

Fast ASIC Commands

a compilation

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Fast ASIC Commands

	CALOROC EICROC2	EICROC0 & EICROC1	FCFD	SALSA	ALCOR	ETROC
IDLE	Idle 0x36	<i>No Fast Commands</i>	<i>Unknown as yet. Perhaps similar to ETROC?</i>	CMD_Idle	Can't find any. <i>Not even sure it has Fast Commands?</i> Handled by the dRICH RDO??	Idle 0xF0
Resync (& various resets)	ChipSync 0xD2			CMD_ReSync		Link Reset 0x33
Clear Counters	BCR 0x1D			CMD_NewTimeFrame <i>But not sure?</i>		BCR 0x5A
Heartbeat/ Send Counters*	none			CMD_HeartBeat		none
various calibration pulse commands	L1A, CalPulseInt, CalPulseExt			CMD_Trig, CMD_Calib_N, CMD_Pulser		L1A, Charge Injection

Red: issued synchronously to the entire EPIC by the GTU

Orange: issued synchronously to the entire Detector (not necessarily global). Perhaps only for special non-physics runs.

Black: can be issued by the DAM user during Run-Start/Run-Configuration

* The Heartbeat command tells the ASIC to send some internal data (e.g. the current "bunch" counter, etc) but the problem to me is that it will compete with the ASIC's output FIFOs which normally have real data in streaming mode. This (IMHO) complicates the ASIC design which needs arbitration at the output stage: internal heartbeat data vs actual streaming data – which has priority? Do we really need it?? What is its intended usage?

CALOROC and EICROC2 (from Frederic)

Fast commands	Value	Description	Comment	Possible back to back
Idle	00110110	Default command inside	~99% of the time	Y
L1A	01001011	External trigger (all channels)	Calibration	Y
ChipSync	11010010	Reset FSM, buffers and counters		
BCR	00011101	Reset timestamp counter to a default value		
EBR	11010001	Empty readout buffers		
LinkResetROCD	10011010	Transmission of synchronization patterns	~ 400x same pattern	
ROC-Serializer-Reset	10011100	Reset serializer link module only		
CalPulseInt	00101101	800 ns internal calibration pulse		
CalPulseExt	01111000	100 ns external calibration pulse		
SC_0	01011010	Send bit 0 for SLIM	I2C over fast commands	Y
SC_1	01011100	Send bit 1 for SLIM	I2C over fast commands	Y
SC_Valid_Reset	10001011	Send validation to SLIM or a reset transaction (2 consecutives)	I2C over fast commands	Y

SALSA (from Irakli)

	A	B	C	D
1		5-bit synchronous commands		
2	Set	Group	Name	Description
3				
4				
5	Base	Sync	CMD_Idle	Continuously received in absence of other commands; used to recover system clock and its phase
5	Base		CMD_NewTimeFrame (TOSync)	Resets system and sampling timestamp counters to predefined values; increments time frame counter; Resynchronizes clocks; Response
7				If configured, response is sent after all data belonging to the current time frame are sent out to assist data collection; response contains state, frame and timestamp counters
3	Base		CMD_ReSync	Resets timeframe and trigger id counters; data taking should be off, otherwise ignored
3	Extended		CMD_ResetTimeFrameCntnr	Resets timeframe counters to 0; data taking should be off; probably can be covered by ReSync
0	Extended		CMD_ResetTriggerId	Resets trigger id counter to 0; data taking should be off, otherwise ignored; probably can be covered by ReSync
1				
2	Base	Run control	CMD_Start	Data taking allowed; if reinforced synchronization mode, data taking starts upon reception of next CMD_NewTimeFrame (TOSync)
3	Base		CMD_Stop	Data taking disabled; if reinforced synchronization mode, data taking stops upon reception of next CMD_NewTimeFrame (TOSync); in all cases all previously acquired data is processed
4	Extended		CMD_Pause	Data taking is suspended, all acquired data is processed and sent, resync commands will be processed, if any; Presumably can be substituted by CMD_Stop;
5	Extended		CMD_Resume	Data taking is resumed, if reinforced synchro mode, data taking starts upon reception of next CMD_NewTimeFrame (TOSync); Presumably can be substituted by CMD_Start;
6				
7	Base	Data	CMD_Trig	Data matching trigger conditions and timing sent out; Typically used in triggered readout systems
8	Base		CMD_Calib_0	
9	Base		CMD_Calib_1	
0	Base		CMD_Calib_2	Responds with calibration data : content depends on configuration; e.g. raw data; common mode subtracted data;
1	Base		CMD_Calib_3	
2	Extended		CMD_Pulser	Arm internal pulser to fire it according to configuration and calibration conditions - will be implemented if not covered by the Calib_x functionality
3				
4	Base	Management	CMD_HeartBeat	Responds by a Heart Beat packet including chip state, frame and timestamp counters
5	Base		CMD_Monitor_0	
6	Base		CMD_Monitor_1	
7	Base		CMD_Monitor_2	Responds with monitoring information : content depends on implementation & configuration; typical cases are configuration info, statistics
8	Base		CMD_Monitor_3	
9				
0	Base	Expert management	CMD_Expert	Should be send prior to the expert management commands : the double command mode enhances erroneous interpretation due to SEUs; the data taking should be off;
1	Base		CMD_WarmReset	ASIC is reset to its configuration state - configuration registers, links, PLL and SynCmd/CDR blocs are untouched
2	Base		CMD_ReSyncTxLink_0	
3	Base		CMD_ReSyncTxLink_1	
4	Base		CMD_ReSyncTxLink_2	Forces predefined or programmed number of IDLE words to be sent on corresponding active TX link
5	Base		CMD_ReSyncTxLink_3	
6	Base		CMD_ReSyncTxLink_4	
7	Base		CMD_ReSyncTxLinks	Forces predefined or programmed number of IDLE words to be sent on all active TX links
8	Base		CMD_ResetDsp	Resets only DSP
9	Base		CMD_ResetPipelineMem	Resets pipeline memories
0	Base		CMD_ResetBufferMem	Resets derandomizer memories
1	Base		CMD_ColdReset	Power cycle equivalent
2				

ETROC (CMS ETL ASIC) but perhaps FCFD?

Command Name	Command Word(Hex)	Description
Idle	0xF0	The ETROC2 expects to receive idle command when no other commands are issued. Idle command is used for alignment as well.
Link Reset	0x33	The ETROC2 sends user defined pattern or PRBS for 25 ns (time period of 40 MHz clock)when received a link reset command.
BCR	0x5A	ETROC2 resets the BX(bunch crossing) counter to zero when receiving BCR command. BX counter rounds back at a user configurable integer (by default 3563).
STP	0x55	synchronize the trigger path. Sending well-defined pattern on trigger
L1A-CR	0x66	ETROC2 resets the L1A counter to zero when receiving L1A-CR
Charge Injection	0x69	injecting charge to the pixels
L1A	0x96	readout trigger
L1A & BCR	0x99	L1A and BCR
WS Start	0xA5	Waveform sampler starts to sample
WS Stop	0xAA	waveform sampler stop sampling

HGCROC (CERN ASIC, as an example)

Fast command	B7	B0	description
IDLE	110 0000	1	Default command
Cmd_Orbit	110 0001	1	Reset internal Bx counter (seen in daq and trigger link header)
Cmd_Trigger	110 0100	1	Readout an event store in L1 buffer
Cmd_Calib	110 1000	1	Generate internal calibration pulse for the preamplifier
Cmd_Sync	110 1111	1	Force the startup mode (e-link synchronisation mode)
Cmd_Dump	110 1011	1	Internal use only (memory dump)

ALTIROC (CERN ASIC, as an example)

Fast Commands	Binary Code	Comments	Trigger data path (Configurable latency from 2 to 1536 BCs)	Luminosity data path (Fixed latency of 7 BCs)
IDLE	8'b11110000	Needs to be sent continuously and is used to keep the fast command unit aligned		
GBRST	8'b11001010	Needs to be sent: <ul style="list-style-type: none"> after changing the I2C configuration in case of permanent issues due to SEU/SET 	FSMs are reset FIFOs are reset L1 counter is reset to '0' (The first event will have L1ID = 1) BC counter is reset to '0' Any data being transmitted is truncated	FSMs are reset Windows are reset to '0' Any data being transmitted is truncated The comma word 16'h4778 is sent out replacing a data packet New luminosity packets will have good data after 11 BCs
BCRST	8'b10011001		L1 counter is reset to '0' (The first event will have L1ID = 1) BC counter is reset to '0'	The comma word 16'h4778 is sent out replacing a data packet
TRIGGER	8'b10110010		L1 counter incremented of 1, the first packet will have L1ID = 1 N.B. : After packet with L1ID = 4095, next L1ID = 1	
BCRTRIGGER	8'b01101001		L1 counter is reset to '0' (The first event will have L1ID = 1) BC counter is reset to '0' L1 counter incremented of 1, the first packet will have L1ID = 1	The comma word 16'h4778 is sent out replacing a data packet
SYNCLUMI	8'b01100110			The comma word 16'h4747 is sent out replacing a data packet
CAL	8'b11010100	Calibration pulse used for: <ul style="list-style-type: none"> pedestal adjustment TOA and TOT resolution 	N.B.: If more than 127 pixels are stimulated in the same BC the readout is stuck	
SETTRIGID	8'b01010011	Allows setting a different L1ID with the three following fast commands. Example: For L1 ID = 4 {8'bx0000xx, 8'bx0000xx, 8'bx0100xx} N.B.: An IDLE command must be issue before this command	L1 counter is reset to '4' (The first event will have L1ID = 5) N.B. : If L1 counter is reset to '4095', the first event will have L1ID = 1	