MARYLAND SPACE GRANT OBSERVATORY
OBSERVATORY PROCEDURES

****User note: this document is a work-in-progress. Please alert observatory staff of any inaccuracies, omissions, etc. Last rev. 2024/12****

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ROOF PROCEDURES, SAFETY, AND OPENING THE DOME SLIT

- **Leave roof access door closed**
    - Check that the inner doorknob remains locked. If you turn the key the wrong way when opening the door, it leaves the door unlocked. **This can be corrected by turning the key in the other direction.** It must remain locked at all times and you should double check when leaving for the night.
- Unlock the observatory door (leave propped open for airflow). If the door/lock is "stuck," **pull the door towards you, instead of pushing the door inwards, while turning the key**.
- Turn on inside and outside red lights. Remember to turn them off at the end of the night.
- Plug in the dome slit cord, decide where you will be observing (near zenith or near horizon), and open the dome slit accordingly.
- If you will be observing near zenith, pull the chain located on the right side of the slit and flip the switch to open. Hang onto the chain until the upper portion of the slit has cleared the hooks, then you can let it go. When the slit is all the way open, it will automatically stop.
- When the dome slit is open, switch the controller off, unplug the box-like connection above the controller switch (leave the cord plugged from the wall), and put the end of the cord all the way up on the metal ledge of the slit opening. **DO NOT FORGET TO UNPLUG THE CORD.**

- **When slewing, make sure ladders, chairs, and humans are completely clear of the telescope**. Injury and damage can occur if people or objects are left unattended when the telescope moves.

OBSERVATORY STARTUP

- ❖ Turn on the PC. The switch is on the bottom right panel. Open the case (put your fingers in the groove and pull the panel open, the little door will swing to the right). Press the black switch to the right of the red button. The black switch will bounce back after you press it.
- ❖ Check the positions of the other switches: ensure that DRIVES is off, TRACK is off, AUTO DOME is off, dome is set to HOME, and HALT MOTORS is pushed in.
- ❖ Turn on MTR DRIVER CHASSIS. HALT MOTORS should turn red.
- ❖ Open the TCS software via the shortcut on the Desktop.
- ❖ In the TCS software, go to the drop down menu that says telescope, scroll down to Misc. Click all red buttons (they should now all be green). Click apply and exit out.
- ❖ Release HALT MOTORS (push it so that it's not depressed; light should turn from red to off).
- ❖ Turn on DRIVES.
- ❖ Use the handpaddle (by holding SLEW and the directional buttons) to move the telescope over to the south (S) and west (W) and remove the yellow cover from the main telescope and the black lid from the finderscope. Put them on the lower tray of the metal cart to keep them from getting dusty. Be mindful of APPROACHING LIMITS, check the TCS before the next step
- ❖ Go back to the TCS software, go to Telescope → Movement → Offset/Zenith → Click "Apply" on Stow at Zenith.
    - ➢ Note: if the telescope was slewed close to the horizon (APPROACHING LIMITS warning in TCS), you will need to use the handpaddle to move the telescope closer to zenith before the TCS command will work.
- ❖ Open TheSky Software (X icon), connect the telescope by going to Telescope → Start Up → Connect.
    - ➢ Note: This is done by pressing Telescope in the sidebar, not the top bar. This will lead you to a page where there is a drop down menu that says "Start Up".
- ❖ Turn on TRACK (and AUX TRACK if desired).
- ❖ **ENSURE the slit controller is unplugged.**
- ❖ Turn on DOME TRACK.

- Turn on AUTO DOME (this is the default mode where the dome will follow the telescope). You can leave it off and control the dome manually.
- Install an eyepiece. One is available in a white plastic case on the table next to the PC and more are available in the case on the table and in another case in the cabinet. Do not attempt to clean the eyepieces.
- Either by entering in the Find box or pressing ctrl+F while in the Sky software search for the object you would like to observe. You can also directly click to an object on the Sky software sky map. Press the slew button within the SkySoftware sub-window to move the telescope to the object.
- In TCS go to Telescope → Initialization → Start Sidereal Track and Rate Corrections (note that returning to zenith will require you to turn on tracking again).
- Focus the telescope. Find the approximate value for your eyepiece in the list below and use the handpaddle or TCS to move the abs. focus to the approximate position. Then fine focus using the handpaddle and your eye.
    - Teleview 55m (default, clear cylinder): ~7000
    - SWAN 40mm: ~12,000
    - DSLR: ~16,500
    - ASI1600 (Science Camera): ~13,000
- Observe and have fun!

SHUTTING DOWN

- Turn DOME TRACK to home (down). If you have not been using AUTODOME, you will need to turn that switch on; otherwise the dome will not automatically return to its home position (south). You can manually return the dome home.
- When the dome has returned to the home position, turn AUTODOME off.
- In TheSky software, disconnect the telescope by going to Telescope → Shut Down → Disconnect Telescope. Close TheSky.
    - Again, this option is available by using the sidebar. It will send you to the telescope page, where there will be a drop down menu in the center called “Shut Down”.
- Use the handpaddle to move the telescope south and west again. Replace the telescopes’ covers.
- Turn TRACK off (and AUX TRACK if on).
- Go back to the TCS software, go to Telescope → Movement → Offset/Zenith → Click “Apply” on Stow at Zenith.
- Once the telescope is “homed” to zenith, turn DRIVES off.
- Exit out of the TCS Software.
- Depress HALT MOTORS (light should come on).
- Turn MTR DRIVER CHASSIS off.
- Plug together slit cord and close the dome’s slit. When the dome slit is closed, turn the controller switch off and unplug the cord from the box-like connection above the controller switch, and from the wall.
    - If observing near zenith, start closing the dome slit regularly. When the upper piece of the slit approaches the lower piece, pull the chain on the lower piece until the upper piece has fully closed, and let the chain go. To confirm that the hooks of the lower piece are aligned with the bar on the upper piece, move the slit up a small amount until you see the hooks latch onto the bar. Then fully close the dome slit.
- Check that DRIVES is off, TRACK is off, AUTO DOME is off, and dome is set to HOME, and that HALT MOTORS is pushed in.
- Turn off the PC.
- Cover the PC with plastic.
- Make sure that you remove any eyepieces from the main telescope and secure them in the black plastic case. Reinstall yellow plastic protector in telescope eyepiece socket.

- (Downstairs) turn off all lights.
- Close the observatory and roof doors. Jiggle them a bit to be certain the lock has caught.
- **REMEMBER TO RETURN KEYS TO OBSERVATORY FELLOW PROMPTLY**. There is only one pair of guest keys. Do not keep them for multiple observing nights unless you have received prior permission from the observatory fellow to do so.

TROUBLESHOOTING COMMON PROBLEMS

- "I Don't See Anything" "I see a big donut" "There is something on the mirror" → **likely defocused**
  - ***TCS → Options → Handpaddle → Fast Focus to more quickly try refocusing
  - Check the whiteboard on the left side of the cabinet for approximate focus values for each eyepiece or instrument.
  - Check that your eyepiece/instrument is fully flush with the 2" socket (check that the eyepiece is pushed all the way into the socket and the screw is tightened)
- **Focus will not respond**
  - Hit the stop button in the TCS
  - If it still doesn't respond, use Telescope → Initialization → Initialize
- **Telescope won't slew** (common issues)
  - Near horizon → manually slew away from horizon until it slews quickly → slew to target
  - Not near horizon → Make sure you set up correctly → MTR DRIVER CHASSIS on, HALT MOTORS depressed, DRIVES on
  - Check no processes ongoing on the TCS main panel (e.g. SLEW ENABLED) → try clicking STOP in TCS (worth giving this a shot even if you don't see an ongoing process)
  - If TCS says HORIZON LIMIT and the handpaddle, virtual handpaddle, and TCS commands cannot move the telescope, call the observatory fellow. They will need to physically push the telescope away from the horizon limits. DO NOT ATTEMPT YOURSELF! If they cannot arrive in time, shut down the observatory with the telescope out of position. Please put dust covers back on and remove the eyepiece, if possible, but do not risk your safety to do so. Notify the observatory fellow.
  - Check the altitude of the object you are trying to slew to. If it is <15 degrees, the telescope cannot point that low.
- **The dome isn't moving** or **dome tracking isn't working**

- ➢ Check that autodome is on and dome tracking is on.
- ➢ Try pressing dome left or right on the handpaddle.
    - ■ If that works, wait 15 seconds to see if dome tracking kicks back in and moves the dome in line with the telescope. If it doesn't automatically move, something is wrong with dome tracking. You'll either need to manually move the dome for the rest of the night or restart the system.
    - ■ If the dome doesn't move, try alternating between pressing left and right quickly for 5-10 seconds, as if you are trying to get it unstuck. If that doesn't work, call the fellow for further advice.

❖ **Telescope not responding** (sporadic issues)

- ➢ Try pushing the handpaddle connection downward and to the left while attempting to slew/focus. Sometimes this connection gets loose, especially when using the paddle at a distance from the chassis.
- ➢ Try twisting/jiggling the GALIL CPU knob on the chassis. If it pops loose (counterclockwise turn), push in and twist clockwise to reset.
- ➢ If lack of response continues, try resetting by following shutdown and startup procedures (no need to replace covers or close dome slit during this reset process)
- ➢ If nothing above works, replace covers if possible and shut down. **Notify the observatory fellow.**

❖ **Unexpected rain, snow or sleet? Shut down as quickly as possible.**

- ➢ Rain: cover the TCS computer with the plastic cover → slew telescope to south and west and replace covers → turn DOME TRACK to HOME → when dome returns to home position, close dome slit
- ➢ Snow/sleet: slew telescope to south and west and replace covers → cover TCS computer with plastic cover → turn DOME TRACK to HOME → when dome returns to home position, close dome slit

❖ **Dome is not shutting/opening**

- ➢ Jiggle the lever back and forth. Check that the plug is plugged in on both sides, and the plugs are flush. If the slit is nearly closed but not responding, open it a little more before closing.
- ➢ Someone might have jammed the switch previously. If you throw the switch in either direction and it doesn't respond, carefully unscrew the handle from the fulcrum, and align the notch in the fulcrum so that it is centered in-between the opening and closing positions of the switch. Re-screw the handle into the fulcrum, and test the lever again.

- ➢ If issues persist, contact the current observatory fellow or Matt. There is a manual method for closing the dome, but it should not be attempted without the Observatory Fellow's knowledge. FOR OBSERVATORY FELLOWS, or trained users in an EMERGENCY ONLY: There is a long pole in the space beneath the telescope by the stairs that can be used to manually shut the dome slit. Hook this pole on to the small metal ring at the center of the dome ceiling. Turn the crank at the bottom of the pole to close the dome. Contact Matt or a previous fellow if you are unfamiliar with the procedure or need help.

- ❖ **Telescope pointing incorrect** or **Object not in FOV**

  - ➢ (Summary) **If small offset,** from current target in TheSky, center target in field of view, then in TCS go to ***Telescope → Initialization → Telescope Position, click Use Next Object Position, then click Apply. **If large offset,** in TCS go to Telescope → Initialization → Set Encoders for Defaults, then find + center, and follow the small offset procedure.

    - ■ When pointing is off and "set encoders for defaults" doesn't cure it, check the computer time. It can get out of sync because the computer isn't connected to the internet. If it's off by more than a few seconds, it should be manually reset. **<<Insert instructions for how to set the time to the second in the version of Windows on the Observatory computer.>>**

  - ➢ 1) Find a target that is easily identifiable, like a very bright star or planet, to slew to. I have found Saturn and Jupiter, or very bright stars like Vega, Polaris, or Arcturus to be useful for this. You can also try the Moon if you think the issue is very severe. Select this target in *SkyX* using the map or target name search and then press *Slew* in *SkyX*. If you have selected the target correctly there should be a red bull's eye around it in the *SkyX* night sky map.

  - ➢ 2) Check that you can see the intended target with your naked eye and that it is above the telescope's horizon limits. Jupiter, Saturn, Polaris, etc, are all more than bright enough to be visible. Depending on the time of year and hour of the day, they might be unviewable or too low in the sky, so check that they are not out of range for the telescope. If you can't see your target with your naked eye, the telescope is probably not out of position, there are just clouds blocking the target. If there are clouds, wait for them to pass.

  - ➢ 3) If you can see the target with your naked eye, try to observe it through the finder scope (5in telescope attached to the main telescope). This telescope has a wider field of view. Jupiter, Saturn, Polaris, Vega, etc should all be very obvious and recognizable, even in the finder scope.

    - ■ 3a) If you can see it in the finder scope, but not the main telescope, check the absolute focus of the main telescope. It should be around 5000. If it is very far from that value, you may be unable to see the target. Use the hand paddle to change the abs focus to 5000. If this solves your issue, congrats, you are finished!

    - ■ 3b) If the abs focus is fine and you can see the target in the finder scope, that suggests that the positioning is only slightly misaligned. Go to step 5.

- 4) **If you can't see the target in the finder scope, but you can see it with your naked eye, the telescope is very out of position.** In *TCS* go to *Telescope → Initialization → Set Encoders for Defaults*. This will reset the position. Now try to slew to the target. It should at least be within the field of view of the finder scope, if not centered within the main telescope. If this solves your problem, congrats, you are finished!
    - 4a) If you are unsatisfied with the centering move on to step 5.
    - 4b) If after completing step 4, you can see the target with your naked eye, but not in the finder scope, then contact the current observatory fellow. They may need to manually aim the telescope as in step 5, or there may be an entirely different issue.
- 5) Slew to your chosen target. Do not touch *SkyX* after this! If you do, you risk introducing a very severe positioning error!
- 6) Center intended target in the field of view of main telescope using handpaddle. You must see the target in the center of the eyepiece on main telescope to move to the next step!
- 7) In *TCS* go to *Telescope → Initialization → Telescope Position*, click *Use Next Object Position*
- 8) Now slew to your chosen target. It should be in the center of the main telescope. If so, congrats, you are finished! If the target is visible with your naked eye but does not appear in the finder scope or main telescope, see 4b.

- If observing near the north celestial pole
    - **Be sure to note exactly the directions in which you slewed to get near the north celestial pole.** The telescope may approach limits if slewing near the north celestial pole. If you slewed close to the north celestial pole and you notice the telescope is approaching the limit, **stop slewing towards your intended position. Backtrack** your motion by going in the opposite direction(s) that were used to reach the intended position.

- **Focus will not respond (does not work as of Dec 2024)**
    - manually set focus value in TCS: Telescope → Initialization → Focus