HPS DAQ Operations Manual v3.0.1

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August 13, 2019

Contents

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1 System Description

The HPS experiment data acquisition (DAQ) handles the acquisition of data for three sub-detectors: the silicon vertex tracker (SVT), electromagnetic calorimeter (ECal) and hodoscope. HPS employs two DAQ architectures: the SVT is read out with the Advanced Telecom Communications Architecture (ATCA) hardware while the ECal uses VXS based hardware. The trigger system receives input from the ECal and hodoscope, and distributes a trigger signal to all detector subsystems to read out a selected event.

For the ECal, every VXS crate contains a Readout Controller (ROC) that collects digitized information, processes it, and sends it on to the Event Builder (EB). The ROC is a single blade Intel-based CPU module running DAQ software under CentOS Linux OS. For the SVT ATCA system, a multi-ROC setup runs on embedded processors situated on the ATCA main board. The EB assembles information from the SVT and ECal ROCs into a single event which is passed to the Event Recorder (ER) that writes it to a RAID5-based data storage system. The DAQ network system is a Foundry router providing high-speed connections between the DAQ components and to the JLab computing facility.

2 DAQ Control

2.1 Starting the CODA Run Control

The HPS experiment uses the CODA software framework for its DAQ run control. During the 2019 Physics Run, CODA will be run in a VNC viewer running on a VNC server started on `clondaq3`. This allows the use of CODA remotely in the event that off-site support is required. Accessing CODA can be done from any of the clon machines in the counting house by issuing the following command from a terminal as user `hpsrun`:

```
> daqvnc
```

In the case that CODA is not running within the VNC, it can be started by opening a terminal and issuing the following command:

```
> runcontrol -rocs
```

This opens up all windows needed on the current workspace. The workspace should look like Fig. 1. It is important to be able to see all the roc terminals. To do so it may be necessary to click on the **rocs** button in the top right corner to make the roc terminals visible.

Note: if the roc terminals are oddly sized or not displaying properly, try slightly resizing the window.

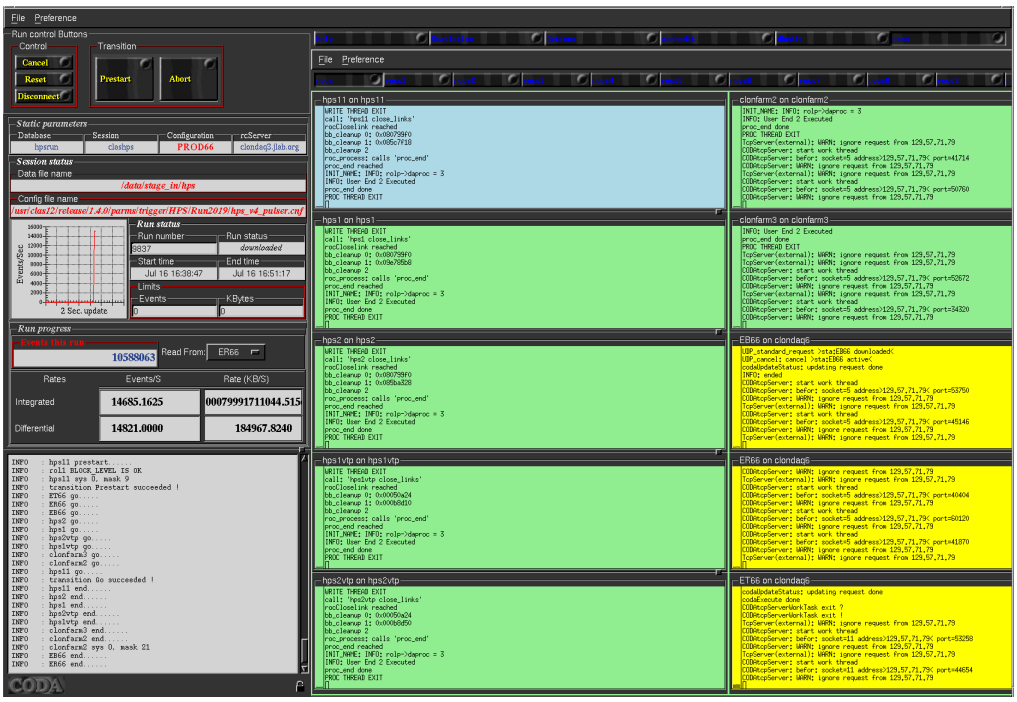

Figure 1: CODA workspace.

2.2 Killing the CODA Run Control

First, in the runcontrol GUI, click "File"→ "Exit". You may have to do that twice. Then, to ensure that all underlying processes are gone, open a terminal within the VNC viewer and execute the two commands:

```
> killall rcServer
> killall rocs
```

2.3 Starting Rogue (SVT Experts Only)

Before taking a run, the SVT data acquisition software (Rogue) also needs to be started. During the 2019 Physics Run, Rogue will be running on a VNC server started on `clonfarm2`. This will allow SVT experts access to Rogue in the event that off-site support is needed. Accessing the VNC containing the Rogue GUI can be done from any of the clon machines in the counting house by issuing the following command from a terminal as user `hpsrun`:

```
> svtvnc
```

Once open, the Rogue GUI should be visible as shown in Fig. 2.

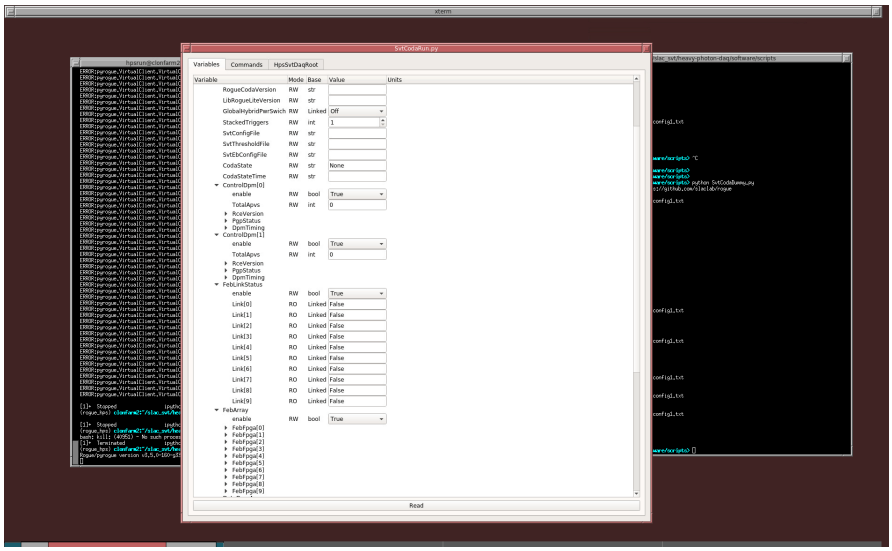

Figure 2: Rogue GUI running inside a VNC viewer.

In the case that Rogue isn't running within the VNC, it can be started by opening two terminals and issuing the following commands:

In the first terminal

```
> cd /usr/clas12/release/1.4.0/slac_svt/
> bash
> source setup_rogue_server.sh
> cd heavy-photon-daq/software/scripts/
> python SvtCodaRun.py
```

In the second terminal

```
> ssh clonfarm3
> cd /usr/clas12/release/1.4.0/slac_svt/
> bash
> source setup_rogue_server.sh
> cd heavy-photon-daq/software/scripts/
> python SvtCodaDummy.py
```

Note, that before doing an SVT DAQ reboot, the two Rogue processes will need to be killed. The two processes can be restarted after the SVT DAQ has rebooted successfully.

2.4 Starting a run

1. Beamline checklist
   (a) Beam conditions are ready for running (see beam line manual for more details).
2. ECal Checklist
   (a) All HV are on.
   (b) ECal monitoring app is running.
   (c) ECal FADC scaler display is running.
3. SVT Checklist (See the *SVT Operations Manual* for details on *Powering the SVT*.)
   For most of the steps below use the SVT summary GUI from Fig. 3 which can be started from the SVT sub-menu in the main EPICS control GUI.
   (a) SVT position is appropriate for the run.
   (b) High voltage bias is ON (at 60V for layers 0/1 and 180V for the rest).
   NOTE: If the the HV is OFF and won't come on you might need to go and reset the interlock by opening the `HV Bias Expert GUI` from the `Summary GUI` and reseting the MPOD interlock. This happens after a beam trip.
   Important: Before resetting the interlock, call the SVT expert!
   (c) FEB Status
      i. Under section `"ALL FEB CONTROL"` check that the status of `FEB ALL` is GREEN.

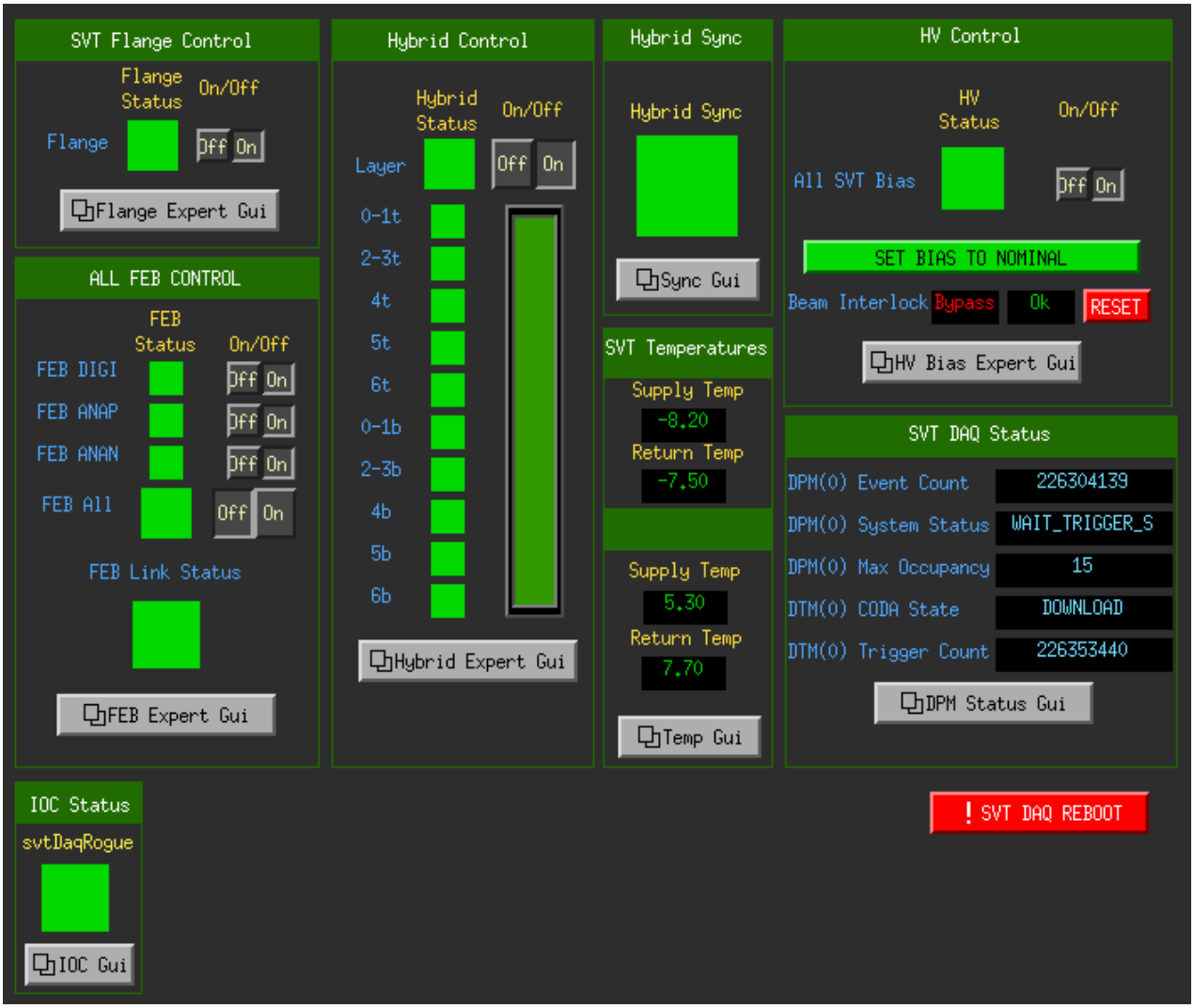

Figure 3: SVT summary GUI.

ii. Under section "ALL FEB CONTROL" check that the status of FEB Link Status is GREEN.

(d) IOC status

i. Under section "IOC Status" check that the status of svtDAQRogue is GREEN.

(e) Hybrid status

i. Under section "HYBRID CONTROL" check that the status of ALL HYBRIDS is GREEN.

4. **If continuing with the same run configuration from a stopped run continue to 11.**

5. Check the svtvnc VNC and make sure Rogue is running.

6. In the RunControl GUI: click connect, the GUI should update with new windows.

7. Click on Configure in the transition section, choose configuration PROD66. Click OK.

8. (a) Check that run number, data file path and run configuration filename shown in the updated GUI make sense.

   (b) The download button should appear.

9. Press Download.

   (a) A popup window should appear to choose the trigger file, which should be defined in the run plan in the short term schedule on the HPS Run Wiki and/or the whiteboard in the counting house.

   (b) Wait until the Prestart button appears and Run Control GUI reports that Download was completed. This may take a few minutes to complete.

10. Check SVT status

    (a) In the SVT summary GUI under section SVT DAQ STATUS, check that DPM(0) CODA State is saying Download.

    (b) In the SVT summary GUI under section ALL HYBRID CONTROL, check that ALL HYBRIDS status is GREEN.

11. Press Prestart.

    (a) Wait for the message of Prestart succeeded in Run Control GUI. This can take a few minutes to complete.

    (b) The Go button should appear.

    (c) Check ECAL status

i. Check that FADC scaler rates are reasonable by comparison with a previous run with a similar trigger. Sharp, odd patterns are a sign of misconfiguration.

(d) Check SVT status

i. In the `SVT summary GUI` under section `SVT DAQ STATUS`, check that `DTM(0) CODA State` is saying `Prestart`.

ii. In the `SVT summary GUI` under section `HYBRID SYNC`, check that status is `GREEN`.

12. Press `Go` to start the run.

(a) Wait for `transition Go succeeded` message in the Run Control GUI. This can take about 10 seconds.

(b) The **End Run** button should appear.

(c) Check that the run status is `running` and that triggers are issued at the expected rate.

(d) In the `SVT summary GUI` under section `SVT DAQ STATUS`, check that the `DTM(0) CODA State` and the `DTM(0) Trigger Count` are incrementing.

(e) Reset the ECal and SVT monitoring plots (disconnect+connect).

(f) Check SVT occupancy and max sample plots.

(g) Fill out a row in the run spreadsheet. Check the whiteboard and run plan wiki for any other logging requirements.

2.5 Stopping a run

1. Press `End Run` in the `RunControl` GUI to stop data taking.

(a) Wait for `End run succeeded` message in RunControl window. This can take about 15 seconds.

(b) The `Prestart` button should appear.

(c) In the `SVT summary GUI` under section `SVT DAQ STATUS` and check that `DTM(0) CODA State` is saying `Prestart`.

2.6 FIX DAQ

Follow this procedure if:

- Any CODA transition (**Download**, **Prestart**, **Go**, **End Run**) failed (Run Control GUI says it failed) or timed out (no new message in Run Control GUI for over a minute)
- A run was started (**Go** succeeded) but the trigger rate is 1 Hz or less (either from the beginning, or after the run has been going for some time)
- Any of the ROC xterms in the Run Control GUI has died (the xterm is showing a command prompt)

1. If any of the ROC xterms are showing command prompts at the bottom (for the xterms on the bottom row, you may have to hit `Enter` a few times in the xterm to make it scroll up), log what CODA transition you had most recently done, and which (if any) xterms were dead. If you had just started a run, log how many events were in the run.
2. Before restarting the run, take a screenshot of the DPM status and DPM Link Status and log it.
3. In Run Control, click **Cancel** (click twice just to be sure), **Reset** (you will get a confirmation dialog). Then start the run as normal starting with **Configure** (procedure in Section 2.4, starting at step 7).
4. If the run fails more than once due to either clonfarm2 or clonfarm3 crashing, call the SVT expert.

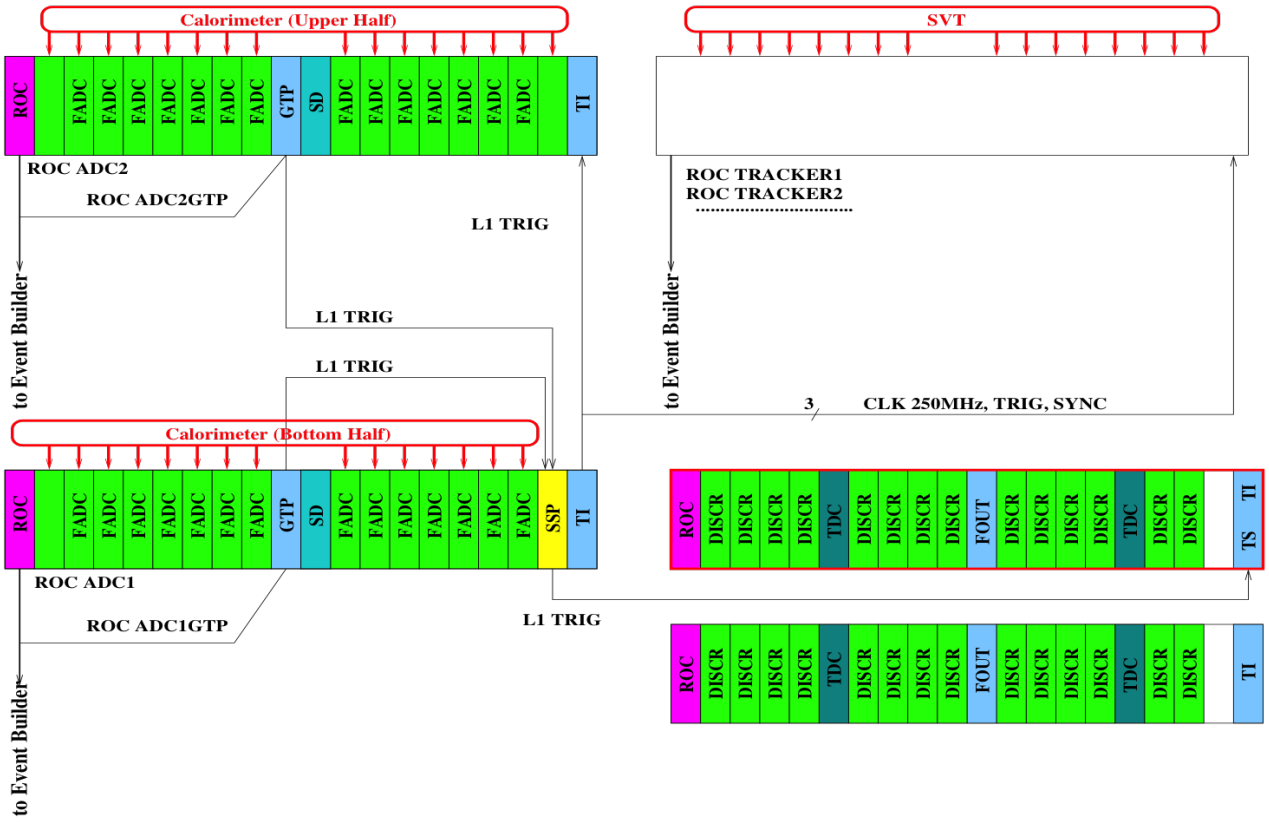

Figure 4: Schematic overview of the DAQ and trigger system.

3 Rebooting an Individual ROC

Execute this command (where `ROC` is one of `hps11, hps1, hps2`):

```
roc_reboot ROC
```

*Note that `hps1vtp` lives in `hps1`, so rebooting `hps1vtp` is done via `roc_reboot hps1` (and similarly for `hps2vtp`).

IF YOU REBOOT `hps11`, YOU MUST WAIT 30 SECONDS AND SUBSEQUENTLY REBOOT ALL OTHER ROCS `hps1, hps2` BEFORE PROCEEDING.