VATT Instructions

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Please Note:

Observers using this manual must be familiar with IRAF, ICE, and Xephm.

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Chapter 1. VATT Operational Instructions: Introduction

Safety at VATT

Personal Safety

Warning

It is more than possible to get locked out of the building in the night in the middle of winter. **This could result in a fatal case of exposure**.

Please keep your keys on your person at all times when moving about the building, or when away from the building. Although it is common to unlock the second floor balcony doors, sometimes the locks don't unlock completely, or get locked by the security personnel.

When not occupying the second floor control room, secure balcony doors.

Check and lock all exterior doors before retiring for the night

Check that your bedroom door is unlocked before exiting your room. Your keys do not open the bedroom doors.

In addition to carrying keys, when observers are going for walks around the site or down the access road they should carry a radio with them for emergencies. Radio contact with security personnel should be possible at all times on one of the frequencies available on the VATT handheld radios. Monitor the State radio located on the upper observing consol deck. The radio channel indicator should display channel 1 which is selected by the Channel up/down switch

Although there are lockouts preventing the dome from rotation when the gate is open leading to the roof, observers should take care on the ladder, as it can become slippery after a snowstorm (the most common time to be heading to the roof). This is also an area that does not get covered often by security.
It is recommended that Observers use a partner when on the roof while checking or removing snow.

Please take care in the dome at all times. Be aware that there is a large telescope there and on occasion moves. Also, when the dome is dark take care moving about the room, and always have a flashlight with you. There are numerous ways to fall off the telescope platform or upper deck. It is particularly confusing if the telescope isn't in its normal south-stowed position, where parts of the staircase are exposed.

Communications with the outside world require the microwave link system to be operational. At times due to weather and or technical problems the Link will be down.
A fixed cell-phone is located under the south facing west control room window.

The Phone number is currently (928) 965-1006 and this system has so far provided voice communication while the microwave link is down. In an emergency the state radio can be used. First try calling for the on duty UAPD by calling for "any star unit"

Telescope and Instrument Safety

Please review the locations of the two emergency stop switches in the building. They are both large round red push switches, the first of which is next to the vatttcs display on the front of the shelf. The second is on the cable box on the lower telescope floor on the east side of the room next to the large vent fan. These switches can always be used to cut power to the telescope in case of emergencies.

It has been a long term policy at VATT that the telescope dome flood lights are to be on during long slews. This is still the case, and users should keep an eye on the telescope during more than a few degree slew. Although it is acceptable to leave the lights off during short moves, users should keep an eye on either the XEphem display or one of the various axis status displays during moves. There have been rare occurrences of non-programmed slews taking place. Usually a **Stop** button on the TCS will terminate these, but the user may need to hit the manual emergency stop button mentioned above.

. **Warning: Telescope must be at zenith before Vatttel is rebooted**

Never reboot the vatttel VME computer if the telescope is not in a vertical stowed position. This can cause damage to the mirror support system.

The Telescope stow pins are to be disengaged unless work is being done on or near the telescope. When the Mirror cover is open the telescope is in balance for optimum performance. When the mirror cover is closed the telescope is top heavy and will accelerate in its drop to the horizon.
If it should be necessary to manually move the telescope to the zenith
Make sure the mirror cover is open.

Chapter 2. VATT Operational Instructions: Checklists

First Arriving at VATT

Unlock second floor balcony doors as desired. Remember to carry keys at all times.

Check Temperature in TCS room, Turn on heater if needed

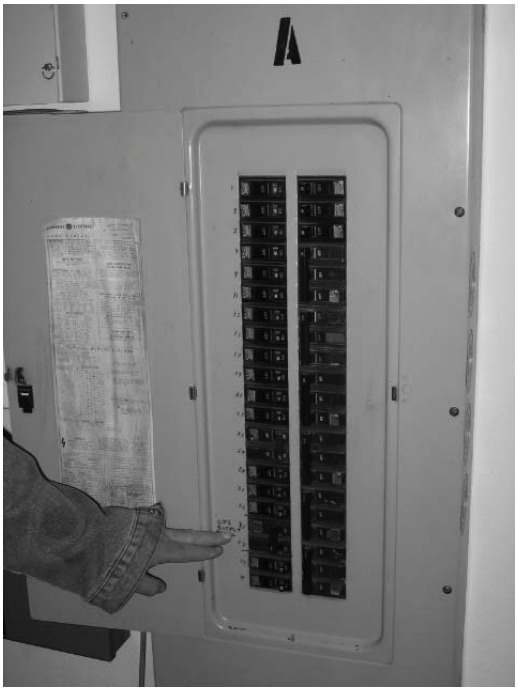
Turn up thermostat at second Floor workstation to a comfortable level. Do not change the setting on the humidifier.

The Uninterruptible Power System (UPS)

Check that both UPS's are running and plugged in.
The UPS are located on the first floor loading dock, receiving area.

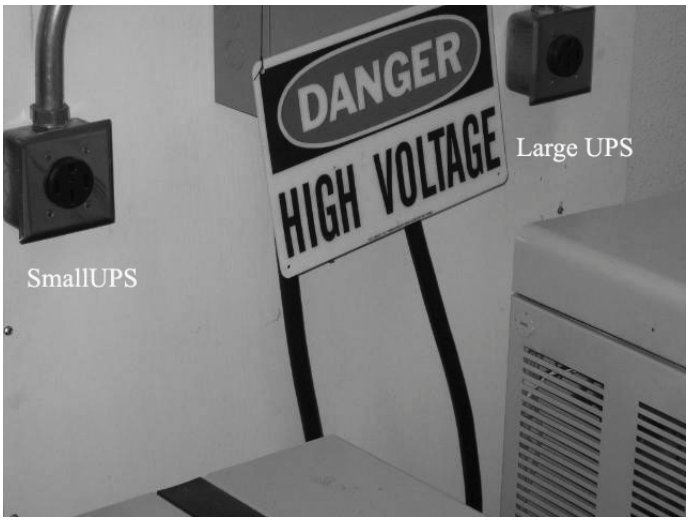
If the UPS system is not running then:

Make sure that the UPS A.C. Supply breakers on Panel A located in the Telecommunication Room is OFF

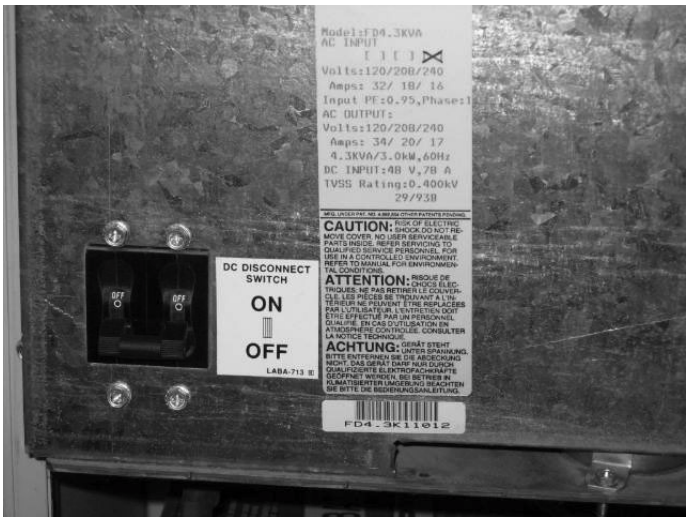


UPS AC Supply Breakers on panel A

Plug in the Large and Small UPS in to the AC supply Sockets
Plug in the two power cords to the two Ups.

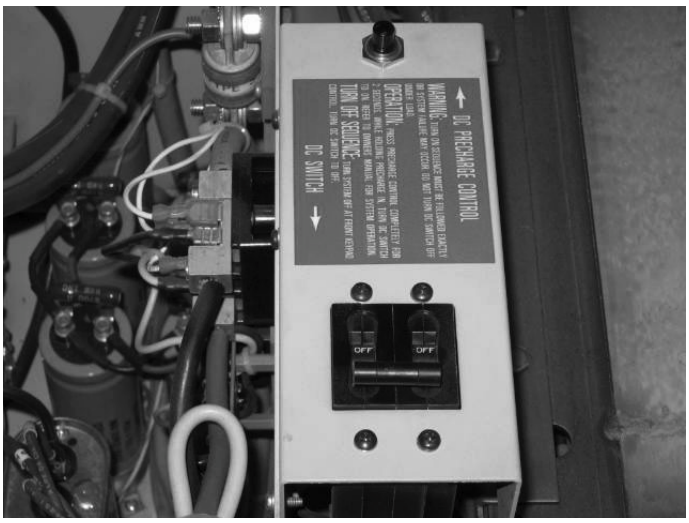


Open the UPS Front panel Door using the Key lock. If the supply is off then the Key is in the door lock if not then mover the key from the on/off switch to the door lock and unlock and open the door.



Locate and turn on the DC disconnect switch.
Close the Panel door and Lock.
Return the key switch to the on/off key switch.

Open the Front Door of the large UPS and then the Front Panel Door.
Locate and turn on the DC disconnect switch



Close the Top and Front Panel Door.

Got back to to Panel A and turn on UPS Supply Breakers

The AC Line indicators on both Supplies should now be on

Turn On the Small UPS by using the Key switch and turning the key to the righ

The AC line and ready lights should now be on

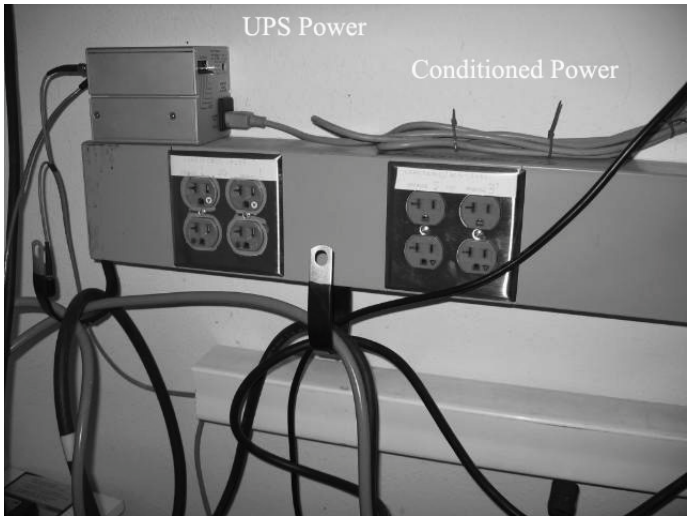
Turn on the large UPS

Press the red button second down from the top right hand side labeled control. (next to 6)

Press Button 2 (Auto in red)
Press bottom right button (green) Enter
LCD will ask for a conformation by pushing Enter a second time
The Ready Light should now come on

Check that all electronics racks are plugged in.

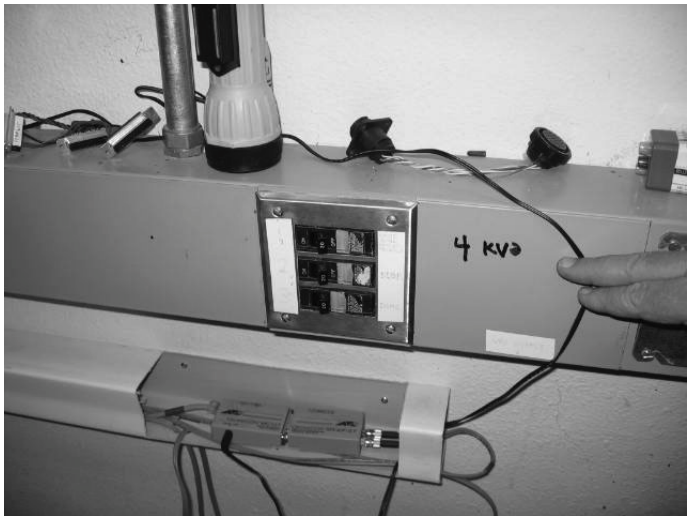
Plug in the power cords under the left (UPS Power) outlets
These plugs should have a yellow marking as does the UPS sockets



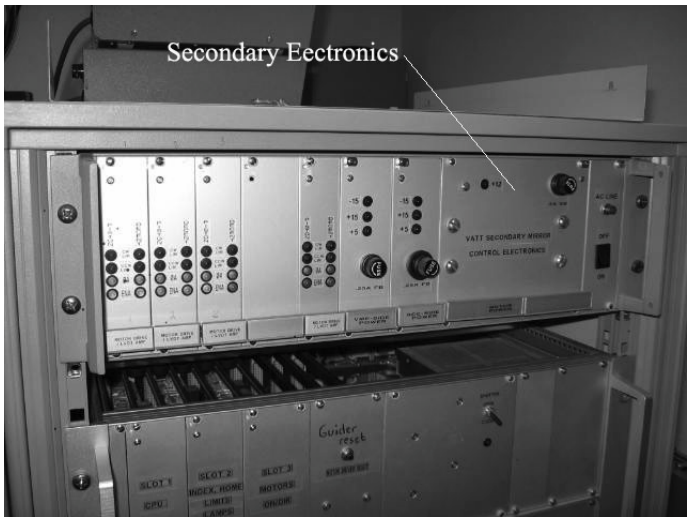
Plug in the remaining plugs under the right sockets (conditioned power) into the sockets

Turn on the three breaker located in the TCS room, north west corner

Turn on the 3 breakers on the TCS west wall



Check that the Secondary Mirror power in on. This is a 3 hour warm up item.



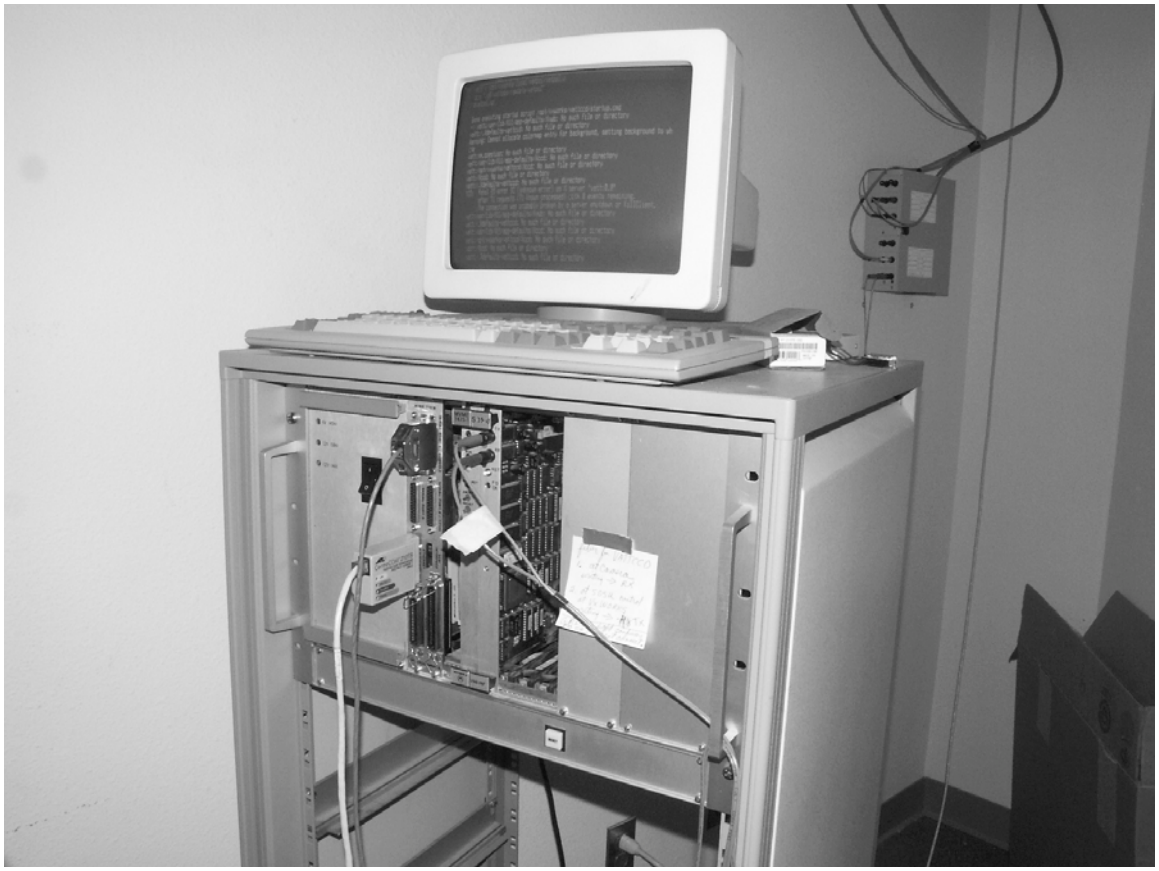
Check that all computers are plugged in and powered up.

The SUN located on the west desk as well as the hard-drives and tape drive.

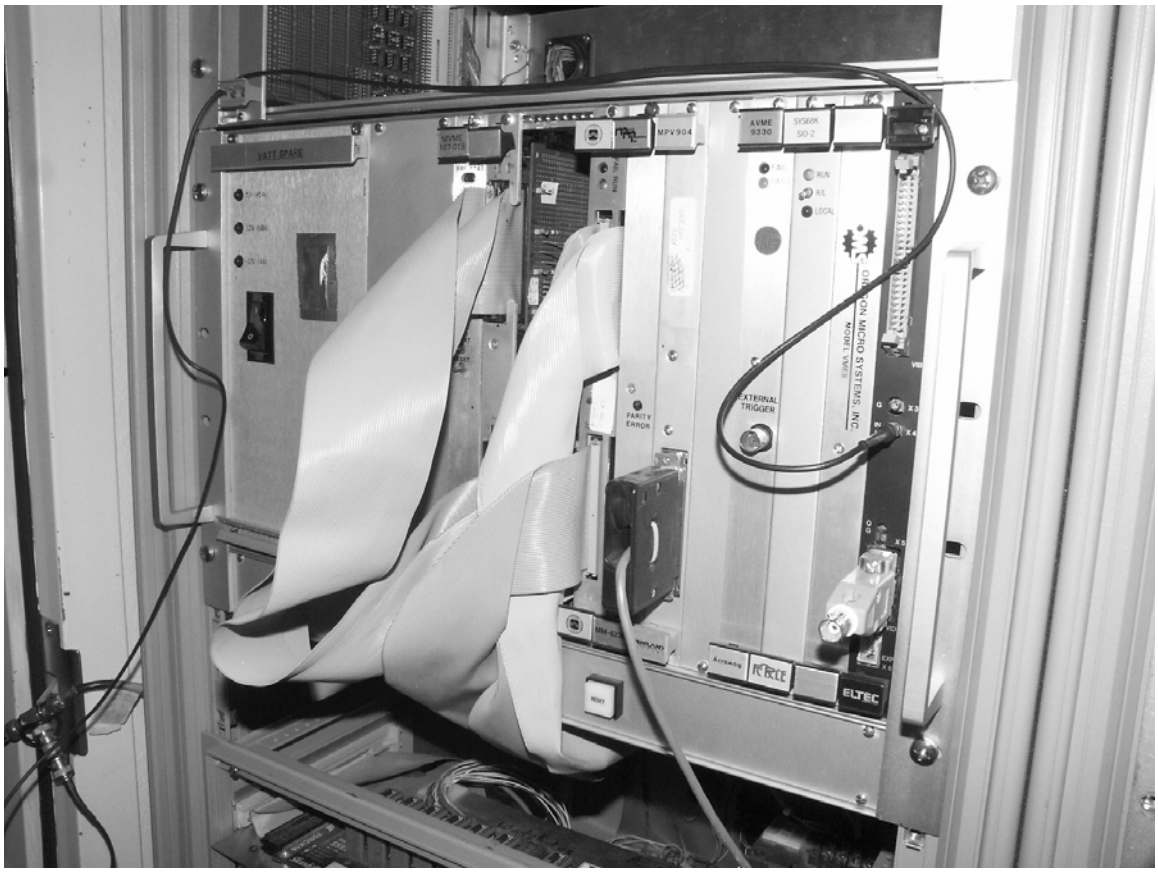
TCS Linux located on the floor under the center of the north-facing desk

Linux Weather server located in the instrument room west-facing table.

VX works CCD computer rack located in the instrument room in the southeast corner



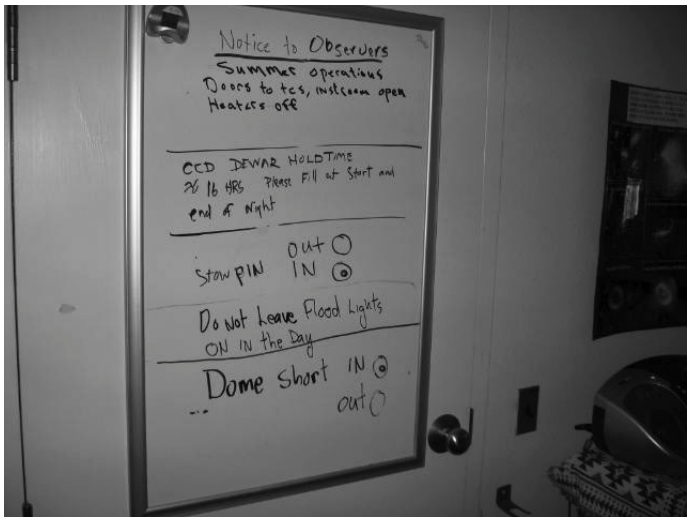
VATTTEL located in the TCS Room left rack upper section



Login to vatt computer and reset vattobs account.

Login to vatttcs computer vattobs account (same password as for vatt com puter).and open a terminal
type startx

Check The Observer status board located on the South interior door.
This should have the Dome short and stow pin as well as other messages as need on it.



Check for snow and ice on roof. (if appropriate for the current season).

In the TCS room on the lower left power amplifier labeled "dome" there is a key used to access the roof ladder door. Remove this key make sure to tell your partners that you are going to check the dome for snow/ice and that you are well dressed. Go to the third floor (dome) and unlock the west exterior door. (do you have your keys ?) If it is dark turn on the roof light switch to the right of the door.
Go out the door and unlock the roof access gate. Be careful to not to be hit by the door as it opens.

Climb to the roof and inspect for snow around the dome skirt use the shovel stored on the roof if needed to clear snow.

When returning remember to shut and lock roof access and west door and
Turn off the roof light if needed.

Telescope Startup for Observations

In the Dome

1 Check that all four air-vents are open.

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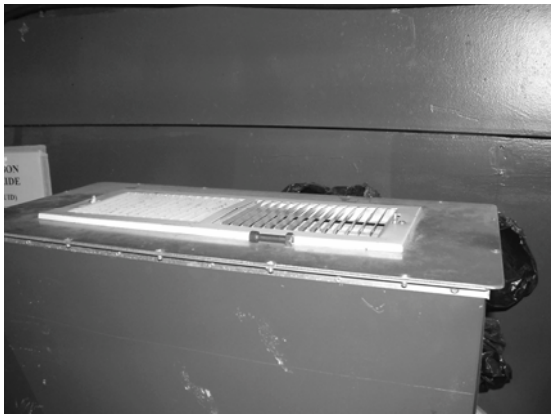
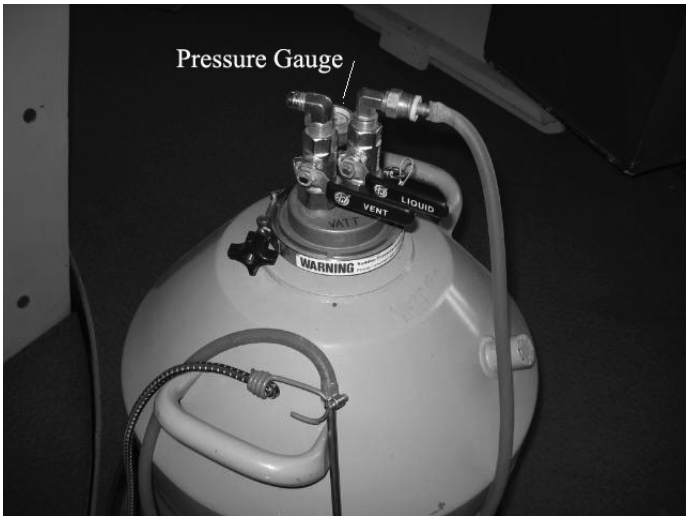


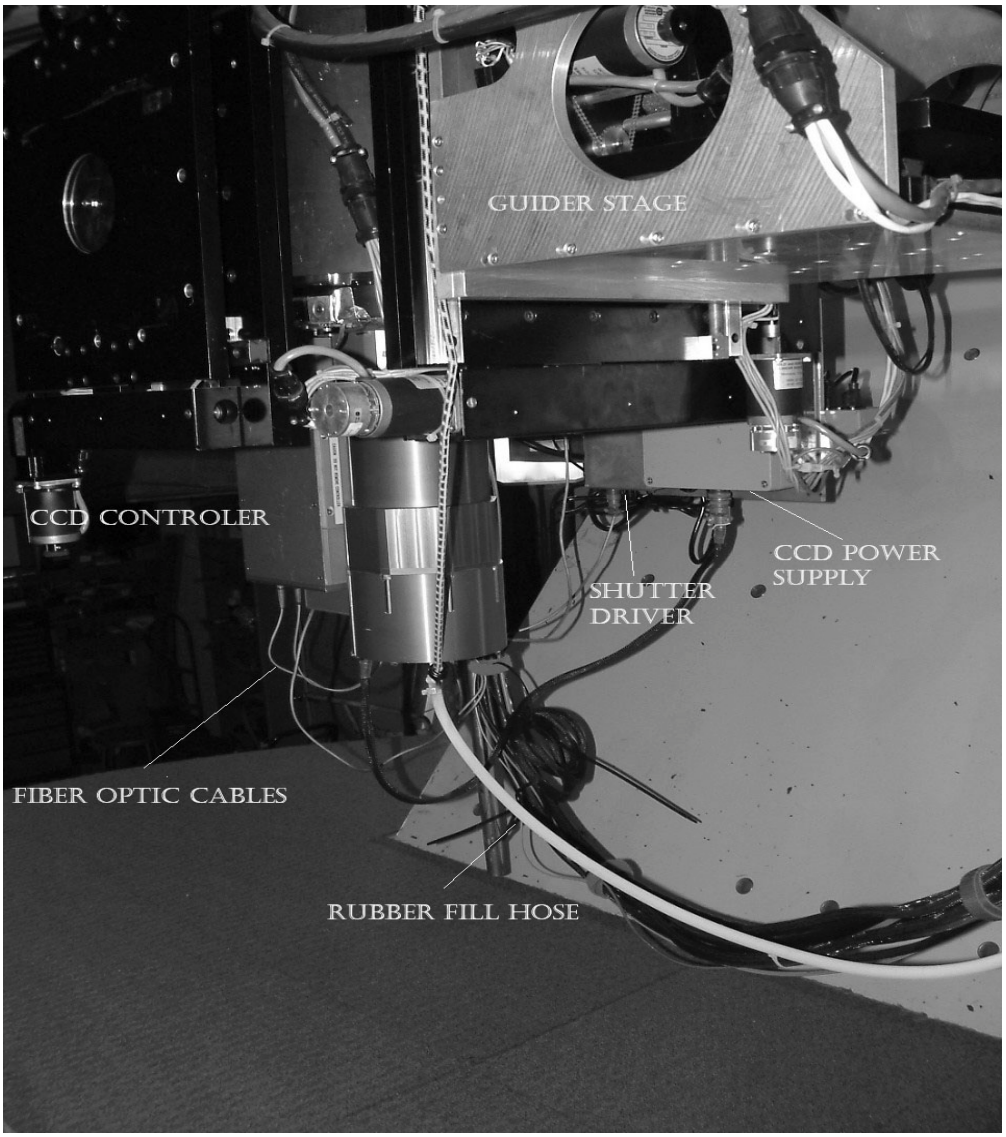
Check Dome Short engagement and release if needed

Store the Dome short on top of the nearest Air-vent
Remember to change the status board dome short status

Filling the detector Dewar



The pressure gauge should read above 5 psi



To Fill the CCD dewar:
The LN2 Supply Dewar is moved a few feet to the south of the CCD Dewar and the
Rubber Fill Hose with the Ln2 Injector is inserted into the LN2 port located on the bottom of the CCD Camera. The Bungee cord that is attached to the injector tube is attached to the guider stage.

The Rubber Hose should not touch the ground or be stretched tight. The drape of the hose is illustrated in the picture on the previous page.

Move the liquid valve on the storage dewar from the horizontal off position to a position angle of 10 Degrees from vertical. When the Ln2 starts to drip on the floor, move the liquid valve lever to 10 degrees from the horizon to reduce the flow rate. When Ln2 starts to drip on the floor shut off the liquid valve by returning the liquid valve to the horizontal (off) position.
The rubber hose must be allowed to thaw completely before removing the fill tube.

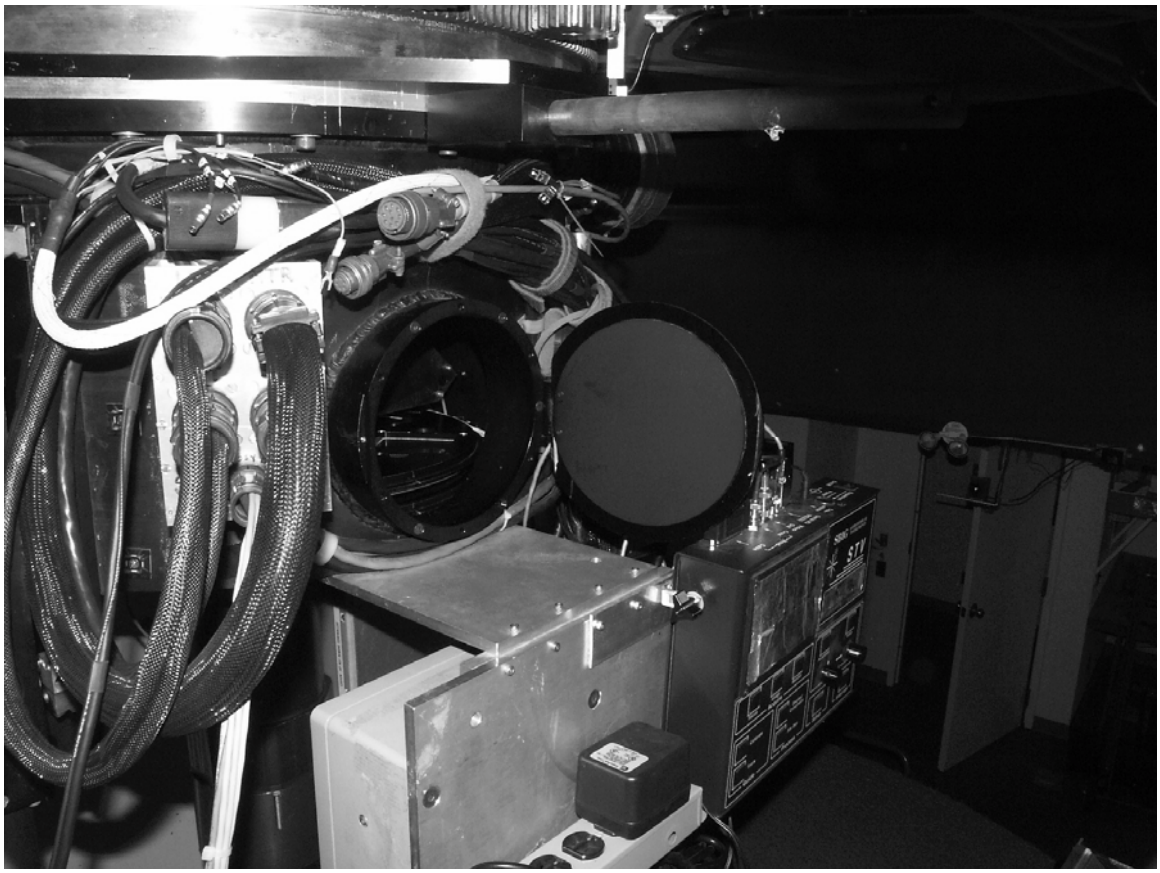
Installing filters

Bring filters and canned air to the interior of the east fork in the normal stow position.

Use caution so as not to touch filter surfaces.

Dust each filter before inserting them in to the filter wheel.

Open filter access port and manually rotate the filter wheels so that both clear
Positions are one space to the right of the filter position in front of the filter access port.



Place filters in the wheel so that the glass side is down furthest from the cell top to prevent fingers from touching the glass.

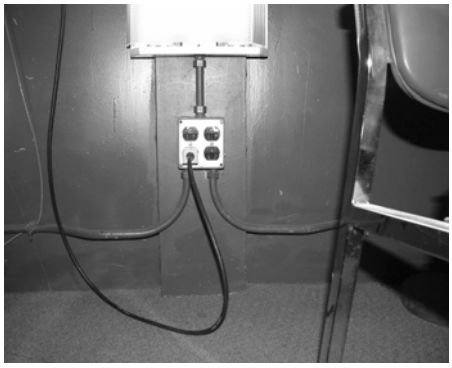
If the lower filter wheel is needed. First rotate the upper wheel so the clear port is directly in the access position.
Remove the clear insert from the top wheel.

Filter position one is the first position to the left side of the clear positions.

When the lower filters are in the desired positions insert the upper clear port and place the upper filters in the same as with the lower wheel. When all filters are loaded return the upper and lower filter wheels to the clear detent position.

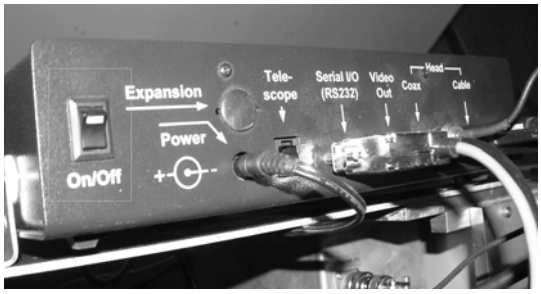
Plug in Dome Shutter power.

Check clearances around the telescope on the upper deck.



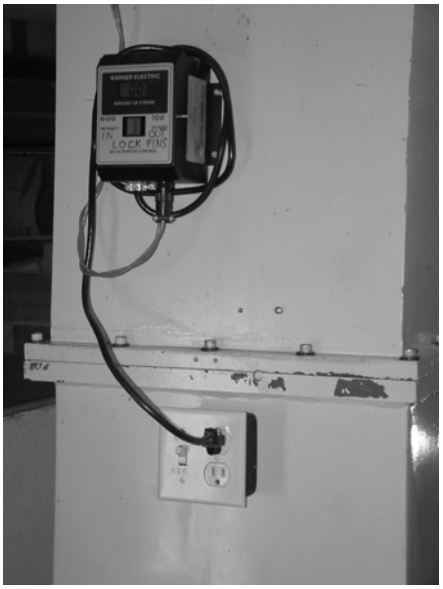
Plug in power to finder camera CCD (on top of box on east fork).

Turn on power to STV guide camera (Below filter access port).



Open finder telescope dust cover.

Check Elevation stow pins and move them to out position if necessary.



To remove or insert stow pins power to the pin drive is first turned on at the plug box and the drive rocker switch is pressed for the direction desired.

Warning

Depressing the switch for too long in a stalled position will cause the circuit breaker to fault.
If this happens turn of the power and open the switch control box with the thumb screw and reset the pushbutton circuit breaker. Close the door and retighten the thumbscrew.

Warning **Do not push with the finder scope or bracket.**

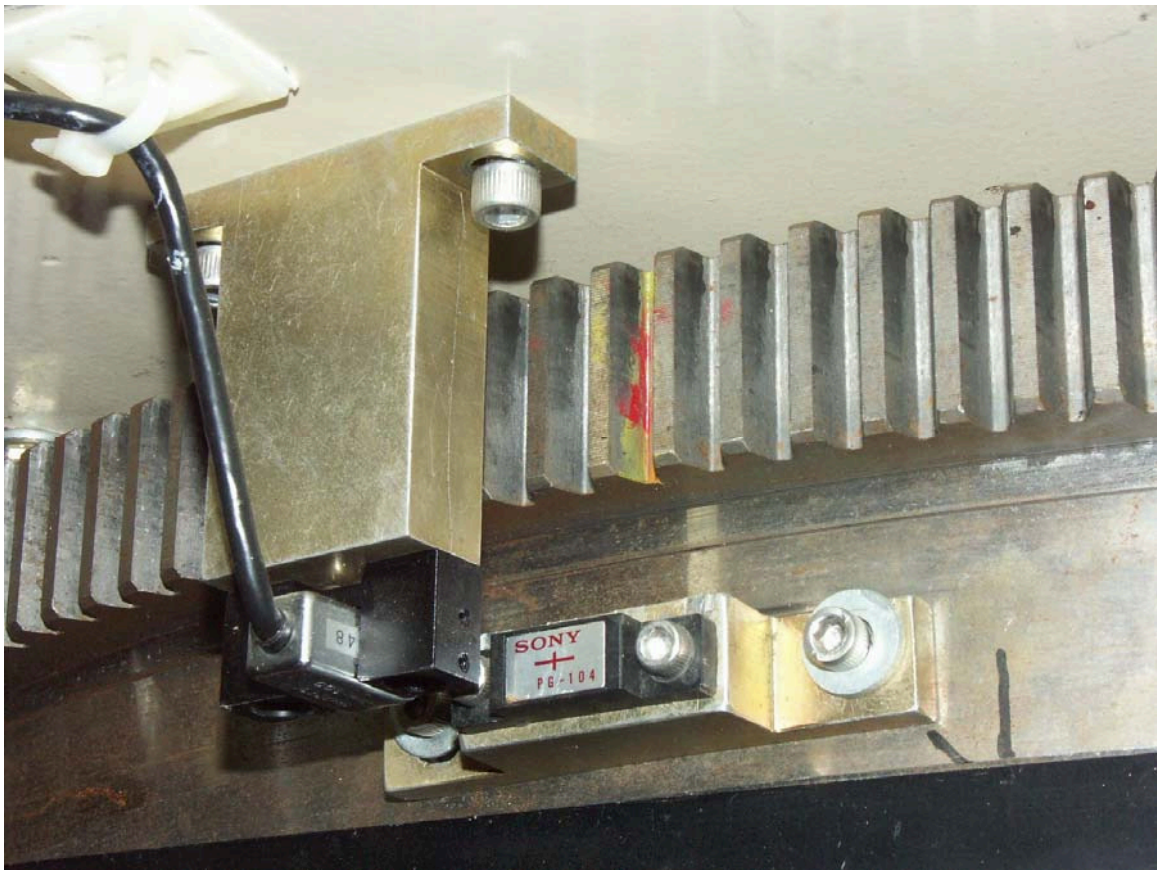
If when stowing the telescope, usually not needed by an observer, and the pins do not fully engage (100-102 on the indicator) then find the zenith marks and push or pull the telescope elevation axis until the zenith marks line up. Then retry the stow pin.

The Stow pin does not always fully release when the pins are move to the out position. This will cause the telescope to shut down and will indicate a problem with a n elevation position error. To recover from this condition have an assistand relase the brakes using the the mount control GUI on your command as transmitted using the intercom.

The brake will click and then you should be able to move the elevation axis by hand a few degrees down in elevation angle.
There might be a pop or bang emitted when the stow pin end is encountered and forced out by the telescope motion.
If the elevation axis is still stuck, center the zenith marks and insert and then with draw the stow pin. Retry to move the elevation axis by hand to a lower elevation angle. Repeat until the axis is free.

Move the telescope elevation axis back to the zenith position and have the brakes re engaged.

Check position of the De-rotator index sensor. (magnet to right of sensor).



When in this position the guide camera will be aligned south

Check Azimuth position marks if these are not lined up then after the oil system is on the azimuth axis can be moved by hand to achieve alignment.

Check the Ln2 transfer dewar and hose to verify safe storage
Make sure that the hose is unfroze be for moving

Check that the west door used for roof access is locked

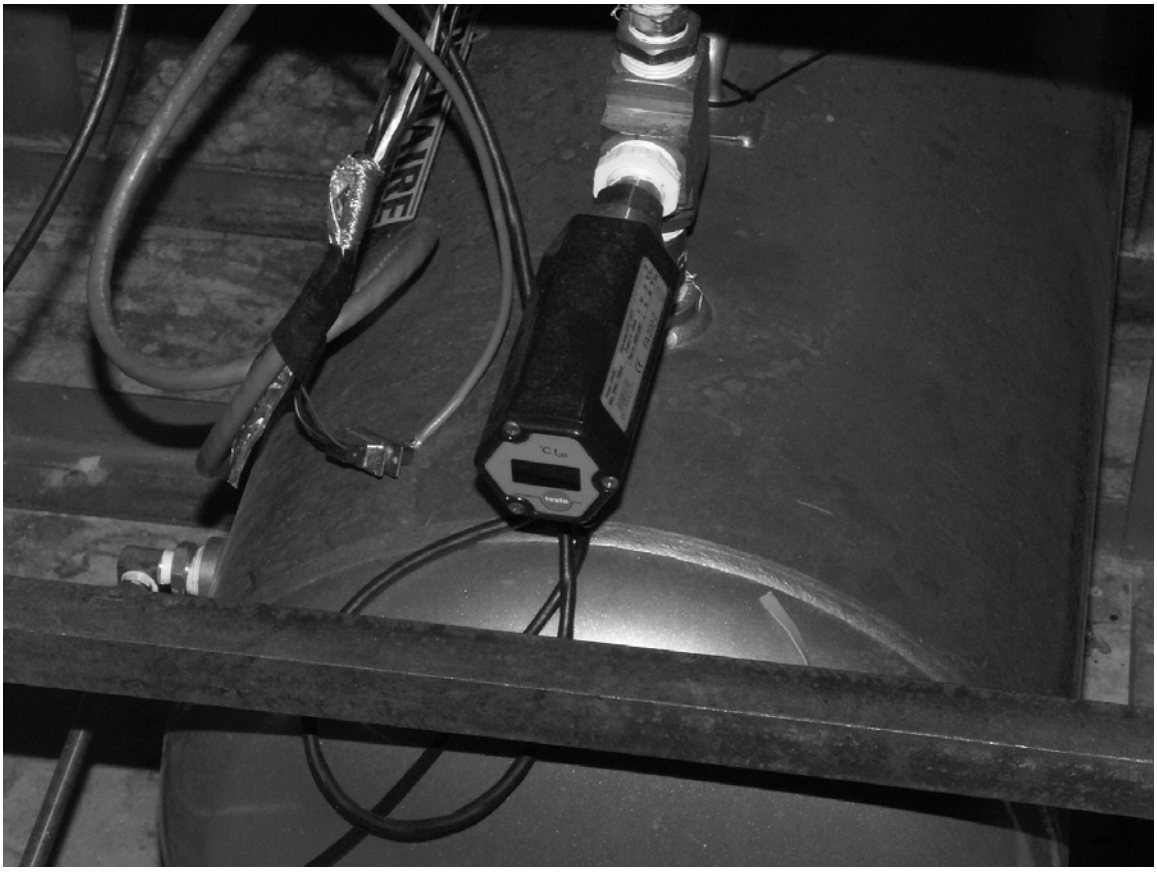
Turn off lights in dome.

In the Basement

Turn on pier and building ventilation fans.

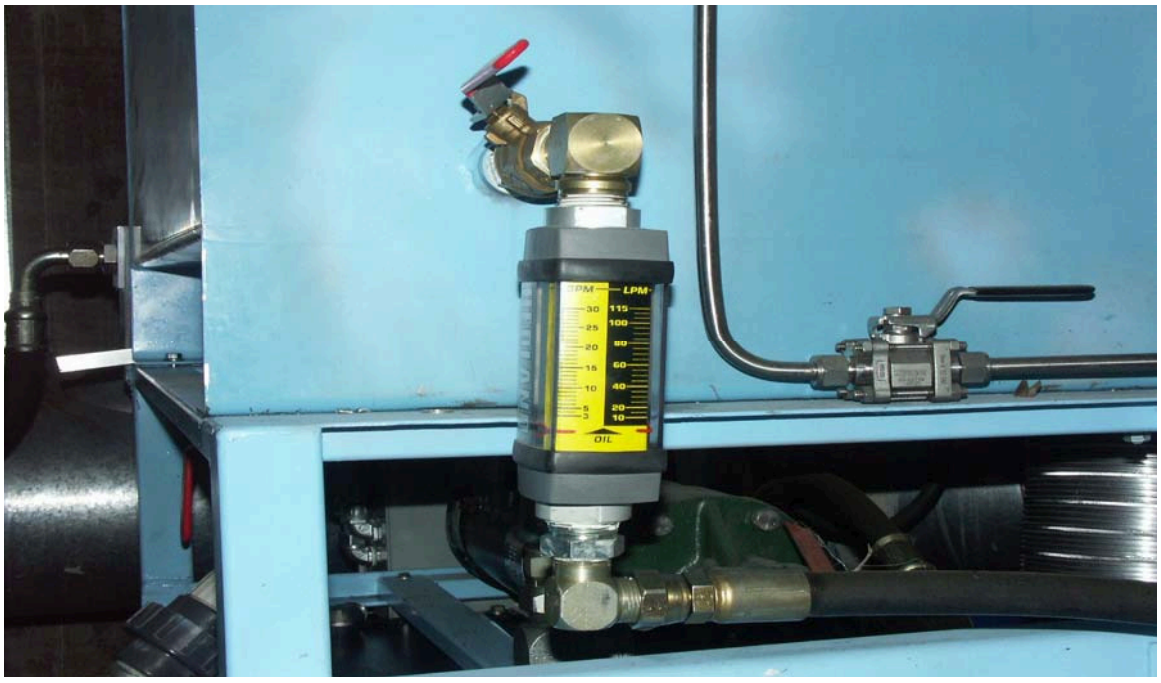
Depress pushbuttons marked start for exhaust fans one and two. Do not use the above breaker levers.

Check that Compressed Dry air dew point < -30 C.



If the Indicated dew point is above –30 be sure and indicate this on the trouble report.

3 Turn on AZ bearing oil control system (Red power mushroom, labeled step 1



Check to see that the cooling system flow meter is above 10 GPM when the cooling pump comes up to speed. (10 seconds after turning on step 1)

The Oil cooler (chiller system) should also come on at this time.
Note there are two systems, 1 and 2. The normal mode is automatic and switches between chiller 1 and 2 with each start to balance the use.

The green button (on) below the auto manual and the button (off) controls the state of each cooler

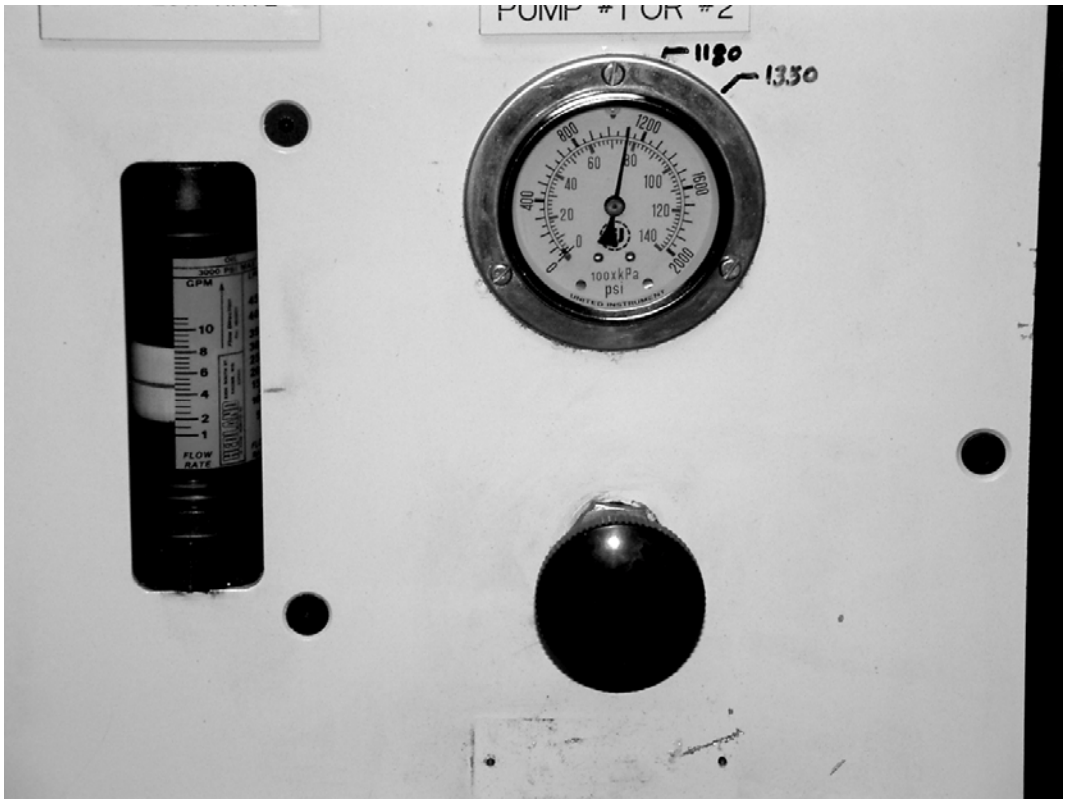
In the manual mode. In summer it is sometimes necessary to run both chillers and is done by switching to manual (1 and 2) and then depressing the green start buttons.

On the Oil system control panel is the Oil temperature controller that has a dual temperature labeled PV for process value and SV for Set value. The heater comes on when the temperature drops below 61 F.
If the PV(oil temperature) exceeds 704 degreed F then the system must be switched to the manual two chiller mode.

Turn on the high pressure pumps

Twist knob labeled step 2 to turn on the high pressure pump their will be a 5 or so second delay.

Check that High Pressure flow is ~ 4 GPM.

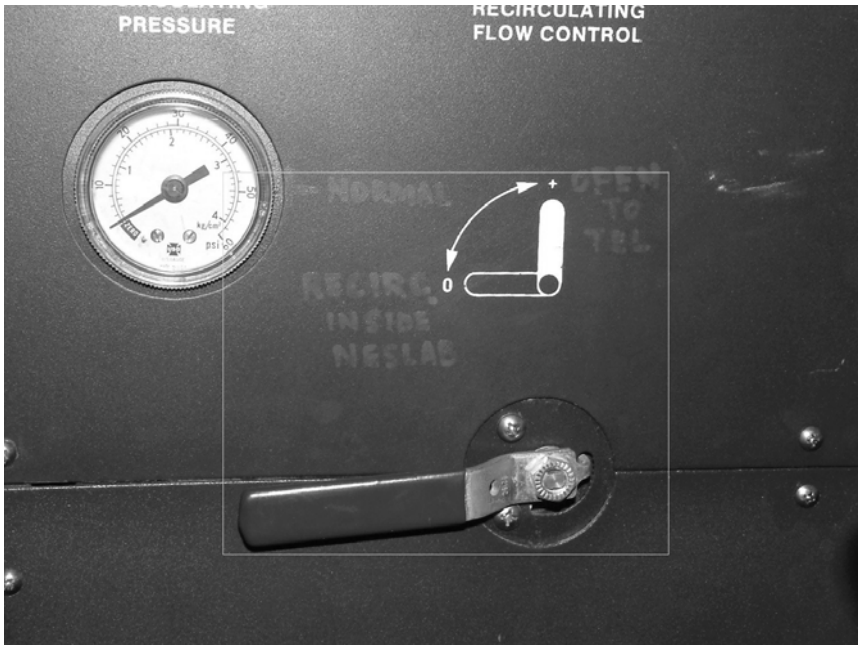


On Second Floor

Outer pier

Warning

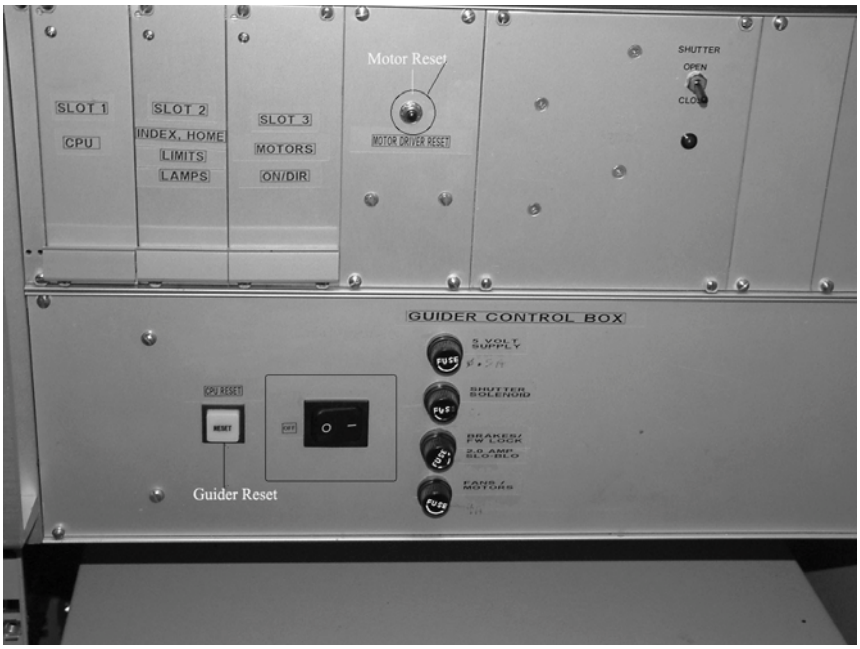
Waiting to long between turning the Neslab power on/off to the cycling of the re-circulation valve will cause a tank return overflow.



Activate the NESLAB temperature controller.
Power on wait 1 second then move re-circulation valve
from the horizontal position to the vertical in no more time than two seconds from the power on.

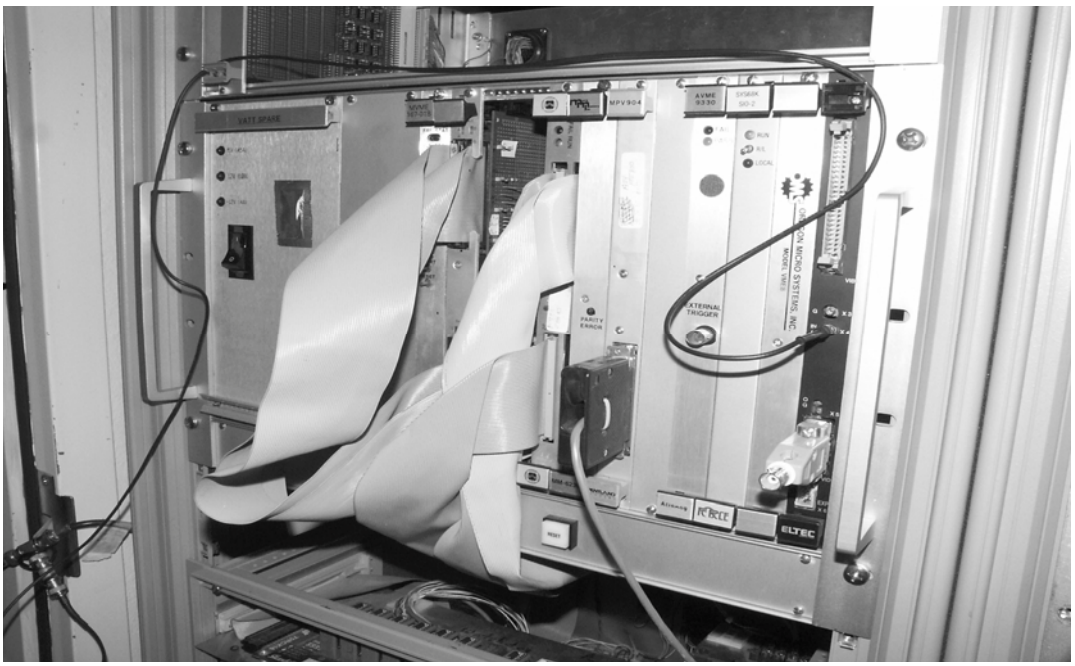
TCS rack room

Depress "Motor Driver Reset" button on Guider electronics 3 times.



Reboot VATTTEL (Simultaneously brings up primary air support)by using the white square reset switch on the VATTTEL lower panel

Warning
Telescope MUST be vertical during reset or power up, or damage will occur to primary mirror hardpoints.



Switch on all four Telescope and Dome drive servo amplifiers (only Dome Amp will power up initially).

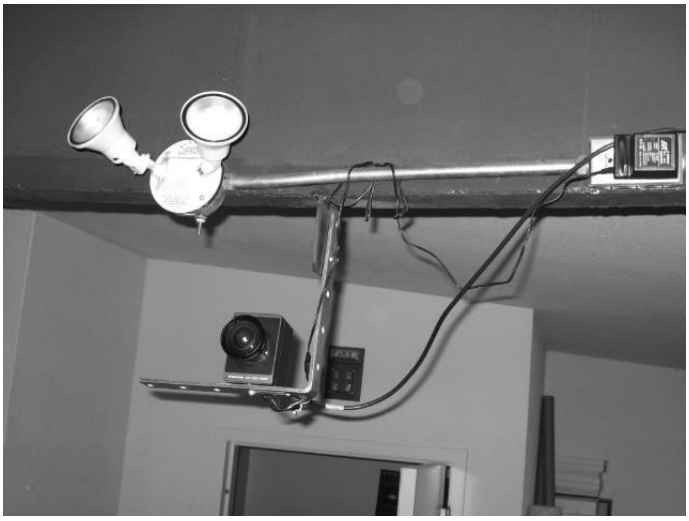
Do Not turn on the counter weight amplifier located above the dome drive. (the one with the roof access key attached.

Close all doors to the outside, and door leading from the control room to the elevator and the door into the pier.

The TCS room should be maintained at a temperature of 70 F due to the temperature sensitivity of the secondary control electronics. A wall heater is located on the north wall next to the entry. In the summer the doors to the control room and instrument storage room are kept open. In the winter, shut all doors and use the wall heater to maintain 70 F.

In the Control Room

Turn on the Dome floodlight.



The dome floods are controllable from three locations.
These controls operate using a X10 lighting control system where commands to the lights are sent ofver the power lines. The Primary control is located on the control room inner Control room wall on the left side of the west porch door. This control is illustrated below.

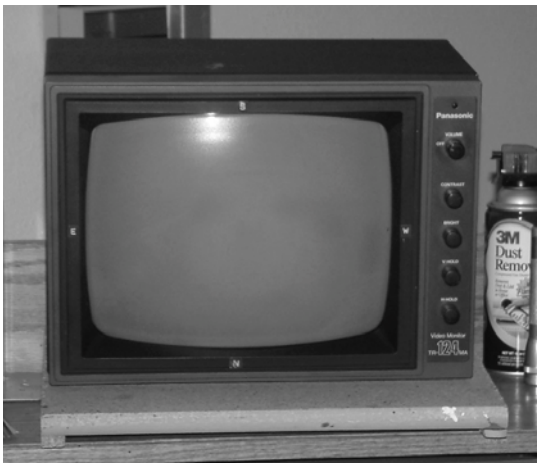
The second control is from the TCS glue GUI discussed later in this manual.
The third control is from the left hand side of the control desk and is a set of buttons that control the dome light, porch light and control room over head lamps.

Turn on the Dome vent fan. Note: fan speed is maximum at 0
And minimum at 10

Only operate the fan in the forward direction.
Usually the best results are obtained running the fan at max speed (0)
Optional :When in the dome reduce the fan speed to a low level for a more pleasant environment remembering to return it to the high speed setting when returning to the control room.

Note: The Fan makes it hard to hear the telescope sounds which some observers like to here using the dome intercom.
The fan sometimes can be reduced with out degrading the image and is up to the observer on how to use.

Turn on the telescope surveillance monitor.



Turn on the Guider camera video monitor (right) and the Finder telescope monitor (left)

Turn on the intercom located on the left hand side of the control desk between the left most TCS display and the Sun monitor that has the dome camera monitor on Select the first "Dome" setting.

At the VATTTCS Workstation

If the VAttpcs is off, use the vattobs login and password used on the sun computer.
If the Vatttcs work station does not have a window system running, type xstart at the command line prompt.

The window system should display its background scene and the tool bar below.

The VATTCS Workstation interacts through several GUI's that are accessed by clicking on the red hat in the above tool bar.
All GUI's are in the VATT section and are:

TCS/Glue
Guide Star Utility
Xephem
And WX (weather)

The VATTTCS workstation uses a dual screen environment with one mouse. The Left screen usually displays the weather and Xephem.
We request that when you leave, unless instructed otherwise,to leave the Weather display running and thus leaving the system xwindows running.

In the above tool bar, the third icon from the left is used to start a terminal window.

Open a new Trouble Report in Netscape(Mozilla)

This is done by:

Open terminal type mozilla

Bring up the TCS interface /glue on vatttcs.
To do this:
Go to the Vatt icon by clicking on the hat, and then click on TCS Glue/interface.

The GUI displayed on the next page will contain the following Fields

The Buttons:

Stop!! Stops the telescope move and tracking
Stow Moves the telescope to the stow position El=90 Az= 180(south)
InitCoords. Sets the telescope coordinates to the displayed value
Lights on turns on dome flood lights
Lights off turns off dome flood lights

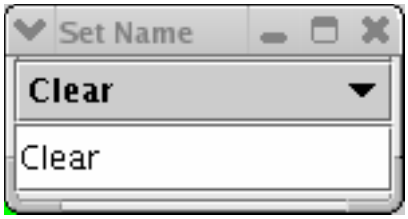
Universal Time, Air mass and Local Sidereal Time are indicated in the next three data display fields.

Right Ascension and Declination are display and entry fields.
By right clicking on the Right Ascension or declination fields a coordinate entry dialog GUI will appear and allow for the direct entry of Ra,Dec and Epoch.

Clicking the GOTO bar will move the telescope to the entered coordinates.

Weather station relative humidity, IR sky temperature, and dome temperature data are displayed and should be monitored along with the mirror temperature on the Mount GUI.

The two main filter wheels are controlled by the TopFW and the BotFW buttons. Right click on the filter selection name will produce the following GUI.

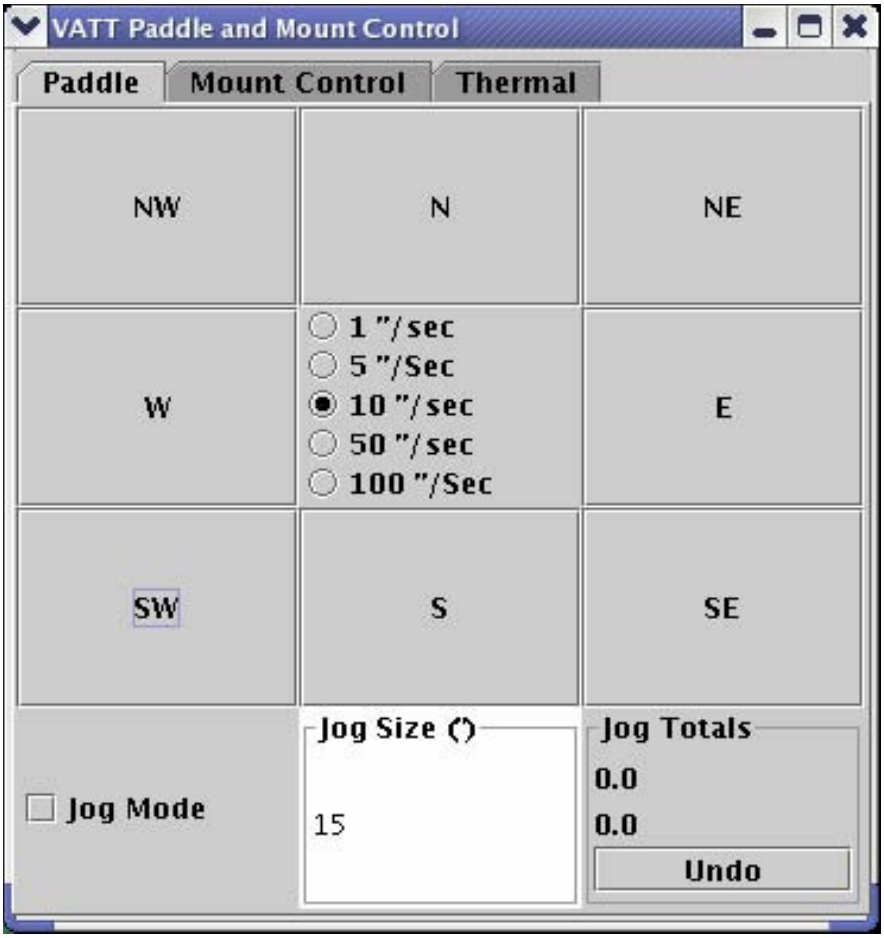


Is a setting for the clear state, the pull down buttons allow you to use pre set fields for VATT filter sets. Custom fields are produced by text box entry. The selected button will the display the programmed label.

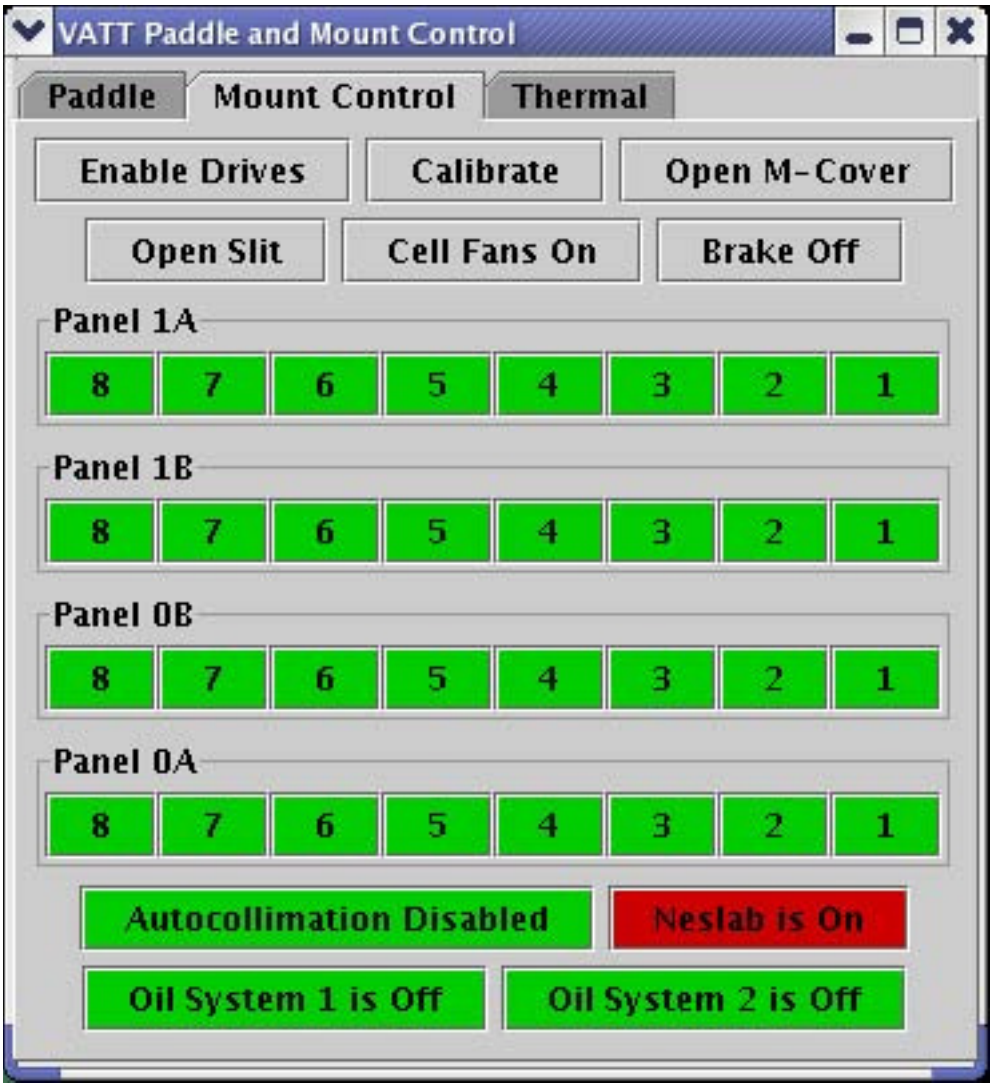
The Dome, Azimuth, Altitude and Derotator display fields indicate the Axes servo position and state. If A Display is in the a picture of the TCS/glue Interface, where the Dome is gray or turned off, and the rest
Are orange. The servos will display Green for a error less than 2 arc seconds. Orange for position errors less than 5 arc seconds and red for over 10 arc seconds.

A red state will disable the telescope servo axes and apply the elevation brake. The elevation brake is pneumatic, and will release its air charge to the atmosphere when it is engaged. It will make a noise that is easy to hear over the intercom if the fans aren't running.

In the Illustration of the Vatttcs GUI the mount GUI access appears above the first button bar. The Mount control GUI allows access to the Position control paddle, Telescope functions, and mirror thermal control.



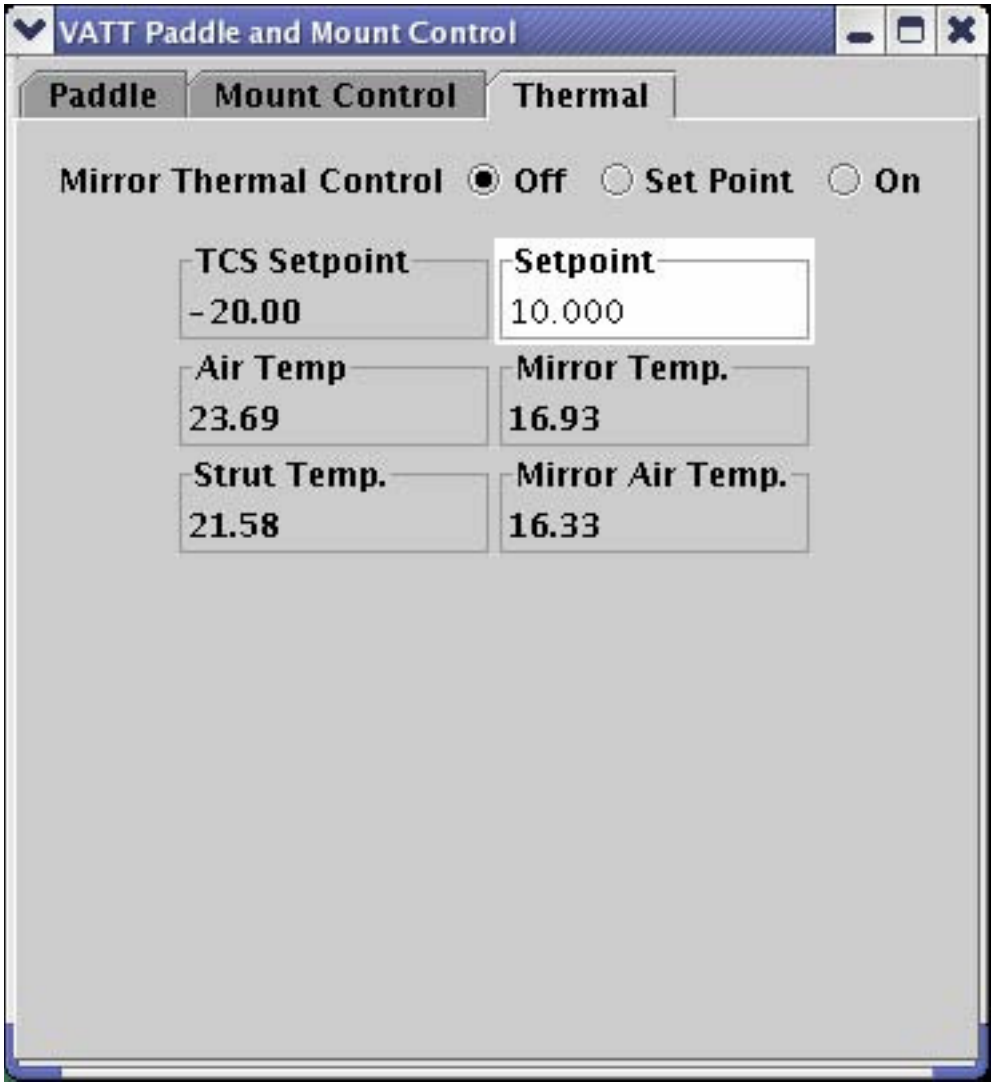
The Mount control window displayed below is divided in to sections, state control as indicated by the buttons and state indication in the form of red/green/gray indicators



Enable Mirror air circulation fans

Left click cell fans on. If the room noise is low and the door to the telescope control rack is open then you will hear a clunk when the fan contactor closes.

Activate temperature control system via TCS.
Change to the Thermal Page by clicking on the Thermal Tab of the
Paddle and mount control GUI



The Vatt uses a water chiller/heater to control the air temperature inside the mirror cell circulated by the mirror cell fans. This temperature control has three states:

Off (open loop)
Misleading because even though the control is off the mirror chiller maybe programmed to a temperature that it is cooling to.

Set point (closed loop manual)

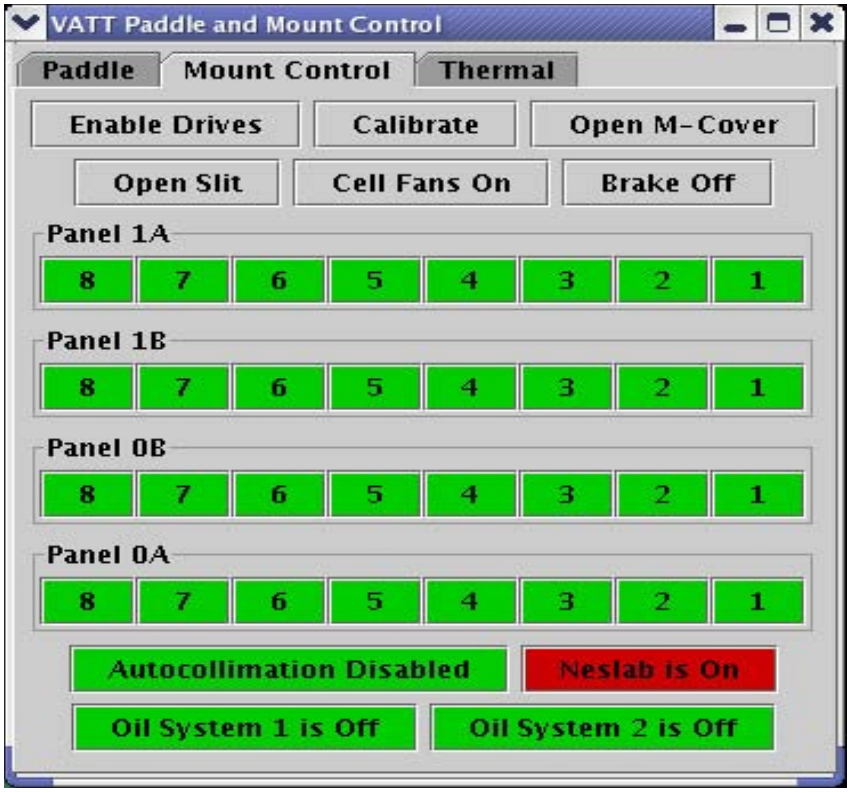
The mirror chiller is using the entered value in the set point window.

On (closed loop tracking)
Air temperature set point

Important! Only cool the mirror, do not set a mirror temperature higher than the air temperature.

The Air temperature are taken from sensors located on the telescope truss. The strut temperature is the truss metal temperature and the Air temperature is the air temperature near the strut .
The mirror temperature is a measurement of the glass temperature and the mirror air temperature is the air temperature inside the mirror cell and near the heat exchangers.

Enable the telescope drives.



Return to the mount control page by clicking on the mount Tab. Left click on the enable drives button. If the room noise is low and the hallway door is open you will hear the power contactors “clunk”.

The servo indicators on the TCS Interface GUI should turn green after two seconds indicating that the servos are on and ready to move.

Enable Dome tracking

On the TCS GUI left clicking on the dome display will cause the display to change from dark gray and the button title will change to **Dome Tracking**

Calibrate telescope Azimuth Axis.

Tab to the Vatt paddle and mount GUI to mount
Click on Calibrate.

The Telescope will turn to the east to about 160 degrees and return to Azimuth 180. Note the dome turning to follow the telescope.

Open the dome slit

Restrictions

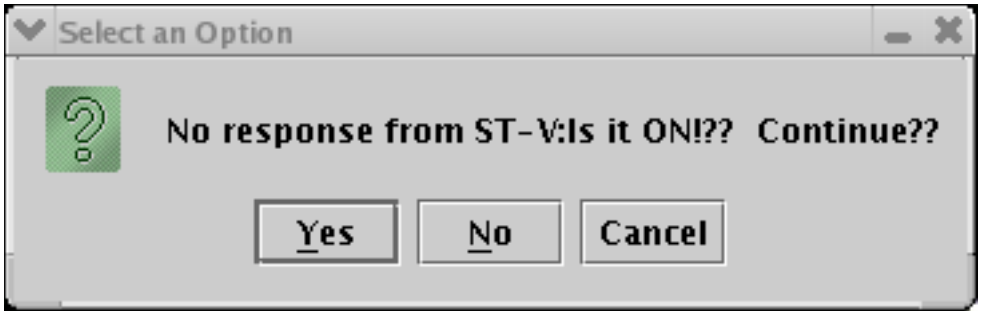
No Sunlight on the Telescope or interior of the dome.
Wind speed under 45 Mph
Relative humidity under 92 %

Click on open slit on the paddle and mount GUI
You should hear over the intercom, the dome shutter drive and see the dome illumination change due to the opening shutter. The button title will change to close slit.

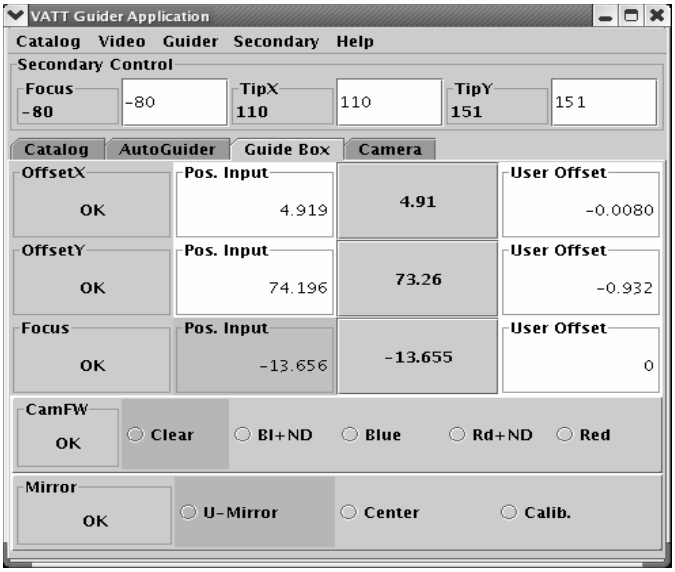
Open the mirror cover.
Click on the paddle and mount GUI mirror open M-cover button

Start the Guide Star Utility GUI
Go to the Vatt programs from the tool bar click on the Guidestar application icon.

If The " *No response message* comes up then verify the SBIG camera is on by checking the guider video monitor for a display signal.
If the SBIG camera is on click on yes.



The VATT Guider Application GUI, VGAG, controls:
Secondary mirror, SBIG guide camera, guide camera filter wheel, guide video routing and display, guide box optical configuration, and Auto Guider star catalog.



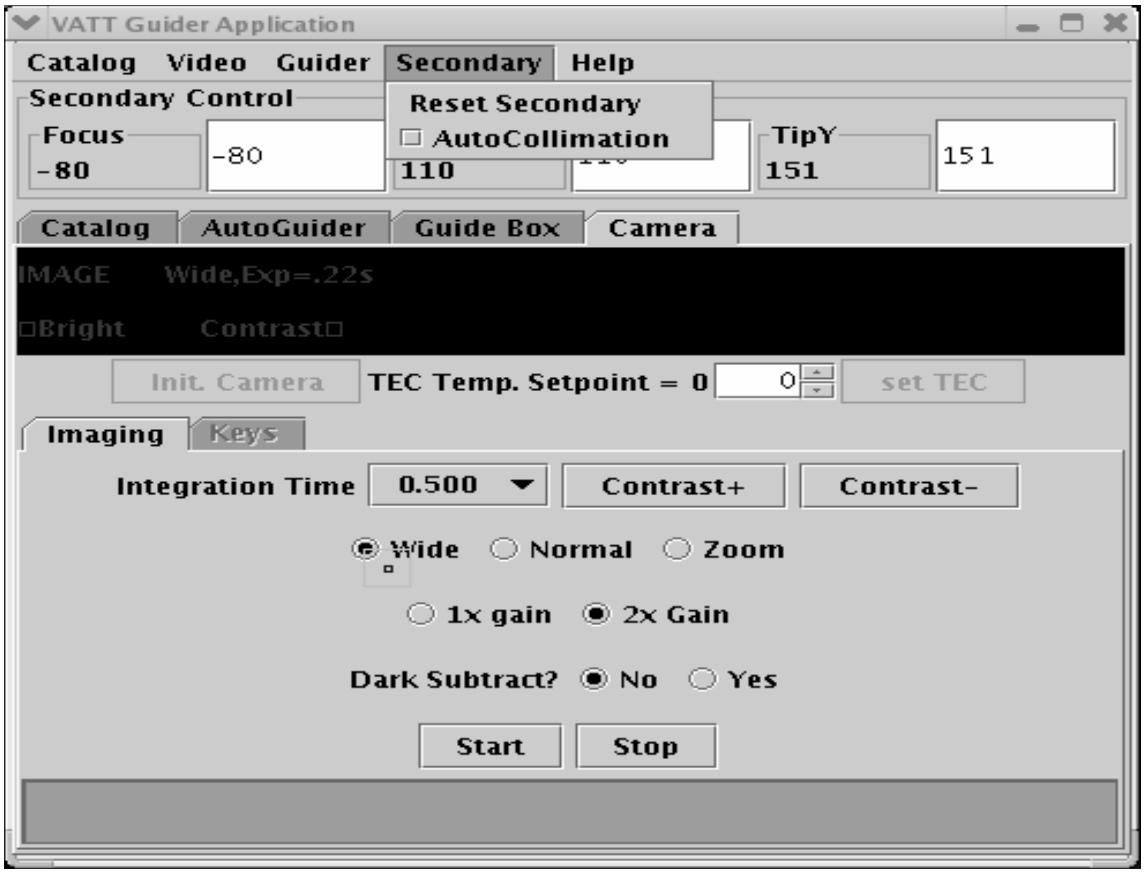
The Secondary is controlled by entering Focus, TipX and TipY values into the Secondary Control data entry fields.

These values change due to drift in alignment and should be estimated from the last observers trouble reports or notes to the next observer.

We request that observers keep track of the focus and tip values that they pass on to the staff and observers.

You must enter the number and press return while the data entry field is active. The Secondary control area will turn yellow when moving. If the position error of the secondary is estimated from the position sensor data the secondary control area will turn red.

The Secondary mirror should be reset at the beginning of the night. To do this go to the VGAG and click on secondary as shown below.
Place secondary in AutoCollimate mode (again wait).
Enter nominal values from previous night in TIPX,TIPY,FOCUS on secondary.



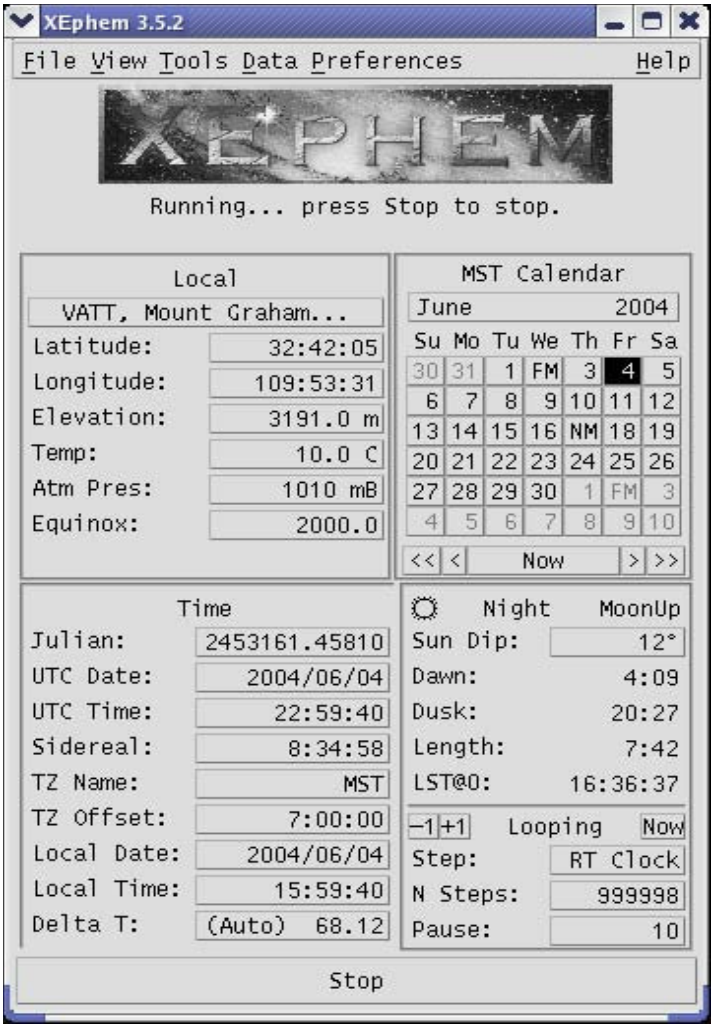
Auto-collimation will correct for strut temperature contributions to focus and elevation de-centering and tipping of the secondary mirror.
The VATT has a F1.0 primary and an f 0.8 secondary. It is necessary to
Keep the relative alignment of the primary and secondary with in a few microns.

Observers will notice a focus shift in the first half of the night due to the primary mirror thermal time constant.

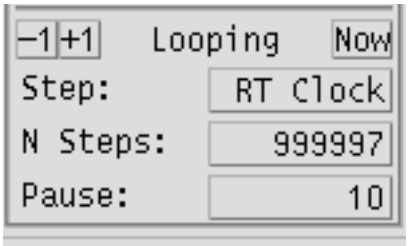
The Auto-Collimation should be turned off at the end of night and off when you reset the secondary.

Start Xephem

Move the Cursor to the left hand screen that has the weather display.
Go to the hat and proceed to the VATT Xphem application icon.
Click to start and the GUI will appear.
section of the GUI is illustrated directly below



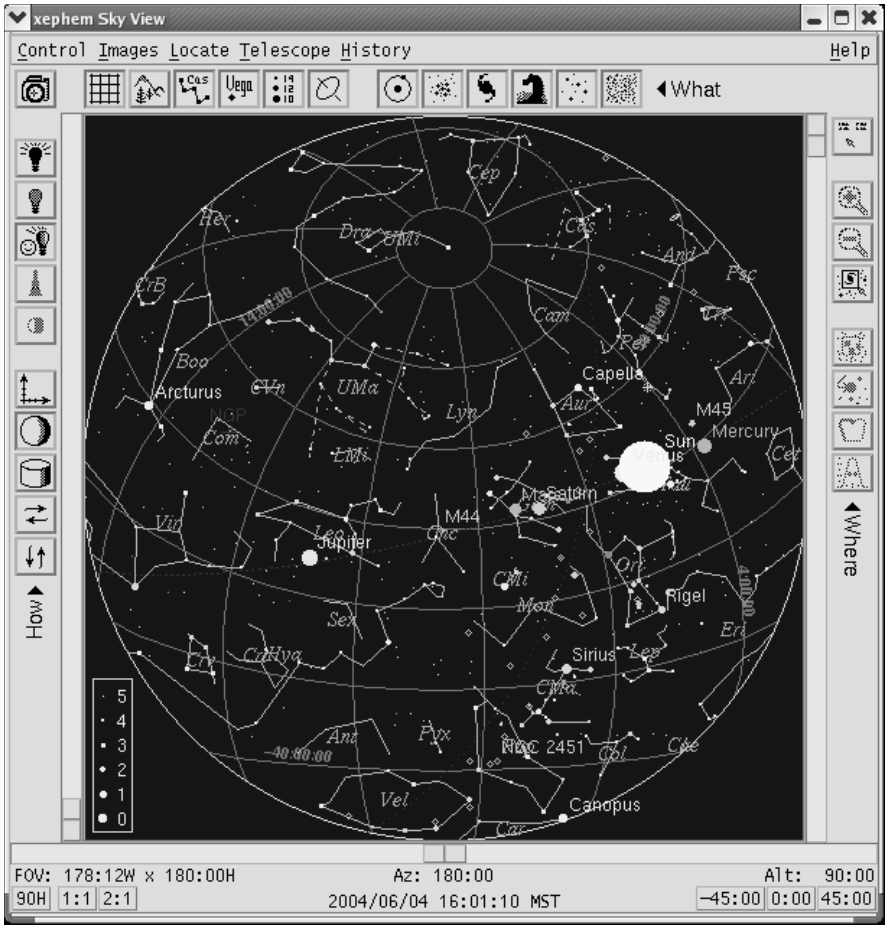
To Start Xephems realtime mode click on the NOW button and the Nstep display will reset to 999999.



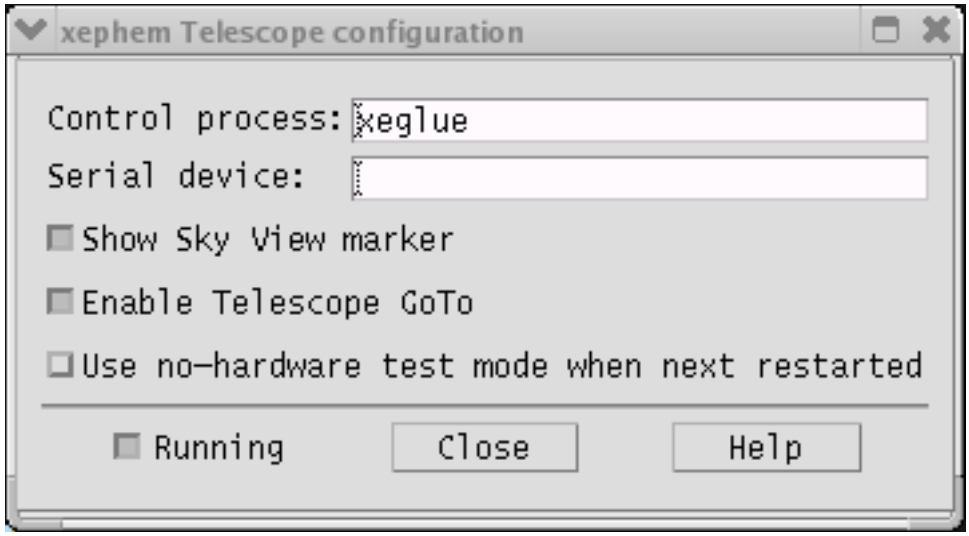
Switch to Sky View

Move the cursor to the Xephem View option and proceed to sky view

The Sky View window will appear in its default configuration



Start the Xephem Telescope interface by clicking on telescope and then configure
The GUI Below, Has the "Show sky view marker" and the "Enable telescope GoTo"
Features enabled. When first starting Xephem, it may come up with the GUI in a run state as illistarated in the below xephem Telescope configuration GUI.

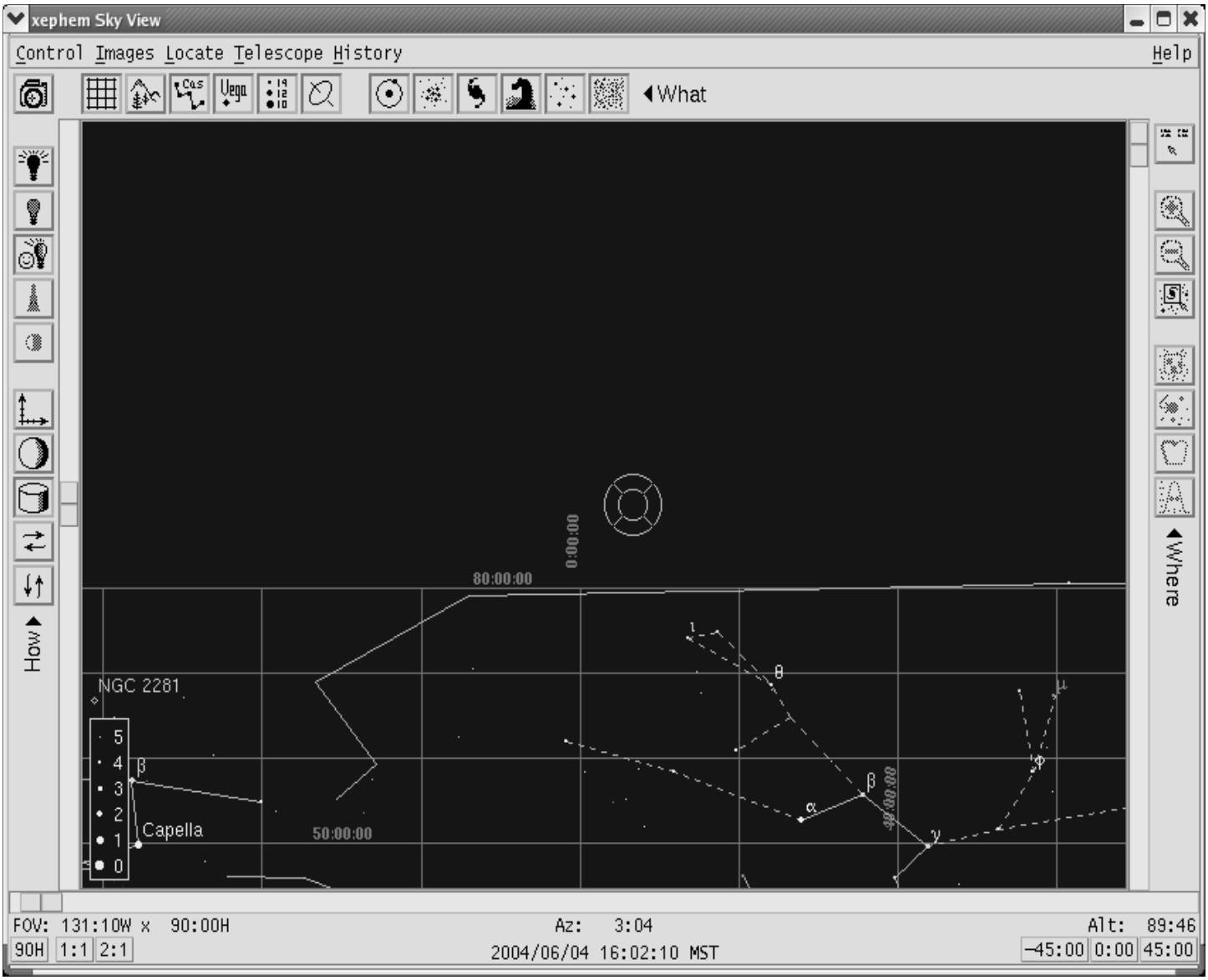


If Running is on,click it off, and close the Telescope configuration GUI.
Now restart the configuration GUI and click on running. Close this GUI

When the Telescope connects to XEphem a sky position marker should appear at the
Current position of Azimuth 180 degrees and elevation 90 degrees.

The View mode can be changed to the south view by clicking on the History option
Of the sky view GUI.

The SKY View can be changed to Altitude, Azimuth coordinates by the grid icon in the center of the left tool bar in the sky view GUI.



The Telescope Sky position is above the grid line and the Az position should read close to 180 degrees. The alert reader will notice that this display is near 0 degrees azimuth which can happen if the telescope initializes at an altitude over 90 degrees.

*Note:

The Telescope is now ready to exercise the elevation axis.
Restrictions: minimum elevation angle 20 degrees

Make two transits of telescope from stow to an elevation 30 degrees.

FROM THE Xephem Sky view GUI move the cursor to a position close to
AZ 180 and elevation of 30 degrees. Right click the mouse and the cursor position data will be displayed in a popup window.
Verify that the position is close to your desired coordinates and move the cursor down to telescope GOTO. Release the cursor
The Dome flood lights should come on and the telescope will move to the
30 degree elevation position. When the telescope stops.
Move the cursor to the TCS window and click on stow.
The lights should come on and the telescope move to the stow position.
Repeat going to the 30 degree position and stow.

*End elevation exercise

Find a setup star.

Using Xephem locate a star between magnitude 6 and 7 near Azimuth 180
And a elevation angle near 45 degrees.

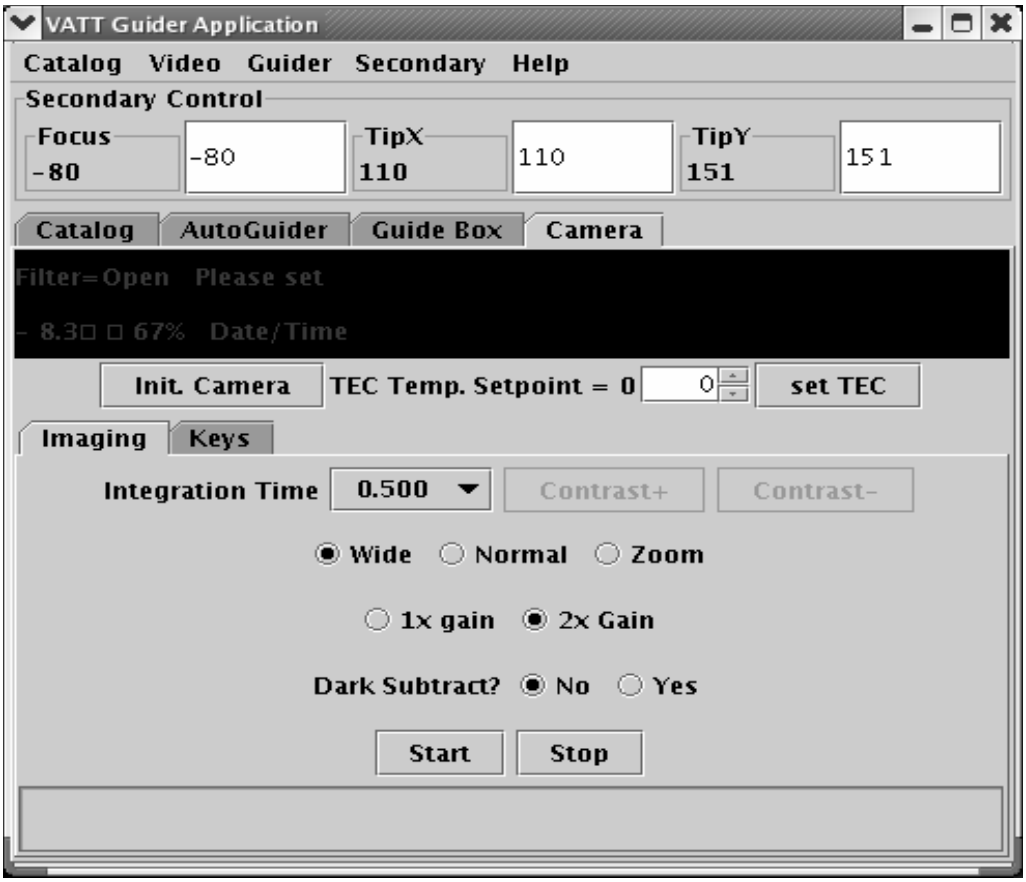
Move the telescope to that location.

Look at the finder camera monitor for the Setup star to appear.
There should be a mark on the screen made with a marker pen.
This marker is changed at will by the observer and should represent
The position where if you place the star, will appear close to field center for the instrument.
Click on the paddle tab of the paddle and mount control GUI.

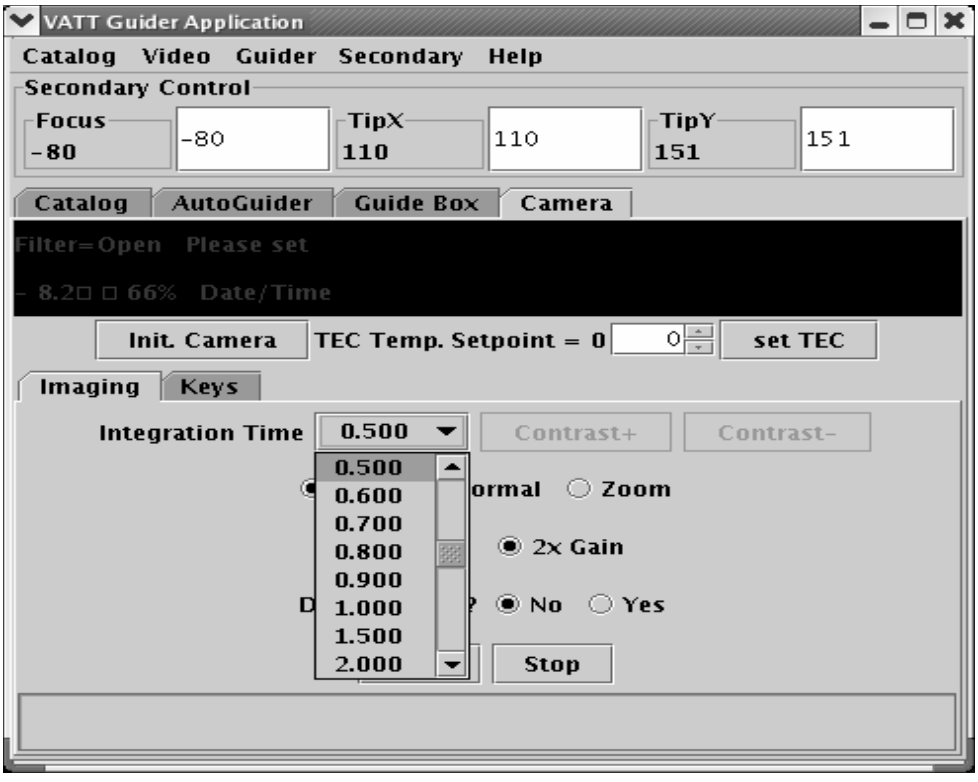
The telescope position paddle has two mode of operation, normal and Jog.
The normal mode will move the telescope at the rate set at the center panel. The jog mode will move the telescope at the distance set by the jog size data entry field. The jog totals are ept track of and a undo button will return the telescope to the original position.

Using the paddle in normal mode and with a rate of 50arc seconds per second, move the star to the finder mark.

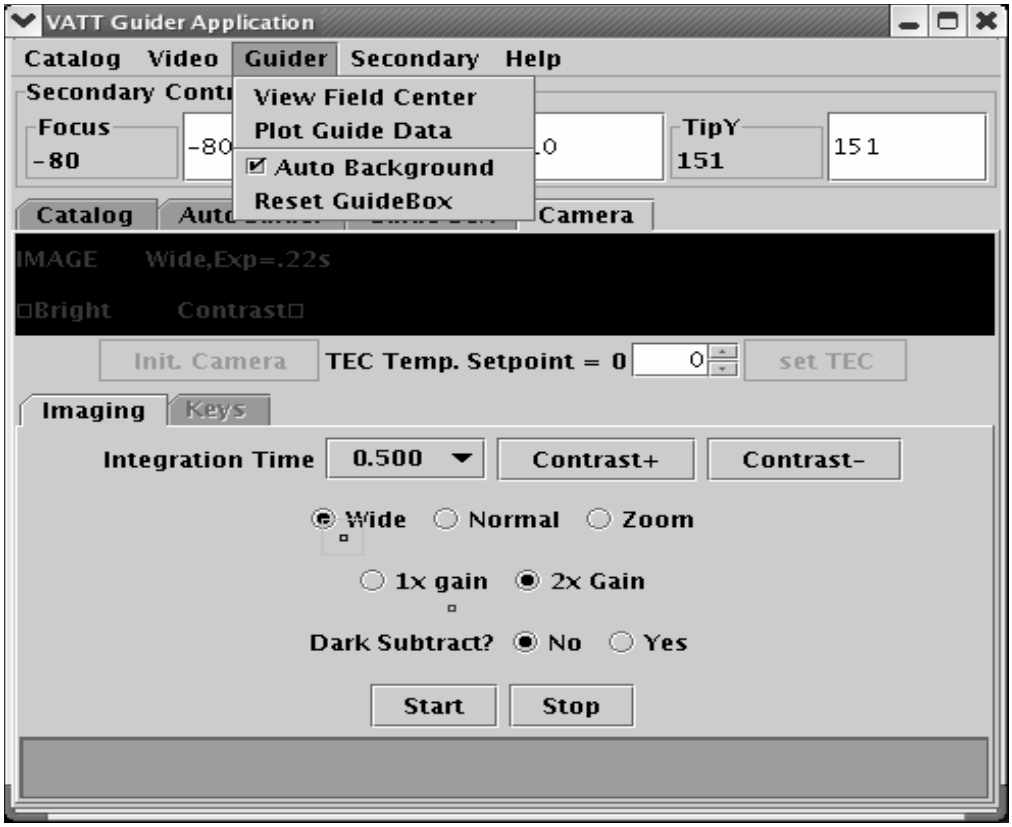
Click on the VGAG and Tab to camera



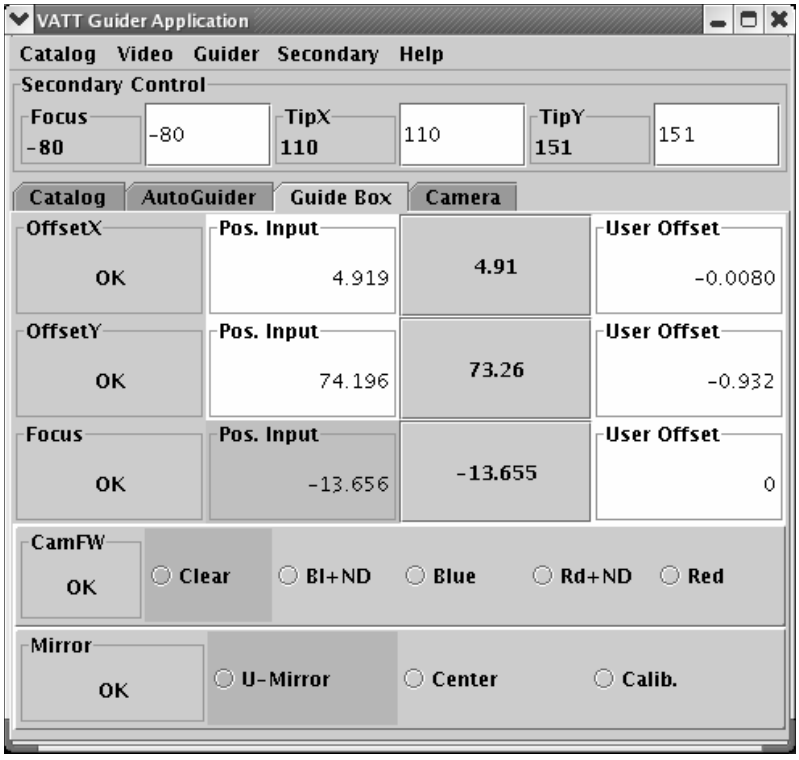
Move the cursor to the start button and click the bottom progress indicator should indicate the upload of parameters to the camera. The Camera Video display should then display frames updating at 0.5 seconds (default).



Click on guider as illustrated below to display the sub menu.
Click on View Field Center



The Vatt guider has two mirror positions U Mirror and Center. When the mirror is in the center position, light is sent to the guide camera that is in the center of the field of view, blocking the light from the telescope to the instrument.
In the U mirror position, the center of the telescope beam is allow to pass to the instrument and a U shaped pick off mirror directs off axis light to the guide camera that must be position for off axis operation by using the catalog interface.



The Mirror configuration and guider position can be entered manually using the mirror buttons of from the computer by selecting view field center. The Guider X, y, and focus position can be entered manually or by selecting a guide object from the catalog. In normal operation the position inputs come from the computer and only the user offsets are used to tune the center and focus.

When the Guider box has finished its configuration the setup star should be visible on the guider screen.

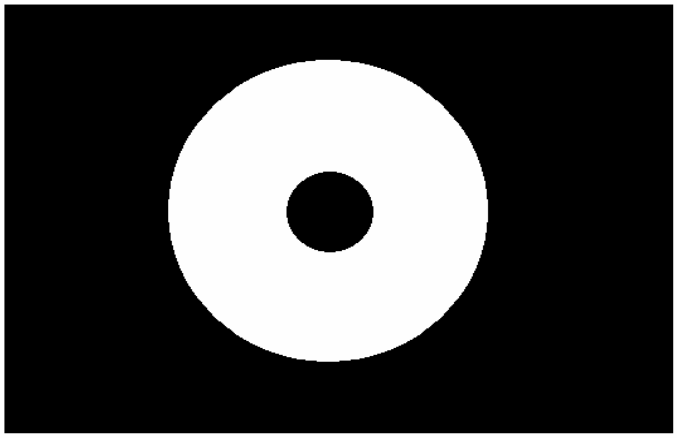
Use the paddle GUI and switch to 10 arc seconds per second rate.
Use the paddle in normal mode to center the star.

Collimate telescope and re-center the star.
Return to the VGAG and select the guide box tab
Enter a user off set of 15 to the guider focus.
Change by clicking to a Bl+ND filter in the guide camera filter control area.

Select the camera tag and click.

Use the integration time slider to set a two second frame rate.
Change the camera raster mode to zoom and restart the camera.

Desired image of a Collimated Telescope



The goal is to obtain an out of focus image that is used to align the secondary tip and tilt by centering secondary shadow on the primary annulus. Use the tip x and y positions to obtain a centered image and record tip and tilt. Center the mirror annulus with respect o the zoom field center.

on the TCS GUI click on initcoords.

Now you are ready to focus the telescope to the science field.

These instructions continue for the VATT CCD camera

The secondary focus position for the CCD camera is determined by issuing an Observe command in the CCD acquisition window

Respond to this command by setting up a focus run of 7, 10second exposures in the automatic detector mode.

The beginning focus value should be 20 units less than estimated focus from the last night.

For example, given a estimated focus of -120 we would set up the focus run starting at -140 in steps of 10.

The focus observation will produce an image that will have seven images with the last one spaced by twice the amount of the previous exposures.

After the exposure is examined for the best image the TELPAR file will need to be modified.

To do this

In the Secondary position focus entry field enter the value found for best focus wait for the secondary to stop verify that it is the desired value.

In the reduction window at the vatt workstation type telpar and a list that can be edited will appear. Use the down arrow key to move the cursor in front of the telescope focus value, and erase it with backspaces and press return to select the next value.
Press control d to finish and return to the prompt.

Telescope Shutdown at end of Night

At the VATTTCS Workstation

Stow the telescope.
Disable Auto Collimation
Disable drives.
turn off Dome tracking on the TCSGlue.
Turn off Mirror temperature control.
Turn off Mirror air circulation fans.
Close the Mirror cover.
Close the Dome slit.
Shutdown TCSGlue interface.
Shutdown Guide Star Utility.
Shut down the XEphem telescope interface.

In the Control Room

Turn off the ?nder telescope monintor.
Turn off the Guide camera video monitor.
Shutdown the Dome vent fan.
Turn up dome ?ood lights.

On Second Floor

Shut off all four power ampli?ers (Dome, ALT, AZ, DeRot).
Shut off guide box electronics.
Turn off the NESLAB.

In the Basement

Turn off Hydraulic Oil system.
Turn off both pier vent fans.

In the Dome

Insert Stow pins (Optional, but always check them at start).
Close Finder Telescope Dust cover.
Unplug Finder Telescope CCD power (on top of box on east fork).
Turn off SBIG STV controller (below filter access port).
Unplug the dome power.
Close Dome vents against inclement weather.

Chapter 3. Operating the VATT with XEphem

Startup

To start up XEphem for operations with vatt use the following sequence of actions:

1. 1. login to vatttcs with the same login/password as is used on the vatt sun.
2. 2. start X windows using the startx command
3. 3. start the normal TCS windows using the TCS entry in the main Kde or Redhat menu on the tool bar (far left). Both the TCS and XEphem create several windows on the display during use, so it may be wise to start XEphem and TCS in different desktops, or after starting move sets of windows to another desktop.
4. 4. start the autoguider interface from the gnome menu. It will appear on the sun workstation's main display.
5. 5. start the TCS Glue interface (again from the gnome menu). This application provides a software interface for various applications to interact with the actual TCS computer. It should start displaying telescope information immediately. Nothing else needs to be done with this application other than to keep it running during operations. It also functions as a convenient and easy to read status display for the telescope.

Note: When run on a dual head video system users often and it convenient to permanently locate this app on one of the two screens and use the other screen to run the desktops for XEphem and TCS.

6. start XEphem and execute the following steps to get the software connected.

. immediately press the **now** button in the lower right of the main display. This will constantly update the displays as the current time and position of objects in the sky is recalculated.

. Open the **Sky View...** display from XEphem's **View** menu.

. Open the **Configure...** panel in Sky View's **Telescope** menu. Leave this open during operations since the **Show Sky View marker** radio button is needed during operation.

. depress the **Running** button on the configuration panel. This will start the interface between XEphem and the telescope control computer. An XEphem Alert dialog will appear and the **Ok** button needs to be hit before interacting further with XEphem.

Congratulations. You are now ready to run VATT with *XEphem*.

Operations With XEphem

XEphem is a replacement for the XCats program adapted for use at VATT from the MMT project. As such it is meant to be the observer's main point of interaction with the virtual sky. The program is very versatile and it is suggested that the observer spend some time with the program preparing databases of objects and interacting with the interfaces to smooth the transition into using it for observation planning and telescope control.

XEphem has the capability of showing the user a representation of the current sky in either AltAz or RaDec modes at scales from a few arc minutes to an entire hemisphere of the sky. Here are some pointers to help you get going with XEphem.

When choosing bright stars to initialize the telescope with an AltAz view of the southern sky is a very good place to start. Look under the History menu of the Sky View panel to choose some canned views of the sky. With this view bright stars near the southern Meridian can easily be found and selected for telescope initialization. If none appear near your area of choice, simply press the "Display one Magnitude fainter" button on the upper part of the left hand tool bar to see the sky fainter. Pressing the right hand mouse button on an object in the sky will display useful information about the object and also allow the user to send to VATT to the object using the "Telescope GoTo" menu item which appears.

XEphem Bug: When switching from AltAz to Ra/Dec, typically the coordinate grid from the previous view is kept. To update this correctly you may need to turn the coordinate grid off and then on again to make all appear normal.

. Using XEphem is as simple as finding science objects on the sky and sending the telescope to them. XEphem includes various databases of stars, galaxies and other objects, and the user will ?nd that tailoring the databases used and displayed will allow for effective observation planning and object selection. Virtually all objects displayed

are controlled by the top **tool buttons** on the Sky View display.

. XEphem uses both the Tycho2 and USNOA2.0 databases to display field stars on the Sky view. This option will only come into effect at field of views of a few degrees or less. The field of view of the VATT 2k CCD is about 6 arcminutes, so a 510 arcminute FOV in XEphem will be best for field identification. If for some reason the display with field stars isn't sufficient for field indentification, the DSS view can be called with a single button stroke (the camera icon in the upper right hand corner of the Sky View panel).

Database Interaction with XEphem

As mentioned, XEphem can load whatever databases the observer needs to interact with the sky. Databases are loaded from the **Data** menu. The user can use the **Load/Delete local files...** to reconfigure the data loaded in memory. The **Shared Dir** button allows loading of system wide databases, and the **Private Dir** button loads files from the ~vattobs/XEphem directory. Pressing either of these button will display in the bottom panel a list of available files in those two locations.

Currently loaded database files are listed in the second panel of the popup window. Selecting the **Delete** will remove a particular file from current memory. Similarly, the **Load** button after selection of a file from the bottom panel will load the highlighted file into memory.

Note: it is only the work of a moments notice to **Delete** a file from memory and load it up again. Users should feel free to reconfigure the loaded objects to reflect what they are searching for on the sky. Doing so will *NOT* effect the functioning of the telescope in any way.

Selecting the **Search memory, define ObjX,Y,Z...** from the **Data** menu will pop up a panel which allows user searching of the object currently loaded into memory. A slider controlled, and alphabetized list of the objects is on the right of the display. The **Search:** field near the bottom will allow searching on object name. The object list is repositioned when the Enter key is struck and will proceed to the next match on the next key strike. Changing the **Search:** pattern will start a new search from the top of the list.

Items found in the search will appear in the lefthand panel, which displays information on the object found. Once an object is loaded into the lefthand panel it is

possible to either reposition the XEphem sky view display with the **Sky Point** button or send the telescope to the object with the **Tel Goto** button.

Warning

It is not possible to preview the **altaz** position of the telescope from the Search window. Therefore, the user should take care to use the **Tel Goto** from here. It is recommended that the user do a **Sky Point** and examine the object and field from the Sky View display. A nice bene?t is that selecting the **Tel Goto** from the object information on the Sky View display also keeps a record of objects pointed to in the **Telescope** menu of that display. The Search **Tel Goto** option does *NOT* .

Currently available are the following databases:

Stellar:

Yale bright star catalog

Tycho/Hipparchos star catalog

USNOA2.0 catalog

. Galaxies/Nebulae Messier NGC or RNGC Revised IC UGC PGC

. Planetary Lowell or MPC databases. Various comet/MP databases from the net.

Warning

Please note that the TCS at this point cannot digest XEphem style ephemerides. When using XEphem to run the VATT, while it is possible to select planetary objects for telescope goto operations, XEphem will send the TCS an ephemeris. This style of commanding the telescope is not supported and the telescope will ignore the input. Instead, a star from the USNO catalog near the current location of the planetary object should be selected.

In addition users can bring their own databases of selected observing lists and standards to the VATT. The format used by XEphem is described in the help documentation with the program. When a user arrives at VATT simply install any private databases in the ~vattobs/XEphem directory of the vattobs account on vatttcs. The ?les can then be loaded and unloaded at will during the night.

Shutting Down the Software Systems

Because of memory leaks in the TCS X server software on the vatttel that computer must be reset before every nights operation. Since the software interfaces for XEphem are all dependent on a single unicast socket for communication, the string of communications needs to be terminated properly before restarting vatttel. In order to ensure that vatttcs survives the disconnection follow the steps below at a minimum to ensure being able to restart everything cleanly.

Close all the TCS displays using either the **close** button, or right click on the title bar and choose the **close** item.

Note: Don't forget the Autoguider interface on the Sun if it has been started. Users should note that the old autoguider interface is obsolete and should not be started unless the new Guide Star Utility fails and won't restart.

stop the XEphem telescope interface by depressing the **Running**. XEphem will bring up an Alert dialog indicating that the process has been stopped. Close this too.

close the TCS Glue and Guide Star Utility interfaces. This will close all connections to vatttel.

The vatttel VME computer can now be rebooted and the interfaces restarted after it has finished rebooting.

Problems

If you are having problems there are a number of places to go for help. First the XEphem software has a help system with adequately explains much of it's internal functions. One question that comes up regularly is how to create database files for use during observing. The format of this file can be found by searching on "edb" in the help system. You will get a description of the file format and the meaning of the fields. The format is easy to master, and can be edited by hand, however users have also found it quite useful to simply use an existing file and "grep" out the names of their targets and redirect them to their own files.

You next best solution is to play. What I mean is to get a copy of XEphem and install it on your own system and play with it extensively before arriving at VATT. A day or two spending an hour getting used to the interactions will smooth out your first night's observing tremendously. If there are particular database files you want to work with let me know and I can arrange to get them to you. XEphem has everything from basic planetarium functions to advanced image examination. Here's a good test of how well you know the interface: Can you bring up the current weather map?

Lastly, but not least, you can feel free to call or mail me with questions or problems[1]

Notes

1. mailto:mnelson@as.arizona.edu?subject=Problems with XEphem

Chapter 4. Guide Stars and Autoguiding with the VATT telescope

The Guide Star Utility

Guide Star Selection

A new guide star selection utility and autoguiding program has been developed for VATT. Currently the guide star selection portions, autguiding, and offset camera stage control portions are working. Operations are fairly obvious and center around two buttons included on the first tabbed panel of the display. The top button when pressed will search the sky around the current position of the telescope and display what stars are found from the USNO A2.0 catalog (USNO B1.0 is coming soon). The current search center coordinates are displayed next to the **Search Catalog** button.

Note: The utility now senses slews to new targets and will, upon seeing a new target from XEphem, automatically run a catalog search for the new target position. This should allow guide probe setup during slews of the telescope, and should also allow the user to use the guide camera for telescope pointing corrections using guide stars instead of the center of ?eld.

Potential guide stars can be examined by simply clicking on their locations on the display. The selected star will highlight red and the corresponding table entry will then be highlighted in the table on the lower half of the split pane. The Umirror symbology of the old findg utility has been kept. An image of the guide star selection panel is displayed below.

This figure shows the appearance of the utility with a potential guide star selected. Pressing the **Search USNO Catalog** button will create a new list of guide stars based on the current position of the telescope. The **Send to Guider** button below the displayed focal plane will send the offset coordinates of the selected star (in red) to the guide probe stages.
Once a suitable guide star has been selected the user can simple press the lower **Send to Guider** button to send the x,y and focus coordinates to the offset guider.
The offset guider control pane (last tab) will look familiar to the user. The only difference is that the user can now program in offsets to the calculated positions and enter them into the last field on the display. A **Return** needs to be struck to enter the value into the software. At that point any coordinates going into the user position fields will have those offsets applied. Users may find a value of 10.0 for an initial guess at a user offset for focus works well. Values for X,Y may vary somewhat on different parts of the U-Mirror, and it may be advisable to set the offsets to 0.0 before making drastic changes in the part of the UMirror used. An image of the offset stage control panel follows.

This figure shows the appearance of the utility with the stage control screen selected. Fields in white are available for user input, and grey fields are informational. Selecting the leftmost field (button) will accomplish a reset of that stage.
When starting up at the beginning of the night follow the following procedure for setting up the stage for guiding and telescope pointing, and for moving to new targets.

Collimate the telescope with the camera in the center of the FOV and all stage values set to 0.0 (axis positions and offsets).

Center the star in field of view of the guide CCD, and initialize telescope pointing.

Center and focus the guide star using the user offset fields, not the main position input fields.
From this point on guide stars should appear in the guide CCD field, and using the **Move to Mark** to position stars to the center mark should result in accurate pointing of the telescope for new targets.

Note: The user should examine the results in the data table after searching the catalog to ensure that the current pointing of the telescope is represented correctly. If not, shutting down and restarting the application will only take a moment and may restore communications if they have been interrupted.

A menu item has been added to the **Guider** menu, to allow users to easily place the guide camera at the center of the FOV of the telescope to establish pointing of the telescope. Selecting a guide star from the catalog panel will reset the UMirror to the normal position for offset guiding.

Finding Guide Stars with VATT

Finding guide starts with the VATT can at times be a somewhat difficult and confusing process. This section is included to help the user understand the issues which can complicate the process. The core issue to finding guide stars reliably is understanding that the guide star selection software needs to know definitively the RA/DEC of the guide probe when it is at X,Y offsets of (0,0). This can only be established by positioning the probe at (0,0), centering a star at that location, and initializing the pointing map of the telescope.
At this point the telescope optical axis has been set to the stage (0,0) positions. The user should understand that this is not the exact center of the science CCD, and any attempts to position a science field on the CCD should be done through XEphem, and the user should NOT hit the Init buttons after centering a science field on the CCD. Be sure to do a new catalog search after small moves of the telescope to ensure the potential guide stars are positioned properly for the new pointing of the telescope. If finding guide stars has become difficult the user should double check the pointing of the telescope with the guide probe at (0,0). This is fairly easy now with XEphem and the Hipparcos/Tycho2 catalog, since a 10th to 12th magnitude star can usually be found fairly close to most fields, which should be easy to see with the finder camera. It should also be noted that the first initialization of the telescope pointing should be made only after initial collimation of the telescope. Changes in TipX,Y effect the pointing of the optical axis of the telescope on the sky.
If you follow these simple guidelines, finding guide stars with VATT should become a fairly routine process.

Autoguiding

The old autoguider utility was run on the Sun workstation has been replaced by a new autoguider interface in the Guide Star Utility application. Please do NOT invoke the old Autoguider application on startup of the telescope. This should provide some protection from the memory problems we have with vatttel. Check above under the Guide Star Utility section for details on how to run the new utility. Notes on autoguiding with the new utility will be provided here.
The new Autoguider utility can be accessed from the middle tab of the main display. Once selected, select **Start Video** from the **Video** menu to start video capture of the ATC5 video output. A view of the application with the autoguiding panel exposed follows:

This figure shows the appearance of the software after pressing the **AutoGuider** tab. Guiding with the new interface revolves around Markers which the user places and controls the position of on the autoguider screen. The software will only attempt to guide to the currently selected Marker (markers appear as small blue boxes). In addition, if the software is actively guiding, selecting a different marker will transfer the telescope so that the guide star moves to the new marker, then repositions the centroiding box there, followed by continued guiding. This allows the user to move the telescope around the guiding field with relative ease. The centroiding box can be repositioned by the user anywhere on the screen by dragging the mouse pointer over the

application. toguider interface doesn't require calibration before starting. A reasonably good guiding
Users should note that the new autransformation is provided in the software which should allow the user to accurately guide and move guide stars on the CCD with the telescope. If a new calibration is for some reason required, contact the author for information on how to recalibrate.
Utility buttons have been provided to move a guide star in the centroiding box, anywhere on the screen, to the currently selected marker with either the telescope or the guide box stages. This facilitates setup of the telescope and/or guide stage for autoguiding. The software currently will place a **Center** marker as a default when the video capture is started.

Quick Start Guide for CCD Users

? Start slew to new target with XEphem.
? After a few seconds a new search will appear in the Catalog panel centered around the new target coordinates. Select a new guide star and use the **Send to Guider** button to reposition the guide probe.

Make sure the currently desired marker is selected in the pull down marker selector at the upper right hand corner of the display.

Drag the Centroiding box over the star image on the screen.
The centroid box should follow the target star to the selected marker.
Wait for the image to update and determine that the star is now in the centroiding box. If not drag the box over the star at the new position and iterate the above move. Once the star is in the centroiding box surrounding the desired marker, toggle the **Not Guiding** button to initiate guiding. The button will darken and the text will now read Guiding
Users should note that the relative positions of the guide probe and science camera can be controlled using the **User Offset** fields of the X,Y and Focus stages on the **Guide Box** tab. This will allow consistent positioning of targets on the science CCD with a given autoguiding marker, and should speed up target centering when moving to new objects. More detail on this is given in the previous section. Follow this section link for reference.
The user may wish to adjust the mark position when arriving at a new source, if the perviously established mark(s) position needs to be slightly different. This can be done using either the **Adjust Mark** button on the **Markers...** dialog or the **UpdateMarks button on the main autoguider screen**. **Either button will reposition the current mark on the currently calculated centroid**. **The Update Marks** button will update the current mark to the new centroid as well as move all other marks so as to keep the relative orientation of the marks on the screen. This is particularly useful for remarking the display for a new guide star for previously existing marks that need to keep their relative orientations (slit positions or CCD field jogging marks are a good example).

Note: The **Update Marks** button will *NOT* move any marker named Center or center. The default marker upon starting is now named "Marker 1".

The user will also notice an entry field on the main display of the autoguider interface, just to the right of the **Update Marks** button. This is a threshold value for the centroiding routine. Fluxes (listed at the bottom of the display along with other information about centroiding values) above this value will result in new centroid values, and guide updates to the telescope. If the value drops below the threshold the red marker on the screen will disappear and no guiding will happen for those frames. It is the users responsibility to ensure that the camera setup and thresold values result in reliable data for guiding the telescope. Background values can be ascertained by dragging the centroid to a place on the frame with no star images and examining the flux values reported, and their deviations. Thresholds should be set about a factor of two above this value.
Changes in integration time can result in background levels changing, and the user should keep an eye on the performance of the centroiding routines.
Controls for the frame grabber are available for adjusting how the data on the video are grabbed. The controls accessed by right mouse button clicking in the video frame, or by

binning for fainter stars. Also the scaling has been checked for this mode and not the others (yet).

For integration times of less than 35 seconds S/N will be slightly better without using dark frame subtraction. At 35 seconds and greater the increase of hot pixel ?ux may start to effect centroiding results and dark frame subtraction may be desired.

Use 2x gain unless the star is very bright.

Play with the contrast once object frames start to appear. Although the software tries to set a reasonable level, you may ?nd a notch or two of contrast up or down is better depending on the star chosen.
Try an integration time of 1.5 seconds to start with. This should show most stars that show up on the catalog search. If a star seems unusually faint, check its color. Bluer stars show up better than heavily reddened stars.
Integration time is automatically forwarded to the frame grabber along with zoom levels depending on imaging mode. If guiding seems unstable check in the **Guide Setup...** that guiding aggressiveness is set below 0.5. Also bring up the frame grabber controls (right click on autoguider screen) and check that the framegrabber isn't capturing with intervals shorter than the integration time of the camera.
If for some reason some features of the camera need to be accessed by the user that are not normally controlled by the new GUI (e.g. focus mode for very bright/fast guiding), the usual STV controller virtual keyboard is still available. There is a second tab internal to the STV interface labeled Keys. This keyboard combined with the instructions in the STV manual, on the bookshelf above the monitors, can be used to manually control the camera. Following is an image of the GUI with the keyboard exposed. Note that the keyboard cannot be accessed during imaging. Press the Stop to halt integrations and get access to the keyboard.

This figure shows the keyboard tab of the STV GUI. Refer to the printed STV manual from SBIG for instructions.

using the **Video** menu **Video Controls.** A view of the controls follows with a reasonable setting for the various controls for brightness, contrast and color. Note also the bottom slider which is the frame interval which is used for capturing video frames. This value is the interval in mSec between frames, and should match the integration time set on the ATC5. Please do not mess around with the two drop down field at the bottom of this panel at this time.

This Figure shows the appearance of the frame grabber controls with a reasonable default setting for grabbing SBIG frames on 1second intervals.

SBIG STV control

The guide camera for autoguiding is now the SBIG STV. The previous version of the STV control software has been retired and a new version which automates much of the normal setup has been implemented and is available as the forth tab on the Guider application. The following image shows the STV software interface upon startup of the guider application.

This figure shows the appearance of the STV interface. Note the display indicating that Date/Time are not set.
The button labeled **Init. Camera** can be used to automatically set the Time, Date TEC servo temperature and other fundamental parameters for proper imaging with the STV. It should be pressed upon startup of the application and if the STV has just been powered up. If you see the time and date on the display, that is a good indication that controller has been initialized already. Following is an image of the application after initialization:

This figure shows the appearance of the STV interface after initialization. Note the display now shows the current Date/Time.
During startup, you may get an informational popup saying that the software was unable to connect, or the camera controller is unresponsive. It is possible to continue on with the application by saying **Yes**. However, there is no way to restart connection to the camera. Double check that the controller (located on the bracket below the filter access port on the guide box) is powered up in the latter case. In the former case the serial server may need to be reset. This can be done by cycling power on the gray electronics enclosure on the south face of the east fork (where you plug in the finder camera power). To cycle power, disconnect the power cable from the button of the box and reconnect it. If neither of these solutions work, panic and call the operations staff.
Imaging with the STV is fairly simple. Select the integration time desired from the drop-down list, chose desired gain, dark subtraction mode and framing type (Wide, Normal, Zoom). Once the proper choices have been made simply press the **Start** at the bottom of the display. The image that follows shows a nominal state for the display after a successful start of imaging. Also note that on the video, there is a box that progresses indicating active imaging.
Note: Initializing the camera, setting the TEC and starting integrations all require substantial interaction with the STV controller's menus. Due to the automation of all these processes delays have been established to ensure maximum reliability of the processes, and there may be a delay of up to 1015 seconds on some of the interactions before completion. You will note that the selected button will go gray and stay that way until the process is done, and the GUI will become unresponsive for the duration. *Please be patient.* Also, it may be possible that some interactions will fail due to the timeouts. If this happens the GUI will return to normal, but a check of the display will show a display that doesn't agree with the desired action. Simply try again.

This figure shows the appearance of the STV interface after a successful start of imaging. Note that the contrast buttons are now active and can be used to change display contrast on the video.
Following are some guidelines for using the STV successfully. Please note your own successes and failures and report them to the operations crew.

Normally use the Wide imaging mode. This mode maximizes field of view and has optimal

Chapter 5 Trouble shooting

What can go wrong ?

Problem Areas

Dome

Dome will not rotate
Dome making loud noise
Shutter will not open / close
Shutter making loud noise

Telescope
Telescope shuts down after enabling power amplifiers
Telescope shuts down during observation
Telescope will not calibrate Azimuth Axis
Rotator will not calibrate

Secondary Mirror

Secondary mirror GUI positions are red
Secondary moving during exposures
Trouble finding focus

Guider /Filter Wheel
Cannot see stars
Cannot find guide stars

TCS

System Time and TCS time differ

CCD camera

Cannot take any ccd data
Shutter not working
Fits data storage
Dewar warming up

NET
Network down
Cannot connect to visitor computer

Phone

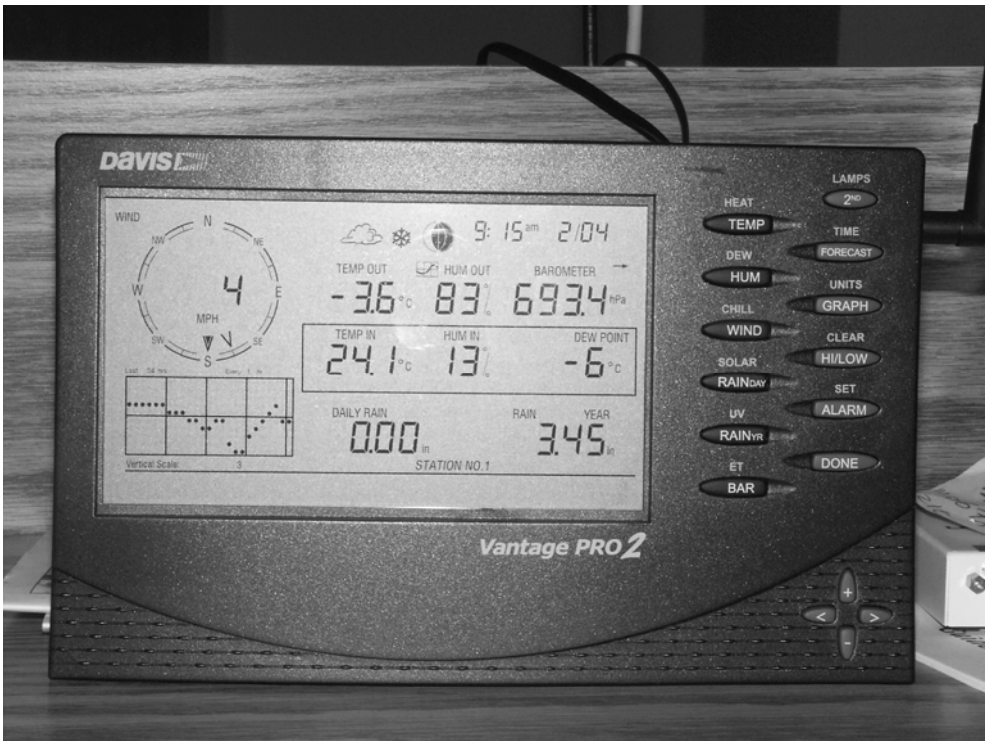
Phone System Down

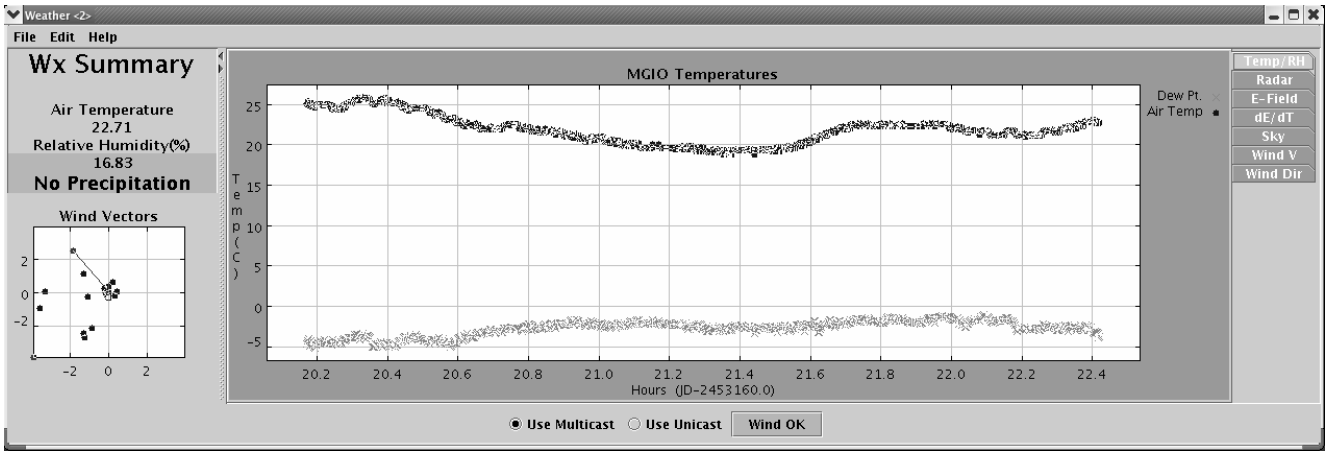
Chapter 6 Weather

Weather limits

Humidity 93 %
Wind 45 Mph or shaking telescope

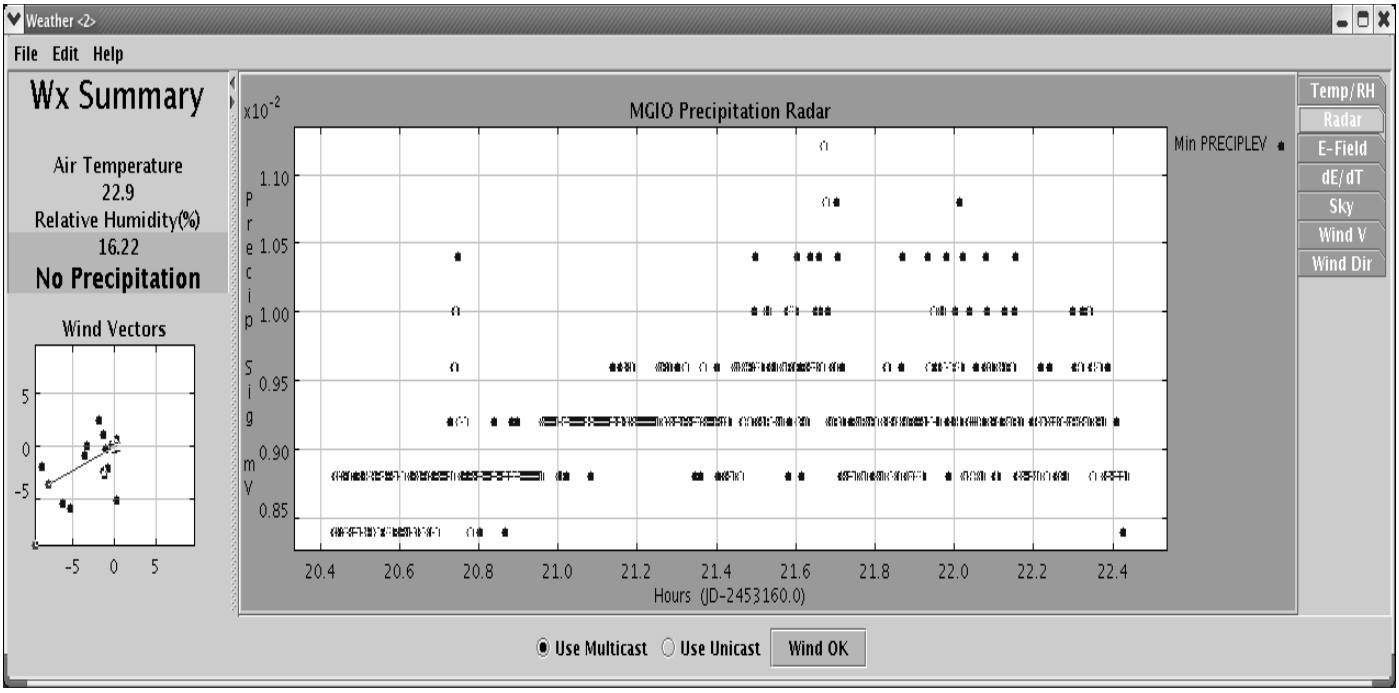
Weather stations
The VATT has two weather stations, local VATT and LBT.
The local Davis weather station has its readout next to the SBIG display.
The manual is next to the station.





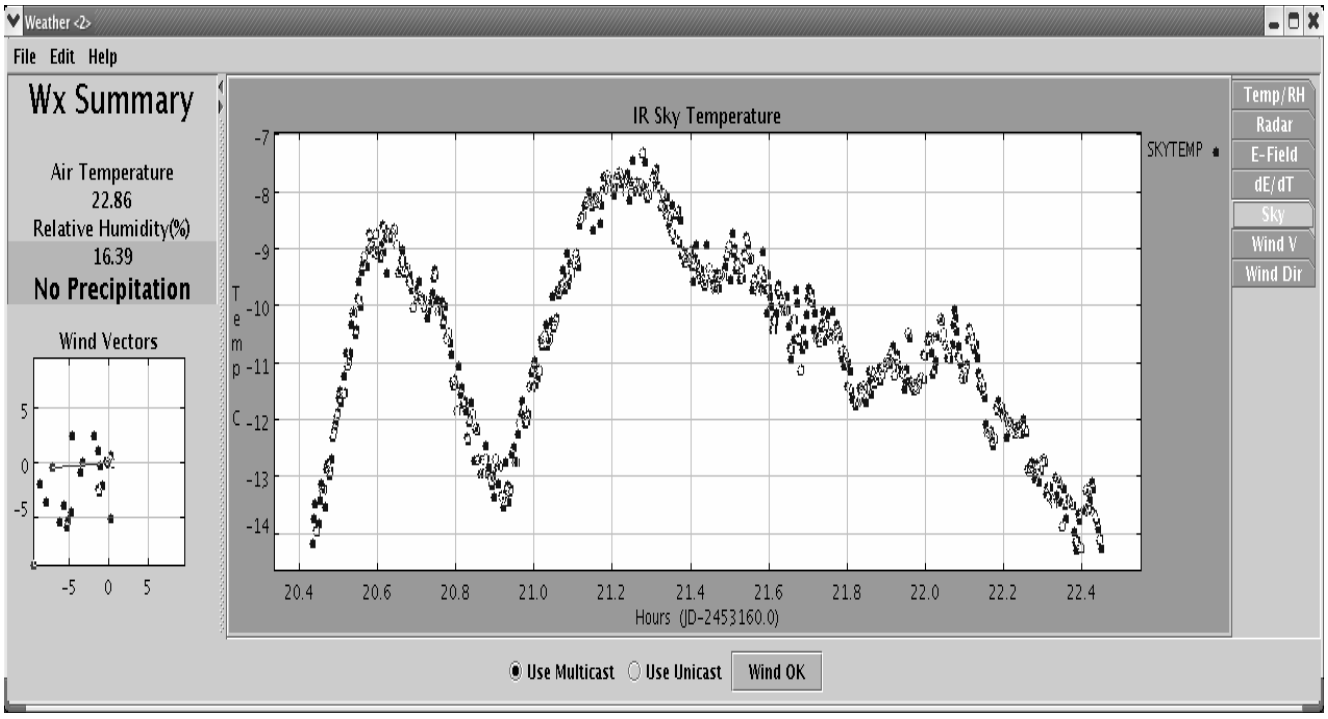
The LBT station has a GUI that will display current data values, warnings and a time plot of the selected variable.
The Plot above is that of the temperature / humidity function

When radar is selected the displayed value corresponds to the amount of backscattered 3 cm microwave energy (20 milli watts) as a function of time. The backscattered signal can be Doppler shifted do to a difference in relative velocity. The signal displayed is the RMS value of the filtered
(10 Hz to 1500 Hz pass-band) backscatter with a time constant of about 3 seconds.

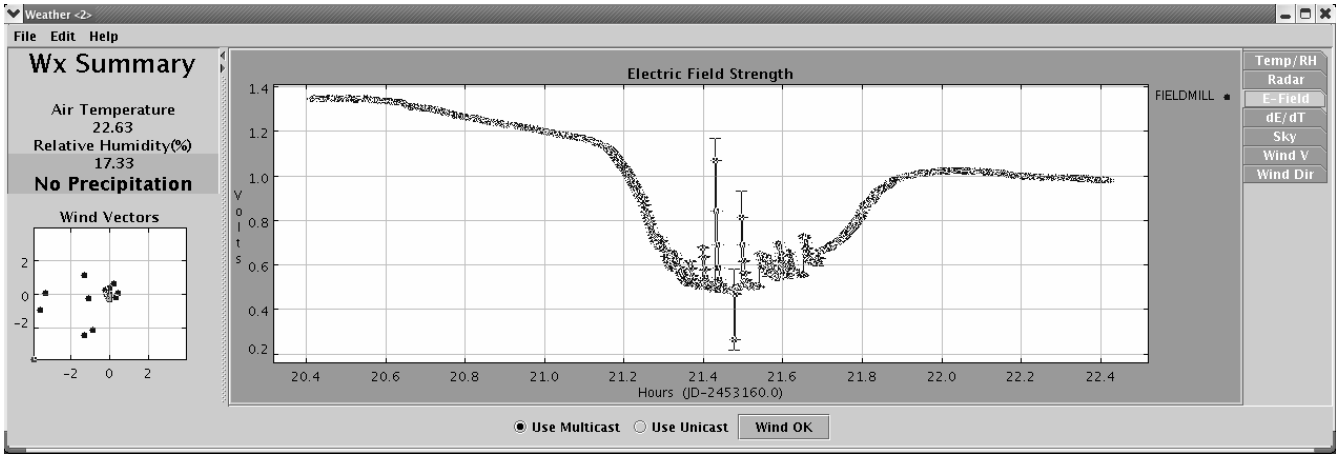


This Plot was obtained during very light precipitation. Normal back ground levels are about 8.5 millivolts in the summer to 12 milli volts in the winter. Strong precipitation produces signal levels in the volts.

An 8 to 14 micron thermocouple with a 90degree field of view is displayed after a calibration of sensor temperature and relative humidity effects. The IR Sky temperature display will indicate temperatures of –20 to –30 on clear nights.



Chapter 7 Lightning Shutdown Procedure



The above time plot from the E Field probe illustrates a passing storm a few 10s of miles away

Caution must be observed in obtaining field strength due to the temperature coefficient of the data link. The E field meter has a calibration of 70 KV per volt. Lightning events can be observed as the spikes (one negative the rest positive) and the over all effect of the indicated field strength can be seen on the background of the temperature induced drif

By pressing dE/dT the E field signal is differentiated with respect with time so the temperature drift is less important in the display. The plot below is only background.

Conditions that produce electrical storms often exist in the summer and winter. To protect the VATT from electrical damage we shut down and disconnect certain components of the VATTs
Subsystem.

When Thunderstorms are forecast to be active the VATT is put into the “Summer shutdown mode”

This is usually and should done by the VATT support staff. The procedure is listed below for times When the staff cannot be present, then the shutdown procedure is.

In the Dome

Insert lightning dome short.
Disconnect CCD power
Disconnect guide video

On the Second Floor

1) Shut down VATT, VATTPC1, printer, and displays
2) Shutdown CCD system
3) Shutdown Vx works TCS
4) Turn off all electronics
5) Disconnect power from wall

On the first floor

Shut down UPS 1 and 2
Disconnect Ups from WALL

Chapter 10. Telescope Specifications

General Information on the VATT

Optical System : aplanatic Gregorian, f/9
Focal Length : 16.48 m
Primary Mirror : f/1.0, Diameter 1.83 meters
Secondary Mirror : f/0.9, Diameter 0.38 meters
Back Focal Distance : 50.80 mm (effective)
Vignetting-Free Field : 72 mm diameter (15 arcmin)
Image Scale : 12.52 arcsec/mm
Image quality : 0.1 arcsec throughout 6.8 arcmin diameter flat FOV
Mount : altitude-azimuth with derotator

Guide camera :SBIG CCD
Guide Camera sensitivity 18th magnitude in one second
Guide Camera FOV

Geographical Location of VATT

Latitude : 32 42' 04.69" N
Longitude : 109 53' 31.25" W
Altitude : 3191 meters
Driving time from Tucson : 3.5 hours in good conditions

IAU Observatory Code number : 290

Sky Conditions at VATT

The sky surface brightness for low-airmass (sec z < 1.2) observations averaged 22.00, 22.53, 21.49, and 20.88 mag arcsec^2 in U, B, V, and R, respectively. These were measured during relatively high solar activity. The darkest run achieved 21.72 in V, close to theoretical minimum of 22.0 mag arcsec^2.

The FWHM seeing for median R-band focus images per run ranged from 0.97" to 2.15", with values occasionally as low as 0.65". While this is very good, please note that the VATT's height and location do not give the best seeing achievable at MGIO.

(These values were determined by Violet Taylor, ASU)

Computer Systems at VATT

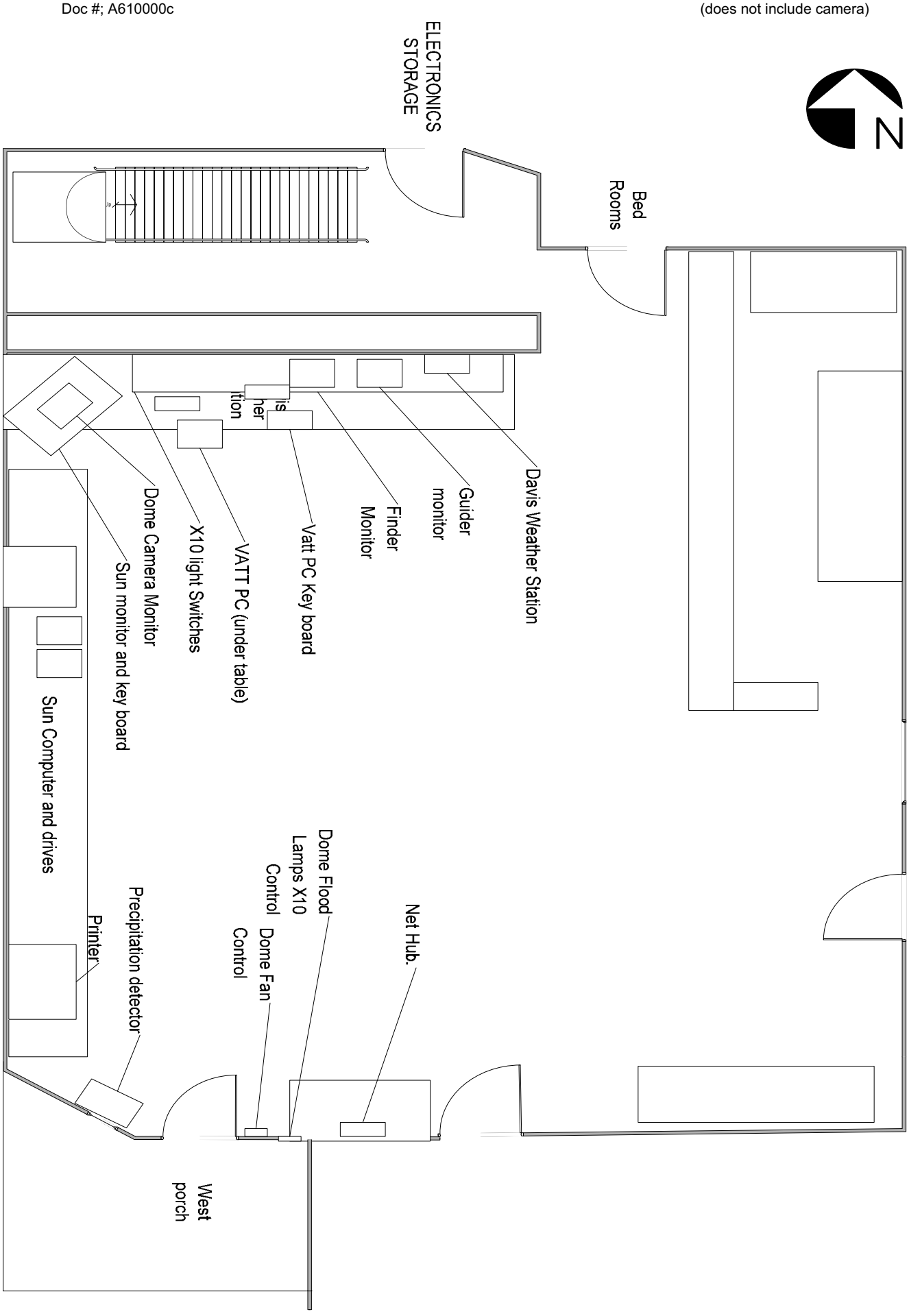
Sun SparcUltra Workstation
with 320 MB RAM and 9 GB hard disk
DAT (dds-1) tape drive
TCP/IP link to the Steward Obs. network via 128K baud
(minimum) microwave connection

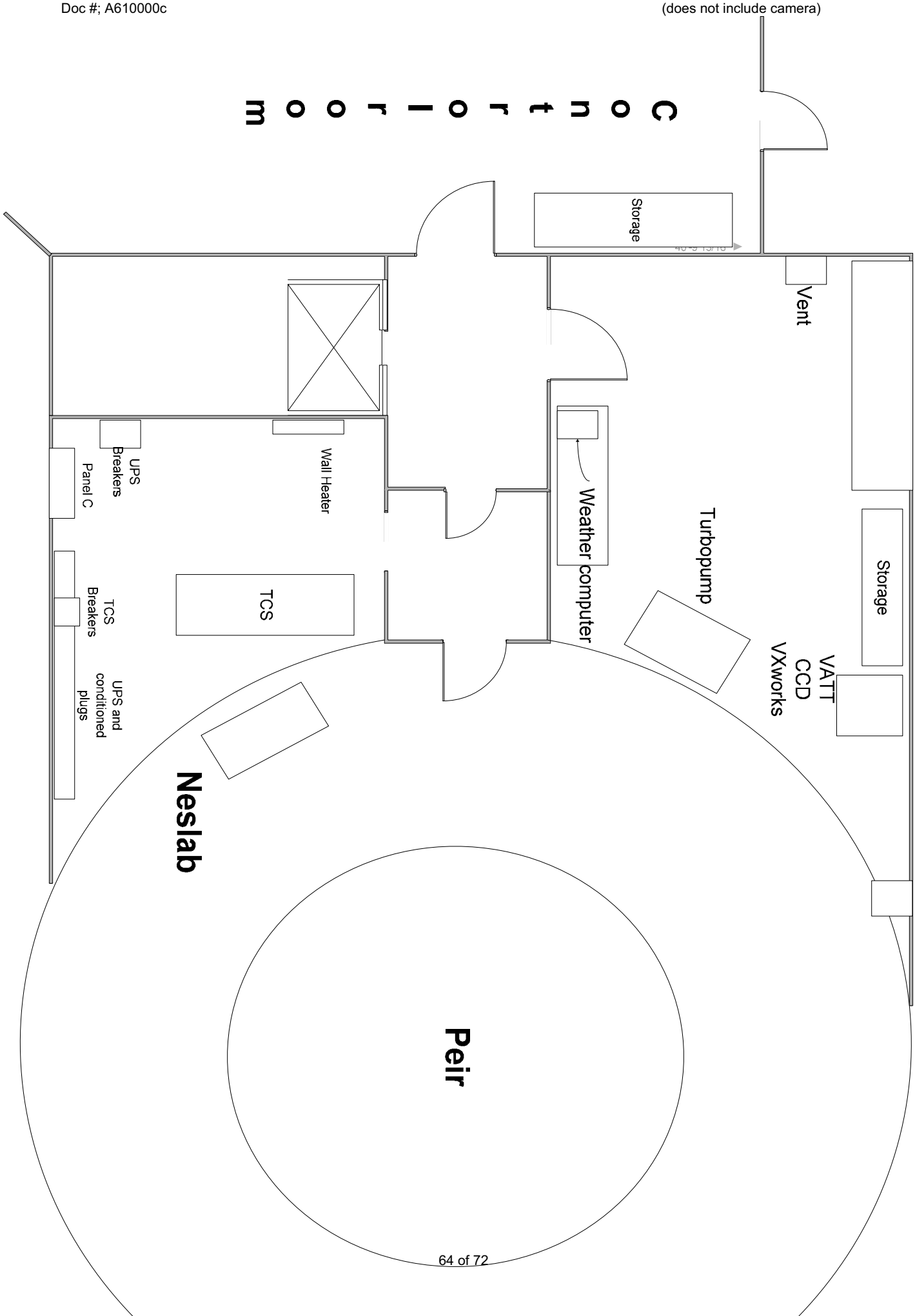
Linux Box for TCS interface, XEphem utility, and autoguider control

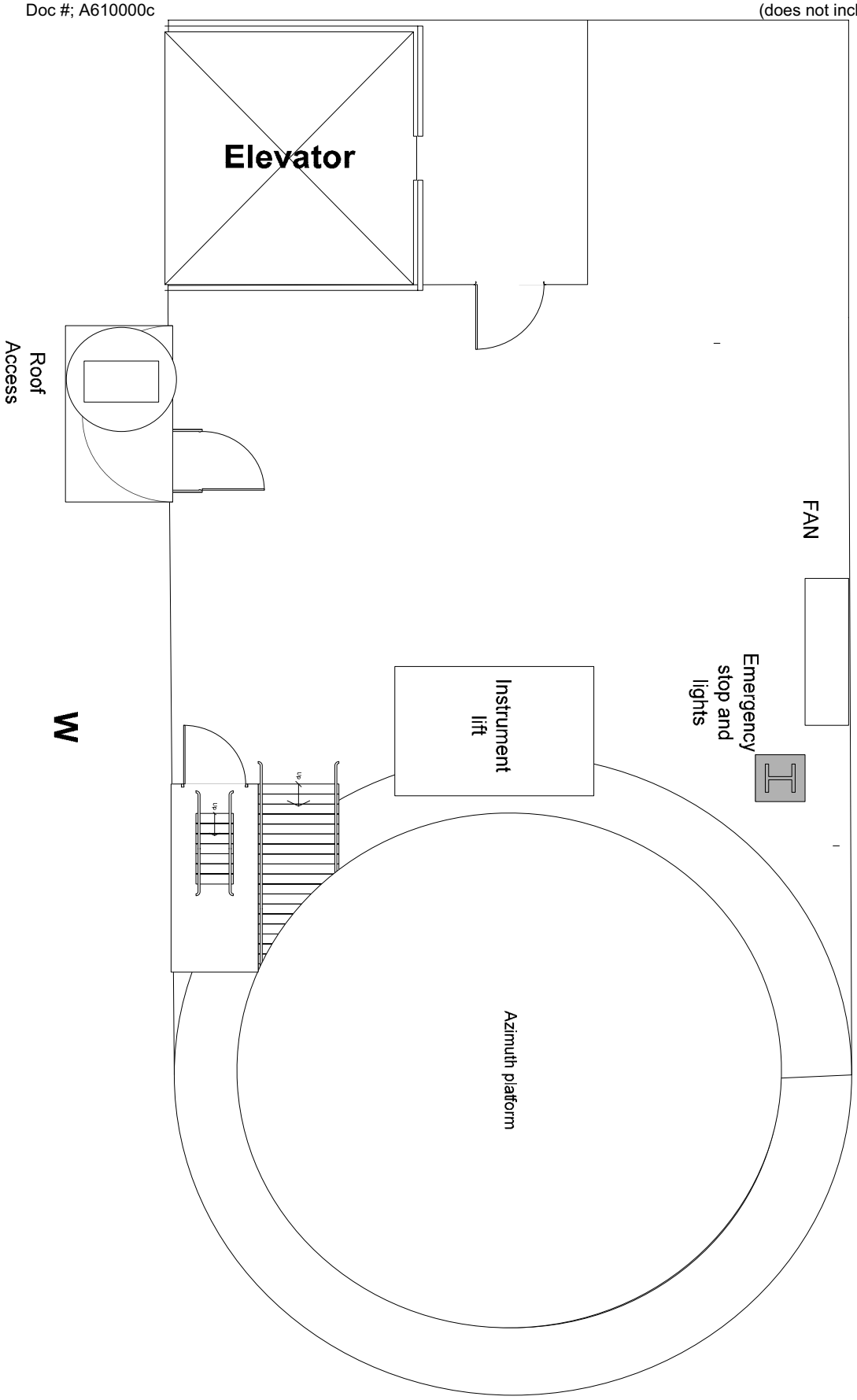
VME instrument computer running VxWorks

IRAF reduction software and ICE data acquisition software

PCs
Pentium II PC with Linux and NT


ELECTRONICS STORAGE
Bed Rooms
N
Davis Weather Station
Guider monitor
Finder Monitor
Vatt PC Key board
VATT PC (under table)
X10 light Switches
Dome Camera Monitor
Sun monitor and key board
Sun Computer and drives
Printer
Precipitation detector
Dome Flood Lamps X10 Control
Dome Fan Control
Net Hub.
West porch


Control room
Storage
Vent
Storage
VATT
CCD
VXworks
Turbopump
Weather computer
Wall Heater
UPS
Breakers
Panel C
TCS
TCS
Breakers
UPS and
conditioned
plugs
Neslab
Peir


Elevator
Roof Access
FAN
Emergency stop and lights
Instrument lift
Azimuth platform
W
S

Floor 3

Start up lists

This list Assumes the telescope is shut down. (cold Start)

- **Make sure that A.C. UPS breakers are off**
- **Plug in Both UPS**
- **Plug in UPS building supply lines to each UPS**
- **Set DC Supply breakers and close housings**
- **Turn on Panel A breakers**
- **Start both UPS**
- **Plug in 2nd floor TCS power cords**
- **Set Both sets of breakers**
- **Turn on secondary electronics**
- **Turn on Guider Box**
- **Turn on VATTTEL**
- **Turn on wall heater or open doors depending on room temperature**
- **Power Up Sun Computer, Linux PC, vx works VATTCCD, Weather PC**
- **Login to VATT as vattobs etc.**
- **Login to TCSPC (vattpc1) etc.**
- **Start VATT Weather Monitor**
- **Turn on CCD camera**
- **Reboot VATTCCD**
- **Do a detector command and check temperature**
- **Set ccd session imtype=fits anf 3 flprs**
- **Set detpar to bin by 2**
- **Take test CCD exposure**
- **Fill dewar if needed.**
- **Load filters**
- **Remove dome short**
- **Plug in dome**
- **Plug in finder**
- **Open Finder Cover**
- **Turn on SBIG camera**
- **Check De-rotator index position**
- **Pull stow pins**
- **Check for obstructions**
- **Remove CCD fill tube and stow LN2 Dewar**
- **Check Azimuth alignment and correct after turning on oil**
- **Check west door is locked**

- **Turn on Neslab**
- **Turn on power amplifiers**
- **Turn on Dome cam monitor**
- **Turn on guider monitor**
- **Turn on Finder monitor**
- **Turn on Dome Fans**
- **Bring up TCS Glue**
- **Start mirror cell fans**
- **Start mirror thermal system**
- **Start the SBIG guide camera**
- **Start Xephem**
- **Start Xehpem Glue**
- **Reset secondary**
- **Set secondary positions to last observers numbers**
- **Set filters in control GUI**
- **Set guider to view center**
- **Turn on dome lamps**
- **Enable drives**
- **Turn on dome tracking**
- **Calibrate mount**
- **Open shutter**
- **Open mirror cover**
- **Enable drives**
- **Move to star**
- **Collimate telescope and refocus guide camera**
- **Center star and init coordinates**
- **go to CCD focus field**
- **Focus telescope on ccd**
- **Center focused star on ccd**
- **Center and focus guider with user offsets**
- **Init coordinates**
- **Observe**

VATT Warm Start Check List

This List assumes that all systems are running and the telescope is ready to go.

- **Reboot VATTTEL**
- **Reboot VATTCCD**
- **Fill CCD Dewar if needed**
- **Open dome vents**
- **Plug in dome**
- **Plug in finder**
- **Open Finder Cover**
- **Turn on SBIG camera**
- **Check De-rotator index position**
- **Check for obstructions**
- **Remove CCD fill tube and stow LN2 Dewar**
- **Check Azimuth alignment and correct after turning on oil**
- **Check west door is locked**
- **Turn on Neslab**
- **Turn on power amplifiers**
- **Turn on Dome cam monitor**
- **Turn on guider monitor**
- **Turn on Finder monitor**
- **Turn on Dome Fans**
- **Bring up TCS Glue**
- **Start mirror cell fans**
- **Start mirror thermal system**
- **Start the SBIG guide camera**
- **Start Xephem**
- **Start Xehpem Glue**
- **Reset secondary**
- **Set secondary positions to last observers numbers**
- **Set filters in control GUI**
- **Set guider to view center**
- **Turn on dome lamps**
- **Enable drives**
- **Turn on dome tracking**
- **Calibrate mount**
- **Open shutter**
- **Open mirror cover**
- **Enable drives**
- **Move to star**
- **Collimate telescope and refocus guide camera**

- **Center star and init coordinates**
- **Go to CCD focus field**
- **Focus telescope on ccd**
- **Center focused star on ccd**
- **Center and focus guider with user offsets**
- **Init coordinates**
- **Observe**

Shutdown

- **Stow Telescope**
- **Disable Drives**
- **Close mirror cover**
- **Close shutter**
- **Turn off Auto Collimation**
- **Turn off mirror thermal system**
- **Turn off Cell fans**
- **TCS GLUE, Guider, and Xephem**
- **Turn off guider and finder monitor**
- **Turn off dome fan**
- **Turn off power amplifiers**
- **Shut of Valve and Turn off Neslab**
- **Turn off oil**
- **Turn off Pier and building fans**
- **Close finder cover**
- **Turn off sbig camera**
- **Unplug finder**
- **Unplug Dome**
- **Fill dewar**
- **Check for locked west door and turn off lights**

Total System Shutdown

- **Shut down telescope if needed**
- **Put in dome short**
- **Shut down VATT using /l/userhalt vatt command**
- **Shut down VATTPC1**
- **Shut down Weather PC**
- **Shut down VATTCCD**
- **Shutdown VATTTEL**
- **Turn of guider**
- **Turn of secondary control**
- **Check for all amplifiers off**
- **Turn of TCS west and north breakers**
- **Turn off and disconnect UPS**

UPS Shutdown

- **Make sure all computers and breakers on second floor are off.**
- **Turn off key switch on small ups**
- **On the large ups press command enter off enter and enter**
- **Verify both ups are off**
- **Turn of panel A UPS breakers**
- **Un-plug both ups**
- **Unplug both building supply lines from UPS**
- **For long shut downs disconnect the DC supplies with the DC breakers**

UPS Start UP

- **Check all breakers are off**
- **Plug in supply and load lines to UPS**
- **If needed set DC supply circuit breakers**
- **Turn on Panel A**
- **Turn on Small UPS**
- **Press command enter Auto enter and enter**
- **Connect 2nd floor rack cords**
- **Turn on south and west 2nd floor TCS breakers**