Cleanroom SL80H Vacuum Pump Remote Control

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1. Weave Cryostats

The Weave Spectrograph and cryostats reside in a cleanroom. There is a requirement that the cryostats remain clean not just on the inside but also the exterior surfaces. Should the cryostats be removed from the spectrograph for maintenance they will be taken to the detector workshop clean-room.

Whenever a Weave cryostat is pumped it will always be in a clean-room. We have bought 2 Leybold TURBOVAC vacuum pumps that are for cleanroom use only.

Figure 1 Cleanroom pumps

These new pumps have an option to enable remote control of the pump, this remote control has been implemented using a Raspberry Pi with a 7" Touchscreen.
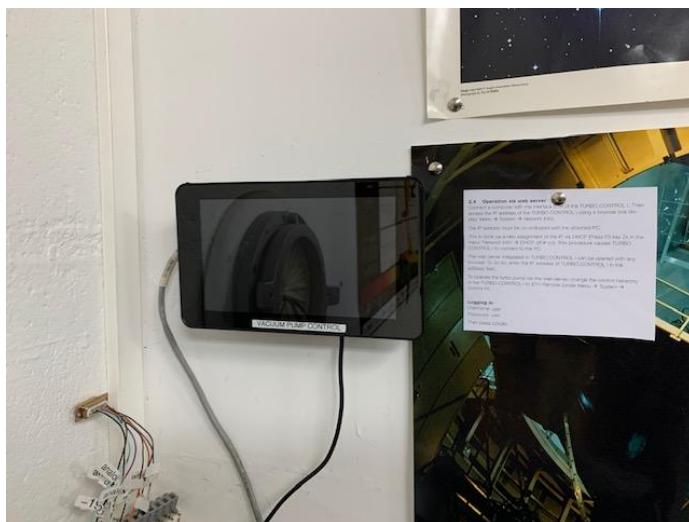

Figure 2 Raspberry Pi 'Tablet'

This avoids the need to constantly enter a cleanroom with the associated dressing and undressing that this entails, just to check the pump.

2. System Hardware

The vacuum pump is controlled by an integrated Turbo control unit

Figure 3 Turbo control front

Figure 4 Turbo control back

The vacuum pump can be controlled and monitored via a webserver by connecting a laptop directly to the ETH connection on the back of the control unit.
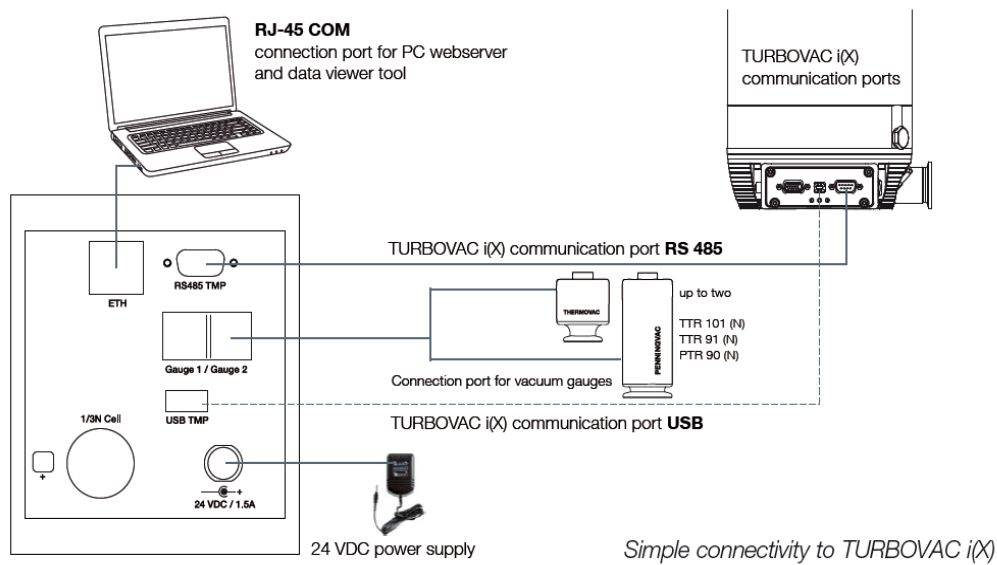
RJ-45 COM
connection port for PC webserver
and data viewer tool

TURBOVAC i(X)
communication ports

TURBOVAC i(X) communication port **RS 485**

ETH

RS485 TMP

Gauge 1 / Gauge 2

Connection port for vacuum gauges

THERMOVAC

PENNINGVAC

up to two

TTR 101 (N)
TTR 91 (N)
PTR 90 (N)

1/3N Cell

USB TMP

TURBOVAC i(X) communication port **USB**

24 VDC / 1.5A

24 VDC power supply

Simple connectivity to TURBOVAC i(X)
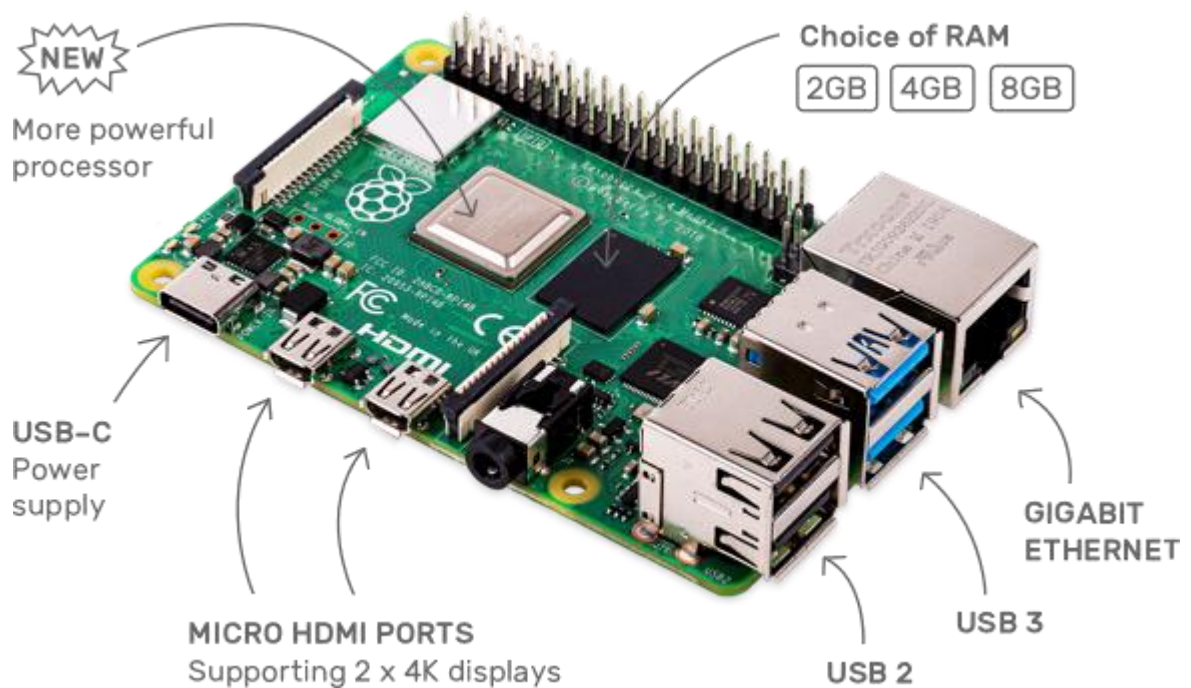
Figure 5 System diagram

To provide a permanently fitted low cost alternative a Raspberry PI 4B 4GB fitted with a 7" Touch Screen Monitor and an on screen keyboard has been used in place of a laptop. This has been wall-mounted outside the detector workshop clean-room. The Screen is connected to the Pi using four pillars, a ribbon cable and power.

Figure 6 Screen front

Figure 7 Screen back

Once the storage card with the operating system has been fitted the unit can be powered up and an on screen keyboard installed.

First connect the Pi to the network, then install the keyboard

```
sudo apt install matchbox-keyboard
```

Reboot and your 'tablet' is ready to connect to the pump.

3. Operation via web server

Connect a computer with the interface ETH of the TURBO.CONTROL i. Then access the IP address of the TURBO.CONTROL i using a browser (via display: Menu à System à Network Info).

The IP address must be co-ordinated with the attached PC.

This is done via a new assignment of the IP via DHCP (Press F3 key 2x in the menu "Network Info" -> DHCP -> on). This procedure causes TURBO. CONTROL i to connect to the PC.

The web server integrated in TURBO.CONTROL i can be opened with any browser. To do so, enter the IP address of TURBO.CONTROL i in the address field. To operate the turbo pump via the web server, change the control hierarchy in the TURBO.CONTROL i to ETH Remote (under Menu -> System -> Control H).

Logging in

Username: user

Password: user

Then press LOGIN

These instructions have been taken from the TURBOVAC i(X) manual that can be found here.

4. Parts List

Name	Part Number	Supplier
Raspberry Pi 4B 4GB	182-2096	Amidata
LCD 7" Touchscreen	899-7466	Amidata
Raspberry Pi PSU	187-3417	Amidata
Raspberry Pi Noobs card	121-3897	Amidata
TURBOLAB SL80H vacuum pump	501592V02000000	Leybold