The SVT DAQ Raw Data Format

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tonko@bnl.gov

Preliminaries

The "natural" data format for the SVT is a quintuplet of numbers:

a) SVT Readout Board	0..23
b) SVT Mezzanine	0..2
c) Hybrid (aka DAQ ASIC)	0..5
d) Anode (aka ASIC channel)	0..239
e) Timebin	0..127

Ad a)

As long as the SVT DAQ is contained in only 2 VME crates DAQ organizes the SVT in two "sectors" numbered 1 & 3 each containing 12 Receiver Boards numbered 1 through 12. The map to the natural SVT Readout Board Sequence is thus:

```
if(DAQ_SECTOR == 1) SVT_RDO = (DAQ_RB-1) ;
else SVT_RDO = 12 + (DAQ_RB-1) ;
```

Once the SVT DAQ starts using 4 VME crates the SVT "sectors" will be numbered from 1 to 4 each containing 6 Receiver Boards numbered from 1 to 6. The map will be thus:

```
SVT_RDO = (DAQ_SECTOR-1)*6 + (DAQ_RB-1) ;
```

This won't happen soon (if ever) though.

Ad b)

Since DAQ numbers Mezzanines from 1 to 3 the map to the SVT Mezzanines is simply:

```
SVT_MEZZ = DAQ_MEZZ – 1 ;
```

Ad c)

DAQ doesn't use "hybrids" internally but instead uses ASICs numbered with capital letters A to F. Each ASIC corresponds to one particular hybrid with the following map of the data as it arrives on the optical fiber for one Mezzanine.

The "offset" corresponds to the byte offset from the start of the raw ADCR data to the start of data for the particular hybrid. Each hybrid thus occupies 0x8000 bytes or 128 timebins X 256 channels/anodes.

	Upper 10 bits (of 20 bit GLink data)	**Lower 10 bits (of 20bit Glink data)**
Strobe 0	ASIC D = Hybrid 3 Offset 0x18000	ASIC A = Hybrid 0 Offset 0x00000
Strobe 1	ASIC E = Hybrid 4 Offset 0x20000	ASIC B = Hybrid 1 Offset 0x08000
Strobe 2	ASIC F = Hybrid 5 Offset 0x28000	ASIC C = Hybrid 2 Offset 0x10000
…repeats…		

Ad d)

Although the fiber data contains 256 anodes only the first 240 anodes have physical data. The rest is filler and should just be ignored.

Raw data format

The DAQ raw data format pertains to the following raw banks:

SVTADCR
SVTCPPR
SVTPEDR
SVTRMSR

SVTCPPR is somewhat special and will be discussed later. The other 3 banks have exactly the same sequencing and indexing and only the interpretation of the byte content differs: it's either the actual ADC value, the actual Pedestal or the RMS multiplied by 16.

The packing and sequencing for the above mentioned 3 banks exists in two different flavors:

1) OLD **Pre 2001. (i.e. during the 2000. data run)**
2) NEW **During and after 2001.**

The formats differ in the anode and timebin sequencing for the above banks but ***NOT*** in the other aspects namely RDO, Mezzanine or hybrid sequencing. This stays the same as explained in Ad a)-c) above.

Old Anode and Timebin sequencing/packing

In the old (pre 2001.) sequencing the anode number can be recovered from the raw data index in the SVTADCR, SVTPEDR & SVTCPPR by simply doing:

```
SVT_ANODE = RAW_BYTE / 128 ;
SVT_TIMEBIN = RAW_BYTE % 128 ;
```

I.e. the data was byte ordered with the following scheme:

```
unsigned char adcr[6][256][128] ;
```
(1-1)

for 6 hybrids, 256 anodes and 128 timebins.

The CPP bank is somewhat special but can be accessed similarly as

```
unsigned short cppr[6][256][16] ;
```
(1-2)

where number 6 indexes the hybrid, 256 the anode and 16 (2 X 8) indexes the start & stop timebin for 8 clusters.

New Anode and Timebin sequencing/packing

Due to the peculiarities of the new CPLD sequencing code in the Mezzanines, both the anode and timebin packing in the SVTADCR and the 2 others looks more complicated. Schematically it can be represented like this for one hybrid with 256 anodes (Axxx) and 128 timebins (Txxx):

Address	Byte 3	Byte 2	Byte 1	Byte 0
0x00000	A192:T0	A128:T0	A64:T0	A0:T0
0x00004	…	A128:T1	A64:T1	A0:T1
…	…	…	…	…
0x0007C	…	A128:T127	A64:T127	A0:T127
0x00080	…	A129:T0	A65:T0	A1:T0
…	…	…	…	A1:T1
…	…	…	…	…
…	…	…	…	A1:T127
…	…	…	…	…
…	…	…	…	A63:T0
…	…	…	…	…
0x07FFC	A255:T127	A191:T127	A127:T127	A63:T127

Thus the data cannot be compactly represented in C as in the old scheme above (1-1) but one needs a more algorithmic (but still trivial) approach using MODs and DIVs.

However, luckily the SVTCPPR data stays exactly the same as in the old data format (1-2).