Fermilab

PPD / EED / Infrastructure Group
Technical Note: IG_ 20100002
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Test of the Smoke Detection and AC Power Interruption System for NOvA Near Detector Surface Building Electronics Racks

Overview:

This afternoon, Andrew Norman and Michael Matulik performed a test of the smoke detection / power interruption systems used in each of the two electronics racks located on the upper platform of the NOvA Near Detector Surface Building (NDSB).

Details of the Smoke Detection and AC Power Distribution / Interruption system can be found in PPD / EED Infrastructure Group Technical Note IG_20100001.

Details:

A FESS Fire Technician came to the NDSB prior to our test to temporarily disable the building VESDA system. After the tests were completed, the VESDA system was re-enabled.

Each of the two racks has two Wiener power supply chassis powered at 240V AC. There is additional ancillary equipment in each rack that operates at 120V AC. In the event of a smoke detector trip, we expect that the ancillary equipment and the Wiener power supply chassis would lose their AC power.

Currently, there are only two Wiener power supply modules (they mount in a Wiener chassis) at the NDSB. We transferred the two modules from chassis in one rack to the other so that both racks could be tested.

Test Procedure:

With Wiener power supply modules installed and operating and ancillary equipment operating, a small amount of canned smoke was sprayed into a temporary enclosure placed around the smoke detector in the rack being tested. We observed the state of the status LED on the smoke detector and observed the reaction of the equipment in the rack.

Results:

Control Station Rack:

The smoke detector status display LED indicated the presence of particulate by changing from a slow green flash to a yellow flash, then the indication of a tripped state by a solid red. The D0 Rack Monitor Interface in the rack detected the tripped state and responded by lowering the interlock signal voltage to a TTL low level. The three solid state relays in the rack (one for 120V, two for 240V) properly responded to the lower interlock signal level and opened their power connection(s). This was verified by observing that the Wiener power supplies and the ancillary equipment ceased to operate.

High Voltage Rack:

The smoke detector status display LED indicated the presence of particulate by changing from a slow green flash to a yellow flash, then the indication of a tripped state by a solid red. The D0 Rack Monitor Interface in the rack detected the tripped state and responded by lowering the interlock signal voltage to a TTL low level. The three solid state relays in the rack (one for 120V, two for 240V) properly responded to the lower interlock signal level and opened their power connection(s). This was verified by observing that the Wiener power supplies and the ancillary equipment ceased to operate.

Observations:

While the Wiener power supplies turned off, there seemed to be a delayed response to the loss of AC power. Observing the front panel of the Wiener Power Supply Module, the indication of output power turning off was coincident with the dropping of the interlock. The front panel display and several of the LEDs remained on for several seconds, presumably executing a safe turn off.