

Second Pass on WIB Metadata

Original Definitions in CE/DAQ interface document

K/D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Data Source
0001	0x00				0x00				0x00				SOF (K28.1)								WIB												
0000	14-bit WIB Code										Data Frame Version#			FEMB Valid	F#	WIB Slot#		WIEC Crate#				WIB											
0000	32-bit WIB/COLDATA Code																																WIB
0000	Timestamp [31:0]																																WIB
0000	Timestamp [63:32]																																WIB
0000	U(2) ADC[3:0]				U(1) ADC[13:0]								U(0) ADC[13:0]												FEMBO								
0000	U(4) ADC[7:0]								U(3) ADC[13:0]								U(2) ADC[13:4]												FEMBO				

0000	X(45) ADC[9:0]				X(44) ADC[13:0]								X(43) ADC[13:6]								FEMB1						
0000	X(47) ADC[13:0]								X(46) ADC[13:0]								X(45) ADC[13:10]								FEMB1		
0000	12-bit flex word										CRC-20																WIB
0001	24-bit flex word																EOF (K28.6)								WIB		
0001	0x00				0x00								0x00				IDLE (K28.5)				IDLE/WIB						

14-bit WIB Code

32-bit WIB/COLDATA Code

12-bit flex word

24-bit flex word

(We are going to completely ignore slow controls and DDSS information, which do not (obviously) go into the frame header or trailer).

+One bit of the COLDATA v2 already dedicated to pulser

Third Pass on WIB Metadata

Current definitions used at ICEBERG

K/D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Data Source
0001	0x00							0x00							0x00							SOF (K.28.1)							WIB				
0000	0x00			LOL	Link mask. Bits [3:0]=FEMB0, bits [7:4]=FEMB1				FEMB Valid	F#	WIB Slot [2:0]			Format_version[3:0]				WIEC Crate [7:0]							WIB								
0000	time stamp FEMB 0 link 3							time stamp FEMB 0 link 2							time stamp FEMB 0 link 1							time stamp FEMB 0 link 0							WIB				
0000	Timing master Time stamp [31:0]																															WIB	
0000	Timing master Time stamp [63:32]																															WIB	
0000	U(2) ADC[3:0]			U(1) ADC[13:0]											U(0) ADC[13:0]															FEMBO			
0000	U(4) ADC[7:0]							U(3) ADC[13:0]							U(2) ADC[13:4]							FEMBO											

0000	X(45) ADC[9:0]									X(44) ADC[13:0]													X(43) ADC[13:6]										
0000	X(47) ADC[13:0]													X(46) ADC[13:0]							X(45) ADC[13:10]												
0000	time stamp FEMB 1 link 3							time stamp FEMB 1 link 2							time stamp FEMB 1 link 1							time stamp FEMB 1 link 0											
0001	0	CRC-20																															EOF (K.28.6)
0001	0x00							0x00							0x00							IDLE (K.28.5)											
Transmit IDLE between frames constantly																																	

14-bit WIB Code

32-bit WIB/COLDATA Code=COLDATA 8-bit time stamps for debugging

12-bit flex word and 24 bit flex words used for COLDATA time stamps, extra bits all 0 ?

Third Pass on WIB Metadata

Current definitions based on our discussions so far

	K/D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Data Source
0	0001	0x00						0x00						0x00						SOF (K28.1)						WIB								
1	0000	0x00				LOL	Link mask. Bits [3:0]=FEMB0, bits [7:4]=FEMB1				FEMB Valid	F#	WIB Slot [2:0]		Format_version[3:0]			WIEC Crate [7:0]						WIB										
2	0000	COLDATA Time Stamp [0:14]															FEMB Synchronization Flags						0x00						WIB					
3	0000	Timing master Time stamp [31:0]																															WIB	
4	0000	Timing master Time stamp [63:32]																															WIB	
5	0000	U(2) ADC[12:0]										U(1) ADC[12:0]										U(0) ADC[12:0]										FEMRO		
0000		Configuration ID				Ready	PSR Cal				WS	0x00	0x00	FLEX Bits [0:15]															WIB					
0001		0				CRC-20																EOF (K28.6)						WIB						
0001		0x00				0x00				0x00						IDLE (K28.5)						IDLE/WIB												
Transmit IDLE between frames constantly																																		

- Replaced 4x8 bit COLDATA time stamps with 1 (15-bit) COLDATA time stamp + 8-bits of synchronization flags
- Added 8-bit configuration ID
- Added WIB Ready bit --- low during configuration transitions
- Added 4 "pulser"(PSR Cal) bits: High means pulse calibration from respective COLDATA [0-3]
- Added "WS"=WIB Sync bit, from timing endpoint
- Format_version = 3

Keep 1 COLDATA timestamp (15) + 8 synch flags = 23 bits → 1 flag/link
 If synch flag is bad, check flex words

Near Term Remaining Issues

- Pulser calibration Information
 - May be two pulser calibrations, one with 6-bit DAC on FEMB, one with 14+ bit DAC on WIB
 - Presumably we indicate this with Config ID and flex bits ?
 - What do we do with 16th (“pulser”) bit from COLDATA time stamp?
 - Should we include pulse count somewhere...? (“This is pulse nnn”)?
- 32-bit I2C serial numbers

OLD slides following

Use Case: Physics Running

We want (at least):

- Data Frame version number
 - WIB slot number
 - WIEC crate number
 - CRC-20
- } Already in frame definition
- FEMB “enables” --- 2-bit mask that tells us which FEMBs are currently providing valid data – **if we keep this, it should be link masks a la ICEBERG**
 - Configuration ID --- how many bits?
 - Configuration ongoing (transition bit?) 1 bit --- **maybe this is a “ready” bit**
 - FEMB Rx Link “enables” –16 bits/WIB
 - ADC Calibration bit (0 for normal data) --- data doesn’t go to FELIX so not needed
 - Pulser calibration bit (0 for normal data)
 - Stream this data (1 bit per FEMB?) and ignore for hit-finding **Database config?**
 - WIB Synchronization OK --- 1 for OK, comes from PLL, could get this from Endpoint
 - FEMB synchronization OK --- 2 bits, 1 for OK
 - Need to figure out how to determine this
 - Will we be able to do this while powered? Just need to test.

Use Case: Pulser Calibrations

Flex bits (contextualized by pulser calibration bit):

- Current DAC setting --- ~16 bits
- ~~Current gain setting — 2 bits — Move this to new run, keep in config database — has to come from Run Control~~
- ~~Current shaper setting — 2 bits? Move this to new run, keep in config database — has to come from Run Control~~
- Pulser offset? --- need to define — need to think about real bit width necessary
- ~~Pulse count? — need to define. Can't set number of pulses, but could count them~~
- Frame includes pulse? -- -can figure out from pulser bit in time stamp (16th bit). Should we just use this on WIB
- I2C serial numbers into flex bits to verify cable map (32 bits; 1 bit says it's been burned)

Maybe let WIB define when pulser data is happening and then not happening

Do we need to double number of bits to deal with 2 FEMBs?

Configurations and Conditions

One way to divide up the cases:

Configurations=the way we want it to be set up

Conditions=how it may have changed

This gets murky when we imagine *dynamic re-configurations*:

- WIB will run calibrations locally, re-configuring DAC settings, etc.
- WIB will have ability to remove and FEMB from data stream (e.g., mask)
- WIB will run its own resynchronizations if necessary

For our purposes, this doesn't matter too much unless we want to go through the pain of first alerting CCM there is a problem and having it re-configure things---
We have to be able to flag dynamic changes to config information