Trigger System Start Up Procedure

Gabby Gelinas

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Cabling

The cabling system for all boards is identical. Please see the image provided. It is important to note that there are three identical gold inputs: one alone and two in a pair. Starting from the outermost input of the pair, their inputs are: calibration pulse, analog signal for the lower numbered board, analog signal to the higher numbered board.

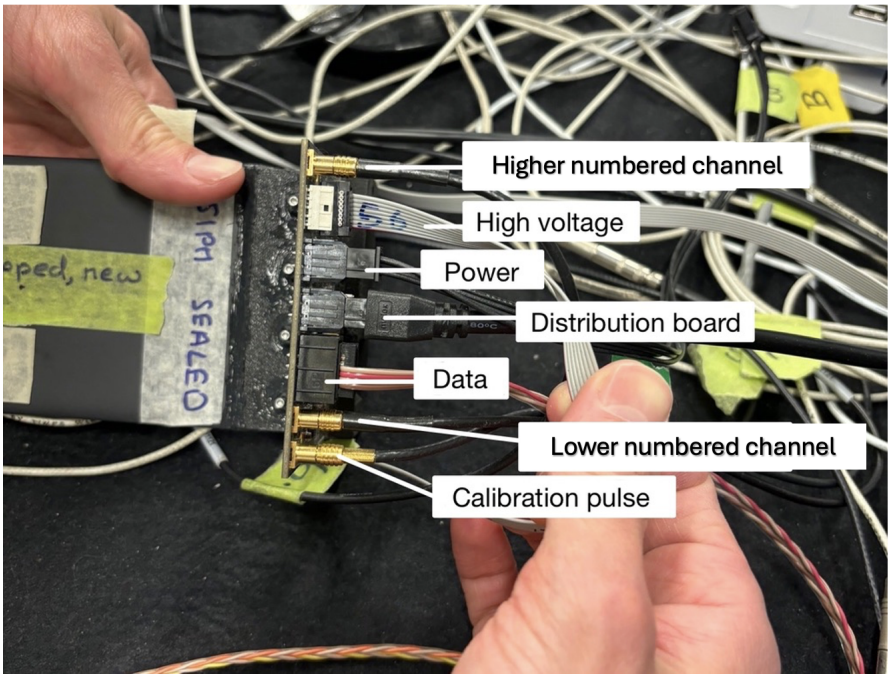

Figure 1: Labeled cabling example for one of the PCBs attached to the end of a scintillator.

Set Up and Starting a Run

1. Open the DAQ status page at `https://daq17.triumf.ca` and sign into midas when prompted. Username is '1eanpk_dl", password is "1eanpk_dl".

2. This will open to the midas status page. You may get a big red message saying "Alarm: program fedldb is not running". This is ok, the distribution just isn't on yet.
    - Fedldb means "front end DarkLight distribution board".
3. **Turn on low voltage** using the power supply on the table with the green tape on it. Just press the power button, do not turn any knobs.
    - It should settle at 6 V, the ideal values are written on the power supply. You should see zero current. The boards aren't drawing any because they aren't turned on. You haven't turned the distribution board on yet so it isn't sending power to the boards.
4. Turn the **fans** on by turning on the power strip labeled "fans".
5. Open the "programs" tab. **Start fechrono02** (the choronobox), and **fedldb** (the distribution board).
6. Once the fedldb is running (green in "programs" tab) you can go back to the status page and press rest on the alarm and it should go away.
7. From the side panel, open "DLDB" to control the distribution board. Make sure all boards you are going to use are set to "enabled". You can change this in "settings" beside "ODB actions"
8. Click **Init** then **all on** to start sending low voltage power to the SiPMs.
    - You know that it worked if you see current being drawn on the low voltage power supply.
9. **Set the threshold**. The threshold (thr) is set as a hex value. Setting it as 4096 gives you 80 mV, please see the overleaf for more values. Press **"write thresholds"** on the main DLDB page for this change to take effect. If you are not changing the threshold, still press the "write thresholds" button.
10. **Turn high voltage on**. Flip the on switch, then press in the green output button, then slowly turn the voltage knob up to 10ish V.
    - If "vbias demand" in DLDB is set to 0, none of this voltage will actually be seen by the boards.
11. In the DLDB tab, open "settings". **Adjust each voltage under "vbias demand"** to what you need. If unsure, 53.9 V is good.
    - Press **"vbias on"** to have your vbias demand changes take effect and send high voltage power to the boards.
    - vbias_dac converts the number you set in vbias demand to what controls the amount of voltage that goes through.
    - The distribution board dissipates 5-10 V so you will see a discrepancy between what you set on the high voltage power supply and the value in "vbias_meas". You will need to set the high voltage power supply higher than what you need because of this.
    - If you run into problems here like vbias_meas not being within 5ish V of what you set it to, go back to the programs tab and stop fedldb and restart it.
12. Continue to **increase the high voltage supplied** by turning the knob on the power supply.
    - Once reaching approximate the voltage you demanded at the boards, increasing the voltage at the high voltage power supply will not increase vbias_meas since the distribution board will not send more to the boards.

13. To get live updated plots, go the “history” tab on the side panel.
    - Rates should be around 1-10 counts/second. If they are significantly higher it means you haven’t set the threshold.
    - Temperatures across all four boards should be similar, though some variation is normal due to fan positioning and differences in fan power.
    - Vbias should match what you saw in the DLDB tab.
    - dldb_vbias is the voltage at the distribution board.
    - dldb_ibias is the current on the distribution board in mA.
    - As of April 23, 2024, dldb_vbias and dldb_ibias are not properly calibrated.
    - To zoom in, drag on the axis. To zoom out, press control r. Every time you change the zoom the plot pauses. Play play button on the right to resume.
14. You are now ready to **start a run**. On the status page and press “start”. **Add a descriptive comment**. Generally, the comment includes the type of run (comics, pulsar/calibration, and source), the threshold, the vbias on each of the boards, what mask you are using, and any other notes like if there’s a gap between the paddles or if you introduced a new board. Press start and your run has begun!
    - Masks are data filters in either the TDC or the FPGA. It sets what data is recorded (paddle coincidence - 0x40fe, top and bottom coincidence - 0x40f0, all hits - no mask)
15. During a run you can use the “rootana” tab on the side bar to view the root plots in live time. This tab only works when there is a run going. You can’t look at the last run if it has already ended. You will need to open the root file yourself to do that.

Turning the System Off

1. On the status page, stop the run.
2. On DLDB page, turn vbias off.
3. Turn the high voltage down to 40 V on the power supply, then press the output button, the turn it off.
4. On the DLDB page, turn SIPM power off by pressing “all off”.
5. In “programs” stop fedldb since no power is going to the distribution board anymore.
6. Turn off the low voltage power supply by just pressing the button, do not touch any knobs.
7. Turn the switch for the fans off.

You only need to turn everything off if you are re-cabling. If you just aren’t taking data at the moment, leave everything on so someone else has the option to start a run remotely.