

Note on data format of *InoDaq* and operating parameters of *rpcanal*

InoDaq is a Linux utility (developed by B.K.Nagesh), used for on-line acquisition of RPC test data based on KineticSystem's CAMAC interface. Currently the following CAMAC modules are being used:

| <i>Station number</i> | <i>Module</i> |
|-----------------------|--|
| 1 | LeCroy peak sensing ADC 2259 (12 channels)(not used) |
| 5 | Real Time Clock |
| 8 | Philips QDC 7166 (12 channels) |
| 11 | LeCroy TDC 2228A (8 channels) |
| 15 | Trigger Control Module (1 channel)(not used) |
| 17 | LeCroy TDC 2228A (8 channels) |
| 22 | GRID Scaler 9706 (16 channels)(10 channels used) |

The above information is decoded in InoDaq.h and is used by InoDaq. Relevant code, defining these parameters in InoDaq.h is reproduced below. This is in fact here that one needs to make changes if modules are to be added or removed from the CAMAC crate. The data is acquired, displayed and stored (in the data file) from the modules in the sequence defined in EveModPos [] array. Data sizes from these modules are defined in the array EveChanPerMod [] respectively.

```
#define ClockPos 5
      :
      :
unsigned short int  EveModPos[]={ClockPos,11,15,17,22,8};
unsigned short int  EveChanPerMod[]={5,8,1,8,16,12};/* Channels + 4 */
```

Data dump of an event (#1) from a run, along with data pointer number in the data block, actual data (16-bit word each), both in decimal and hex format are reproduced below.

| Event | Index | Data[Dec] | Data[Hex] |
|-------|-------|-----------|-----------|
| 1 | 0 | 4369 | 1111 |
| 1 | 1 | 1 | 1 |
| 1 | 2 | 0 | 0 |
| 1 | 3 | 53632 | d180 |
| 1 | 4 | 63861 | f975 |

| | | | |
|---|----|-------|------|
| 1 | 5 | 17992 | 4648 |
| 1 | 6 | 38400 | 9600 |
| 1 | 7 | 53760 | d200 |
| 1 | 8 | 603 | 25b |
| 1 | 9 | 2067 | 813 |
| 1 | 10 | 2067 | 813 |
| 1 | 11 | 2067 | 813 |
| 1 | 12 | 2067 | 813 |
| 1 | 13 | 2067 | 813 |
| 1 | 14 | 2067 | 813 |
| 1 | 15 | 2067 | 813 |
| 1 | 16 | 46080 | b400 |
| 1 | 17 | 3934 | f5e |
| 1 | 18 | 3934 | f5e |
| 1 | 19 | 1566 | 61e |
| 1 | 20 | 1373 | 55d |
| 1 | 21 | 1404 | 57c |
| 1 | 22 | 3934 | f5e |
| 1 | 23 | 3934 | f5e |
| 1 | 24 | 3934 | f5e |
| 1 | 25 | 177 | b1 |
| 1 | 26 | 201 | c9 |
| 1 | 27 | 91 | 5b |
| 1 | 28 | 124 | 7c |
| 1 | 29 | 151 | 97 |
| 1 | 30 | 243 | f3 |
| 1 | 31 | 6 | 6 |
| 1 | 32 | 4 | 4 |
| 1 | 33 | 3 | 3 |
| 1 | 34 | 0 | 0 |
| 1 | 35 | 0 | 0 |
| 1 | 36 | 0 | 0 |
| 1 | 37 | 0 | 0 |
| 1 | 38 | 0 | 0 |
| 1 | 39 | 0 | 0 |
| 1 | 40 | 0 | 0 |
| 1 | 41 | 1227 | 4cb |
| 1 | 42 | 5256 | 1488 |
| 1 | 43 | 9439 | 24df |
| 1 | 44 | 13863 | 3627 |
| 1 | 45 | 17661 | 44fd |
| 1 | 46 | 21601 | 5461 |
| 1 | 47 | 25719 | 6477 |
| 1 | 48 | 29725 | 741d |
| 1 | 49 | 32959 | 80bf |
| 1 | 50 | 37097 | 90e9 |
| 1 | 51 | 41224 | a108 |
| 1 | 52 | 45296 | b0f0 |
| 1 | 53 | 0 | 0 |
| 1 | 54 | 0 | 0 |
| 1 | 55 | 0 | 0 |
| 1 | 56 | 0 | 0 |
| 1 | 57 | 0 | 0 |
| 1 | 58 | 0 | 0 |
| 1 | 59 | 0 | 0 |
| 1 | 60 | 0 | 0 |
| 1 | 61 | 0 | 0 |
| 1 | 62 | 0 | 0 |
| 1 | 63 | 0 | 0 |
| 1 | 64 | 0 | 0 |
| 1 | 65 | 9423 | 24cf |

Here is a brief explanation of the data storage format, given as per data index:

- ✓ 0: Event marker. Always '1111' in hex. One word.
- ✓ 1-2: Event number, Two words.
- ✓ 3: Real time stamp. Micro seconds. Three BCD digits.
- ✓ 4: Real time stamp. Milli seconds. Three BCD digits.
- ✓ 5-7: Real time stamp. Station number 5. Three words. Seconds(00~59), Minutes(00~59), Hours(00~23) and Days(0000~9999) stored as BCD digits (i.e four bits per digit) started from Word#5 and going to Word#7.
 - ◆ Word5 – Lower byte: Seconds
 - ◆ Word5 – Upper byte: Minutes
 - ◆ Word6 – Lower byte: Hours
 - ◆ Word6 – Upper byte: Days(Units and tens)
 - ◆ Word7 – Lower byte: Days(Hundreds and thousands)
- ✓ 8-15: Y-plane TDC data. Station number 11. Eight words.
- ✓ 16: Trigger Control module data (not used). Station number 15. One word.
- ✓ 17-24: X-plane TDC data. Station number 17. Eight words.
- ✓ 25-40: Scaler data. Station number 22. Sixteen words.
- ✓ 41-52: X-plane ADC data. Station number 8. Twelve words.
- ✓ 53-64: Y-plane ADC data. Station number 1. Twelve words.
- ✓ 65: Checksum word. One word.

Listing of configuration file (*rpcanal.cfg*) used by *rpcanal* utility is given below:

| | | |
|------|-------------------------------------|------|
| 0066 | Event record size (16-bit words) | (1) |
| 0041 | Pointer offset for X-plane ADC data | (2) |
| 0053 | Pointer offset for Y-plane ADC data | (3) |
| 0017 | Pointer offset for X-plane TDC data | (4) |
| 0008 | Pointer offset for Y-plane TDC data | (5) |
| 0025 | Pointer offset for scaler data | (6) |
| 0000 | Minimum value for a valid ADC data | (7) |
| 4095 | Maximum value for a valid ADC data | (8) |
| 0000 | Minimum value for a valid TDC data | (9) |
| 4095 | Maximum value for a valid TDC data | (10) |
| 0012 | Number of used scaler channels | (11) |
| 0008 | Number of X-plane ADC channels | (12) |
| 0008 | Number of Y-plane ADC channels | (13) |

| | | |
|------|---|------|
| 0008 | Number of X-plane TDC channels | (14) |
| 0008 | Number of Y-plane TDC channels | (15) |
| N | Flag for displaying event day and time | (16) |
| Y | Flag for creating summary file | (17) |
| Y | Flag for creating histograms' file | (18) |
| Y | Flag for creating plots' file | (19) |
| P | QDC make; (P)hillips or (L)eCroy | (20) |
| N | Flag for displaying raw data for first 5 events | (21) |
| I | Saving (A)ll or (I)mportant histograms to file | (22) |
| 0256 | Number of bins for ADC histograms | (23) |
| 0256 | Number of bins for TDC histograms | (24) |

Here is a brief explanation of some of the configuration parameters, given as per the line number (right most column in ()) in the configuration file. Meaning of other parameters is self explanatory by the comments in the configuration file.

- ✓ 7-8: Used as cuts for making TDC distributions.
- ✓ 9-10: Used as cuts for making ADC distributions.
- ✓ 12-15: Number of ADC and TDC channels should be the same in order to make ADC Vs TDC data scatter plots.
- ✓ 16: Used for debugging.
- ✓ 21: Used for debugging.
- ✓ 23-24: Used for re-binning the ADC/TDC histograms.

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