RPC Shift Manual

V1.0

Dayabay RPC Group

(RPC module, Gas, HV, Electronics, DAQ and DCS Groups)

2011.08.02

Content

1. Contact List

Here is a list of people who are more familiar with/in charge of the subsystems. If you have any problems, please feel free to contact them.

Group	Name	E-mail	Mobile	Landline	IM	Onsite? (may be old)
RPC modules	Qingmin zhang	zhangqm@ihep.acn	86-13810098800	86-10-88236069	qmzhang0721 (skype)	No
	Mengyun Guan	dreamy_guan@ihep.ac.cn	86-13683265881			No
	Jilei Xu	xujl@ihep.ac.cn	86-13426305618			No
	Haoqi Lu	luhq@ihep.ac.cn	86-15118079742(SZ) 86-13466573680(BJ)		Luhq2521(skype)	**Yes**
	Jie Zhao	zhaojie10@mails.gucas.ac.cn	86-18911126839			
	Viktor Pec	viktor.pec@gmail.com	86-15601128409			No
	Logan	llebanowski@gmail.com	1-832-303-2038		Houstonomni(skype)	**Yes**
	Zhe Ning	ningzhe@ihep.ac.cn	86-15110141629	86-10-88200015	416811511(QQ)	**No**
	Shih-Kai Lin	slin10@uh.edu				**Yes**
Gas system	Changguo Lu	changguo@Princeton.edu	86-13520394224	1-609-258-1288		No
	Hansheng Sun		86-15013471875			**Yes**
	Qingmin Zhang	zhangqm@ihep.acn	86-13810098800	86-10-88236069	qmzhang0721 (skype)	NO
	Mengyun Guan	dreamy_guan@ihep.ac.cn	86-13683265881			No
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HV System	Joseph Hor	ykhor@vt.edu	86-13410885529		joesphhor (skype)	**Yes**
	Jon Link	jonathan.link@vt.edu	1-540-231-5321		jonathanlink	**NO**
	Yue Meng	mengyue@vt.edu	86-13417453124		my85310	**Yes**
	Deb Mohapatra	dmohapat@vt.edu	86-15220121478		dmohopat	**NO**
	Jo Ellen Narron	jenarron@vt.edu		1-540-231-6389	oellenjay	**NO**
Electronics	Huifeng Hao	hhfeng@mail.ustc.edu.cn	86-15955126536		hhfeng1224 (skype)	**NO**
	Lei Zheng	zhengl@mail.ustc.edu.cn				**NO**
DAQ	Fei Li	lifei@ihep.ac.cn	86-13910107419	86-10-88236046	fei.li(skype)	**NO**
	Xiaolu Ji	jixl@ihep.ac.cn	86-18611698384	86-10-88236422	jixiaolu84(skype)	**NO**
	Qun Wu	qwu@agni.phys.iit.edu	86-15118047245		qwuiit	**Yes**

Slow Control	Mei Ye	yem@ihep.ac.cn	86-13910597588		yemei-sc (skype)	**NO**
	Jun Xu	xujun@ihep.ac.cn	86-13126875553		94615427 (QQ)	**Yes**

2. Overview

2.1. Before your shift

Before your shift, please read through this manual and make sure you well understand everything. If you have any questions, please feel free to contact the experts.

2.2. Scope

This manual is written for shift takers and only covers basic knowledge of how to run/monitor the RPC system. If you encounter something that is not mentioned in this manual, please notify the experts.

2.3. Subsystems

The RPC detector system includes the RPC Modules, Gas system, HV system and Readout system (electronics and DAQ), and is conveyed in the diagram below. Detector Control System (DCS) has been setup for monitoring/control hardware status and Performance Quality Monitor (PQM) allows monitoring of RPC performance. The following sections will cover the procedures of how to run these subsystems and find/fix problems.

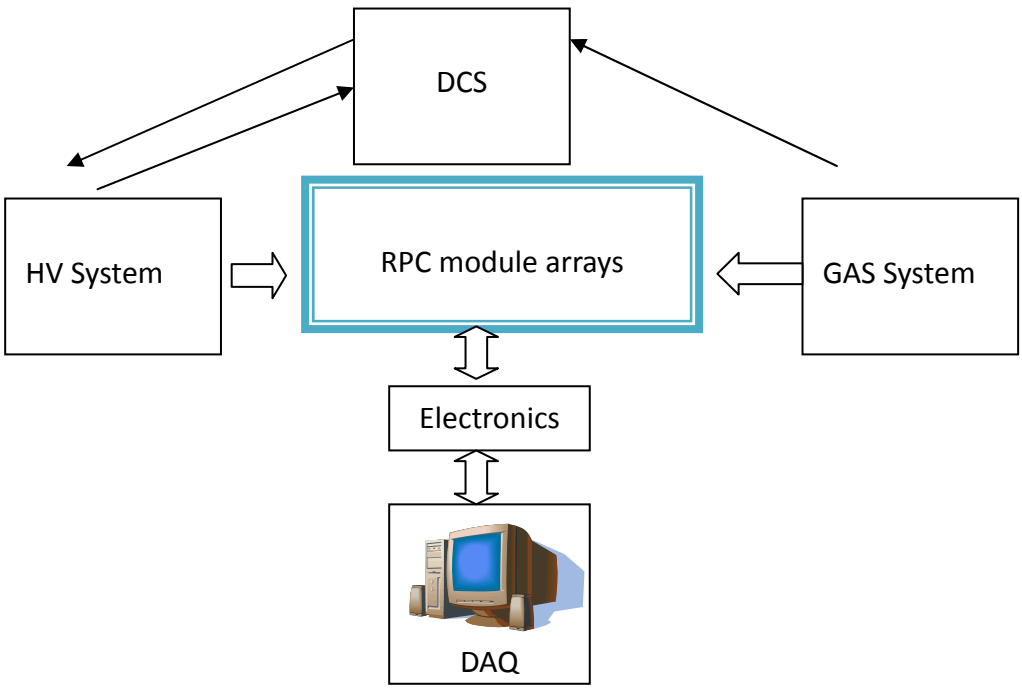


Fig. 1 schematic diagram of RPC detector

2.4. Your Responsibility

1. Monitor the system and determine whether it is running safely and normally. Report any safety emergency to the control room and LIM.
2. Take data according to the plan of the experiment.
3. Solve any problems according to this manual.
4. Report the problems which are not mentioned in this manual/you cannot handle to the experts.
5. Give feedback about this manual.

3. RPC Modules

3.1. Introduction

There are 54 RPC modules in EH1, shown in Fig. 2 which are installed on a supporting structure with 9 columns and 6 rows. Each module has 4 layers of RPCs, 2 gas lines, 4 pairs of HV supplies, and 1 FEC with 32 readout channels.

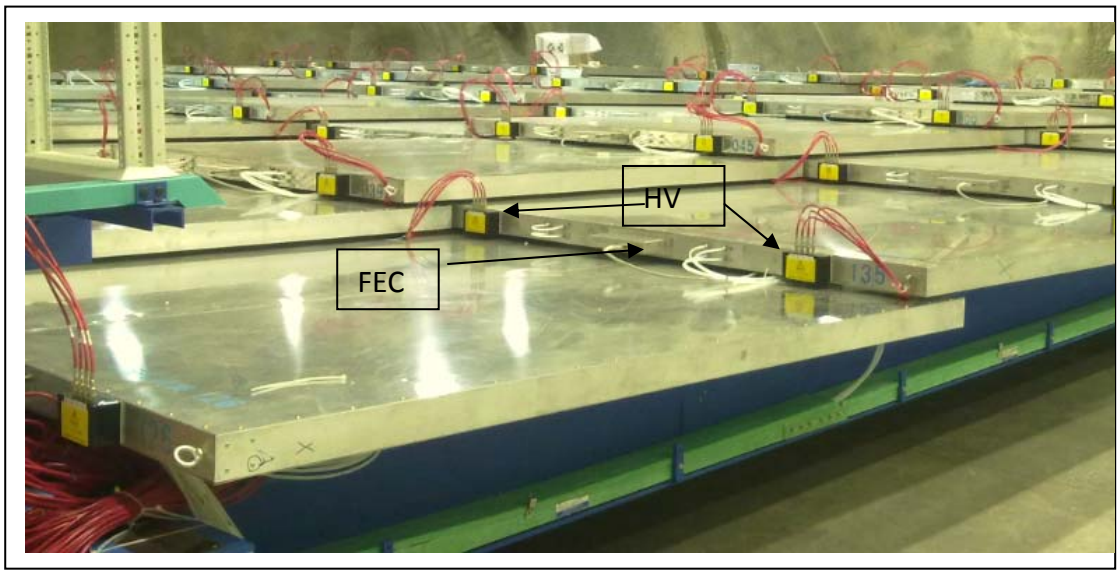


Fig. 2 Picture of RPC modules in EH1

3.2. Coordinate system

Please use the following coordinate system shown in Fig. 3 when reporting problems about modules/layers/strips and communications. Note that this is the same system used in PQM except counting begins with 1 instead of 0.

3.3. Before ramping up HV

Please make sure the RPC modules have been flushed with ~4 volumes of working gas before ramping up HV. This is just a reminder for the experts, because in principle the shift takers never ramp up HV by themselves unless they get the permission from HV experts.

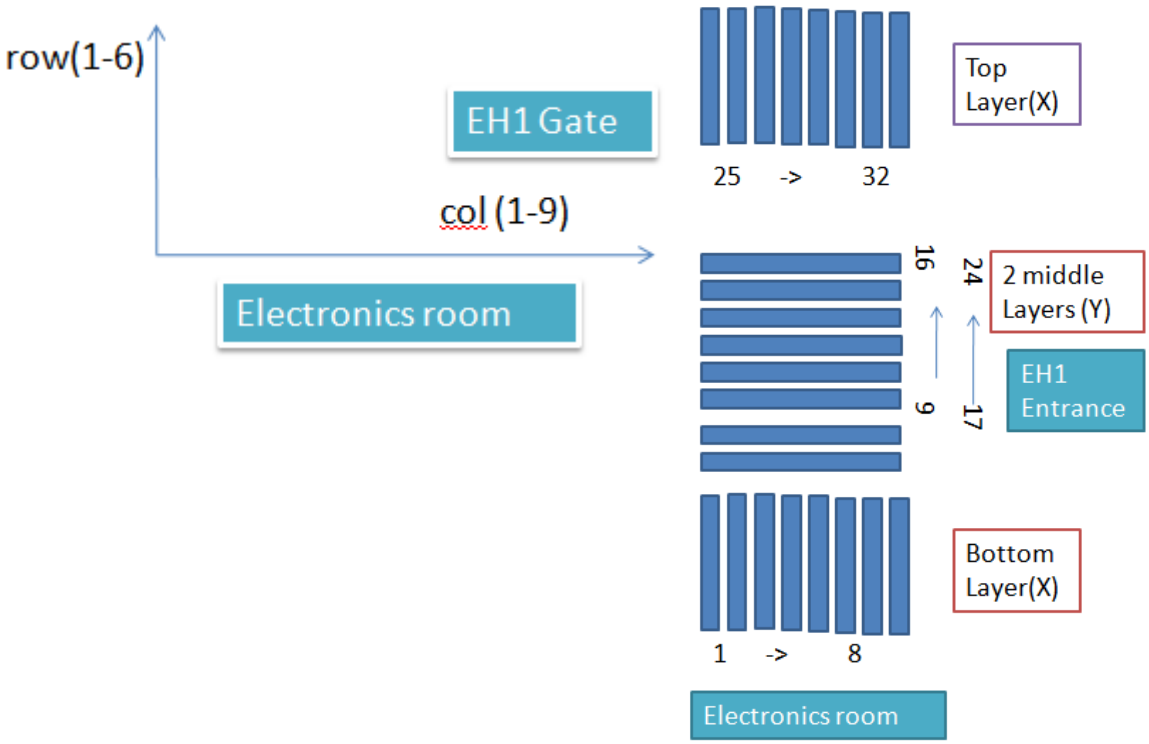


Fig. 3 coordinate system of RPC module array

4. Gas system

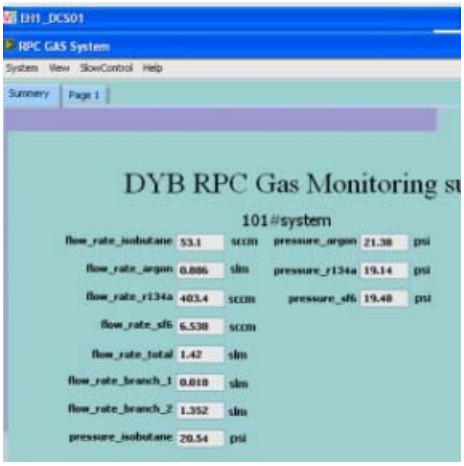
Right now, the gas system runs 24/7. You can monitor the status of the system through DCS RPC gas monitor system.
If in need of gas cylinder replacement or system turn off/on, please contact the gas experts.

4.1. Detector control system for RPC gas system

a. Login to the DCS system from an on-site computer through VNC Viewer. Use the username '***' and password '******', (please ask DCS experts if you really need it). The screen display of the DCS system is shown in Fig. 4.

Fig. 4 DCS system.

b. Click on the icon "Shortcut to **DCS RPCGASSYSTEM**" (If the PC you are using has been installed with this monitoring program, you can ignore the 'VNC' procedure. By default, this monitoring program has been started already, so you can skip this step.), there are two pages for the gas system as shown in Fig. 5:



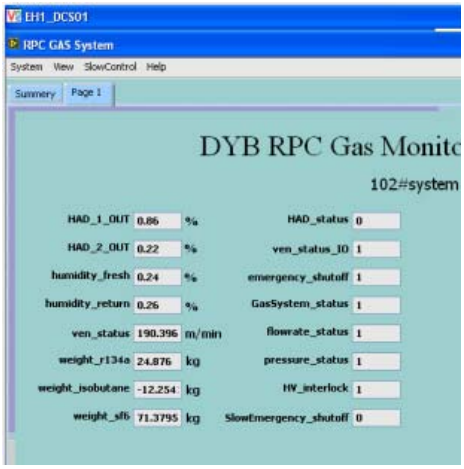


Fig. 5 Two pages of DCS RPC gas monitoring system.

Under normal running conditions, the values displayed on these two DCS pages are summarized in Table 1. The gas flow rate depends on the setting of the total flow rate. The flow rates shown in Table 1 are for a total rate of 1400 sccm, which is about 1 vol/day.

Table 1. The gas system running parameters under normal condition.

Summary page							
Flow rate	Isobutane	Argon	R134A	SF6	Total	Branch #1	Branch #2
sccm	56	917	420	7	1400	0	1400
Pressure	Isobutane	Argon	R134A	SF6			
psi	19 - 21	19 - 21	19 - 21	19 - 21			
Page #1							
HAD_1	HAD_2	Hum_frsh	Hum_rtn	Ven_stat	Wgt_R134a	Wgt_Isob	Wgt_SF6
~0%	~0%	~0%	~0%	100~300 m/min	>1kg	>1kg	>1kg
HAD_stat	Ven_stat	Emg_shtoff	Gas_stat	Flow_stat	Pres_stat	HV_intlck	Shutoff
0	1	1	1	1	1	1	0

Attention: If the displayed value is out of the normal range as defined in Table 1, you should call gas expert for help. Flow rates may vary due to the gas flow rate setting, so they may be ok if they are above 40 sccm; please consult the previous shift taker.

4.2. Gas room main check points

The daytime shift taker should go to the gas room twice a day to check if the DCS display is consistent with the values shown on the gas control crates, which includes the Gas flow meter crate, Gas pressure crate and Gas status crate, as shown in Fig. 6. The status of the first two crates is reported on the DCS summary page while the last crate is reported on DCS Page #1. (This is a temporary policy. With more site running, this will be nor possible. But this manual will be updated accordingly.)

(A)

(B)

(C)

Fig. 6 Gas control crates, (A) Flowmeter; (B)

Pressure; (C) Status.

4.3. Emergency contacts

Some key ingredients of the DCS gas monitoring system have not yet been implemented. These ingredients include alarm trigger levels for each monitored parameter, a real time on screen alarm prompt and buzz, emergency remote shutoff soft button. Because of this, the shift taker must review the RPC gas page from time to time so that alarm states do not go unnoticed for long periods of time.
In case of an emergency in which you don't know how to deal with the situation, the following gas experts must be contacted for immediate assistance:

Name	Institution	Cellphone number	E-mail
Changguo Lu	Princeton University	13520394224 1-609-258-1288	changguo@princeton.edu
Jilei Xu	IHEP	15118079742 1088236095	xujl@ihep.ac.cn
Qingmin Zhang	IHEP	13810098800	zhangqm@ihep.ac.cn
Mengyun Guan	IHEP	13683265881	dreamy_guan@ihep.ac.cn
Hanshen Sun	IHEP	15013471936	sunhs@ihep.ac.cn

5. HV system

The RPC HV system provides the High Voltage (HV) needed by the RPCs. The HV is provided by a Caen Sys 1527LC mainframe and positive HV cards A1732P and negative HV cards A1733N. Each card can provide 12 channels. In the near halls there are 48 high voltage channels, in the far hall there are 72. Each RPC module receives HV from 8 fan-out channels, 4 positive and 4 negative. Each fan-out channel is distributed among 1 layer of each of 9 RPC modules (18 RPCs). The HV is controlled through the DCS system.

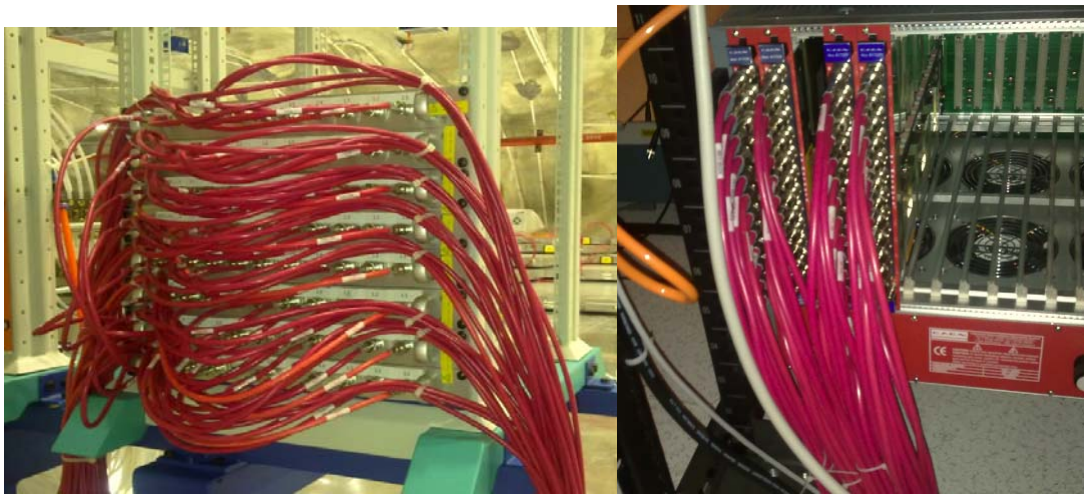


Fig. 7 pictures of HV (back side of Main Frame and fan-outs)

5.1. Scope

This manual is only for a shift operator in the control room. It assumes that the HV system has been turned on and set up for continuous running by an HV Expert and a DCS expert. Problems with the HV hardware not addressed here should be reported to a HV expert. About DCS problems, please contact DCS experts.

5.2. System Introduction

The RPC high voltage (HV) control and monitoring software is used to control and monitor the HV. The status of voltage, current, real-time temperature and running status of all channels can be shown by the main GUI as shown in Fig. 8. High voltage can be powered on or off by clicking the relevant buttons.
You may see gray(inactive)menus which is due to you don't log on or log on with a certain user. About log-on, please refer to the section "How to configure".

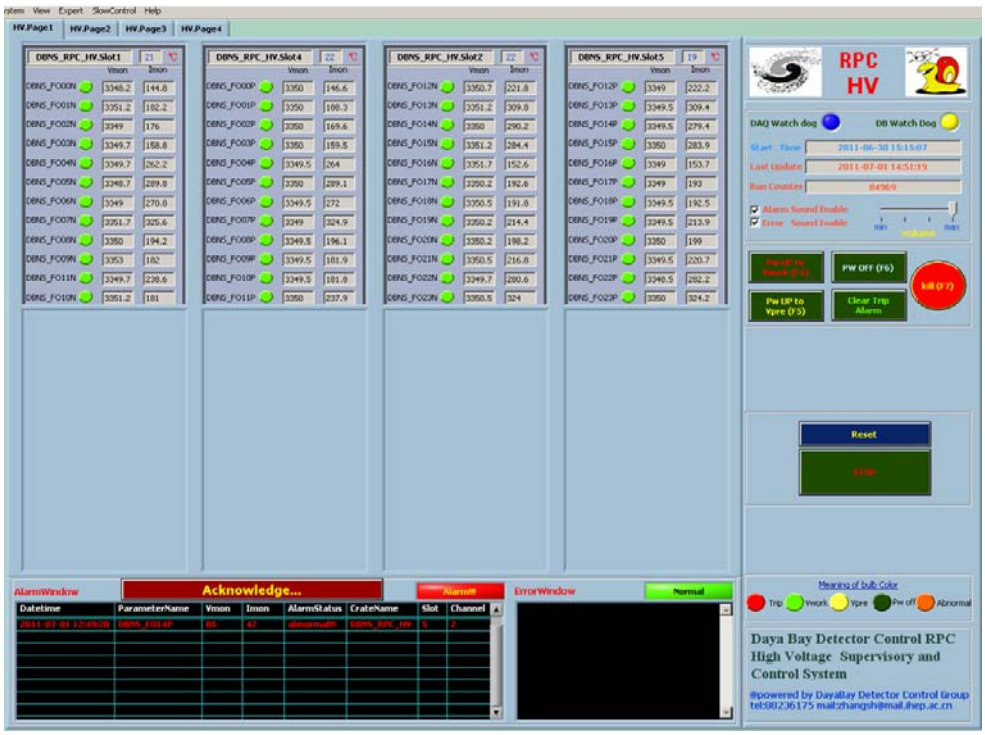


Fig. 8 The interface screen of DCS HV control/monitor program

5.3. How to run HV DCS program

➢ How to start the program

Double click the icon on desktop (shown in Fig. 9) to start the software.
The GUI interference will come up, as shown in Fig. 8.

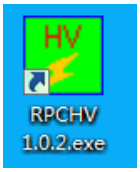


Fig. 9 Icon of DCS HV control/monitoring program on desktop

This screen shows all monitored channels.

Notes about the channels:

A). Channels are listed as Site_F###(N or P).
   1. N = negative, P = positive
   2. 0xxN is paired with 0xxP

B). At the top of each Column of channels, the slot number of the card is listed.

C). On This screen, the columns are listed Slot 1, Slot 4, Slot 2, and Slot 5.
   1. Negative channels in Slot 1 are paired with Positive channels in Slot 4.
   2. Negative channels in Slot 2 are paired with Positive channels in slot 5.

D). In slot 1, channels 010N & 011N are not in the expected order.

Status Indication: The bulb color beside each channel should be a light green

to indicate normal running. The other options available for bulb colors are (Fig. 10):

Fig. 10 Possible Bulb Colors

A). If you are color blind, watching only the bulbs will be more difficult or impossible, you will have to watch & listen for alarms as well as suspicious voltages & currents.

B). The colors are

1. **Red**, Trip -> A HV channel has drawn more current than its preset limit. The channel has turned itself off.
2. **Light Green**, Vwork -> High Voltage is working as expected at the pre-set level.
3. **Yellow**, Vpre -> NOT important to our experiment, IGNORE.
4. **Dark Green**, Pw Off -> The channel has been turned off.
5. **Orange**, Abnormal -> The voltage is not at its expected level.

d. Each channel also has an entry for observed voltage and current draw. This is useful knowledge for all operators and especially useful to the color blind operator.

e. If there are no problems, the operator doesn't need to do anything to the system; all lights should be on and light green.

➢ How to configure/control

Click the "System"→ "Login" (shown in Fig. 11), it will pop up the *User Login Window*. There are three limits of authority you can choose (shown in Fig. 12):

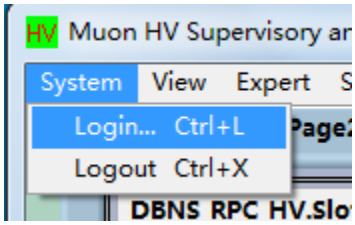


Fig. 11 log in/out DCS HV control system

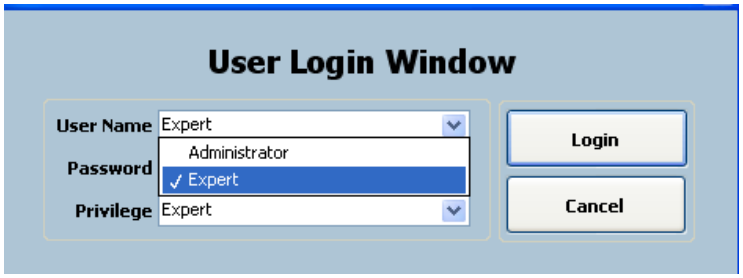


Fig. 12 log-in window

Users with different privileges will see the different menus and interface and some

items may be in gray (inactive). About the password, please contact the slow control experts.

Tab.1 main functions for different users

	Administrator	Expert	Log out
System Configure	YES	NO	NO
“Stop”Button	YES	NO	NO
"Reset" Button	YES	YES	NO
Tools	YES	NO	NO
Processes	YES	NO	NO
Parameter Config	YES	YES	NO
Single Channel Control	YES	YES	NO
Realtime Bar Chart	YES	YES	YES
History Graph	YES	YES	YES
Running Log	YES	YES	YES

Please notice the “view” menu (see Fig. 13),

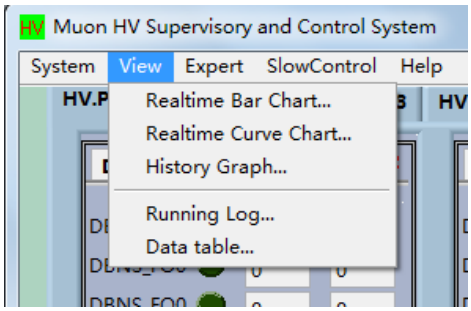


Fig. 13 view real-time/historical graphs

The first three items are functional when local database is enabled. Users can check the “Real-time Chart” and “History Graph” by DCS website through the under address: http://dcs2.dyb.ihep.ac.cn/MainSysList.php?Site=DBNS

Note: the HV current is normally constant except for direct variations with T and RH

Operation

You can power up, power off, and kill all channels' voltage by clicking buttons shown in Fig. 14.

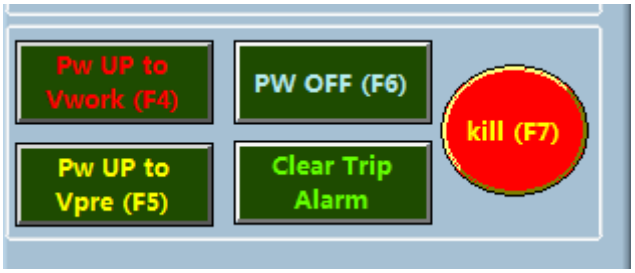


Fig. 14 Operation buttons

You can also operate this on individual channels:

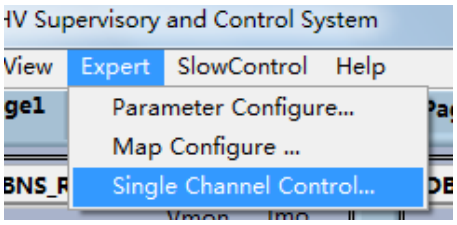


Fig. 15 how to control single channel

Select the ”Single Channel Control…”, and switch buttons shown in Fig. 15 to bring up the on/off interface window shown in Fig. 16 for all the individual channels.

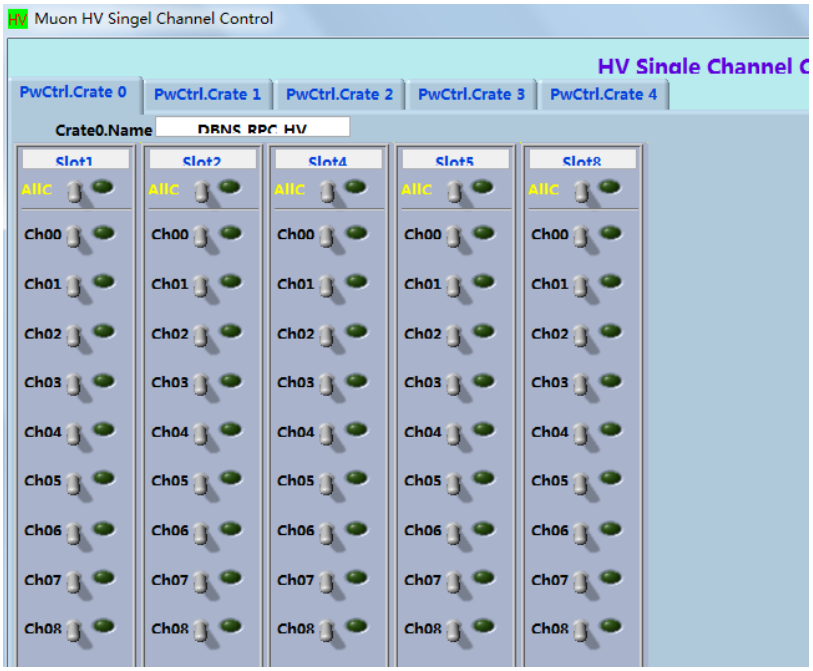


Fig. 16 on/off knobs for all the HV channels

Expert configuration

This part is for experts, as a shift taker you can skip it.

1. Parameter Configure

Select the item as shown in Fig. 17

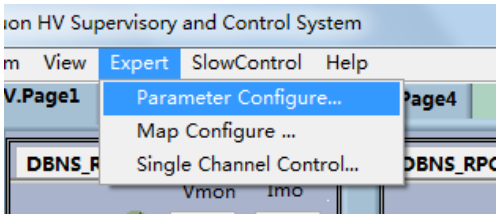


Fig. 17 Configure program as an expert

You need to specify parameters to make HV crate working properly. (Fig. 18)

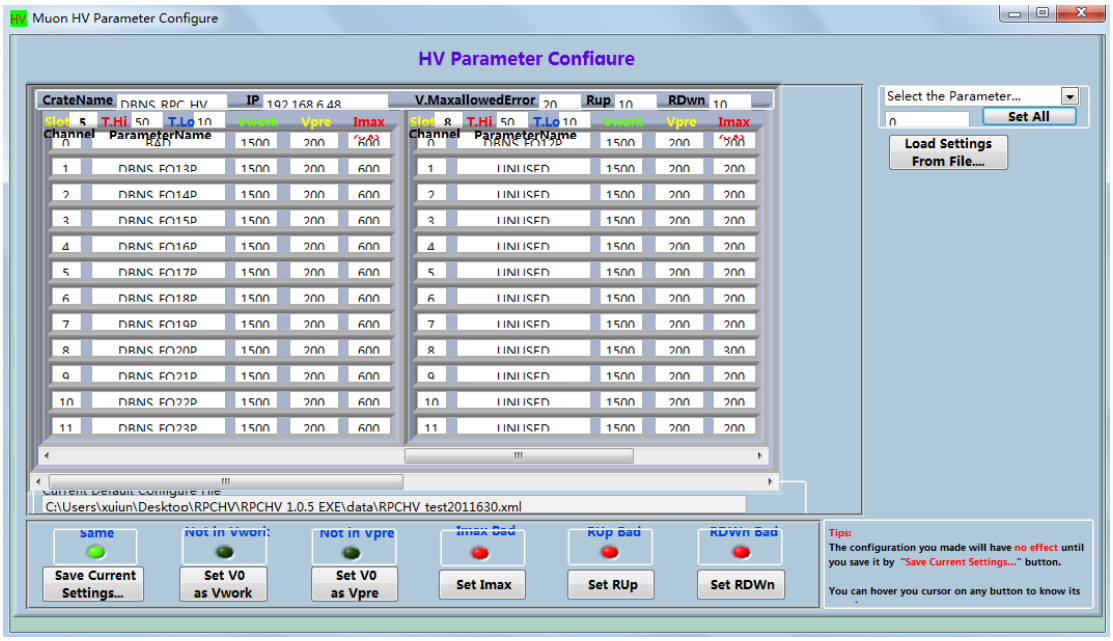


Fig. 18 Interface window for configuration

Crate information:

"CrateName" and "IP" identify which HV crate is being used. Type IP set in the hardware into this; don't change the "CrateName" which is related to the database name.

"V.MaxallowedError" is the size of the range over which a voltage is allowed to fluctuate without alarming frequently, because the value of voltage could only raise up in the proximity of the Vwork.

"Rup" and "RDwn" set the raising speed (V/s) when increasing or decreasing the HV.

Slot information:

Type the slot number to fix where the corresponding board is installed, set the T.Hi and T.Lo as a range of the temperature limit for the board.

"Vwork "and "Imax" are parameters which are defined identically with the hardware. Please ignore "Vpre" that this function is not used often now.

"ParameterName" has a fixed format which is necessary for interaction with the database. You could set parameter names coincident with channels in one slot even in other slot column, but please do not change the character format. If one channel were broken or not in use, type them as "BAD" , "UNSED".

Setting

You can set "Imax", "Vwork" one by one. You also can set them all together at the same time by doing as follows:

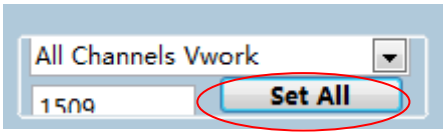


Fig. 19 set "Imax" or "Vwork" all together

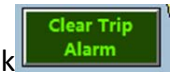
To make the configuration effective, click the “Save Current Settings” button (Fig. 20):

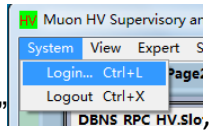
Fig. 20 Make your setting be effective

When the settings take into effect, these lights will turn on.

➢ Restoration and Troubleshooting

1. **What can I do when an alarm occurs?**
   When an alarm occurs, please contact the HV experts.
   The following is for HV experts and you can skip it as a shift taker:
   Please check the alarm windows and click the “Acknowledge” button 

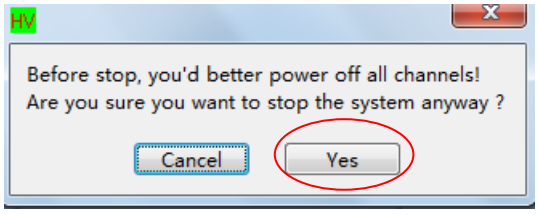
for acknowledgement and call the expert. Tell them the details listed in the alarm window. You can also add comments for the acknowledgement actions. Some alarms say "trip alarm" (take RPC high voltage for example) and cannot be removed by pressing this button. This is because it comes from the alarm of the hardware. You need to click 

to send a command of clearing trip to the hardware.
2. **Start/Stop and Re-login when a communication interruption between DCS and HV mainframe occurs.**
   Select “System”→“Login...” 

, choose admin/expert and type correct password in the "User Login Window"

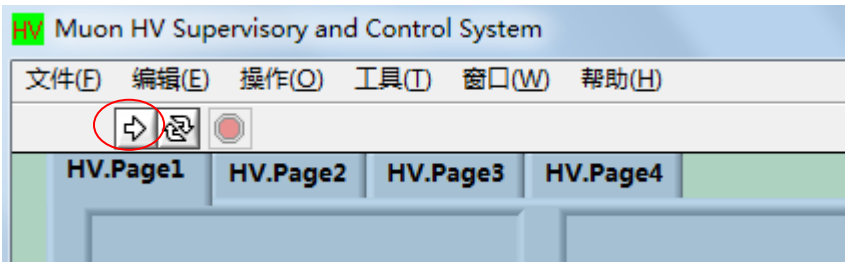
Then you could see "STOP" button 

, click it and choose "yes"



******Rebuild communication:**

If the software is not communicating with Hardware, please click the arrow “->” which is circled with a red ellipse shown in the picture below and “reset” button shown in Fig. 8 . The program will run again.



5.4. Troubleshooting:

NOTE: If a problem occurs, please make sure the problem has been solved before you turn it back on. Please contact HV experts first. With the permit from HV experts, you can follow the following procedures or these procedures can be only implemented by HV experts.

A. Channel Trips

1. When a channel trips, the bulb will turn red, an audible alarm will sound, and there will be a new entry in the Alarm and Error windows at the bottom of the screen of the DCS Monitoring Window (Fig. 21). The channel will turn itself off.

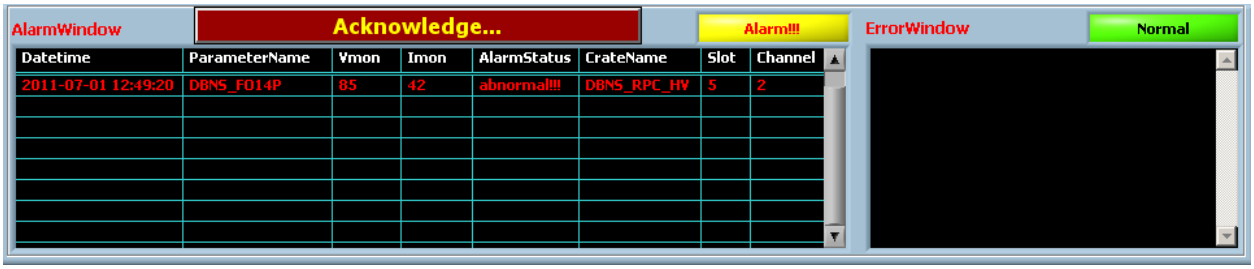


Fig. 21 Alarm Window and Error Window in the DCS Monitoring screen.

2. Clear the alarm and the error by hitting the Acknowledge button above the Alarm Window and the button in the Error window.

3. On the 1st time a channel trips, turn it back on immediately by using the Single Channel Control Panel Interface.

A. Open the single channel interface by going to Menu Expert -> Single Channel Control

B. Note that Channel Naming is different on this screen than on the DCS Monitoring Screen. Here, slots are ordered numerically AND channels are named 00 - 11. The channel mapping is currently:

Caen Channel	DCS Remote monitoring	Caen Channel	DCS Remote monitoring
1.00	00N	4.00	00P
1.01	01N	4.01	01P
1.02	02N	4.02	02P
1.03	03N	4.03	03P
1.04	04N	4.04	04P
1.05	05N	4.05	05P
1.06	06N	4.06	06P
1.07	07N	4.07	07P
1.08	08N	4.08	08P
1.09	09N	4.09	09P
1.10	10N	4.10	10P
1.11	11N	4.11	11P
2.00	12N	5.00	12P
2.01	13N	5.01	13P
2.02	14N	5.02	14P
2.03	15N	5.03	15P
2.04	16N	5.04	16P
2.05	17N	5.05	17P
2.06	18N	5.06	18P
2.07	19N	5.07	19P
2.08	20N	5.08	20P
2.09	21N	5.09	21P
2.10	22N	5.10	22P
2.11	23N	5.11	23P

Table 1: Mapping of Caen Channels and DCS Channel names, showing positive and negative pairs together.

4. Turn on the tripped channel by clicking on the switch by the proper channel. The bulb should change to orange as the Channel ramps back up to operating voltage. Do not worry about the Channel's Voltage and current readings flashing red while the channel is coming back up to operating voltage. This is normal.
5. If a channel trips for a second time, almost immediately (within 15 minutes), clear the alarms as before and Leave the channel off for 10 minutes. Then turn the channel back on using the Single Channel Interface as before.
6. If the channel trips a 3rd time, almost immediately (within 15 minutes), clear the alarms as before, and Leave the channel off.
7. Find the channel's paired channel and also turn off the paired channel using the Single Channel Interface.
8. Contact an HV Expert and describe all tripped channels and how many times they

tripped.

B. Abnormal Channels:

1. If a channel goes abnormal (orange bulb, Voltage & Current readings flashing orange) AFTER the channel has been operating normally, turn off the channel and its paired channel using the Single Channel Control Interface. This is typically due to low voltage or inability to hold voltage

A. To turn off channels, follow the instructions in “Channel Trips,” #3-4.

2. Contact a HV expert with any details about the abnormal channel.

5.5. Emergency Off

If there is any emergency at Daya Bay (fire, typhoon, etc) or if the entire HV system is acting funny, there is an emergency off button on the general monitoring screen. To KILL the entire system hit the large red circle, which says kill, on the middle right side as shown in Fig. 14.

5.6. Experts

The HV hardware is designed and built by Virginia Tech (VT), so only the people from VT are considered as HV hardware Experts. VT’s current policy has a minimum of 1 person on-site at all times. If you need to contact an HV hardware expert, please look for the person on-site first. If it is night in China, either look for VT people in America on Skype OR email them.

For DCS problems, please contact DCS experts.

	Name	**Email**	**Skype**	**Phone Number**
HV Hardware	Joesph Hor	ykhor@vt.edu	joesphhor	134 1088 5529
	Jonathan Link	jmlink@vt.edu	jonathanlink	
	Deb Mohapatra	dmohapat@vt.edu	dmohopat	152 2012 1478
	Jo Ellen Narron	jenarron@vt.edu	oellenjay	1-540-231-6389:
	Yue Meng	mengyue@vt.edu	my85310	134 1745 3124
DCS	YE Mei	yem@ihep.ac.cn	Yemei-sc	+86-010-88236172
	Jun Xu	xujun@ihep.ac.cn	dayabay_xujun	+86-0755-88475630

6. Readout system

6.1. On/Off of electronics

Please follow the following normal orders.

- **Power on**
    1. Turn on RPC VME crate
    2. Turn on ROT
    3. Ramping up HV

Please wait for 5 minutes, and then run the DAQ program. (Because it takes the system a few minutes to synchronize)

- **Power off**
    1. Ramping down HV
    2. Turn off ROT
    3. Turn off VME crate

(The on/off switch of VME Crate is shown in Fig. 22. and the on/off switches of ROTs are shown in Fig. 23.)

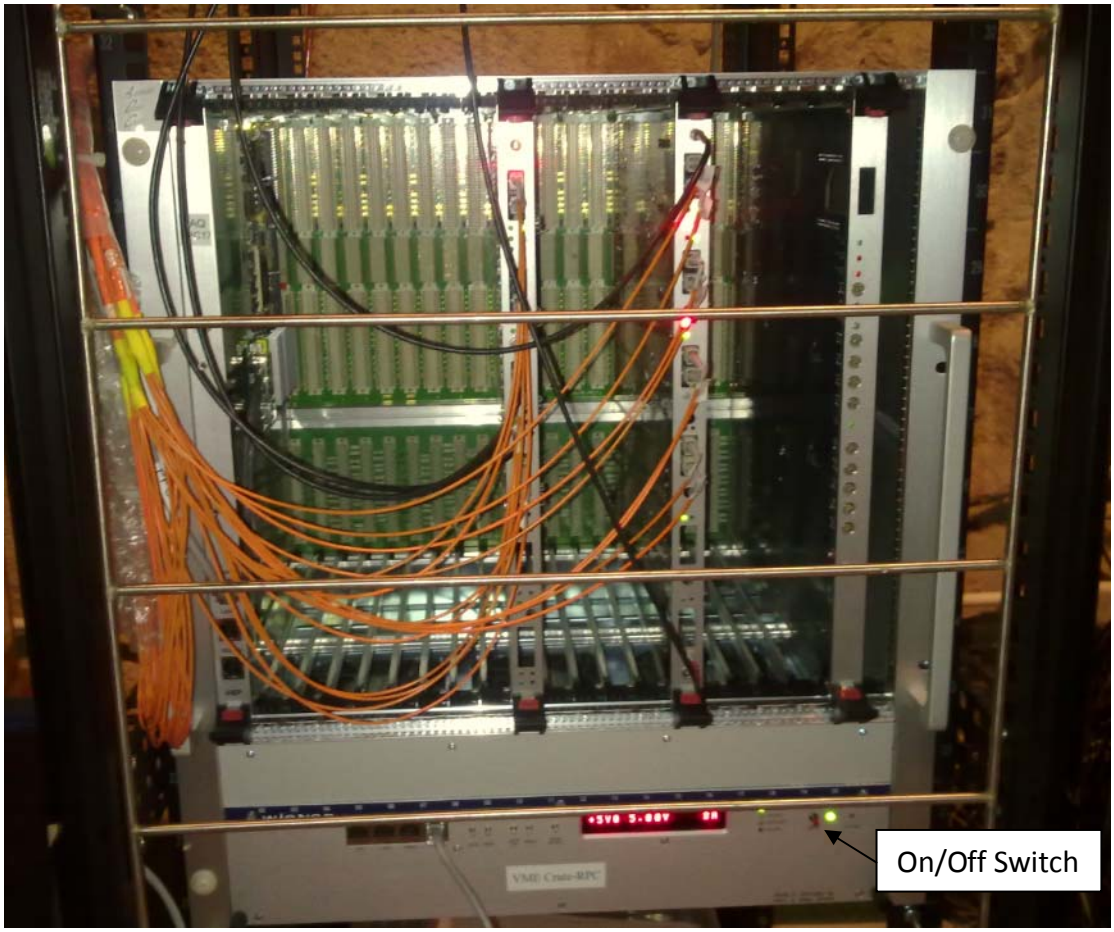


Fig. 22 RPC VME Crate in Electronics room

Fig. 23 On/off switches of ROTs (please don't touch the far right switch which is not used for ROT. The current position is on)

6.2. Run DAQ

a. Start DAQ interface

Log on daq3.daq.local

- Username: dybrun
- Password: dybrun

ssh daqs1 (it's encouraged that your start up DAQ at host daqs1)
cd /home/dybrun/workarea/daq1.5
source setup.sh
setup_daq part_eh1-rpc.data.xml part_eh1-rpc (now, you will see Fig. 25.)
click "boot"

b. Configure electronics

If you want to change some parameters, please follow these steps:
1) cd /home/dybrun/workarea/daq1.5
2) vi eh1-rpc.data.xml
3) Change the parameters you need to change, then save&quit
Usually, you may need to change the threshold, you can change the number 1432 (40 mV) to the value you need according to the table shown in Fig. 24.

Usually, you don't need to change the other parameters. If you do, please contact the experts.

```
<attr name="FEC_threshold" type="u32">1432</attr>
<!--
        965: ==> 70mV
        1121: ==> 60mV
        1276: ==> 50mV
        1432: ==> 40mV
        1588: ==> 30mV
        1743: ==> 20mV

-->
```

Fig. 24 Threshold<->DAC

4) Before reloading, you need make sure DAQ is running at the state of "initialize" or "boot". (Because new parameters can only be reloaded at states before "config". See Fig. 25.)
5) Click the "Reloading database" button shown in Fig. 25 to reload the configuration file.

(**If you first change the parameters before starting the DAQ interface, you don't need to do this**.)

c. Start a run

1) Click "Boot"
2) Click "Initialize"
3) Click "Config"
4) Click "Start"

Before clicking, make certain that the "button" is clickable (the text is black, not gray).

5) For monitoring purpose, click "data flow" tab, "Site-EH1-Segment-1", "EH1-RPC-Segment-1", "ROS-EH1-RPC", and "currentEventReceiveRate" in sequence. Click right key to show history pictures.

d. Stop a run

1) Click "Stop"

   If you will start another run with no any changes, you don't need to implement the following two steps.

2) Click "Unconfig"
3) Click "Terminate"

e. Exit DAQ

1) Make sure you have stopped the run following the procedures of the previous section, "Stop a run".

2) Click “shutdown”

3) Click “Exit” at the top right corner.

4) Click “Yes” in the new pop-up windows to shutdown infrastructure applications of DAQ

6.3. Trouble-Shooting

- If for any reason you exited DAQ incorrectly or encounter any unexpected PC shut-off, and you cannot start DAQ again, please follow the following steps (when you use this, you have to be very careful. Make sure others are not running DAQ. If you are not sure, you’d better ask the experts to solve the problem):
  - 1. cd /home/dybrun/workarea/daq1.5
  - 2. source setup.sh
  - 3. igui_start -p <partition name> -DdisableRM
  - 4. After clicking “ok ” for a few warning message boxes, Click “Exit” at the right corner.
  - Now, you can start DAQ following the normal procedures.

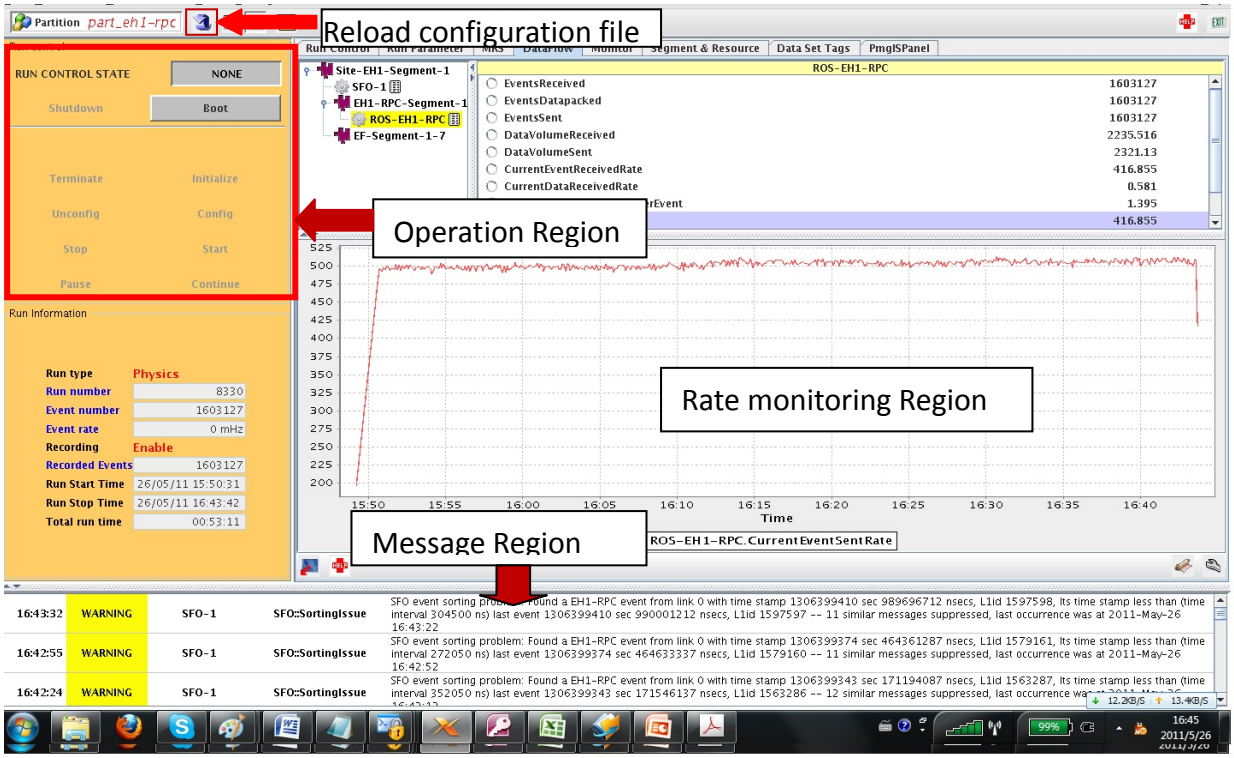


Fig. 25 DAQ interface

Error information	Solution
Clock system valid error	Click Stop->unconfig->Terminate->initialize->Config->Start
ROS configuration problem	Click Stop->unconfig->Terminate->shutdown Power off/on VME and ROT, Click Boot->initialize->Config->Start
data check error, fec data flag error。	Click Stop->unconfig->Terminate->initialize->Config->Start
data check ERROR: RTM module 15, CFID0: trgdata flag error!	Click Stop->unconfig->Terminate->initialize->Config->Start

7. Others

7.1. PQM

Physics Quality Monitoring (PQM) is used to monitor the performance of RPC detectors. The wed page is http://web.dyb.ihep.ac.cn/dqm/ shown in Fig. 26. There are two modes: real-time and history. Real-time means the current run, while you can choose the run you want to see in “history” mode. After choosing the run you want to see, click “submit”, you will see Fig. 27. The plots may not be real-time due to processing, but it’s still useful for figuring out problems when taking data. Usually the following plots may be helpful: SysTrigRate vs. time, 4-fold vs. time, RtmErr vs. time, FecErr vs. time and variable plots about hits,efficiency and noise rates.

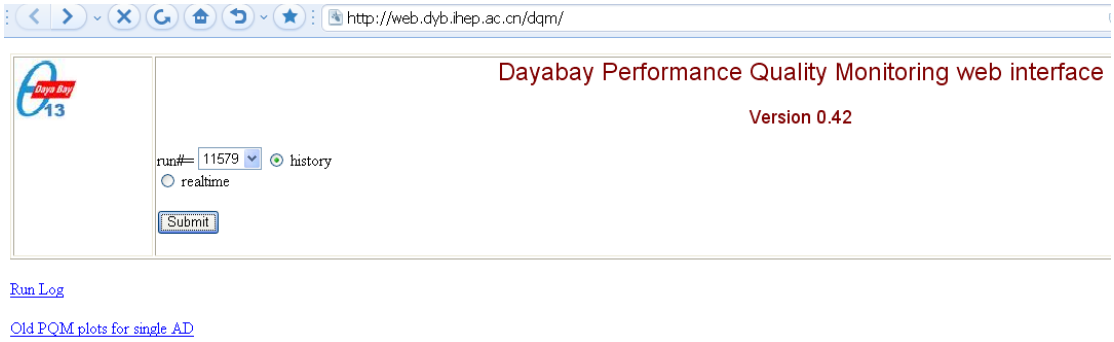


Fig. 26 Screen Snapshot of PQM web page

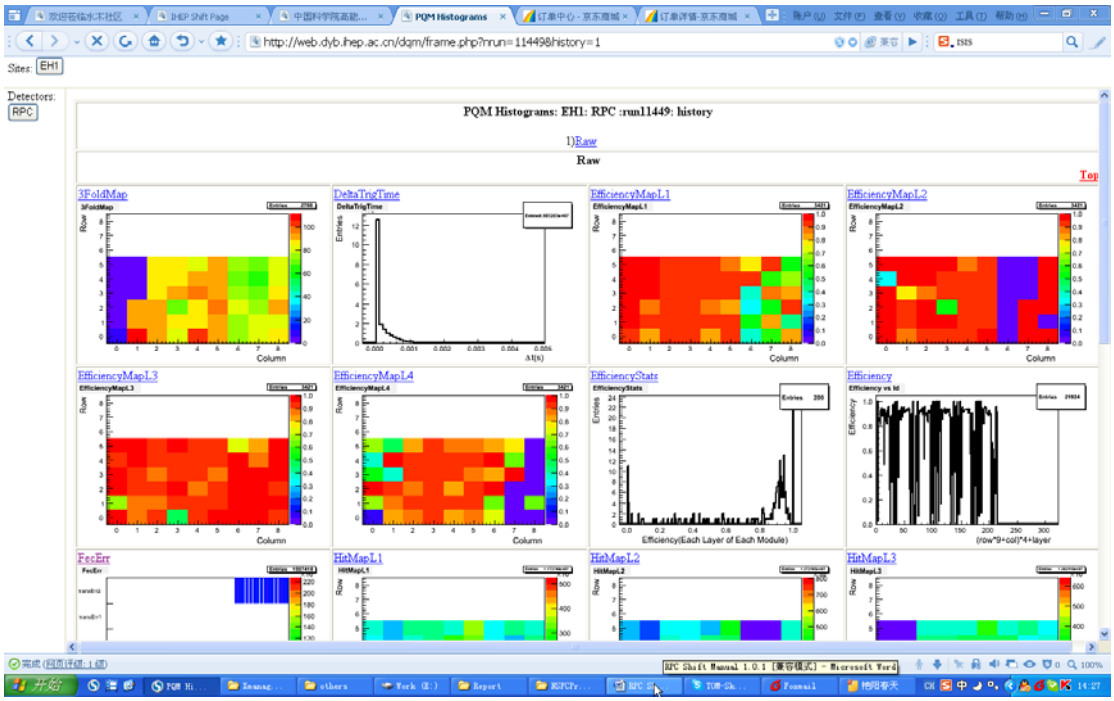


Fig. 27 Screen snapshot of RPC PQM webpage (run#11449)

7.2. DCS webpage

You can also remotely monitor the HV and Gas system in real time and look up the historical data through http://dcs2.dyb.ihep.ac.cn/SubSysList.php?MainSys=RPC shown in Fig. 28.

Fig. 28 Screen snapshot of RPC DCS data webpage

The HV current depends on environmental conditions, so you can loop up the environmental data through http://dcs2.dyb.ihep.ac.cn/TableList.php?MainSys=ENV&SubSys=PTH shown in Fig. 29. There are two modes: real-time and history and you can just look up the data you are interested in following the meaning of the menus.

Note: the temperature is about 3°C higher than the real temperature due to because the sensors are calibrated.

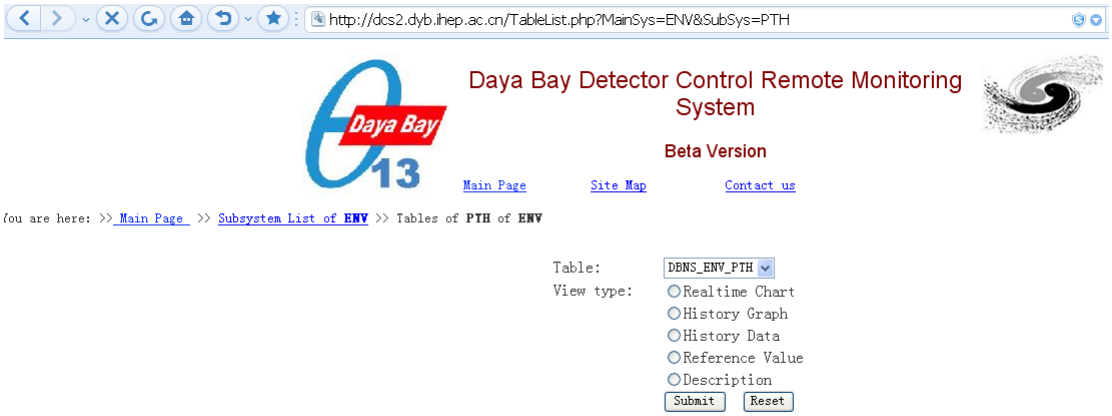


Fig. 29 Screen snapshot of EH1 environmental data webpage