the public wants to know!)

- The 12" refractor lens was made by Brashear (see the photograph by the door). It is a doublet with an airspace set by postage stamps. The lens is $f/15$, and is well-corrected for the usual aberrations. It produces excellent images when the seeing is good, and was designed for work on visual binaries.
- The telescope and dome cost \$7500 in 1901, roughly \$170,000 in today's dollars. The Observatory was financed by IU.
- Kirkwood never used the telescope himself. It was built in 1901, after he died. Kirkwood was a member of the IU faculty from 1856 until 1886, and he died in 1895.
- The magnification is about 100x, and the highest possible magnification is about 1000x.
- The Howard Clock was used to time binary stars (contrary to urban legend, it was never used for time dissemination).
- The dome, mount and OTA were built by Warner & Swasey, a company that built science instrumentation (not ships).

Note that the public also wants to know how big and how far away are the objects that they are seeing through the telescope.

Using the Solar Telescope

The solar telescope uses three mirrors to feed three different light paths

- The top path through a lens and a prism forms a white light image of the Sun on the screen across the room.
- The middle path feeds a spectrograph. The knob at the top of the spectrograph can be used to adjust the slit width.
- The lower path includes a stop, a heat-absorbing pre-filter (it must be there or the Sun will damage the H-alpha filter), a camera lens, and a narrow band Ha filter to a TV camera. The filter stays plugged in all the time, and the camera is left on. The three tilt adjustments on the narrow band filter can be used to adjust the filter passband (try to optimize contrast). The wavelength of the filter needs to be adjusted for each spot on the limb. The best tilt is also a function of where the Sun is in the field of view.

Remove the plastic-bag mirror covers (2) and the hard plastic covers (3). Turn on the telescope power, and hold it on with the maximum slew rate to run it west to find the Sun. It is usually easy to find the Sun. Getting the brightest beam is the easiest way. The heliostat mirror cover opens automatically when the telescope drive is on.

The motors on the solar telescope sometimes stick. To fix this, drive the telescope in the opposite direction for a while. Eventually, the motor will start working again.

The telescope may not track well, and the pointing needs to be tuned up every 5-10 minutes. The autoguider never worked.

Stow the telescope all the way to the east limit switch. Turn off the power. Sometimes the telescope will creep off the limit switch while the cover is closing, so keep driving the telescope east while the cover is closing, then turn off power.

Leave the N/S drive wherever it is. There is no need to drive it to a limit.

DON'T adjust the optics on the optical bench except the tilt of the H-alpha filter. The optics are hard to align.

The CCD camera is normally left on. There is no switch, so just leave it plugged in.

The TV monitor should be turned off when not in use.

The monitor in the lobby also works but may be turned off (someone needs to get a ladder to turn it back on). The cables can be switched behind the solar lab monitor to connect to the monitor in the lobby.