CDF Silicon Vertex Detector Low Voltage Power Pigtail Cable: Safety Information for the CDF Cable Committee 1/3/2001

Length and Quantity Information

The document gives the specifications and safety information for the CDF Silicon Vertex Detector low voltage power pigtail cable that runs from the junction cards to the SVXII port cards.

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Low Voltage Power Cable (inner SVX)

Cable

General Description
Amphenol SpectraStrip 843-111-2213-010
Unjacketed 22 AWG 10 conductor flat PVC cable 7/30 stranded
105C, 300V, VW1 Fire Safety
and
Amphenol SpectraStrip 843-111-2609-016
Unjacketed 26 AWG 15 conductor flat PVC cable 7/34 stranded
105C, 300V, VW1 Fire Safety

Manufacturer: Amphenol
Cable Type: Flat ribbon
Part Number: 843-111-2213-010, 843-111-2609-016

Function: Supplies low voltages to the SVXII port card and the SVX3 JC.

Location_1: edge of SVXII and ISL barrel
Location_2: SVXII and ISL port cards

Fire Safety
Flame test rating: Cables Rated for 105 C @ 300V
Both: UL1581 and VW-1
Insulation material: PVC
Jacket material: None

Electrical Considerations
Power conductor ampacity: See chart below.
Power conductor over-current protection: Fused at power supply: each line is fused to prevent currents higher than the maximum current listed in the table below. Also hardware and software trip control. As the maximum current for any supply is below the rated maximum of the individual lines in the cable assembly, fusing of individual lines is not necessary.

Connector 1
24 pin Micro-Fit wire-mount circuit receptacle, keyed to prevent incorrect insertion
Part #: Molex 43025-2400

Receptacle pins
Part #: Molex 43030-0008 and 43030-0011 as appropriate
Terminal and pins rated to 5.0A per pin and 250V pin to pin

Connector 2
26 pin Micro-Fit wire-mount circuit receptacle, keyed to prevent incorrect insertion
Part #: Hirose Electronics DF11-26DS-2C
Receptacle pins
Part #: Hirose Electronics DF11-22-5CA and DF11-2428-5CA as appropriate
Terminal and pins rated to 2.0A per pin and 250V pin to pin

Quantity, Length and Termination:
30(24 + 6 spare) assemblies, length = 57cm and standard termination
60(48 + 12 spare) assemblies, length = 24cm and standard termination

Pin out (labeled by HDI 1-5)

Molex PIN #	Hirose PIN #	PCP Stub PIN #	Conductor Number	Description	Comment
1	1	2	1a	+5V DOIM	AWG 22 cable a
13	2	1	2a	+5V DOIM	AWG 22
2	3	4	1b	DGNDP	AWG 26 cable b
14	4	3	3a	+2V DOIM	AWG 22
3	5	6	2b	DGND1	AWG 26
15	6	5	3b	DVDD1	AWG 26(layer 4)
4	7	8	4b	DGND2	AWG 26
16	8	7	5b	DVDD2	AWG 26(layer 1)
5	9	10	6b	DGND3	AWG 26
17	10	9	7b	DVDD3	AWG 26(layer 0)
6	11	12	8b	DGND4	AWG 26
18	12	11	9b	DVDD4	AWG 26(layer 3)
7	13	14	10b	DGND5	AWG 26
19	14	13	11b	DVDD5	AWG 26(layer 2)
8	15	16	4a	AGND1	AWG 22
20	16	15	5a	AVDD1	AWG 22(layer 4)
	17	18		AGND1	Only stuffed on PCP
	18	17		AVDD1	Only stuffed on PCP
9	19	20	12b	AGND2	AWG 26
21	20	19	13b	AVDD2	AWG 26(layer 1)
10	21	22	14b	AGND3	AWG 26
22	22	21	15b	AVDD3	AWG 26(layer 0)
11	23	24	6a	AGND4	AWG 22
23	24	23	7a	AVDD4	AWG 22(layer 3)
12	25	26	8a	AGND5	AWG 22
24	26	25	9a	AVDD5	AWG 22(layer 2)

Note: Molex connector pin numbering convention is as follows. Pins number from 1 to 12 on the first row of twelve and from 13 to 24 on the second row of 12. Pin 1 is in the upper left when viewed looking down onto a board.

Note: Hirose connector pin numbering convention is as follows. Pins number from 1 and two on the first column of two where there are 12 columns. Pin 1 is in the upper left when viewed looking down onto a board.

Note: PCP stub numbers as the Hirose connector except in that pin 1 is in the upper right when viewed looking down onto the board. i.e. all even odd pairs are reversed.

Maximum voltage and current per supply
Note maximum recommended current for flat cable(10 degree heating)

AWG 28 is 1.0A
AWG 26 is 1.5A
AWG 24 is 2.0A
AWG 22 is 2.5A

Supply Name	Maximum Voltage(V)	Maximum Current(A)	AWG
+5V DOIM	8.0	2.0/2=1.0	AWG 22
+5V DOIM	8.0	2.0/2=1.0	AWG 22
+2V DOIM	3.5	1.7	AWG 22
DGNDP	0.0	1.1	AWG 26
DVDD1	8.0	2.0	AWG 26(layer 4)
DGND1	0.0	2.0	AWG 26
DVDD2	8.0	0.9	AWG 26(layer 1)
DGND2	0.0	0.9	AWG 26
DVDD3	8.0	0.6	AWG 26(layer 0)
DGND3	0.0	0.6	AWG 26
DVDD4	8.0	1.5	AWG 26(layer 3)
DGND4	0.0	1.5	AWG 26
DVDD5	8.0	1.5	AWG 26(layer 2)
DGND5	0.0	1.5	AWG 26
AVDD1	10.0	2.0	AWG 22(layer 4)
AGND1	0.0	2.0	AWG 22
AVDD2	10.0	0.9	AWG 26(layer 1)
AGND2	0.0	0.9	AWG 26
AVDD3	10.0	0.6	AWG 26(layer 0)
AGND3	0.0	0.6	AWG 26
AVDD4	10.0	1.5	AWG 22(layer 3)
AGND4	0.0	1.5	AWG 22
AVDD5	10.0	1.5	AWG 22(layer 2)
AGND5	0.0	1.5	AWG 22

Low Voltage Power Cable (inner ISL/L00)

Cable

General Description
Amphenol SpectraStrip 843-111-2213-030 (or three 10)
Unjacketed 22 AWG 24 conductor flat PVC cable 7/30 stranded
105C, 300V, VW1 Fire Safety

Manufacturer: Amphenol
Cable Type: Flat ribbon
Part Number: 843-111-2213-030 (or two 15)

Function: Supplies low voltages to the SVXII port card and the SVX3 IC.

Location_1: edge of ISL barrel
Location_2: ISL port cards

Fire Safety
Flame test rating: Cables Rated for 105 C @ 300V
Both: UL1581 and VW-1
Insulation material: PVC
Jacket material: None

Electrical Considerations
Power conductor ampacity: See chart below.
Power conductor over-current protection: Fused at power supply: each line is fused to prevent currents higher than the maximum current listed in the table below. Also hardware and software trip control. As the maximum current for any supply is below the rated maximum of the cable assembly, fusing of individual lines is not necessary.

Connector 1
24 pin Micro-Fit wire-mount circuit receptacle, keyed to prevent incorrect insertion
Part #: Molex 43025-2400
Receptacle pins
Part #: Molex 43030-0008
Terminal and pins rated to 5.0A per pin and 250V pin to pin

Connector 2
26 pin Micro-Fit wire-mount circuit receptacle, keyed to prevent incorrect insertion
Part #: Hirose Electronics DF11-26DS-2C
Receptacle pins
Part #: Hirose Electronics DF11-22-5CA
Terminal and pins rated to 2.0A per pin and 250V pin to pin
Note: All AVDD lines will have software trips at or bellow 2.0A, all DVDD lines will have software trips at or bellow 1.0A.

Quantity, Length and Termination:
10(8 + 2 spare) assemblies, length = 63cm and standard termination
42(34 + 8 spare) assemblies, length = 27cm and standard termination

Pin out (labeled by HDI 1-5)

Molex PIN #	Hirose PIN #	PCP Stub PIN #	Conductor Number	Description	Comment
1	1	2	1	+5V DOIM	AWG 22
13	2	1	2	+5V DOIM	AWG 22
2	3	4	3	DGNDP	AWG 22
14	4	3	4	+2V DOIM	AWG 22
3	5	6	5	DGND1	AWG 22(layer 4)
15	6	5	6	DVDD1	AWG 22
4	7	8	7	DGND2	AWG 22(layer 1)
16	8	7	8	DVDD2	AWG 22
5	9	10	9	DGND3	AWG 22(layer 0)
17	10	9	10	DVDD3	AWG 22
6	11	12	11	DGND4	AWG 22(layer 3)
18	12	11	12	DVDD4	AWG 22
7	13	14	13	DGND5	AWG 22(layer 2)
19	14	13	14	DVDD5	AWG 22
8	15	16	15	AGND1	AWG 22(layer 4)
20	16	15	16	AVDD1	AWG 22
	17	18			
	18	17			
9	19	20	17	AGND2	AWG 22(layer 1)
21	20	19	18	AVDD2	AWG 22
10	21	22	19	AGND3	AWG 22(layer 0)
22	22	21	20	AVDD3	AWG 22
11	23	24	21	AGND4	AWG 22(layer 3)

23	24	23	22	AVDD4	AWG 22
12	25	26	23	AGND5	AWG 22(layer 2)
24	26	25	24	AVDD5	AWG 22

Note: Molex connector pin numbering convention is as follows. Pins number from 1 to 12 on the first row of twelve and from 13 to 24 on the second row of 12. Pin 1 is in the upper left when viewed looking down onto a board.

Note: Hirose connector pin numbering convention is as follows. Pins number from 1 and two on the first column of two where there are 12 columns. Pin 1 is in the upper left when viewed looking down onto a board.

Note: PCP stub numbers as the Hirose connector except in that pin 1 is in the upper right when viewed looking down onto the board. i.e. all even odd pairs are reversed.

Maximum voltage and current per supply
Note maximum recommended current for flat cable
AWG 28 is 1.0A
AWG 26 is 1.5A
AWG 24 is 2.0A
AWG 22 is 2.5A

Supply Name	Maximum Voltage(V)	Maximum Current(A)	AWG
+5V DOIM	8.0	2.0/2=1.0	AWG 22
+5V DOIM	8.0	2.0/2=1.0	AWG 22
+2V DOIM	3.5	1.7	AWG 22
DGNDP	0.0	1.1	AWG 22
DVDD1	8.0	2.7	AWG 22(layer 4)
DGND1	0.0	2.7	AWG 22
DVDD2	8.0	2.7	AWG 22(layer 1)
DGND2	0.0	2.7	AWG 22
DVDD3	8.0	2.7	AWG 22(layer 0)
DGND3	0.0	2.7	AWG 22
DVDD4	8.0	2.7	AWG 22(layer 3)
DGND4	0.0	2.7	AWG 22
DVDD5	8.0	2.7	AWG 22(layer 2)
DGND5	0.0	2.7	AWG 22
AVDD1	10.0	2.4	AWG 22(layer 4)
AGND1	0.0	2.4	AWG 22
AVDD2	10.0	2.4	AWG 22(layer 1)
AGND2	0.0	2.4	AWG 22
AVDD3	10.0	2.4	AWG 22(layer 0)
AGND3	0.0	2.4	AWG 22
AVDD4	10.0	2.4	AWG 22(layer 3)
AGND4	0.0	2.4	AWG 22
AVDD5	10.0	2.4	AWG 22(layer 2)
AGND5	0.0	2.4	AWG 22

Low Voltage Power Cable (outer SVX)

Cable

General Description
Amphenol SpectraStrip 843-111-1801-024
Unjacketed 18 AWG 24 conductor flat PVC cable 19/30 stranded

105C, 300V, VW1 Fire Safety

Manufacturer**: Amphenol**
Cable Type: Flat ribbon
Part Number: 843-111-1801-024

Function: Supplies low voltages to the SVXII port card and the SVX3 IC.

Location_1: Junction Card ring at End of ISL extension tube
Location_2: edge of SVXII and ISL barrel

Fire Safety
Flame test rating: Cables Rated for 105 C @ 300V
UL VW1
Insulation material: PVC
Jacket material: None

Electrical Considerations
Power conductor ampacity: See chart below.
Power conductor over-current protection: Fused at power supply: each line is fused to prevent currents higher than the maximum current listed in the table below. Also hardware and software trip control. As the maximum current for any supply is below the rated maximum of the cable assembly, fusing of individual lines is not necessary.

Connector 1
24 pin Micro-Fit wire-mount circuit receptacle, keyed to prevent incorrect insertion
Part #: Molex 43025-2400
Receptacle pins
Part #: Molex 43030-0008
Terminal and pins rated to 5.0A per pin and 250V pin to pin

Connector 2
24 pin Micro-Fit wire-mount circuit plug, keyed to prevent incorrect insertion
Part #: Molex 43020-2401
Receptacle pins
Part #: Molex 43031-0008
Terminal and pins rated to 5.0A per pin and 250V pin to pin

Quantity, Length and Termination:
90(72 + 18 spare) assemblies, length = 91cm and standard termination

Pin out (labeled by HDI 1-5)

PIN @ JB	PIN @ Edge of Spacetube	Conductor Number	Description	Comment
1	1	1	+5V DOIM	AWG 18
13	13	2	+5V DOIM	AWG 18
2	2	3	DGNDP	AWG 18
14	14	4	+2V DOIM	AWG 18
3	3	5	DGND1	AWG 18(layer 4)
15	15	6	DVDD1	AWG 18
4	4	7	DGND2	AWG 18(layer 1)
16	16	8	DVDD2	AWG 18
5	5	9	DGND3	AWG 18(layer 0)
17	17	10	DVDD3	AWG 18
6	6	11	DGND4	AWG 18(layer 3)

18	18	12	DVDD4	AWG 18
7	7	13	DGND5	AWG 18(layer 2)
19	19	14	DVDD5	AWG 18
8	8	15	AGND1	AWG 18(layer 4)
20	20	16	AVDD1	AWG 18
9	9	17	AGND2	AWG 18(layer 1)
21	21	18	AVDD2	AWG 18
10	10	19	AGND3	AWG 18(layer 0)
22	22	20	AVDD3	AWG 18
11	11	21	AGND4	AWG 18(layer 3)
23	23	22	AVDD4	AWG 18
12	12	23	AGND5	AWG 18(layer 2)
24	24	24	AVDD5	AWG 18

Note: Molex female connector pin numbering convention is as follows. Pins number from 1 to 12 on the first row of twelve and from 13 to 24 on the second row of 12. Pin 1 is in the upper left when viewed looking down onto a board.

Note: Molex male connector pin numbering convention is as follows. Pins number from 1 to 12 on the first row of twelve and from 13 to 24 on the second row of 12. Pin 1 is in the upper right when viewed looking down the cable toward the connector.

Maximum voltage and current per supply

Supply Name	Maximum Voltage(V)	Maximum Current(A)	AWG
+5V DOIM	8.0	2.0/2=1.0	AWG 18
+5V DOIM	8.0	2.0/2=1.0	AWG 18
+2V DOIM	3.5	1.7	AWG 18
DGNDP	0.0	1.1	AWG 18
DVDD1	8.0	2.0	AWG 18(layer 4)
DGND1	0.0	2.0	AWG 18
DVDD2	8.0	0.9	AWG 18(layer 1)
DGND2	0.0	0.9	AWG 18
DVDD3	8.0	0.6	AWG 18(layer 0)
DGND3	0.0	0.6	AWG 18
DVDD4	8.0	1.5	AWG 18(layer 3)
DGND4	0.0	1.5	AWG 18
DVDD5	8.0	1.5	AWG 18(layer 2)
DGND5	0.0	1.5	AWG 18
AVDD1	10.0	2.0	AWG 18(layer 4)
AGND1	0.0	2.0	AWG 18
AVDD2	10.0	0.9	AWG 18(layer 1)
AGND2	0.0	0.9	AWG 18
AVDD3	10.0	0.6	AWG 18(layer 0)
AGND3	0.0	0.6	AWG 18
AVDD4	10.0	1.5	AWG 18(layer 3)
AGND4	0.0	1.5	AWG 18
AVDD5	10.0	1.5	AWG 18(layer 2)
AGND5	0.0	1.5	AWG 18

Bias Voltage Cable

Cable

General Description

3M 3355/16
Unjacketed 28 AWG 16 conductor flat TPE cable 7/34 stranded

105C, 300V, ULH and VW1 Fire Safety

(note: L00 is hardware limited to 500V, ISL and SVXII are limited to 250V)

(see L00 testing note below)

Manufacturer: 3M
Cable Type: Flat ribbon
Part Number: 3355/16

Function: Supplies bias to the silicon ladders.

Location_1: Junction Card ring at End of ISL extension tube
Location_2: SVXII and ISL port cards

Fire Safety
Flame test rating: Cables Rated for 105 C @ 300V
ULH and VW1
Insulation material: TPE
Jacket material: None

Electrical Considerations
Power conductor ampacity: Current limited cable: max 5mA/(6mA for L00)
Power conductor over-current protection: fused at power supply. Also has hardware and software trip control.

Connectors

16 pin IDC wiremount female receptacle, mass terminated, keyed to prevent incorrect insertion using keying plug 3M 3425-0

Part#: 3M 3452-7000 and keying plug Part # 3M 3425-0

Terminal and pins rated to 1.0A per pin and 1000V pin to pin

Quantity, Length and Termination:
30(24 + 6 spare) assemblies, length = 148cm and when cable is laid flat terminate with one connector facing up and one connector facing down with pin 1 to the outside of the cable.
30(24 + 6 spare) assemblies, length = 115cm and when cable is laid flat terminate with one connector facing up and one connector facing down with pin 1 to the outside of the cable.
30(24 + 6 spare) assemblies, length = 120cm and when cable is laid flat terminate with both connectors facing down.
42(34 + 8 spare) assemblies, length = 32cm and when cable is laid flat terminate with both connectors facing down.
10(8 + 2 spare) assemblies, length = 68cm and when cable is laid flat terminate with both connectors facing down.

L00 Testing Note:
L00 cables and connector were tested to 1000V as follows.
1) Apply 1000V difference between positive and negative bias lines. Positive line at 1000V, negative line at 0V and reference line at 0V. Actual system run with positive line at a maximum of 500V. Result, correct voltages were seen, no breakdowns and leakage currents of less than 10nA(below detectable threshold.)
2) Wrap bundle in aluminum foil. No breakdowns and leakage currents of less than 10nA.
3) Connect aluminum foils to HV ground. No breakdowns and leakage currents of less than 10nA.
4) Rub vigorously the aluminum foil along the length of the cable. No breakdowns and leakage currents of less than 10nA.

Note that these tests were developed after speaking to the 3M cable engineer about the tests performed to receive a UL voltage rating.

Pin out (labeled by HDI 1-5)

PIN @ JB	PIN @ PCB	Conductor Number	Description
1	1	1	
2	2	2	DBP4(layer 3)
3	3	3	DBG4
4	4	4	DBZ4
5	5	5	DBZ1(layer 4)
6	6	6	DBG1
7	7	7	DBP1
8	8	8	DBP3(layer 0)
9	9	9	DBG3
10	10	10	DBZ3
11	11	11	DBZ2(layer 1)
12	12	12	DBG2
13	13	13	DBP2
14	14	14	DBP5(layer 2)
15	15	15	DBG5
16	16	16	DBZ5

Note: 3M connector pin numbering convention is as follows. Pins number from 1 and two on the first column of two where there are 8 columns. Pin 1 is in the upper right when viewed looking down onto a board.

Note: since we are using female connectors at each end the first end must be terminated with the connector facing the down and the second up.

FIB Digital Timing Signal Cable

Cable

General Description
Hitachi 23195/26
Unjacketed 30 AWG 26 conductor micro twist flat PVC cable7/38 stranded

105C, 30V, VW1 Fire Safety

Manufacturer: Hitachi
Cable Type: Flat micro twist ribbon
Part Number: 23195/26

Function: Transmits differential timing signals for the SVX3 chip

Location_1: Junction Card ring at End of ISL extension tube
Location_2: SVXII and ISL port cards

Fire Safety
Flame test rating: Cables Rated for 105 C @ 30V
UL VW-1
Insulation material: PVC
Jacket material: None

Electrical Considerations
Power conductor ampacity**:**

Current limited cable:
Power conductor over-current protection: NA

Connectors
26 pin single polarized female receptacle,
Part#: Samtec FFSD-13-D-78-01-N
Terminal and pins rated to 0.5A per pin and 375V pin to pin

Quantity, Length and Termination:
30(24 + 6 spare) assemblies, length = 150cm and when cable is laid flat terminate with one connector facing up and one connector facing down. FFSD-13-D-78-01-N-D-O

30(24 + 12 spare) assemblies, length = 125cm and when cable is laid flat terminate with one connector facing up and one connector facing down. FFSD-13-D-78-01-N-D-O

30(24 + 12 spare) assemblies, length = 125cm and when cable is laid flat terminate with both connectors facing down. FFSD-13-D-78-01-N-D

42(34 + 8 spare) assemblies, length = 25cm and when cable is laid flat terminate with both connectors facing down. FFSD-13-D-78-01-N-D

10(8 + 2 spare) assemblies, length = 75cm and when cable is laid flat terminate with both connectors facing down. FFSD-13-D-78-01-N-D

where –D stands for double connector, i.e. one on each side and –O stands for outside reversed, i.e. one connector faces up and the other faces down.

Pin out

PIN @ JB	PIN @ PCB[1]	Conductor Number	Description	Comment
1	1	1	Shield	
2	2	2	Shield	
3	3	3	ICFE_CLKH	
4	4	4	ICFE_CLKL	
5	5	5	C_CLK (H)	
6	6	6	C_CLK* (L)	
7	7	7	C_DATA (H)	
8	8	8	C_DATA* (L)	
9	9	9	C_C0 (H)	
10	10	10	C_C0* (L)	
11	11	11	C_C1 (H)	
12	12	12	C_C1* (L)	
13	13	13	C_C2 (H)	
14	14	14	C_C2* (L)	
15	15	15	C_C3 (H)	
16	16	16	C_C3* (L)	
17	17	17	C_C4 (H)	
18	18	18	C_C4* (L)	
19	19	19	ICBE_CLKL	
20	20	20	ICBE_CLKH	
21	21	21	C_L1A (H)	
22	22	22	C_L1A* (L)	
23	23	23	CPIPE_RD2H	
24	24	24	CPIPE_RD2L	
25	25	25		n/c
26	26	26		n/c

Note: 3M connector pin numbering convention is as follows. Pins number from 1 and two on the first column of two where there are 8 columns. Pin 1 is in the upper right when viewed looking down onto a board.

Note: since we are using female connectors at each end the first end must be terminated with the connector facing the down and the second up.