

# SWANSON TELESCOPE

## *Operation Manual*



Jeff Delmas  
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### Forewords and Cautions

The Swanson 21" Newtonian reflector is the principal telescope of the Von Braun Astronomical Society and it is located in the Swanson Observatory building. The whole complex includes the Telescope, its Mount, The Dome, The Control Room and the Viewing Foyer where the public can follow the operation of the telescope. The Dome, Dome Doors and the Scope are all items weighting in excess of several thousands pounds and extreme precautions should be exercise to avoid severe injuries and damages to the equipment.



*Images Courtesy of VBAS*

**Scope of this manual is to provide a reference guide for the operation of the scope but, by itself, it is not sufficient to assure a complete description or operations of all its components.**

**Separate Manuals are provided for specific operations of components.**

It is assumed that the user of these instructions is familiar with the facilities and has received the Basic training for operating the scope.

# SAFETY

## Equipment Safety

- **Do No Harm.** Antique optics can only be fixed by replacing the whole scope. Avoid using sprays, and smoking. Both will damage optics. Do not attempt to clean the optics. The only person authorized to clean the optics is the observatory director.
- **Leave The Gorillas At Home.** -- Although the telescope is large and massive, it does not require brute strength to operate. If the scope resists moving, there is probably something wrong such as a latch not released, or the scope is out of balance, etc. Set screws on the focuser draw tube should not be over tightened, since the brass threads can be easily stripped. They only need to be snug enough to prevent slippage of the eyepiece or camera.
- **Leave it Ready to Support the Shows.** If you make changes to use special equipment, after your session please return the balance, focus, and other settings to normal eyepiece viewing. Shows usually start after dark, and it is difficult and time consuming to figure out and adjust the scope in the dark. The scope needs to be ready to use.
- **Report Damage or Malfunctions to the Observatory Director.** You may also want to cc the Facilities Director depending on the nature of the problem.

## Personal Safety

- **Do NOT point telescope at or near the sun.** It can cause permanent eye damage.
- **Buddy System.** Although sometimes one must work alone, VBAS prefers that adult members use the buddy system whenever possible. VBAS requires that minors have adult supervision.
- **Emergency Planning.** Although there is a phone beside the eyepiece box and in the Library, it is a good idea to bring a cell phone. For minor emergencies instead of 911 you may want to call the Park Ranger Office since they can get there quickly: 534-3757. Additional phone numbers are listed by the phone.

# CERTIFICATION

## Privileges

Although the telescopes are for the VBAS members to use, certification is required to use the telescopes for private observing sessions to help prevent unnecessary damage, and to maintain the scopes ready to support the VBAS public and private shows. VBAS hopes that certified telescope operators will help support public and private shows. The shows not only help keep VBAS running, but they provide a tremendous service to the community. Folks wishing to conduct research projects are also welcome, and VBAS would be grateful if you would share your results with the membership via the newsletter or member's meetings.

## Process

The certification process is quite simple and can be completed in as short or long a time as the student wishes. The process requires a minimum of three observing sessions. The first session is accompanied by a lecture to cover the manual, followed by a hands on session. The first session may be a group session, but the second observing session should be a one on one session with the trainer, or another certified operator. Additional joint training sessions should be scheduled until the student feels that they are ready for the certification session.

**Until the student is certified they should not attempt to operate the telescope alone.** For beginners it is especially helpful to schedule sessions with several different certified operators in order to get exposure to doing things different ways. For students willing to support public shows, assisting with several public shows is recommended.

## Certification Session

When the student is ready they can schedule the certification observing session with the trainer, or the Observatory Director. The certification observing session allows the student to demonstrate that they can plan an observing session for 3 or 4 objects, set up and operate the scope to find the objects both with and without the planetarium SW. The student should also know some facts about each object, and the telescope. The public likes to ask questions.



## Components of the System

The Swanson Telescope System is composed of the following major elements:

- The Swanson 21"  $f/4$  Newtonian telescope on a modified German Equatorial Mount, located upstairs in the domed observatory, called the scope room.
- The Control Room, located downstairs on the back of the Visitors Foyer that welcome the public.
- The "Battle Station" (BS); the upstairs control station with monitor for scope camera, handpad for telescope control, and handpad for dome control.
- Monitor Cameras. These cameras monitor the scope and the dome position to provide operators in the control room information for making adjustments to the dome or scope. They include:
  - Floor monitor: on the floor near the South wall upstairs
  - Dome monitor: on the scope near the Telrad mount.
  - Finder Camera. This is a wide angle camera mounted on the scope to assist in locating brighter objects.
  - Observing camera. Currently, the observing camera is a StellaCam II.
- StellaCam Radio Remote Control unit.
- Telrad. Every scope needs one!
- Control room equipment:
  - Laptop: located at the center of the monitors station displays the scope view (StellaCam II) and allows for digital recording of the images and videos
  - Monitor 2: displays the finder camera view
  - Monitor 3: displays the scope floor monitor camera view.
  - Monitor 4: displays the scope/dome position
  - The control computer and monitor, with SiTech scope control software and Cartes du Ciel (CdC) sky map and ASCOM compliant control software.
  - The dome rotation controller in the control room (Top of blue rack).
  - DVD Video Recorder (DVR) (Middle of blue Rack).
  - The scope power supply (Bottom of the blue rack)
- Visitor Foyers: Includes the visitors' monitor – the 32" flat screen in the corner.



## Startup Procedure

Follow these steps to open the scope and prepare it for observing:

### Initial Opening

1. Open the Control Room and the observatory trap door. Be sure to store the combination lock CLOSED as shown in Figure 2.



*Figure 1 (Left) and 2 (Right): Control Room on the Left, Trap Door & Lock on the right.*

2. Power up the control computer in the control room.



*Figure 3: Power Scope Control Computer in the Control Room.*

3. Power up the two raised monitors and the one on the left and the laptop computer in the center. They are all identified by white labels on the top and are located in the left corner of the control room (See Figure 4).

- a) Check that the signal converters from Video to VGA are turned on (See Figure 5); there are two rows of buttons on the converter as shown in figure - the power button is the top right.
- b) Check that the power strip in the corner is turned on (See figure 6) : it powers the monitors.
- c) Check that the power supplies for the Laptop and the Analog/Digital Video Acquisition box are plugged in. They are on the left of the monitors almost behind the keyboard. They plug in the white power strip that runs along the desk (See Figure 7).



*Figure 4 (Left), 5 (Center) and 6(Right): Control Room Monitors, VGA Converter and Power Strip*



*Figure 7: Laptop and Analog/Digital Video converter power supply plugs*

4. Power up the DVD Video Recorder (DVR) in the Blue rack (See Figure 8).The Stella-Cam is input to the DVR and from there the signal is split to two monitors (the Battle Station, and the Visitors' Monitor) and to the Analog/Digital Video Converter connected to the Laptop.



*Figure 8: The Power Button of the DVR is on the Left.*

5. Retrieve the StellaCam stowed in boxed kits (showed in Figure 9 and 10) from the right desk in the control room and take it upstairs to the telescope.

*Note: The Telrad is stored in the same area but it is optional and should only be needed if manual star alignment is required. Typically, manual alignment is only required if the scope misses its alignment from the starting position. In this case follow the alignment procedure described in section XXXX.*



*Figure 9 (Left) and 10 (Right): Stella Cam Kits (Left) and Stella Cam with Remote(Right)*

## **Upstairs in the Scope Room**

6. Uncover the Battle Station. Stow the cover in such a way such that it doesn't block the floor monitor camera (See Figures 10, 11 and 12)



*Figures 10 (Left), 11 (Center), 12 (Right): Station with and without cover and proper cover storage*

7. Remove the blue foam main mirror cover (Figure 13). Stow the blue foam cover in the bottom of the Battle Station to form a temporary shelf (Figure 14). This can be used to stow the empty Telrad and StellaCam boxes while they are in use.



*Figure 13 (Left) and 14 (Right): Main mirror cover becomes a temporary shelf.*

8. Remove and stow the secondary mirror (Figure 15) and the focuser (Figure 16) plastic covers on the temporary shelf of the Battle Station (Figures 17).



*Figures 15 (Left), 16 (Center), 17 (Right): plastic covers for the secondary mirror (Left) and focuser (Center) are properly stored.*

9. Mount the StellaCam into the focuser (Figure 18). Hand-tight the screw on the left of the focuser mouth (Figure 19).



*Figure 18 (Left) and 19 (Right): Camera is secured to the focuser with the antenna pointing up.*

10. Plug the BNC video cable into the back of the StellaCam (Figure 20), followed by the power plug (Figure 21). The final configuration is shown in Figure 22.



*Figures 20 (Left), 21 (Center), 22 (Right): Camera is connected to video cable and power.*

11. Plug the Battle Station power cord (White Cable) and the Scope power (Black Cable), in Figure 23, to the power outlet at the base of the east side of the mount (Figure 24).



*Figure 23 (Left) and 24 (Right): Scope and Battle Station power cables.*

12. Locate the south wall camera (Blinky). Adjust the camera to point toward the scope (Figure 25) and plug the big cream transformer in the South wall outlet below the light (Figure 27).



*Figures 25 (Left), 26 (Center), 27 (Right): Camera is adjusted and powered.*

13. Open the Dome Doors (see detailed manual for dome doors operations). The Dome Doors controls are located on the platform facing the doors on the rotating dome. The Dome Doors should be positioned in The South-SouthEast direction to allow the solar panel to complete the charge of the battery by dusk. In this way, the solar panel will face south-south west and will get the peak of energy transmission in the afternoon hours.



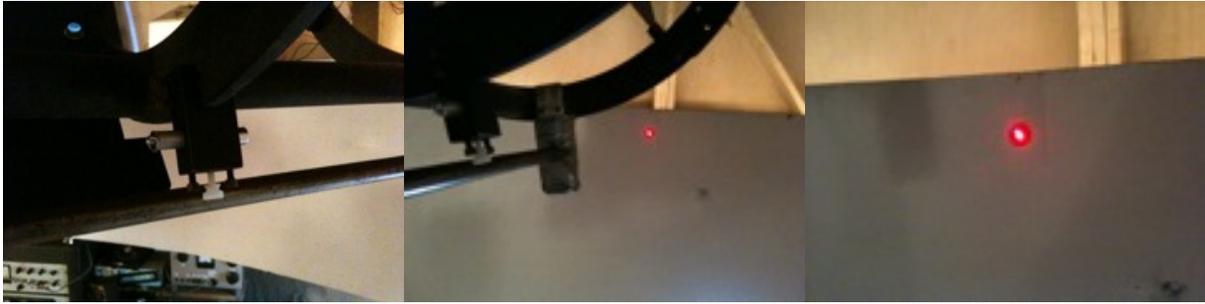
*Figure 28 (Left) and 29 (Right): Dome Doors control panel and successful opening. Note the positions of the doors with respect to the Sun (Spring Equinox); in this position the dome has its solar panel pointed to the Sun during the afternoon hours, allowing the battery to complete its charging cycle by dusk.*

14. Spin the dome to enable observing a bright star near the southwestern horizon by using the dome controls located on the back of the top shelf of the Battle Station (Figure 30).



*Figure 30: Battle Station Controls; Dome controls are on the left.*

15. Locate the Red Laser Pointer mounted on the scope near the front of the tube (Figure 31 and 32). Turn on the red laser pointer by turning the white knob (see Figure 34). Position the scope such that the laser is in the center of the orange target on the wall due south of the scope (Figure 33). This is the scope park position that is used as reference by the scope controller SW. Failing to align or improperly align the scope will result in the need to manually align the scope using the Telrad.



*Figures 31 (Left), 32 (Center), 33 (Right): Scope Red Laser Pointer for Park Positioning.*

16. **Turn off the red laser by turning the white knob !!** Forgetting this will result in dead batteries in the laser pointer the next time the scope is used! Spare batteries are located in the control room in the black box on the left of the monitors.



*Figures 34 :Laser On/Off knob.*

17. Darken the scope room by turning off all lights and closing the trap door.



## Downstairs in the Control Room

18. Check Monitors 1, 2 and 3 for signal from the monitor cameras and the finder camera.



*Figure 36: Monitors Numbering*

19. Check that the Laptop is on and the DVR is on.

*Note: the Laptop uses VirtualDUB program (shortcut icon on the desktop) to show the streaming video. Please refer to the specific manual on the VBAS website for streaming and recording of digital data.*

20. Check the Analog/Digital Video Converter input is on ANALOG.



*Figure 37: ADVC Blue Light shall be on Analog (right)*

21. Get the StellaCam remote from the box on the right countertop (Figure 38) and power it on by pushing the little white button on the bottom (Figure 39). Set the exposure to 0.25 sec or less (top right black knob) with gain  $\sim 70$  (center left black knob).



*Figure 38 (Left) and 39 (Right): StellaCam Remote control.*

22. Power up the scope by flipping the switch on the power supply at the bottom of the blue rack on the wall (Figure 40). The Voltage meter should read about 25 Volts.



*Figure 40: Power Up the Scope controller*

The LED lights on the control box located at the south face of the scope mount should be visible on Monitor 2.

Move the dome aperture to line up with the scope, if you have not done it previously, by pushing the black switch on the Dome Controller panel (Figure 41). The Red Switch near the black one, turns on a Red LED Lights for temporary illumination of the dome during remote operations.



*Figure 41: Power Up the Scope controller*

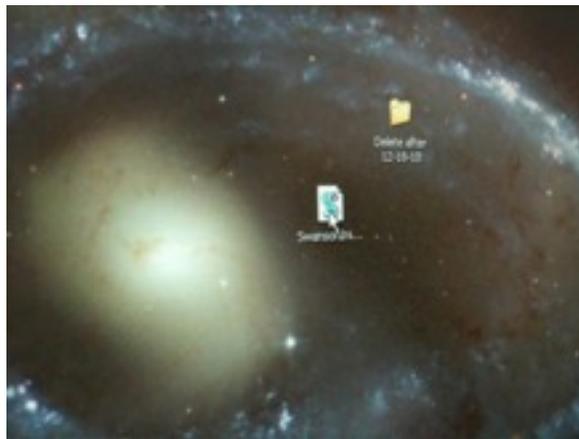
PLEASE OBSERVE MONITOR #1, 2 and 3 to check for proper movement of the dome and for interference.

## Start The Scope Operations

**Before start, read and understand the following sequence of events.**

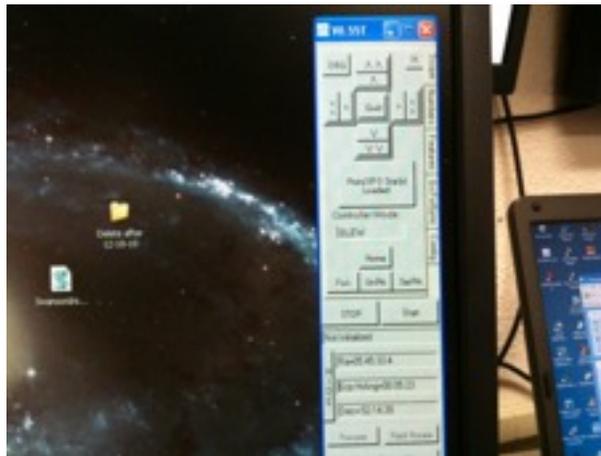
Starting the Swanson.vbs file will run a sequence of Visual Basic commands that will initialize the scope controller and connect the planetarium software, Cartes du Ciel (CdC), to the scope for operations via ASCOM commands. These commands require positive acknowledgment from the operator for safety reasons. Please be ready to promptly act as instructed below.

(A) Double click on the Swanson.VBS icon (Figure 42) on the computer desktop



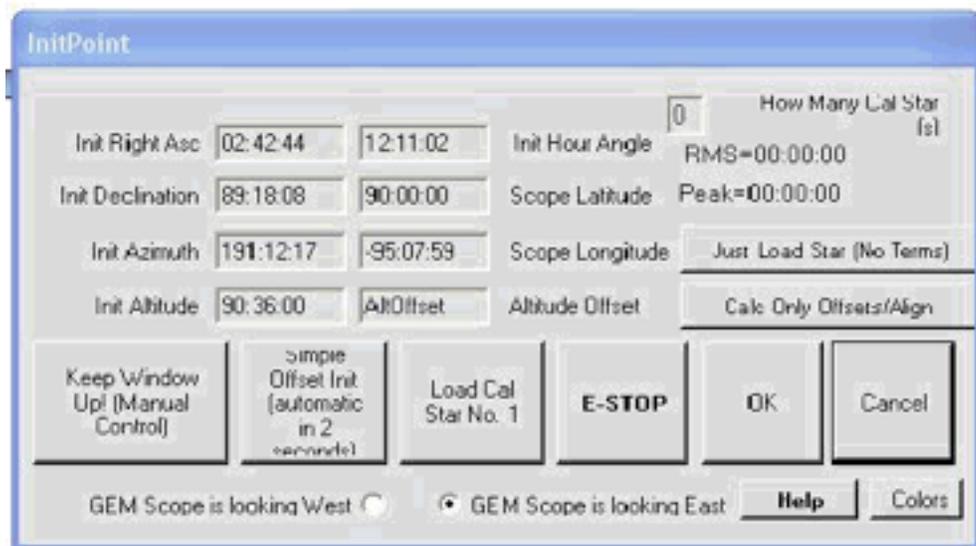
*Figure 42: Computer Desktop with the Swanson.VBS Icon.*

(B) WAIT! The Scope Controller SW (Sitech.Exe) will appear on the right side of the screen and then it will minimize. WAIT!

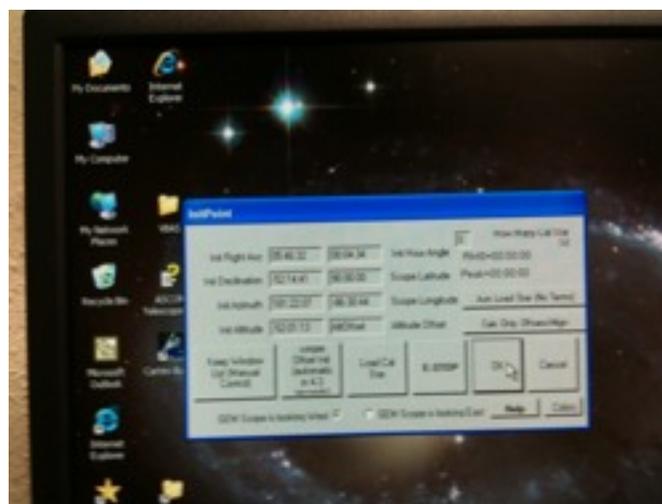


*Figure 43: Sitech.Exe appears on the right side of the screen.*

(C) A window **InitPoint** will appear requesting you to confirm the orientation of the scope (GEM Scope is Looking West). You need to press the OK button within 5 Seconds. If not sure of where the scope is, press the E-STOP button and then check you have lined up the scope using the red laser pointer at step 15.



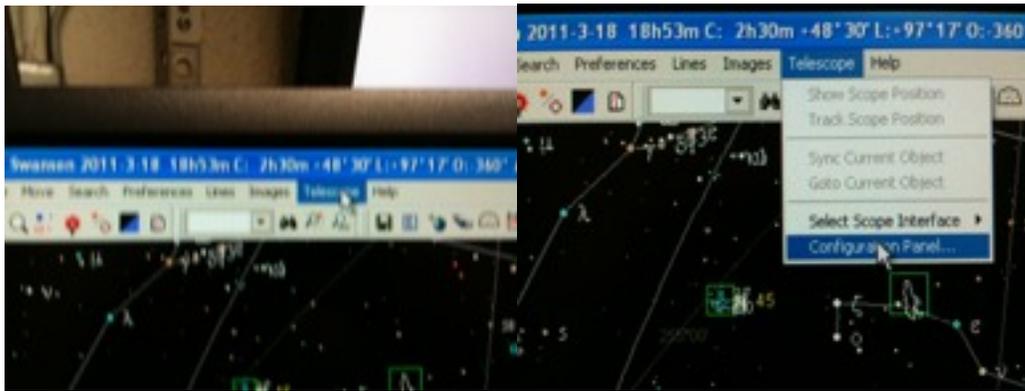
Few words about the German Equatorial Mounts (GEM) terminology. The Telescope is, conventionally, said looking WEST when the telescope itself is east of the local meridian. The parking position of the scope is looking WEST. If you have aligned the scope with the laser pointer at step 15, you have no problem and the scope is in the proper expected position.



*Figure 44: InitPoint Window. Check the bottom line for GEM Looking West is selected then press the big OK button.*

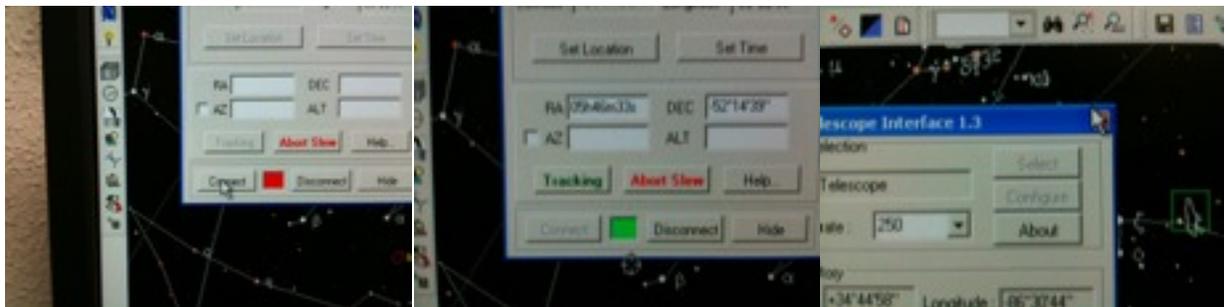
Sometime a **Pink Warning Window** will advise that the scope was not left in the parking position or its last stored position is far away from the one currently commanded. It will request if you want to continue. ALWAYS Press YES and, possibly, OK in the InitPoint window that meanwhile is running in background. Remember, you have 5 seconds only !!

(D) At This point Relax and wait for CdC to start. It should open automatically the Scope Config Window. However, Microsoft Windows may have decided to move the focus somewhere else and no windows will appears. If this is the case, click on the Telescope menu (Figure 45) and select the Configuration Panel item (Figure 46).



*Figure 45 (Left) and 45 (Right): CdC Telescope Menu and Configuration Panel Selection.*

Look at the Bottom right corner of the Configuration Panel window and locate the **Connect** Button. Press the **Connect** Button and the red box will turn green, indicating the successful connection between CdC and the Scope controller. Close the Configuration Panel.



*Figure 47 (Left), 48 (Center) and 49 (Right): Manual Connection of CdC to the Telescope*

Once Cartes Du Ciel is up and active, the scope should now be tracking at sidereal rate and ready for GOTO commands.

## Focus the Stellacam

(A) Using CdC, select a moderately bright star low in the southwest.

(B) Left-click on it in CdC to select it,

(C) Right click to bring up the context menu and select “GOTO current object”.

(D) The scope will slew to the star.

(E) If you don't see the star in the StellaCam VirtualDub window on the laptop, use manual positioning to center it in the monitor by using this procedure:

(E)(1) Bring the SiTech control panel to the front from the toolbar on the bottom of the screen.

(E)(2) Use the fast or slow motion controls to move the star into the FOV of the StellaCam by watching the star in the finder camera monitor and positioning it in the sight target. This should bring the star into the FOV of the StellaCam.

(E)(3) Continue to move the star into the center of the StellaCam monitor.

(E)(4) Once centered, re-sync on that star using CdC with this procedure:

(E)(5) Select the star in CdC

(E)(6) Right-click to open the context menu and click on Sync Current Object.

(F) Focus the image using the remote focuser pad (Figure 49) located on the side of the laptop as best you can. Once focused on the bright star, it helps if you can view fainter stars and focus on them for fine focusing.



*Figure 49: Focuser is on the right of the laptop*

## **GOTO a Desired Object**

- (A) Click the desired object on the CDC map to select it.
- (B) Click Telescope ==> GOTO Current Object
- (C) The scope will slew automatically to the selected object.

## Shutdown Procedure

The shutdown procedure is basically to reverse the startup process. Please note these general guidelines:

If you recorded a DVD, you must finalize it in order to view it on any other DVD player or computer. Start from the Main Menu button on the remote and step through the finalize process.

Using a Sharpie pen, mark the DVD with the date, operator(s), and a objects observed. Put the DVD in a paper sleeve and into the storage box.

Be sure to complete a log entry in the log book.

Make sure the StellaCam is stowed in its box in the control room and all power to all devices is turned off or unplugged.

Be sure the dome doors are pointed South-SouthEast

## During The Session

### **CDC Tips**

Click Telescope ==>Track Scope Position. This will show a grey 3-ring eyepiece at the scope's position on the CDC sky map and will move the eyepiece as the scope changes position.

The CDC sky map cannot be moved such that the scope eyepiece is out of view. So if you want to move around the map, you should turn this option off.

Use the scroll wheel on the mouse to zoom in or out of the CdC view.

Select an object, right-click, and select "Center" to center that object on the screen.

Try to plan your sky tour for a rather small region of the sky to keep from needing to flip the scope. Most observing tends to be in the east and southeast since objects rise from the east.

The CdC "eyepiece" display is set up with three concentric rings with diameters:

15mins – mimics the StellaCam FOV

1deg

2deg

### **Observing Tips**

#### **Star-Hopping**

The scope tracks very well, but GOTO control is not as accurate. To compensate, use a star-hopping technique. When you want to go to a very faint deep-sky object, first go to a medium-bright star near the desired object and re-sync on that.

#### **Log Observations and Record a DVD**

The Swanson Log book is located on the bookshelf above the monitors. Be sure to log your observation session on the next available blank page. To record the observations on DVD, pop in a fresh DVD and press the Record button. Make sure that the unit shows that it is in fact recording by inspecting the display for the record indicator.

Upon completion of the evening's observations, finish the log book entry. Finalize the DVD using the handheld remote control. Press the "menu" button, then navigate to Disc Setup, Finalize. When you finalize the DVD it can then be read on any DVD player. Remove the

disc, label it with a Sharpie pen showing the date, time, and perhaps who observed and what was observed.

### **Start West – Go East**

Start your session by viewing objects west of the meridian. Do this because of the need to focus manually on a southwestern star. When moving from viewing western objects to viewing eastern objects, the scope must go through a flip. You should try to plan your observing such that you view objects in the west first, and then move to observing the eastern sky.

Plan the flip by moving your observing northward while in the west. While observing an object in the northwest, select an object in the northeast.

Note: it is not possible to observe objects at or very close to the meridian while viewing to the east due to the geometry of the telescope mount.

### **Lock Out Light**

Once the scope is started up and working well, turn off all lights in the scope room, including the Battle Station monitor. Close the trap door to eliminate light from the visitors' room from interfering with the scope and StellaCam.

### **Be Prepared to Present to Visitors**

Visitors will want to know about the object being viewed. Use the internet or have a reference book handy for facts you can share with visitors. It's good to know what the object is and some general information about it or its class of objects, how far away it is, how wide it is, how old it is, etc.

## **Warnings??**

There's lots!

Controller goes 'blinky'

Scope hits a hard stop

Aperture door closing problems