

[mu2ehwdev@mu2edaq05 Anal]\$ hexdump -v junkdata8.bin | more

```
0000000 0410 8050 0040 0001 0000 0000 0055 0000
0000010 2008 0080 2008 0080 2008 0080 2008 0080
0000020 2008 0080 2008 0080 2008 0080 2008 0080
0000030 2008 0080 2008 0080 2008 0080 2008 0080
0000040 2008 0080 2008 0080 2008 0080 2008 0080
0000050 000f 8000 0001 0000 f0ce 0338 f0cc 0338
0000060 2008 0080 2008 0080 2008 0080 2008 0080
0000070 2008 0080 2008 0080 2008 0080 2008 0080
0000080 2008 0080 2008 0080 2008 0080 2008 0080
0000090 2008 0080 2008 0080 2008 0080 2008 0080
00000a0 2008 0080 2008 0080 2008 0080 2008 0080
00000b0 000f 8000 0001 0000 8326 033b 8325 033b
00000c0 2008 0080 2008 0080 2008 0080 2008 0080
00000d0 2008 0080 2008 0080 2008 0080 2008 0080
00000e0 2008 0080 2008 0080 2008 0080 2008 0080
00000f0 2008 0080 2008 0080 2008 0080 2008 0080
0000100 2008 0080 2008 0080 2008 0080 2008 0080
0000110 000f 8000 0001 0000 178c 033e 1785 033e
0000120 2008 0080 2008 0080 2008 0080 2008 0080
0000130 2008 0080 2008 0080 2008 0080 2008 0080
0000140 2008 0080 2008 0080 2008 0080 2008 0080
0000150 2008 0080 2008 0080 2008 0080 2008 0080
0000160 2008 0080 2008 0080 2008 0080 2008 0080
0000170 000f 8000 0002 0000 abe4 0300 abe1 0300
0000180 2008 0080 2008 0080 2008 0080 2008 0080
0000190 2008 0080 2008 0080 2008 0080 2008 0080
00001a0 2008 0080 2008 0080 2008 0080 2008 0080
00001b0 2008 0080 2008 0080 2008 0080 2008 0080
00001c0 2008 0080 2008 0080 2008 0080 2008 0080
00001d0 000f 8000 0002 0000 3e45 0303 3e3f 0303
00001e0 2008 0080 2008 0080 2008 0080 2008 0080
```

Header words

Data pattern

Time stamp

Data pattern

Word #s

Header words decoded

Data Header Packet

15

0

<i>K28.0</i>			<i>D5.0</i>	
Data Block Byte Count High			Data Block Byte Count Low	
Valid	Reserved	Subsystem ID [10:8]	Packet Type (0x5)	ROC Link ID [3:0]
0b00000		Packet Count [10:0]		
Event Window Tag byte 1			Event Window Tag byte 0	
Event Window Tag byte 3			Event Window Tag byte 2	
Event Window Tag byte 5			Event Window Tag byte 4	
Data Packet Format Version [15:8]			Status [7:0]	
Event Window Mode [15:8]			DTC ID [7:0]	
<i>CRC high</i>			<i>CRC low</i>	

Figure 1 Data Header Packet format from mu2e-docdb-4914

The Data Header Packet Status 8-bit field is defined as follows:

Bit Position	Definition
0	“Event Window has Data” flag indicates detector data present, else No Data for Event Window.
1	“Invalid Event Window Request” flag indicates the ROC did not received a Heartbeat packet corresponding to this Data Request.
2	“I am corrupt” flag indicates the ROC has lost data or the ability to conduct detector readout has been compromised.
3	“Data Request FIFO Empty” flag indicates that there are more data requests queued.
7:3	Reserved

Figure 2 Data Header Packet Status 8-bit field from mu2e-docdb-4097

Word #	Value	Meaning
1	0x0410	total byte count in the data block – in this case 0x0410 or 1,040 bytes. This is inserted by the DTC.
2	0x8050	From low to high bits: ROC link ID=0, Packet type 0x5, Subsystem ID 0 (Tracker), don’t know what the 0x8 is (this is perhaps Valid=1, Reserved=0, if Valid is 2bits wide). The DTC inserts the ROC link ID, the rest comes from the ROC.
3	0x0040	This is packet count = 64. The 0b00000 in the table above is just to show that the high 5 bits are not used.
4	0x0001	Event window tag byte (=1).
5	0x0	Event window tag byte
6	0x0	Event window tag byte

7	0x0055	From low to high: Status (0x55 = 01010101): (bits from low to high) 1 = detector data present, 0 = (not) invalid event window request, 1 = I am corrupt flag, 0 = FIFO empty flag. Second 5 (i.e. 0x50) is "reserved" so don't know why it is "5". Data packet format version 0x00.
8	0x0000	From low to high: DTC ID (0), Event Window Mode (0)

Figure 3 Decoding the data packet header for this example. Data is from tracker DRAC, reading out 1 ROC with 1 DTC.

According to mu2e-docdb-25599, the tracker data format for beam test and vertical is as below:

event_window_counter(31-0)			
flag	channel(6-4)	tot _{hv} (3-0)	tdc _{hv} (23-0)
	channel(3-0)	tot _{cal} (3-0)	tdc _{cal} (23-0)
00	sample ₂ (9-0)	sample ₁ (9-0)	sample ₀ (9-0)
00	sample ₅ (9-0)	sample ₄ (9-0)	sample ₃ (9-0)
...			

- ▶ 24 bit TDC word (up to 400 μ s per window)
- ▶ 32 bit ewm counter (2 hours of 1700 ns windows)
- ▶ Always multiple of 3 samples read out
- ▶ Option to flag start of hit with K28.0 as in DAQ packets

Figure 4 Tracker data format from mu2e-docdb-25599

There should be 3 32bit word "headers" but it looks like there are 4. Not sure why.

The number of samples taken is determined by the "-s" option in the "read" command. In this case, s=20, hence 20 32b words (2008 0080 repeated 20 times).

000f 8000 0001 0000 f0ce 0338 f0cc 0338

According to Richie, it looks like the word order is swapped. Below is his interpretation of the "header" words.

16 bit Word #	Value	Meaning
0	0x8000	Don't know, but 0x8000 is what it is supposed to be.
1	0x000f	fifo full flag, digi number, channel number (5-0). In this case the channel number is 0x0f = 15?
2,3	0x0001 0x0000	Event counter (32 bits, word swapped) = 1
4	0x0338	Hv tot [0-3], hv timestamp [24-16]. So hv tot = 0x3
5	0xf0ce	Hv timestamp [15-0] So timestamp is 0x38f0ce
6	0x0338	cal tot [0-3], cal timestamp [24-16]. So cal tot = 0x3
7	0xf0cc	cal timestamp [15-0] So timestamp is 0x38f0cc

<i>K28.0</i>		<i>D6.1</i>	
Straw index (16 bits)			
First TDC value (16 bits)			
Second TDC value (16 bits)			
Second ToT value (8 bits)		First ToT value (8 bits)	
ADC Sample 1...	ADC Sample 0 (12 bits)		
ADC Sample 2...		ADC Sample 1 cont	
ADC Sample 3			ADC Sample 2 cont
ADC Sample 5...	ADC Sample 4		
<i>CRC high</i>		<i>CRC low</i>	

Figure 5 Tracker data format from mu2e-docdb-4914. I believe this must be obsolete? In principle the format is heading towards Figure 4?