MVD Signals

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MCM Output Cable Signals

- Power & Ground   15
- MCM Temperature Monitor   1
- Discriminator Sum Output   2
- Control Signals   9
- Serial Link   6
- Xilinx Program   1
- Silicon Detector Bias   2
- Spy Channels   2
- PECL Clock for ADC   2
- LVDS Output Data   3
- Spares   5

48 Total

Power/Communication Circuit Board Signals

- Power & Ground   42
- MCM Temperature Monitors   6
- Discriminator Sum Outputs   12
- Control Signals   9
- Serial Links   11
- Xilinx Program   6
- Silicon Detector Bias   12
- Spy Channels   12
- PECL Clock for ADCs   2
- Output Data   36
- Spares   12

160 Total

Power/Control Circuit Board Signals (inner central detectors) & Daughter Board Signals (pad detectors)

MCM Output Cable Connectors (2ea Elco 24 contact .5mm pitch surface mount horizontal ZIF, 0.4 amp, model # 08-6212-024-001-000)

MCM Out Connector 1 "Analog"

1. silicon bias
2. silicon bias return   (tied to TGV preamp +5V Analog)
3. +5 volts analog, TGV preamp
4. spare
5. discriminator sum output
6. discriminator sum return
7. spare
8. +5 volts, analog: discriminator (reguires capacitor)
9. +5 volts, analog, AMU, current sum op-amp
10. - 5 volts, analog, current sum op-amp
11. +2.5 volts, analog, Vmid (reference)
12. analog ground, comparator
13. analog ground, TGV, AMU, current sum op-amp
14. mcm temperature sensor output
15. spare
16. preamp output   (spy channel)
17. AMU output   (spy channel)
18. serial enable   SER.EN
19. global serial enable   GEN (enables SDOUT - used w/ SER. EN)
20. serial clock   SCLK   (XCLK)
21. serial data in   SDIN   (XDIN)
22. serial data out   SDOUT (xilinx done when PROG asserted)
23. serial latch   SLATCH
24. xilinx program   PROG

MCM Out Connector 2 "Digital"

1.	+5 volts, digital, heap manager & ADC			
2.	+5 volts, digital, heap manager & ADC			
3.	digital ground, heap manager & ADC			
4.	digital ground, heap manager & ADC			
5.	spare			
6.	mode bit 0	Run/Stop		
7.	mode bit 1	Reset	Group	
8.	mode bit 2	Reset	Group	
9.	mode bit 3	Other	Group	
10.	mode bit 4	Other	Group	
11.	mode bit 5	Other	Group	
12.	lvl 1 accept			
13.	Digital Ground			|
14.	MCM data out clock	40 Mhz (4X Beam Clock)		|
15.	Digital Ground			|
16.	MCM data out 1	40 Mbit/sec serial data link #1		| output data links
17.	Digital Ground			|
18.	MCM out 2	40 Mbit/sec serial data link #2		|
19.	Digital Ground			|
20.	9.5 MHz beam clock			
21.	38 MHz clock	(4X Beam Clock)		
22.	spare			
23.	PECL differential clock	(required for ADC)		
24.	PECL differential clock	(required for ADC)		

Note: 40 Mbit/sec data links plus clock go to LVDS chips which are mounted on the Power/Communication circuit board (or Daughter board).

Mother Board Signal 160 contact (2 x 80)
0.5 amp. current capacity

1.	mode bit 0		2.	mode bit 1
3.	mode bit 2		4.	mode bit 3
5.	mode bit 4		6.	mode bit 5
7.	lvl 1 accept		8.	9.5 MHz beam clock
9.	spare		10.	38 MHz clock (4 X beam clock)
11.	spare		12.	spare
13.	PECL differential clock*		14.	PECL differential clock*
15.	spare		16,	spare
17.	MCM1 LVDS data out clock A		18.	MCM1 LVDSdata out clock B
19.	MCM1 LVDS data out 1 A		20.	MCM1 LVDS data out 1 B
21.	MCM1 LVDS data out 2 A		22.	MCM1 LVDS data out 2 B
23.	MCM2 LVDS data out clock A		24.	MCM2 LVDS data out clock B
25.	MCM2 LVDS data out 1 A		26.	MCM2 LVDS data out clock B
27.	MCM2 LVDS data out 2 A		28.	MCM2 LVDS data out 2 B
29.	MCM3 LVDS data out clock A		30.	MCM3 LVDSdata out clock B
31.	MCM3 LVDS data out 1 A		32.	MCM3 LVDS data out 1 B
33.	MCM3 LVDS data out 2 A		34.	MCM3 LVDS data out 2 B
35.	MCM4 LVDS data out clock A		36.	MCM4 LVDS data out clock B
37.	MCM4LVDS data out 1 A		38.	MCM4 LVDS data out 1 B
39.	MCM4 LVDS data out 2 A		40.	MCM4 LVDS data out 2 B
41.	MCM5 LVDS data out clock A		42.	MCM5 LVDS data out clock B
43.	MCM5 LVDS data out 1 A		44.	MCM5 LVDS data out 1 B
45.	MCM5 LVDS data out 2 A		46.	MCM5 LVDS data out 2 B
47.	MCM6 LVDS data out clock A		48.	MCM6 LVDS data out clock B
49.	MCM6 LVDS data out 1 A		50.	MCM6 LVDS data out 1 B
51.	MCM6 LVDS data out 2 A		52.	MCM6 LVDS data out 2 B
53.	mcm 1 serial enable		54.	mcm 2 serial enable
55.	mcm 3 serial enable		56.	mcm 4 serial enable
57.	mcm 5 serial enable		58.	mcm 6 serial enable
59.	serial clock		60.	serial data in
61.	serial data out		62.	serial latch
63.	global serial enable		64.	spare
65.	xilinx program mcm1		66.	xilinx program mcm2
67.	xilinx program mcm3		68.	xilinx program mcm4
69.	xilinx program mcm5		70.	xilinx program mcm6
71.	spare		72.	spare
73.	mcm 1 preamp output spy		74.	mcm 1 amu output spy
75.	mcm 2 preamp output spy		76.	mcm 2 amu output spy
77.	mcm 3 preamp output spy		78.	mcm 3 amu output spy
79.	mcm 4 preamp output spy		80.	mcm 4 amu output spy
81.	mcm 5 preamp output spy		82.	mcm 5 amu output spy
83.	mcm 6 preamp output spy		84.	mcm 6 amu output spy
85.	spare		86.	spare
87.	mcm1 discriminator sum		88.	mcm1 discriminator sum return
89.	mcm2 discriminator sum		90.	mcm2 discriminator sum return
91.	mcm3 discriminator sum		92.	mcm3 discriminator sum return

93.	mcm4 discriminator sum	94.	mcm4 discriminator sum return
95.	mcm5 discriminator sum	96.	mcm5 discriminator sum return
97.	mcm6 discriminator sum	98.	mcm6 discriminator sum return
99.	spare	100.	spare
101.	+5 volts, digital, heap manager, mcm 1	102.	+5 volts, digital, ADC, mcm 1
103.	+5 volts, digital, heap manager, mcm 2	104.	+5 volts, digital, ADC, mcm 2
105.	+5 volts, digital, heap manager, mcm 3	106.	+5 volts, digital, ADC, mcm 3
107.	+5 volts, digital, heap manager, mcm 4	108.	+5 volts, digital, ADC, mcm 4
109.	+5 volts, digital, heap manager, mcm 5	110.	+5 volts, digital, ADC, mcm 5
111.	+5 volts, digital, heap manager, mcm 6	112.	+5 volts, digital, ADC, mcm 6
113.	digital ground, mcm1	114.	digital ground, mcm1
115.	digital ground, mcm2	116.	digital ground, mcm2
117.	digital ground, mcm3	118.	digital ground, mcm3
119.	digital ground, mcm4	120.	digital ground, mcm4
121.	digital ground, mcm5	122.	digital ground, mcm5
123.	digital ground, mcm6	124.	digital ground, mcm6
125.	+5 volts, analog, compar, mcm 1, 2	126.	+5 volts, analog, compar, mcm 3, 4
127.	+5 volts, analog, compar, mcm 5, 6	128.	+5 volts, analog, TGV, AMU, mcm 1, 2
129.	+5 volts, analog, TGV, AMU, mcm 3, 4	130.	+5 volts, analog, TGV, AMU, mcm 5, 6
131.	-5 volts, analog, discri sum amp, m1, 2	132.	-5 volts, analog, discr sum amp, m3, 4
133.	-5 volts, analog, discr sum amp, m 5, 6	134.	+2.5 volts, analog, Vmid, mcm 1, 2
135.	+2.5 volts, analog, Vmid, mcm 3, 4	136.	+2.5 volts, analog, Vmid, mcm 5, 6
137.	analog ground, comparator, mcm 1, 2	138.	analog ground, comparator, mcm 3, 4
139.	analog ground, comparator, mcm 5, 6	140.	analog ground, TGV, AMU, mcm 1, 2
141.	analog ground, TGV, AMU, mcm 3, 4	142.	analog ground, TGV, AMU, mcm 5, 6
143.	MCM1 temperature monitor	144.	MCM2 temperature monitor
145.	MCM3 temperature monitor	146.	MCM4 temperature monitor
147.	MCM5 temperature monitor	148.	MCM6 temperature monitor
149.	silicon detector 1 bias	150.	silicon detector 1 bias return
151.	silicon detector 2 bias	152.	silicon detector 2 bias return
153.	silicon detector 3 bias	154	silicon detector 3 bias return
155	silicon detector 4 bias	156	silicon detector 4 bias return
157	silicon detector 5 bias	158.	silicon detector 5 bias return
159.	silicon detector 6 bias	160.	silicon detector 6 bias return

Note:
-The daughter board servicing the pad detector mcms has the same signals as the
Power/Communications Circuit Board for the central inner detector MCMs. On the
daughter board, there are 2 each Samtec TFM-140-11-S-D 80 contact header
connectors. The connector located at larger radius maps to the first 80 signals of the
160 contact connector. The second 80 contact connector maps to signals 81-160 of the
160 contact connector. The mating connectors on the motherboard are Samtec SFM-
140-01 80 contact socket connectors.
-The discriminator sum output is not used for the outer layer strip detectors.

* Assumes PECL clock distribution on Power/Communications Circuit Board

MVD Endplate Connections

1. DC Power –

Panduit MAS-CON IDC: 10 contact, 8 amp contact rating, (.156 pitch), 18 gauge wire.
Header (MLSS156-10TA): 31.7mm x 3.7mm x 3.2mm high   Right Angle Plug
(CT156F18-10): 31.7mm x 9.0mm x 19.6mm high.

For each set of 6 MCMs (corresponds to power/communications circuit board), require
10 each 18 gauge wire. The ampacity of the 18 gauge wire is 3A. 3 each +5V, 3 each
digital ground, 1 each -5V, 1 each analog ground. For 7 groups of 6 MCMs, we have
70 each 18 gauge wire. Assuming 2 mm O.D. of insulated wire + 2/3 packing factor,
get a cross sectional area of 328mm^2 (18mm x 18mm). Associated with each
connector are 5 each voltage regulators with a capacity of 3 amps each. The regulator
outputs are protected by Raychem PolySwitch resettable fuses. In addition, need to
current limit lines to the 160 contact connector to avoid using the connector as a fuse.

Typical Power Connector Pin Assignments

1. +5V digital
2. +5V digital return
3. +5V digital
4. +5V digital return
5. +5V analog
6. +5V analog return
7. +5V analog
8. +5V analog return
9. -5V analog
10. -5V analog return

2. Silicon Bias -

Maximum of 42 silicon detectors/quadrant => 42 bias + 42 bias returns. Low current requirement (130V Max), so use shielded 25 mil pitch cable and IDC connectors. These connectors are rated for 500Vrms at sea level. Require 2 connectors, 1 ea. 50 contact connector and 1 ea. 40 contact connector. These cables go to the power distribution box.

Silicon Bias Connector 1

50 contact header:	3M 81050-660X0X
50 contact mating socket connector:	3M 82050-6006

1. group 1, mcm 1, silicon bias
2. group 1, mcm 1, silicon bias return
3. group 1, mcm 2, silicon bias
4. group 1, mcm 2, silicon bias return
5. group 1, mcm 3, silicon bias
6. group 1, mcm 3, silicon bias return
7. group 1, mcm 4, silicon bias
8. group 1, mcm 4, silicon bias return
9. group 1, mcm 5, silicon bias
10. group 1, mcm 5, silicon bias return
11. group 1, mcm 6, silicon bias
12. group 1, mcm 6, silicon bias return
13. group 2, mcm 1, silicon bias
14. group 2, mcm 1, silicon bias return
15. group 2, mcm 2, silicon bias
16. group 2, mcm 2, silicon bias return
17. group 2, mcm 3, silicon bias
18. group 2, mcm 3, silicon bias return
19. group 2, mcm 4, silicon bias
20. group 2, mcm 4, silicon bias return
21. group 2, mcm 5, silicon bias
22. group 2, mcm 5, silicon bias return
23. group 2, mcm 6, silicon bias
24. group 2, mcm 6, silicon bias return
25. group 3, mcm 1, silicon bias
26. group 3, mcm 1, silicon bias return
27. group 3, mcm 2, silicon bias
28. group 3, mcm 2, silicon bias return
29. group 3, mcm 3, silicon bias
30. group 3, mcm 3, silicon bias return
31. group 3, mcm 4, silicon bias
32. group 3, mcm 4, silicon bias return
33. group 3, mcm 5, silicon bias
34. group 3, mcm 5, silicon bias return
35. group 3, mcm 6, silicon bias
36. group 3, mcm 6, silicon bias return
37. group 4, mcm 1, silicon bias
38. group 4, mcm 1, silicon bias return
39. group 4, mcm 2, silicon bias
40. group 4, mcm 2, silicon bias return
41. group 4, mcm 3, silicon bias
42. group 4, mcm 3, silicon bias return
43. group 4, mcm 4, silicon bias
44. group 4, mcm 4, silicon bias return
45. group 4, mcm 5, silicon bias
46. group 4, mcm 5, silicon bias return
47. group 4, mcm 6, silicon bias
48. group 4, mcm 6, silicon bias return
49. spare
50. spare

Silicon Bias Connector 2

    40 contact header: 3M 81040-660X0X
    40 contact mating socket connector: 3M 82040-6006

1.	group 5, mcm 1, silicon bias	2.	group 5, mcm 1, silicon bias return
3.	group 5, mcm 2, silicon bias	4.	group 5, mcm 2, silicon bias return
5.	group 5, mcm 3, silicon bias	6.	group 5, mcm 3, silicon bias return
7.	group 5, mcm 4, silicon bias	8.	group 5, mcm 4, silicon bias return
9.	group 5, mcm 5, silicon bias	10.	group 5, mcm 5, silicon bias return
11.	group 5, mcm 6, silicon bias	12.	group 5, mcm 6, silicon bias return
13.	group 6, mcm 1, silicon bias	14.	group 6, mcm 1, silicon bias return
15.	group 6, mcm 2, silicon bias	16.	group 6, mcm 2, silicon bias return
17.	group 6, mcm 3, silicon bias	18.	group 6, mcm 3, silicon bias return
19.	group 6, mcm 4, silicon bias	20.	group 6, mcm 4, silicon bias return
21.	group 6, mcm 5, silicon bias	22.	group 6, mcm 5, silicon bias return
23.	group 6, mcm 6, silicon bias	24.	group 6, mcm 6, silicon bias return
25.	group 7, mcm 1, silicon bias	26.	group 7, mcm 1, silicon bias return
27.	group 7, mcm 2, silicon bias	28.	group 7, mcm 2, silicon bias return
29.	group 7, mcm 3, silicon bias	30.	group 7, mcm 3, silicon bias return
31.	group 7, mcm 4, silicon bias	32.	group 7, mcm 4, silicon bias return
33.	group 7, mcm 5, silicon bias	34.	group 7, mcm 5, silicon bias return
35.	group 7, mcm 6, silicon bias	36.	group 7, mcm 6, silicon bias return
37.	spare	38.	spare
39.	spare	40.	spare

3. Analog Sum Outputs Connector

24 each single ended signals. Assume shielded 25 mil pitch cable and a 50 contact connector.

50 contact header:	3M 81050-660X0X
50 contact mating socket connector:	3M 82050-6006

This cable goes to the trigger interface

01. group 1, mcm1, discriminator sum	02. group 1, mcm1, discriminator sum return
03. group 1, mcm2, discriminator sum	04. group 1, mcm2, discriminator sum return
05. group 1, mcm3, discriminator sum	06. group 1, mcm3, discriminator sum return
07. group 1, mcm4, discriminator sum	08. group 1, mcm4, discriminator sum return
09. group 1, mcm5, discriminator sum	10. group 1, mcm5, discriminator sum return
11. group 1, mcm6, discriminator sum	12. group 1, mcm6, discriminator sum return
13. group 2, mcm1, discriminator sum	14. group 2, mcm1, discriminator sum return
15. group 2, mcm2, discriminator sum	16. group 2, mcm2, discriminator sum return
17. group 2, mcm3, discriminator sum	18. group 2, mcm3, discriminator sum return
19. group 2, mcm4, discriminator sum	20. group 2, mcm4, discriminator sum return
21. group 2, mcm5, discriminator sum	22. group 2, mcm5, discriminator sum return
23. group 2, mcm6, discriminator sum	24. group 2, mcm6, discriminator sum return
25. group 3, mcm1, discriminator sum	26. group 3, mcm1, discriminator sum return
27. group 3, mcm2, discriminator sum	28. group 3, mcm2, discriminator sum return
29. group 3, mcm3, discriminator sum	30. group 3, mcm3, discriminator sum return
31. group 3, mcm4, discriminator sum	32. group 3, mcm4, discriminator sum return
33. group 3, mcm5, discriminator sum	34. group 3, mcm5, discriminator sum return
35. group 3, mcm6, discriminator sum	36. group 3, mcm6, discriminator sum return
37. group 7, mcm1, discriminator sum	38. group 7, mcm1, discriminator sum return
39. group 7, mcm2, discriminator sum	40. group 7, mcm2, discriminator sum return
41. group 7, mcm3, discriminator sum	42. group 7, mcm3, discriminator sum return
43. group 7, mcm4, discriminator sum	44. group 7, mcm4, discriminator sum return
45. group 7, mcm5, discriminator sum	46. group 7, mcm5, discriminator sum return
47. group 7, mcm6, discriminator sum	48. group 7, mcm 6, discriminator sum return
49. spare	50. spare

4. Timing/Control Connectors

7 each 40 contact connectors
40 contact header: 3M 81040-660X0X
40 contact mating socket connector: 3M 82040-6006

1. mode bit 0	2. digital ground
3. mode bit 1	4. digital ground
5. mode bit 2	6. digital ground
7. mode bit 3	8. digital ground
9. mode bit 4	10. digital ground
11. mode bit 5	12. digital ground
13. level 1 accept	14. digital ground
15. 9.5 MHz beam clock	16. digital ground
17. 38 Mhz (4 X beam clock)	18. digital ground
19. serial clock	20. digital ground
21. serial data in	22. digital ground
23. serial data out	24. digital ground
25. serial latch	26. digital ground
27. mcm 1 serial enable	28. mcm 2 serial enable
29. mcm3 serial enable	30. mcm 4 serial enable
31. mcm 5 serial enable	32. mcm 6 serial enable
33. global serial enable	34. digital ground
35. xilinx program mcm1	36. xilinx program mcm2
37. xilinx program mcm3	38. xilinx program mcm4
39. xilinx program mcm5	40. xilinx program mcm6

Assume control and serial signals are single ended logic consistent with 50 ohm loads (e.g. Motorola FACT CMOS). Assume 25 mil pitch pleated foil shielded cable (3M 90101/40) with IDC connectors (3M 82040-600X .050"x .100" tripolarized wiremount mini socket) and mating headers (3M 81040-6X0C0X .050" x .100" tripolarized latch/ejector header).   Require 7 each 40 contact connectors. The serial data-out signal requires a driver on the motherboard (7 signals). Header size: 7.9mm x 39.6mm x 10.3mm high

5. LVDS Outputs

7 each 36 contact connectors
36 contact header: 3M 81036-660X0X
36 contact mating socket connector: 3M 82036-6006

01.	MCM1 LVDS data out clock A	02.	MCM1 LVDSdata out clock B
03.	MCM1 LVDS data out 1 A	04.	MCM1 LVDS data out 1 B
05.	MCM1 LVDS data out 2 A	06.	MCM1 LVDS data out 2 B
07.	MCM2 LVDS data out clock A	08.	MCM2 LVDS data out clock B
09.	MCM2 LVDS data out 1 A	10.	MCM2 LVDS data out clock B
11.	MCM2 LVDS data out 2 A	12.	MCM2 LVDS data out 2 B
13.	MCM3 LVDS data out clock A	14.	MCM3 LVDSdata out clock B
15.	MCM3 LVDS data out 1 A	16.	MCM3 LVDS data out 1 B
17.	MCM3 LVDS data out 2 A	18.	MCM3 LVDS data out 2 B
19.	MCM4 LVDS data out clock A	20.	MCM4 LVDS data out clock B
21.	MCM4LVDS data out 1 A	22.	MCM4 LVDS data out 1 B
23.	MCM4 LVDS data out 2 A	24.	MCM4 LVDS data out 2 B
25.	MCM5 LVDS data out clock A	26.	MCM5 LVDS data out clock B
27.	MCM5 LVDS data out 1 A	28.	MCM5 LVDS data out 1 B
29.	MCM5 LVDS data out 2 A	30.	MCM5 LVDS data out 2 B
31.	MCM6 LVDS data out clock A	32.	MCM6 LVDS data out clock B
33.	MCM6 LVDS data out 1 A	34.	MCM6 LVDS data out 1 B
35.	MCM6 LVDS data out 2 A	36.	MCM6 LVDS data out 2 B

6. Monitoring Signals

LDO output voltages (35) and MCM temperatures (42 fully populated, 34 nominal - Analog Devices TMP37) monitored on motherboard using 10 ea MAXIM 8-channel serial 12 bit ADCs. Serial control and readout from Power Distribution Box through 40 contact 3M header (81040-6X0X0X). Use 3M 90101 series 25 mil pitch pleated foil shielded cable.

Each MCM has two spy lines (AMU input and AMU output for any 1 of 256 channels) for a total of 42 spy line pairs assuming full population. Analog Devices ADG406 16 channel analog multiplexer (6 required) appears to be a candidate component. Some glue logic will be required to interface to a serial link.

40 Contact Monitor Connector Signals

1	digital ground	2.	digital ground
3.	monitor serial clock	4.	digital ground
5.	monitor serial data in	6.	digital ground
7.	monitor serial data out	8.	digital ground
9.	monitor serial latch	10.	digital ground
11.	monitor serial enable	12.	digital ground
13.	digital ground	14.	digital ground
15.	spare	16.	spare
17.	digital ground	18.	digital ground
19.	spy serial clock	20.	digital ground
21.	spy serial data in	22.	digital ground
23.	spy derial data out	24.	digital ground
25.	spy serial latch	26.	digital ground
27.	spy serial enable	28.	digital ground
29.	spare	30.	spare
31.	analog ground	32.	analog ground
33.	amu input spy channel	34.	analog ground
35.	analog ground	36.	analog ground
37.	amu output spy channel	38.	analog ground
39.	analog ground	40.	analog ground