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Engineering Note

Date: 12.18.2012
Rev Date:

Project: MicroBooNE D0DAQ Test Stand Readout Rack ORC
Doc. No: B121812_Bagby_D0DAQ_TS_Readout_Rack

Subject: MicroBooNE D0DAQ Test Stand-Readout Rack ORC Request
Team members: L. Bagby, L. Camilleri, H. Chen, D. Huffman, G. Karagiorgi, B. Littlejohn

Introduction:

The MicroBooNE collaboration has constructed an electronics test stand in room 313 of the D0 Assembly Building (DAB). This room is located next to the Hurricane Deck meeting room on the third floor of the building. The test stand consists of three electronics racks; DAQ, Readout, and Power. The DAQ rack received ORC clearance November 1, 2012. The complete report can be found here:

http://www-ppd.fnal.gov/EEDOffice-w/Projects/MicroBoone/ORC/D0DAQ_TS_ORC.pdf

The collaboration requests an ORC review of the Readout rack for unattended operation. The Power rack ORC review will be requested at a later time.

Figure 1: DAQ Test Stand Readout Rack

The Readout rack contains the following commercially available equipment:

1 Mech-Tronics Model 201 NIM Bin, assorted modules

1 1U Fan Tray

1 PL508 Wiener Power Supply

1 Eaton 208, 3-phase Power Strip, PW309BA0U409

The Readout rack contains the following custom designed electronics:

1 Nevis designed Readout Crate, all custom electronics

1 3U Fan Tray with plenum

1 Fermilab designed AC Switch Box

EDR Reviews:

A Pre-Production Engineering Design Review was conducted on the custom design electronics housed in the Readout crate July 18, 2012. A summary of the findings are posted under Round 1, Item #1 (Review Findings and Approvals) here:

http://www-ppd.fnal.gov/EEDOffice-w/Projects/MicroBoone/EDR/Round_1.html

The items requiring attention for ORC approval are cited below.

DC Distribution:	Cover rear of crate with Lexan to prevent accidental shorting of bus work.
	Install an insulating spacer between +4V and RTN bus bars.
	Mechanically restrain cables rather than using adhesive backed cable-tie anchors.
Backplane:	Cover +12VDC exposed trace on backplane, as viewed from the inside of the crate, with Kapton tape.
	Label DC power bugs on backplane as viewed from the rear of the crate.
Trigger card:	Label fuse values on board.
FEM:	Label fuse values on board. (Shown in Figures 2 and 3.)
Controller:	Label fuse values on board.

All of the issues have been addressed in the D0DAQ Readout crate.

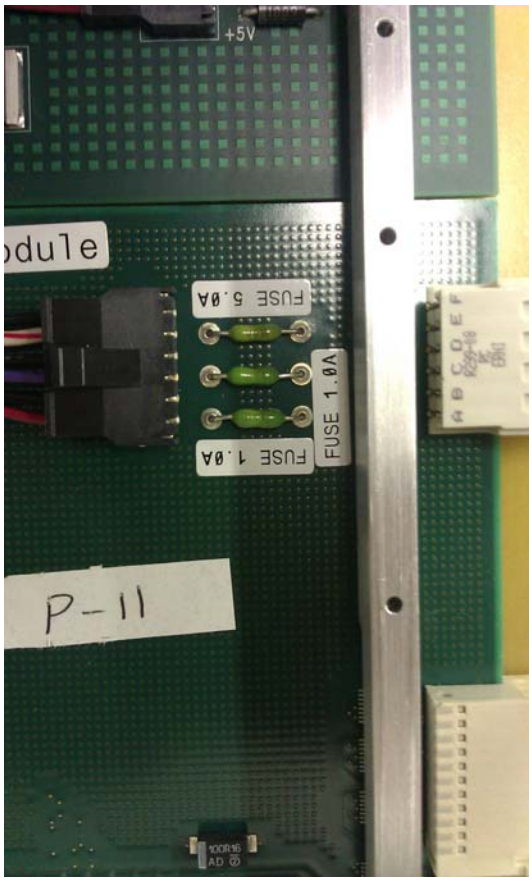

Figure 2: FEM 1A and 5A Fuse Labels

Figure 3: FEM 1A Fuse Labels

DC Distribution:

Figure 4 is the schematic for the DC Distribution circuit. Power is provided to the custom designed backplane by a Wiener PL508 power supply. Fusing is appropriate for the cable sizes as shown in the drawing. Production bus bars are used to distribute current along the backplane. A G-10 spacer has been placed between the bus bars as requested by the backplane EDR. Figure 5 illustrates the DC fusing for the Trigger Card. Bus bar calculations and Sense line fusing details can be found on Dave's website under DC Distribution here:

http://www-ppd.fnal.gov/EEDOffice-w/Infrastructure_group/Huffman/Web/uboone/default.html

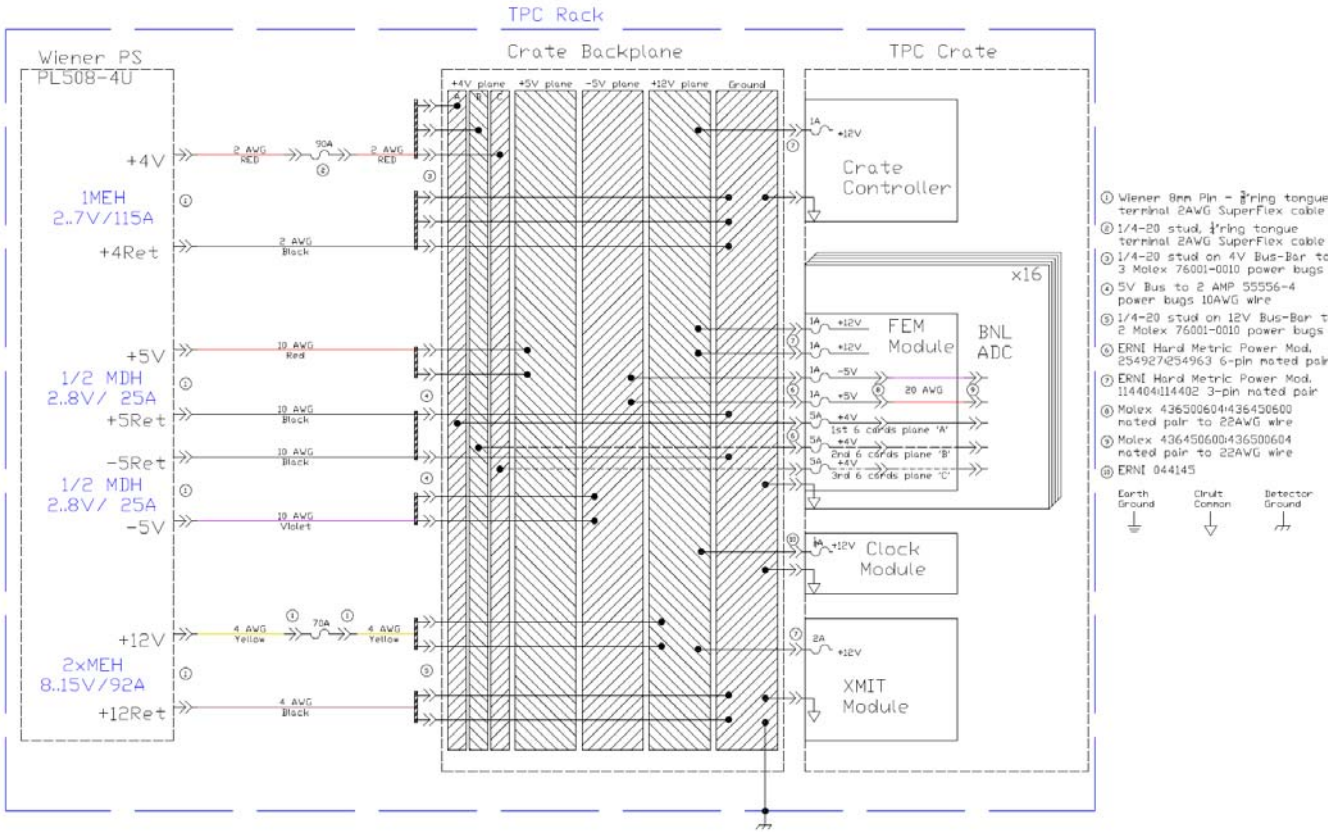

Figure 4: DC Distribution

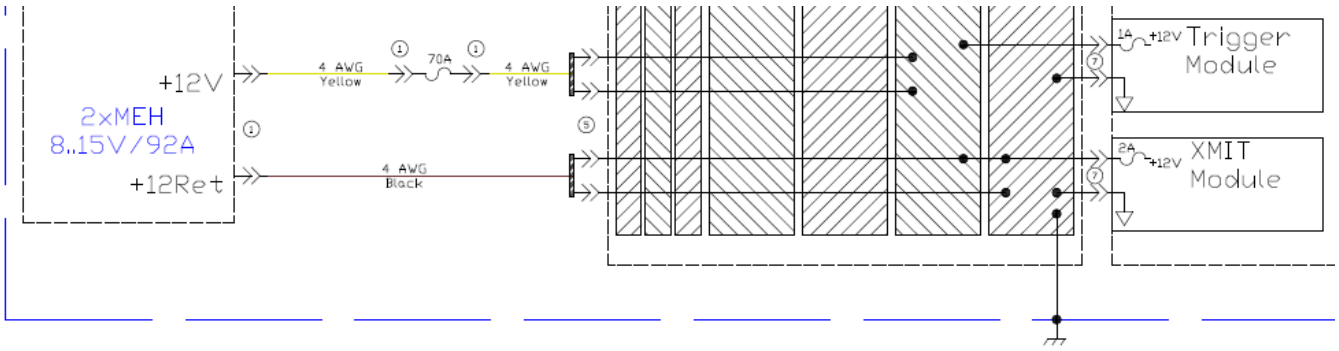

Figure 5: Trigger Module DC Distribution

AC Distribution:

The AC Distribution consists of two components; a commercial Eaton ePDU-PW309BA0U409, 208 3-phase power strip and a custom designed AC Switch Box. Figure 6 is the line drawing for the AC distribution circuit. 5 conductor, 10AWG cable is used with NEMA L21-30R and L21-30P plugs and receptacles. Figure 6 is the AC Switch Box schematic. More information can be found on Dave Huffman's site under AC Distribution and AC Switch Box.

http://www-ppd.fnal.gov/EEDOffice-w/Infrastructure_group/Huffman/Web/uboone/default.html

Eaton ePDU specifications are here: http://powerquality.eaton.com/ePDU-PW309BA0U409.aspx?CX=3

Relay specifications are here: http://www.crydom.com/en/Products/Catalog/5_3tp.pdf

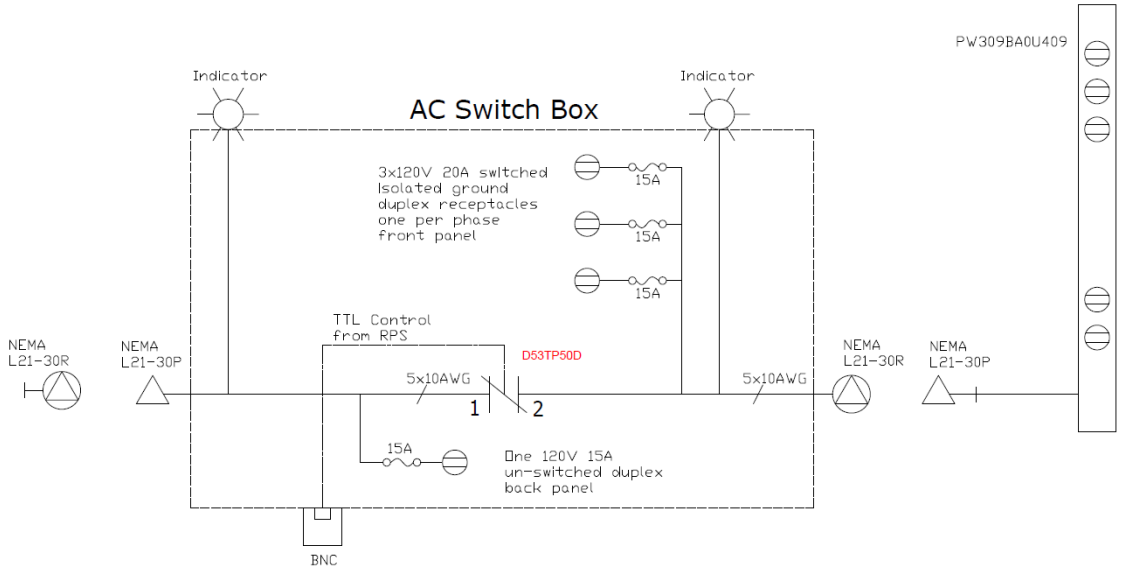

Figure 6: AC Distribution Line Drawing

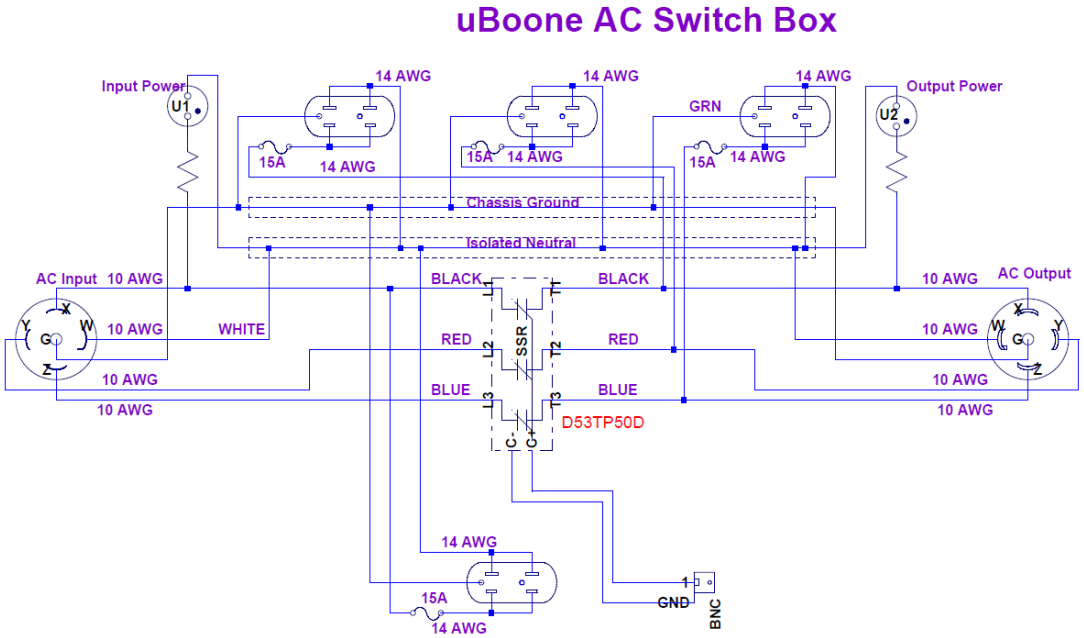

Figure 7: AC Switch Box Schematic

Rack Protection System:

The Readout Rack is monitored for smoke by the Rack Protection System chassis housed in the DAQ Rack. An additional System Sensor 2W-B smoke detector has been installed in the Readout Rack on the same circuit as the DAQ Rack sensors, Figure 8. If smoke is detected in one of three areas, AC power is removed from both the DAQ and Readout racks. Smoke detectors are mounted in the top areas of both racks and above the PCIe cards in the DAQ rack. The output interlock signal from the Rack Protection System chassis is connected to the AC Switch Box in the Readout rack via a RG58 cable terminated with a BNC connector. This interlock controls the D53DP50 switch inside the AC Switch Box, supplying or removing power to the Eaton power strip. Specifications for the System Sensor can be found here: http://www.systemsensor.com/pdf/A05-0318.pdf

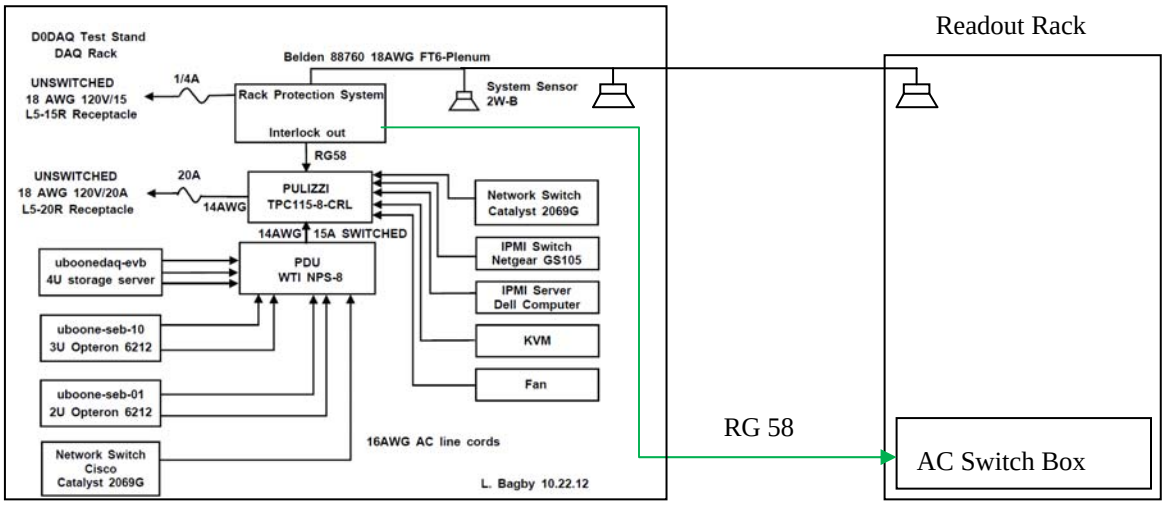

Figure 8: Rack Protection System