FTPC DAQ Raw Data Format

Version 1.0

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This document specifies the format for the Forward TPCs only and should be taken in conjunction with the official STAR DAQ Raw Data Format Documentation to provide the complete data readout specification.

FTPP (FTP Pointer Bank)

Format Version 1.0

This short bank indicates the relative position and length of each of the two FTP chamber pointer banks.

Length is 14 (4 data words).

Contents:

Data Words 1–4: Offset (words) from first word of the FTP contribution to the chamber contribution for each of the two FTPCs, followed by the length (words) of each contribution. A zero signifies no contribution is present. BankId = 1 corresponds to the first installed FTPC (FTPC West?), BankId = 2 corresponds to the second installed FTPC (FTPC East?).

Word 1: FTPC 1 offset

Word 2: FTPC 1 length

Word 3: FTPC 2 offset

Word 4: FTPC 2 length

FTPCHAP (FTPC Chamber Pointer Bank)

This bank allows navigation among the banks containing the contributions from the various receiver boards corresponding to this chamber. The bank identification indicates the chamber.

Length is 30 (20 data words).

Contents:

Data Words 1–20: Offset (words) from first word of FTPCHAP header to the chamber contribution for receiver boards 1,...,10 and the length (words) of each contribution. A zero signifies no contribution is present.

Word 1: Offset to Receiver Board 1 contribution

Word 2: Length of Receiver Board 1 contribution

Word 3: Offset to Receiver Board 2 contribution

Word 3: Length of Receiver Board 2 contribution

etc.

FTPRBP (FTPC Receiver Board Pointer Bank)

The bank identification in the header corresponds to the receiver board number. Each Receiver Board handles three sectors. The map between receiver board and the physical sector position is to be determined.

Length is 32 (22 data words).

Contents:

Data Words 1–6: Offset (words) from first word of FTPRBP to the receiver board contribution for each sector, and the length (words) of each contribution. A zero signifies no contribution is present.

Word 1: Offset to sector 1 contribution

Word 2: Length of sector 1 contribution

Word 3: Offset to sector 2 contribution

Word 4: Length of sector 2 contribution

Word 5: Offset to sector 3 contribution

Word 6: Length of sector 3 contribution

Data Words 7–22: Header as received via the fiber (64 bytes)

FTPSECP (FTPC Sector Pointer Bank)

The bank identification in the header corresponds to the internal sector number (1,2,3). These pointers may prove redundant if the hardware is constructed such that each Mezzanine Card handles only a single sector's contribution. For now, the sector pointers buffer the Raw Data Format against unforeseen hardware requirements.

Length is 16 (6 data words).

Contents:

Data Words 1 –6: Offset (words) from the first word of FTPSECP to the mezzanine board contribution for each sector, and the length (words) of each contribution. A zero signifies no contribution is present.

Word 1: Offset to mezzanine board A pointer bank

Word 2: Length of mezzanine board A pointer bank

Word 3: Offset to mezzanine board B pointer bank

Word 4: Length of mezzanine board B pointer bank

Word 5: Offset to mezzanine board C pointer bank

Word 6: Length of mezzanine board C pointer bank

FTPMZP (FTPC Mezzanine Board Pointer Bank)

The bank identification in the header corresponds to the mezzanine board number (1–3).

Length in this bank is variable; unused offset/length pairs may be omitted from the end of the list.

Contents:

Data Word 1: Offset (words) to the FTPADCD bank
(zero–suppressed data)

Data Word 2: Length (words) of the FTPADCD bank

Data Word 3: Offset (words) to the FTPSEQD bank
(sequence data)

Data Word 4: Length (words) of the FTPSEQD bank

Data Word 5: Offset (words) to the FTPADCX bank
(index to ADC data and sequences)

Data Word 6: Length (words) of the FTPADCX bank

Data Word 7: Offset (words) to the FTPPADK bank
(key to raw ADC, pedestal, RMS, configuration and gain data)

Data Word 8: Length (words) of the FTPPADK bank

Data Word 9: Offset (words) to the FTPCPPR bank
(raw cluster pointer pairs)

Data Word 10: Length (words) of the FTPCPPR bank

Data Word 11: Offset (words) to the FTPADCR bank
(unsuppressed (raw) ADC data)

Data Word 12: Length (words) of the FTPADCR bank

Data Word 13: Offset (words) to the FTPMZCLD bank
(cluster data – normally exported by SL3)

Data Word 14: Length (words) of the FTPMZCLD bank

Data Word 15: Offset (words) to the FTPCFGR bank
(raw configuration data)

Data Word 16: Length (words) of the FTPCFGR bank

Data Word 17: Offset (words) to the FTPPEDR bank
(raw pedestal data)

Data Word 18: Length (words) of the FTPPEDR bank

Data Word 19: Offset (words) to the FTPRMSR bank
(raw pedestal RMS data)

Data Word 20: Length (words) of the FTPRMSR bank

Data Word 21: Offset (words) to the FTPGAINR bank
(raw gain data)

Data Word 22: Length (words) of the FTPGAINR bank

Data Word 23: Offset (words) to the FTPBADR bank
(bad channel list)

Data Word 24: Length (words) of the FTPBADR bank

[Offset of 0 signifies a bank is not present]

FTPADCD (FTPC Mezzanine ADC Data Bank)

This bank contains only zero–suppressed ADC data. Bank identification = 1,2,3 for mezzanine A,B,C.

Format Number =	0	zero–suppressed data, uncompressed
	1	zero–suppressed data, compressed

Note that for compressed ADC data, this bank must be uncompressed before any of the information contained in FTPADCX, FTPSEQD can be applied to it.

Contents (Format 0):

Words 1,...: ADC data (packed 4 ADC values per word).
The last word is padded with trailing zeroes, if required.

Contents (Format 1):

Word 1: number of encoded ADC values

Words 2–129: encoding dictionary (one short per entry)

Words 130,...: encoded ADC data

FTPADCR (FTPC Mezzanine ADC Raw Bank)

This bank contains only unsuppressed ADC data. Bank identification =1,2,3 for mezzanine A,B,C.

Format Number =	0	unsuppressed data, uncompressed
	1	unsuppressed data, compressed

Note that for compressed ADC data, this bank must be uncompressed before any of the information contained in FTPPADK can be applied to it.

Contents (Format 0):

Words 1,...: ADC data (packed 4 ADC values per word)

Contents (Format 1):

Word 1: number of encoded ADC values

Words 2–129: encoding dictionary (one short per entry)

Words 130,...: encoded ADC data

FTPPADK (FTPC Mezzanine Pad Key Bank)

This bank serves as a key to the sequences found in the FTPADCR, FTPCPPR, FTPPEDR, FTPRMSR, FTPCFGR, and FTPGAINR banks. The bank identification corresponds to the mezzanine board number (1–3).

Length is 208 (198 data words).

Contents:

Data Word 1: number of bytes per ADC sequence

Data Word 2: number of bytes per CPP sequence

Data Word 3: number of bytes per PED sequence

Data Word 4: number of bytes per RMS sequence

Data Word 5: number of bytes per CFG sequence

Data Word 6: number of bytes per GAIN sequence

Data Words 7–198: struct {

```
struct {
        unsigned char padrow;
        unsigned char pad;
};
struct {
        unsigned char padrow;
        unsigned char pad;
};
};
```

(outermost struct repeated 192 times, where invalid pad/padrow combinations are signified by 0xff for both pad and padrow)

FTPADCX (FTPC Mezzanine ADC Index Bank)

This bank is present only in conjunction with FTPADCD and FTPSEQD.

Contents:

Data Word 1: padrow number

Data Word 2: offset (in bytes) into (uncompressed) FTPADCD bank to beginning of ADC data for this padrow

Data Word 3: offset (in bytes) into FTPSEQD bank to beginning of SEQ data for this padrow

Data Words 4,...: repeat words (1–3) as necessary (up to a total of 6 times)

FTPCPPR (FTPC Mezzanine Cluster Pointer Pair Raw Bank)

The bank identification corresponds to the mezzanine board number (1–3). This bank contains the raw cluster pointers provided by the ASICs. Note that the least 10 bits are significant, and the remaining bits should all be zero if the sequence is a valid one. Invalid sequences are marked by one or more of the high order bits set to 1. The pad and padrow order are defined in the FTPCPPK bank.

Length is 10251 (10241 data words).

Contents:

Data Word 1: ASIC cluster finding parameters

```
struct {
```

```
unsigned char thresh_lo;
unsigned char thresh_hi;
unsigned char n_seq_lo;
unsigned char n_seq_hi;
};
```

Data Word 2−33: start time bin (16 bits), stop time bin (16 bits) [pad 1]

Data Word 34−65: start time bin (16bits), stop time bin (16 bits) [pad 2]

etc.

Data Word 10241: 32 words per pad, for pads 1−320

FTPSEQD (FTPC Mezzanine Sequence Data Bank)

This bank is present only in conjunction with FTPADCD. Bank identification = mezzanine number.

Contents:

Data Word 1−n: sequence (packed 2/word)

bit 15: Switch (discriminates between 2 formats following)

Switch = 0:	bits 14−6:	start time
	bit 5:	last sequence (this pad)
	bit 4−0:	sequence length
Switch = 1:	bits 14−0:	s_padnumber = 256*padrow + padnumber

If (Switch == 0) first member of union is used; else next 15 bits contain a pad number for the next sequence. For heavily populated padrows, switch=0. The assumption is that every pad has at least one sequence to report. The maximum sequence length which can be accommodated in one unsigned short is 32 time bins. If bit 5 is a '1' this signifies that the current sequence is the last for a given pad. The default is that the next sequence corresponds to the next pad in numerical sequence. If this is not the case, switch=1 for the next unsigned short, together with the next pad number. If a sequence is longer than 32 time bins, it has to be reported in pieces. [Overhead for Au−Au events: ~33%]. Pad number = 255 ==> ignore (dummy spacer to fill out bank).

The first sequence of the bank must start with switch=1, as must the first sequence of every padrow.

FTPCFGR (FTPC Mezzanine Configuration Raw Bank)

This bank carries information derived from a configuration special event. The bank identification corresponds to the mezzanine board number (1–3).

Length is 90 (80 data words).

Contents:

Data Words 1–80:

```
struct {
        unsigned char FEE_id;
        unsigned char FEE_id;
        unsigned char FEE_id;
        unsigned char FEE_id;
};
struct repeated 80 times
```

FTPBADR (FTPC Mezzanine Bad Channel Bank)

This bank carries information derived from a configuration special event. The bank identification corresponds to the mezzanine board number (1–3).

Length is variable.

Contents:

Data Word 1–n:

```
struct {
        unsigned char padrow;
        unsigned char pad;
} badChannel[N];
struct repeated N times (up to 320).
```

The last word is padded with trailing zeroes, if required.

FTPPEDR (FTPC Mezzanine Pedestal Raw Bank)

This bank carries information derived from a series of pedestal special events. The bank identification corresponds to the mezzanine board number (1–3).

Length is 20491 (20481 data words).

Contents:

Data Word 1: number of events used in the calculation

Data Words 2–20481: 8 bit pedestal values, packed 4 per word.
The last word is padded with trailing zeroes, if required.

<u>FTPRMSR (FTPC Mezzanine RMS Raw Bank)</u>

This bank carries information derived from a series of pedestal special events. The bank identification corresponds to the mezzanine board number (1–3).

Length is 20491 (20481 data words).

Contents:

Data Word 1: number of events used in the calculation

Data Words 2–20481: 8 bit pedestal RMS values, packed 4 per word as (RMS<<4). The last word is padded with trailing zeroes, if required.

<u>FTPGAINR (FTPC Mezzanine Gain Raw Bank)</u>

This bank carries information derived from a series of gain special events. The bank identification corresponds to the mezzanine board number (1–3).

Length is 716 (706 data words).

Contents:

Data Word 1: number of events used in the calculation

Data Word 2: mean gain in absolute ADC counts used in conjunction with the relative gains defined below.

Data Words 3–322:

```
struct {
    UINT16 (t0<<4);
    UINT8 (t0_RMS)<<4;
    INT8 (rel gain n 1)<<6;
};
```

Data Words 323–578: UINT8 trans_table[1024]; //master table used in ASICs

Data Words 579–706: UINT16 exp_table[256]; //inverse of above