

MINERvA

Hot Spares Rack

Electrical Documentation

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Location: MINOS Near Detector Hall

During the MINERvA Data Acquisition System review, it was found that an electronics rack was needed, underground, to hold powered, mission critical, pieces of equipment. This pORC describes the Hot Spares Rack used to hold this equipment. The Minerva experiment requests unattended operation of this rack.

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MINERvA Hot Spares Rack

1 Introduction

The Minerva Data Acquisition System Review Committee cited the need for an electronics rack, located in the MINOS Near Detector Hall, which contains powered spare computers. A Hot Spares Rack has been built which holds the required equipment. A new Rack Protection System has been designed for the rack because a production version, used in other Minerva electronics racks, is now cost prohibitive. In addition to powered DAQ PCs, the rack will contain the production spare AC Distribution Box and BiRa Rack Protection System chassis. The Hot Spares Rack is located on the west side of the MINOS cavern, close to the staircase (Figure 1).



Figure 1: Minerva Hot Spares Rack Location

2 Hot Spares Rack Layout

Figure 2 shows the layout of the Hot Spares Rack. Links to the technical specifications for each component are found in Appendix A.

HOT SPARES RACK

SSDIB
SPACE
AC Distribution Box
SPACE
Cisko Switch
SPACE
minervadaq04
SPACE
mnvonlinebck1
SPACE
mnvonlinebck2
SPACE
PC
SPACE
mnvonline2
SPACE
PDU
SPACE
Spare RPU
Spare
AC Distribution Box

UPS

Figure 2: Hot Spares Rack Layout

The SSDIB (Simple Smoke Detector Interlock Box) is a simplified version of the Minerva production BiRa Rack Protection System. This chassis provides an interlock output to the AC Distribution Box and an immediate emergency shut-off to the UPS in the event smoke is detected in the rack. The SSDIB has been reviewed by the PPD Engineering Review Committee. The committee’s review findings and operational approval can be found here

http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spa res/SSDIM.pdf

The AC Distribution Box is used throughout the Minerva experiment and has also obtained operational approval from the PPD Engineering Committee.

3 AC Power Distribution

The AC power distribution line drawing is shown in Figure 3. The AC Distribution Box receives power from a 30A, 208V, AC outlet. The current is limited by a 30A circuit breaker located in the service’s main breaker panel. A NEMA L21-30 twist and lock connector is used on a 6 foot, 10/5, SO cord. The 20A output service is limited by an internal 20A circuit breaker, part number P&B W67-X2Q12-20. A schematic showing circuit breakers and wire gauges internal to the AC Distribution Box can be found in Appendix A.

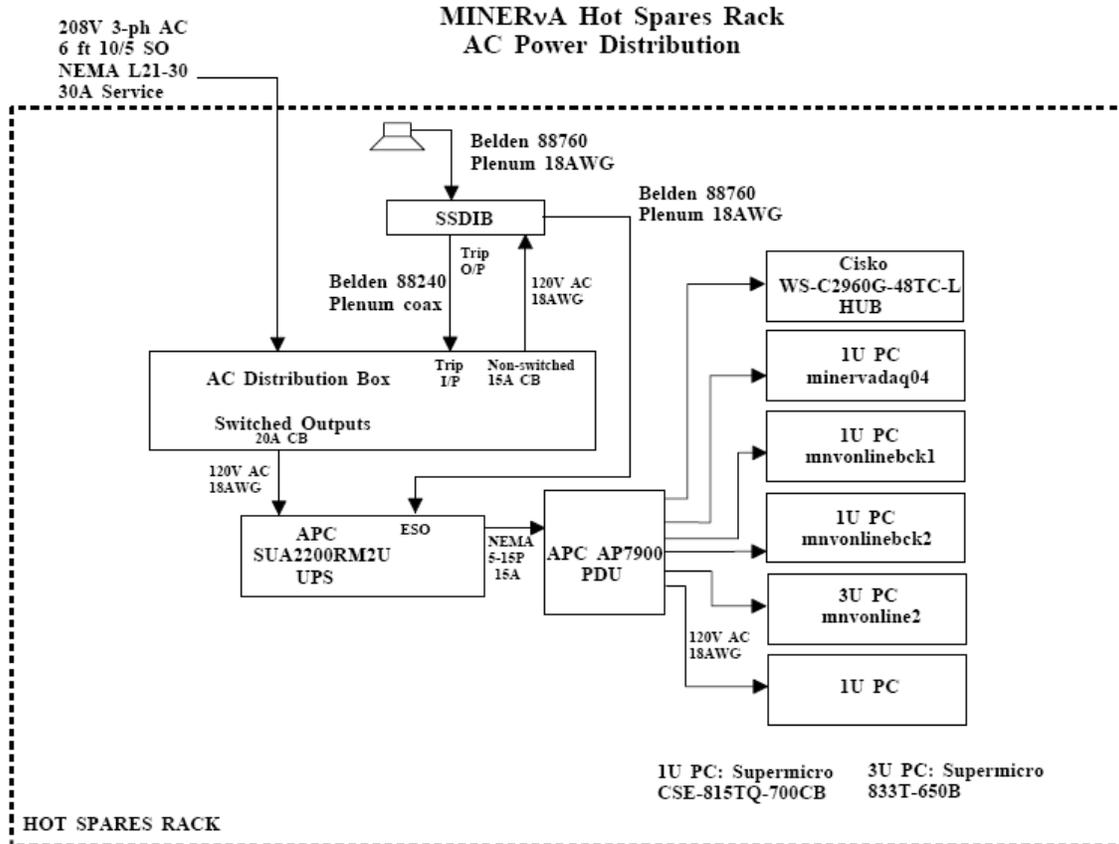


Figure 3: Hot Spares Rack AC Distribution

The AC Distribution Box utilizes a Crydom D53TP50D solid state relay to remove power from all interlocked loads via the interlock control signal (Belden 82240) originating from the SSDIM (Simple Smoke Detector Interface Box). The interlocked load is the APC SUA2200RM2U, Uninterruptible Power Supply (UPS). The power cord for the UPS and all computers are 18AWG. The non-interlocked output of the AC Distribution Box powers the SSDIB and is fused at 2A. The computers, PDU (Power Distribution Unit), and Cisco switch are commercially available equipment.

4 Rack Protection

The rack protection system is composed of a smoke detector and power interlock chassis (SSDIB). In the event smoke is detected, an interlock trip condition is sensed by the AC Distribution Box. Power is removed from all interlocked outputs via circuit breakers. Since the only interlocked output from the AC Distribution Box is the UPS, this action would normally engage the UPS battery output. However, the SSDIM also has a normally open dry contact output which closes and immediately shuts down the UPS

battery output via the EPO feature. Belden 88760, 18AWG, FT6, plenum cable is used for the smoke sensor and EPO connections.

Figure 4 is the schematic for the SSDIB and smoke sensor. The SSDDIB is fused at 1A with 16 AWG wire. The smoke sensor used is a System Sensor model number 4W-B. The alarm current for the device is 20mA at 12V.

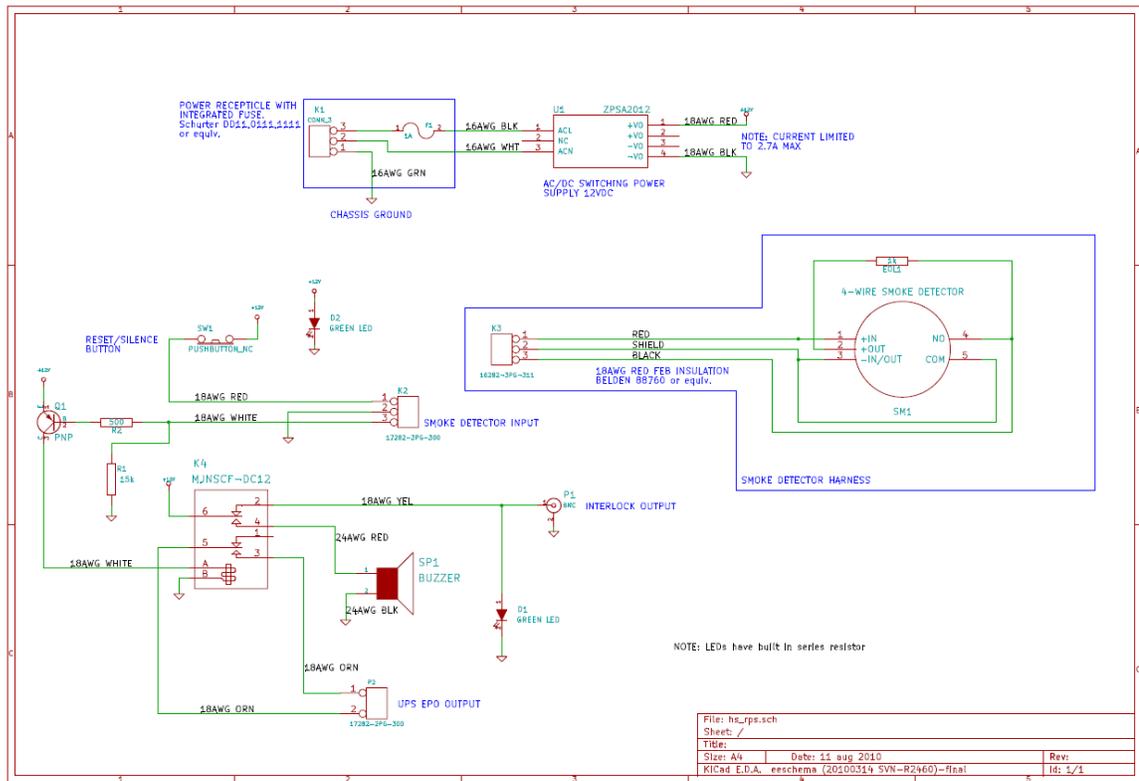


Figure 4: SSDIB Rack Protection Chassis and Smoke Sensor Schematic

5 Appendix A – Technical Documentation Links

Appendix A provides links to all technical documentation of the equipment in the Hot Spares Rack.

SSDIB (Simple Smoke Detector Interlock Box)

Description: http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spares/Equip/Mini_RPU.pdf

Schematic: http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spares/Equip/Mini_RPU_Sch.pdf

Smoke Sensor

Specifications Sheet: http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spares/Equip/4W_B.pdf

Engineering Note:

http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spares/Equip/4W_B_Eng.pdf

Installation and Maintenance Instructions:

http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Hot_Spares/Equip/4W_B_Inst_Main.pdf

AC Distribution Box:

Description: http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/Power_Dist.pdf

Schematic:

http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/FINAL_ORC/AC_Dist_Mod.pdf

Cisco Switch- WS-C2960G-48TC-L:

http://www.cisco.com/en/US/prod/collateral/switches/ps5718/ps6406/product_data_sheet_0900aecd80322c0c.html

Computers

SC833T-650B: mnvonline2

<http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/SC833T-650.pdf>

SC815TQ-700CB: mnvonlinebck1, mnvonlinebck2, minervadaq04

<http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/SC815TQ-700C.pdf>

PDU- AP7900: <http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/PDU.pdf>

UPS- SUA2200RM2U: <http://www-ppd.fnal.gov/EEDOffice-w/Projects/CMS/Minerva/Elect/UPS.pdf>