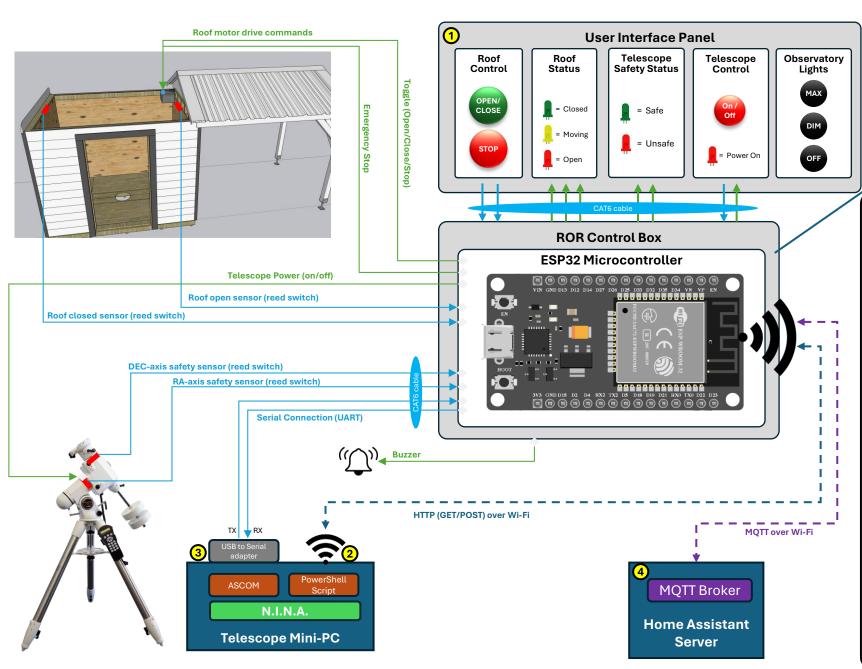
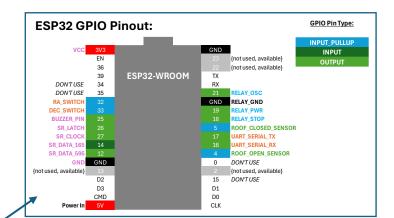
Roll-off Roof Automation Control System





Operation

There are 3 separate control mechanisms:



Manual (via locally wired control panel)

- Open/Close button and Emergency stop buttons situated on a control panel inside the observatory.
- Telescope on/off button controls a relay that turns on power to the telescope
 equipment.
- LEDs represent status of roof (open/closed/moving/lost), telescope mount (safe/unsafe) and telescope equipment (on/off).



HTTP (over WiFi)

- Controlled via HTTP calls (GET/POST) over Wi-Fi connection between ESP32 and miniPC.
- Can be integrated into N.I.N.A. / SGP imaging sequence to automatically open/close roof at beginning and end of imaging sessions, or when weather requires, using PowerShell script to invoke the HTTP call.



Serial (wired serial UART connection)

- Controlled via a wired serial connection between ESP32 and miniPC using UART pins on ESP32. On miniPC a CP2102 USB to serial adapter module is used as this allows longer cable runs than possible with a standard USB cable.
- The ASCOM Rolling Roof Computer Interface (RRCI) by Chuck Faranda is used on the miniPC to send and receive serial commands to the ESP32.



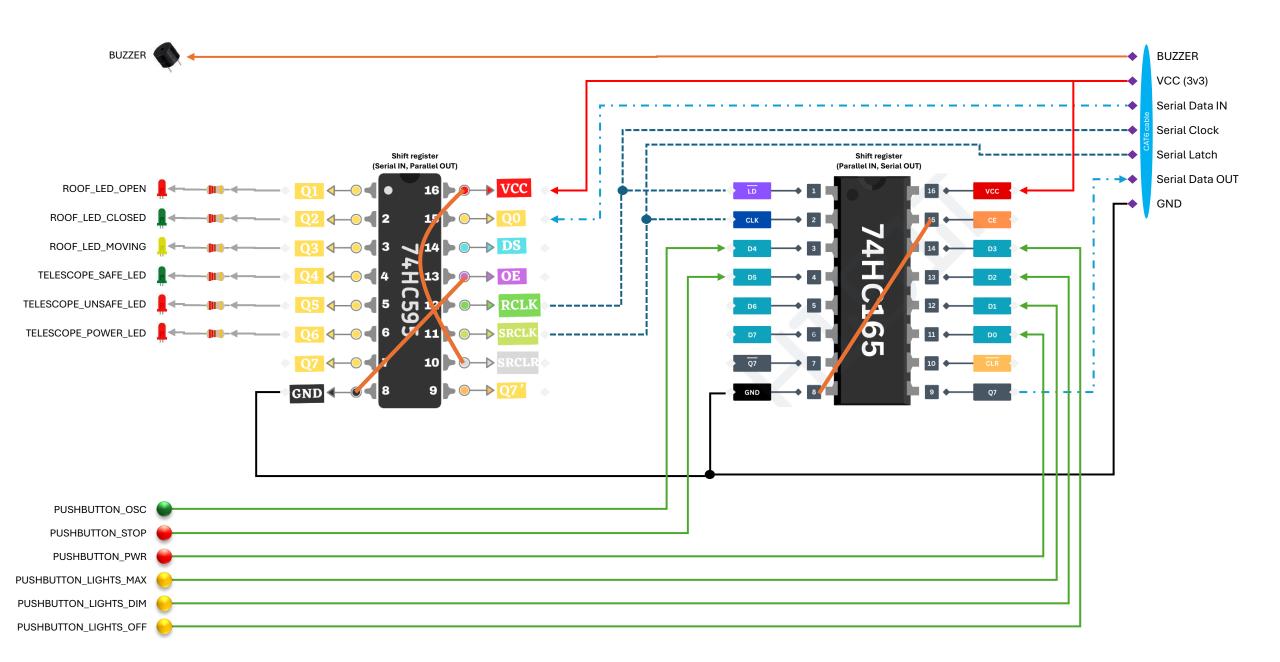
Home Assistant (via MQTT over WiFi)

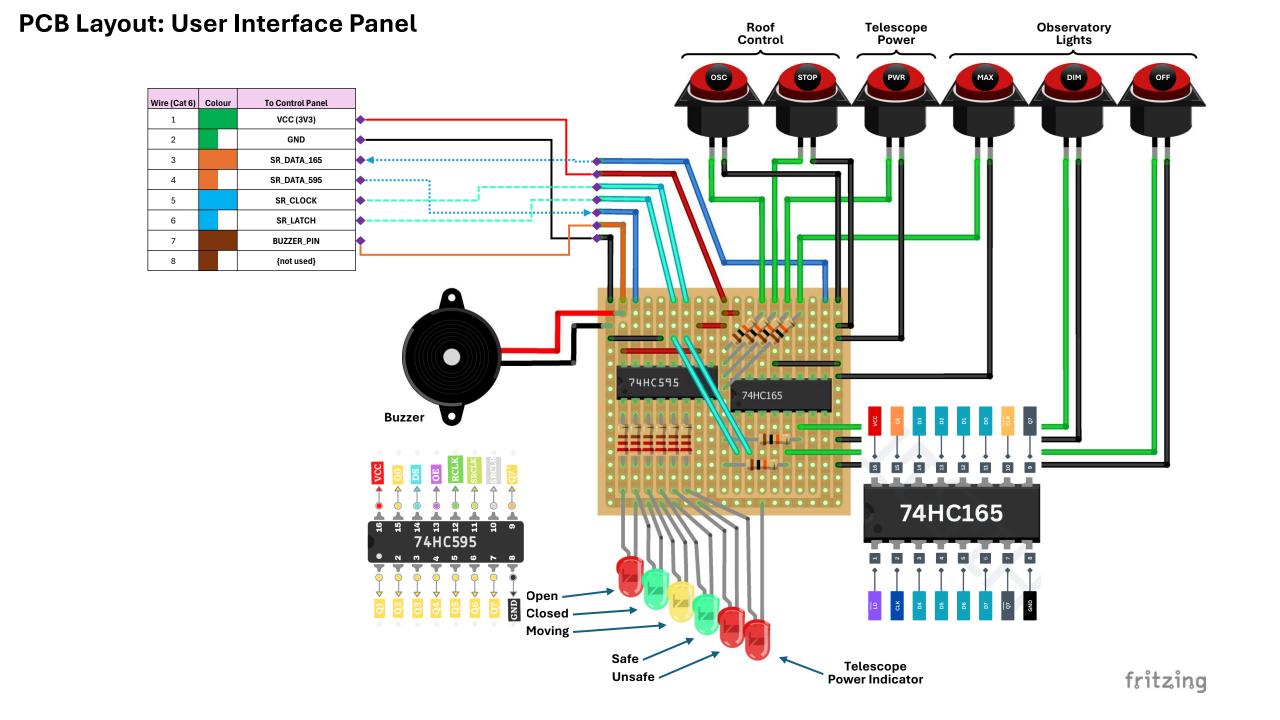
- Controlled using MQTT via WiFi connection between ESP32 and MQTT broker running on Home Assistant server.
- Allows Home Assistant to monitor and control roof operation via smart switches, phone apps and touchscreens.

Notes:

- All 4 mechanisms only allow roof movement when telescope is "safe" (i.e. RA & DEC axes are
 parked in safe position, as measured by external reed switches on mount.
- A local buzzer will sound if roof movement is not allowed.
- LEDs on control panel provide visual indicators of roof and telescope status. To reduce the number
 of wires running between the User Interface Panel and the ROR Control Box (and allow a CAT6 cable
 to be used), a 74HC595 shift register is integrated into the user interface panel to control all the
 local LEDs. This allows up to 8 LEDs be controlled using just 5 wires. The remaining 3 wires carry the
 pushbutton switch signals. Similarly, a 74HC165 shift register is used to multiplex the button
 commands onto a single data wire.

Wiring Diagram: User Interface Panel





Wiring Diagram: ROR Control Box

