

Schulman Telescope Startup Procedure

Updated 8/4/2022 - Travis Deyoe

The order of operations below is designed for time efficiency. Missing a step could lead to frustration as some steps may feel “out of order” but are designed to reduce down time waiting for things to power on.

Pre-Startup Checks

Pull Off Tarps

The Telescope, Controller, and desk will always be tarped whenever the telescope is put into Lightning Shutdown. They will need to be removed before inspecting or moving the telescope.

Perform your best interpretive dance to appease the tarp gods. If that does not make the tarp fall off you must remove it manually. Folding it up and placing it to the right of the brown cabinet is a nice touch.

Check Telescope Position

Verify the telescope is not at any limits. If it is or looks “wrong” to you, move it manually into a safe position before the next steps. This guarantees that it will be able to successfully and safely home in a future step. It's recommended to place it either at [Zenith](#) or the [Park](#) position.

Check Emergency Stops

If engaged, release any E-stops on the Hand Paddle, Telescope Controller, and the MaxDome Controller by pulling them outward. They all appear as big red buttons that scream “PRESS ME IN CASE OF EMERGENCY”.



Check the Telescope Balance State

The telescope is in a balanced state when one of the following conditions are met:

- The camera is on with a single weight attached at the “top” of the backplate.
- The focuser is on with both eyepiece weights attached on either side of the focuser and there is no weight on the “top” of the telescope.

In either state an eyepiece should be in the 6” refractor and the mirror covers are open (this will be done later in [this step](#)). If the telescope is in neither of these states, then place it in one of the [Configurations](#) now or at the very least before [homing the telescope](#).

Check RA Encoder Tape

Follow the RA [optical tape](#) along the big RA wheel and check for any smudges, bug guts, and so forth. The WEST [read head](#) is active while the east read head is not currently utilized, so make sure through the entire motion of the telescope (in RA of course) that there is nothing blocking the reading of the tape on the west side and that there is nothing obstructing the read head's ability to “see” the optical tape.

Make certain both the [drive and idler bearings](#) are also free of anything that might be transferred to the optical tape. A bit of felt is held in place there that *should* wipe off anything, but its best to check still.

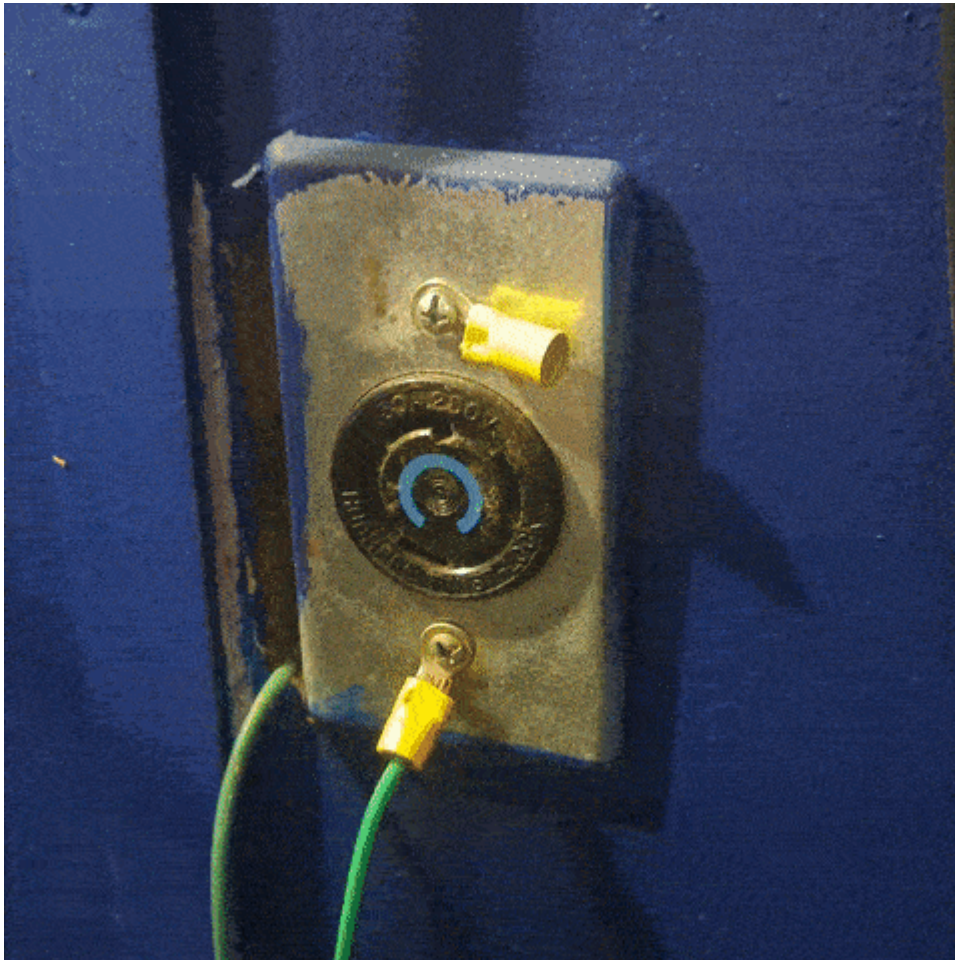
If anything is observed, use a microfiber cloth or TEX wipe to wipe it away. You can use 99% isopropyl alcohol if necessary. Note that you should only wipe along the narrow width NOT along the circumference (or length) of the tape.

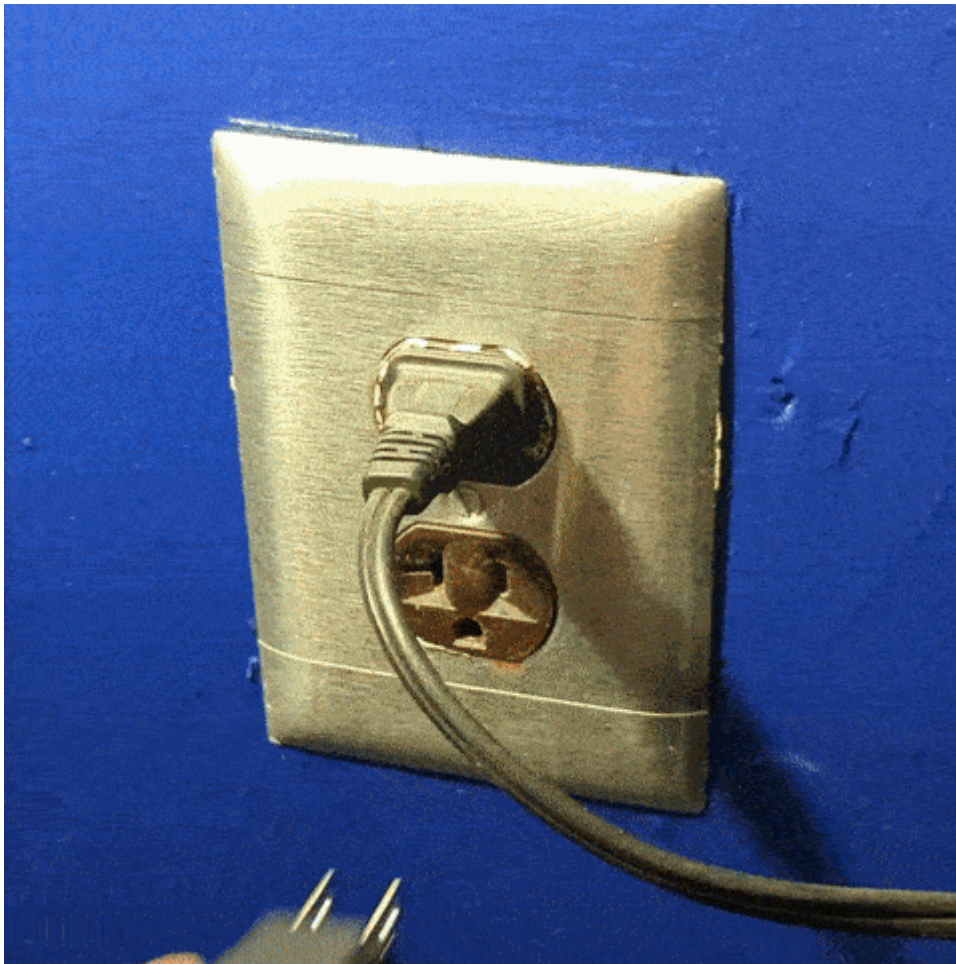
Powering Everything On

Now that you have inspected the telescope for safety, it is now time to start turning things on.

Power On UPS's

First plug in the Big and Small UPS's to the left of the desk. The BIG UPS should be twisted clockwise after insertion in order to secure it in the socket. The Big UPS powers the larger controller box on the wall above it while the Small UPS powers basically everything else.





Next you must turn on both UPS's. Press and hold the corresponding “on” button for at least a second until you hear a beep then let go. For the Big UPS this will take a few moments as it cycles through some littles (shown in full in the GIF below). The Small UPS will power on quicker.



Both UPSs will immediately supply power to their output plugs so no further button pressing is

necessary.

Power On Controller and Desktop computer

The big gray box on the wall is the Controller. Turn it on by turning the large red switch on the bottom left of the Controller box to the right (clockwise). Assuming the UPS was powered on in the last step Fans and other noises will be heard as the system comes on.



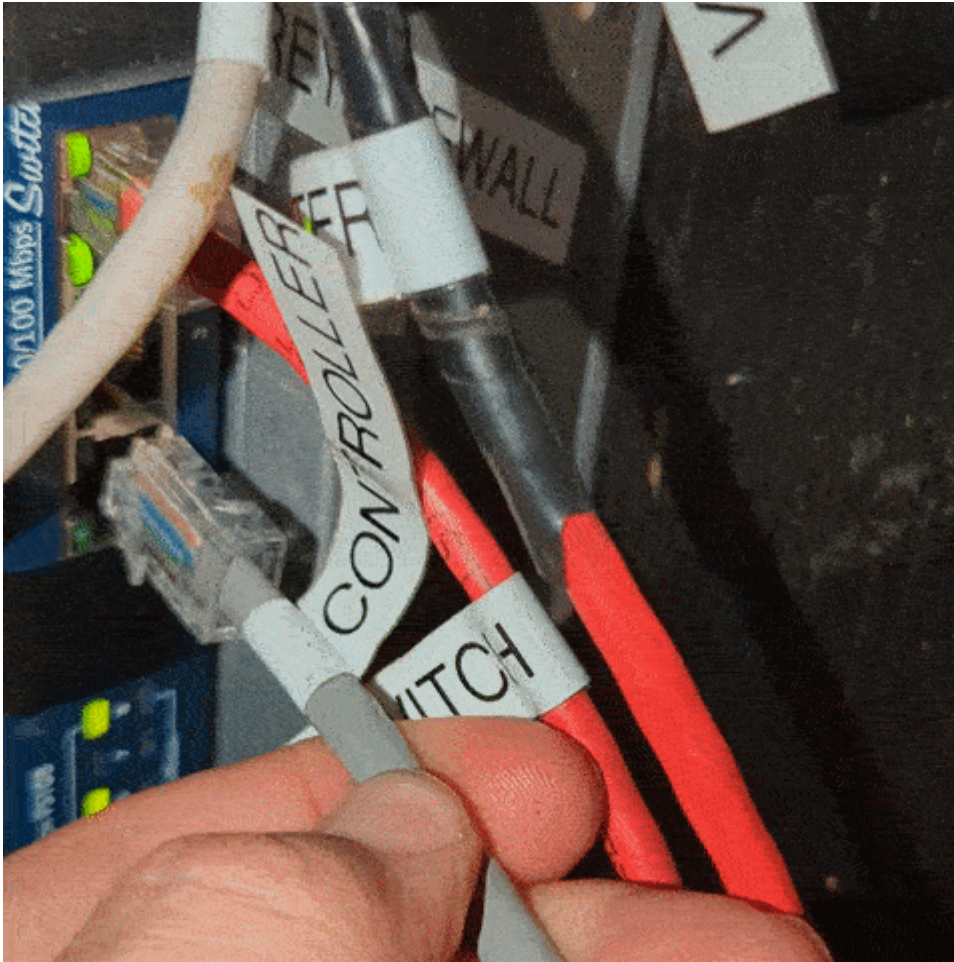
Now is also when you should turn on the Desktop computer. It is under the desk behind the little door on the left. The power button is the same color as the computer case so in a dimly lit room (like it most likely is now without the dome open) you may need a light to find it.

Power on TIM Unit

The TIM unit is a small gray/black box on back of the telescope just below where the camera or eyepiece is installed. There is a standard power switch on the left side to turn it on.

Check Controller Ethernet Cable

While the Controller and Desktop are powering on (the Controller takes about 15 years to do so) go into the warm room. Now go into the closet. There is a grey ethernet cable labelled "Controller". Plug this into the switch on the right wall and confirm there are the happy internet lights on the switch.



Desktop Tasks

Procced back to the desktop computer which should be fully powered on. Login to the computer (standard SkyCenter password). The next few task will all be done on this computer.

Open Mirror Covers

Open the [RCOS TIM software](#) from the desktop link or toolbar quick link.



Connect to the TIM unit and navigate to the “Primary Mirror Covers” tab.



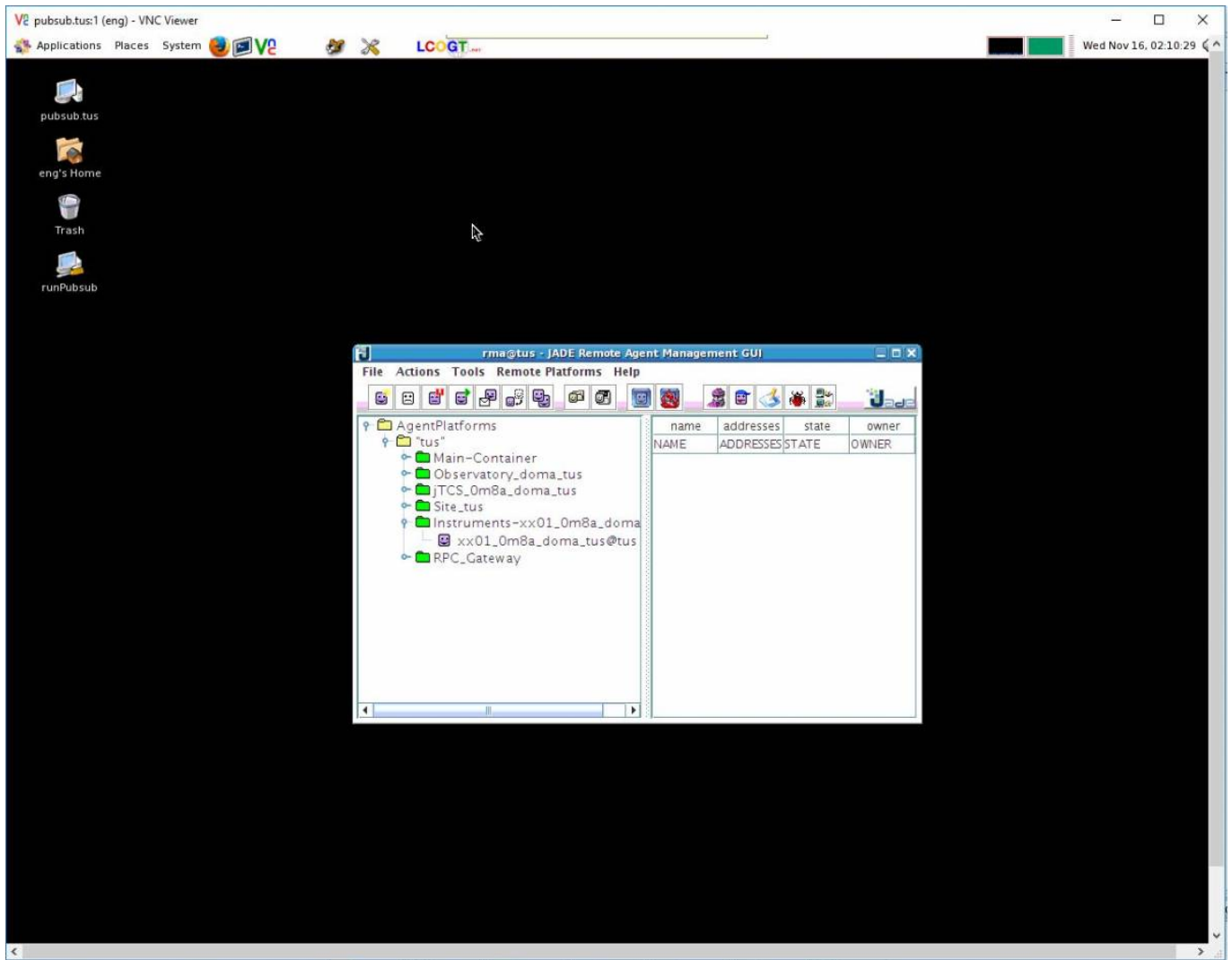
Open the Mirror Covers:



If the mirror covers aren't opening correctly or the current stays high (over 1000milliamps) then there is a problem. Abort the opening (or closing) and follow [this procedure](#)

Remotely connect to MIC and PubSub

Launch [VNC Viewer](#). It will appear on the middle right of the desktop (or just search it in the start menu). You will now want to remotely connect to the MIC and PubSub computers that run the Controller. This is what VNC Viewer does so just double click on the MIC and SUBSUB links in VNC Viewer and it will open a window of each.



The small icons to the right of processes can be pressed to expand them and reveal the list as shown. Once the “Instruments-xx01_0m8a_doma” process is loaded under its section PubSub is ready to communicate with the telescope (and the user). The “RPC_Gateway” process will not show up until communication to PubSub through the web browser commences. This is in the next step. It is OK to close the VNC window.

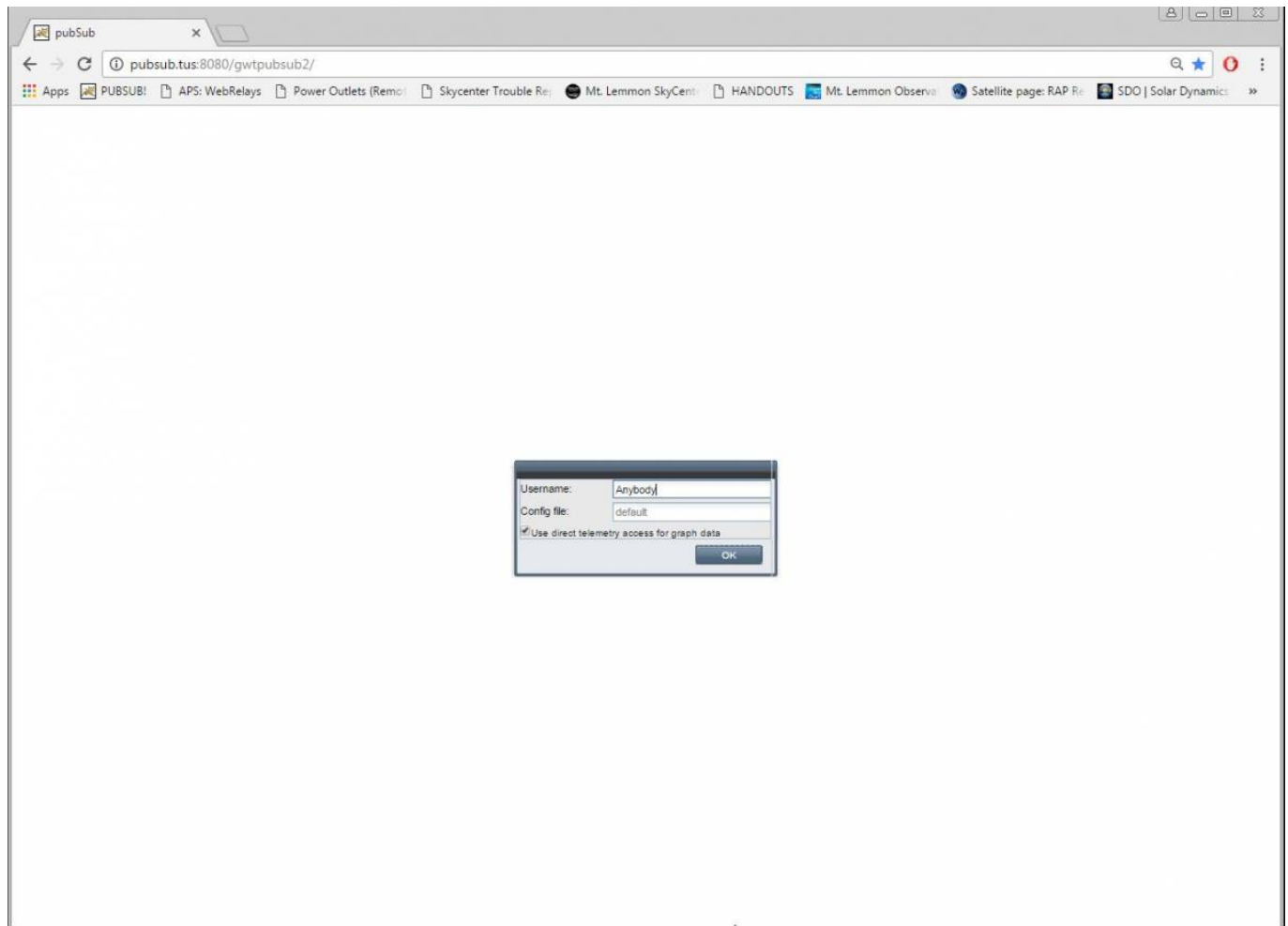
From Pubsubs Desktop folder double click on the “Clear and Restart Pubsub” program. This will open both a Terminal window and a GUI. The gui will slowly populate with a list of items. **Do not process until all those below show up**

- Main-Container
- Observatory_doma_tus
- Site_tus
- jTCS_0m8a_doma_tus
- Instruments-xx01_0m8a_doma
- (RPC_Gateway) ← only shows once connected (via [this step](#)) to the controller, will not show initially

Access the LCOGT (PubSub) GUI

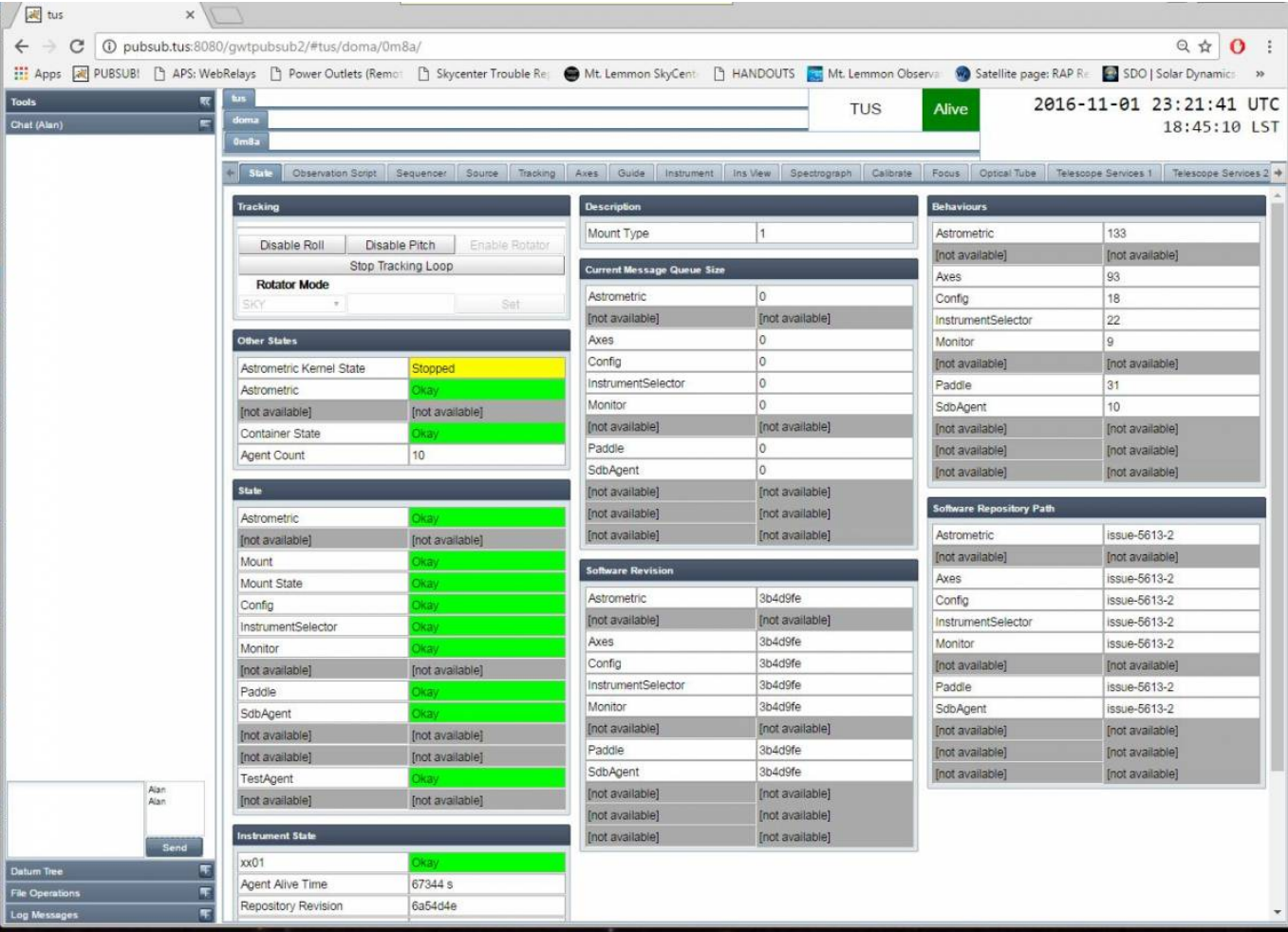
Now that the system is up and running with drives, servos, and PubSub- access the LCOGT GUI:

Open [Google Chrome](#) and click the bookmark labeled PubSub. You will be presented with the screen below:



The Username is unused so leave it as is or write something funny for the next operator to see. **default** is required for the Config File field. Once those are confirmed click OK.

PubSub will now take a long time to load. Go read a book (I recommend [Remembrance of Things Past](#)) and come back when you are done. If it feels like it's taking too long try refreshing and logging in again.



Take note of the colors you should mostly see greys (items that just aren't used in our setup) or greens. There may be a yellow or two but if there is any red there may be an issue.

Homing the Telescope

The telescope must be homed before it can be operated.

When PubSub loads it should already be on the Axes tab. If not click on it. Note that the axes are **Unhomed**.

State
Observation Script
Sequencer
Source
Tracking
Axes
Guide
Instrument

Agent State

Mount
Okay

Suspend @ 2016-11-16 02:52:49

Axes Command

Agent Enable
Agent Disable

Roll	Pitch	Rotator
Standby	Standby	Off
Unhomed	Unhomed	UNKNOWN
<input checked="" type="radio"/> Pos <input type="radio"/> Vel <div>0.0 deg</div>	<input checked="" type="radio"/> Pos <input type="radio"/> Vel <div>0.0 deg</div>	<input checked="" type="radio"/> Pos <input type="radio"/> Vel <div>0.0 deg</div>
Slew	Slew	Slew
Halt	Halt	Halt
Home	Home	Home
Park	Park	Park
Unwrap	Unwrap	Unwrap
Stop	Stop	Stop
Stop Reset	Stop Reset	Stop Reset
Enable	Enable	Enable
Disable	Disable	Disable
Goto Pos L1	Goto Pos L1	Goto Pos L1
Goto Neg L1	Goto Neg L1	Goto Neg L1
Recover L2	Recover L2	Recover L2
Fault Reset	Fault Reset	Fault Reset

Slew
Halt
Park
Home
Stop

Press the large *HOME* button (circled below) to move both axes simultaneously to the home position. See [Telescope Orientation](#) for the correct position.

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Once homed successfully the state field will briefly go to "stopped" and then finally "L1 Positive Limit" in both axes:

State
Observation Script
Sequencer
Source
Tracking
Axes
Guide
Instrument

Agent State

Mount
Okay

Axes Command

Agent Enable
Agent Disable

Roll	Pitch	Rotator
Okay	Okay	Off
Halted L1 Positive Limit	Halted L1 Positive Limit	UNKNOWN
<input checked="" type="radio"/> Pos <input type="radio"/> Vel	<input checked="" type="radio"/> Pos <input type="radio"/> Vel	<input checked="" type="radio"/> Pos <input type="radio"/> Vel
0.0 deg	0.0 deg	0.0 deg
Slew	Slew	Slew
Halt	Halt	Halt
Home	Home	Home
Park	Park	Park
Unwrap	Unwrap	Unwrap
Stop	Stop	Stop
Stop Reset	Stop Reset	Stop Reset
Enable	Enable	Enable
Disable	Disable	Disable
Goto Pos L1	Goto Pos L1	Goto Pos L1
Goto Neg L1	Goto Neg L1	Goto Neg L1
Recover L2	Recover L2	Recover L2
Fault Reset	Fault Reset	Fault Reset

Slew
Halt
Park
Home
Stop

Park Wizard

Now go to the *Source* tab and move the telescope out of the limits to a valid sky position. If the telescope is not going to be used immediately typically the telescope is sent to the **Park** position. Remember to stop the tracking loop if observing is not going to start. The **Zenith** position is inputted in the picture below.

The screenshot displays the LCOGT GUI interface. At the top, the status bar shows 'TUS' as 'Alive' and the date/time as '2016-11-01 23:25:14 UTC' (18:48:46 LST). The main interface is divided into several panels:

- Agent State:** Shows 'Astrometric' as 'Okay'.
- Point:** Includes buttons for 'Point/Next', 'Start', 'End', 'Skip', 'Store', 'Clear', and 'Goto nearest pointing star'.
- Source:** A table listing source parameters: Name, Right Ascension Source, Declination Source, Coordinate System, Equinox Source, Limit Expected, Limit Time Left, Moon Zenith Distance, and Sun Zenith Distance.
- Source Selection:** Includes 'Astrometric Kernel State' (Stopped), 'Known objects' dropdown, 'Source Name' (none), and 'Coordinates' (Coordinate System: APPARENT_HA, Hour Angle: 0, Declination: 32).
- Refraction:** Includes 'Pressure', 'Humidity', and 'Temperature' fields, with 'Apply Override' and 'Clear Override' buttons.
- Tracking:** Includes 'Disable Roll', 'Disable Pitch', 'Enable Rotator', and 'Stop Tracking Loop' buttons.
- Telescope:** A table listing telescope parameters: Tracking In Tolerance, Air Mass, Altitude, Azimuth, Hour Angle, Zenith Distance, Sun Separation, and Moon Separation.
- Space Motion:** Includes 'Source Space Motion Enabled' (false), 'Source Parallax', 'Source Proper Motion Epoch', and 'Source Proper Motion Right Asc.'.
- Time:** A table listing time parameters: Local Apparent Sidereal Time, Modified Julian Day, Julian Epoch, TAI Minus UTC, TT Minus TAI, and UT1 Minus UTC.
- Orbital Element:** A table listing orbital element parameters: Source Orbital Element Scheme, Source Orbital Element Argument, Source Orbital Element Daily Mo, Source Orbital Element Eccentric, Source Orbital Element Epoch O, Source Orbital Element Epoch MJD, and Source Orbital Element Longitude.
- Pointing Control:** Includes 'M1 and M2 Alignment', 'Collimation', 'Roller Encoders', and 'Encoder Non-Linearity'.
- Pointing Corrections:** Includes 'Polar Motion X', 'Polar Motion Y', 'Collimation Correction Enabled', 'Collimation Correction Pitch', and 'Collimation Correction Roll'.

Please see the Using the [LCOGT GUI](#) and [Moving the Telescope](#) section for more information.

Normal Startup Operations

You have now successfully pulled the Schulman telescope out of Lightning Shutdown! Congrats. It is now time to start your normal program procedures to get everything ready for a SkyNight program or remote operation.

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Permanent link:
https://lavinia.as.arizona.edu/~tscopewiki/doku.php?id=public:catalinas:lemmon:schulman_32:startup_procedure&rev=1663191261

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