Master Panel Board

dRICH meeting - Novembre 06th 2024

Since 2021 the Ferrara electronics group has contributed to the development of the ePIC experiment with the MasterLogic cards (1 and 2) and Adapters cards (32 and 64 channels). The task of the MasterLogic cards was to regulate the voltages and read the detector temperature.

Now moving towards the final version of PDU it is necessary to create a new version of the control card compatible with the ePIC framework that we will call MASTER PANEL.

MasterLogic1

(2021)



Test beam setup (2021)



MasterLogic2 (2023)

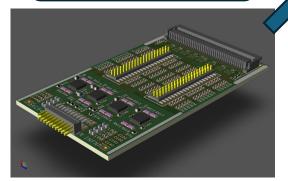


Test beam setup (2023)

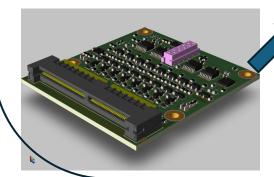
THE BACKGROUND



Adapter Carrier to ALCOR 64 channels (2023)



Adapter Carrier to ALCOR *32 channels* (2021)

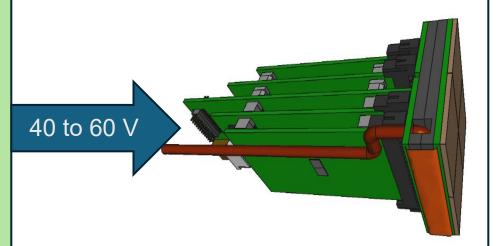


Master Panel Block Diagram PDU 1: Power supply distribution (Photo Detector Unit) 1 RDO Board 1.4V The MasterPanel Board distribute 4 FEB Boards Analog Power Supply to PDU: 1.4V to RDO (digital P.S.) 2.7V to RDO (digital P.S.) 1.4V Digital 1.4V to FEBs (analog P.S.) 2.7V to FEBs(digital P.S.) 1.4V to FEBs (digital P.S.) Without monitoring functions. 2.7V Only for power routing. Digital

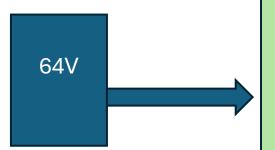
2: SiPM Voltage Bias supply distribution

PDU (Photo Detector Unit)

1 RDO Board 4 FEB Boards 256 SiPM



I and V measures



The MasterPanel Board regulate and distribute VBias to PDU:

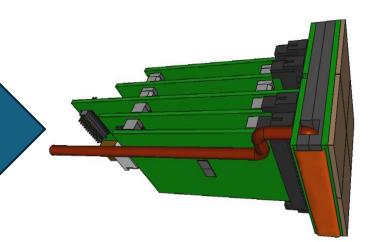
One Vbias regulator for PDU. The current and output voltage is measured for diagnostic purpose.

To reduce the wiring size the Vbias is split in 8 sector for each PDU.
(1 sector is a group of 32 SiPM)

3: SiPM Voltage Annealing supply distribution

PDU (Photo Detector Unit)

1 RDO Board 4 FEB Boards 256 SiPM



V Annealing 1 0 to -12V

V Annealing 2 0 to -12V

V Annealing 3 0 to -12V

V Annealing 4 0 to -12V

V Annealing 5 0 to -12V

V Annealing 6 0 to -12V

V Annealing 7 0 to -12V

V Annealing 8 0 to -12V The MasterPanel Board
Switch the Annealing current to SiPMs sectors.

Output voltage is measured for diagnostic purpose.

When Annealing process is active Vbias regulator is switched off.

V measures

4: Monitoring functions

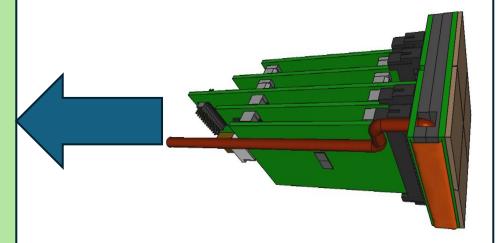
PDU (Photo Detector Unit)

1 RDO Board 4 FEB Boards 256 SiPM

Temperature measures

The Master Panel Board Reads 4 NTC (temperature sensor) for PDU.

Temperature measure in necessary as feedback for cooling system and annealing process.

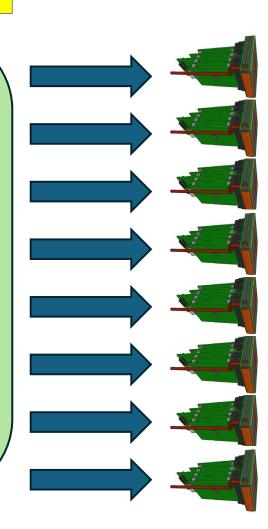


EACH MASTER PANEL IS CONNECT TO 8 PDU

PDU (Photo Detector Unit)

A Master Panel Board perform:

- 8 Vbias voltage regulations,
- 8 Vbias Current Measurements,
- 8PDU x 8 Sector V Annealing switch,
- 8PDU x 8 Vbias/Annealing Measurements,
- 8PDU x 4 temperature sensor measurements.



PDU (Photo Detector Unit)

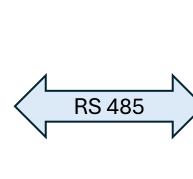
5V

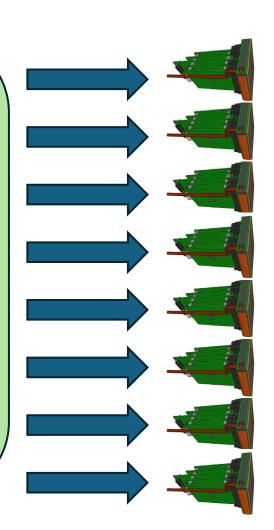
A MICROCONTROLLER IN EACH MASTER PANEL PERFORM:

- Voltage regulations (i.e. DACs programming),
- V Annealing switch (MOSFETs driving),
- Current measurements (ADC reading),
- Voltage measurements (ADC reading),
- Temperature measurements (ADC reading).

+5V 100mA supply a Master Panel Board.

Data transit on an RS485 connection.





CONCLUSION

THE NEXT STEPS ARE:

- Tests single blocks (i.e. voltage regulator, MOSFET switch, ADC, ecc) to validate the project,
- Define the communications protocol,
- Chose the power supply connectors and cables,
- Design, in collaboration with mechanical engineers, the PCB.



