

# EVIO Data Format

## EVIO Data Format

- [Overview](#)
- [EVIO Data Types](#)
- [EVIO Event types - 2015 Data Set](#)
- [EVIO Banks - 2015 Data Set](#)
  - [Prestart Bank](#)
  - [GO Bank](#)
  - [Event ID Bank](#)
  - [Scaler Bank](#)
  - [EPICS Header Bank](#)
  - [EPICS Bank](#)
- [Resources](#)

## Overview

EVIO (Event IO) is the raw data format used by the DAQ event builder. The structure of an EVIO file is a tree of banks, each of which has a header and a data payload.

## EVIO Data Types

Each EVIO bank has a data type a tag and a num. The type corresponds to the contents of the bank.

data_type	Size	content	notes
0x0c,0x0d,0x0e,0x10,0x20,0x40	N	container	this is a bank that contains other banks
0x00, 0x01	4	uint32_t	unsigned integers
0x02	4	float	
0x0b	4	int	signed integers
0x0f	N	compound type	FADC (or other!) compound format.
0x03	1	char	char
0x06	1	int8_t = char	char
0x07	1	uint8_t	unsigned char
0x04	2	int16_t	short
0x05	2	uint16_t	unsigned short
0x08	8	double	
0x09	8	int64_t	long
0x0a	8	uint64_t	unsigned long

Source: EVIO C++ code data parser.

Note: The 0x0f compound type data contains a string that tells you what the layout of the data is. See EVIO documentation.

On the CLON machines, in the directory pointed to by \$CLON\_PARMS, is the file "clonbanks.xml", which contains the "dictionary" for the EVIO contents of various bank tags used in the data.

## EVIO Event types - 2015 Data Set

The very top bank in an event tree is usually a container bank (0x10). The "tag" of this bank indicates the event type. The event types used for the 2015 data set of HPS are listed below. Note that this is set by the DAQ configuration and is thus subject to change. Currently 16 - 32 are special event types, all others are "Physics" events. For physics events, the number is a bit encoded state of the trigger, with the high bit, bit 7, set. Thus physics events start at 128 and go up. The bit 6 encodes a "sync" event, which will contain scalers.

Event type #	Name	Notes
17	Pre Start	Indicates the "pre-start" transition in the DAQ
18	Go	Indicates the user pressed "Go" on DAQ

19	Pause	Indicates the user pressed "Pause" on DAQ
20	End	End of run marker event.
31	Epics	Epics event - Slow controls data that is injected into the data stream.
Bit 7	Physics	Physics events should have bit 7 set
Bit 6	Sync	Sync events (containing scalers and trigger config) should have bit 6 set. (Note: The 1st event in the run will be a sync event, but does not always have the sync bit set.)
Bit 5	Pulser	The pulser triggered the event.
Bit 4	LED/Cosmic	LED or Cosmic trigger.
Bit 3	Pairs 1	Indicates a Pair1 trigger.
Bit 2	Pairs 0	Indicates a Pair0 trigger.
Bit 1	Single 1	Indicates a Single1 trigger.
Bit 0	Single 0	Indicates a Single0 trigger.

## EVIO Banks - 2015 Data Set

Below is a list of the banks and tags used in the 2015 Engineering Run for HPS. Note that the bank numbers and tags used are chosen by the DAQ configuration, and are thus subject to change.

Parent bank	tag	tag hex	Name	Notes
event type 17	17	0x11	Prestart	Only bank in pre-start event
event type 18	18	0x12	Go	Only bank in go event
event type 31	129	0x81	Epics	Epics mother bank
-	57618	0xe112	Epics header	Epics header bank
-	57620	0xe114	Epics string	Epics string bank - contains the epics data in one long string of value-key pairs.
	57621	0xe115	Scalers	Scaler banks
		0xe101		
Physics event	>128	bit 7 set	Physics	
-	49152	0xc000	Event ID	
-	37,39,46,58	0x25,0x27,0x2e,0x3a		

Crate Name	Contents	Tag	Tag Hex
hps11	SSP, ECal Bottom Disc/TDCs/Scalers, RF FADC	46	0x2e
hps12	ECal Top & RF Disc/TDCs/Scalers	58	0x3a
hps1	ECal Top FADC	37	0x25
hps2	ECal Bottom FADC, Faraday Cup Disc/Scalers	39	0x27

### Prestart Bank

Index	Prestart bank	0x11 (17)
0	start time	unix timestamp
1	run number	
2	file number	

### GO Bank

Index	GO bank	0x12 (18)
0	start time	unix timestamp

1	0	
1	0	

## Head Bank

index	HEAD bank	0xe10F (57615)
0	version number	
1	run number	
2	event number	
3	event unix_time	
4	event type	
5	roc pattern	
6	event classification	17,18,20,etc
7	Trigger bits	

## Event ID Bank

index	EVENT ID bank	0xc000 (49152)
0	Event number	
1	TI trigger bits?	
2	Readout Status	should be 0

## Scaler Bank

index	Scaler bank	0xe115 (57621)
0-2	header?	
3	gated faraday cup with "TDC" threshold	
19	gated faraday cup with "TRG" threshold	
35	ungated faraday cup with "TDC" threshold	
51	ungated faraday cup with "TRG" threshold	
67	gated clock	
68	ungated clock	

## EPICS Header Bank

index	Epics Header Bank	0xe112 (57618)
0	0	?
1	Run number	
2	Sequence #	
3	Time Stamp	
4	0x1f	?

## EPICS Bank

index	Epics Sting Bank	0xe114 (57620)
0	Epics String	See details below

Epics name	Meaning	Notes
MBSY2C_energy	Beam energy according to Hall B BSY dipole "bus"	
ARCx:p	Beam energy measured in Arc "x" ; e.g. ARC2:p	x=12...9A
PSPECIRBCK	Pair Spectrometer Current Readback	
HPS:LS450_2:FIELD	Frascati probe field	
HPS:LS450_1:FIELD	Pair Spectrometer probe field	
MTIRBCK	Frascati Current Readback	
VCG2C21	2C21 Vacuum gauge pressure	
VCG2C21A	2C21A Vacuum gauge pressure	
VCG2C24A	2C24A Vacuum gauge pressure	
VCG2H00A	2H00 Vacuum gauge pressure	
VCG2H01A	2H01 Vacuum gauge pressure	
VCG2H02A	2H02 Vacuum gauge pressure	
scaler_calc1	Faraday cup current	
scalerS12b	HPS-Left beam halo count	
scalerS13b	HPS-Right beam halo count	
scalerS14b	HPS-Top beam halo count	
scalerS15b	HPS-SC beam halo count	
hallb_IPM2C21A_XPOS	Beam position X at 2C21	
hallb_IPM2C21A_YPOS	Beam position Y at 2C21	
hallb_IPM2C21A_CUR	Current at 2C21	
hallb_IPM2C24A_XPOS	Beam position X at 2C24	
hallb_IPM2C24A_YPOS	Beam position Y at 2C24	
hallb_IPM2C24A_CUR	Current at 2C24	
hallb_IPM2H00_XPOS	Beam position X at 2H00	
hallb_IPM2H00_YPOS	Beam position Y at 2H00	
hallb_IPM2H00_CUR	Current at 2H00	
hallb_IPM2H02_YPOS	Beam position X at 2H02	
hallb_IPM2H02_XPOS	Beam position Y at 2H02	

## Resources

- [EVIO Homepage](#)
- [EVIO API Javadoc](#)
- [EVIO User's Guide](#)
- [EVIO Event Building Scheme \(pdf\)](#)
- [JIRA ECal and RF TDCs](#)
- [JIRA RF FADCs and TDCs](#)