

Beam Time Access and Control

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March 2, 2017

This document describes data access and beam time control for the KOTO data acquisition system (DAQ) starting Apr. 2015 run (Run62).

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1 Beam Time Monitoring System

There are three computers used for system monitoring. All computers, along with Yasu's Dell laptop (for firmware downloading), are set up using VNC program for remote access.

1.1 Connect to the KOTO Local Network

For MAC users: You need to connect to KOTO local network (to banjo or mandolin) to access any of the monitoring system.

To connect:

- `ssh -L (local port to look):(host port to look via banjo/mandolin):(port to look at) banjo/mandolin`
Ex. Connect to Yasu's laptop (`ssh -L`)
`ssh -L 5901:192.168.10.96:5900 banjo`
Note: banjo IP = 10.105.50.13
- Click the desktop
- On the toolbar, click "Go" → "Network" (or command + k)
- connect: `vnc://127.0.0.1:5901`

Now you are able to remote access the screens of these computers

1.2 IP Addresses for the Monitoring System

There are three computers inside the counting room - right, middle, and left. The computer at the left is the closest computer to banjo clusters next door. IP address for database and three computers under koto local network are:

- **Database - kotodb:** 192.168.10.201
The Database records the several monitoring statistics for each run. You can find a table of of trigger info for each run, such as L1Req, L1A, L2A, etc. The Database is located next to banjo, on top of the DAQ test rack in the counting room. These data are updated to the Justice Server at Osaka University, where we can gain access to via external network.
- **DAQ monitoring computer (left) - kotodaq:** 192.168.10.202
Statistics are generated at the end of each run → people on shift will write out statistics and report in the logbook and the statistics will be stored in ROOT files, then transferred to KEKCC, as well as recorded in the Database.
- **Online, detectors, HV monitoring computer (right) - localhost:** 192.168.10.203
Alarm is set to check the status every 30 mins → people on shift will write out statistics and report in the logbook.

- **Old online monitoring computer (middle) - kotomon2:** 192.168.10.204 (if you are on banjo network: 192.168.56.100)
Currently not used for anything. The computer is NFS mounted on the banjo network.
- **Yasu's DELL laptop:** 192.168.10.96 The laptop has VNC program installed, which allows remote firmware download by screen share control

1.3 Database - kotodb

We can access KOTO Database server inside the container room via the KOTO local network. A copy of the KOTO Database is stored in the Osaka University Justice Server.

1.3.1 Database Server at J-PARC

IP Address: 192.168.10.201

Once you are inside the KOTO local network, you can access the server by opening the firefox browser and connect to (url) 192.168.10.201

There are 7 available trigger types, depending on the triggers setting we do for each run (look at Yasu's DAQ workshop at Arizona, 2013).

- 0 - Physics
CsI(Total Et) ! (CV | NCC | MB | CC03) w/COECut
- 1 - Normalization
CsI(Total Et) ! (CV | NCC | MB | CC03)
- 2 - Minimum Bias
CsI(Total Et)
- 3 - Calibration
CsI(Total Et & RegionCount1) ! (CV | NCC | MB | CC03)
- 4 - NCC OffSpill
(NCC) OnlyOffSpill
- 5 - OEV OffSpill
(OEV) OnlyOffSpill
- 6 - CsI OffSpill
CsI(TotalEt) OnlyOffSpill
- 7 - TBD
- 8 - Spill Gate
- 9 - External 1
clock, laser, LED
- 10 - External 2
TMon - this is used sometimes, depending on what kind of special run we need.

1.3.2 Osaka Justice Server

The Osaka Justice Server can be accessed via any external network.

<https://justice.hep.sci.osaka-u.ac.jp/run40/>

1.4 DAQ Monitoring Computer - kotodaq

IP Address: 192.168.10.204

Run_Control for the whole DAQ is stored on this computer (originally created by Yasuyuki Sugiyama). See

1.5 Online, Detectors, HV Monitoring Computer - localhost

IP Address: 192.168.10.203

1.6 Old Online Monitoring Computer - kotomon2

IP Address: 192.168.10.204

IP Address: 192.168.56.100

This computer is NFS mounted on banjo network. We can also run production locally on this computer.

1.6.1 Production

- Copy file from /u/localdata or /u/data1 to /Stage9/test
- Log in to kotomon2
- /home/prod/production/run69/work
- ./FillFiber_production.sh with 5 arguments
[input_file_directory output_file_directory run# node# file#]

2 Set Up DAQ Run Control for Beam Time

Run_Control is the user that controls the KOTO data taking. The Run Control has to be adjusted to the correct configurations for each beam time. The main control scripts are located at kotodaq. The configuration related to the L3 code is located on banjo.

2.1 Run Control on kotodaq

Run_Control integrates all the DAQ parts - ADC, L1, L2, and L3. Below are the instructions from Yasu. The code is located on the DAQ Monitoring Computer (kotodaq).

- **All DAQ codes:** /home/koto/DAQcodes
This directory is shared as "/DAQcodes" by all VME processors booted from Ethernet.
- **Run Control:** /home/koto/DAQcodes/DAQrunCode/2016June
Main script: runDAQ2016.sh.
In this code, two scripts are called.
output_run_conf_2016June.sh : script to output the list of parameters
"run_config.txt"
runDAQ_exec_2016June.sh: call the script to run DAQ codes in ADC, Lv1 crates and Lv3 (Need to be modified if the directory for their DAQ code changed)
- **Trigger Boards:** /home/koto/DAQcodes/TrigBoard/2016/June
Main code: vmetest.cc.
This code initialize Lv1 modules in Lv1 crate and send command to Lv2 crate via ssh.
To run this code in Lv1 crate, we have to make symbolic link (soft link) in Lv1 crate, and compile by "make" command.

Note: if the configuration of the DAQ system is modified, we have to change the corresponding code.

The code read the configuration file which is made by:

```
output_run_conf_2016June.sh
```

This code specifies the place of the configuration file:

```
RunConfigManager* run_conf=new RunConfigManager();  
run_conf->GetConfigFromFile("/DAQcodes/DAQrunCode/2015Oct/  
run_config.txt");
```

If we use new directory for RunControl, we have to change this.

Example: The number of ADC crates we use is written in the code. Given an example if the configuration of the DAQ changed. Now it assume 17 crates in the code and will wait until all of 17 crate get ready to take data. We may need to change 17 → 18 in the code in the future.

- **FADC:** /home/koto/DAQcodes/FADC/2016/June
Main code: vmetest_bin.cc.
This code initialize the ADC modules.

- To run this code in Lv1 crate, we have to make symbolic link (soft link) in one of ADC crate, and compile by "make" command.

- **Since all ADC crates share the home directory, the change in one crate affect all of ADC crates.**

The code recognize CrateID by its IP address.

BaseFunc.h: list of ADC registers (may need to be modified if we have new register)

BoardManager.h: function to set up ADCs

If we want to change the status of any register, we can use "vme_write_reg" command made by Duncan.

- **Configuration for ADC:** /home/koto/DAQcodes/FADC/conf_file

If we have additional crate, we need to create these files below:

ADCSlotInfo/SlotInfo_Crate**.txt: the list of slot number we use in each

crate threshold_conf_crate**.txt: threshold for making trigger if each channel or for scaler functions. **Note:** adc_mod_conf.txt: We may need to add entry in this file. This file is for determining sending either the SumEt or Hit information.

2.2 L3 Configuration

The L3 code is stored on banjo. To see more details on the L3 hardware/software structure, data format, previous L3 code in Run49 (May 2013), visit the L3 Documentation[Apr 2015] at <http://koto.physics.lsa.umich.edu/documents/instructional-documents>.

- A directory dedicated for each run is created: /sudaq/Run_Control/L3Code/Run**. To change the configuration: You will need to access this directory to change the configurations in "kotoconfig.h" for the corresponding beam run. This files specifies the number of L2 boards (Type 1 nodes) and Type 2 nodes used for the run.

- Code for DAQ testing and L3 stand alone tests is at /sudaq/Run_Control/L3Code/DAQtest.

- Path for the L3 code: /sudaq/Run_Control/L3Code/Run**/L3Run**

- A soft link is created at /sudaq/Run_Control/L3Code/L3Run2016June, to be linked to DAQ Run Control (DAQtest/DAQtest_coe)

3 Access DAQ Statistics and Related Beam Time Info

Beam power, run number, trigger info, and other information related to the beam time are documented in several places - Database at J-PARC, Osaka University's Justice Server, and Yamagata University's server of KOTO Wiki site. Some trigger related information are transferred to KEKCC as well. See Sec. 4 for how to access these information on KEKCC.

3.1 Database

As described in Sec.1.3, trigger information are recorded in the database. Local KOTO network at J-PARC is required to access the KOTO Database. Information recorded includes but not limited to

- Run number
- Trigger type

- Start and end time of the run
- L1Req, L1A, L2A, etc.
- Online monitoring plots

These information are updated to the Justice server, which can be accessed from external network. See Sec.1.3.2 for more information.

3.2 KOTO Wiki Site

The KOTO Wiki site is maintained by Yamagata University. It contains many information about the KOTO experiment and anyone can edit the page.

Location: <http://koto.quark.kj.yamagata-u.ac.jp/wiki/index.php?FrontPage>

Contents on the KOTO Wiki site includes but not limited to the following:

- Personnel
- Photos of the KOTO experiment
- Beam time related information

For example, we can see the following at the front page

- **Beam time/Jun.2016 (Run#69)**

Contains information from the logbook*, DAQ trigger summary for data taking, data taking run types, shifts manual, shift summary sheets, and analysis information*.

*Note:

Logbook -

Maintenance, work at J-PARC, and beam time related information are kept in the hand-written logbook. The logbooks are scanned can uploaded to the KOTO Wiki site.

Analysis information -

The binary files (.bin) collected by the DAQ system will go through production and turned into ROOT files (.root) for offline analysis. The analysis information contains the description for different branches inside the ROOT file, explanation of trigger bits and trigger tags, maps of detector channels, connection to the Database, dead detector channels for the Run, etc. This file is useful for analysis.

- **RunInfo/201606**

Contains information such as daily meeting log, photos, preliminary data plots, etc.

- **BeamShift/201606**

Contains beam time shift tables and beam schedule (with beam power).

4 KEKCC

KEKCC is the computer server located at KEK, where the KOTO experiment stores all our data and analysis. To gain access to KEKCC, follow the instruction in the "KEK-JPARC Access" documentation located at the Michigan KOTO website (<http://koto.physics>).

lsa.umich.edu/documents/instructional-documents).

- E14 Library: /sw/koto/e14lib/
- DAQ Statistics: /hsm/had/koto_JC/run**/TriggerData

The names of the directories below (ex. TriggerData) the above paths depends on the runs and alter a little but these are the general paths to the files.

Ex. run49/TrigBoardData vs. run62/Trigger_data.

For clustering and analysis files, check the offline analysis emails for more details.