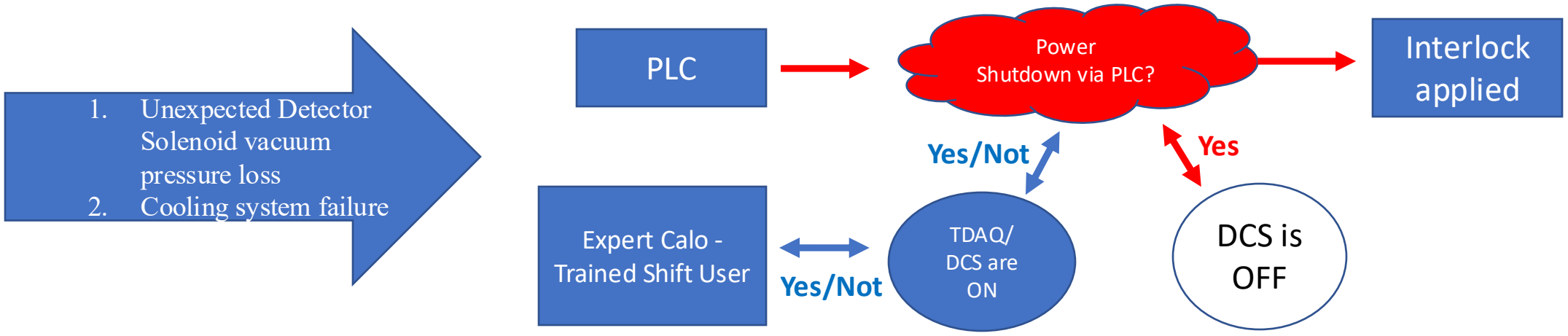
Summary of proposals for calorimeter Interlocks and control

We consider the needs of an interlock as a last line of defense. All the calorimeter power and electronics system is monitored and controlled via TDAQ or DCS. However:

- The TDAQ is not expected to be working all the time;
- Also the ethernet comunication with the power supplies, is not expected to be working all the time
- If the expert user is TDAQ/DCS connected and see the variation of the conditions can or cannot override the interlock and proceed with an ordered HV-LV shutdown, if needed.
- If there is no user or the DCS/TDAQ are down no ovverride is provided and the PLC will intervene

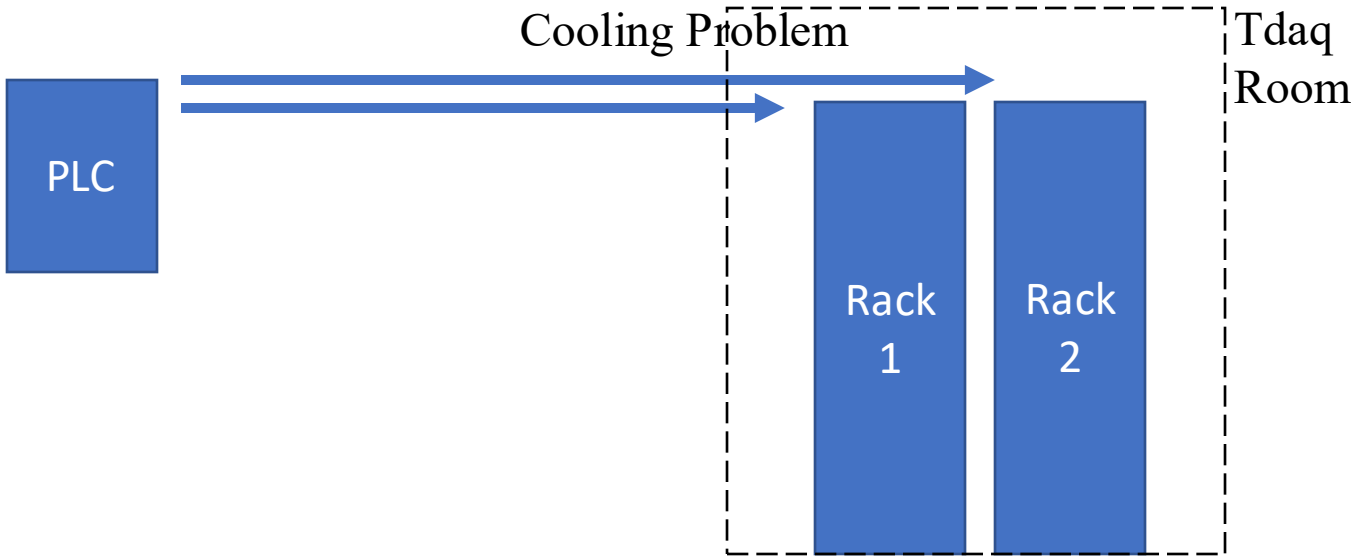
- **PLC usage for interlock will be our last level of protection in case of:**
  1. Unexpected Detector Solenoid vacuum pressure loss
  2. Cooling system failure



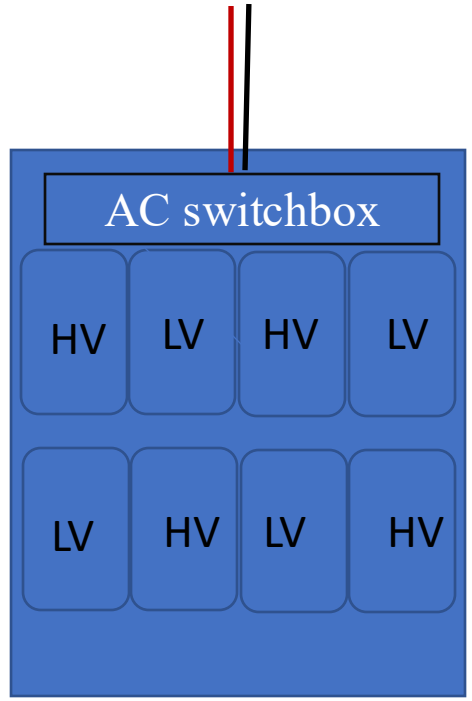
Calorimeter Interlock Strategy – Cooling

1) The calorimeter cooling system is like a box with inlet and outlet pipes, and for each supply and return line, the temperature difference, flow rate, and pressure will be measured.
2) Values will be communicated to the PLC.

→ The requirement has not been finalized yet, but if the measured values exceed predefined thresholds (to be determined by our cooling experts), or if the cooling station loses communication with the PLC, the HV and LV power supplies will be interlocked.



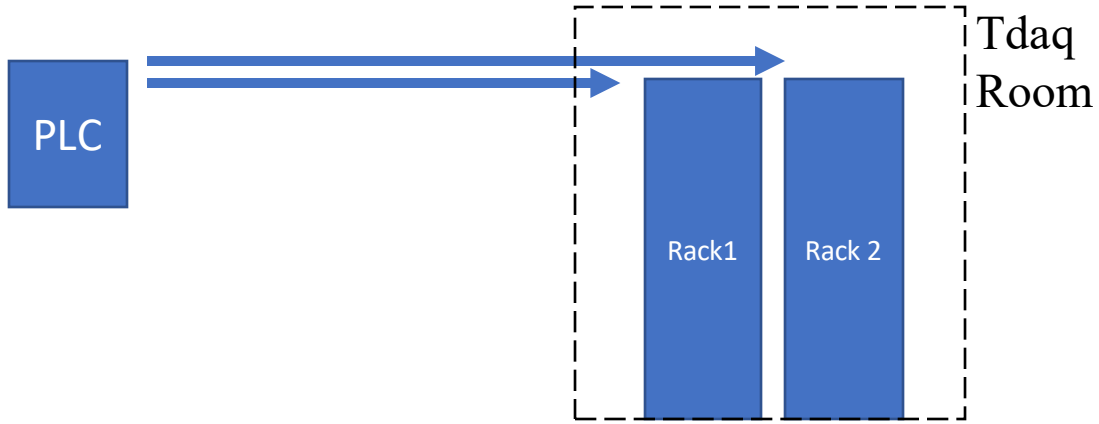
The LV power supplies **do not have an interlock:**
24 Volt to shout down the rack PDUs through the AC switchbox

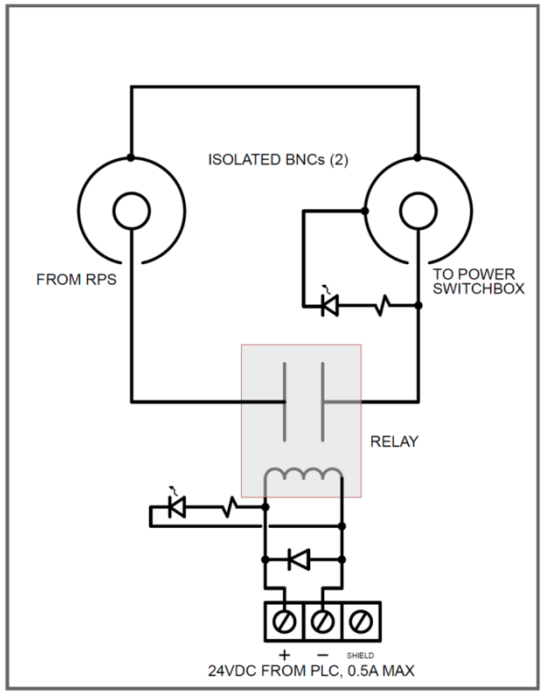


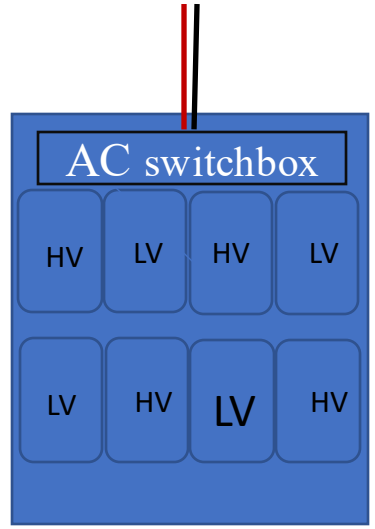
Calorimeter Interlock Strategy – AC switchbox

From the PLC, two 24 V lines are provided during normal operation:

- Normally, the 24VDC signal closes the relay contacts, which maintains continuity of the enable signal that the RPS sends to the AC Switchbox.
- Used to shut down the rack PDUs via the AC switchbox by switching from 24 V to 0 V

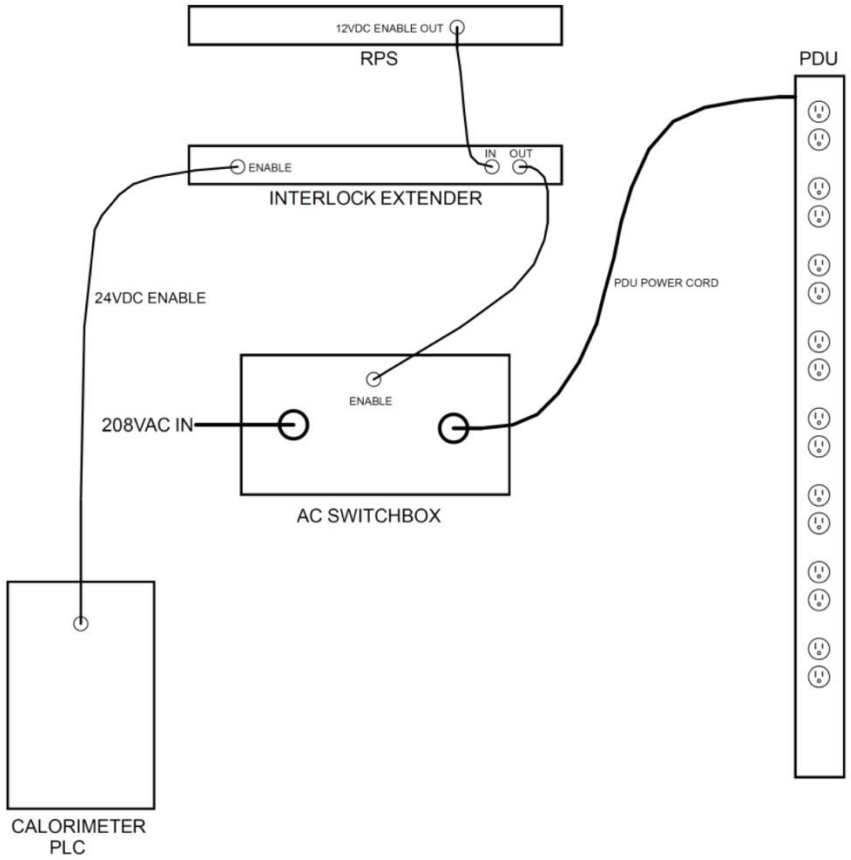






Calorimeter Interlock Extender (CIE)

- The CIE intercepts the rack's Rack Protection System (RPS) enable signal to the AC Switchbox, which supplies AC power to the PDU



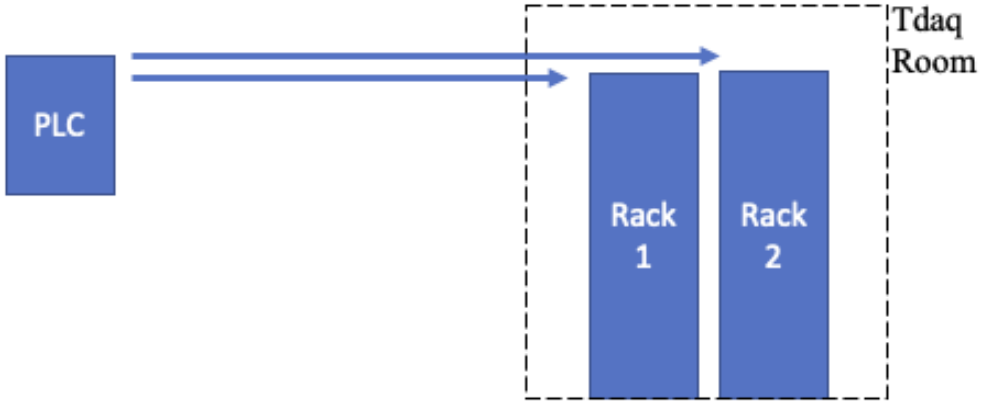
Calorimeter Interlock Strategy – Vacuum Level

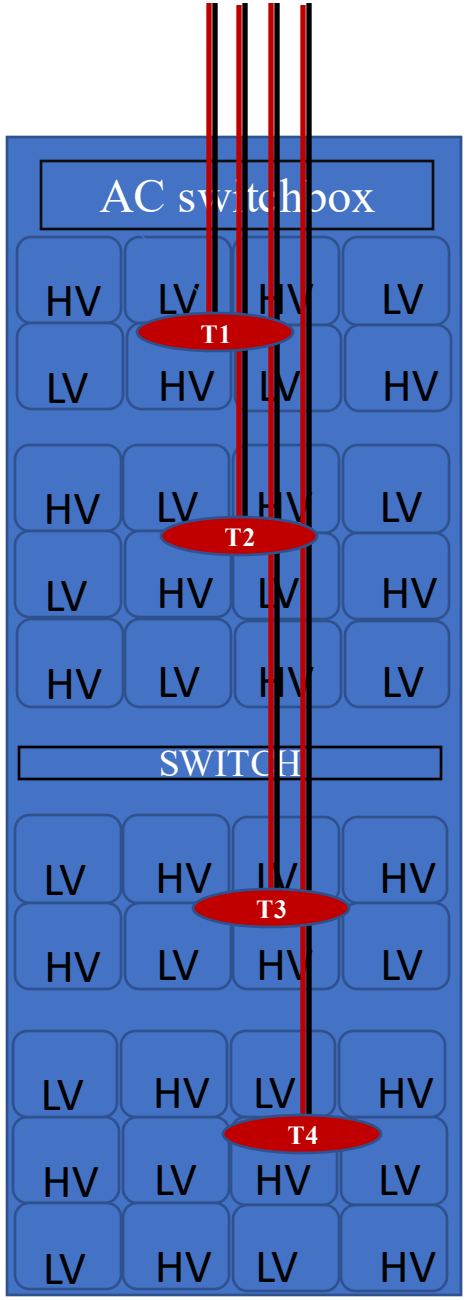
1) When the Vacuum level stays in the range **0.1 Torr : 500 Torr** (Upper values NOT YET finalized)

2) Shut down the rack PDUs via the AC switchbox by switching from 24 V to 0 V

Other controls: Rack Temperature Monitor

- 4 pt100 per rack has been installed to monitoring the power supplies temperature inside the rack sectors



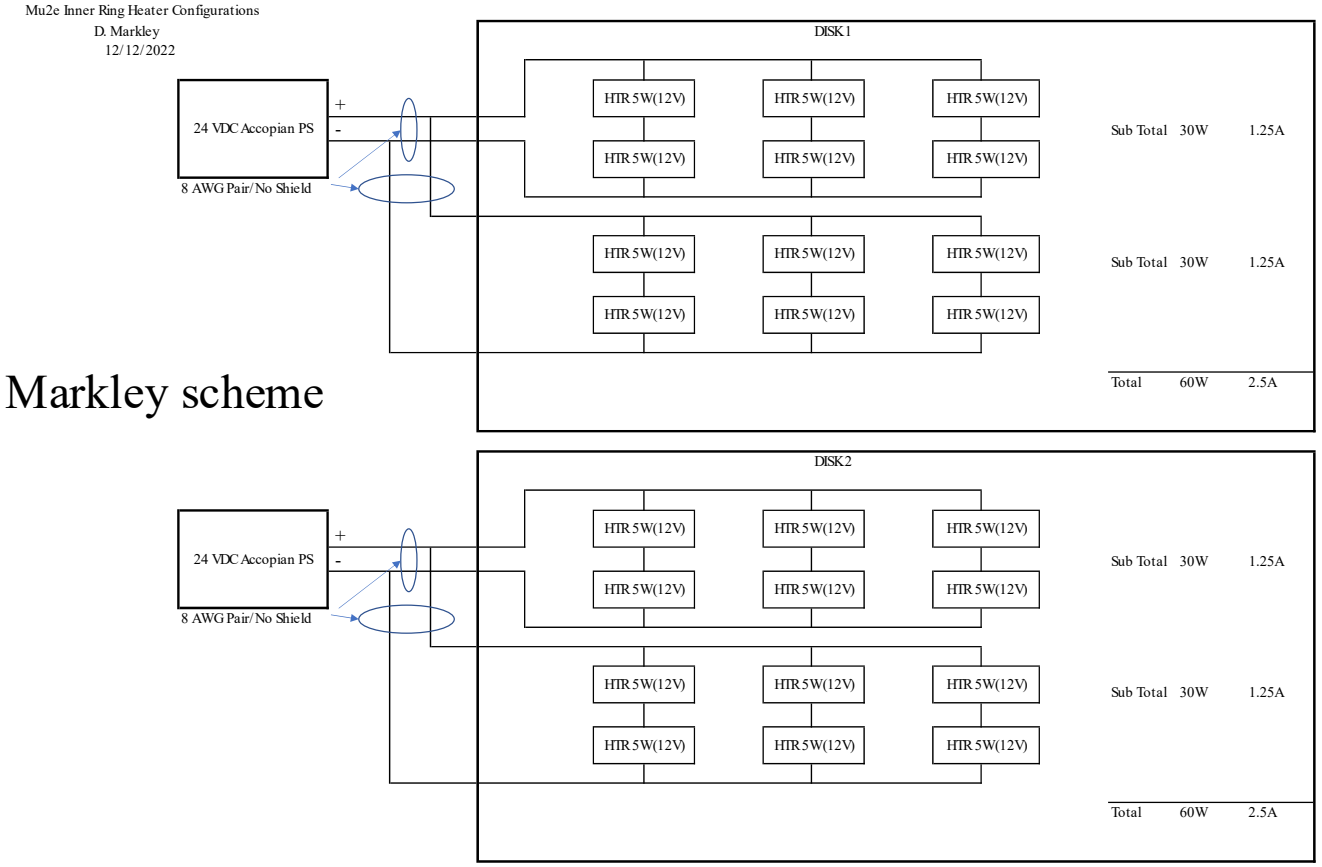


Inner Ring Temperature Control

- The calorimeter Inner Ring is a potential cold spot that could create problems to the Tracker temperature.

Indeed, not all the tracker is protected by the reflective screen in front to the calo

D. Markley scheme



- PLC will monitor and control the inner rings temperature with 7 PT100 (3 wires controlled) and 12 heaters for each disk.