

Dome shutters and windblind technical description

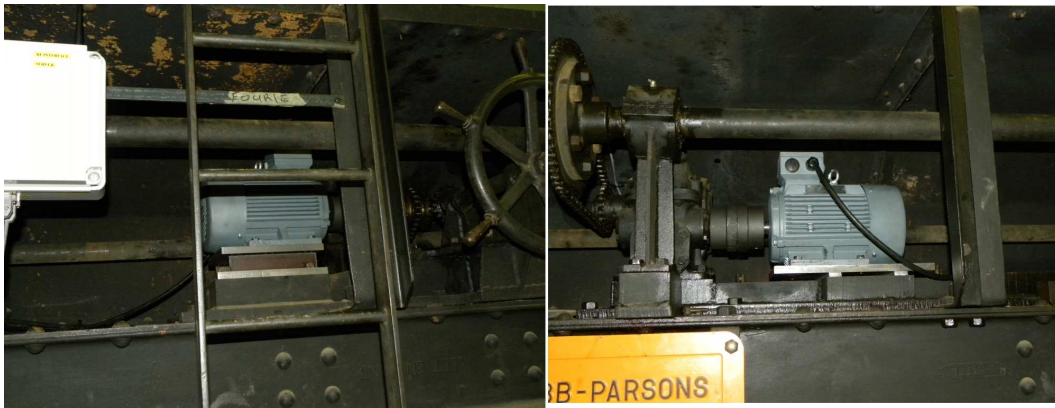
The dome shutters and windblind upgrade has resulted in a complete change of all the electrical systems of the 1.9m telescope shutters and windblind drives. After the upgrade the user now has several places from where the shutters and windblind can be controlled. The telescope control PLC now controls the remote operation of the shutters and windblind, allowing the TCS to control and monitor the status of the system.

Refer to the Dome Shutters and Windblind Operations manual for control instructions.

Dome shutters and windblind sub systems.

The dome shutters and windblind control system can be divided into several sub systems.

➤ Drive Motors



Shutter Motor

Windblind Motor

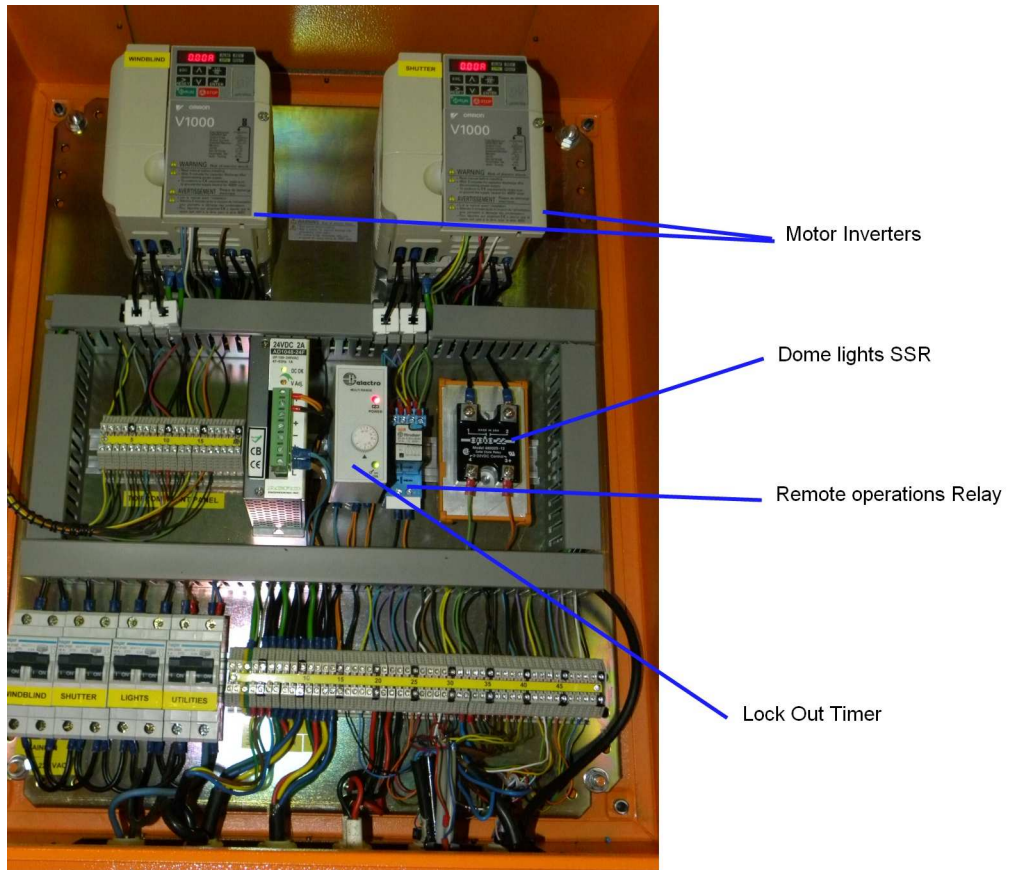
The dome shutters and windblind 250Vdc motors were replaced with 220V 3 phase motors.

➤ **Control cabinet**

A cabinet with switches on the front panel to allow local control is mounted next to the drive motors on the dome shutters and windblind assembly.



This cabinet also contains all the drive electronics.



➤ **Limit switches.** The limit switches stops the different units at the end of travel and some are used to indicate to the drive inverter to change the speed of the motor.

- RF Modules. These modules allow the telescope PLC to communicate with the drive electronics systems. All control from the observing floor and the TCS are via this radio link.



The one radio module is installed in the warmroom above the north facing door and the other next to the control cabinet.

- Observing floor control panel. This panel is used to allow the user to control the dome shutters and windblind from the observing floor.

Operation principle

The motors are controlled via two separate Omron inverters. The inverters receives signals from the control sections and controls the motors accordingly. The circuit diagrams for the complete system is in the **1.9m Telescope PLC control system** file under the section **Windblind/shutters schematics**

- A0-1365 - Block diagram of the system.
- A0-1366 - Mains wiring of the control cabinet.
- A0-1367 – Windblind Inverter and motor wiring
- A0-1368 – Dome shutter Inverter and motor wiring
- A0-0953 – RF control PIC card
- A0-1369 – RF Interface – Dome control panel
- B0-1369 – RF Interface – Dome control panel wiring
- A0-1370 – RF Interface – PLC
- B0-1370 – RF Interface to PLC wiring.
- A0-1371 – Observing floor Control Panel

1. Mains Power

Power to the dome shutters, windblind and dome lights are provided via two sliprings. The pick-up points for the sliprings are on the east side of the dome.

The power to the sliprings is 220Vac and the main circuit breaker for the power is in the Circuit breaker box, DB5, on the South/West side of the observing floor. The circuit breaker is number 22 and is marked ‘Dome Shutters’. A SSR in DB5 that is controlled via the switched mains of the telescope switches the power to the shutter and windblind as the telescope is switched on and off.

Once the power is switched on a timer is used to disable and remote control of the dome shutters and windblind for about 30 seconds. See drawings A0-1366, A0-1367 and A0-1368. This is to allow the different systems to start and for the RF-link to establish communications with the PLC. During this period the local control from the control panel is active even when Remote operation is selected. If for any reason should the timer or the 24V power supply fail the motors can still be controlled from the control cabinet. The remote operation and status for the PLC/TCS will be inoperative.

2. Dome lights

The dome lights can be controlled from the control panel or remotely via the RF-link. See drawing A0-1366. The dome lights are not affected by the lock-out timer or the mode of operation of the control cabinet. The lights can be switched on from the control cabinet by switching the light switch to the on position. Switching the switch to the ‘Remote On/Off’ position will switch the lights to the setting of the remote unit. The lights will not operate if the 24Vdc power supply fails.

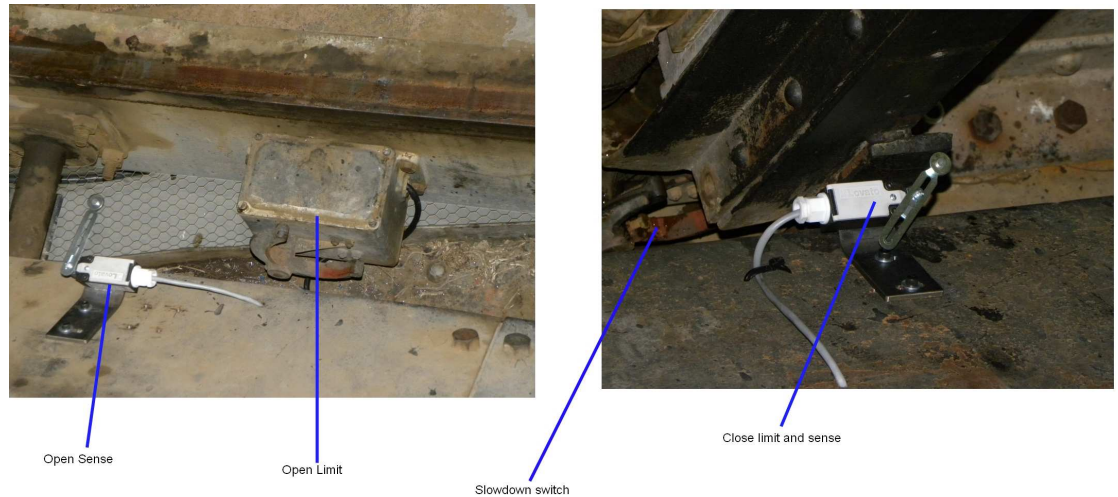
3. Windblind

The windblind is controlled via the windblind inverter. See drawing A0-1267. Two limit switches limit the travel of the windblind. If the windblind has tripped a specific limit it will stopped even of the command to the inverter is issued. No feedback regarding the status of the limit switches is passed back to the PLC via the RF-interface. The only status returned is the inverter running

and if the inverter is in a fault state. If the inverter enters a fault state pressing the Inverter-Reset button can reset it. Investigate what caused the fault state. It could be a broken/shorted wire to the motor or the blind is stuck and the inverter tripped due to overload.

4. Dome Shutters

The dome shutters are controlled via the shutter inverter. See drawing A0-1368. Two limit switches limit the travel of the windblind. At the end of travel are two extra switches that are used to sense the open and close positions and they state of them are returned to the PLC via the RF-link as status.



When the shutters are opening and it trips the Open-limit it will coast for a small distance and trips the open-sense switch. When the shutters are closing the slowdown switch is tripped first and the shutter motor will slow down. This is to ensure the shutters do not close too fast. When the Close and Close sense switch is tripped the motor will stop. When the shutter is opening it will also run at the slower speed until it has switched the slowdown switch to the fast setting. When the motor is running the inverter running status is returned to the PLC/TCS. If the inverter enters a fault state pressing the Inverter-Reset button can reset it. Investigate what caused the fault state. It could be a broken/shorted wire to the motor or the shutter is stuck and the inverter tripped due to overload.

5. RF-Link

The RF-link is used to allow control from the observing floor and TCS via the PLC. The status of the windblind and shutters are returned via the RF-link to the PLC and is displayed on the TCS. The signals from the RF-link to the inverters are via relays in the RF-link box. This done to convert the signals from 5V to 24V. On the PLC side the RF-link is connected to the TTL input and output modules of the PLC. Use the 'LED Identification note' to check the signals to and from the RF-Link. The TTL input and output notes in the 1.9m Telescope PLC control system can be used to identify the individual bits.

- 6. Observing Floor Control Panel.** See drawing A0-1371 and B0-1370. The user can choose from where the control must be by pushing the Local-req button on the control panel or selecting control from the TCS. The indicator on the panel will illuminate if the control is from the panel. This indicator will extinguish a minute after the last button was pressed on the panel. The next time a button is pressed it will be switched on again for at least a minute.

