Fermilab

TM-1107
2836.000

A LOW-COST REPLACEMENT CABLE FOR BEAMLINE SWIC INSTALLATION

Daniel Schoo

May 1982

With the availability of the improved microprocessor controlled SWIC scanners installation of beamline SWIC systems has become much easier than in the past. Original systems used a multiconductor RG-174 coaxial cable to connect the chamber to the readout system. This cable was physically unwieldy to handle, was highly prone to failure from flexing, and time consuming to terminate. When new scanners became available, a new type of cable was used. The new cable was also a multiconductor coaxial assembly, but was bonded together in a flat ribbon that could be mass terminated to a matching connector. The new cable has many advantages over the old, but it has one big problem. It is very expensive. For installations requiring a short run, this is not a big factor compared to the advantages. For long runs of several hundred feet, it becomes very expensive to install a SWIC.

In the Meson area, most of our SWICs and scanners were no more than 20 feet apart. At this distance, our cable usage was affordable. As the beamline intensities increased, we were forced to move the scanners out of the tunnel area and into the service buildings to prevent radiation damage. We projected a need for about 13000 feet of SWIC cable. Using the AMP ribbon coax this would cost over $ 58,000. Because of this, I decided

to investigate the possibility of using a less expensive replacement. To this end, Jack Schmidt and I obtained a 510 foot roll of 19 pair twisted shielded cable from stock. We terminated each end with a standard AMP mass termination connector. We then set up a SWIC system to test the cable. We connected the first 24 wires of the vertical plane of the chamber to the cable, then plugged the cable into J1 of the scanner. We plugged the last 24 wires of the vertical plane directly into the scanner J2 input. The horizontal plane was connected directly to the scanner J3 and J4 inputs. We set up the following conditions for the test:

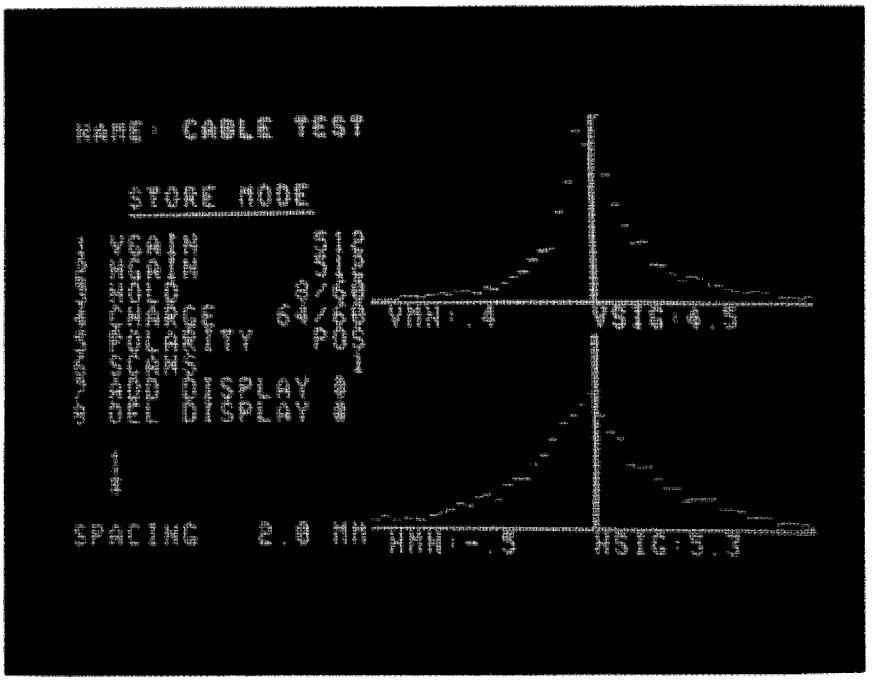
SCANNER:	Store Mode	
	Vert Gain:	512
	Horz Gain:	512
	Hold Time:	8/60
	Charge Time:	64/60
	Polarity:	Pos
	Scans:	1
	Add Display:	1
HIGH VOLTAGE:	3400 volts	

Using a 2 Millicurie Strontium 90 source on the chamber, we manually entered start and clear functions into the scanner, and opened the shutter on the source only during the charge cycle after the start command. This is the normal test procedure when checking gain SWICs. The resulting plot was better than we had hoped for. The long cable introduced a small attenuation and little or no distortion of the shape of the plot.

See the photograph for the results of a similar test using Belden 9768 cable.

On the basis of this test, we installed two SWIC systems in the Meson M-2 line. The installations each used 90 foot cables, and connected chambers that were exposed typically to 10 to the 12th particles/pulse. No irregularities were found in the plots. Several other installations have since been made using Belden 9768 12 pair individually shielded cable. 13000 feet of this cable was purchased for $ 6,600, saving over $ 50,000 in cable cost. To date no problems have been encountered from using this cable. SWICs in low and high intensity beamlines have been functioning equally well.

The obvious disadvantage to the use of this cable is the reversion back to individual termination of each conductor. It does take a lot more time to put a connector on, but this is still a reasonable tradeoff. Diagrams are included with this text to show the termination procedure for the SWIC itself and the extension cable. Since the male to male connector used to splice the AMP connector on the SWIC to the AMP connector on the extension cable is not a "crossover header" it reverses the wire numbers. The diagram shows the extension cable wire numbers reversed at each end to compensate for this reversal. With this wiring arrangement multiple extension cables can be connected together, whether they are AMP cable or Belden. AMP cables used in the Meson area are terminated with the ends reversed for the same reason.



Photograph of an actual plot made under the test conditions. The test cable was inserted in series with the wires for the left half of the upper plot. Belden 9768 12 pair individually shielded cable, 1000 foot length was used.

FERMILAB

ENGINEERING NOTE

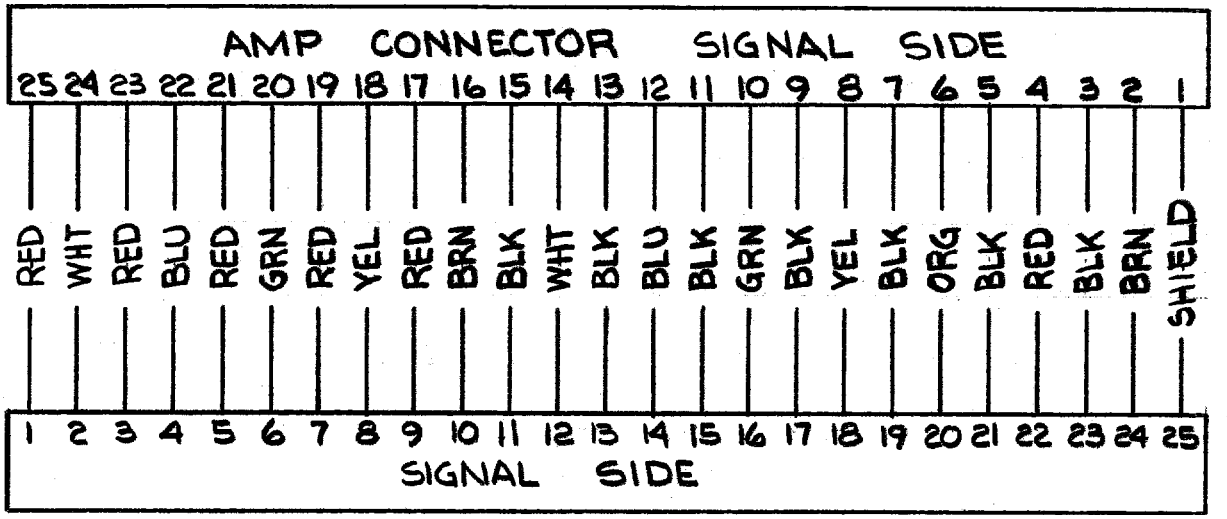
SECTION	PROJECT	SERIAL-CATEGORY	PAGE

SUBJECT: SWIC EXTENSION CABLE TERMINATION
MULTIPAIR TWISTED SHIELDED CABLE

NAME: DAN P. SCHOO

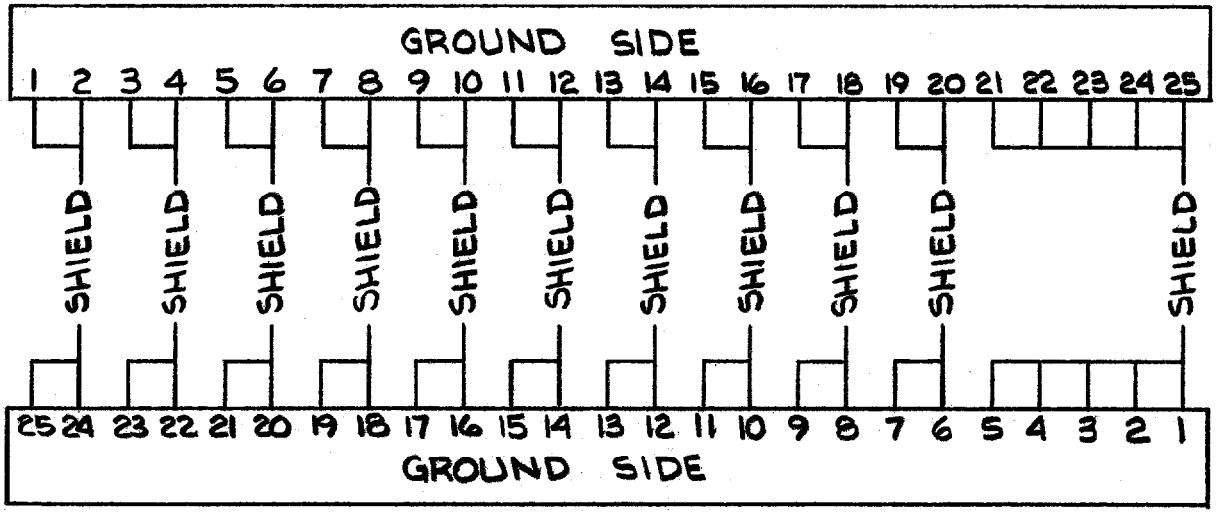
DATE	REVISION DATE
11-9-81	—

CHAMBER END



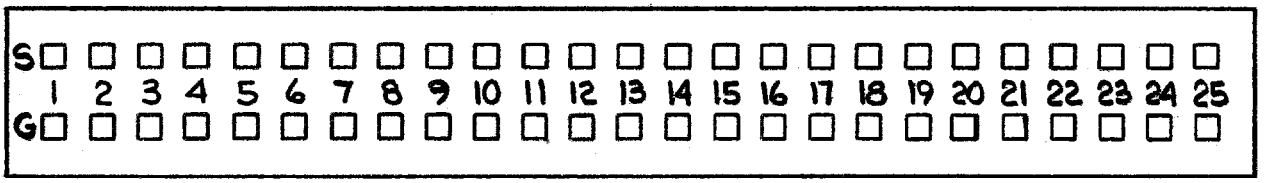
SCANNER END (CABLE: BELDEN 9768)

CHAMBER END



SCANNER END

AMP CONNECTOR
END VIEW
SIGNAL SIDE



GROUND SIDE

FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE

SUBJECT: SWIC WIRING TERMINATION
AMP MASS TERMINATION TYPE CONN.

NAME: DAN P. SCHOO

DATE	REVISION DATE
3-10-80	—