

Overview

The readout hardware is based on the ALICE TPC readout system, which consists of Front End Cards (FEC) with 8 16 channel ALTRO chips on each FEC. The FECs are placed on a bus, which is controlled by a Readout Control Unit (RCU). The RCU can control up to 32 FECs. The data is transmitted through an optical link, Detector Data Link (DDL) to a Data ReadOut Receiver Card (DRORC) placed in a PC. In the system described here are the ALICE drivers and libraries used for the data acquisition. On top of this is a small readout system being developed. It consists of the readout task (written in C), which performs the setup, readout and raw binary data storage in a file. Text files are used for the configuration of the system. A monitor server provides a sample of events for monitoring. Events to be monitored are sent through TCP/IP to a simple local monitor task (written in C++ and ROOT), and a histogram presenter (written in ROOT). Playback of data files is also possible. Some run and debug information is logged in text files. A rudimentary local run control is implemented in Java. The communication between the readout and the local run control is done using ascii string commands through TCP/IP. The system is eventually to be connected to a common test beam readout system. The trigger interface is done with a Distributor BOX (DBOX) which generates the triggers and clocks to the RCU, and the trigger information which will be read by the readout task through TCP/IP. This is not yet fully implemented, but is currently to be tested. The system is shown in figure OVW-1. The final system will consist of 2 DRORC, 4 RCUs, and 10000 channels (roughly 80 FEC).

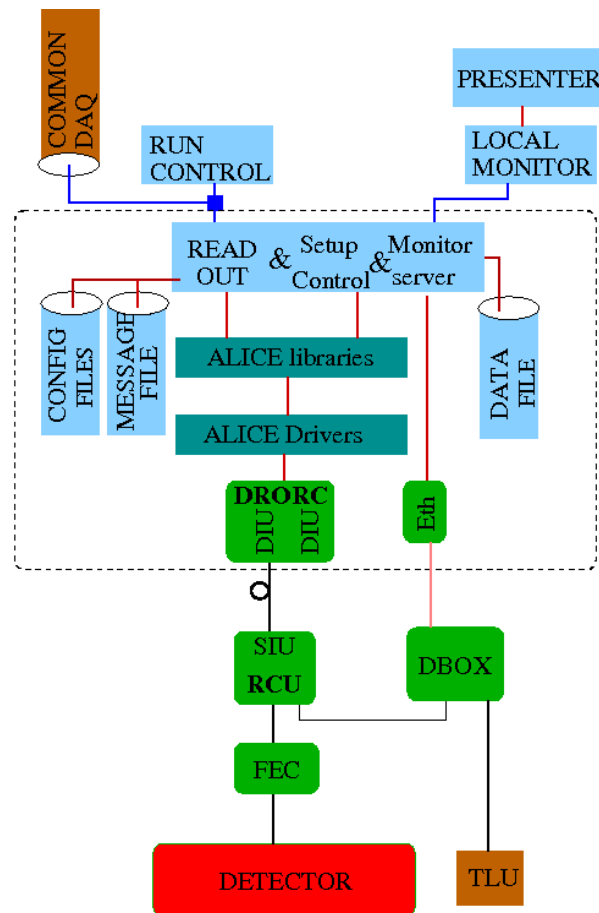


Figure OVW-1: Overview of the readout system

Test DAQ setup

The system used to develop and test the system is shown figure OVW-2. The readout hardware consists of one FEC (128 channels), 1 RCU, and 1 DRORC. The code is written to handle up to four RCUs (128 FEC), but has not been tested with anything but one FEC. The signals readout by the system is either pulses to the FEC inputs, or from the Lund Small TPC equipped with GEMs. The trigger to readout the TPC is provided by scintillators, either from cosmic muons or a radioactive source. The trigger is handled with the parallel port on the PC and a NIM system, and eventually by the distributor box. If not using the TPC, then a pulser is used as a trigger.

The DAQ is split on two computers, one is dedicated to the readout, the second one is a workstation running the local run control, local monitoring, and the histogram presenter. The two computers are connected with a network. On the DAQ computer are also standalone testprograms for testing the digital parts of the FEC, i.e. registers.

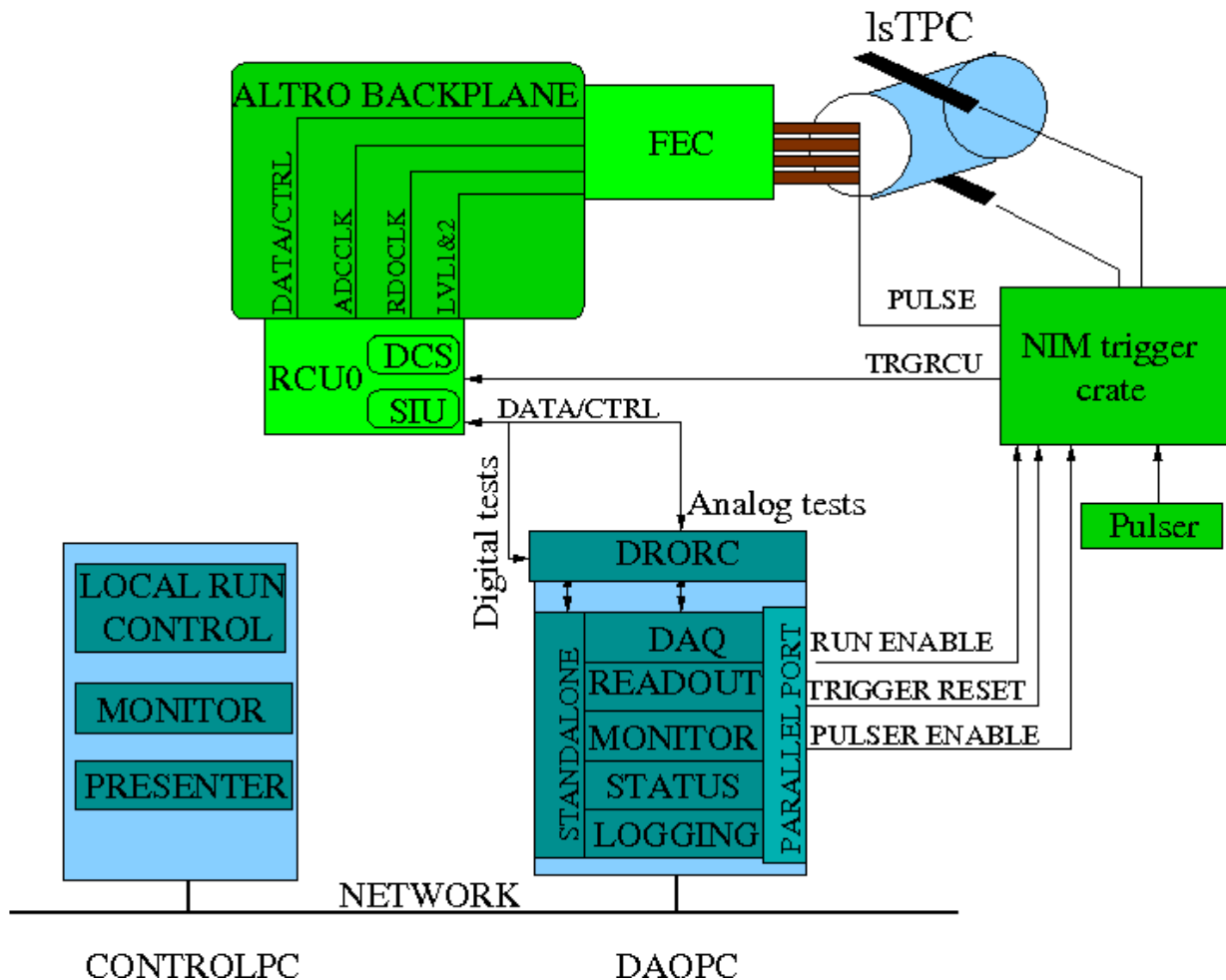


Figure OVW-2: Test setup of the DAQ with the ALTRO based readout.

The trigger can be either data driven, i.e. the program polls for data from the DRORC, or interrupt driven, i.e. waiting for an interrupt through ethernet from the DBOX. In both cases is the trigger

distributed by the DBOX to the RCUs, which send it on the ALTRO backplane to the Front End Cards. The trigger signal is a 3.3V pulse of 30-50ns length. In the current test setup is a NIM system used to generate the trigger. The trigger starts the sampling in the ALTROs, and after a predefined time is the sampling stopped, an automatic second level trigger is sent from the RCU to the ALTROs. The ALTRO do then validate the data and marks the event buffer as used. The RCU starts the readout of the data and sends it to the DRORC, which stores it in the memory of the DAQ PC. I.e. the data transfer is always data driven. The communication with the DBOX is currently being tested in Brussels. The readout program is now being rewritten to handle a new RCU firmware needed for the sampling with 20/40MHz, as well as some minor improvements/changes in the program logic. The new RCU firmware require major changes in the libraries for communicating with the RCU/FEC/ALTRO. A second test setup with the new RCU firmware is being setup in Lund to test and further develop the new readout.

The local run control is written in Java. Through the local run control do one always have to setup the FEC, e.g. power on/off and loading the settings for the PCA16. This his to be done even if a common run control is used. There is not yet any common run control interface implemented in the readout.

The interface is divided into several sections:

- Power settings:** Displays status for RCU0, RCU1, RCU2, and RCU3. Each RCU has a row of 16 colored squares (red for power on, yellow for power off). Buttons for 'Power On' and 'Power Off' are on the right.
- PCA settings:** Includes checkboxes for 'Polarity', 'Shutdown', and 'Preamp enable'. It also has input fields for 'Gain', 'Shaper', and 'Decay time', along with a 'Pcaload' button.
- Control buttons:** A vertical column on the left contains buttons: 'DAQ Active' (cyan), 'Stop DAQ' (red), 'Running' (cyan), 'Pause' (green), 'Stop run' (green), 'Status' (green), and 'SCRIPT' (cyan).
- Log window:** A text area showing a series of timestamped messages, such as '[2008-08-21 14:05:37] Retrieving power status...' and '[2008-08-21 14:05:41] SRV:*STATUS DAQ 1 RUN 1 LOG 0 MON 1 EVT 0 TYPE 0 MODE 1 RUNNB 2642 ERR...'. It includes a scrollbar.
- Run comment:** A text input field with the label 'Run comment (max 240 characters):' and a '--- Write run comment ---' button below it.
- Run type and mode:** Radio buttons for 'Physics' (selected), 'Pedestals', and 'Test'. Checkboxes for 'Pedestal subtraction' (checked), 'Zero suppression', and 'Logging'. A 'Monitor' section shows '1 Read events'.
- Summary and Exit:** On the left, it shows 'Events: 867', 'Run:2642', and '[2008-08-21 14:05:40]'. An 'Exit' button is located below this.

Figure OVW-3: The local run control interface

The local test monitoring system is simple, it gets an event through the network, unpacks it and fills histograms for a single FEC. i.e. 128 channels. It can not handle more than one FEC at a time. Histograms filled are single event time spectra and pulse height distributions. In a special pedestal run mode does it calculate the mean and rms of the pulse heights for all channels (not only one FEC), which can be used as pedestals for pedestal subtraction. To view the histograms is a presenter available, from the presenter do one select the FEC to study. The monitor/presenter is still unstable in the sense that they sometimes crash. An example of a display in the presenter is shown in figure OVW-4. The local monitoring system is not intended to be a general purpose test beam monitoring task.

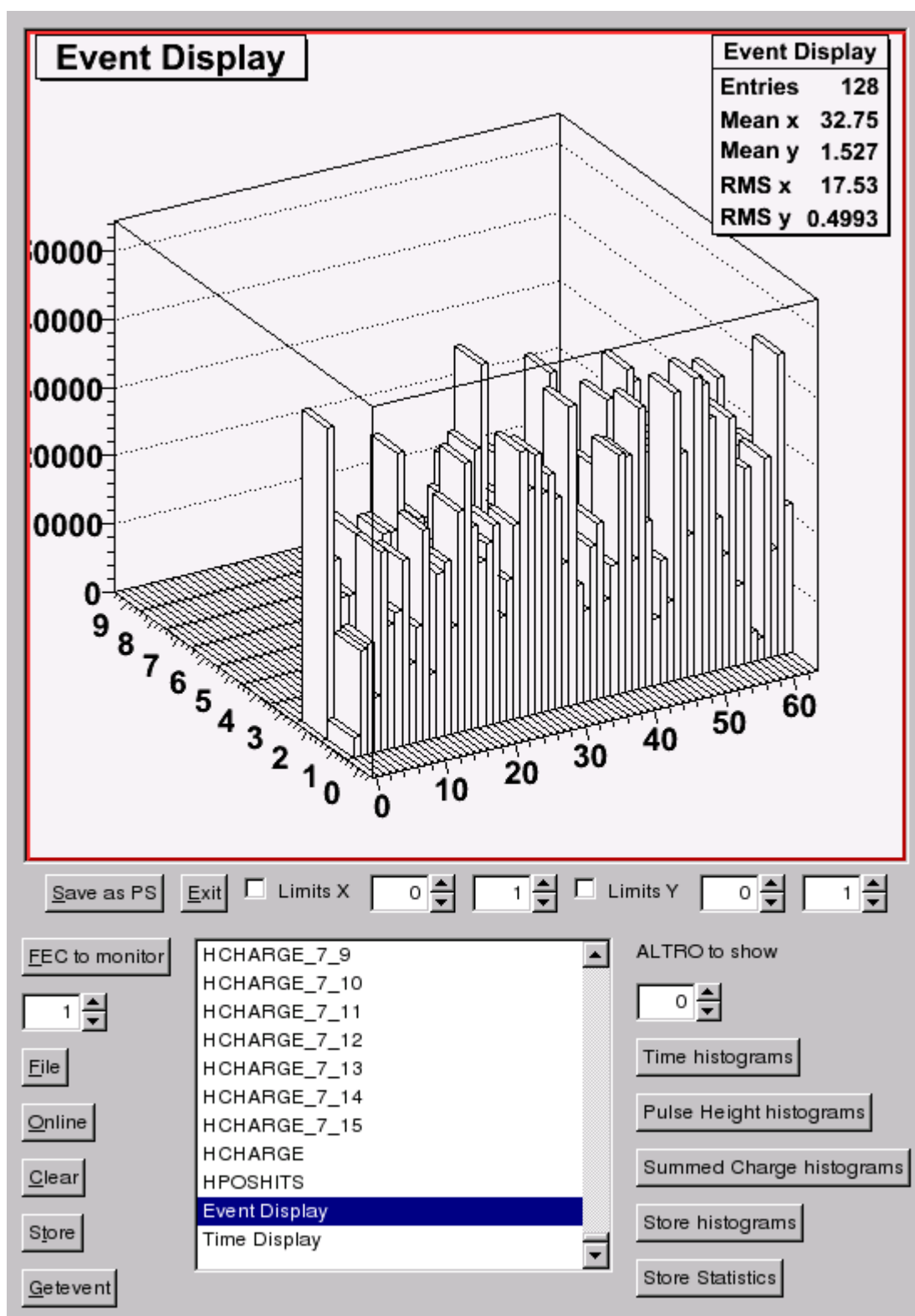


Figure OVW-4: The histogram presenter interface.