Fermilab

Experiment Electronic Systems Group

DRAFT

Specification for XFT Finder Backplane

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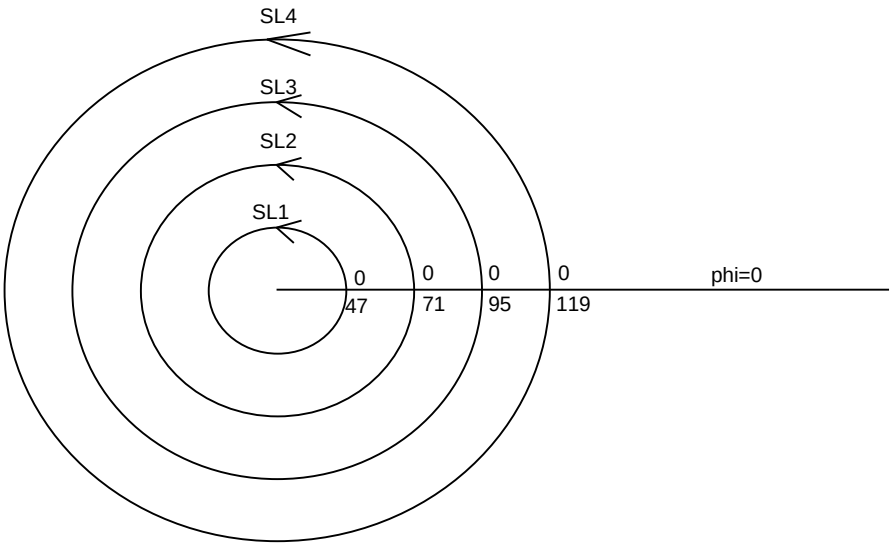
Revision History

orig. TMS 10/17/96
rev. TMS 11/4/96
switched sides of +Neighbors and -Neigbors
rev. TMS 11/7/96
adjusted backplane for guided 2mm HM Connectors
rev. TMS 11/19/96
changed from SL1/2 and SL3/4 Finder Boards
to SL1/3 and SL2/4 Finder Boards. This was done to
drop the cable count into a slot from 9 to 8.
rev. TMS 11/26/96
changed Ansley cable pair definitions.

XFT Hardware Description



Finder Mapping to the COT

Finders: Each Finder will cover four supercells of the COT detector.

Inputs: Finder inputs (for all four supercells) will consist of wire information from 48 TDC channels plus 5 neighbor channels on either side.

Outputs: Finder Outputs will consist of 6 (12) pixel outputs for each of the four supercells as well as a B0 (Beam Zero marker).

TDC to Finder

Each TDC has 96 channels. Information from these channels will be sent to Finder Boards on two Ansley cables. The Ansley cables have connections for 24 differential pairs plus a ground pair, so data will need to be multiplexed.

Each channel has two pieces of information associated with it; a prompt and delayed hit bit.

The proposed choice would be to send the information up in 6-to-1 multiplexed scheme, giving 22 ns per word. Other information carried up the cable would be a word #0 marker carried on Pair 7, and a Beam_zero marker on Pair 5. The Beam_zero marker should be set high for all 6 words associated with a Beam_zero event.

Pairs 1,2	Pair 3	Pair 4	Pair 5	Pair 6	Pair 7	Pairs 8-23	Pairs 24,25
GND	STROBE	GND	Beam_zero	GND	logic high	Channels 0-15 Prompt	GND
GND	STROBE	GND	Beam_zero	GND	logic low	Channels 16-31 Prompt	GND
GND	STROBE	GND	Beam_zero	GND	logic low	Channels 32-47 Prompt	GND
GND	STROBE	GND	Beam_zero	GND	logic low	Channels 0-15 Delay	GND
GND	STROBE	GND	Beam_zero	GND	logic low	Channels 16-31 Delay	GND
GND	STROBE	GND	Beam_zero	GND	logic low	Channels 32-47 Delay	GND

Some advantages of this scheme would be the word 0 indicator (pair 7), which would provide a check, and the data path is now 16 bits which fits better with available chips if we need to do data alignment/de-multiplexing outside the FPGA.

FINDER BOARDS

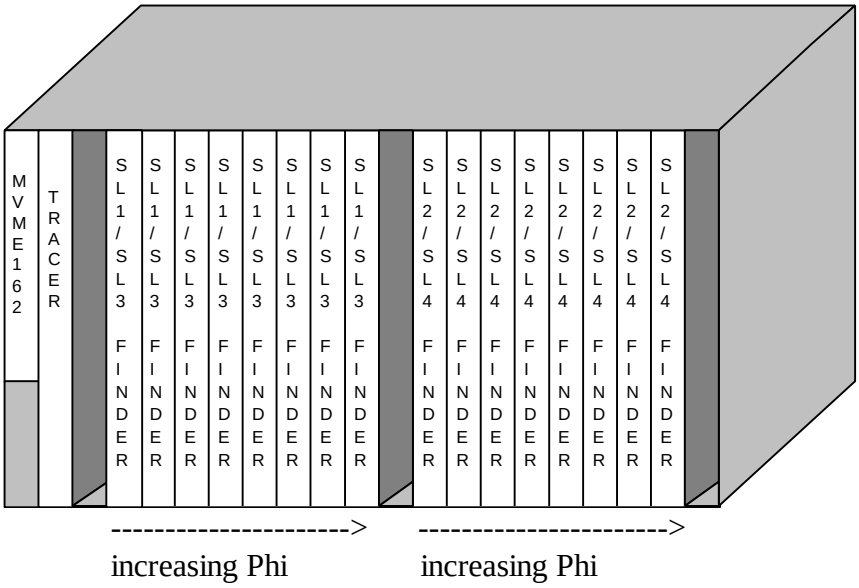
Two types of Finder boards will be designed. Each Finder board will span 15 degrees of the Superlayers it is dealing with.

Board type SL1/SL3 will contain 2 Finder chips for SL1 and 4 Finder chips for SL3. Cable inputs to the board will also provide for the possibility of SL1 wires being split.

Board type SL2/SL4 will contain 3 Finder chips for SL2 and 5 Finder chips for SL4.

CRATE CONFIGURATION

There will be a total of 24 SL1/SL3 Finder Boards and 24 SL2/SL4 Finder Boards to be populated among 3 Finder Crates. The Crate layouts will look like that below.



BACKPLANE PINOUT

A custom J3 backplane will be required in order to bring TDC data into the Finder Board.

A SL1/SL3 Finder board requires connections to up to 8 (assumes 2 cables per SL1 Finder due to wire split) Ansley Cables as well as neighbor information from 6 additional cables. The neighbor information will be bussed along the custom J3 from adjacent slots.

The 8 cables plus Neighbors will be labeled as follows:
Neighbors from Cable SL1(-N) and SL1(-N')
Cable SL1(A)
Cable SL1(A')
Cable SL1(B)
Cable SL1(B')
Neighbors from Cable Cable SL1(+N) and SL1(+N')

Neighbors from Cable Cable SL3(-N)
Cable SL3(A)
Cable SL3(B)
Cable SL3(C)
Cable SL3(D)
Neighbors from Cable Cable SL3(+N)

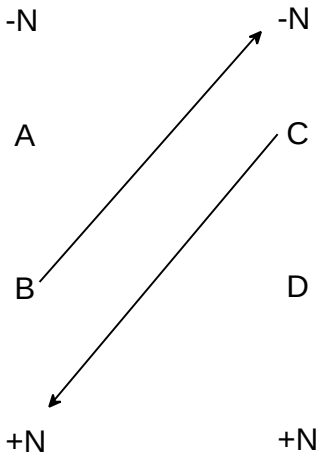


Illustration of Neighbor sharing between adjacent slots

PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
1	GND	+5V	+5V	+5V	+5V	+5V	GND
2	GND	RET_WX	Reserved	+5V	TBUS 1+	TBUS 1-	GND
3	GND	RET_WX	Reserved	Reserved	TBUS 2+	TBUS 2-	GND
4	GND	Vw	Reserved	SL3C-W0	SL3C-STRB	SL3C-B0	GND
5	GND	Vw	Reserved	USR I/O	SL3C-D(0)	SL3C-D(1)	GND
6	GND	RET_WX	Reserved	SL3B-STRB	SL3C-D(2)	SL3C-D(3)	GND
7	GND	AREF_WX	Reserved	SL3B-B0	SL3C-D(4)	SL3C-D(5)	GND
8	GND	RET_WX	Reserved	SL3B-W0	SL3C-D(6)	SL3C-D(7)	GND
9	GND	Vx	Reserved	SL3B-D(0)	SL3C-D(8)	SL3C-D(9)	GND
10	GND	Vx	Reserved	SL3B-D(1)	SL3C-D(10)	SL3C-D(11)	GND
11	GND	Vy	Reserved	SL3B-D(2)	SL3C-D(12)	SL3C-D(13)	GND
12	GND	Vy	Reserved	SL3B-D(3)	SL3C-D(14)	SL3C-D(15)	GND
13	GND	RET_YZ	Reserved	SL3B-D(4)	SL3B-D(8)	SL3B-D(9)	GND
14	GND	AREF_YZ	Reserved	SL3B-D(5)	SL3B-D(10)	SL3B-D(11)	GND
15	GND	RET_YZ	Reserved	SL3B-D(6)	SL3B-D(12)	SL3B-D(13)	GND
16	GND	Vz	Reserved	SL3B-D(7)	SL3B-D(14)	SL3B-D(15)	GND
17	GND	Vz	Reserved	Reserved	TBUS 3+	TBUS 3-	GND
18	GND	RET_YZ	Reserved	Reserved	TBUS 4+	TBUS 4-	GND
19	GND	RET_YZ	Reserved	Reserved	TBUS OC1	TBUS OC2	GND

Finder SL1/SL3 J0 Connecter

PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
1	GND	SL3A-STB	SL3A-B0	GND	SL3+N-STB	SL3+N-B0	GND
2	GND	SL3A-D(0)	SL3A-D(1)	GND	SL3+N-D(0)	SL3+N-D(1)	GND
3	GND	SL3A-D(2)	SL3A-D(3)	GND	SL3+N-D(4)	SL3+N-D(5)	GND
4	GND	SL3A-D(4)	SL3A-D(5)	GND	SL3+N-D(8)	SL3+N-D(9)	GND
5	GND	SL3A-D(6)	SL3A-D(7)	GND	SL3+N-D(12)	SL3+N-W0	GND
6	GND	SL3A-D(8)	SL3A-D(9)	GND	SL3D-STRB	SL3D-B0	GND
7	GND	SL3A-D(10)	SL3A-D(11)	GND	SL3D-D(0)	SL3D-D(1)	GND
8	GND	SL3A-D(12)	SL3A-D(13)	GND	SL3D-D(2)	SL3D-D(3)	GND
9	GND	SL3A-D(14)	SL3A-D(15)	GND	SL3D-D(4)	SL3D-D(5)	GND
10	GND	SL3A-W0	GND	GND	SL3D-D(6)	SL3D-D(7)	GND
11	GND	SL3-N-STB	SL3-N-B0	GND	SL3D-D(8)	SL3D-D(9)	GND
12	GND	SL3-N-W0	SL3-N-D(3)	GND	SL3D-D(10)	SL3D-D(11)	GND
13	GND	SL3-N-D(6)	SL3-N-D(7)	GND	SL3D-D(12)	SL3D-D(13)	GND
14	GND	SL3-N-D(10)	SL3-N-D(11)	GND	SL3D-D(14)	SL3D-D(15)	GND
15	GND	SL3-N-D(14)	SL3-N-D(15)	GND	SL1B-W0	SL3D-W0	GND
16	GND	SL1-N-STB	SL1-N-B0	GND	SL1B-STB	SL1B-B0	GND
17	GND	SL1-N-W0	SL1-N-D(3)	GND	SL1B-D(0)	SL1B-D(1)	GND
18	GND	SL1-N-D(6)	SL1-N-D(7)	GND	SL1B-D(2)	SL1B-D(3)	GND
19	GND	SL1-N-D(10)	SL1-N-D(11)	GND	SL1B-D(4)	SL1B-D(5)	GND
20	GND	SL1-N-D(14)	SL1-N-D(15)	GND	SL1B-D(6)	SL1B-D(7)	GND
21	GND	SL1A-STB	SL1A-B0	GND	SL1B-D(8)	SL1B-D(9)	GND
22	GND	SL1A-D(0)	SL1A-D(1)	GND	SL1B-D(10)	SL1B-D(11)	GND

PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
23	GND	SL1A-D(2)	SL1A-D(3)	GND	SL1B-D(12)	SL1B-D(13)	GND
24	GND	SL1A-D(4)	SL1A-D(5)	GND	SL1B-D(14)	SL1B-D(15)	GND
25	GND	SL1A-D(6)	SL1A-D(7)	GND	SL1+N-STB	SL1+N-B0	GND
26	GND	SL1A-D(8)	SL1A-D(9)	GND	SL1+N-D(0)	SL1+N-D(1)	GND
27	GND	SL1A-D(10)	SL1A-D(11)	GND	SL1+N-D(4)	SL1+N-D(5)	GND
28	GND	SL1A-D(12)	SL1A-D(13)	GND	SL1+N-D(8)	SL1+N-D(9)	GND
29	GND	SL1A-D(14)	SL1A-D(15)	GND	SL1+N-D(12)	SL1+N-W0	GND
30	GND	SL1A'-W0	SL1A-W0	GND	SL1+N'-STB	SL1+N'-B0	GND
31	GND	SL1A'-STB	SL1A'-B0	GND	SL1+N'-D(0)	SL1+N'-D(1)	GND
32	GND	SL1A'-D(0)	SL1A'-D(1)	GND	SL1+N'-D(4)	SL1+N'-D(5)	GND
33	GND	SL1A'-D(2)	SL1A'-D(3)	GND	SL1+N'-D(8)	SL1+N'-D(9)	GND
34							
35							
36							
37	GND	SL1A'-D(4)	SL1A'-D(5)	GND	SL1+N'-D(12)	SL1+N'-W0	GND
38	GND	SL1A'-D(6)	SL1A'-D(7)	GND	GND	SL1B'-W0	GND
39	GND	SL1A'-D(8)	SL1A'-D(9)	GND	SL1B'-STB	SL1B'-B0	GND
40	GND	SL1A'-D(10)	SL1A'-D(11)	GND	SL1B'-D(0)	SL1B'-D(1)	GND
41	GND	SL1A'-D(12)	SL1A'-D(13)	GND	SL1B'-D(2)	SL1B'-D(3)	GND
42	GND	SL1A'-D(14)	SL1A'-D(15)	GND	SL1B'-D(4)	SL1B'-D(5)	GND
43	GND	SL1-N'-STB	SL1-N'-B0	GND	SL1B'-D(6)	SL1B'-D(7)	GND
44	GND	SL1-N'-W0	SL1-N'-D(3)	GND	SL1B'-D(8)	SL1B'-D(9)	GND
45	GND	SL1-N'-D(6)	SL1-N'-D(7)	GND	SL1B'-D(10)	SL1B'-D(11)	GND
46	GND	SL1-N'-D(10)	SL1-N'-D(11)	GND	SL1B'-D(12)	SL1B'-D(13)	GND
47	GND	SL1-N'-D(14)	SL1-N'-D(15)	GND	SL1B'-D(14)	SL1B'-D(15)	GND

CUSTOM J3 - Slot definition for SL1/SL3 Finder

A SL2/SL4 Finder board requires connections to 8 Ansley Cables as well as neighbor information from 4 additional cables. The neighbor information will be bussed along the custom J3 from adjacent slots.

The 8 cables plus Neighbors will be labeled as follows:
Neighbors from Cable SL2(-N)
Cable SL2(A)
Cable SL2(B)
Cable SL2(C)
Neighbors from Cable Cable SL2(+N)

Neighbors from Cable Cable SL4(-N)
Cable SL4(A)
Cable SL4(B)
Cable SL4(C)
Cable SL4(D)
Cable SL4(E)
Neighbors from Cable Cable SL4(+N)

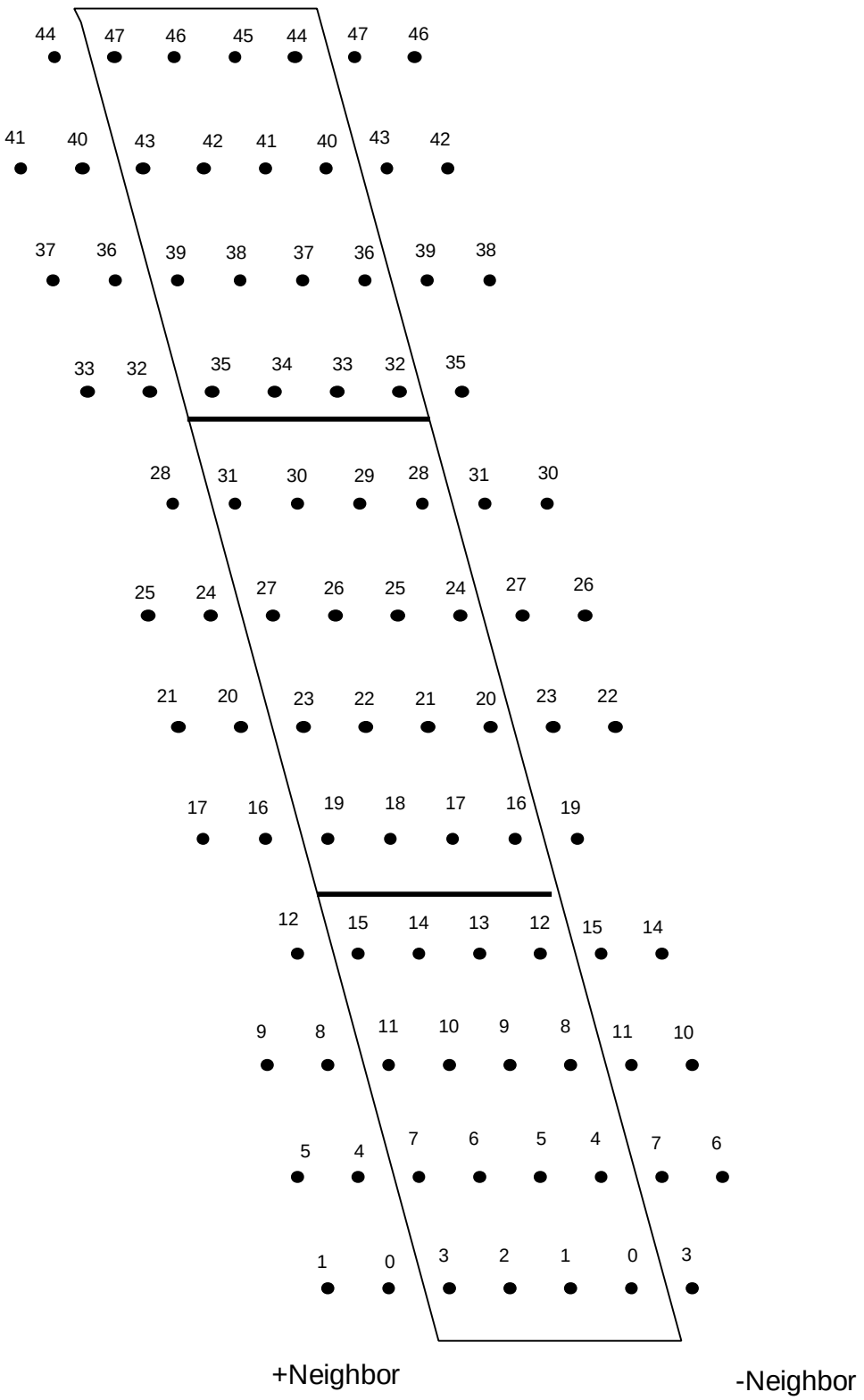
PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
1	GND	+5V	+5V	+5V	+5V	+5V	GND
2	GND	RET_WX	Reserved	+5V	TBUS 1+	TBUS 1-	GND
3	GND	RET_WX	Reserved	Reserved	TBUS 2+	TBUS 2-	GND
4	GND	Vw	Reserved	SL4B-W0	SL4B-STRB	SL4B-B0	GND
5	GND	Vw	Reserved	USR I/O	SL4B-D(0)	SL4B-D(1)	GND
6	GND	RET_WX	Reserved	SL4C-STRB	SL4B-D(2)	SL4B-D(3)	GND
7	GND	AREF_WX	Reserved	SL4C-B0	SL4B-D(4)	SL4B-D(5)	GND
8	GND	RET_WX	Reserved	SL4C-W0	SL4B-D(6)	SL4B-D(7)	GND
9	GND	Vx	Reserved	SL4C-D(0)	SL4B-D(8)	SL4B-D(9)	GND
10	GND	Vx	Reserved	SL4C-D(1)	SL4B-D(10)	SL4B-D(11)	GND
11	GND	Vy	Reserved	SL4C-D(2)	SL4B-D(12)	SL4B-D(13)	GND
12	GND	Vy	Reserved	SL4C-D(3)	SL4B-D(14)	SL4B-D(15)	GND
13	GND	RET_YZ	Reserved	SL4C-D(4)	SL4C-D(8)	SL4C-D(9)	GND
14	GND	AREF_YZ	Reserved	SL4C-D(5)	SL4C-D(10)	SL4C-D(11)	GND
15	GND	RET_YZ	Reserved	SL4C-D(6)	SL4C-D(12)	SL4C-D(13)	GND
16	GND	Vz	Reserved	SL4C-D(7)	SL4C-D(14)	SL4C-D(15)	GND
17	GND	Vz	Reserved	Reserved	TBUS 3+	TBUS 3-	GND
18	GND	RET_YZ	Reserved	Reserved	TBUS 4+	TBUS 4-	GND
19	GND	RET_YZ	Reserved	Reserved	TBUS OC1	TBUS OC2	GND

Finder SL2/SL4 J0 Connecter

PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
1	GND	SL4A-STB	SL4A-B0	GND	SL4+N-STB	SL4+N-B0	GND
2	GND	SL4A-D(0)	SL4A-D(1)	GND	SL4+N-D(0)	SL4+N-D(1)	GND
3	GND	SL4A-D(2)	SL4A-D(3)	GND	SL4+N-D(4)	SL4+N-D(5)	GND
4	GND	SL4A-D(4)	SL4A-D(5)	GND	SL4+N-D(8)	SL4+N-D(9)	GND
5	GND	SL4A-D(6)	SL4A-D(7)	GND	SL4+N-D(12)	SL4+N-W0	GND
6	GND	SL4A-D(8)	SL4A-D(9)	GND	SL4E-STB	SL4E-B0	GND
7	GND	SL4A-D(10)	SL4A-D(11)	GND	GND	SL4E-W0	GND
8	GND	SL4A-D(12)	SL4A-D(13)	GND	SL4E-D(0)	SL4E-D(1)	GND
9	GND	SL4A-D(14)	SL4A-D(15)	GND	SL4E-D(2)	SL4E-D(3)	GND
10	GND	SL4A-W0	GND	GND	SL4E-D(4)	SL4E-D(5)	GND
11	GND	SL4-N-STB	SL4-N-B0	GND	SL4E-D(6)	SL4E-D(7)	GND
12	GND	SL4-N-W0	SL4-N-D(3)	GND	SL4E-D(8)	SL4E-D(9)	GND
13	GND	SL4-N-D(6)	SL4-N-D(7)	GND	SL4E-D(10)	SL4E-D(11)	GND
14	GND	SL4-N-D(10)	SL4-N-D(11)	GND	SL4E-D(12)	SL4E-D(13)	GND
15	GND	SL4-N-D(14)	SL4-N-D(15)	GND	SL4E-D(14)	SL4E-D(15)	GND
16	GND	SL4D-STRB	SL4D-B0	GND	SL2B-STB	SL2B-B0	GND
17	GND	SL4D-D(0)	SL4D-D(1)	GND	GND	SL2B-W0	GND
18	GND	SL4D-D(2)	SL4D-D(3)	GND	SL2B-D(0)	SL2B-D(1)	GND
19	GND	SL4D-D(4)	SL4D-D(5)	GND	SL2B-D(2)	SL2B-D(3)	GND
20	GND	SL4D-D(6)	SL4D-D(7)	GND	SL2B-D(4)	SL2B-D(5)	GND
21	GND	SL4D-D(8)	SL4D-D(9)	GND	SL2B-D(6)	SL2B-D(7)	GND
22	GND	SL4D-D(10)	SL4D-D(11)	GND	SL2B-D(8)	SL2B-D(9)	GND

PIN #	Row Z	Row a	Row b	Row c	Row d	Row e	Row f
23	GND	SL4D-D(12)	SL4D-D(13)	GND	SL2B-D(10)	SL2B-D(11)	GND
24	GND	SL4D-D(14)	SL4D-D(15)	GND	SL2B-D(12)	SL2B-D(13)	GND
25	GND	SL4A-W0	GND	GND	SL2B-D(14)	SL2B-D(15)	GND
26	GND	SL2A-STB	SL2A-B0	GND	SL2+N-STB	SL2+N-B0	GND
27	GND	SL2A-D(0)	SL2A-D(1)	GND	SL2+N-D(0)	SL2+N-D(1)	GND
28	GND	SL2A-D(2)	SL2A-D(3)	GND	SL2+N-D(4)	SL2+N-D(5)	GND
29	GND	SL2A-D(4)	SL2A-D(5)	GND	SL2+N-D(8)	SL2+N-D(9)	GND
30	GND	SL2A-D(6)	SL2A-D(7)	GND	SL2+N-D(12)	SL2+N-W0	GND
31	GND	SL2A-D(8)	SL2A-D(9)	GND	SL2C-STB	SL2C-B0	GND
32	GND	SL2A-D(10)	SL2A-D(11)	GND	GND	SL2C-W0	GND
33	GND	SL2A-D(12)	SL2A-D(13)	GND	SL2C-D(0)	SL2C-D(1)	GND
34							
35							
36							
37	GND	SL2A-D(14)	SL2A-D(15)	GND	SL2C-D(2)	SL2C-D(3)	GND
38	GND	SL2A-W0	GND	GND	SL2C-D(4)	SL2C-D(5)	GND
39	GND	SL2-N-STB	SL2-N-B0	GND	SL2C-D(6)	SL2C-D(7)	GND
40	GND	SL2-N-W0	SL2-N-D(3)	GND	SL2C-D(8)	SL2C-D(9)	GND
41	GND	SL2-N-D(6)	SL2-N-D(7)	GND	SL2C-D(10)	SL2C-D(11)	GND
42	GND	SL2-N-D(10)	SL2-N-D(11)	GND	SL2C-D(12)	SL2C-D(13)	GND
43	GND	SL2-N-D(14)	SL2-N-D(15)	GND	SL2C-D(14)	SL2C-D(15)	GND
44	GND	GND	GND	GND	GND	GND	GND
45	GND	GND	GND	GND	GND	GND	GND
46	GND	GND	GND	GND	GND	GND	GND
47	GND	GND	GND	GND	GND	GND	GND

CUSTOM J3 - Slot definition for SL2/SL4 Finder



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Wires inside the box represent signals from a single Ansley Cable.