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The STRAW TUBES plateaus

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Abstract

A dedicated set of programs, running in the framework of the general FINUDA DAQ system, has been developed to perform straw tubes plateau runs automatically.

1 Introduction

In order to determine the high voltage values to which the FINUDA straw tubes must be operated, it is necessary to know their counting rates and efficiencies as a function of the voltage supplied. Moreover, once the operating voltage has been selected, it is necessary to perform plateau runs to monitor detector stability.

Usually, plateau studies are done using scaler counters. On FINUDA straw tubes we don't have scaler counters, but only TDCs. To overcome the problem we decided to use TDCs has counters. This is done by opening a time window of fixed width with a pulse generator, and counting the accidental signals coming from the straw tubes laying in this "gate". This procedure is repeated many times and finally the counting rate of each straw tube is:

$$counting\ rate = \frac{num.\ of\ accidentals}{(num.\ of\ trigger) \times (time\ window\ width)} \tag{1}$$

To implement this procedure a dedicated set of programs have been developed and inserted into the general DAQ system.

2 General overview

Fig. 1 shows the scheme of the FINUDA DAQ architecture. It can be seen that the only available link with the Slow Control (SC) system is through the Ethernet line.

The FINUDA Run Control process (FRC) runs on a PowerPc workstation, and allows the operator to drive the whole data acquisition system, using a Graphic User Interface based on the *Tcl/Tk* [1] package.

The main window of the system has a three button structure: the green button starts the standard DAQ procedure; the yellow button gives access to the automatic run procedure (this is the one used to perform plateau runs); the red button stops the program execution [2].

The straw tube Slow Control program is a set of routines written using Labview [3] which uses caenet protocol [4] to drive CAEN SY527 power supply. Those routines normally are driven by an operator who decides which values have to be set. Nevertheless, this system can be accessed through the Ethernet network with a TCP socket connection. Therefore, when the yellow

FRC button is pressed a TCP communication socket with the SC is opened and a request of setting the straw tubes high voltage to desired values is sent. Once these values have been set, the SC program send an acknowledge message on the same channel and then a dedicated run is started.

3 The data readout program

The program which actually performs the readout of the front-end electronics is **daq_fnd** running on a dedicated VME CPU [2]. The communication between FRC and **daq_fnd** is realized through a TCP socket connection [5].

To perform plateau measurements from FRC SET UP window it is necessary to choose pulser trigger type, and PLAT run type. In this way, the Lynx-OS readout program (**daq_fnd**) recognises this name as the flag to start a special readout procedure:

1) all the TDCs are initialised in common start mode with a common start window width set to 32768 ns;

2) when the run is started a special routine (bf read_plat) is called instead of **read_events** so to count TDC hits instead of measuring drift times;

3) when 10^6 triggers have been received the counting rate of each tube is evaluated and written in a file named plaxxxx.dat (xxxx is the value of the voltage to which the straws have been set) located in the /dat CPU subdirectory.

4 FRC automatic run procedure

The automatic run procedure has been developed not only to perform straw tubes plateau measurements, but is a general frame that allows to take a sequence of predefined runs without the presence of a human operator. It is based on the content of the **autorun.list** file which structure is reported in fig. 2. This file is a sequence of line containing all the information to be sent to each program of the DAQ. The information that must be put here is:

- run type: is the name to give to the run. To performe plateau measurements it must be PLAT;

- run number;
- number of runs to be performed with the same conditions;
- maximum number of events to be taken;
- the detectors active in the acquisition;
- trigger types;
- data recording type and/or the directory in which data have to be stored;
- the name of the machine performing slow controls;
- the port number to be used to open the socket connection with the SC machine;
- a string of characters that is sent to the machine performing SC to set high voltage value (see next section for more details).

When the operator click on the yellow FRC button a new window is opened showing the content of **autorun.list** file. By clicking on the OK button the automatic run procedure starts. This means that the string of character to set high voltage values is sent to the SC machine. As soon as the SC procedure finishes a DAQ run is started and the counting rate of the tube is evaluated. When all the procedure is completed the window showing the content of **autorun.list** file disappeared.

5 Slow Control command sequence

As already mentioned, inside the file **autorun.list** a string is written containing the information to be sent to SC machine. This information is encoded in the following way:

- the first number is the command that must be executed by SC program: **7** to set voltage value on all channels, **6** to set voltage value to only one channel;
- crate number;

- board number;
- channel number;
- high voltage value (Volts);
- current limit (μA);
- ramp up (Volts/s);
- ramp down (Volts/s);
- trip time (s);
- status. This field must be one to swich on the hv.

6 Data analysis

Once DAQ runs at different high voltage values have been performed, these must be analysed to produce histograms. To do this plaxxxx.dat files must be copied to **osfin1** machine where the off-line analysis program is installed. This program reads the data files corresponding to hv values and produces for each straw tube the histogram of the counting rate [6].

References

[1] J. K. Osterhout, “Tcl and the Tk Toolkit”, Addison-Wesley 1994.

[2] P. Cerello et al., FINUDA note, 38/LNF/ONL/96
P. Gianotti et al., FINUDA note, 42/LNF/ONL/97.

[3] National Instruments, “LABVIEW User Manual”.

[4] CAEN,“Model A303 A H.S. Caenet PC controller Technical Manual”.

[5] J. Blomer,”Power Programming with RPC”, O’Reilly & Associates Inc., Sebastopol, CA, 1992.

[6] P. Gianotti, “Plateau analysis program”,FINUDA note 52/LNF/ONL/99.

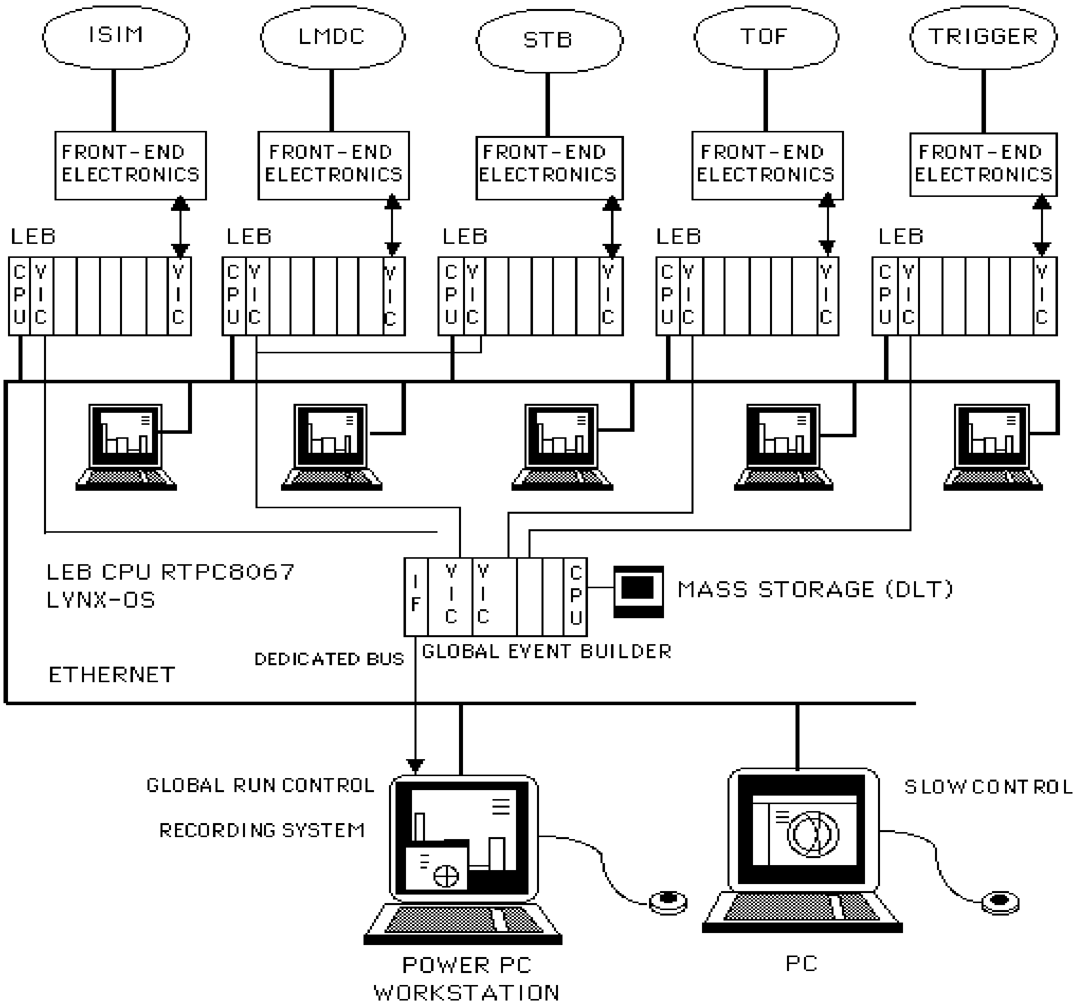

Figure 1: The FINUDA DAQ hardware architecture.

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###########################################################################################################################
# type  fnum  how_many  max_event   GTS TOF ISI OSI LMD STB     0 1 2 3 4 5 6 7    datarec    dir||tape  host     port    data....
#
  PLAT   110     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 1600 5 100 1000 10 1
  PLAT   111     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 1700 5 100 1000 10 1
  PLAT   112     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 1800 5 100 1000 10 1
  PLAT   113     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 1900 5 100 1000 10 1
  PLAT   114     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 2000 5 100 1000 10 1
  PLAT   115     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 2100 5 100 1000 10 1
  PLAT   116     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 2200 5 100 1000 10 1
  PLAT   117     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 2300 5 100 1000 10 1
  PLAT   118     1       1000000     0   1   0   0   0   1      0 0 1 0 0 0 0 0       0          /tmp    pcstcon  4000    7 0 0 0 2400 5 100 1000 10 1
```

Figure 2: Structure of file autorun.list.