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Electronic Racks for the Micro-vertex detector

1 Introduction

The racks for the electronics of the ZEUS micro-vertex detector will be placed in the region of the veto wall racks at the entrance to the ZEUS experiment at the west wall.

We hope that three racks will be sufficient. WE ASSUME THAT HV NEEDS NOT MORE THAN HALF RACK. If more racks are required we may use some racks B-1-11 and B-1-12 in the second floor of the rucksack. The electronic racks will house crates for ADCs, high and low voltage, clock and control and a crate for micro-vertex detector slow control.

In addition the micro-vertex detector needs a rack for the water cooling system which will be placed at the south west balcony N/O of the experiment or at the west wall near the emergency cooling of ZEUS.

2 Rack position and allocation

We assume that we require three racks which will be positioned as shown in fig. 1. It is assumed that existing vetowall and cryo tower racks cannot be moved, but that the calorimeter pump can be repositioned, and that the racks will be closed during operation which should mean that no additional fire safety requirements exist although a pedestal construction on which the racks will sit is required to allow cable, water cooling and power distruibution within the racks and this volume will almost certainly have to be instrumented as a fire safety area. Three racks will provide acceptable, through-traffic, access to and from the vetowall area.

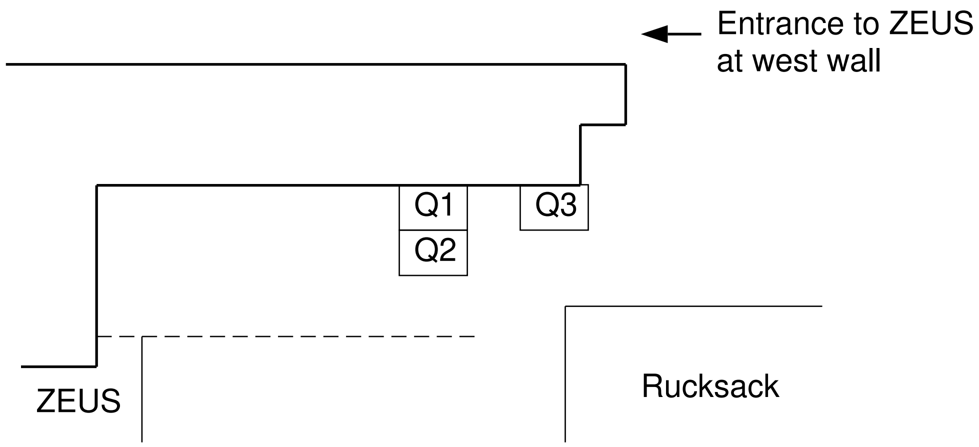

Figure 1: Position of electronic racks in the area of the veto wall racks. Access to the racks from the back side is possible

As a starter we assume that the ZEUS standard blue rack can be used. We plan to use those racks currently standing in the hall computer room (201). Their use has a number of advantages: zero cost, existing connections to crate and rack slow control, known cooling capabilities, an over-temprature power off bi-metal switch, and existing smoke detector installation and connection to the fire safety system, etc.. The dimensions of the racks are 60 cm width, 90 cm depth and 243 cm height.

The precise number of racks required and the allocation of crates, both VME and custom, within them should know be definable. Using the information currently available, Table 1, the allocation would be similar to that shown in Fig 2. and requires 3 to 4 racks.

Table 1. Known Vetowall 19 inch space requirements

type	Number	height (U)	depth (cm)	Cooling (KW)	what
VME crate	3	9U	34+32	$\leq$2	ADC
Custom crate	6	6U	?	$\leq$2	+-2 V LV
Specoal? HALF RACK??	?	?	?	High Voltage system	
VME crate	1	6U	16+32	$\leq$1 ?	SC crate
VME crate	1	6U	16+32	$\leq$1 ?	Clock and control

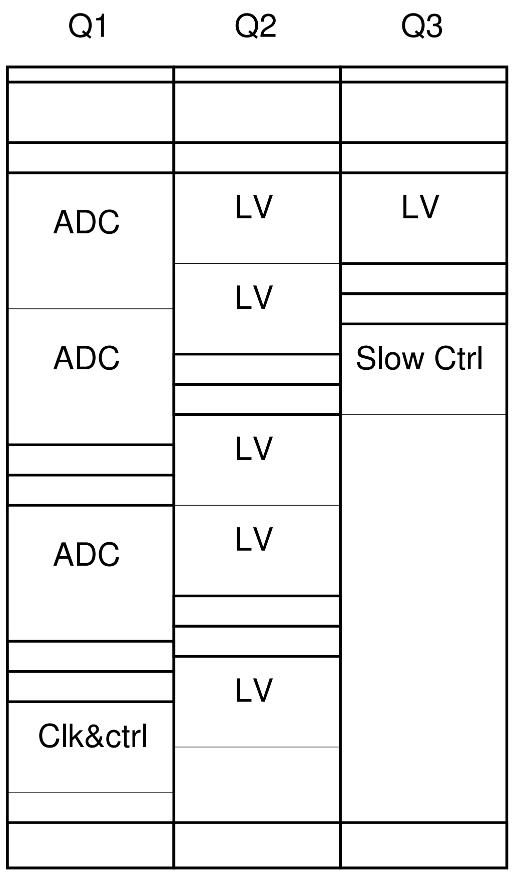

Figure 2: Allocations of crates in the electronic racks.

2.1 Power connections to racks and crates

The rack power distribution scheme, described here, is a repetition of the power distribution system used in the racks of the ZEUS rucksack with some additions specific to the micro-vertex detector:

- All racks are switched off if there is a gasalarm in the ZEUS hall or if electricity has to be off by an emergency power off.
- All electronic racks for the micro-vertex detector can be centrally switched off by a single switch. The water cooling rack will not be switched off by the central switch.
- All electronic racks will be separately switched off if the temperature sensor in the rack or the rack's monitor unit give an alarm.
- Some crates (low voltage, high voltage) will be switched off by software if the temperature sensors for the corresponding part of the micro-vertex detector is too high.
- High voltage crates will be inhibited if the corresponging low voltage is not switched on.
- In addition to these safety measures we will install a safety loop. If the temperature in the micro-vertex detector rises above a certain limit because the normal temperature monitoring system failed we will switch off the low and high voltage crates.

Fig 3 shows the basic power distribution system.

3 The interlock system (safety loop)

The MVD interlock slow control component is required to ensure the safe operation of the MVD detector. Like in each heating system (heater, boiler) a separate switch (typically 100 degrees) is installed in addition to the thermostat which regulates the temperature. If the thermostat fails the safety switch will shut down the heater - and it will stay off. For the micro-vertex detector the consensus is that this will be acheived with a simple "hardware" system, using relays, which does not require intelligent intervention from computer based programs.

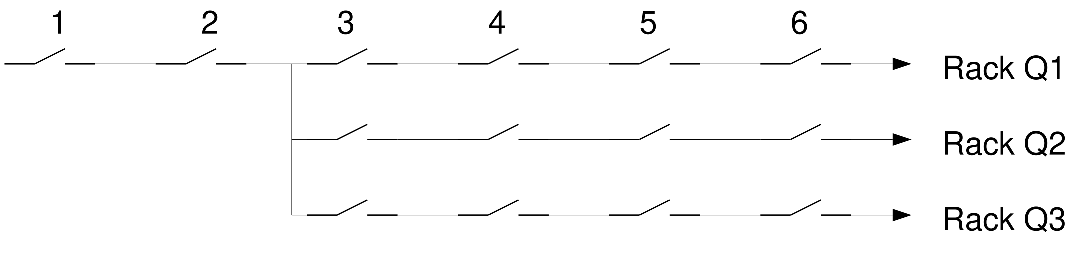

Figure 3: Power distribution to electronic racks. Switch 1: Open if there is a gasalarm or an emergency power cut in the ZEUS hall. Switch2: Central switch for all MVD electronic racks. Switch 3: To switch rack on. If the rack is switched off due to switch 1, 2, 5 or 6 it will remain off until it is switched on by switch 3. Switch 4: Switch rack off. If the switch is not released one cannot switch the rack on. Switch 5: Monitor unit of the rack. Switch 6: Temperature in rack to high

The current design of the interlock is show schematically in Fig. 4. A relay based hardware system will switch off power to crates in the MVD electronic racks, and prevent the power being turned on. Fig. 5 shows some details of the interlock system. The temperature switches are passively connected to the CAN input interface. The first switch which opens in case of high temperature generates 5V input to the CAN input module. The relais will switch off the LV and HV crates. The software will read the CAN input module and will turn the corresponding LED on via the CAN output module. When the temperature decreases the temperature switch will be closed. The corresponding LED will start to blink (via software) until the crates may we switched of after having given a reset. Cables will be routed from the MVD via the patch panel to the cooling rack and from there to the racks at the veto wall area.

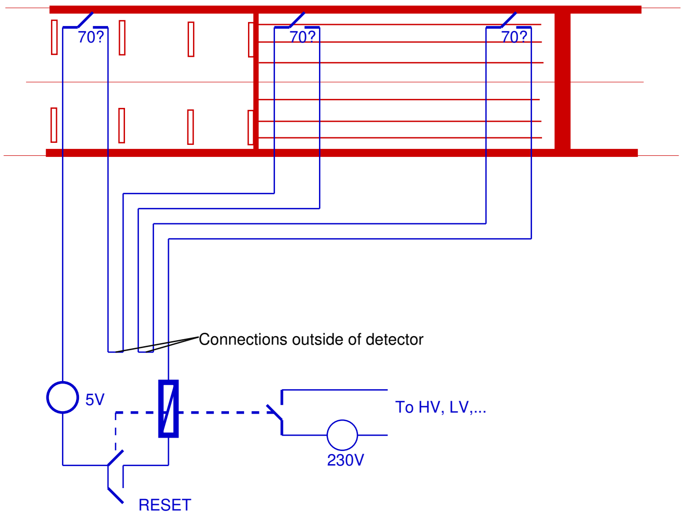

Figure 4: If the normal temperature monitor system fails and the temperature in the MVD rises above (here) 70 ^{o} the crates for low and high voltage will be switched off and remain off until reset.

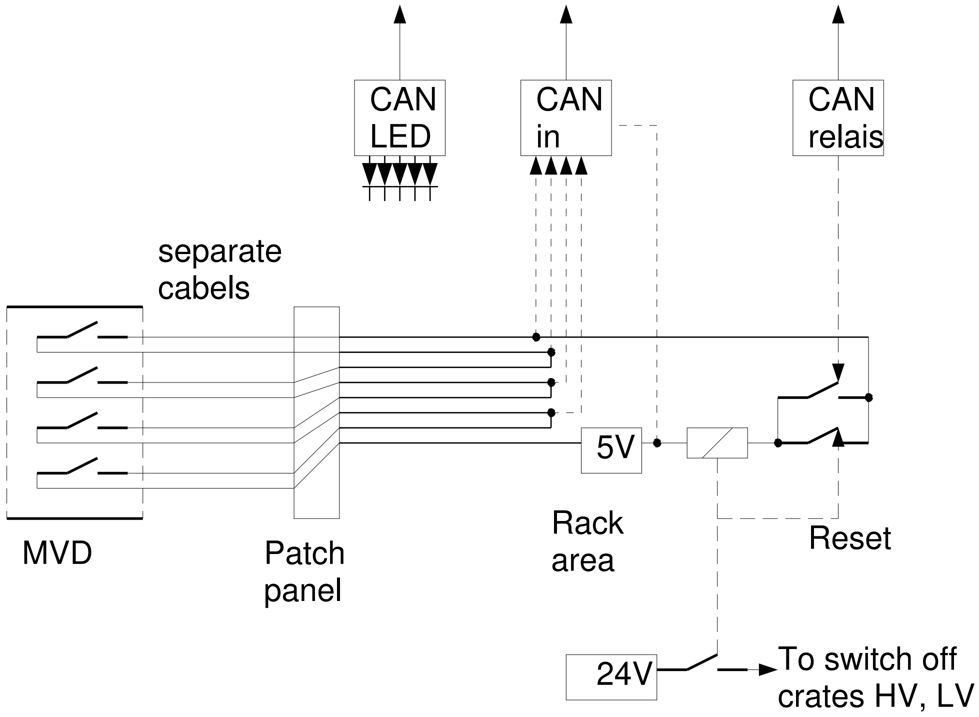

Figure 5: Interlock system (safety loop). If the temperature in the MVD gets too hot the crates (HV, LV) will be switched off and will remain off. They can be switched on after reset (Manually or by CAN). If a temperature sensor fails it can be bridged outside the MVD.