

Silicon Vertex Tracker Cables

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November 14, 2014

This note presents specifications, attachment procedure, and connector protection scheme for the cables of the Silicon Vertex Tracker (SVT).

The SVT comprises 66 modules, which are mounted as four concentric regular polygons around the target. Each polygon is called a region. The number of modules in regions R1, R2, R3, and R4 is 10, 14, 18, and 24, respectively.

Each module is powered and read out by a set of five cables. Each set contains high voltage, low voltage, slow controls, data, and external pulser cables. Cable specifications are given in Table I.

The high voltage, low voltage, and slow controls cables were fabricated by the Detector Support Group (DSG). For quality control, each cable conductor was tested for continuity and for isolation. Additionally, each cable's pin-out was checked against a color-indexed traveler, Appendix A. Test results were recorded in the travelers. Data and pulser cables were manufactured by the companies Tyco and Sabritec, per DSG specifications, Appendix B.

Data cable quality control tests on continuity and isolation were done on a test stand, which consists of a Beta Automations multi-conductor cable tester and a set of custom-designed printed circuit boards called the spy-boards, Fig. 1.

For detector assembly, prior to installing a module, the five cables of a module are bundled together. Each bundle is arranged such that the cable connectors can, with minimal stress, mate with the associated connectors on the module readout electronics board (Hybrid Flex Circuit Board or HFCB), Fig. 2.

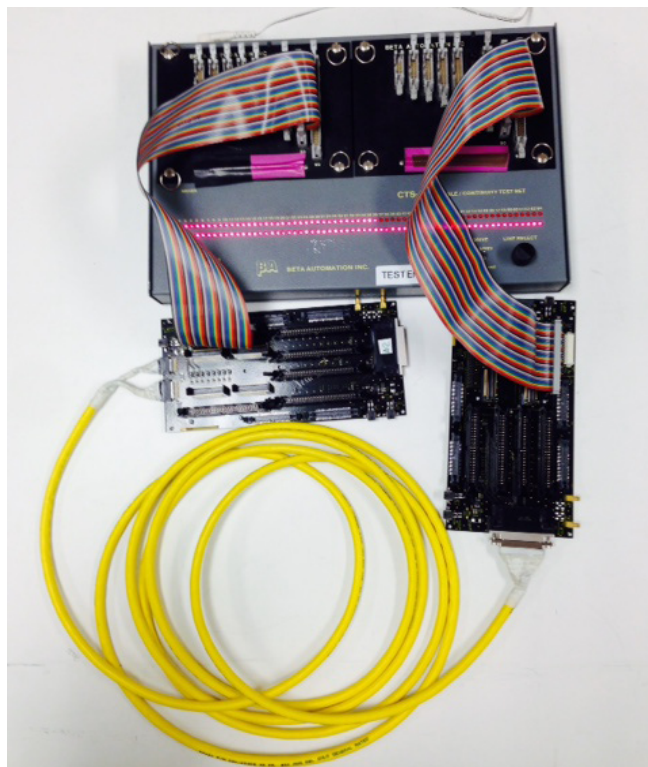


FIG. 1. Cables test stand with data cable.

Type	Cable	Connector	Length [ft]	Diameter [in]	Color	Manufacturer
High voltage	GWP p/n 030-23521 4 conductor 26 awg	Molex Microfit 11-pin to Amp CPC 9-pin	20	0.170	red	DSG
Low voltage	GWP p/n 030-23535 4 pr 24 awg + 4 pr 28 awg	Amp Mini Ct 17-pin to Tyco 37-pin "D"	20	0.296	white	DSG
Slow controls	GWP p/n 030-23521 4 conductor 26 awg	Molex Clik-Mate 4-pin to ferrule	20	0.170	blue	DSG
Data	GWP p/n 030-23428 43 pr 32 awg	MicroDot MCK 100-pin plug to Nanonics 51 and 37-pin plugs	15	0.324	yellow	Tyco
External pulser	RG-403	NDL-Q to NDL-Q	17	0.116	brown	Sabritec

TABLE I. Cable specifications. GWP is General Wire Products.

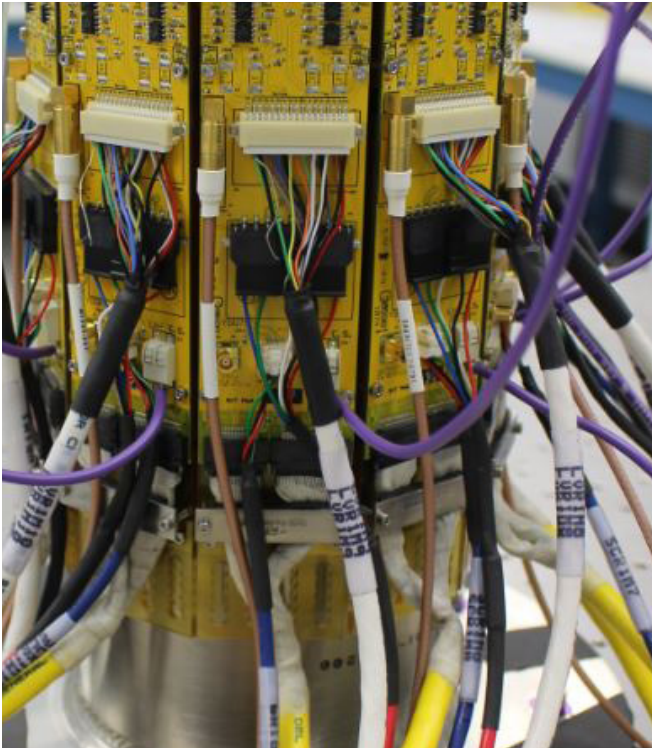


FIG. 2. Region 1 cable connections on the HFCB.

As a region is assembled, each cable bundle is clamped onto the assembly table to reduce pull-stress on the connectors. Once the detector is assembled, the inner regions' cable connectors are inaccessible; hence the cables have to remain connected on the detector side.

During configuration change from assembly position (vertical) to test/transport position (horizontal), all cable bundles will be disconnected at the crate end and rolled up as individual bundles.

Care will be taken with the connectors to avoid damage during configuration change and transport; bubble wrap will be used to protect the connectors from inadvertent damage (Fig. 3). All 66 bundles will be cable-tied to the transport cart, Fig. 4.

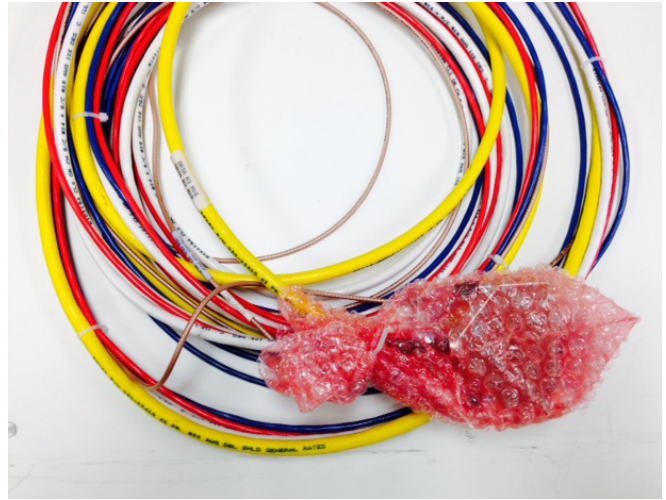


FIG. 3. Cable bundle, with bubble wrap on connectors.

To conclude, all cables, including spares, have been fabricated and tested. The assembly procedure has been tried and tested on R1, R2, and R3.

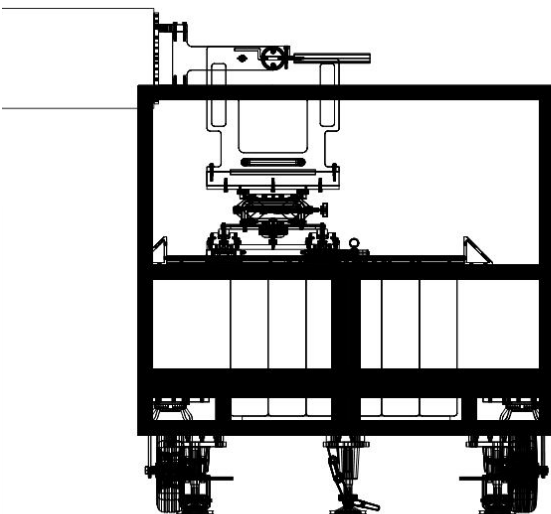
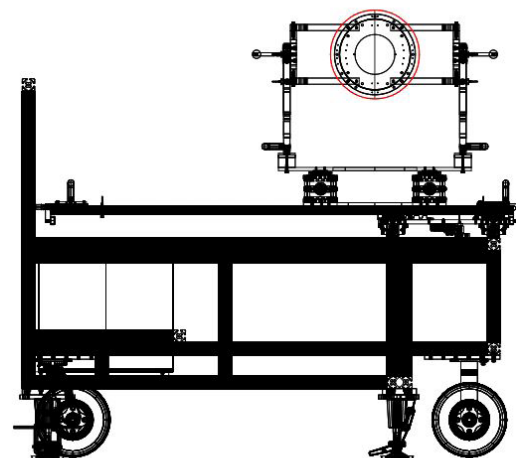


FIG. 4. Transport cart.



APPENDIX A: CABLE TRAVELERS

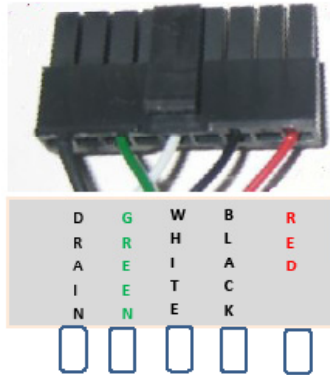
HV Cable Traveler

Date _____

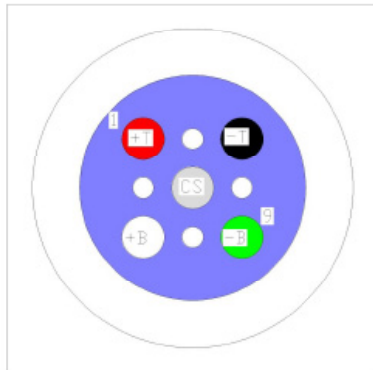
Reg. Module _____

Inspector _____

HFCB End



Distribution Box End



Resistance measurement

	Red	Black	White	Green
Red				
Black				
White				
Green				

Current

HV Circuit	Voltage Setting	Current Draw	Comment
Top			
Bottom			

Pinout

HFCB Version 2 HV Connector			
Mini Fit (Color)	Name	CPC Connector	
1 Red	HV Top	1	
2	N/C	2	
3 Black	HV GND	3	
4	N/C	4	
5 White	HV Both	7	
6	N/C	6	
7 Green	HV GND	9	
8	N/C	8	
9 Drain	Cable Sheath	5	

LV Cable Traveler

Date _____

Reg. Module _____

Inspector _____

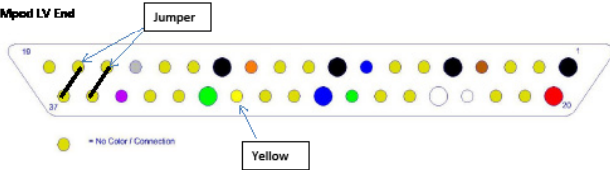
HFCB End



D	G	B	v	E	B	B	y	o	E	b	W	B	w	b	R	B
R	R	L	i	r	L	L	e	r	r	l	H	L	h	r	E	L
A	E	A	o	e	U	A	i	a	e	u	I	A	i	o	D	A
I	E	C	l	y	E	C	i	n	e	T	C	t	w	C	C	
N	N	K	e	t	K	o	E	n	E	K	e	n	K			



MpoD LV End



Resistance measurement

Slow Controls Cable Traveler

Date _____

Reg. Module _____

Inspector _____

HFCB End



R	B	G	D
E	L	R	R
D	A	E	A
C	E	I	
K	N	N	



Resistance measurement

	Red	Black	Green	Drain
Red				
Black				
Green				
Drain				

Pinout

Click-Mate 4 Pin	Color	Name	NI Connection
1	Red	Bot Temp	
2	Black	GND	
3	Green	Top Temp	
4	Drain	Cable Shield	

	BLACK	RED	BROWN	WHITE	BLACK	WHITE	blue	green	orange	yellow	BLACK	BLUE	gray	White	BLACK	BROWN	Gold
BLACK																	
RED																	
BROWN																	
WHITE																	
BLACK																	
WHITE																	
blue																	
green																	
orange																	
yellow																	
BLACK																	
BLUE																	
gray																	
White																	
BLACK																	
BROWN																	
Gold																	

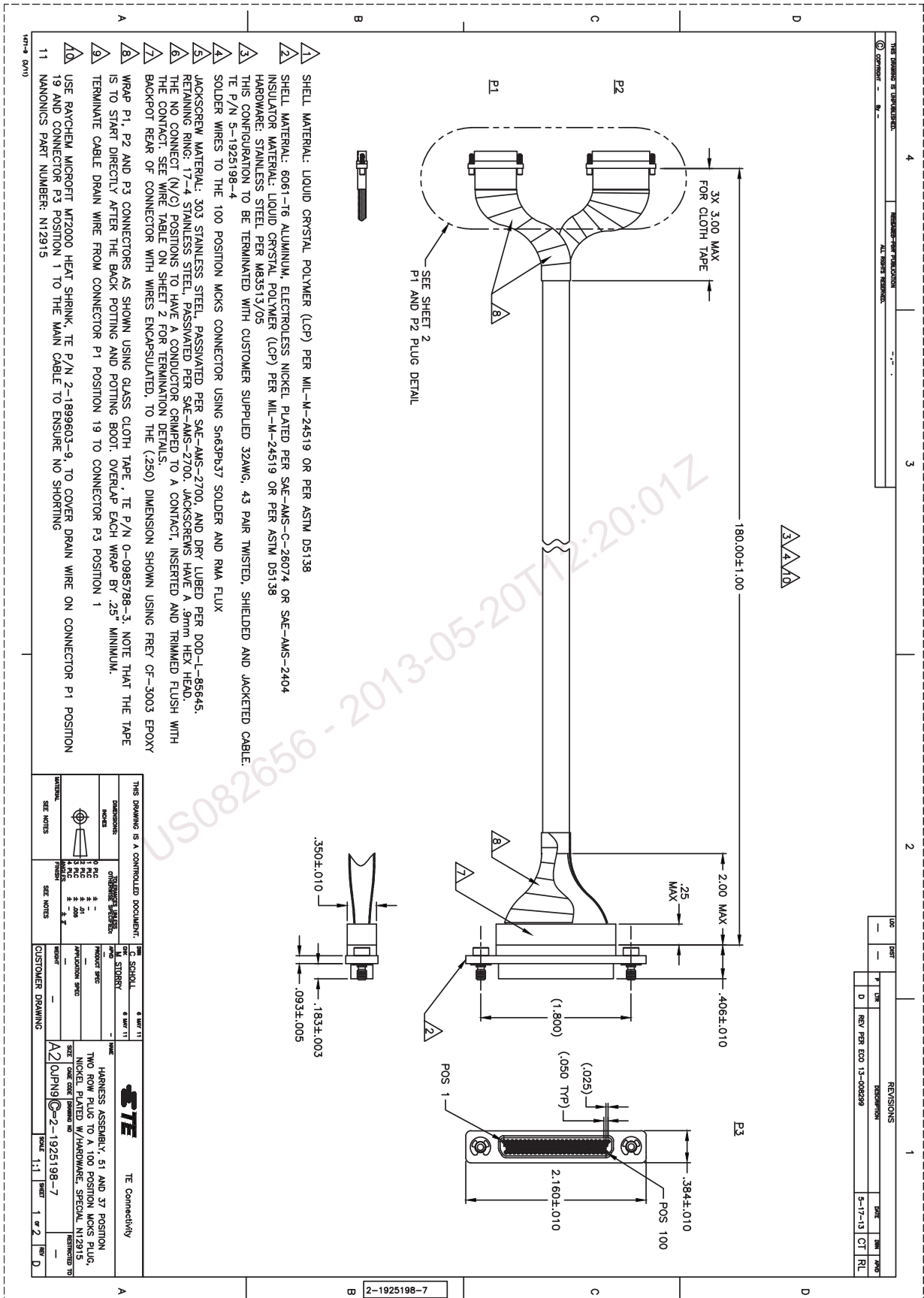
Current

LV Circuit	Voltage Setting	Current Draw	Comment
Top Analog			
Top Digital			
Bottom Analog			
Bottom Digital			

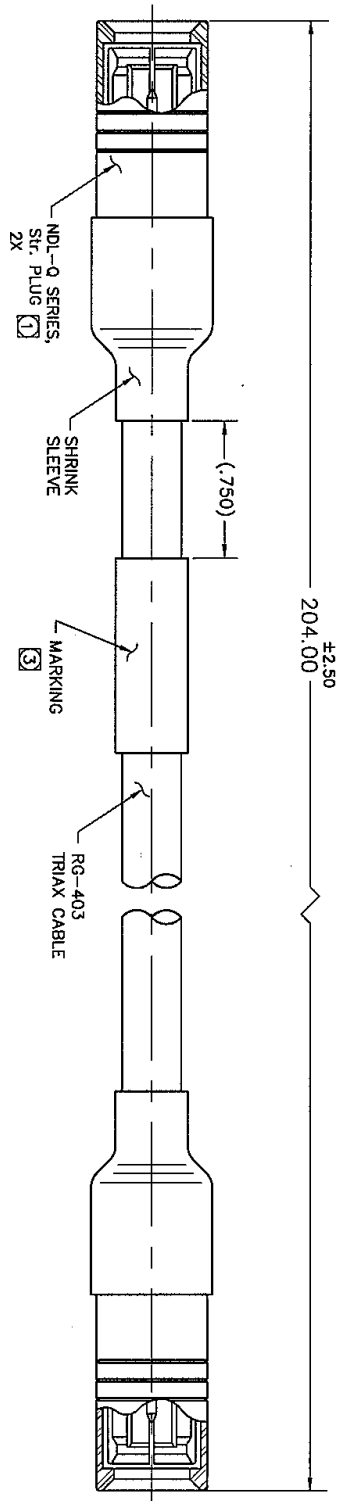
Pinout

Pin	Color Code	Type	37 Pin D	37 pin D	
1	BLACK	GND		1	
2	RED	Top VDDA+		20	
3	BROWN	GND		4	
4	WHITE	Top VDDA+S		23	
5	BLACK	GND		5	
6	WHITE	Top VDDD+		26	
7	blue	GND		8	
8	green	Top VDDD+S		27	
9	orange	GND		12	
10	yellow	Bot VDDA+S		31	
11	BLACK	GND		9	
12	BLUE	Bot VDDA+		28	
13	gray	GND		16	
14	White	Bot VDDD+S		35	
15	BLACK	GND		13	
16	GREEN	Bot VDDD+		32	
	Jumper			17	36
	Jumper			18	37
17	shield	Cable Shield			

APPENDIX B: MANUFACTURER DRAWINGS



THIS IS ISSUED IN STRICT COMPLIANCE WITH THE CONTRACT SPECIFICATIONS AND IS NOT TO BE USED FOR MANUFACTURE OR SALE AND THAT IT IS THE PROPERTY OF THE COMPANY AND IS TO BE RETURNED TO THE COMPANY WITHOUT THE PRIOR WRITTEN CONSENT OF THE COMPANY.



- NOTES: (UNLESS OTHERWISE SPECIFIED)
- 1 STR. NDL-Q PLUG IS DESIGNED TO MATE WITH SABRITEC NDL-Q JACK MATING CONN. NDL-Q JACK P/N: SEE SABRITEC CATALOG
 - 2 CABLE ASSEMBLY SHALL BE TESTED FOR CONTINUITY & INSULATION RESISTANCE 5000 MEGOHMS MIN @ 200 VDC.
 - 3 LEGIBLE AND PERMANENT MARKING:
 - A) "SABRITEC 58795" B) SABRITEC P/N: "028028-2132" C) DATE CODE

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REVISIONS		1		
ZONE	LTR	DESCRIPTION	DATE	APPR

PRELIMINARY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	Jefferson Lab, VA
XXX ANGLES	APPROVALS
E, 30° ANGLES	DATE
THIRD ANGLE PROJECTION	DRW: K KIM
USED ON	CHECKED
Customer Use	ENG: K KIM
APPROVED	DATE: 11/09/12

	TITLE	Customer Use Dwg.
	DESCRIPTION	Cable Assembly NDL-Q Series, Str. Plug to Plug with 204 Inches Long, Concentric Triax Cable
SIZE	CAGE CODE	DRAWING NO.
B	58795	028028-2132
SHEET		1 OF 1