Schulman Telescope Startup Procedure

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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 the telescope is not at any limits. If it is or looks "wrong" to you move it manual into a safe position before the next steps. This guarantees that it will be able to successful 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. They all appears 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 the this step. If neither of these are the state the telescope is in 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 heads 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. There is a bit of felt held in place there that *should* wipe off anything but its best to check still.

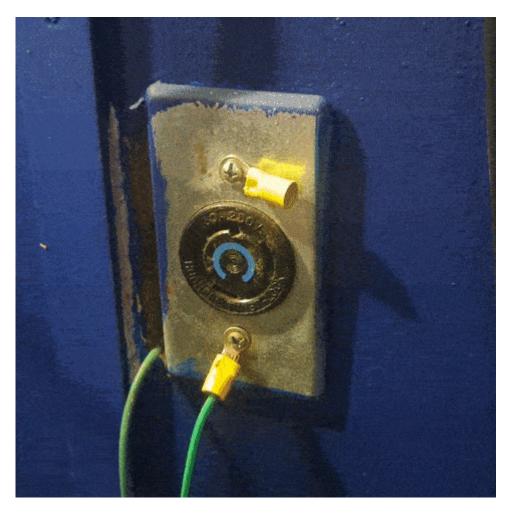
If anything is observed use a microfiber cloth or TEX wipe to wipe it away. 99% isopropyl alcohol may be utilized if necessary. Note that you should only wipe along the narrow length NOT along the circumference of the tape.

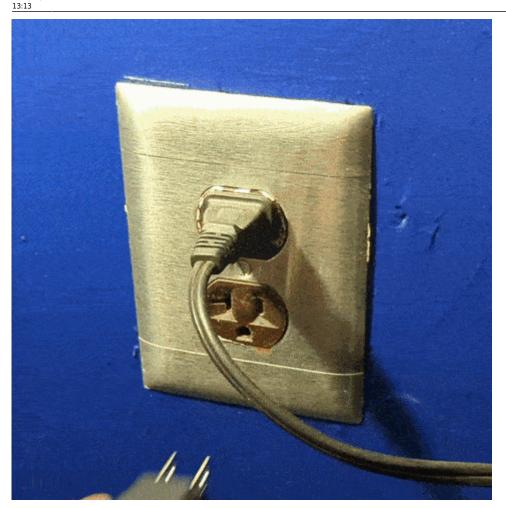
Powering everything on

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

Power On UPS's

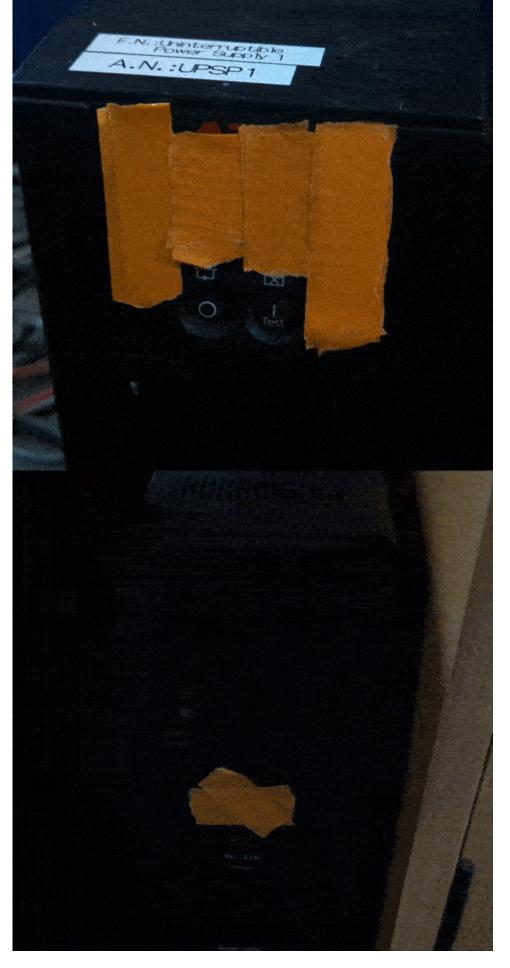
First plug in the Big and Small UPS's to the left of the desk. The BIG UPS should be twisted clockwise after insertion in order to secure it in the socket. The Big UPS powers the larger controller box on the wall above it while the Small UPS powers basically everything else.





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.

DO NOT USE THIS PROCEDURE

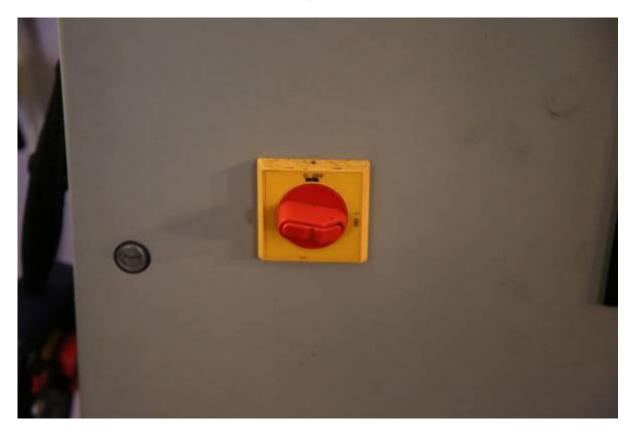


Both UPSs will immediately supply power to their output plugs so no further button pressing is

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

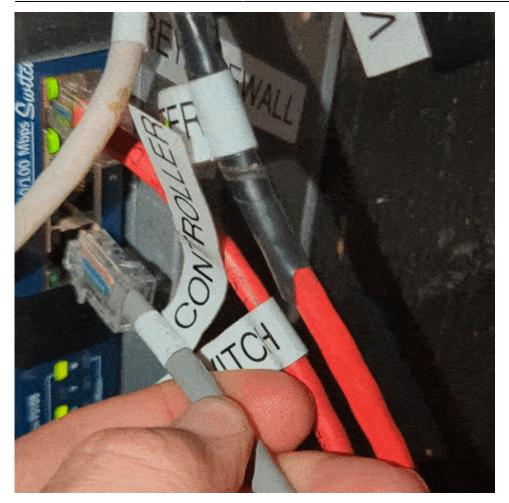
The TIM unit is a small gray/black box on back of the telescope just below where the camera or eyepiece is installed. There is a standard power switch on the left side to turn it on.

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.

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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.

rimary Mirror Cover Controlle	r Rotator Fan Temperature Pri. Mir er	
Cover 1	Cover 2	Open
0% 1 mA	0 mA	X Reset
Cover 3	Cover 4	Close
0% 1 mA	0% 1 mA	

Open the Mirror Covers:

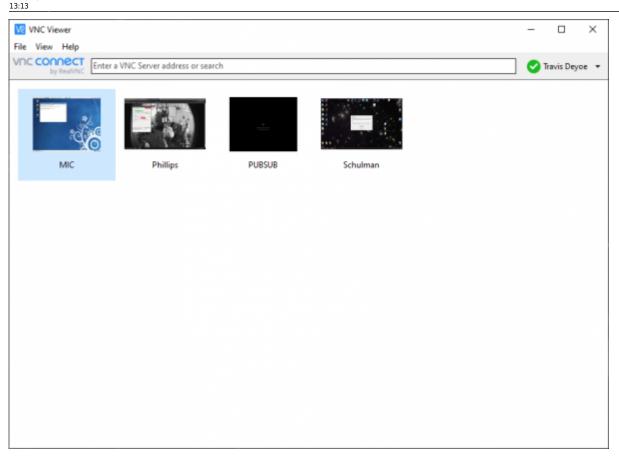
connect Record Focus	er Rotator Fan Temperature Pri. Min	rror Cover
Primary Mirror Cover Control	ller	
Cover 1	Cover 2	Open
0% 1 m	A 0% 1 mA	X Reset
Cover 3	Cover 4	Close
0% 0 m	A 0% 1 mA	

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.

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Verify Mic and PubSub time

NOTE: At this time PubSub is dumb and will display a "Logout" screen. Click that button and it will display an empty desktop. To find the actual desktop you will need to use the file manager in the Programs menu (top left of the screen)

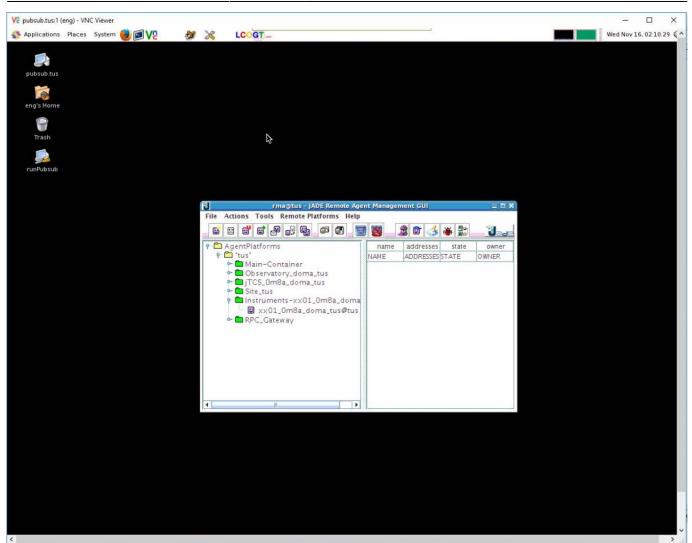
Make it so you can view the top right of both screens next to each other and confirm that the two computers times are within about 5 seconds of each other. If they are not you must perform the following task: Sync Controller Times.

Launch Pubsub software

Initially the desktop will be blank (black). Start PubSub processes by pressing the tool utility icon at the top of desktop. It is circled in the image below:



This will clear the database and give everything a clean start. Eventually (a few minutes) the "JADE" agent will load and the desktop will look like the below:



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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

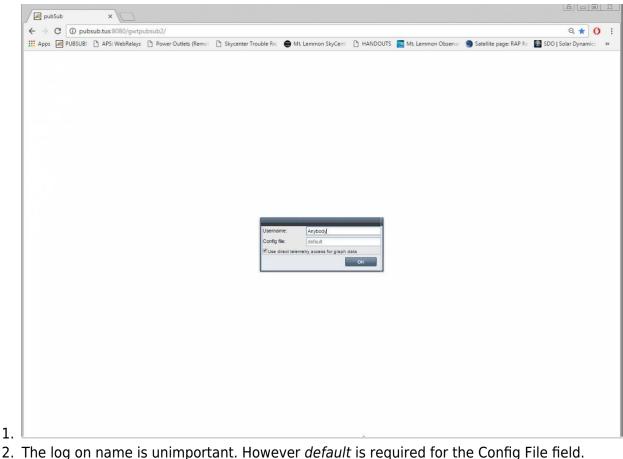
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- jTCS_0m8a_doma_tus
- Instruments-xx01_0m8a_doma
- (RPC_Gateway) ←- only shows once connected (via this step) to the controller, will not show initially

Access the LCOGT (PubSub) GUI

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

1. Open the Chrome Browser and click the quick link labeled PubSub (leftmost icon). You will be presented with the screen below:



- 3. Press the "OK" button to continue.
- 2. Wait for PubSub to send all of the data to the browser. It will take 2-4 minutes. If you simply have a blank/white screen → going back to PubSub through VNC may be necessary to make certain it is setup correctly.
- 3. Once the GUI comes up you will be presented with the Site heads up information. Note the small tab is labeled "tus." This stands for "Tucson." None of the capabilities on this screen are currently in use.

← → C ① pubsub.tu:	:8080/gwtpubsub2/						Q ★
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Tools	RC bus				THO	2016-1	1-01 23:20:4
Chet (Alan)	doma				TUS	Alive 2016-1	18:44:1
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				Sun Override	False	Panel Temp	0*C
	Weather Control					Battery Voltage	0 V
		Overrides	-	Values		Last Reading	
	Cloud	Enable	Disable	Air Temp	0.0 °C	Watchdog Errors	0
	Sun	Enable	Disable	Barometric Pressure	0.0 mbar	Weather System Type	DUMMY
	Countdown to Open		Reset	Dew Point	0.0 *C	Weather System Url	
	Limits One			Electric Field	0 V/m		
	Ok To Open	Faise		Humidity	0 %	Moon	
	Countdown To Open	0 sec		Weather Leaf Sensor Voltage	Va 0 mV	Topocentric Right Ascension	16:11:02.796 h
	Interlock Reason	Sun Up		SQM Sky Brightness	0.00 mag/arcsec^2	Topocentric Declination	-16:40:53.857 deg
		Sun Op		Solar Insolation	0 W/m/m	Zenith Distance	61.29 deg
	Threshold Class			Wind Direction	0 deg	Azimuth	222.61 deg
	Limits Two			Wind Direction Avg	0 deg	Angular Diameter	0.49 deg
	Ok To Open	False		Wind Speed	0.00 m/s	Illumination Fraction	0.044
	Countdown To Open	0 sec		Wind Peak 12 seconds	0.00 m/s		
	Interlock Reason	Sun Up		Wind Peak 10 minutes	0.00 m/s	Sun	
	Threshold Class	Surrop		Weather Rain Alert	Clear	Topocentric Right Ascension	14:30:14.616 h
	Theshold Glass			Particulates (1 micron)	0 parts/m^3	Topocentric Declination	-14:48:12.161 deg
	Limits Three			Boltwood Transparency Aver	age NaN %	Zenith Distance	76.89 deg
	Ok To Open	False		Boltwood Sky Minus Ambient	Av NaN *C	Azimuth	242.68 deg
	Countdown To Open	0 sec		(Massession of the second s		Angular Diameter	0.54 deg
	Interlock Reason	Sun Up		Failures		Morning Astronomical Twilight	12:17:44,304 h
	Threshold Class			Battery State		Morning Civil Twilight	13:15:31.680 h
				Electric Field Sensor State		Sunrise	13:40:55.524 h
	All Sky Camera			Humidity Sensor State		Sunset	00:33:00.972 h
Alan				Leaf Sensor State		Evening Civil Twilight	00:58:21.720 h
	no allely	camera a		Particulate Sensor State		Evening Astronomical Twilight	01:56:04.272 h
Send	and the second se	camera a		Pressure Sensor State			
				Rain Sensor State		Sky	100
Datum Tree	<u></u>			Sky Brightness Sensor State		Illumination	18150.0541 lux
File Operations	<u>5</u>			Solar Sensor State		Brightness Ratio	9075027.07

4. Click on the tab beneath "tus" to expose the information under the "doma" tab. The LCOGT software can be used to control multiple telescopes at a site. Our single site has a single telescope in the "A" dome which is roughly "doma." Again this functionality is not being used.

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		0m8a						10.141.45
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		Pa	ark	Home	[not available]	[not available]	[not available]	[not available]
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5. Finally click on the "0m8a" tab to expose the controls for the Schulman Telescope. This tab roughly translates to 0.8m a (or first 0.8m telescope).

update: 2022/08/04 public:catalinas:lemmon:schulman_32:startup_procedure https://lavinia.as.arizona.edu/~tscopewiki/doku.php?id=public:catalinas:lemmon:schulman_32:startup_procedure&rev=165964 13:13
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		0m8a					10.45.1
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		Tracking		Description		Behaviours	
				Mount Type	1	Astrometric	133
		Disable Roll Di	sable Pitch Enable Rotator	Mount Type	P	[not available]	[not available]
		Stop	Tracking Loop	Current Message Queue Size		Axes	93
		Rotator Mode		Astrometric	0	Config	18
		SKY *		[not available]	[not available]	InstrumentSelector	22
		Other States		Axes	0	Monitor	9
			Stopped	Config	0	[not available]	[not available]
		Astrometric Kernel State	Stopped Okay	InstrumentSelector	0	Paddle	31
				Monitor	0	SdbAgent	10
		[not available] Container State	[not available] Okay	(not available)	(not available)	[not available]	[not available]
		Agent Count	10	Paddle	0	[not available]	[not available]
		Agent Count	10	SdbAgent	0	(not available)	[not available]
		State		[not available]	[not available]		
		Astrometric	Okay	[not available]	[not available]	Software Repository Path	
		[not available]	[not available]	[not available]	[not available]	Astrometric	issue-5613-2
		Mount	Okay			[not available]	[not available]
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		Config	Okay	Astrometric	3b4d9fe	Config	issue-5613-2
		InstrumentSelector	Okay	[not available]	[not available]	InstrumentSelector	issue-5613-2
		Monitor	Okay	Axes	3b4d9fe	Monitor	issue-5613-2
		[not available]	(not available)	Config	3b4d9fe	[not available]	[not available]
		Paddle	Okay	InstrumentSelector	3b4d9fe	Paddle	issue-5613-2
		SdbAgent	Okay	Monitor	3b4d9fe	SdbAgent	issue-5613-2
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	Alan	TestAgent	Okay	SdbAgent	3b4d9fe	[not available]	[not available]
	Alan	[not available]	[not available]	[not available]	[not available]		
		Instrument State		[not available]	[not available]		
	Send			[not available]	[not available]		
Datum Tree		xx01	Okay				
ile Operations	5	Agent Alive Time	67344 s				

6. Take note of the color of the fields in the column on the left in the above image. They should all be green when the telescope is ready to be used. The "astrometric kernal" can be "yellow" when the drives are not tracking. If the telescope is tracking, this will also be green. If you come to this tab/screen quickly after rebooting PubSub, you may see fields such as "Mount State" indicate "initializing." This is OK provided that the agent does eventually initialize the drives and the field goes to green after a minute or two.

Homing the Schulman Telescope

The telescope must be homed before it can be operated.

1. Go to the Axes tab. Note that the axes are **Unhomed**.

lgent State							
Mount			Oka				
				St	ispend @ 201	5-11-16 02:52	
xes Command							
Age	nt Enable				Agent Disable	e	
Roll		Pitch					
Standby		Standby	r.		Off		
Unhomed		Unhome			UNKNOWN		
Pos Vel		Pos O			@Pos Ovel		
0.0	deg	0.0		deg		de	
Slew	1	Slew			Slew		
Halt		Halt			Halt		
Home		Home		Home			
Park	Park			P	ark		
Unwrap		Unwrap		Unwtab			
Stop		Stop		Stop			
Stop Rese	ət	Stop Reset		Stop Reset			
Enable		Enable		Enable			
Disable		Disable		Disable			
Goto Pos I	.1	Goto Pos L1			Goto Pos L1		
Goto Neg I	.1	Goto Neg L1			Goto Neg L1		
Recover L	2	Recover L2			Recover L2		
Fault Res	et	F	ault Reset		Fault	t Reset	
			Slew				
			Halt				
			Park				
			Home				

1.

2. 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:

gent State			
Mount	Okay		
xes Command			
Agent Enable	1	Agent Disable	
Roll	Pitch	Rotator	
Okay	Okay	Off	
Halted L1 Positive Limit	Halted L1 Positive Limit	UNKNOWN	
Pos Vel	Pos Vei	@Pos @Vel	
0.0 deg	0.0 deg	0.0 de(
Slew	Slew	Slew	
Halt	Halt	Halt	
Home	Home	Home	
Park	Park	Park	
Unwrap	Unwrap	Unwrate	
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		

4. 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.

1.

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		State Observation Script S	equencer Source Tracking	Axes Guide Instrument Ins	View Spectrograph Calorate	Focus Optical Tube Telescoj	le Services 1 Telescope
		Agent State		Source Selection		Refraction	
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		(Second		Maria Maria	• Go	Humidity:	%
		Point		Known objects:	• Go	Temperature:	*(
		Point/Next St		Source Name: none	Fetch Clear	Apply C	Dverride
		Skip Sto		▼ Coordinates		Clear C	Override
		Goto nearest pointing s	tar Clear local offsets	Coordinate System: APP	ARENT_HA •	Tracking	
		Source		Hour Angle: 0	h		
		Name	1	Declination: 32	deg	Disable Roll Disabl	e Pitch Enable Ro
		Right Ascension Source	NaN h	Space Motion		Stop Trac	king Loop
		Declination Source	NaN deg	 Orbital Elements 		Rotator Mode	
		Coordinate System		When?	e is it?	SKY *	Set
		Equinox Source	NaN yr	Where v	vill it be?	Refraction	
		Limit Expected	Horizon Limit	Clear local offsets			1
		Limit Time Left	3.65 h	Go	Moon Flat	Manual Override	False
		Moon Zenith Distance	61.89 deg	Stop		Air Temperature Value	0 °C
		Sun Zenith Distance	77.69 deg	Time		Barometric Pressure Value	0 mbar
					40.4046.044.5	Humidity Value	0 %
		Telescope		Local Apparent Sidereal Time	18:48:46.944 h 57693.9759 MJD	Wavelength	0.6000 um
		Tracking In Tolerance	Out Of Tolerance	Modified Julian Day Julian Epoch	2016.8363 yr	Guiding Wavelength	NaN um
		Air Mass	2.3429	TAI Minus UTC	36 s	Pointing Control	
		Altitude	25.15 deg	TT Minus TAI	32,1840 s	M1 and M2 Alignment	Falsa
		Azimuth	179.23 deg	UT1 Minus UTC	-0.3238 s	Collimation	False Ena
		Hour Angle	-00:03:18.493 h		1	Roller Encoders	False Ena
		Zenith Distance	64.8 deg	Orbital Element		Encoder Non-Linearity	False Ena
		Sun Separation	132.20 deg	Source Orbital Element Scheme		Pointing Corrections	
	Alan	Moon Separation	47.44 deg	Source Orbital Element Argume	r NaN deg		10.4000
		Space Motion		Source Orbital Element Daily M	o NaN deg	Polar Motion X	0.1892 arcsec
	Send		false	Source Orbital Element Eccentr	ic NaN	Polar Motion Y	0.2811 arcsec
atum Tree		Source Space Motion Enabled Source Parallax	false NaN arcsec	Source Orbital Element Epoch (NaN MJD	Collimation Correction Enabled Collimation Correction Pitch	False 0 arcsec
		I SOUNCE F GI GIIGA	I TROITE OF COCC	Source Orbital Element Epoch			

6. Please see the Using the LCOGT GUI and Moving the Telescope section for more information.

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