

Fabrication of the High Voltage Supply Cables for the Hall C Neutral Particle Spectrometer Photomultiplier Tubes

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To provide ~1100 V to the photomultiplier tubes (PMTs) of the Hall C Neutral Particle Spectrometer (NPS), high voltage cables were fabricated. This note details their fabrication.

Forty high voltage cables were fabricated. Each cable is ~145 feet long, with forty-two, 26-AWG, insulated conductors, procured from General Wire Products. The cables were terminated at one end with a Radiall 52-pin connector and at the other with three Samtec connectors (two 30-position and one 16-position).

To terminate the cable with the Radiall connector, first the Radiall connector was disassembled and the shroud (back-shell) removed from the connector. The shroud and three $\frac{1}{2}$ "-diameter pieces of heat shrink, two cut to 1" and one cut to 2", were slipped over the cable jacket; the cable jacket was stripped 1.88", Fig. 1.

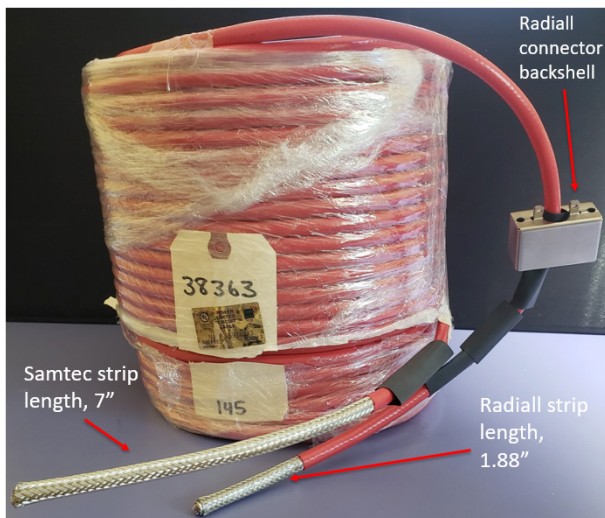


FIG. 1. Cable with jacket stripped back at both ends. Heat shrink and Radiall connector backshell are in place.

For the drain wire, the braid was cut to be 1" long and the foil insulation was removed. The braid was then combed and wrapped around the $\frac{1}{4}$ " stripped end of an 11" long high voltage wire and soldered, Fig. 2. The solder joint was covered with $\frac{3}{4}$ " long heat shrink. If needed, the drain wire can be used to connect each cable assembly to ground.

Since only 40 conductors are needed, the two extra conductors were cut back to the strip length and left unterminated. The 40 conductors were stripped 0.12" and a pin crimped to each conductor. Using an insertion tool, each pin was pushed into the Radiall connector, Fig 3, following the DSG-developed color pinout guide, Fig 4. The heat shrink was shrunk using a heat gun, the shroud was slid onto the connector, and the connector was reassembled, Fig 5.

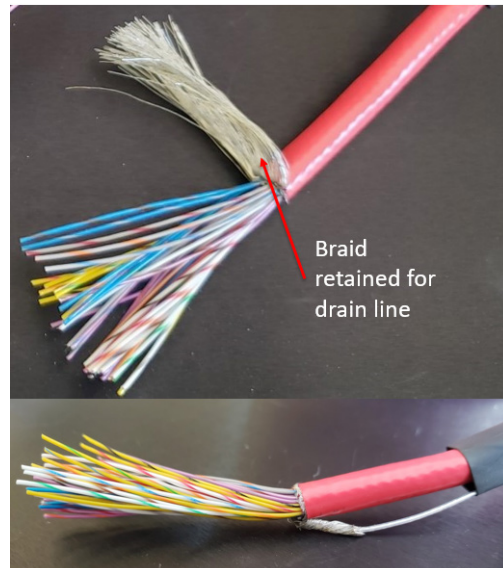


FIG. 2. Drain wire added for grounding the cable at the Radiall connector end.



FIG. 3. Terminated wires in Radiall connector.

To fabricate the Samtec connector end of the cable, first a 3" piece of heat shrink was slipped over the cable jacket. Then the cable jacket was stripped 7" and the braid and foil insulation removed. According to the color pinout guide, the conductors were grouped into three sections: Samtec 1 (30-position), Samtec 2 (30-position), or Samtec 3 (16-position). The conductors for Samtec 2 (the center connector) were trimmed to be 6", as the full 7" is not needed.

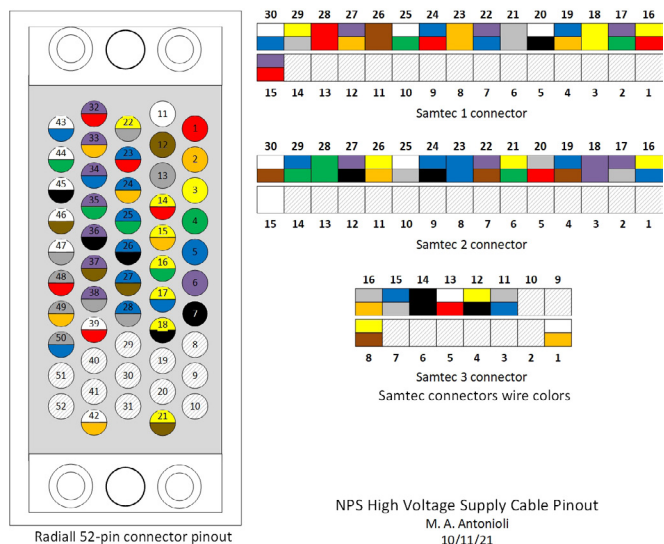


FIG. 4. Radiall-to-Samtec pinout.



FIG. 5. Radiall 52-pin connector.

All conductors were stripped 0.14", crimped, and inserted into the connectors according to the color guide, Fig. 6.

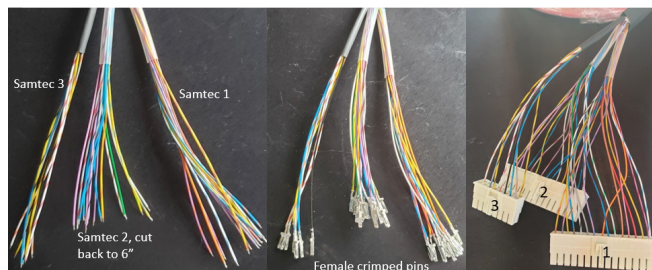


FIG. 6. The conductors at the Samtec connector end of the cable stripped and trimmed (left), with pins crimped on (center), and with connectors 1 through 3 terminated (right).

There are empty positions in each of the Samtec connectors. Since only 40 conductors are required—36 for the high voltage channels, three for the returns, and one for the safety loop—of the 76 available positions within the three Samtec connectors, 36 positions are unused.

In conclusion, 40 high voltage supply cables were fabricated. These cables were terminated with a Radiall 52-pin connector on one end and three Samtec connectors on the other and will be used to supply high voltage to the PMTs of the Hall C's Neutral Particle Spectrometer. Twelve-hour tests were conducted on these cables to confirm that the cables had no shorts or excessive leakage currents.