Sherwood Observatory 24” Telescope & Dome Operation Guide

This document is to act as a guide to those who have had official training and are signed off on the operation of the 24” telescope and dome or is to be used in conjunction with such official training. NB: Please refer to Mr Chris Dakin/Qualified Members for further guidance should you be in any doubt!

The SAFETY of MEMBERS, any GENERAL PUBLIC, the HISTORIC TELESCOPE and of the OBSERVATORY itself is of PARAMOUNT IMPORTANCE!

To set up the telescope for a viewing session:

From the bottom of the dome stairs:

1) Use your authorised issued member swipe card to gain access if holder.

2) Switch on light switch at bottom of stairs to turn on stair light.

3) At top of stairs turn on right-hand switch on light switch plate. This will bring on the dome LED lights (red or white).

4) Check that all is ok and looks safe within the dome, the telescope and the general area before proceeding. Do NOT proceed and seek advice should anything look or feel out of place.

5) If intending to use the telescope, turn on main power supply feed under the control panel bench (two brass bolts either side) via the switched fused spur (a neon should come on):

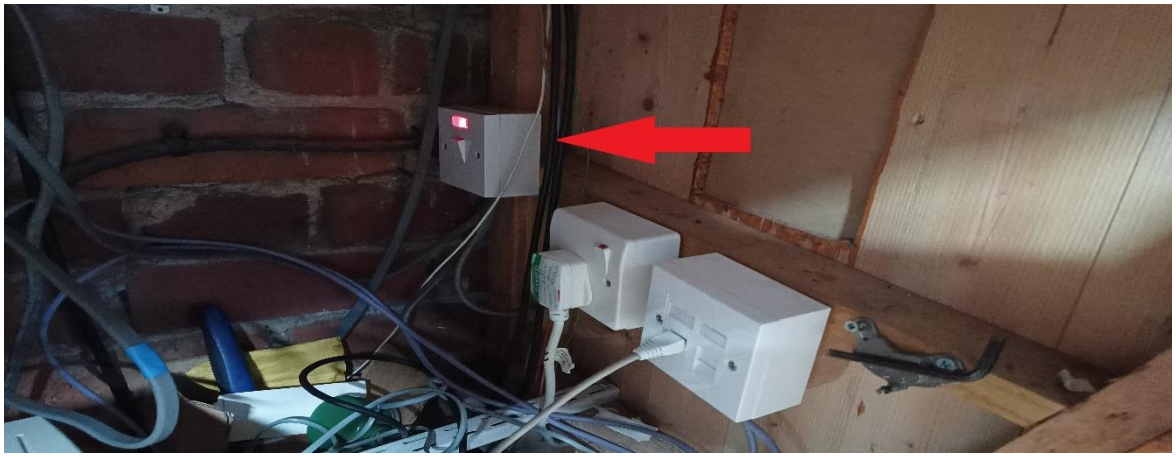

Fig. 1: Main power switch ON

6) Next, open the dome aperture:

Find the Dome Control Box on the wall of the dome located above and right of the control panel:

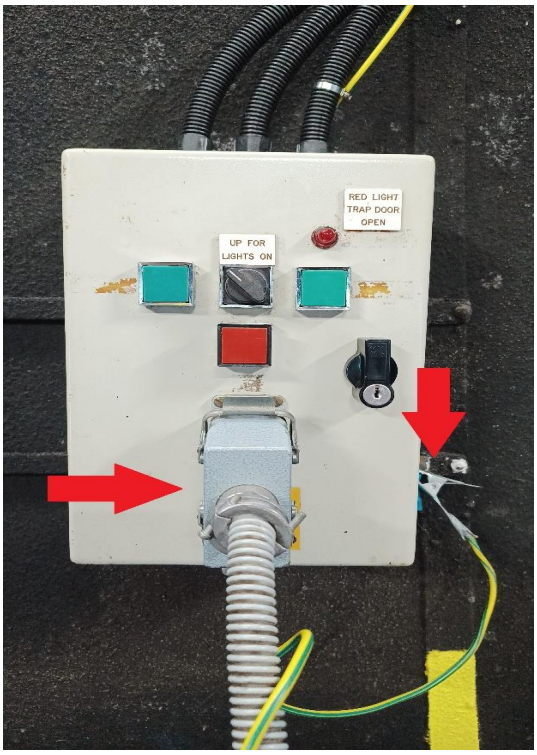

Fig. 2: Plug/Earth connected to Done Control Box

a) If the bulky metal plug on the metal flexible conduit is not plugged into the Dome Control Box ENSURE the rotary switch on the (grey) Control Panel Switch Box adjacent the control panel is set to “OFF”:


Fig. 3: Control Panel Switch Box Rotary Switch set to OFF

b) If the bulky metal plug on the flexible metal conduit is not plugged into the Dome Control Box you can now plug it AND attach the earthing wire clip to the side of it as fig. 2.

c) On the Control Panel Switch Box adjacent the control panel turn the rotary switch to “APERTURE”:

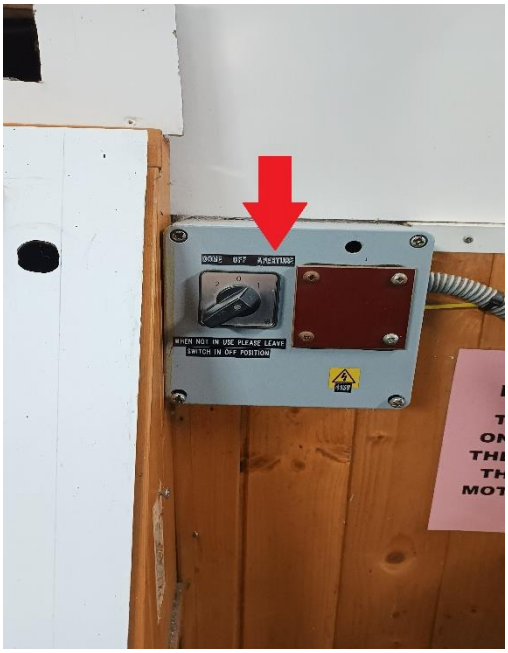

Fig. 4: Control Panel Switch Box set to APERTURE

d) On the Dome Control Box, using the green square buttons, press the left-hand one to OPEN the dome aperture:

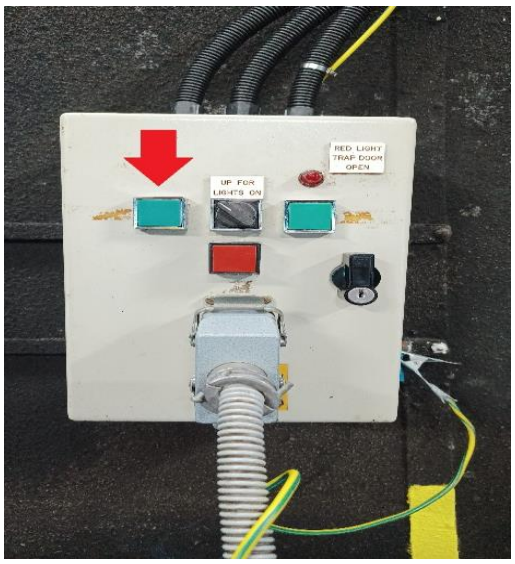

Fig. 5: Dome Control Box OPEN APERTURE BUTTON

The dome aperture will fully open without having to keep the button pressed in and will stop at the correct position when it reaches a limit switch. (See Fig. 6). Use the RED button as an ‘emergency stop’ if required. It is recommended to wait by the control box to ensure the aperture does actually stop when opening (even though it ‘should’):

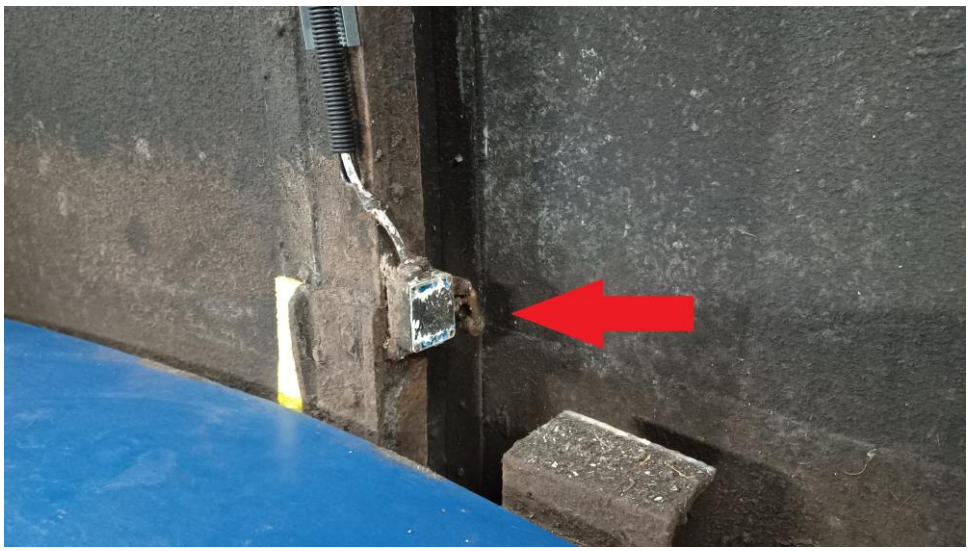

Fig. 6: Limit switch to which aperture engages to stop it when fully open.

(Should the red stop button not work then use the rotary switch on the Control Panel Switch Box back to OFF).

e) Then (if required) open the lower ‘trap door’ on the aperture:

(Use the steps if required to be able to safely reach)

Fig. 7: Trap Door locking lever pins

i) Remove the rope hooked on the handle and just leave loose.

ii) Rotate handle anti-clockwise to unlock the two locking pins either side.

iii) Use the rope to gently lower the door to the open position.

7) You can now prepare the telescope itself:

a) Switch ON the RED rocker switch on top of the black square Telescope Control Box on the rear of the telescope lower body:

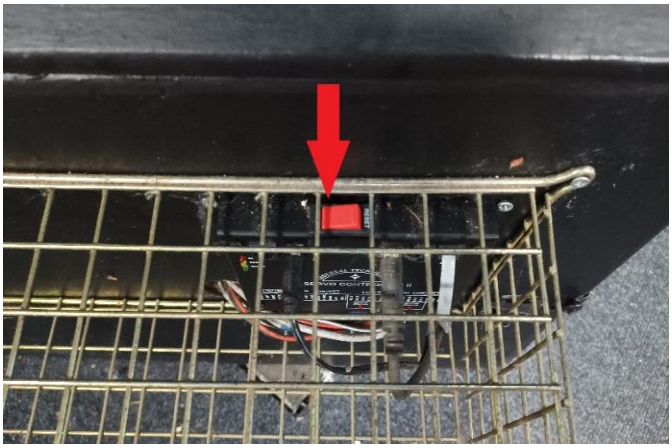

Fig. 8: Telescope Control power ON Button

b) Take the Hand Controller (should be located on a hook on the side of the telescope, (see Fig. 9). Power it up by pressing 'SPD' (Fig. 9a)– the red light at front of Hand Controller should blink. The 'SPD' button also sets the slew/pan speed (see speed colour guide below):

Fig. 9: Hand Controller hook

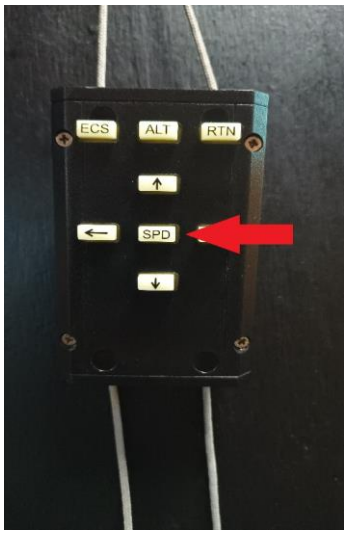

Fig. 9a: Hand Controller 'SPD' button

The Speed (SPD) button sets the slew/pan speed as confirmed by the LEDs on the top of the black control unit. Press 'SPD' once to change between speeds as follows:

-RED is fast speed slew/pan

-YELLOW is slow speed slew/pan

-GREEN is slow speed (NOT USED)

c) Place an Eyepiece into the telescope focuser, taking out the brass 'blank' extension tube beforehand (undo the small grub screw to assist with this). The eyepieces are normally located in the silver case in the white box on the wall to the left of the control panel:

Fig. 10: Main eyepiece used stored in silver case

We normally use this 2" 24mm Eyepiece to start with at least. This is often (at present) will be good to use with most normal observations with the telescope. Please ensure the black extension tube is attached to it, as otherwise you will not obtain a proper focus.

Reach up and slide the Eyepiece into focuser. Ensure the small grub screw on the side is tightened to hold it in:

Fig. 11: Eyepiece located into the Focuser

d) Next the secondary mirror can now be opened:

Slide the unlocking lever (1) in direction as shown by green arrow on fig. 12, and at same time twist handle (2) 90 degrees to unlock from around the mirror and pull handle (2) towards you. NB that when the lever is in the open position, the clamps holding the cover onto the secondary will be fully extended – the arm should swing open (towards you) freely with no friction or difficulty. Do not attempt to 'pull' the arm free if you feel any obstruction!

(This is shown in the OPEN position):

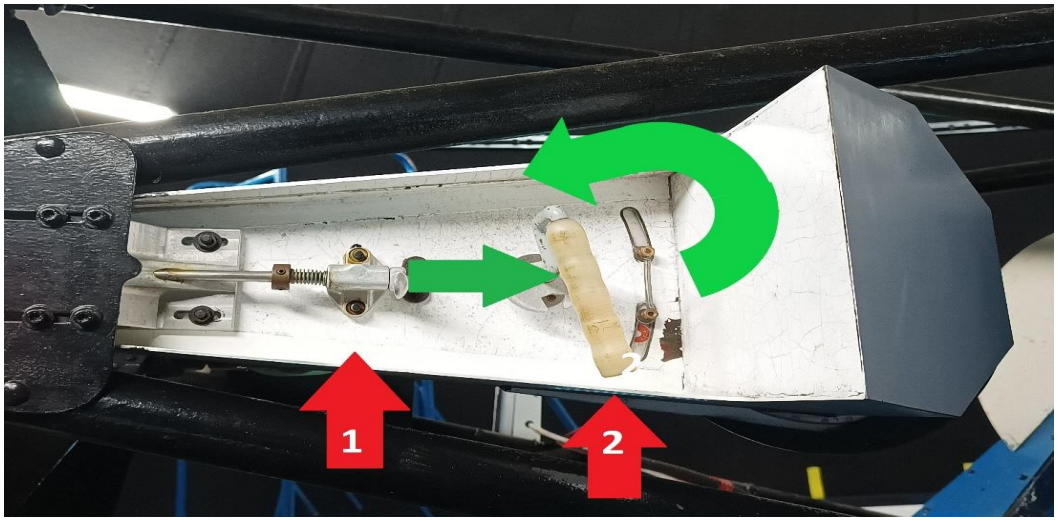

Fig. 12: Secondary Mirror Cover (shown in the open position)

e) Now the Primary Mirror Cover can now be opened:

Press and hold the black rocker switch on the side of the telescope body to open the mirror. You will hear a whirling sound. Keep it pressed in until the mirror is fully opened. It will stop on its own:

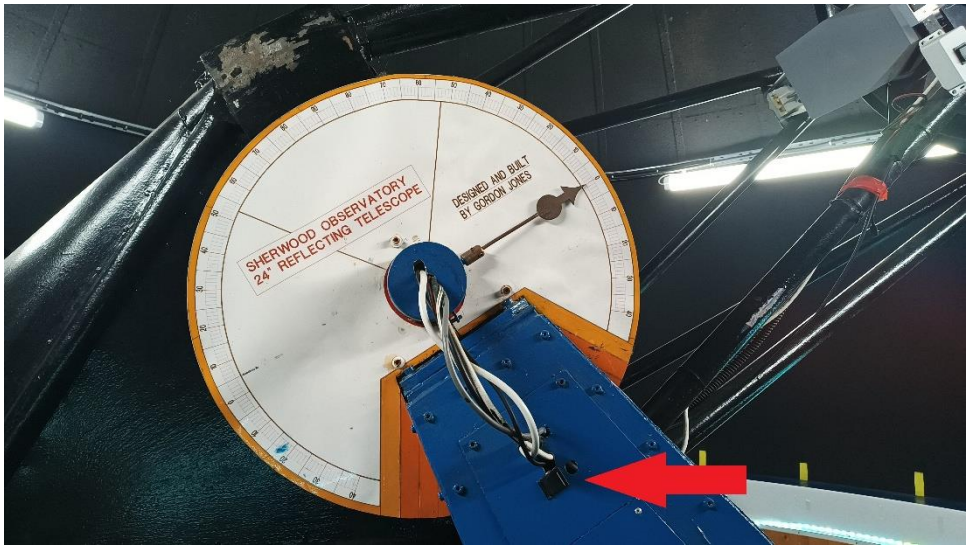

Fig. 13: Primary Mirror Cover Switch

8) Now the telescope has been prepared the dome needs to be further prepared in order to allow for viewing:

a) On the Control Panel Switch Box now rotate the switch to OFF:

Fig. 14: Control Panel Switch Box set to OFF

This will turn out the main dome roof strip lights!

The RED/WHITE LEDs should remain on. These can be switched between red or white as desired and dimmed via the control panel switches.

b) Now UNPLUG the grey chunky plug by releasing the upper and lower clips on the plug itself and also unclip the earthing clip from the Dome Control Box:

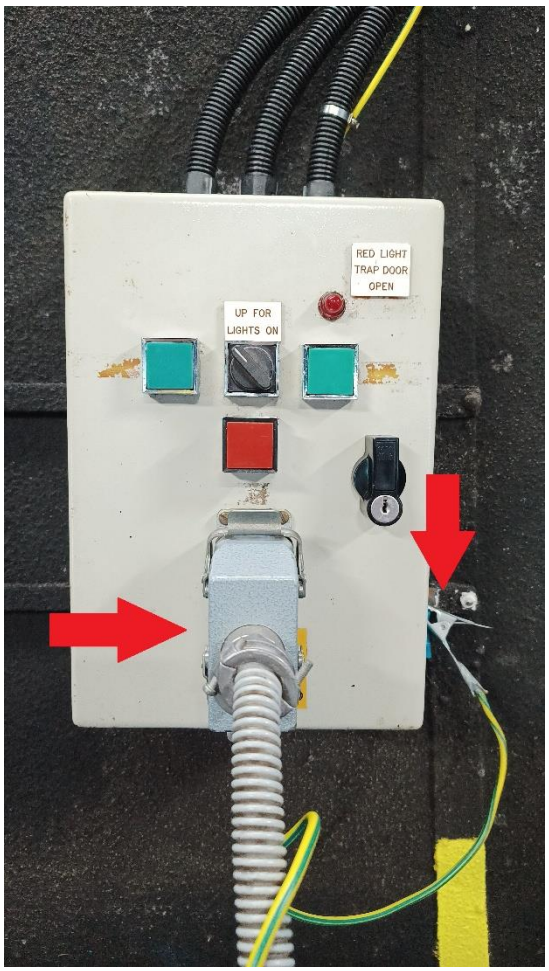

Fig. 15: Dome Control Box plug/earth connected

This "frees up" the dome to allow it to be rotated around as required to a desired target.

c) Now turn the rotary switch to the DOME position on the Control Panel Switch Box:

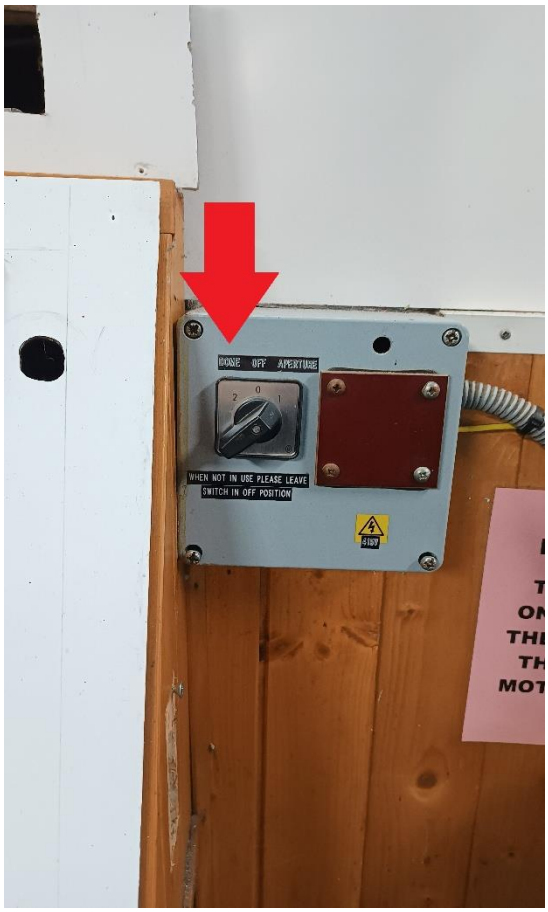

Fig. 16: Control Panel Switch Box (arrow pointing to the DOME position)

9) To rotate the dome round to allow viewing on the desired object through the dome aperture use the green/red square buttons on the Control Panel as shown in Fig. 17 below:

(Press and release button and dome will continue to rotate in the same direction)

Green left button: A-C/W slews anti-clockwise

Green right button: C/W slews clockwise

Red STOP is to stop the rotation

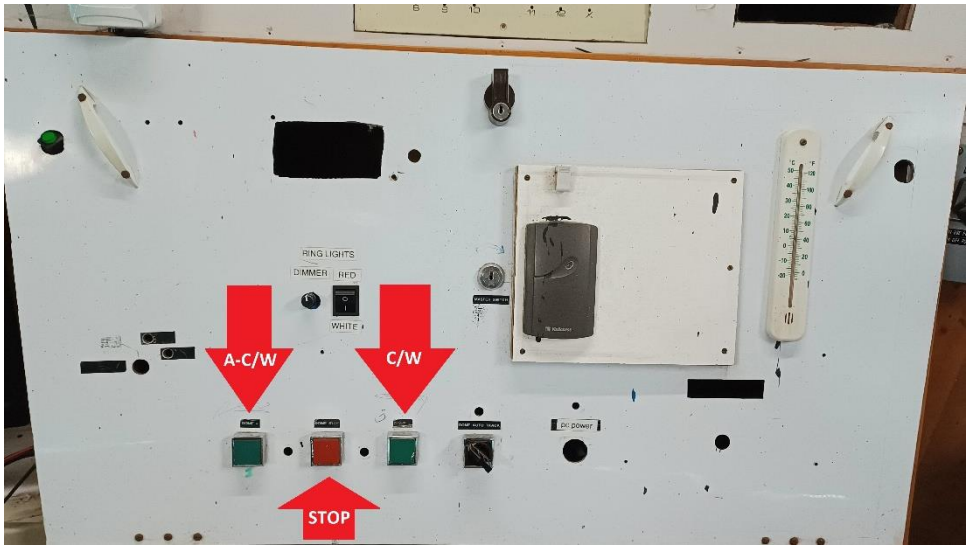

Fig. 17: Control Panel dome rotation switches

Rotate the dome aperture to the desired area of interest.

10) You can now use the Hand Controller to slew/pan the telescope to the desired target. This is a manual control of the telescope using the Hand Controller to manually locate targets.

There are two always powered on 'Telrads' on the telescope to aid manually finding targets (Fig. 18 below). Once the target is located within the centre of the Telrad's 'red rings' the target should then be (more or less) in the centre of the Eyepiece:

Fig. 18: 'Top' & 'Bottom' Telrads

11) Use the silver focus knob (Fig.19) to focus the eyepiece (to suit your eyes) to bring the object into sharp focus (or as sharp as possible depending on many factors, inc. environmental). Adjust the wheel ever-so-slightly either clockwise or anticlockwise as required. (Please don't grab hold of the eyepiece itself as this could affect the alignment of the telescope):

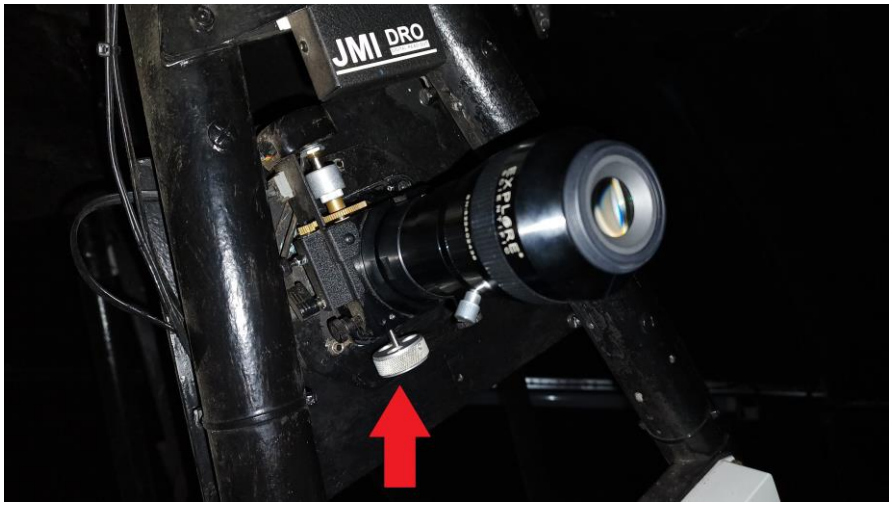

Fig.19: Focus Knob

12) To allow the dome to rotate in sync with the telescope, switch on the black rotary switch as shown in Fig. 20:

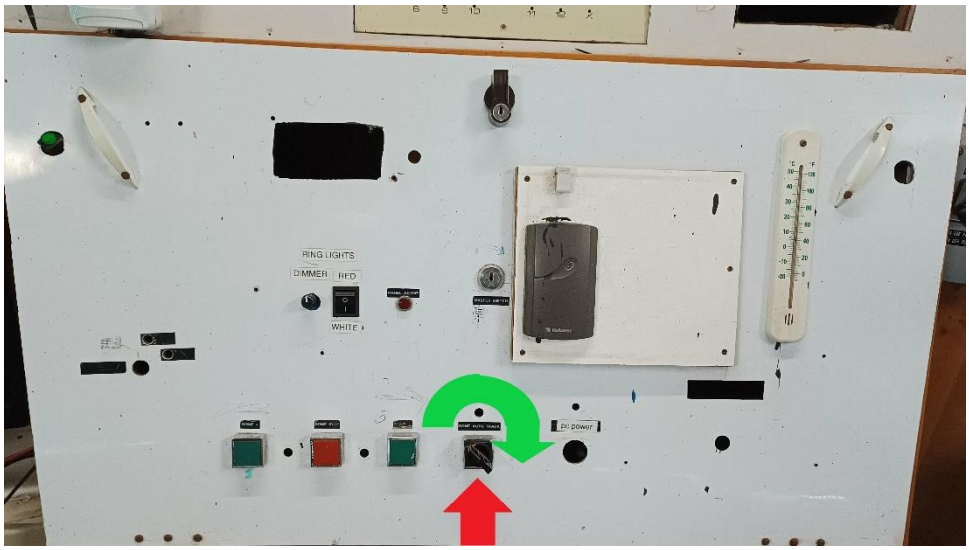

Fig. 20: Auto Dome/Telescope Sync Control Switch

NB: Turn OFF the auto dome sync control BEFORE slewing the telescope to a new target as otherwise the dome won't be able to keep up and can cause problems.

(Effectively move the dome and THEN the telescope to the new desired target, and THEN once aligned switch back on auto sync)

Notes:

In normal manual (non-computer use) once everything is switched on the telescope should auto track the target once located.

This guide does not cover the use of the computer control.

If ‘strange voice commands’ are unexpectedly heard, then the PC has been turned on (a green light will show top left of the control panel shown by red arrow in Fig. 18). If the PC control is not required, then it is recommended to shut the PC down properly via the keyboard and mouse (stored in the adjacent white box where the eyepiece case is kept). *NB PC control auto tracking only works once the PC has been synced to a star. See separate guide as required.*

Fig. 21: PC control ’ON’ light

(The PC is located below the main telescope body but generally no one needs access in normal operation).

13) To view objects of interest located in the WEST you do NOT need to invert the telescope.

To view objects located in the EAST you need to invert the telescope to the opposite side as follows:

As a rule of thumb, look at the base of the telescope:

Eyepiece on the left side of the telescope = Objects in the EAST

Eyepiece on the right side of the telescope = Objects in the WEST

To INVERT the telescope, use the Hand Controller:

(Assuming from the HOME position)

NB Ensure the slewing/inverting telescope will not hit any objects/steps/humans AND the auto dome sync control is turned OFF! (See Fig. 21).

a) PRESS both the UP and RIGHT buttons together, this will cause the telescope to slew on both axes UP and RIGHT at the same time (Fig. 21):

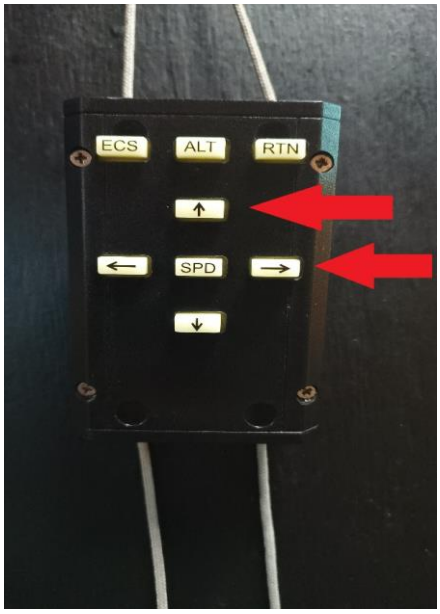

Fig. 22: Hand Controller indicating buttons for starting telescope inversion

When the telescope is in the fully UPRIGHT position (Secondary Mirror uppermost) then release the RIGHT button and just keep UP button pressed to continue the inverting manoeuvre until the eyepiece is on the left-hand side and the telescope is pointing towards the EAST.

Note: The telescope primary mirror won't collide with the forks even if you think it will during the inverting! (Ensure nothing will get trapped in this tight space!)

To reverse the inversion to bring the telescope back over to the WEST press both the LEFT and DOWN buttons on the Hand Controller (Fig. 23):

Note: The 'UP' & 'DOWN' buttons are in effect "reversed" due to the inversion.

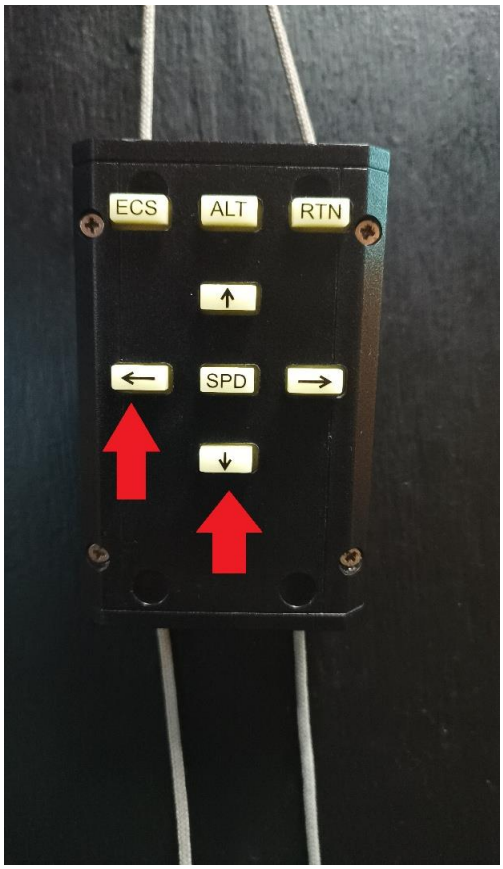

Fig. 23: Hand Controller indicating buttons for starting to reverse the telescope inversion

Again, the telescope will move in both axes. Once the telescope base is square, then release the LEFT button, just leaving the DOWN button pressed. Release the DOWN button when the telescope is back in the HOME position with the telescope base 'square on' and the eyepiece back on the RIGHT-HAND side, as shown in Fig. 24 below:

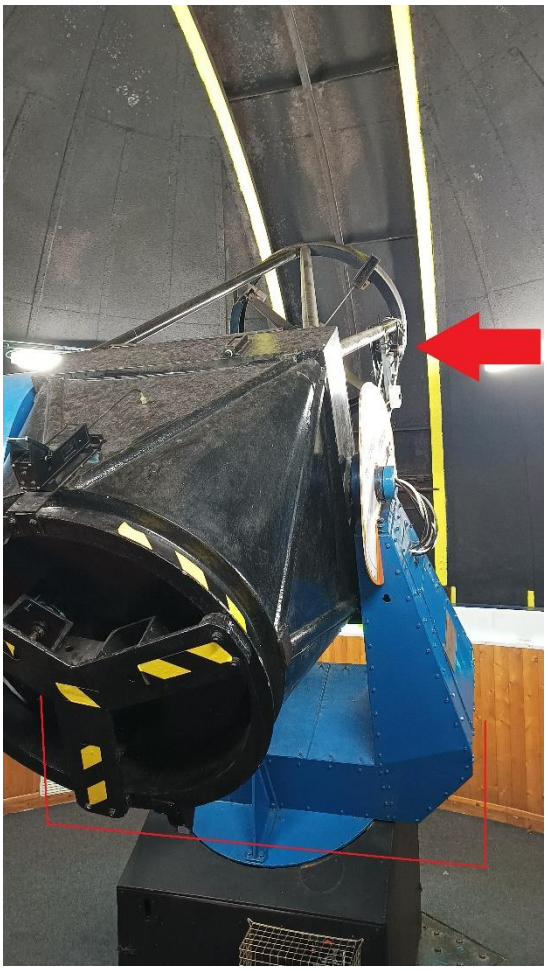

Fig. 24: Telescope back in the HOME position

NB: it is IMPERATIVE that if the telescope is inverted for any viewing, it MUST be returned back to the home position (or westerly viewing positions) by reversing the procedure. Please do NOT simply carry on "spinning" the telescope!

A suggestion would be to practice the inversion procedures with the lights on prior to any public demonstrations as it can be confusing at first....

Closing the telescope down at end of a viewing session:

The **FIRST** thing to do in closing down is to **PROTECT THE MIRRORS**, with the primary mirror being protected first, then followed by the secondary mirror:

1) Close the primary mirror: use the black rocker switch on the side of the telescope body as before:

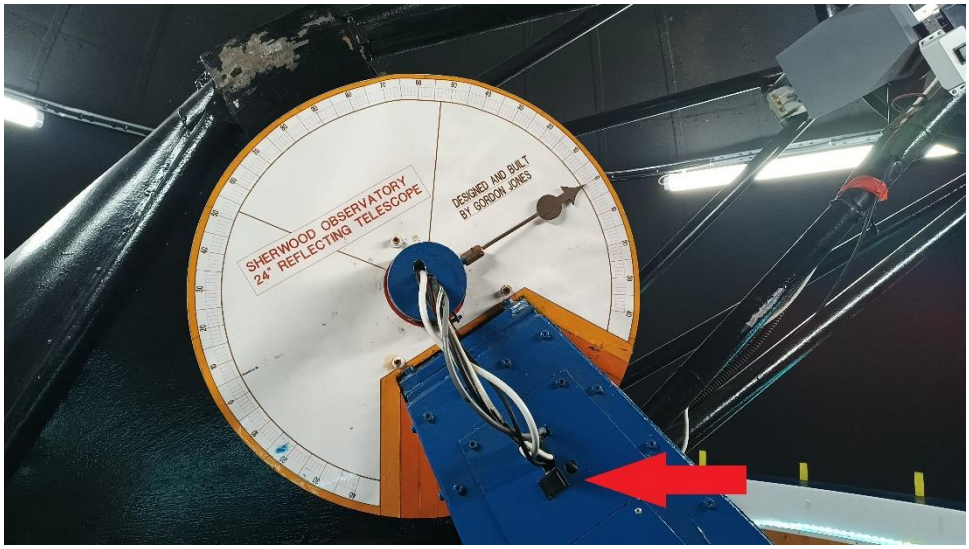

Fig. 13: Primary Mirror Cover Switch

As before PRESS and HOLD the switch until the cover is fully closed. It will auto stop again when fully closed.

2) Close the secondary mirror:

(If required use the Hand Controller and bring the telescope down so you can reach it):

(See Fig. 12 below) Slide unlocking lever (1) in direction as shown by green arrow, at same time twist handle (2) 90 degrees and PUSH handle (2) AWAY from you to swing the arm 90 degrees to close onto the secondary mirror. Lock the clamping mechanism into place around the mirror by twisting the lever (2) around it and releasing.

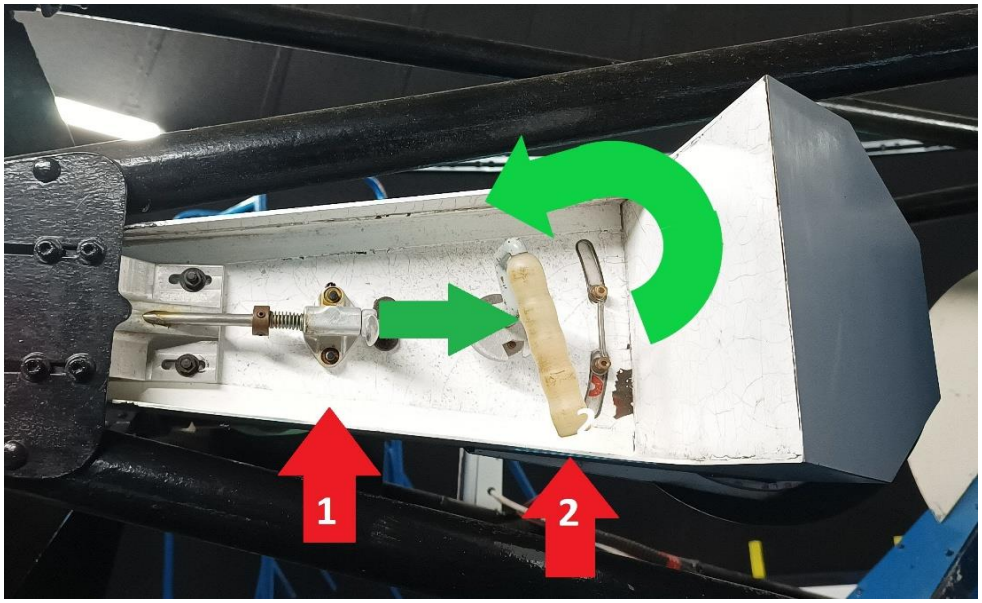

Fig. 12: Secondary Mirror Cover (shown in the open position)

3) Next take out and put away the eye piece into the silver case (Fig 10). Put back in the brass extension tube into the telescope focuser where the eyepiece was (and tighten using the small grub screw). Put the case away back into the white cabinet. (If the keyboard and mouse are out then please put these away onto top of the case in the cabinet to keep things tidy).

4) If the telescope has been inverted ('flipped over'), then it MUST be inverted back to the HOME position, that being with the eyepiece on the RIGHT-HAND side as you look towards the secondary mirror (See Fig. 24 and how to invert (Section 13) above).

5) Now bring the telescope back up to '0' degrees as shown on the scale and slew base back round to the SOUTH (See Fig. 24: HOME position).

6) Switch OFF the telescope control unit (square black unit located on the back of telescope) using the RED rocker switch into the opposite position (See Fig. 25).

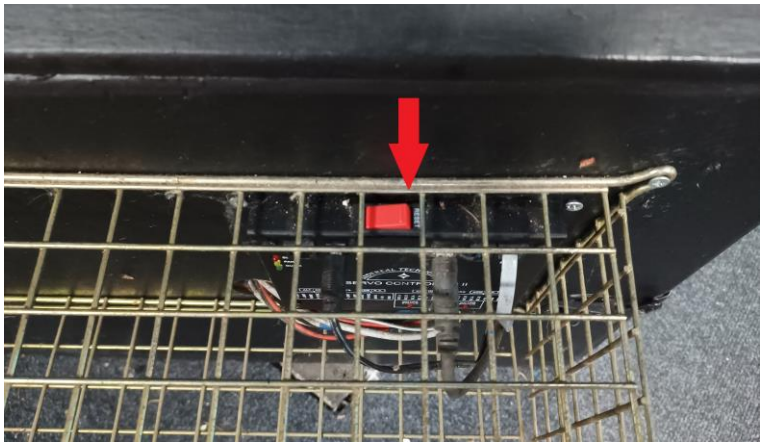

Fig. 25: Telescope control unit (arrow pointing to OFF)

7) Next slew the DOME back round back to its HOME position (left-hand edge of the Dome Control Box roughly aligning with the right-hand side of the control panel (see Fig. 31 below) using the green/red buttons as before on the control panel (see Fig. 17). (Should there be a dome motor failure then you may need to use the Emergency Cable Procedure noted in H&S Section 10).

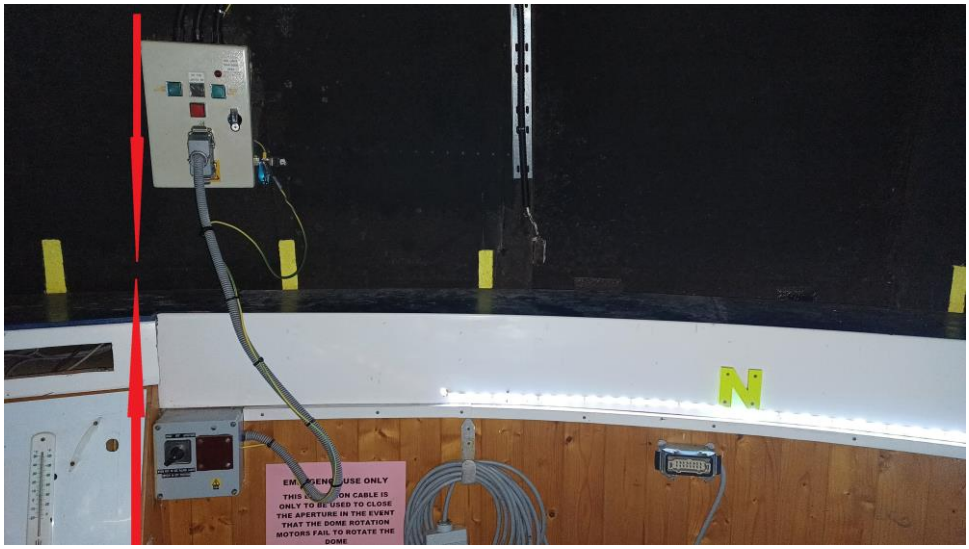

Fig. 31: Dome Home Position

8) Switch the Control Panel Switch Box next to control panel to OFF (Fig. 14). Then plug back in the grey chunky plug into the Dome Control Box, ensuring the upper and lower clips on the plug are fully engaged (Fig. 15).

9) Next switch the Control Panel Switch Box to the APERTURE position (Fig. 4). *The main dome lights will come on.*

10) Now close the aperture trap door (Fig. 26) (if open) by pulling on the rope and pulling the door in towards you. **(Be careful as it is heavy and needs a firm pull by hand.** *The use of the small steps may help***)**. Once it's pulled up then use the locking lever to twist close the pins in the direction of the green arrows to engage with the yellow painted dome frame sections:

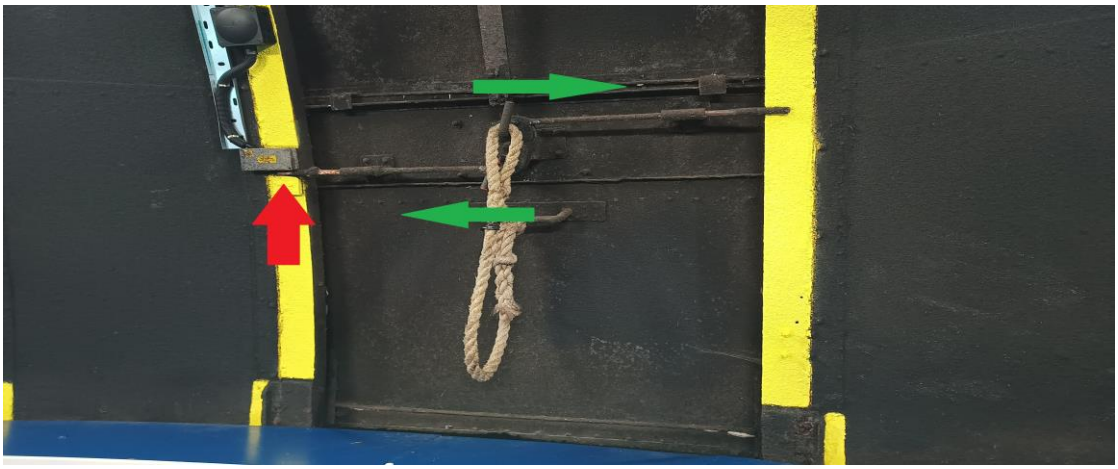

Fig. 26: Trap Door locking lever pins (green arrows) & Interlock switch (red arrow)

Ensure it is fully closed to enable the interlock switch (red arrow) to be engaged by the left-hand pin.

11) Then close the dome aperture using the RIGHT-HAND green button on the Dome Control Box:

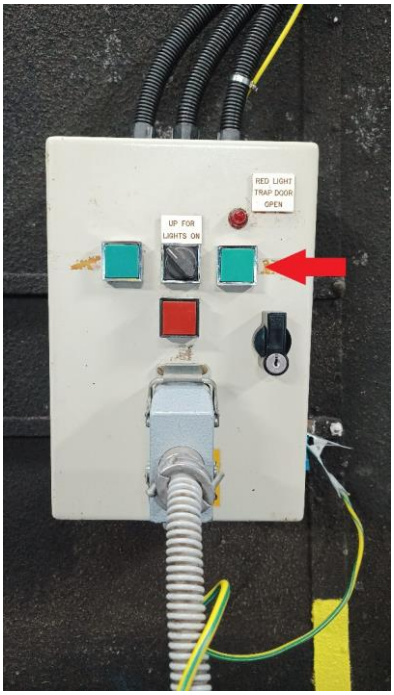

Fig. 27: Dome Control Box closing dome aperture button

Press and release the button. It will auto stop once closed by engaging with a limit switch located in the roof. See Fig. 28.

But just wait by in case it does not (unlikely but could happen) RED button (if working) is an EMERGENCY STOP. (Rotary switch to OFF if doesn't work)

Fig. 28: Dome Aperture closing limit switch

NB: Should the RED indicator light (located on the Dome Control Box) be on OR THE DOME APERTURE DOES NOT START TO CLOSE then this indicates that the trap door is not fully shut. It may just need the locking lever opening and fully and firmly closing again.

12) Power down the Hand Controller by pressing ALT & SPD simultaneously then hang it back onto the hook on the side of the telescope:

Fig. 9: Hand Controller hook

13) Finally switch OFF the main power switch under the control panel (see Fig.1). This will then leave just the (red/white) dome wall LED lights on.

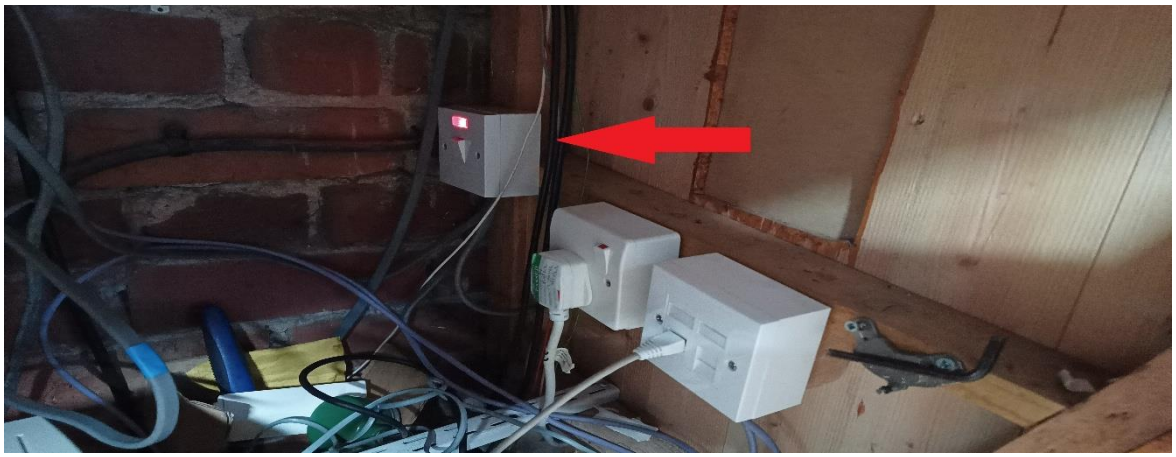

Fig. 1 Main Power Switch (shown here on), when OFF the red neon will go out.

14) When leaving the dome, remember to switch OFF the light switch at the top of the stairs (far right-hand rocker switch). This will then turn off the dome wall LED lights.

15) At the bottom of the stairs, turn OFF the single light switch which will turn off the stair lights.

16) Finally ensure the dome entrance door is then unhooked and fully CLOSED behind you as you exit the dome (unless there is good reason to leave open). ***Remember, the dome and telescope are authorised controlled access only!***

Note: PC control and the software use will be covered separately; this guide is for the 24" telescope basic safe operation and 'manual' control.

FAQs:

1) **What happens if the circuit breakers trip out whilst using the telescope?**

The circuit breakers can be found in the fuse board located on the far wall of the office. Your access card to the dome will also give you privileged access to the office for this purpose. **NB: DO NOT switch any breakers back on UNLESS you know what the reason for the trip was, AND you believe it is safe to do so. It is recommended to consult Mr Chris Dakin too** (esp. If there is any burning smells/smoke seen etc or if there is any doubt!)

2) **Why can I hear 'voices' coming from the telescope?**

This means that the PC is on. Should you not wish to use the PC & software to control the telescope *(not covered in this guide)* then please shut down the PC using the keyboard and mouse like any other PC. Then switch off the monitor at the plug socket adjacent (if on).

3) **The dome aperture won't close?**

This is more than likely because the trap door lever pin is not fully closed and fully engaged with the interlock switch (See fig. 26). Open and firmly close it again ensuring it is FULLY and FIRMLY engaged!

4) **How do I reset the telescope if it appears to be not responding?**

Try turning the red rocker switch on top of the black control unit off and back on again. (See Figs. 8 & 25)

5) **Why isn't the dome aperture keeping up with the telescope when it's auto object tracking?**

This maybe because the auto dome/telescope sync control switch on the main control panel has not been turned on. (See fig. 20)

6) **What is the ‘iris control feature’ on the telescope?**

This feature allows the telescope aperture to be reduced down to say view a bright Moon for example, without needing the full telescope aperture open.

Use the black rocker switch shown in Fig. 29 to close the metal finned iris as required:

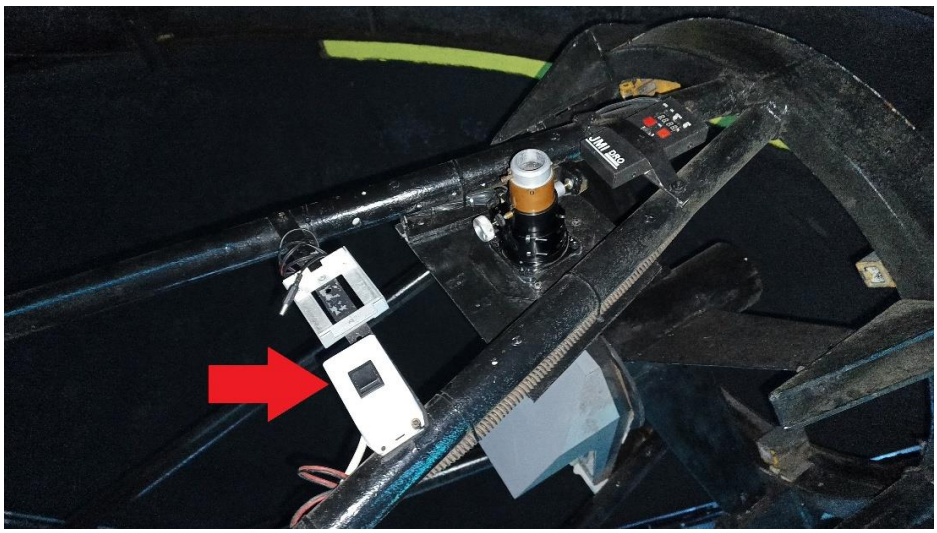

Fig. 29: Iris Control Switch

7) **Is there a function to be able to home in on targets whilst at the eyepiece when the telescope is in the right region of interest?**

Use the ‘Spiral Target Finder’ using the Hand Controller (see instructions on rear) when at the eyepiece and want to find something that you know you are close by.

8) **The Hand Controller seems to have gone to sleep?**

Hit ‘SPD’ on it to wake it (see fig. 9a)

Health & Safety:

Whist operating and using the main dome 24" telescope to view night sky celestial objects is a joyous experience, there are however some health and safety rules to follow to keep everyone involved (inc. any members of the public present, esp. young children) safe, and to keep the telescope and dome running safely and effectively:

1) **CHECK** that all is ok and looks **SAFE** within the dome, the telescope and the general area before proceeding with opening up.

2) **NO** food or drink is to be consumed or brought up into the dome.

3) **SHUT** the metal gate at the top of the stairs whilst the telescope and dome are in use. This is to prevent anyone falling down the stairs (esp. in the dark) or to act as a warning to anyone coming up the stairs that a session is in progress.

4) Turn the Switch to **OFF** on the Dome Control Box **BEFORE** unplugging or plugging in the grey chunky plug! There is mains voltage present!

5) **PROTECTION** of the primary and secondary mirrors is **PARAMOUNT**. This is especially so when opening up and closing down the telescope. Open the mirror covers (secondary then primary) last only at the end of the opening procedure, and close both mirror covers first (primary then secondary) before starting the close down procedure. An absolute must is to ensure they are both closed before leaving the dome at the end of the session!

6) **ENSURE** the steps are safe for use **BEFORE** climbing. This is especially so before any members of public inc. young children use them (it's likely to be dark!). Ensure the lowering wheels lever is disengaged to ensure the feet are firmly on the carpet and won't move before climbing. Only

engage the moving wheels lever when no one is on the steps to move them to a new location, then disengage to ensure firmly secure again.

7) **ENSURE** the steps are moved away to be up parallel against the dome wall **BEFORE** slewing the telescope to ensure there are no collisions of the telescope against the steps! It is still wise to check that no collisions are possible even when the steps are moved against the wall.

8) **ALWAYS** keep the Hand Controller on you to hand to stop any telescope slewing movements at any time if required, esp. when any potential collision is imminent! This includes if using the PC software control system as the Hand Controller will override the PC control to be able to stop the telescope if required. (Do **NOT** allow the Hand Controller to be taken out of the dome when the telescope is in use!).

9) There is a safety feature on the telescope control unit to sense any collision/straining on the telescope to prevent damage *(motor current limit)*. This will put control into '*SAFE MODE'* which is denoted by one of the lights on the control unit flashing red rather than continually lit. To reset, just turn it off and on again via the RED rocker switch on the telescope control unit (Figs. 8 & 25).

10) Should you not be able to slew the dome back round due to a possible motor failure etc and thus not able to plug the dome aperture cable back in (to be able to close the dome aperture) then follow this emergency procedure:

ENSURE the Control Panel Switch Box rotary switch is **OFF** (fig. 14). TAKE the grey chunky plug (should be unplugged and loose) from the Control Panel Switch Box (adjacent the control panel) and PLUG it into the multipin socket on the wall under "N" (arrowed red in fig. 30 below) on the peripheral dome wall.

Take the coiled and hung-up extension cable (arrowed red) with another grey chunky plug on over to where the Dome Control Box is and plug it in as before.

Then follow instructions as for closing the dome aperture in the Closing Down section.

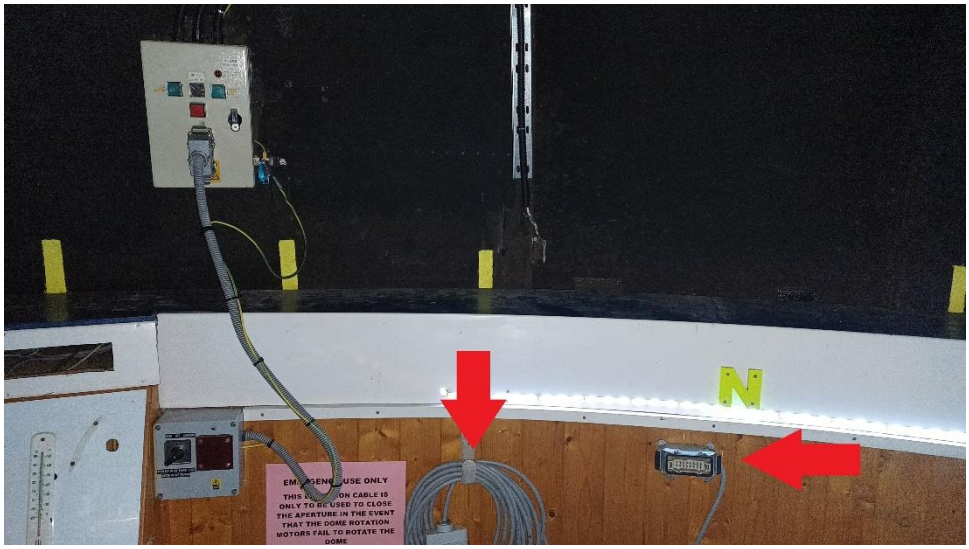

Fig. 30: Emergency Dome Control Cable and fixed wall multipin socket

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Author: Julian Best, with thanks to fellow members for their contributions and assistance.