ZPD Memory Organization – Blocks, Addresses, and Formats

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Memory Block Organization

Block	Finders	Block	Fitters	Block	Miscellaneous
0x2	Finder 0	0x4	Fitter 0	0x1	Sergio (segment I/O)
0x8	Finder 1	0x10	Fitter 1	0x4000	Clock Manager reset (temp)
0x20	Finder 2	0x40	Fitter 2	0x8000	Decision Module
0x80	Finder 3	0x100	Fitter 3		
0x200	Finder 4	0x400	Fitter 4		
0x800	Finder 5	0x1000	Fitter 5		
0x2a	SL10 Finders	0x54	SL10 Fitters		
0xa80	SL7 Finders	0x1500	SL7 Fitters		
0xaaa	All Finders	0x1554	All Fitters		

Diagnostic Memories

Block	Address	Name
Sergio 0x1	4000 – 7F9F	TSF Segment Input; XXA0 – XXFF reserved[1]
Finders	4000 – 7F9F	Megabus; XXA0 – XXFF reserved[1]
Finders	1000 – 17FB	Finder Results; 1XXC – 1XXF unused
Fitters	4000 – 41FF	Fitter Results
Decision Module 0x8000	4000 – 4BFF	Fitter Results[2]
Decision Module 0x8000	3000 – 303F	Output

DAQ Memories (mostly read only[3])

Block	Address	Name
Sergio 0x1	2000 – 2049	Segment Masks output buffer 0
"	2100 – 2149	Segment Masks output buffer 1
"	2200 – 2249	Segment Masks output buffer 2
"	2300 – 2349	Segment Masks output buffer 3
"	2400 – 267F	Circular Buffer (**16 bit data**)
"	2A00	offset
"	2A01	clock4 ticks (default=8)
Decision Module 0x8000	2000 – 20C9	Fit Results and output buffer 0
"	2100 – 21C9	Fit Results and output buffer 1
"	2200 – 22C9	Fit Results and output buffer 2
"	2300 – 23C9	Fit Results and output buffer 3
"	2400 – 273F	Circular Buffer **(32 bit data)**
"	2A00	offset
"	2A01	clock4 ticks (default=8)

[1] Reserved addresses in the segment/Megabus diagnostic memories will return 0xBADD if read.
[2] 0x4000-0x41FF for Fitter 0; 0x4200-0x43FF for Fitter 1, etc.
[3] Offsets (between the pointer of the circular memory and of the daq memory) and clock4 ticks (determine the length of the daq memory, the maximum is 8) are writable.

Miscellaneous – All Blocks

Address	Name
0	Version[4] (read only)
1	Control (unused)
2	Status (read only, unused)
3 – F	Reserved

Basic Parameters

These parameters are used to derive the contents of all the other LUTs.

block 1; all values are signed 16-bit

Address	Name	Units
10	ZPDi TSF Mask	
11	Number of $1/p_T$ bins	
12	min p_T	MeV
13	number of tanλ bins (A10)	
14	min tanλ (A10)	10^{-3}
15	max tanλ (A10)	10^{-3}
16	number of tanλ bins (A7)	
17	min tanλ (A7)	10^{-3}
18	max tanλ (A7)	10^{-3}
19	B field	milliTesla
1a	IPx	10^{-3} cm
1b	IPy	10^{-3} cm
1c	IPz	10^{-3} cm
1d	ZPD octant (0-7)	
1e-2f	reserved	

The Finder blocks also contain read only memory addresses of the basic parameters which were used to derive their constants:

Address	Name	Units
110	Number of $1/p_T$ bins	
111	min p_T	MeV
112	number of tanλ bins (A10)	
113	min tanλ (A10)	10^{-3}
114	max tanλ (A10)	10^{-3}
115	phi bin merge	
116	B field	milliTesla

[4] The upper nybble of the Sergio version number is the ZPD serial number. For Finder or Fitter blocks, the upper byte is the Fitter version and the lower byte is the Finder version, and the highest bit is 1 for an A10 Finder/Fitter.

Look Up Tables (LUTs)

Block	Size	Address	Name
Finders		100 - 109	Best seg road width
"		8000 - A7FF	Seed phi SL conversion
"		C000 - E7FF	Expected phi position **(32 bit data)**
Fitters	9	8000 - 8008	phiconv
"	9	8100 – 8108	twistzero
"	9	8200 – 8208	wr2
"	64	8300 – 833f	sumr2
"	192	8400 – 84bf	dphidrho
"	64	8500 – 853f	useax
"	256	8600 – 86ff	rho5
"	256	8700 – 87ff	rho3
"	6	8800 – 8805	rstereo
"	6	8900 – 8905	sigma2z
"	48	8a00 – 8a2f	dsigma2z
"	64	8b00 – 8b3f	sums2
"	64	8c00 – 8c3f	rhoconv
"	18	8d00 – 8d11	ipcorr
"	288	9000 – 911f	wr2dpdr
"	512	9200 – 93ff	fitok
"	512	9400 – 95ff	hitax
"	512	9600 – 97ff	sumds2
"	512	9800 – 99ff	sumd2s2 **(32 bit data)**
"	512	9a00 – 9bff	denomzt
"	512	9c00 – 9dff	z0err
"	2048	a000 – a7ff	sumr2dpdr
"	2048	a800 – afff	sumrd2pdr2
"	2048	b000 – b7ff	denomrp
"	2304	c000 – c8ff	curvcorr
Decision Module		100 – 1f0	cuts for decision bit 0
(block 0x8000)		100, 101	A10 ρ min, max [2^{-12}/cm]
"		102, 103	A10 tanλ min, max [2^{-5}/cm]
"		104, 105	A10 z_0 min, max [cm]
"		106	A10 z_0 error max
"		107	A10 max missing segments
"		110-117	A7∂uts
"		1f0	4-bit seed sector mask
"		200 – 2f0	cuts for decision bit 1
"		300 – 3f0	cuts for decision bit 2
"		400 – 4f0	cuts for decision bit 3
"		500 – 5f0	cuts for decision bit 4
"		600 – 6f0	cuts for decision bit 5
"		700 – 7f0	cuts for decision bit 6
"		800 – 8f0	cuts for decision bit 7
"		1000 – 1fff	Max possible segments

Diagnostic Memory Formats

See
http://www.slac.stanford.edu/BFROOT/www/Detector/Trigger/upgrade/docs/zpd/doc/DiagMemFormat.html

DAQ Memory Format

See
http://www.slac.stanford.edu/BFROOT/www/Detector/Trigger/upgrade/docs/zpd/doc/ZpdEventData.pdf

LUT Formats

The LUT formats are perhaps best understood by reading the C++ code which generates them in `L1DctConfig/L1DZpdLut.cc`. Also see:
http://www.slac.stanford.edu/BFROOT/www/Detector/Trigger/upgrade/docs/zpd/doc/LutFormat.html