DØ SMT
Shift Instructions

Version 1.42

Draft of March 13 2004 P.Rapidis
Modified by M. Kirby July 26 2005

Contents

General Instructions

Page Section

Shift Guidelines

1. If you haven't done so, read the instructions!
2. Login into the logbook at the beginning of your shift.
3. Log everything you do, and try to be thorough in the description of problems you may run into. Fill in the checklists relevant to what is going on. Start filling in the « Begin of Shift » checklist as soon as you start your shift.
4. Most of the GUIs you need can be started from the « GUI starter » GUI (in a terminal window type: cd; setup d0online; ./startguis.py)
5. If one of the VRB crates is 100% FEB try the following, in order, until the busy is cleared:
    1. Ask the DAQ expert for a SCL init.
    2. Can you find HDIs responsible for it? One or many HDIs in a row showing high DVDD current (look in the SMT DVDD CURRENTS GUI) can stall the readout. Ask for a run pause and redownload the problematic HDIs from the corresponding SEQ in the download GUI (SMT Download GUI). Note!: If the problem HDI is tripped, remember to ramp down and turn off the HV first.
    3. Ask for a run pause and do a "Reinit VME" for that crate in the SMT Download GUI.
    4. Ask for a run pause and reinit the sequencer controller for that crate in the SMT Download GUI (left click on the SEQC_**** box near the top of the crate's details window, then click on "reset" and "init")
    5. Ask for a run pause and do a "download" for the whole crate (SMT Download GUI)
    6. If all of the above fails: Ask for a run pause, power cycle the corresponding VME crate, do a "reinit VME », once the Power PC has rebooted, and continue the run. How to powercycle a VME (=VRB) crate? go to 2nd floor Movable Counting house; in the upper part of each rack, there are two 3 pull switches labeled with the crate numbers present in that rack. Flip the corresponding switch down to turn the crate off, wait a few seconds and flip the switch back up. It takes 30 seconds to a minute for the crate to reboot.
    7. Page the SMT expert (218-8764)

Shift Guidelines

6. HV trips when ramping up :
   See the « Troubleshooting HV pod Trips » section of the « High Voltage » chapter of the SMT Shift Instructions.
7. Check for major and minor HV alarms:
   1. If they are related to currents which are getting close to the trip limit, increase the limit by 10uA using the HV current limit GUI
      (GUI starter - page B - Button 4).
      If you need to do it more than 3 times in your shift for the same pod, page the expert (218-8764).
   2. If they are related to voltages, check that you ramped the voltages up to 100%.
      - if not, fix it.
      - if so, page the SMT expert (218-8764)
7. Check for major « Occupancy » or « Dead » alarms.
   The ONLY monitoring alarms that you can disregard are the « Occupancy » alarms, ONLY when the SMT HV is OFF. In ALL other cases, IF the monitoring is running, you should take the « Dead » and « Occupancy » alarms seriously.
   Try to fix the alarms by redownloading the corresponding HDIs. You may need to wait 5 to 10 munites to see the effect of your doanload (check the « SES UPDATE TIME » for the corresponding crate - see the « Monitoring » part of these Guidelines for more details).
   If the problem persists, page the expert (218-8764)
8. Check smt_examine histograms and compare them with the references. Write in the logbook any discrepancy you can see.
9. At the end of your shift, fill in the « Shift Summary » check list and logout from the logbook.

Types of HDIs present in D0SMT

- Barrels: 1 HDI = 1 Ladder
  - 3 chips:
    Bi-j-k ∀k (i=1,6; j=1,2,5,6) [k=1,6 or k=1,12]
    2 Single Sided sensors
  - 6 chips [3 p-side + 3 n-side]:
    Bi-j-k ∀k, (i=2,3,4,5; j=1,2,5,6)
    1 Double Sided 90° stereo sensor
  - 9 chips [5 p-side + 4 n-side]:
    Bi-j-k ∀i, ∀k, (j=3,4,7,8)
    2 Double Sided 2° stereo sensors

  where Bi-j-k means Barrel i, Layer j, Position k

- F-Disks: 1 wedge = 1 Double Sided sensor
  1 HDI = 1 side of a wedge
  - p-side: 8 chips
    Fi-1-k ∀i, ∀k [k=1,12]
  - n-side: 6 chips
    Fi-2-k ∀i, ∀k

  where Fi-j-k means Disk i, Side j, Position k

- H-Disks: 1 HDI = 1 side of a wedge
  - p-side: 6 chips
    Hi-1-k ∀i, ∀k
    2 Single Sided sensors
  - n-side: 6 chips
    Hi-2-k ∀i, ∀k
    2 Single Sided sensors
    (it is actually a second p-side)

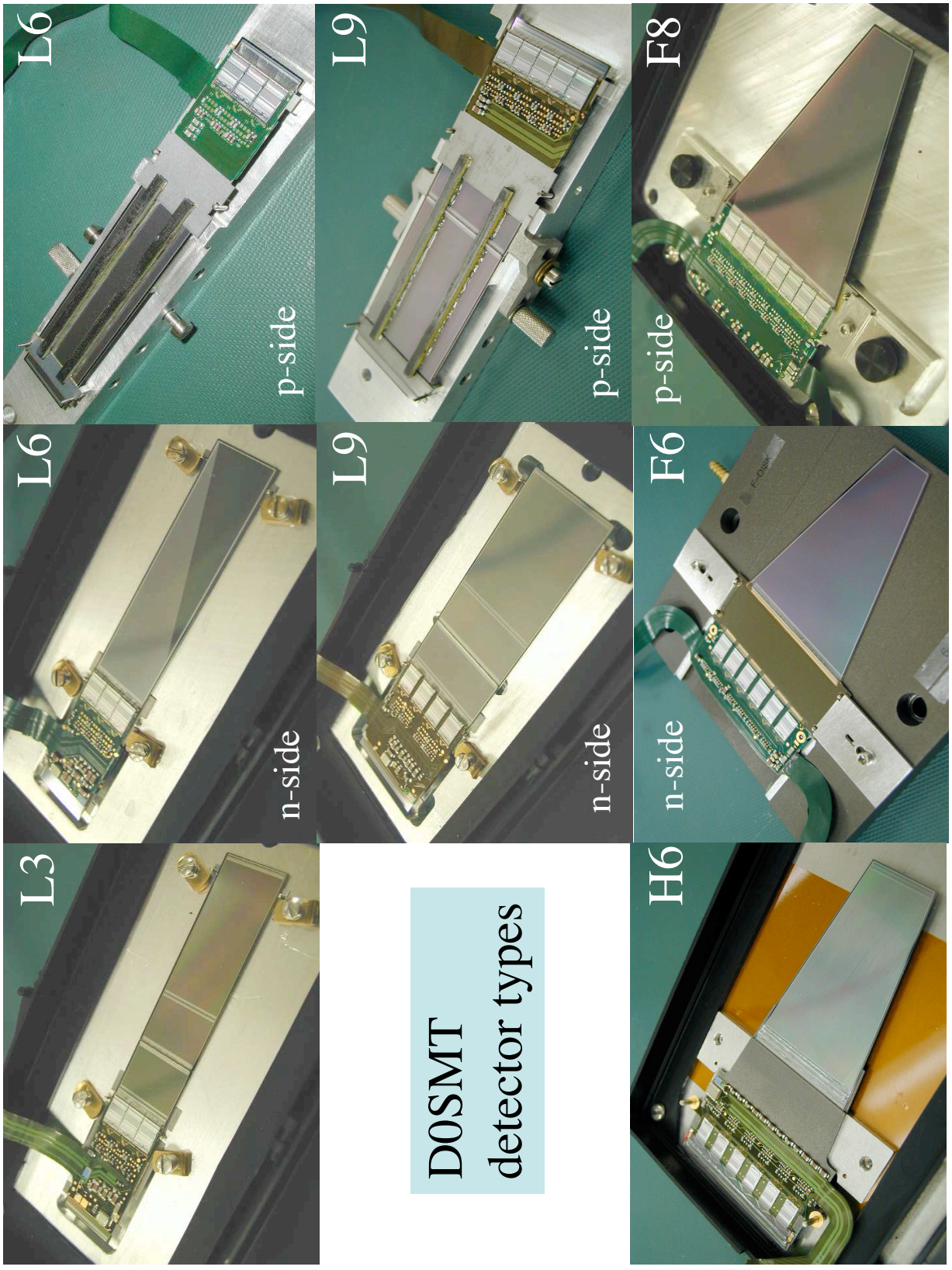
  where Hi-j-k means Disk i, Side j, Position k

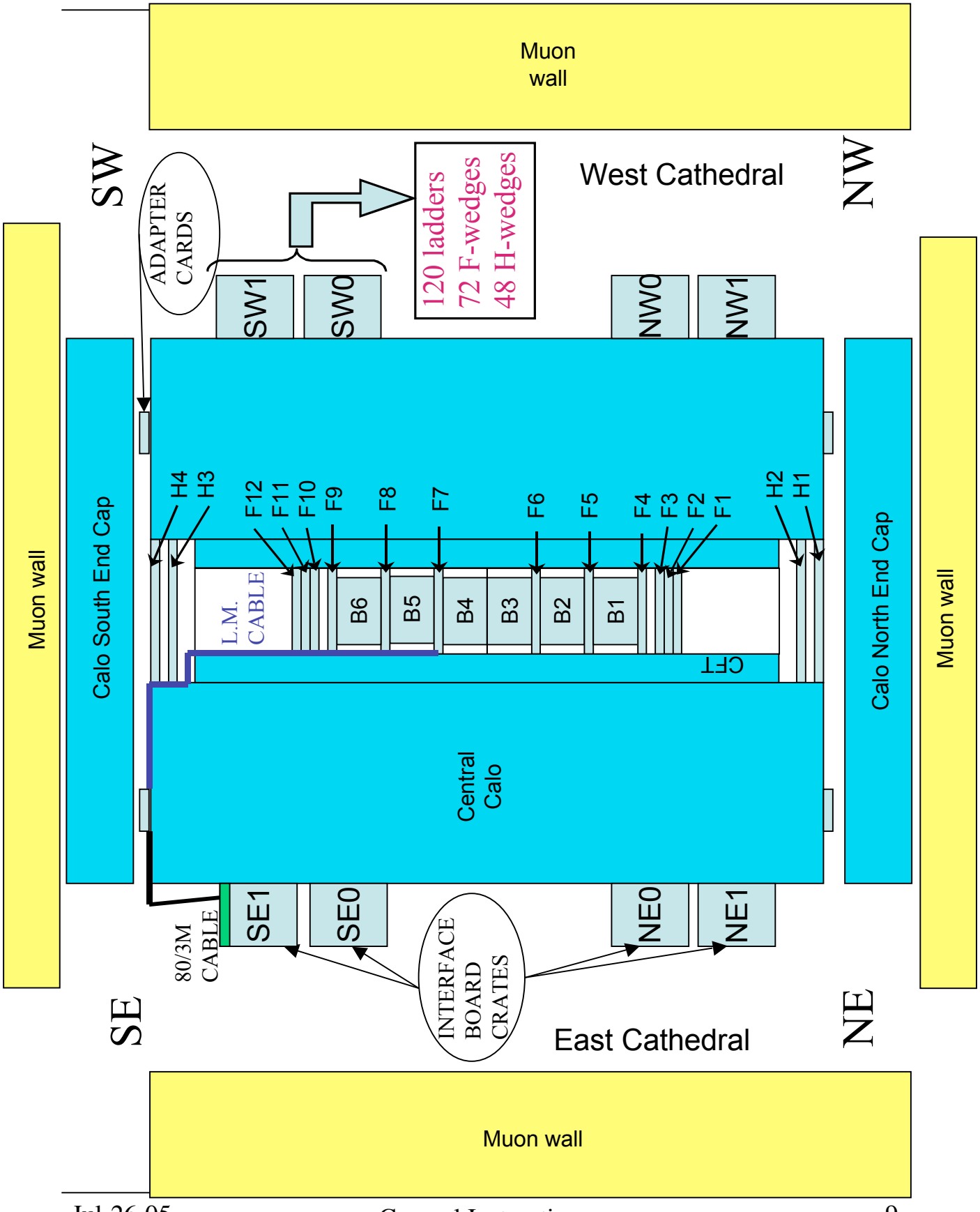
Correpondence between different mappings

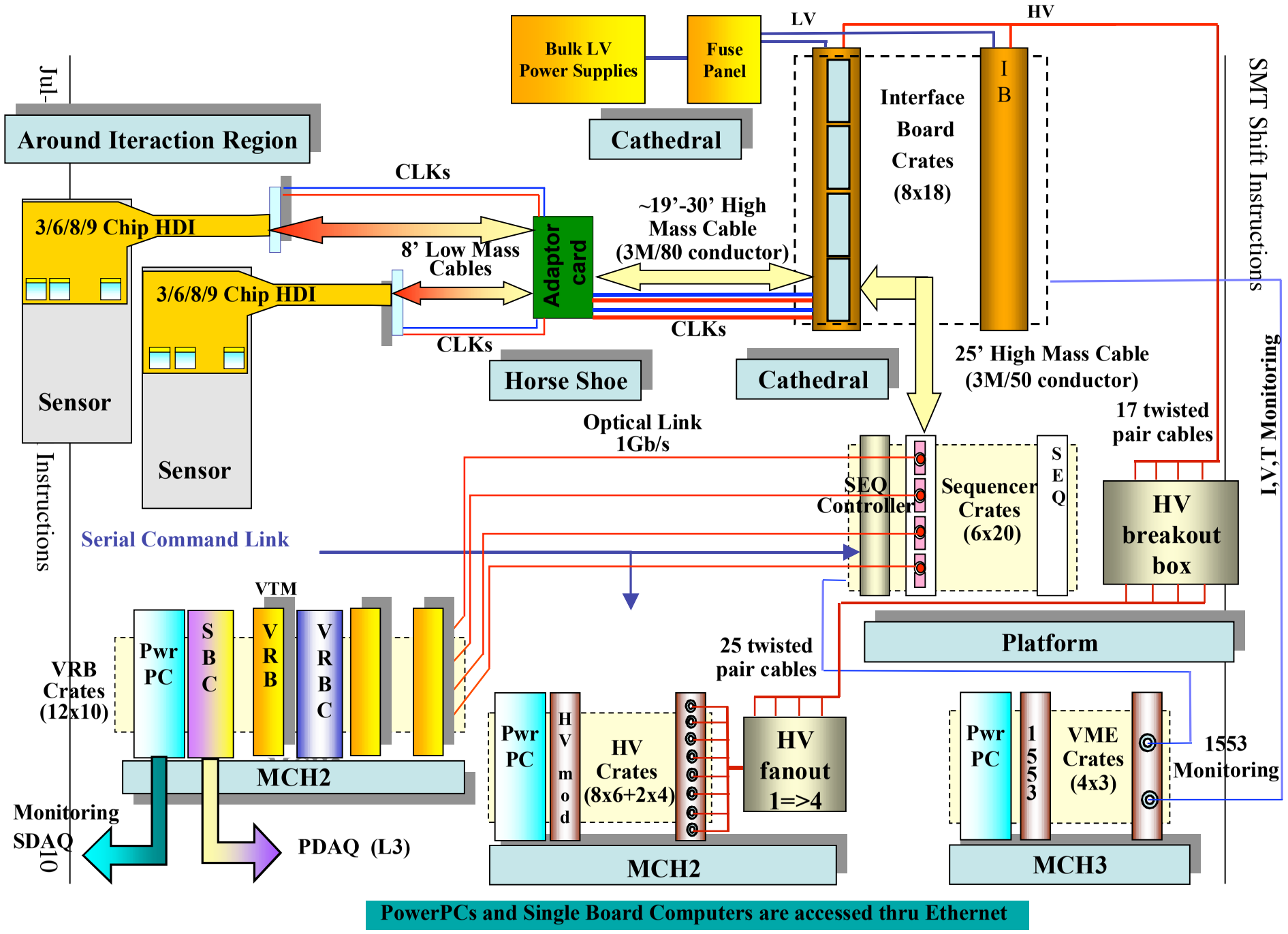
SMT Download GUI	Smt_Examine	Online Monitoring and Offline
B2-L5-HDI09-(N)	B2-5-09-p	B2-5-9
	B2-5-09-n	
H4-L1-HDI03-(N)	HD 4 03-p	H4-1-3
H4-L2-HDI03-(N)	HD 4 03-n	H4-2-3
F3-L1-HDI05-type8-(N)	FD 3 05-p	F3-1-5
F3-L2-HDI05-type6-(N)	FD 3 05-n	F3-2-5

« L » identifies:

- the layer (1,...,8) in a barrel
- the side (1,2) of a disk


L6
p-side
L9
p-side
F8
p-side
L6
n-side
L9
n-side
F6
n-side
L3
H6
D0SMT
detector types


Muon wall
SW
ADAPTER CARDS
120 ladders
72 F-wedges
48 H-wedges
West Cathedral
NW
SW1
SW0
NW0
NW1
Muon wall
Calo South End Cap
H4
H3
F12
F11
F10
F9
F8
F7
F6
F5
F4
F3
F2
F1
H2
H1
L.M. CABLE
B6
B5
B4
B3
B2
B1
CFT
Calo North End Cap
Muon wall
Central Calo
80/3M CABLE
SE1
SE0
NE0
NE1
INTERFACE BOARD CRATES
SE
East Cathedral
NE
Muon wall

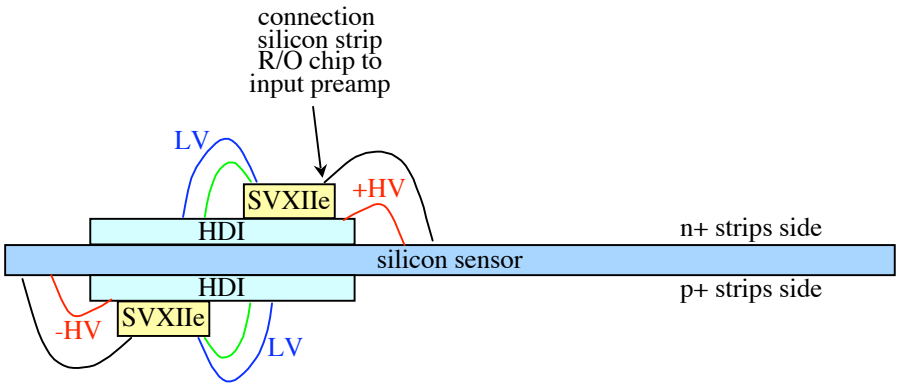

Jul-
Around Iteraction Region
Instructions
Bulk LV Power Supplies
Fuse Panel
LV
HV
Cathedral
Interface Board Crates (8x18)
I B
SMT Shift Instructions
I,V,T Monitoring
CLKs
3/6/8/9 Chip HDI
8' Low Mass Cables
Adaptor card
~19'-30' High Mass Cable (3M/80 conductor)
3/6/8/9 Chip HDI
CLKs
CLKs
Horse Shoe
Cathedral
25' High Mass Cable (3M/50 conductor)
Sensor
Sensor
Optical Link 1Gb/s
17 twisted pair cables
SEQ Controller
Sequencer Crates (6x20)
S E Q
HV breakout box
Serial Command Link
VTM
VRB Crates (12x10)
Pwr PC
S B C
V R B
V R B C
Platform
25 twisted pair cables
Pwr PC
H V m o d
HV Crates (8x6+2x4)
HV fanout 1=>4
Pwr PC
1 5 5 3
VME Crates (4x3)
1553 Monitoring
MCH2
MCH2
MCH3
Monitoring SDAQ
PDAQ (L3)
PowerPCs and Single Board Computers are accessed thru Ethernet

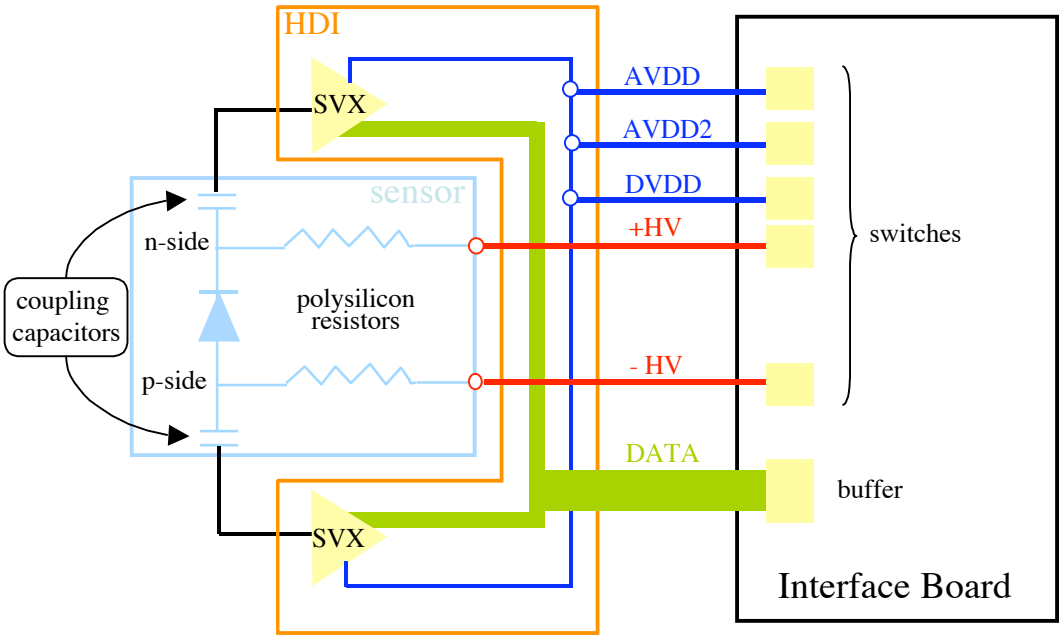
About LV and HV (1)

Our silicon detectors are made of 1 or 2 silicon sensor(s) glued to an HDI which carries SVXIIe chips. These chips allow to read out information about the charge collected on the sensor strips, when charged particles went through the sensor(s). For the detector to function properly:

- the silicon sensors must be depleted. This requires 1 (single sided sensors) or 2 (double-sided sensors) HV power supplies.
- the SVXIIe read out chips must be powered. This requires 3 different LV power supplies: AVDD, AVDD2, and DVDD.

HV and LV are provided by the IB to the HDI which, in turn, provides it to the sensor(s) and to the SVXIIe chips, respectively.





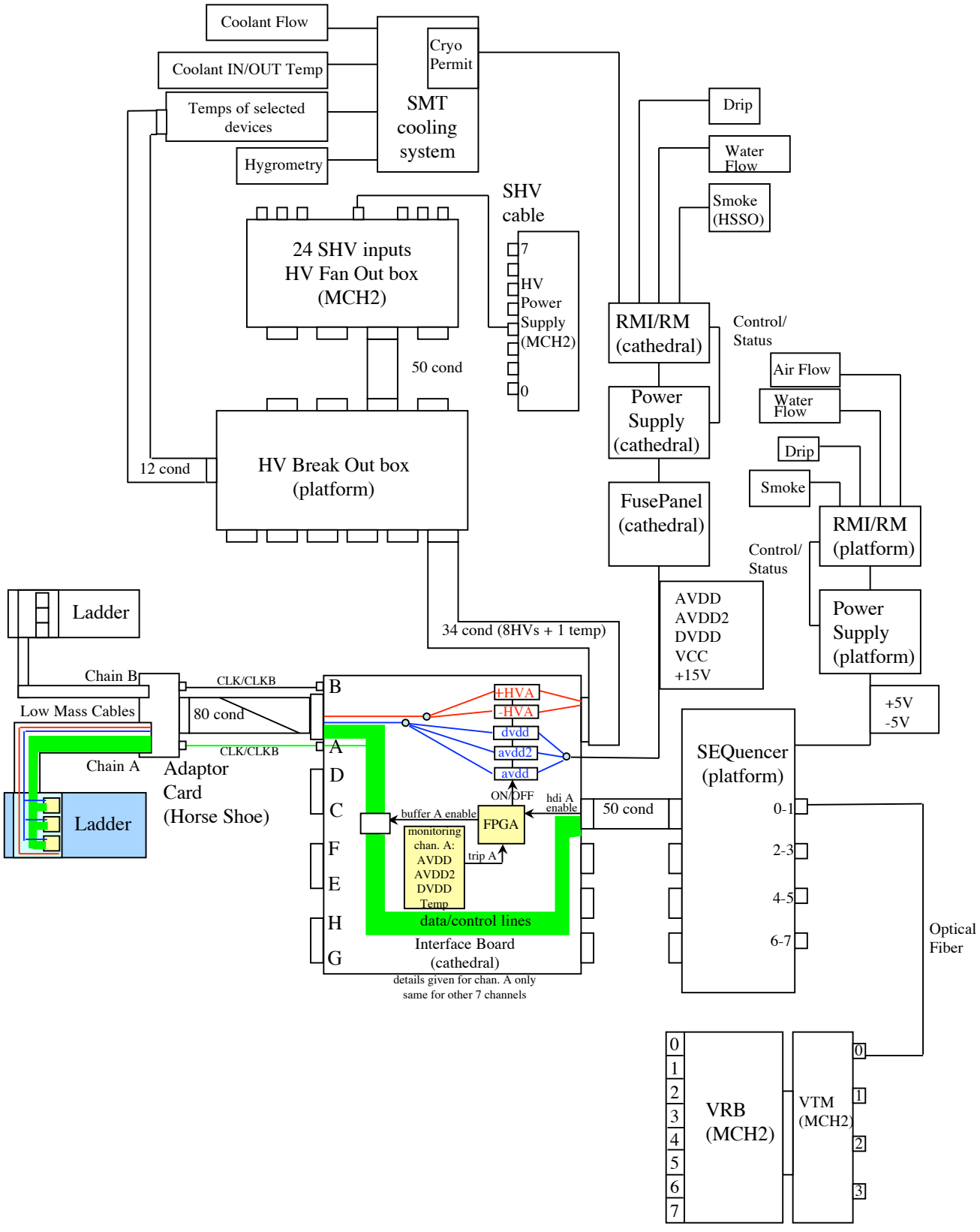
About LV and HV (2)

In the SMT download GUI, when you click « download », e.g. in the Left-click menu of a Sequencer or a Sequencer Fiber, what happens for the corresponding HDIs is the following:

1. The Sequencer asserts the HDI enable line for the corresponding IB channel:
   a) if the SVX chips on the HDI are already powered, nothing new happens.
   b) if the SVX chips on the HDI are not powered:
      a) if there is a trip condition, i.e. HDI AVDD, AVDD2 or DVDD current greater than 700mA, or HDI temperature greater than 40°C, the IB channel will be kept OFF and a corresponding Trip Bit(s) will be asserted, making the corresponding IB channel turn red in the SMT download GUI and blink red/black on the DVDD current GUI. Resetting the trip condition requires to do, in the SMT download GUI, a « HDI off » in the Left-click menu of the tripped HDI. This will, of course, work only if the cause of the trip has disappeared before you try to reset the trip condition.
      b) if there is no trip condition, the firmware in the FPGA of the IB will try to turn, in sequence, the IB switches for AVDD, AVDD2 and DVDD:
         a) if none of the currents for these 3 HDI supplies is greater than 700mA and the HDI temperature is not greater than 40°C, the IB buffer for the HDI data lines will be enabled and the IB HV switches will be turned on.
         b) if not, all switches will be turned off, and the corresponding Trip Bit(s) will be asserted, making the corresponding IB channel turn red in the SMT download GUI and blink red/black on the DVDD current GUI (see above).
2. Download the chips of the corresponding HDI with the initialization parameters as defined in the « SVX parameter » item of the « Global Parameter » button Left-click menu in the SMT Download GUI

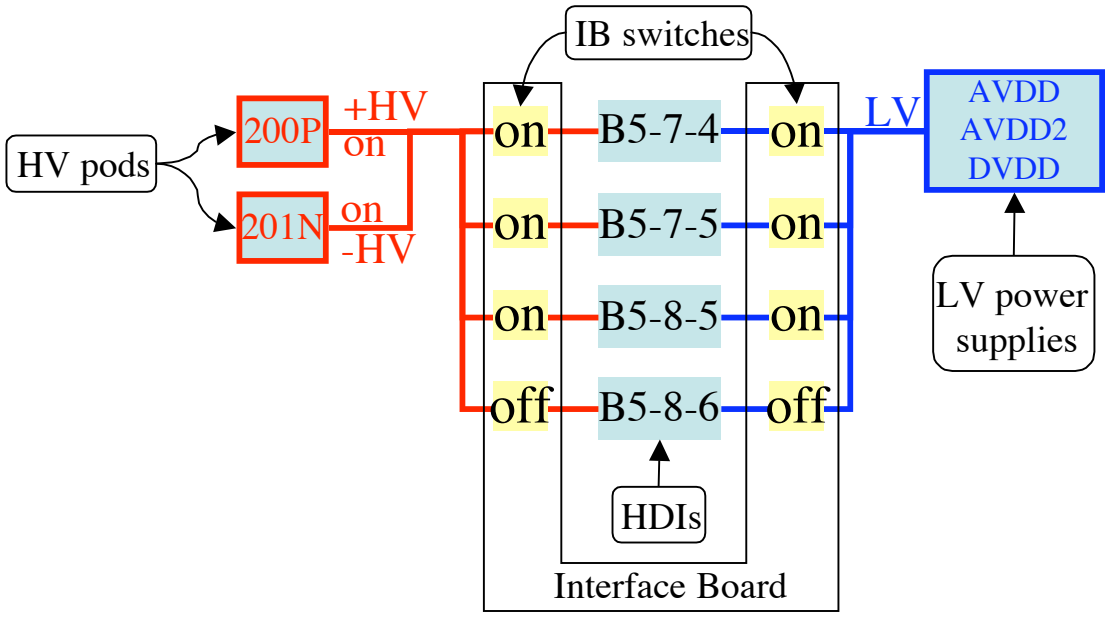
When you click on « HDI off » , e.g. in the Left-click menu of a Sequencer, a Sequencer Fiber or an HDI, the Sequencer de-asserts the corresponding HDI enable line(s), which makes the FPGA in the corresponding IB channel(s) disable the data buffer and turn off the switches for DVDD, AVDD2, AVDD, +HV and -HV. This will not turn off the HV pods, it will only turn off the IB switches connected to the HV HDI lines.

General rule for HDI(s): Turn ON LV first, then HV.
Turn OFF HV first, then LV.


Coolant Flow
Coolant IN/OUT Temp
Temps of selected devices
Hygrometry
Cryo Permit
SMT cooling system
Drip
Water Flow
Smoke (HSSO)
SHV cable
24 SHV inputs
HV Fan Out box
(MCH2)
7
HV Power Supply (MCH2)
0
50 cond
RMI/RM (cathedral)
Control/ Status
Air Flow
Water Flow
Drip
Smoke
Power Supply (cathedral)
FusePanel (cathedral)
RMI/RM (platform)
Power Supply (platform)
12 cond
HV Break Out box
(platform)
34 cond (8HVs + 1 temp)
AVDD
AVDD2
DVDD
VCC
+15V
+5V
-5V
Ladder
Chain B
Low Mass Cables
Chain A
Ladder
CLK/CLKB
80 cond
CLK/CLKB
Adaptor Card (Horse Shoe)
B
A
D
C
F
E
H
G
+HVA
-HVA
dvdd
avdd2
avdd
ON/OFF
hdi A enable
buffer A enable
FPGA
monitoring chan. A:
AVDD
AVDD2
DVDD
Temp
trip A
data/control lines
Interface Board (cathedral)
details given for chan. A only
same for other 7 channels
50 cond
SEQuencer (platform)
0-1
2-3
4-5
6-7
Optical Fiber
0
1
2
3
4
5
6
7
VRB (MCH2)
VTM (MCH2)
0
1
2
3

About LV and HV (4)

Now, up to 4 HDIs can share the same HV pod (single-sided detector) or the same pair of HV pods (double-sided detectors). For instance, the 9-chip ladders (double-sided) B5-7-4, B5-7-5, B5-8-5, B5-8-6 share positive pod 200P and negative pod 201N:

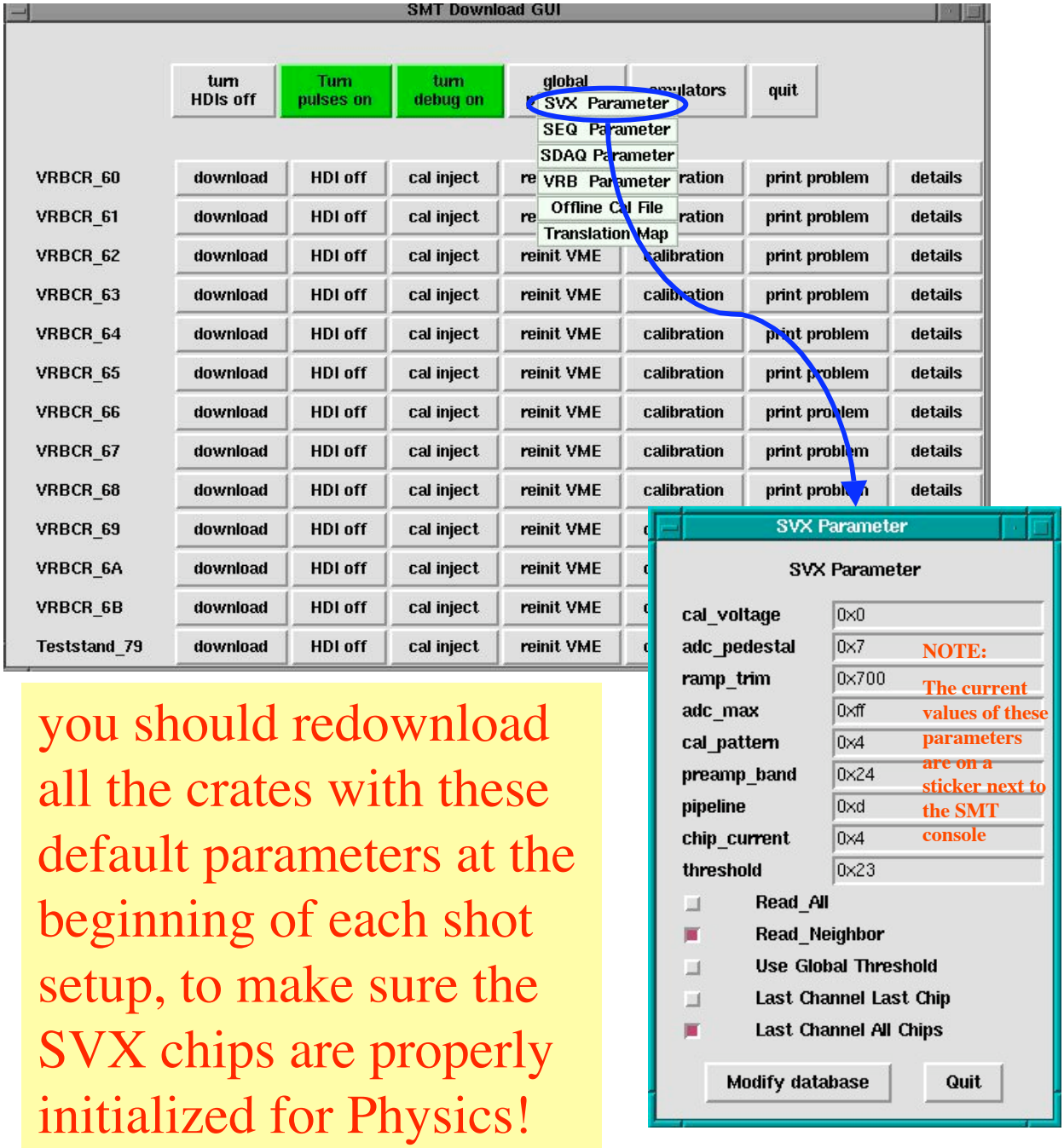


If the Download GUI would let you download B5-8-6 with pods 200P and 201N on, it would make the corresponding Sequencer assert the HDI enable line for B5-8-6, making the LV and HV switches turn ON on the corresponding IB channel. The problem here is that as soon as the switches are on, since the input of the SVX chips are at a virtual ground when powered, the coupling capicitors on the n-side(resp. p-side) of the silicon sensors of B5-8-6 will see a volatge step of +HV (resp. -HV). These capacitors are very delicate, to avoid stressing them and breaking them prematurely, it's better to slowly ramp the HV on them.

So, to make a long story short, to make things safe, each time you need to turn ON or OFF the LV on an HDI, first, you ABSOLUTELY need to ramp down and turn OFF the HV on that HDI and on all the HDIs which share the sequencer with the HDI you want to deal with (how to do it is described on page 22). The download GUI will not execute your command (and print an error message on the terminal window) if you do not comply.

If you want to redownload HDIs which already have their LV ON, you can do it without touching the HV. The LV will not be touched, but the SVX chips of the corresponding HDIs will be re-initialized with the current download parameters.

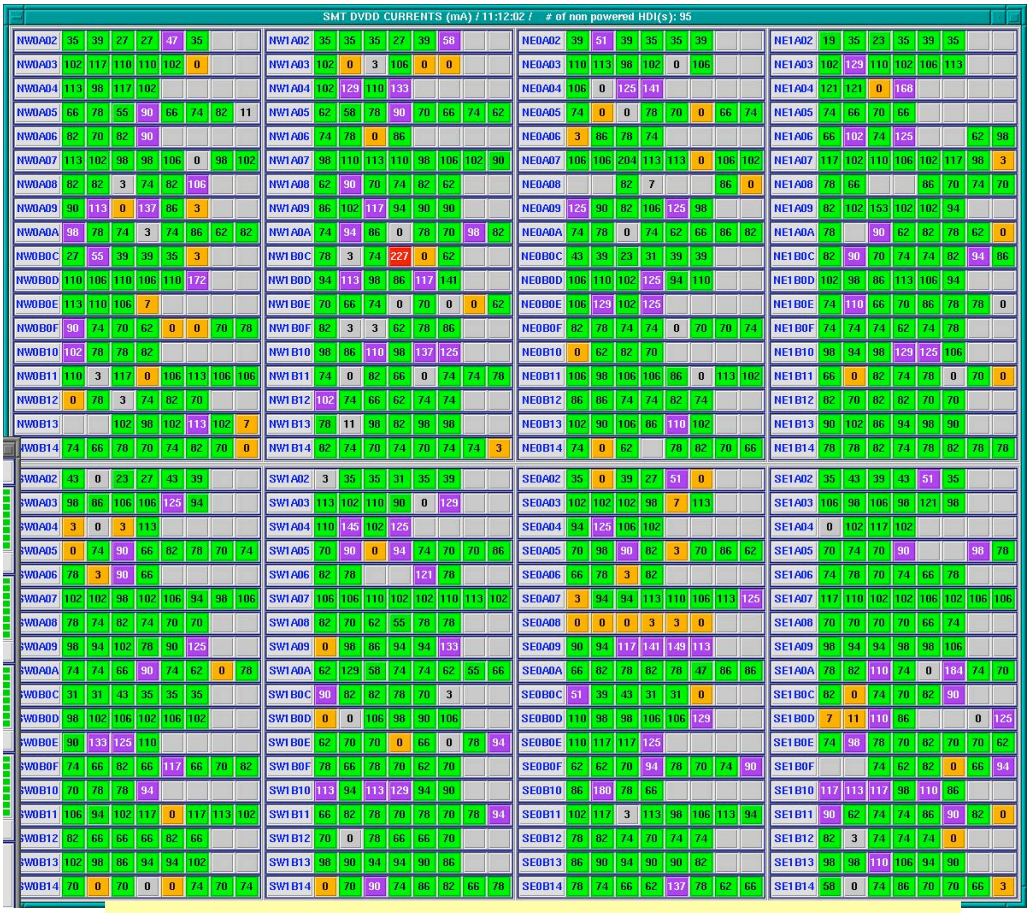
SVXIIe read out chips download parameters



you should redownload all the crates with these default parameters at the beginning of each shot setup, to make sure the SVX chips are properly initialized for Physics!

High DVDD currents and HDI LV Trips (1)

If a lot of HDIs show high currents in the DVDD Current GUI, that usually means that the SVX chips are not read out. This happens when the crates are not in a global run, or when the global run is pause or stalled for some reason. **You should not let the system in that state for too long**.



DVDD Currents GUI color coding:

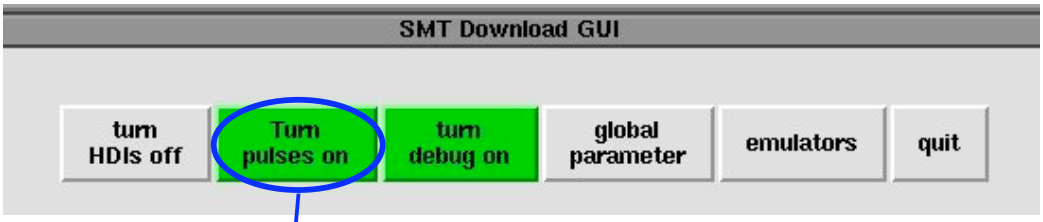
orange:	LV is OFF
green:	LV is ON and I_DVDD OK
purple:	LV is ON and I_DVDD slightly high
red:	LV is ON and I_DVDD high
red/black:	Abnormal state (Trip or Buffer Disabled)
light blue:	Channel is a disabled 6-chip F-wedge used only to provide bias to the 8-chip partner
pink:	Channel permanently disabled
grey:	Channel not Used

High DVDD currents and HDI LV Trips (2)

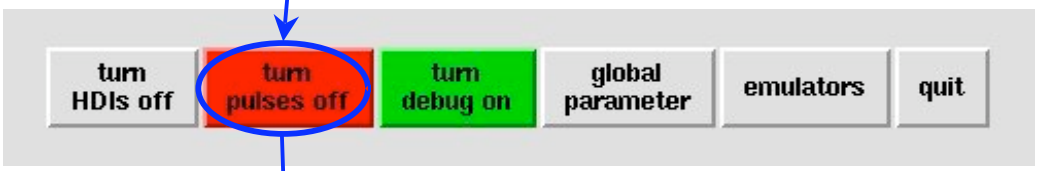
A way to lower the DVDD current drawn by the SVX chip, is to send trigger to the Sequencer Controllers so as to make the chips work. This can be achieved in several ways, by:

- having the crates in a working Global Run,
- having the crates out of the Global Run and making use of a special run which just sends triggers to the sequencer crates (the VRB crates are not read out). This is described in the « SMT Crater » section,
- sending triggers to the Sequencer Controllers via the 1553, by pressing the « turn pulses ON » button in the SMT Download GUI main page. Do not forget to « turn the pulses OFF » before the Global Run starts or resumes readout of the SMT crates. If you try to read out the crates while pulses are ON, this will result in 100% L1 FEB, because you are sending more triggers to the sequencer crates than to the VRB crates.

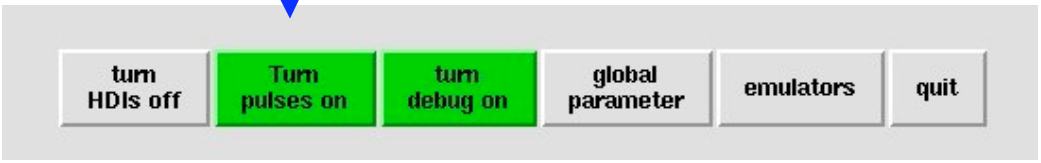
Pulses are OFF



Pulses are ON

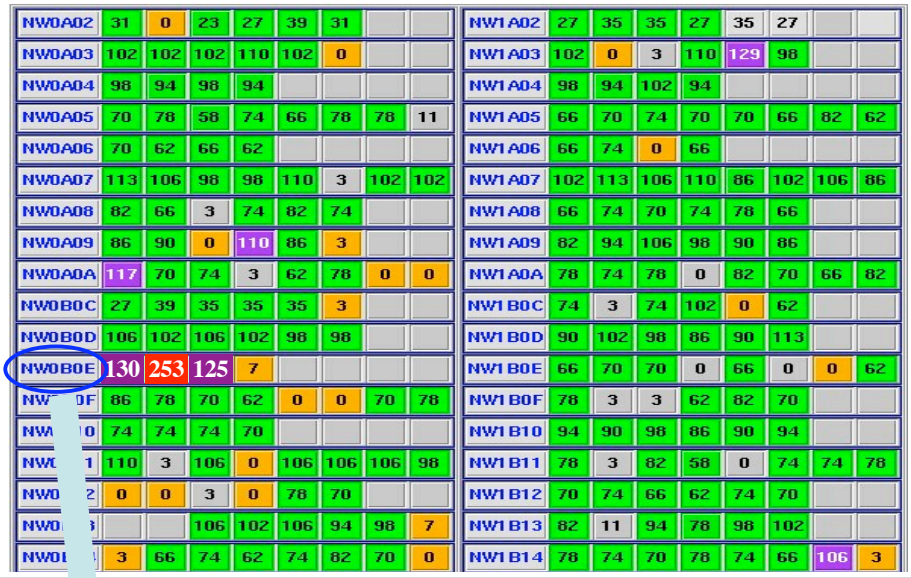


Pulses are OFF



High DVDD currents and HDI LV Trips (3)

If some HDIs consistently draw too much current (red or purple on the DVDD Currents GUI) you need to REDOWNLOAD them. The first step is to find what VRB they are connected to. This can be done looking at the IB mapping chart:



NW0A02	31	0	23	27	39	31		
NW0A03	102	102	102	110	102	0		
NW0A04	98	94	98	94				
NW0A05	70	78	58	74	66	78	78	11
NW0A06	70	62	66	62				
NW0A07	113	106	98	98	110	3	102	102
NW0A08	82	66	3	74	82	74		
NW0A09	86	90	0	110	86	3		
NW0A0A	117	70	74	3	62	78	0	0
NW0B0C	27	39	35	35	35	3		
NW0B0D	106	102	106	102	98	98		
NW0B0E	130	253	125	7				
NW[illegible]F	86	78	70	62	0	0	70	78
NW[illegible]0	74	74	74	70				
NW[illegible]1	110	3	106	0	106	106	106	98
NW0[illegible]2	0	0	3	0	78	70		
NW0[illegible]			106	102	106	94	98	7
NW0[illegible]	3	66	74	62	74	82	70	0

NW1A02	27	35	35	27	35	27		
NW1A03	102	0	3	110	129	98		
NW1A04	98	94	102	94				
NW1A05	66	70	74	70	70	66	82	62
NW1A06	66	74	0	66				
NW1A07	102	113	106	110	86	102	106	86
NW1A08	66	74	70	74	78	66		
NW1A09	82	94	106	98	90	86		
NW1A0A	78	74	78	0	82	70	66	82
NW1B0C	74	3	74	102	0	62		
NW1B0D	90	102	98	86	90	113		
NW1B0E	66	70	70	0	66	0	0	62
NW1B0F	78	3	3	62	82	70		
NW1B10	94	90	98	86	90	94		
NW1B11	78	3	82	58	0	74	74	78
NW1B12	70	74	66	62	74	70		
NW1B13	82	11	94	78	98	102		
NW1B14	78	74	70	78	74	66	106	3

NORTH

west	0		1		0		1	east
66	NW 0	VRB 6609	62	NW 1A02 VRB 6209	60	NE 0A02 VRB 6009	68	NE 1A02 VRB 6809
	NW 0A	VRB 6610		NW 1A03 VRB 6210		NE 0A03 VRB 6010		NE 1A03 VRB 6810
	NW 0A	VRB 6611		NW 1A04 VRB 6211		NE 0A04 VRB 6011		NE 1A04 VRB 6811
	NW 0A	VRB 6612		NW 1A05 VRB 6212		NE 0A05 VRB 6012		NE 1A05 VRB 6812
	NW 0A	VRB 6611		NW 1A06 VRB 6211		NE 0A06 VRB 6011		NE 1A06 VRB 6811-2
	NW 0	VRB 6613		NW 1A07 VRB 6213		NE 0A07 VRB 6013		NE 1A07 VRB 6813
	NW 0A	VRB 6615		NW 1A08 VRB 6215		NE 0A08 VRB 6015		NE 1A08 VRB 6815
	NW 0A	VRB 6616		NW 1A09 VRB 6216		NE 0A09 VRB 6016		NE 1A09 VRB 6816
	NW 0A0	VRB 6618		NW 1A0A VRB 6218		NE 0A0A VRB 6018		NE 1A0A VRB 6818
64	NW 0B0C	VRB 6409	66	NW 1B0C VRB 6617	6A	NE 0B0C VRB 6A09	60	NE 1B0C VRB 6015,17
	NW 0B0D	VRB 6410		NW 1B0D VRB 6615-7		NE 0B0D VRB 6A10		NE 1B0D VRB 6015-7
	NW 0B0E	VRB 6411		NW 1B0E VRB 6619		NE 0B0E VRB 6A11		NE 1B0E VRB 6019
	NW 0B0F	VRB 6412	64	NW 1B0F VRB 6417		NE 0B0F VRB 6A12,17	6A	NE 1B0F VRB 6A17
	NW 0B10	VRB 6411		NW 1B10 VRB 6415-7		NE 0B10 VRB 6A11		NE 1B10 VRB 6A15-7
	NW 0B11	VRB 6413		NW 1B11 VRB 6419		NE 0B11 VRB 6A13		NE 1B11 VRB 6A19
	NW 0B12	VRB 6415	62	NW 1B12 VRB 6217		NE 0B12 VRB 6A15	68	NE 1B12 VRB 6817
	NW 0B13	VRB 6416		NW 1B13 VRB 6215-7		NE 0B13 VRB 6A16		NE 1B13 VRB 6815-7
	NW 0B14	VRB 6418		NW 1B14 VRB 6219		NE 0B14 VRB 6A18		NE 1B14 VRB 6819

SOUTH

west	0		1		0		1	east
67	SW 0A02	VRB 6709	63	SW 1A02 VRB 6309	61	SE 0A02 VRB 6109	69	SE 1A02 VRB 6909
	SW 0A03	VRB 6710		SW 1A03 VRB 6310		SE 0A03 VRB 6110		SE 1A03 VRB 6910
	SW 0A04	VRB 6711		SW 1A04 VRB 6311		SE 0A04 VRB 6111		SE 1A04 VRB 6911
	SW 0A05	VRB 6712		SW 1A05 VRB 6312		SE 0A05 VRB 6112		SE 1A05 VRB 6912
	SW 0A06	VRB 6711		SW 1A06 VRB 6311		SE 0A06 VRB 6111		SE 1A06 VRB 6911-2
	SW 0A07	VRB 6713		SW 1A07 VRB 6313		SE 0A07 VRB 6113		SE 1A07 VRB 6913
	SW 0A08	VRB 6715		SW 1A08 VRB 6315		SE 0A08 VRB 6116		SE 1A08 VRB 6915
	SW 0A09	VRB 6716		SW 1A09 VRB 6316		SE 0A09 VRB 6117		SE 1A09 VRB 6916
	SW 0A0A	VRB 6718		SW 1A0A VRB 6318		SE 0A0A VRB 6119		SE 1A0A VRB 6918
65	SW 0B0C	VRB 6509	67	SW 1B0C VRB 6717	6B	SE 0B0C VRB 6B09	61	SE 1B0C VRB 6118
	SW 0B0D	VRB 6510		SW 1B0D VRB 6715-7		SE 0B0D VRB 6B10		SE 1B0D VRB 6116-8
	SW 0B0E	VRB 6511		SW 1B0E VRB 6719		SE 0B0E VRB 6B11		SE 1B0E VRB 6120
	SW 0B0F	VRB 6512	65	SW 1B0F VRB 6517		SE 0B0F VRB 6B12	6B	SE 1B0F VRB 6B17
	SW 0B10	VRB 6511		SW 1B10 VRB 6515-7		SE 0B10 VRB 6B11		SE 1B10 VRB 6B15-7
	SW 0B11	VRB 6513		SW 1B11 VRB 6519		SE 0B11 VRB 6B13		SE 1B11 VRB 6B19
	SW 0B12	VRB 6515	63	SW 1B12 VRB 6317		SE 0B12 VRB 6B15	69	SE 1B12 VRB 6917
	SW 0B13	VRB 6516		SW 1B13 VRB 6315-7		SE 0B13 VRB 6B16		SE 1B13 VRB 6915-7
	SW 0B14	VRB 6518		SW 1B14 VRB 6319		SE 0B14 VRB 6B18		SE 1B14 VRB 6919

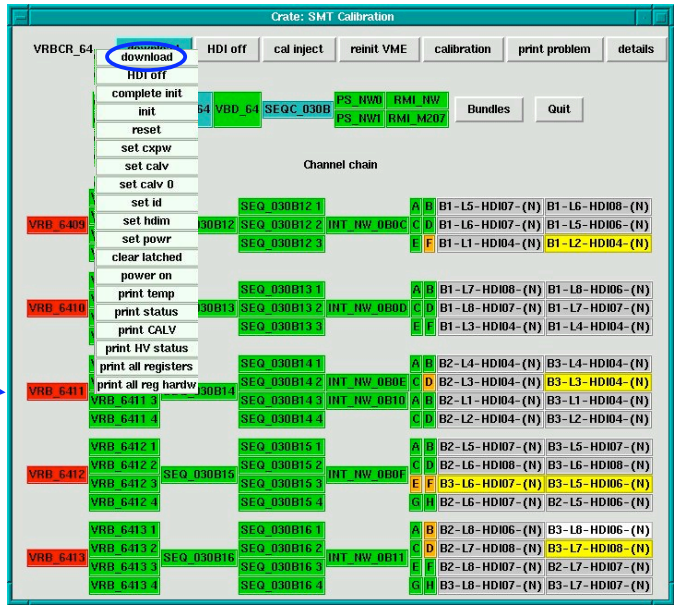
High DVDD currents and HDI LV Trips (4)

Then, go to the corresponding VRB in the SMT Download GUI, and click download on the Left-click menu of the corresponding sequencer.

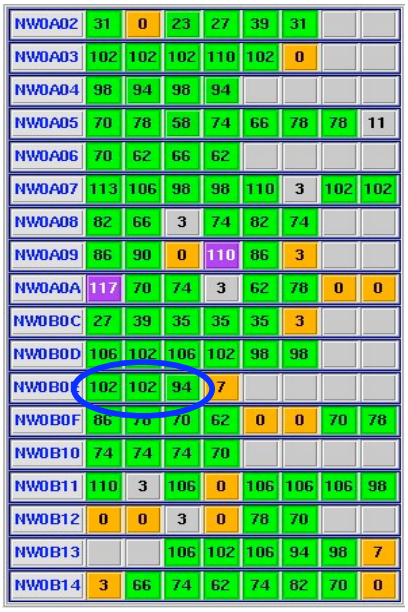
Most buttons have a Right- and Left-click menus.

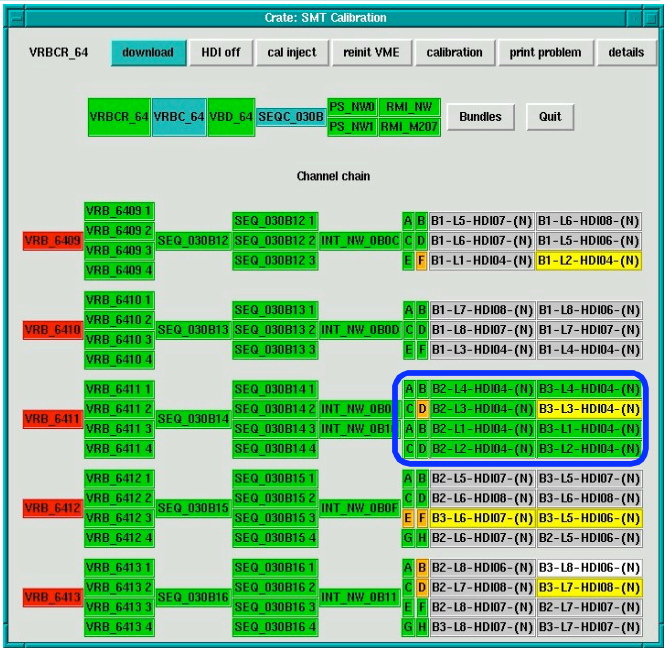
A Left-click on an item of a menu executes that item

A Right-click on a menu closes it.



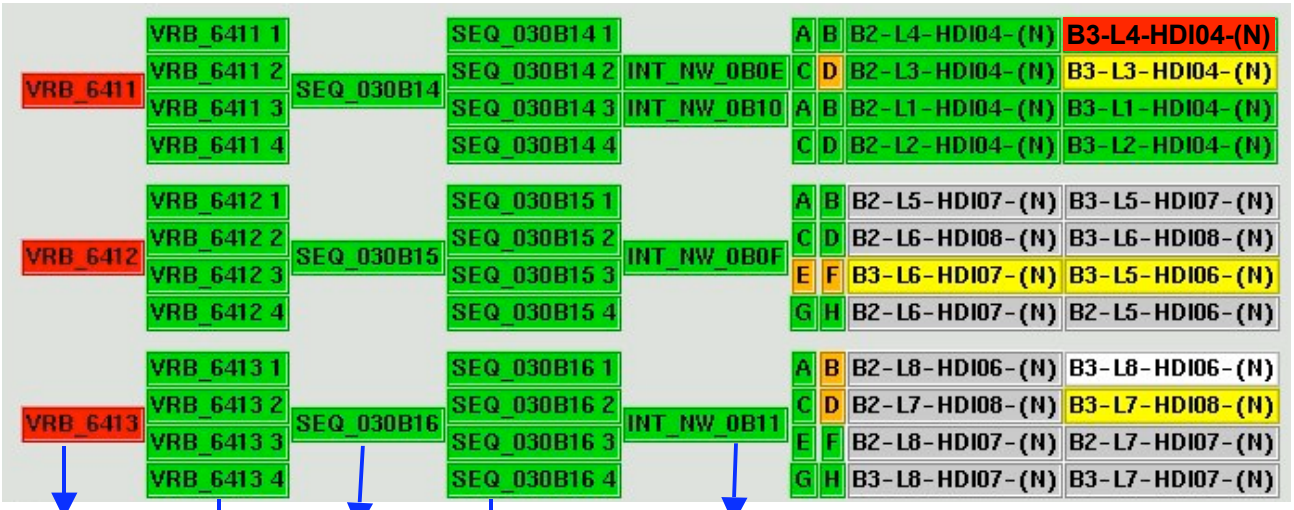
If the download was successful, the HDIs should appear green, both in the Download GUI and on the DVDD Currents GUI:





High DVDD currents and HDI LV Trips (5)

If one or more HDIs appear red in the Download GUI, the download was not successful.



1 Fiber = 2 HDIs

IB Channel Status Color Coding:
- green: OK
- red: tripped

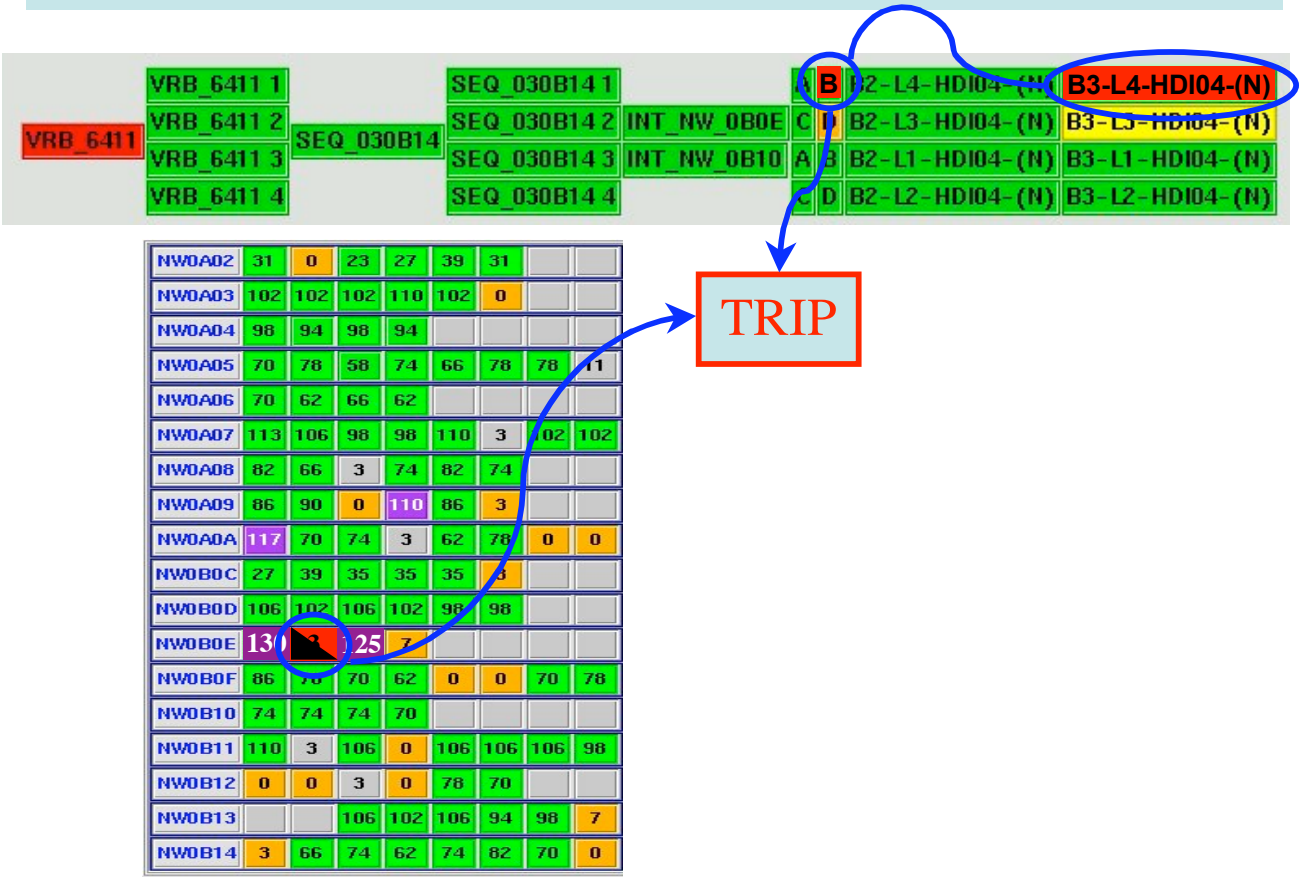
HDI Status Color Coding:
- white: permanently disabled
- yellow: disabled
- grey: enabled and either OFF or unknown
- green: enabled, ON and downloaded OK
- red: enabled, (ON and failed download) or tripped

Try to download a few more times at the Sequencer level. If it still does not work, try to download at the corresponding Sequencer Fiber level.

High DVDD currents and HDI LV Trips (6)

1. If this still does not work, it sometimes helps, when an **HDI is reluctant in downloading properly**, to turn it OFF and ON again.

2. In the same way, if an **HDI has tripped**, to recover it, you need to clear the trip by turning the HDI OFF and then turn it back ON again, by downloading it.



In both cases, if the High Voltage is ON, you will need first, to RAMP DOWN and TURN OFF the HV on ALL HDIs connected to the SAME SEQUENCER as the HDI you want to turn ON or OFF. Otherwise, the Download GUI will not execute your commands.

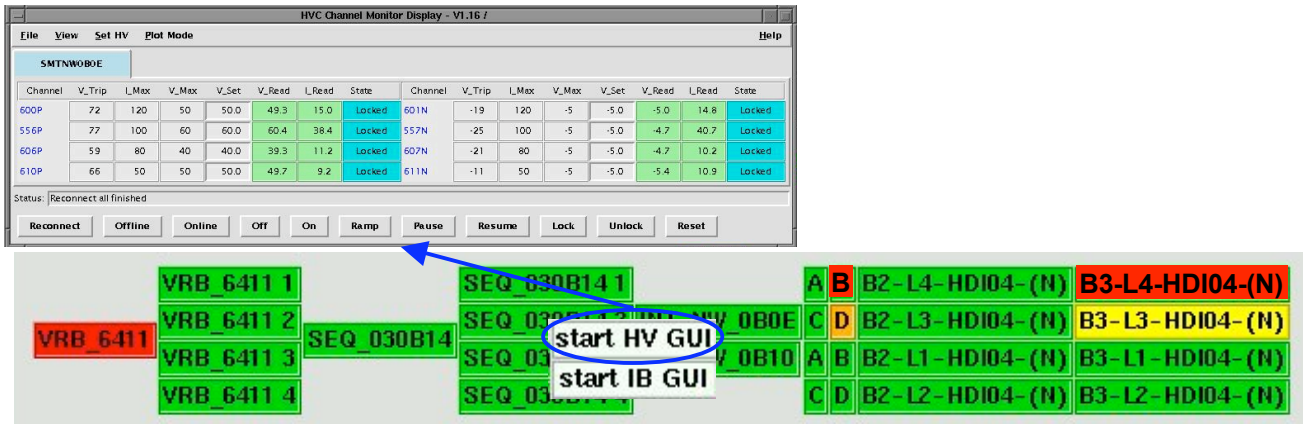
If an HDI has tripped

If an HDI has tripped on DVDD or AVDD …

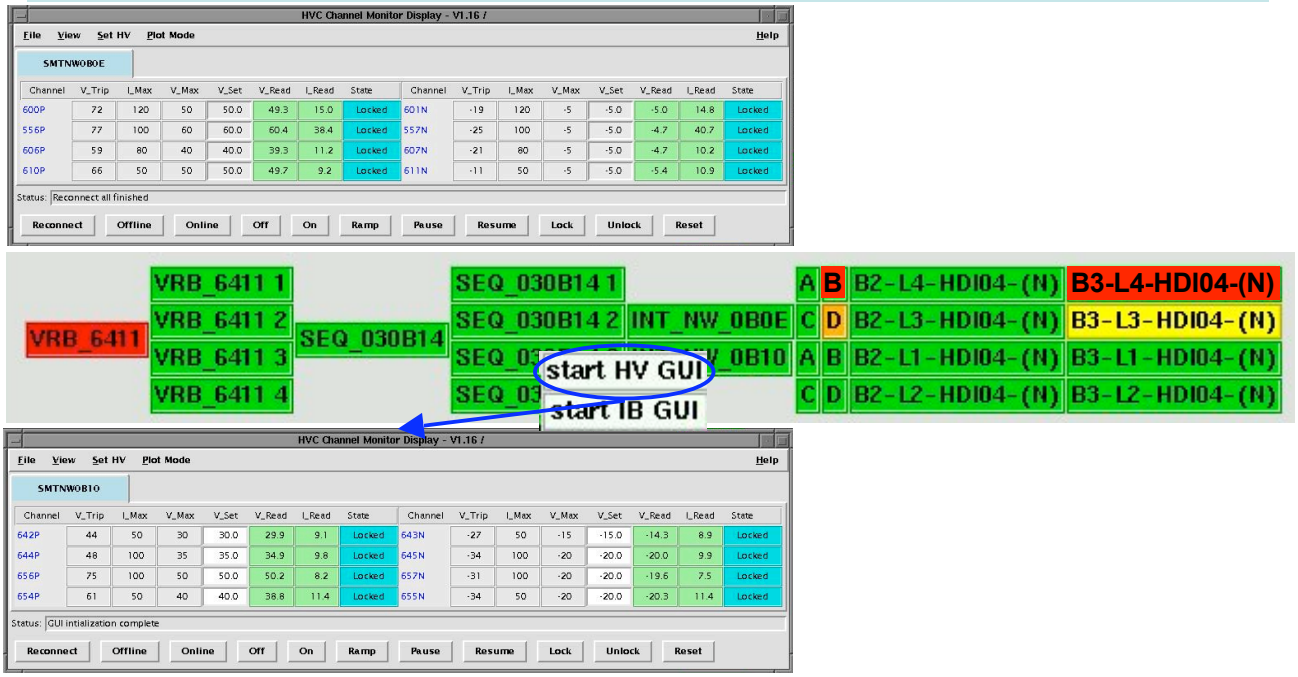
- Pause the run (normally the trip causes an alarm that stops the run automatically)
- Using the appropriate HV channel GUI (started by a left click on the Interface Board button of the Download GUI) unlock the HV channel, set its HV to zero, ramp it down, and turn it off.
- Redownload the offending HDI(s). You may have to turn them off first and then redowload them.
- Re-init the VME crate.
- Turn on the HV to the HDI(s) by following the reverse procedure given above (i.e. reset the HV channel, turn it on, set HV to full, ramp it up, and lock it).
- Resume the run.

High DVDD currents and HDI LV Trips (7)

In the left-click menu of each Interface Board connected to the sequencer, the corresponding HDI(s) is(are) connected to, click on « start HV GUI ». For each IB a GUI will pop up showing the pods you need to ramp down and turn off. In our example, HDI B3-L4-HDI04 is connected to sequencer SEQ_030B14. That sequencer is connected to 2 IBs, namely: INT_NW_0B0E and INT_NW_0B10. Start the HV GUI for the first IB:



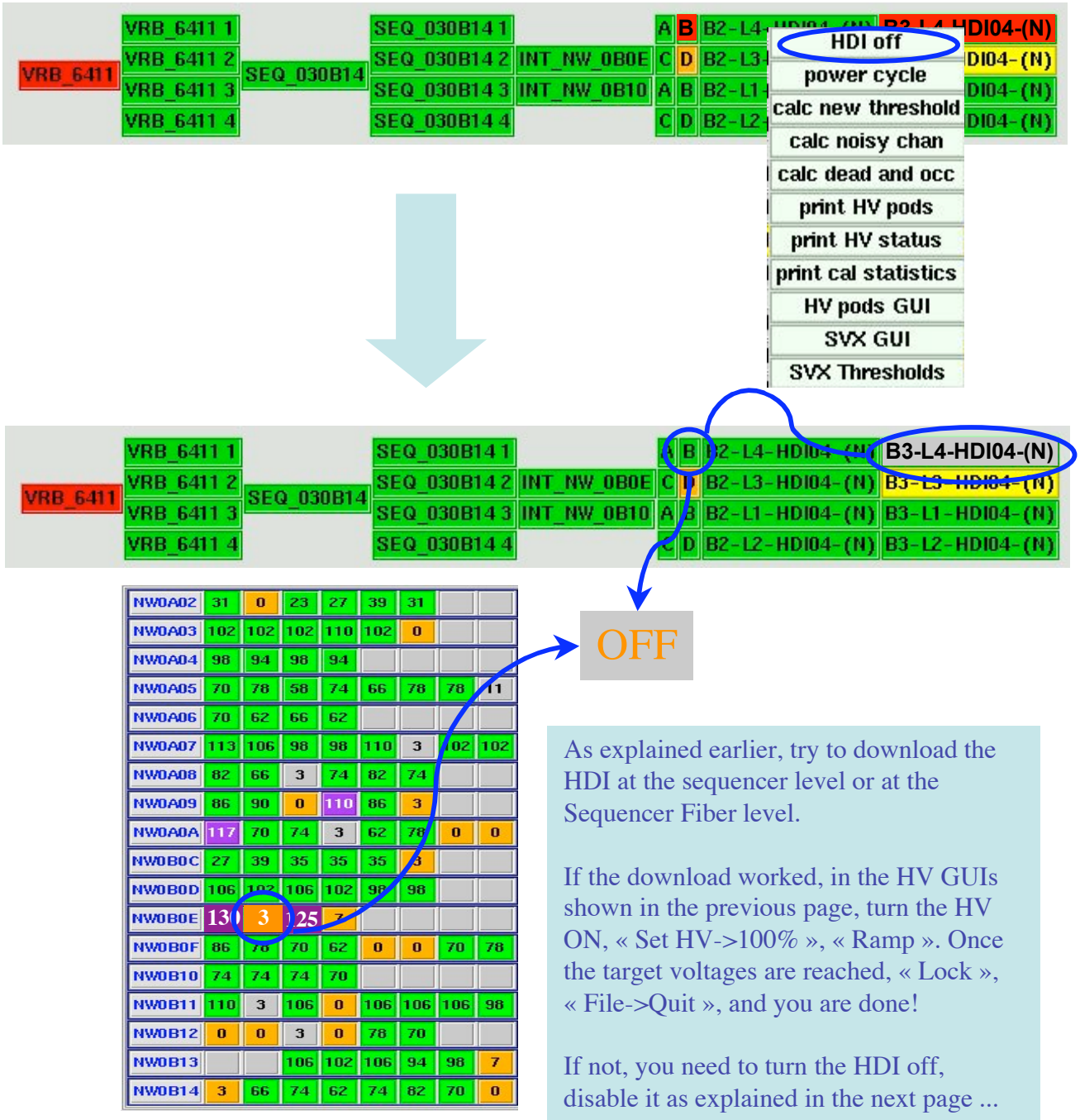
Do the same for the second IB:



In all the HV GUIs, do « Unlock », « Set HV to 0% », « Ramp », and when the all the « V_Read » values are below 3V, click on « Off ». You are now ready to take care of the problematic HDI.

High DVDD currents and HDI LV Trips (8)

Turn OFF the tripped HDI:



As explained earlier, try to download the HDI at the sequencer level or at the Sequencer Fiber level.

If the download worked, in the HV GUIs shown in the previous page, turn the HV ON, « Set HV->100% », « Ramp ». Once the target voltages are reached, « Lock », « File->Quit », and you are done!

If not, you need to turn the HDI off, disable it as explained in the next page ...

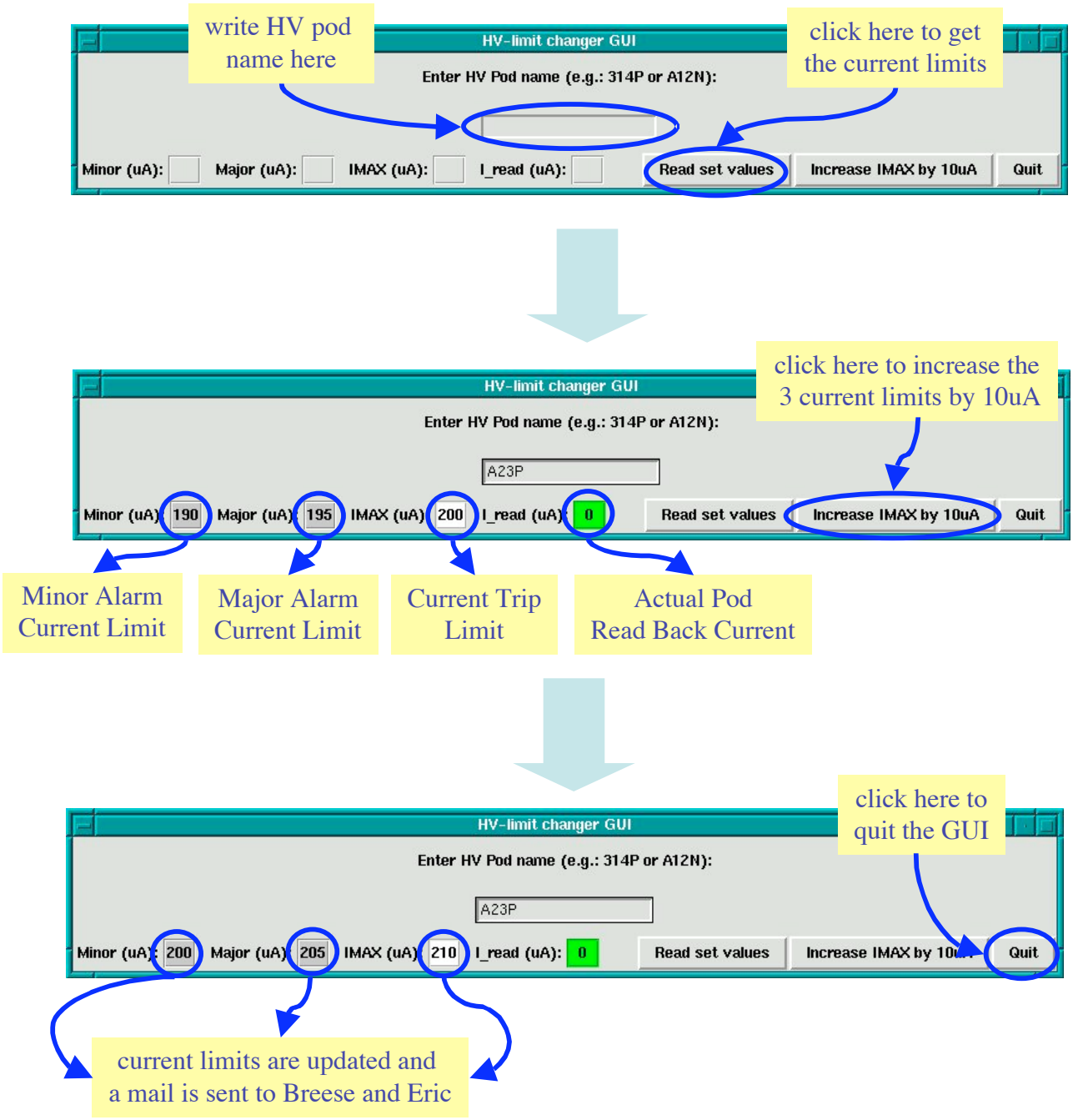
High DVDD currents and HDI LV Trips (8)

Disabling Instructions

High DVDD currents and HDI LV Trips (9)

HV current limit GUI

Start the HV current limit GUI using the « GUI starter » GUI, Page B, button 4
(to start the GUI starter, type in a terminal window: cd; setup d0online; ./startguis.py)

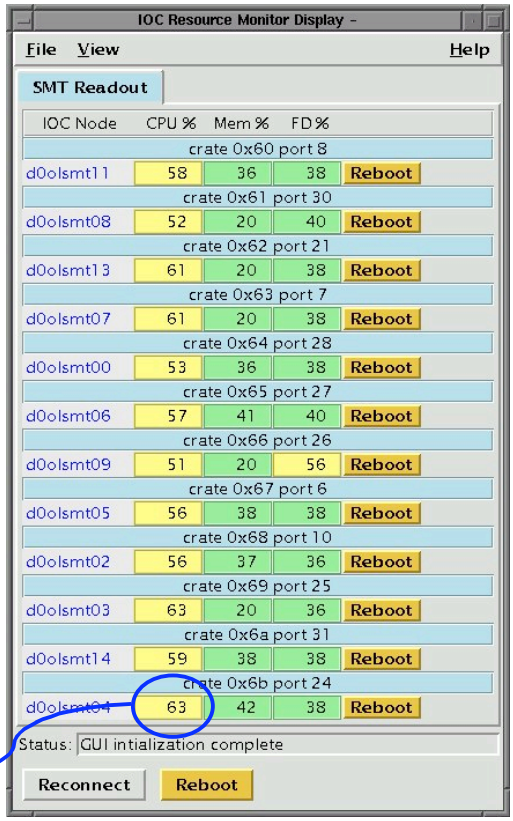


Monitoring (1)

Monitoring of the data quality is done at the strip level in processes which run in the VRB crates Power PCs (IOCs). The status of these IOCs can be looked at from the « Readout IOC Monitor » (from GUI starter, page C, button 6).

Power PCs (IOCs) in the 12 VRB crates

CPU consumption varies between 50 and 75% when monitoring is running



For each VRB crate, the monitoring process captures events from the SBC and makes histograms out of them. A Linux box queries the IOCs one after the other to get their histograms out, so as to allow their browsing through a WEB interface. When an IOC is queried, if the number of events accumulated by the IOC lies between 8,000 and 10,000, an update will be sent for the corresponding crate to the Significant Event System (the result of which is shown in the Alarm Display) for major alarms related to the « Occupancy » and « Dead » categories. An « Occupancy » alarm is set whenever the occupancy of an HDI is greater than 25%. A « Dead » alarm is set if (a) chip(s) of an HDI never appear in the read out stream. Note that disabled HDIs do not generate a « Dead » alarm. You have to take Occupancy and Dead alarms seriously!

Monitoring (2)

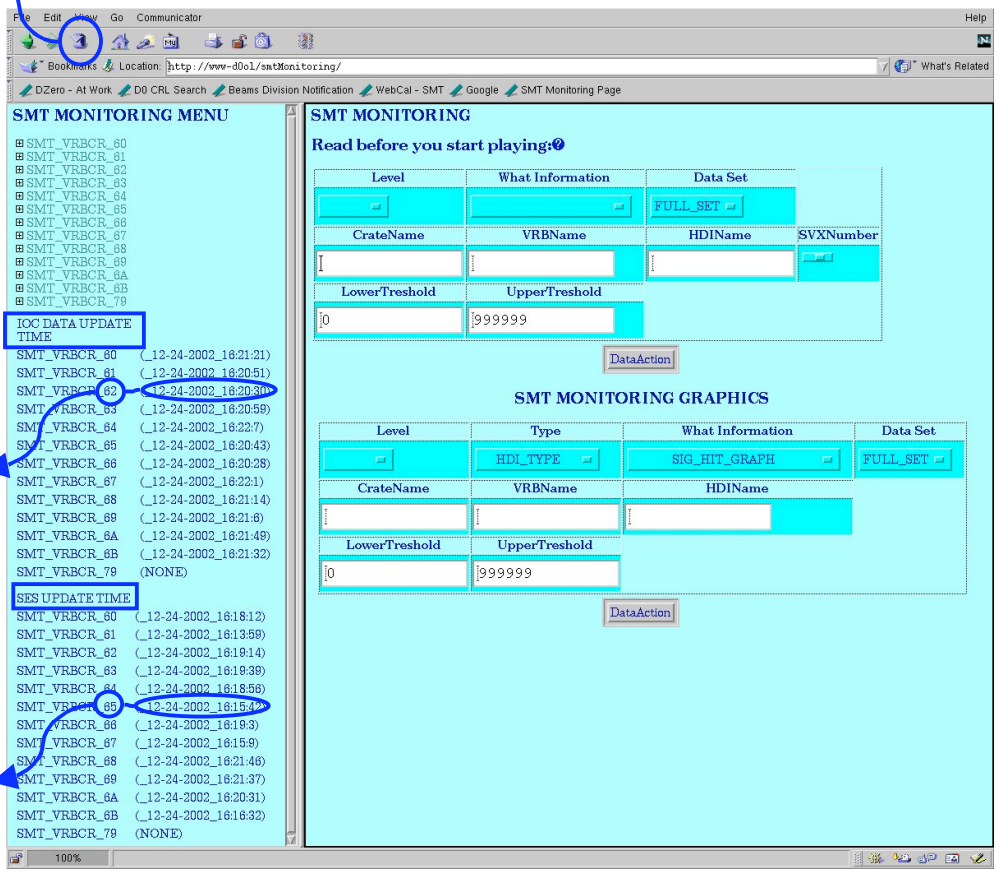
You can connect with Netscape (or you favorite Browser) to the Monitoring Server page (http://www-d0ol/smtMonitoring/). It also appears labeled as « SMT Monitoring Page » in the Netscape Toolbar and in the Bookmarks menu.

click on this to update the page

VRB crates

Last time data were received from IOC in VRB crate 62

Last time update was sent to SES (Alarm system) for crate 65

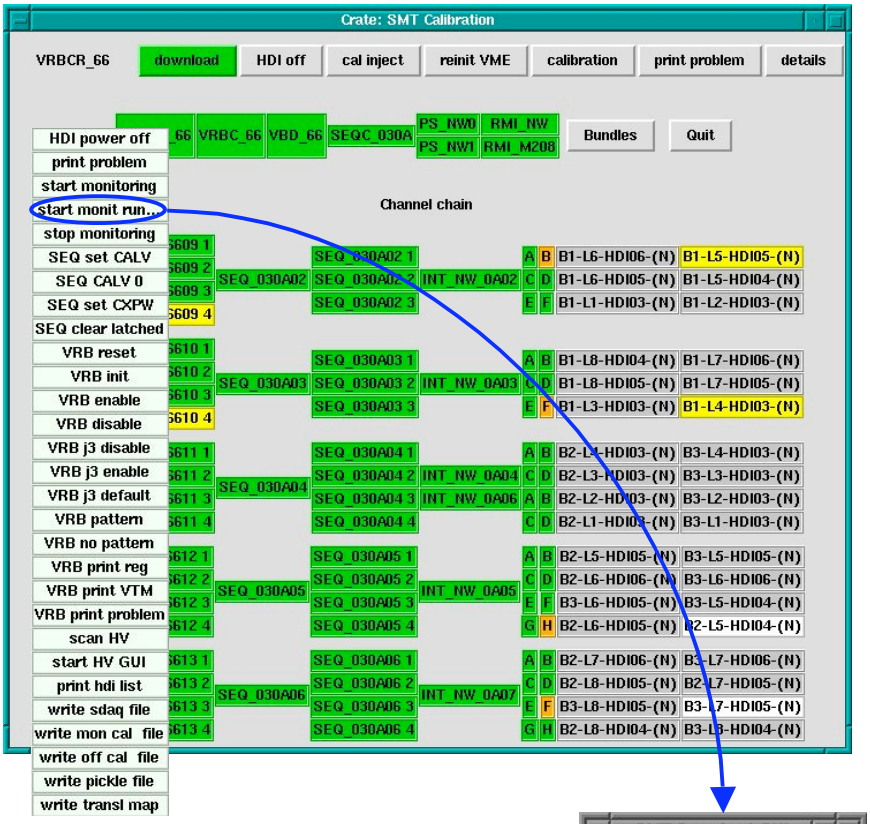


As a general rule, the monitoring should always be turned on during Global Runs (zero_bias or physics). Check this by looking at the IOC CPU consumption, on theReadout IOC Monitor GUI, at the « IOC DATA UPDATE TIME » and « SES UPDATE TIME » on the Monitoring WEB page. The monitoring is started at the beginning of a run and stopped at the end of a run. If monitoring does not seem to be on, during a Global Run, check with the DAQ shifter that the trigger file has SMT monitoring enabled. If not, the DAQ shifter should enable the monitoring and start a new run. You can also start the monitoring « by hand », VRB crate by VRB crate, usingthe crate « details » page in the SMT download GUI, as follows:

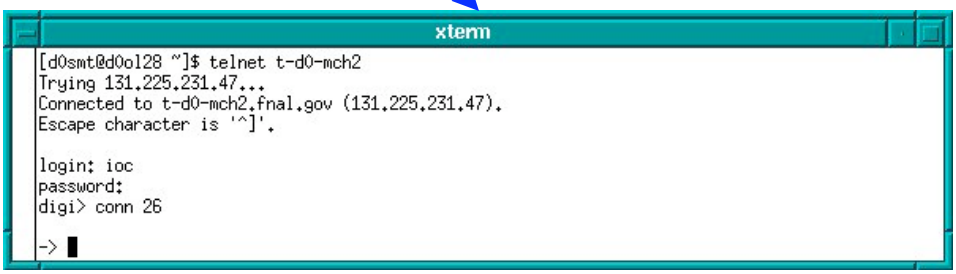
Monitoring (3)

Imagine that for some reason, you need to power cycle crate 66 during a global run. After pausing the run, you cycle the power on crate 66, you wait for the Power PC to reboot, you « Reinit VME » and you resume the run. Now, what you see on the IOC monitoring is that the monitoring process in crate 66 is probably not processing anything:

open the details page for crate 66 in the SMT download GUI and click on the « Start monit run » item in Left-clickmenu of the VRBCR_66 button. In the resulting pop up window, write the current run number and click « Start »

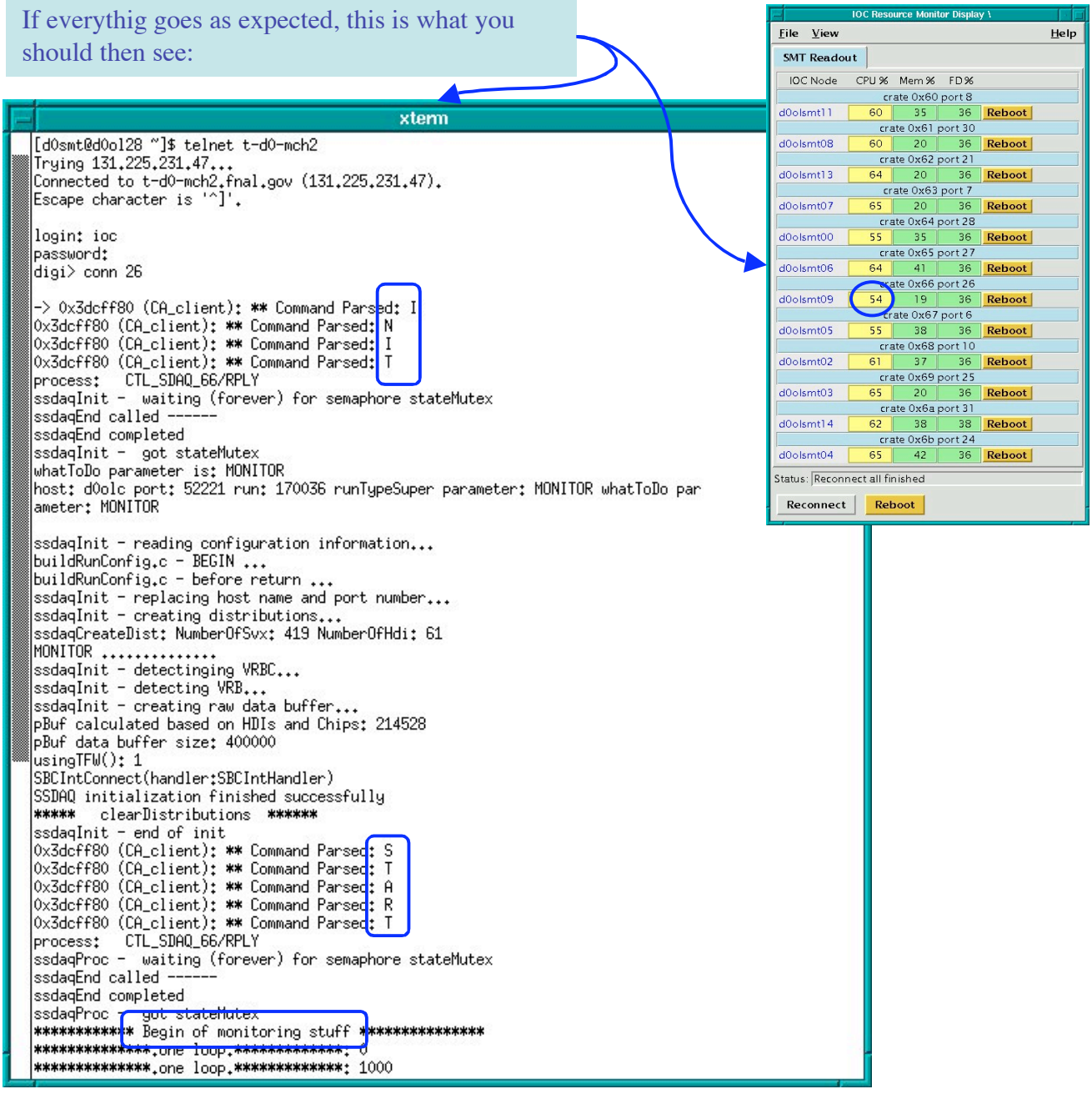


You can open a terminal window on the IOC by connecting to it through the MCH2 terminal server. The login name is: ioc
the passwd: 0nlined0



Monitoring (4)

If everythig goes as expected, this is what you should then see:



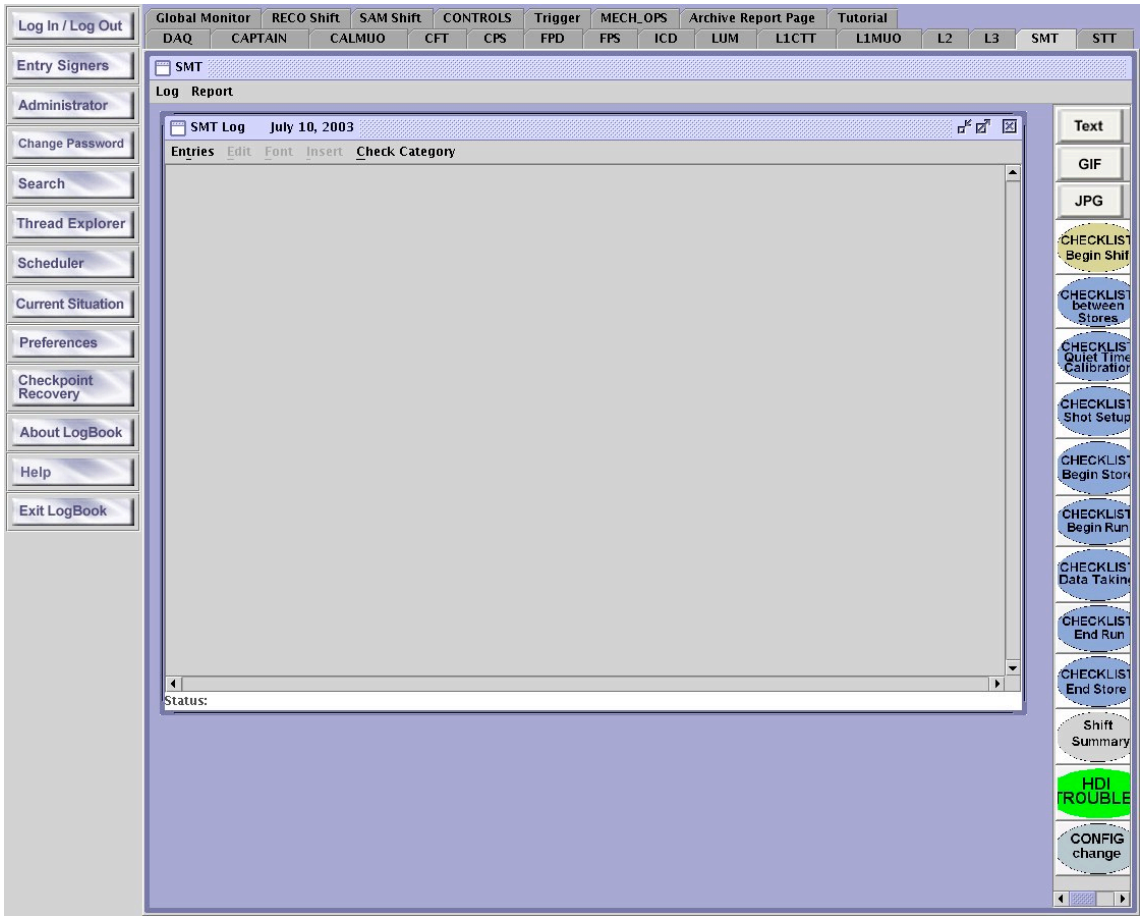
After 5 to 10 minutes, you can also check that the « IOC DATA UPDATE TIME » and « SES UPDATE TIME » are current on the Monitoring WEB interface.

Logbook
Starting

The very first thing that a shifter should do is log into the online electronic logbook. Normally it is already running on one of the SMT monitors. If it is not, then start the logbook:

- > setup d0online
  > start_daq logbook &
  Or from the "startgui" gui D.1.
- Click on the **SMT** tab.
- Select **SMT Log** from the **Log** menu.

An SMT Log window should now appear in the central field, with pre-configured checklist icons to the right:



Logbook
Use

General Guidelines: *Everything* that is done to any part of the SMT system by the shifter or anyone else must be recorded in the logbook. Some guidelines to follow are:

- **Use Checklists**: The pre-configured checklists are there to provide a thorough framework and guide for conducting a shift. They are required, but not sufficient; i.e. a starting point for logbook entries.
- **Keep it short**: Each entry should be concise and focussed on a single task/observation/event. Practice a "log-as-you-go" habit instead of saving up a lot of information for a big summary entry.
- **Archive promptly**: Archive entries immediately upon *timely* completion. Do not keep entries open for extended periods. For example, do not wait for a Shot Setup to complete before archiving the Shot Setup checklist. Archive promptly, and annotate later, if necessary. Also, do not make logs within entries (e.g. 8:00 – started shift. 8:30 – ramped up HV. 9:00 – recovered all dead HDI's).

Log In/Log Out: To log into the logbook, click on the **Log In/Log Out** button at the top left. Enter your account name and password in the window that pops up (to obtain an account, contact Harald Fox or Eric Kajfasz). Remember to log out of the logbook at the end of your shift.

Checklists: There are twelve pre-configured checklist icons to the right. To use one of the checklists, select an icon and drag it into the SMT Log window. Then proceed to complete the checklist by filling in all of the fields.

The checklists are:

- **Begin Shift**: complete at the beginning of a shift
- **Between Stores**: fill out (and update once per hour) during the time between the last store and the next shot setup. This includes during beam studies.
- **Quiet Time Calibration**: complete any time a calibration run is taken.
- **Shot Setup**: complete when MCR is preparing for shot setup.
- **Begin Store**: complete after a new store has been verified with the Shift Captain.
- **Begin Run**: fill out any time a new data run is started.
- **Data Taking**: complete a new Data Taking checklist once every hour during an ongoing data run.
- **End Run**: complete at the end of every data run.

Logbook
Use

- **End Store**: complete before a store is dumped (or after a store is lost unexpectedly).
- **Shift Summary**: complete at the end of a shift (this summary will be automatically e-mailed to the d0smt mailing list).
- **HDI TROUBLE**: fill out any time an individual HDI erquires special attention (i.e. redownload due to FEB or high currents, disable, re-enable, etc.).
- **CONFIG Change**: fill out any time the SMT run configuration has changed (i.e. any time an HDI has been disabled/re-enabled or there has been a change in the voltage setting of any of the HV pods).

Text Entry: To add a text entry to the logbook, select the **Text** icon from the right and drag it into the SMT Log window. Then compose in the generated entry.

Creating Images: Many times it is required or desired to make an image of a plot or gui window on one of the monitors. This can be done with the **import** command:

- Open a shell on the screen in which the desired image (plot, gui, etc.) appears.
- **cd** to the appropriate SHIFT directory which may need to be created (e.g. ~d0smt/SHIFTS/2002/oct/16/day).
- >import <filename>.jpg or >import <filename>.gif (you choose!)
- Place the '+' cursor on the desired window to be imaged, and left-click. The image will be created as <filename>.jpg/gif in the current directory.

Viewing Images

The command >xview <filename>.jpg/gif can be used !

Inserting Images: There are two ways to insert images into the logbook:

- **GIF/JPG Entry**: Select either the **GIF** or **JPG** icon from the right and drag it into the SMT Log window. A **Get File** pop-up window will appear from which you can browse for the desired image.

Logbook
Use

- **Insert into an existing entry**: with the cursor positioned within an existing logbook entry, select **Image > From a File** from the **Insert** menu on the SMT Log toolbar. A **Get File** pop-up window will appear from which you can browse for the desired image.

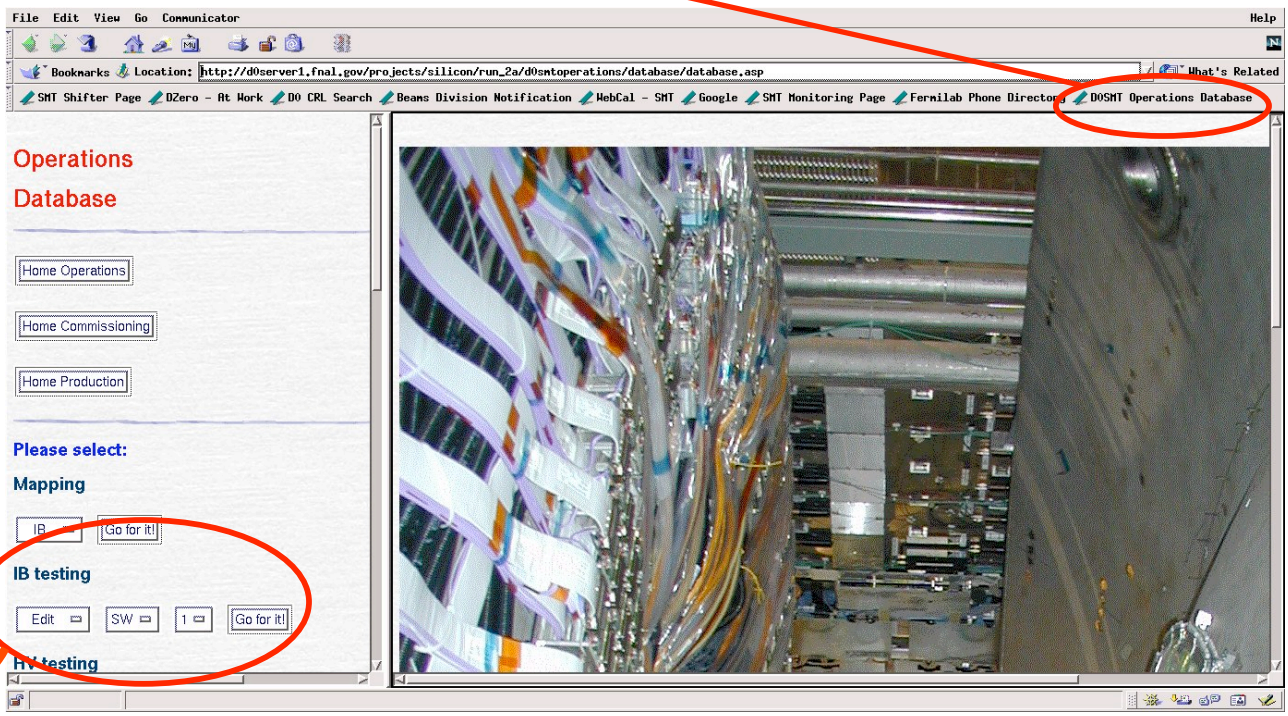
Archiving Entries: Any entry to the logbook should be archived immediately upon completion. To do this, left-click on the entry header, then right-click and select **Archive Selected Entries**.

Annotating Entries: An annotation can be added to any archived entry by clicking on the **ANNOTATE** button in the archived entry.

DØSMT Operations Database

The Operations Database is a web-based database that we use to keep track of the performance history of the SMT. By far, the most-used section of the Operations Database is the one in which we keep track of individual HDI histories. In particular, it is a shifter's responsibility to make a database entry each time that an HDI is disabled or re-enabled.

The Operations Database can easily be located from a netscape window started from the d0smt account. A link to "D0SMT Operations Database" can be found at the far right of the quick link bar.

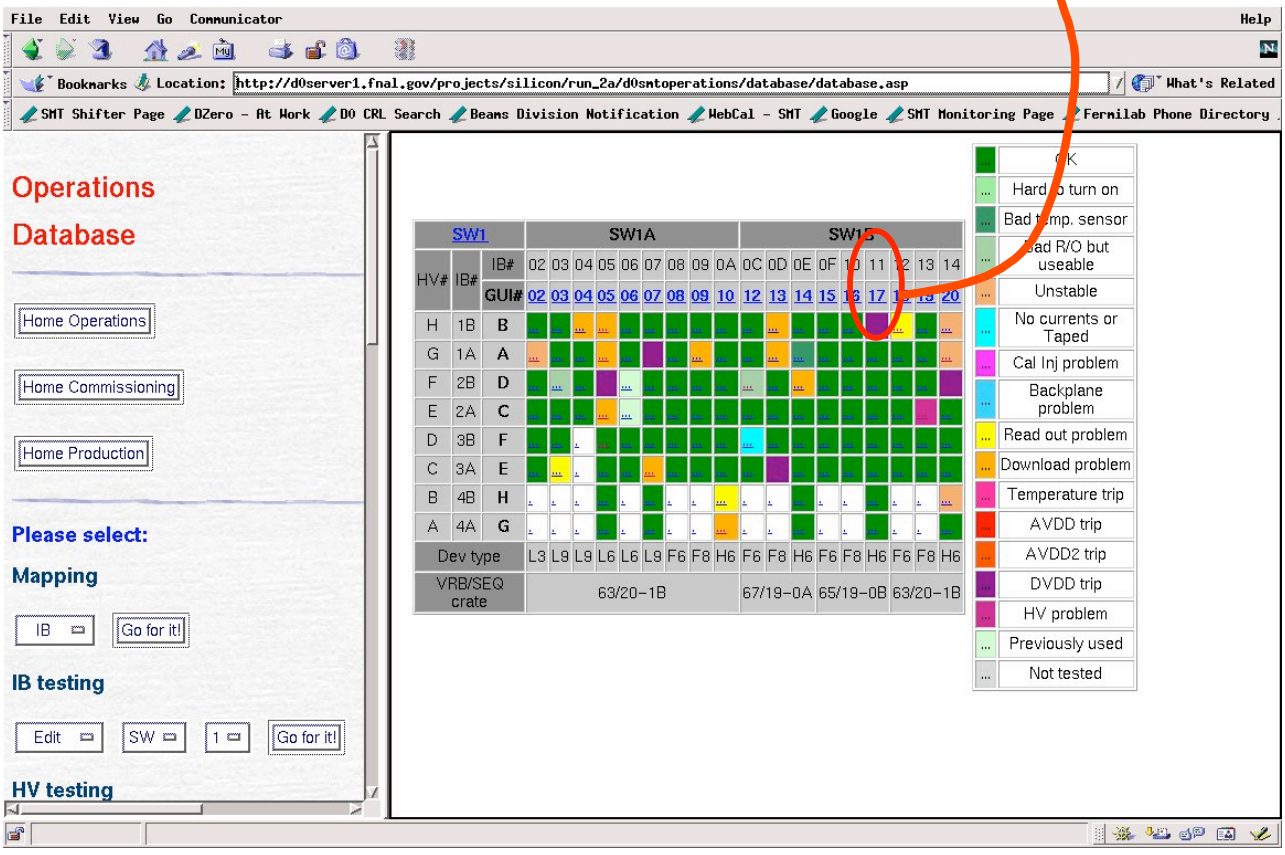


If you need to make an entry into the database for a particular HDI (e.g. when an HDI has been disabled or re-enabled) , go to the "IB Testing" section in the left-hand frame. Let's assume you have disabled SW1B11-B:

- From the pull-down menus in the "IB Testing" area, select: "Edit" "SW" "1". Then click "Go for it!".

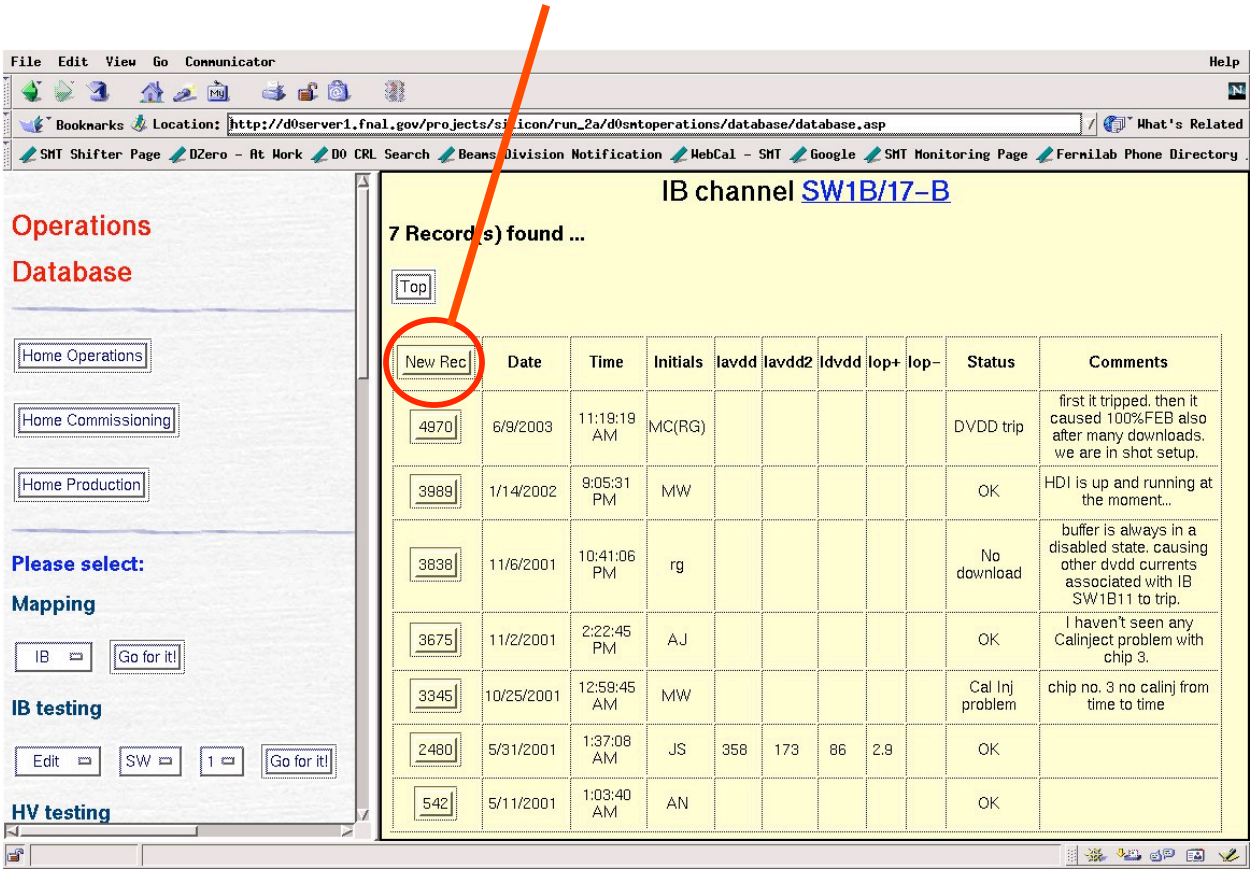
DØSMT Operations Database

- You will be prompted for a user name (d0smt) and password (dab). Enter those at the appropriate spaces and click “Submit”.
- A graphic map of the SW interface board crates will appear. Click on the colored box corresponding to the IB channel for the HDI that you want to make an entry for.
  NOTE!: In the download GUI and elsewhere, when HDIs are referred to by their Interface Board channel, the numbering is in hexadecimal (e.g. the ’11’ in SW1B11-B). In the Operations Database, two designation are given: the top ‘IB #’ row is in hexadecimal, the bottom ‘GUI #’ row is in decimal. Be careful that you are selecting the correct HDI!



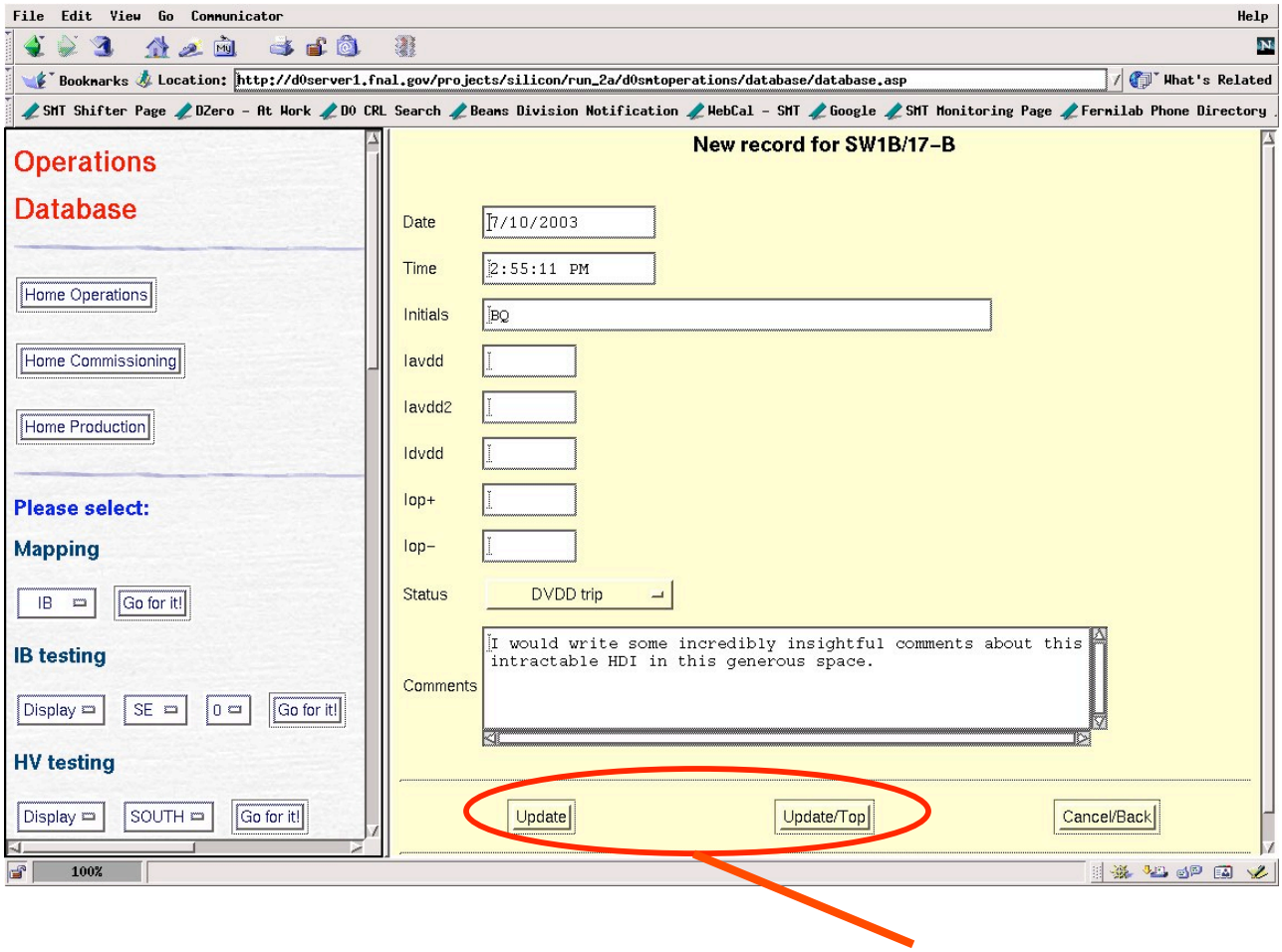
DØSMT Operations Database

- A list of all entries made for that particular HDI will appear. To make a new entry, click on the "New Rec" button near the upper left.



- A new record template will appear. Fill in your initials, choose a "Status" representing the current state of the HDI, and enter some thorough comments describing the problems observed, what actions were taken and why. The fields for individual currents do not, in general, need to be filled in.

DØSMT Operations Database



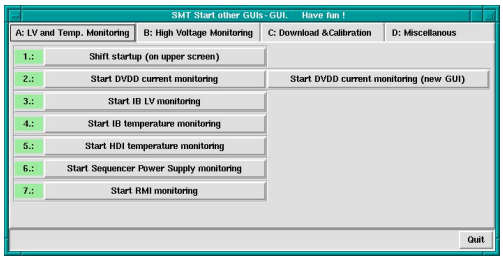
- When the entry has been completed, either click “Update”, which will return you to the HDI’s history (where your new entry will appear), or click “Update/Top”, which will return you to the interface crate map.

All-GUIs-starter

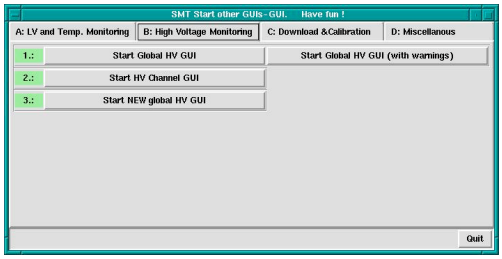
This GUI has been written to make your life, as a shifter, easier. It will allow you to start most of the other GUIs you will need to perform your work.
To start this GUI:

- open a d0smt shell window
- type:

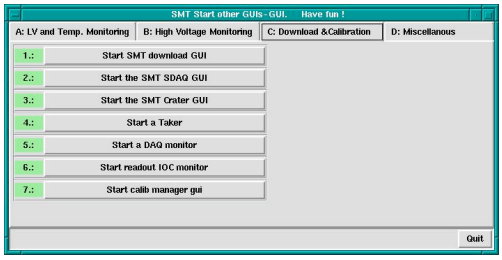
> setup d0online
> cd ~
or
> cd ~/monitoring (it doesn not matter, as you whish...)
> ./startguis.py &



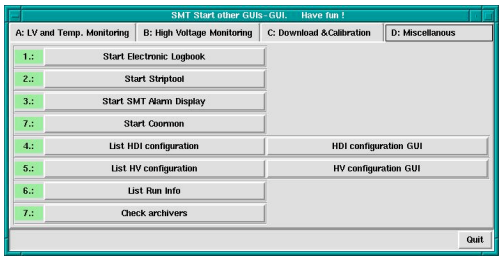
Page A: monitoring GUIs related to Low Voltages and temperatures



Page B: monitoring GUIs related to High Voltage



Page C: monitoring GUIs related to download, calibration and data taking



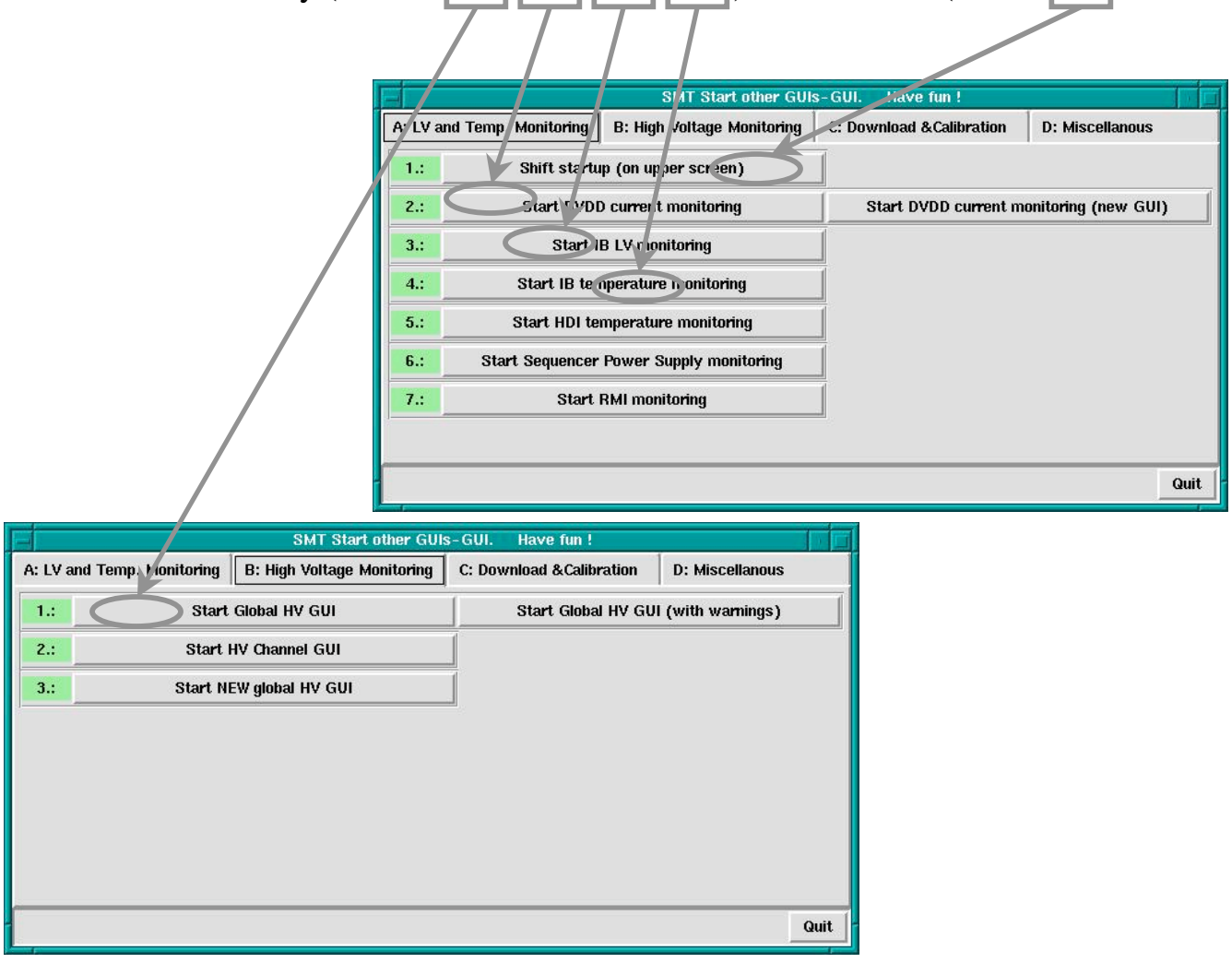
Page D: miscellaneous GUIs

All-GUIs-starter
General Monitoring GUIs

The General Monitoring GUIs are the ones which allow you to monitor the behavior of the detector as far as:

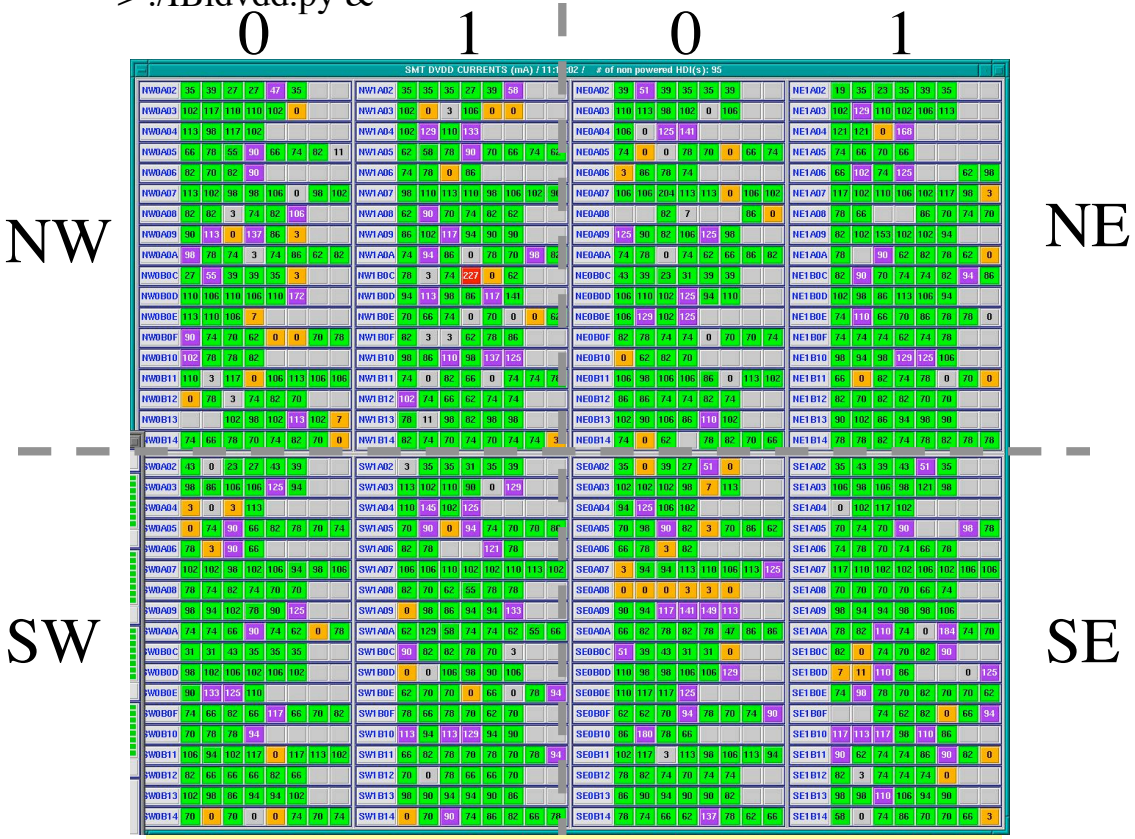
- HDIs DVDD currents
- Interface Board Low Voltage
- Interface Board Temperature
- High Voltage.

They need to be active at ALL TIMES. Using the all-GUIs-starter, they can be started individually (buttons B.1., A.2., A.3 , A.4.) or all at once (button A.1.)



HDIs DVDD current GUI

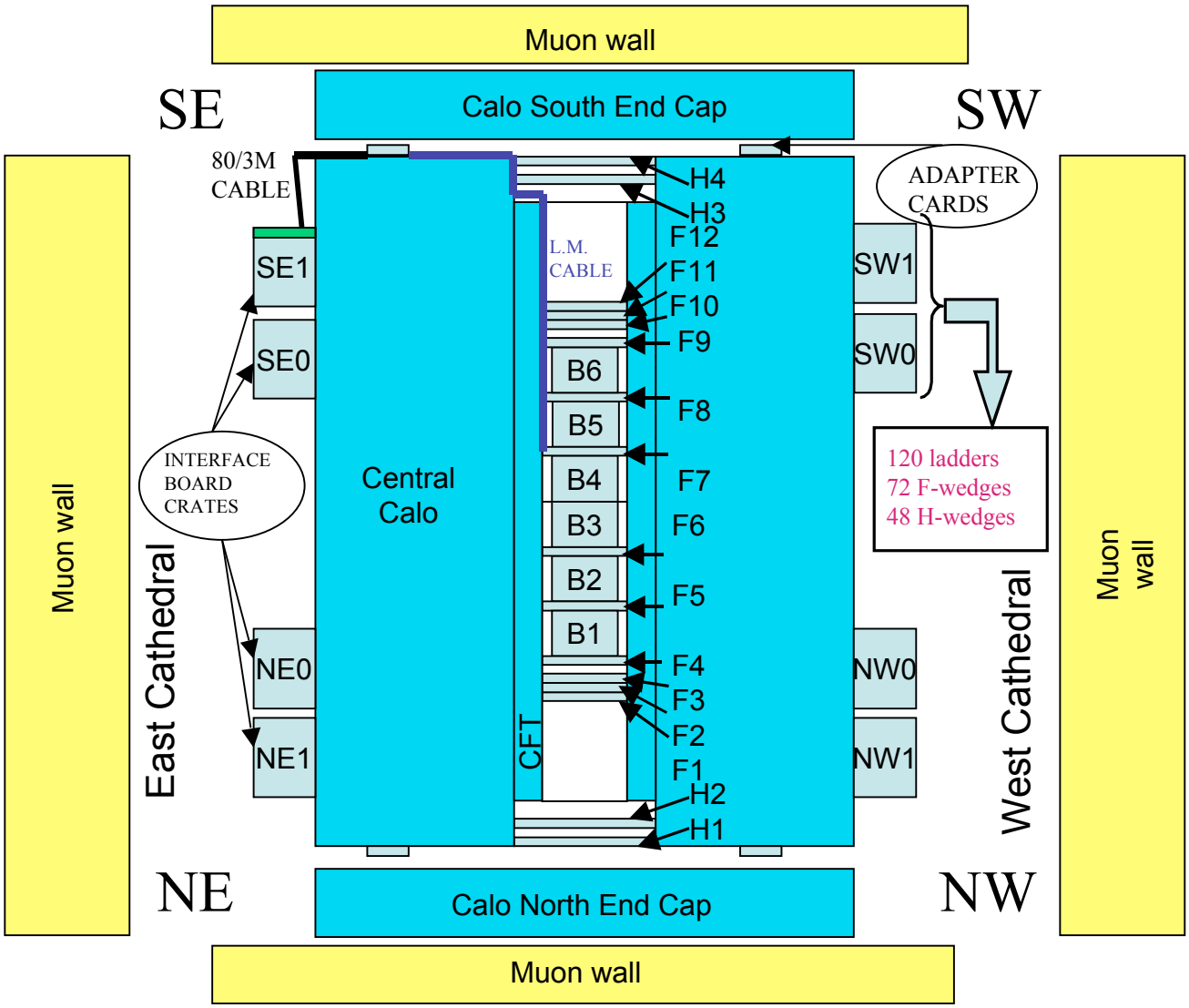
1. this GUI displays the DVDD currents of each Interface Board Channel (i.e. each HDI)
2. It can be started from the all-GUIs-starter (A.2.) or by typing in a d0smt shell window:
   > setup d0online
   > cd ~/monitoring
   > ./IBidvdd.py &



DVDD Currents GUI color coding:

orange:	LV is OFF
green:	LV is ON and I_DVDD OK
purple:	LV is ON and I_DVDD slightly high
red:	LV is ON and I_DVDD high
red/black:	Abnormal state (Trip or Buffer Disabled)
light blue:	Channel is a disabled 6-chip F-wedge used only to provide bias to the 8-chip partner
pink:	Channel permanently disabled
grey:	Channel not used

HDIs DVDD current GUI

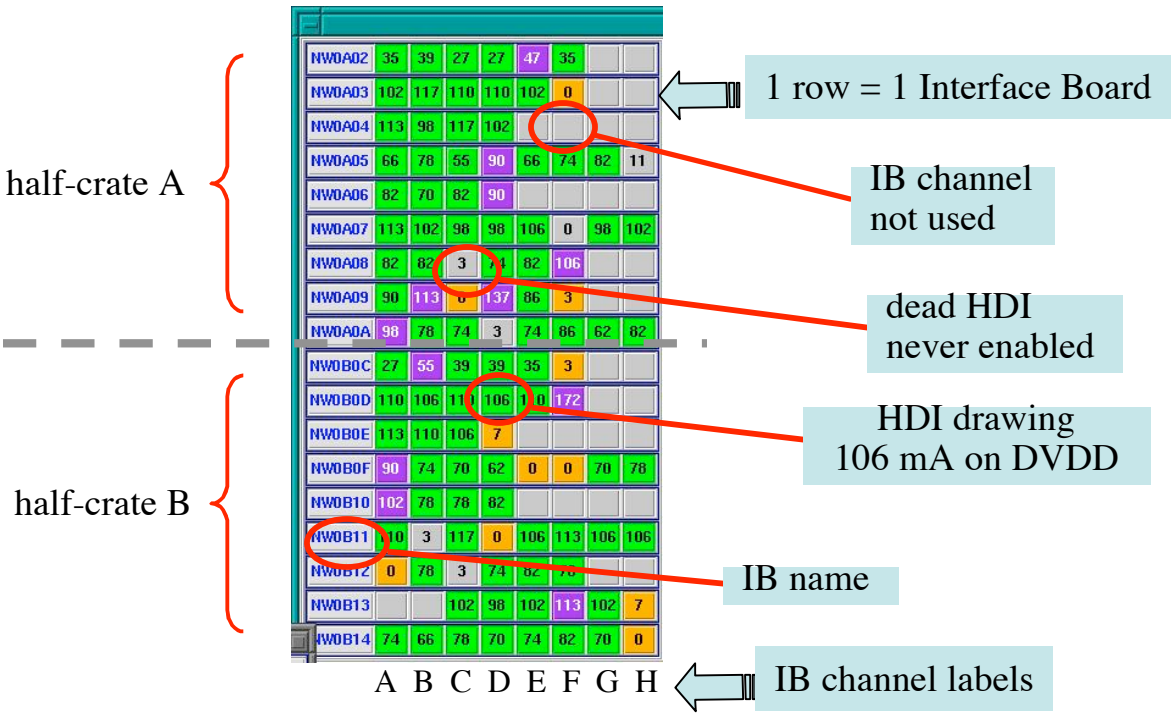


Location of the Interface Board Crates in the Cathedral

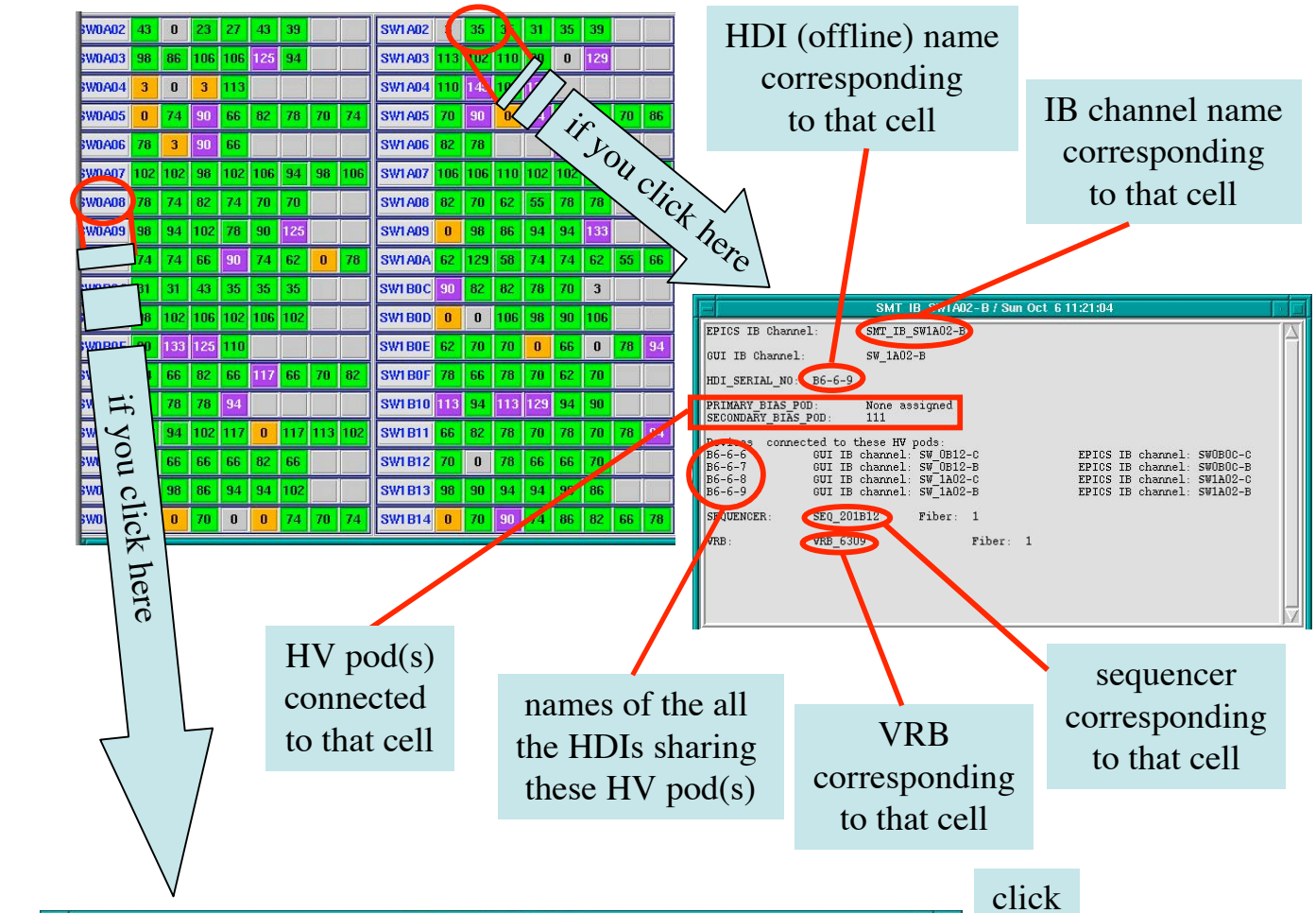
HDIs DVDD current GUI

The IB crates are subdivided into 2 halves (A and B), each half corresponds to 9 IB boards. In the IB crate GUI each IB is represented by a row:

- The first cell of the row contains the name of the interface board. The name is constructed as follows:
  - quadrant (NE, NW, SE, SW)
  - crate number (0, 1)
  - crate half (A, B)
  - IB slot number (in hex: 02-0A and 0C-14)
- It is followed by 8 cells corresponding to the 8 IB channels (labeled A thru H). Each IB channel can be connected to an HDI. The numbers written in the cells give the DVDD current in mA drawn by the corresponding HDIs
  - if a cell is gray and has a number, it means the HDI is really dead and thus never enabled.
  - if a cell is gray without number, it means that the IB channel is not used (no HDI connected to it)



HDIs DVDD current GUI



IB Name	AVDD (A)	AVDD2 (A)	DVDD (A)	AVDD (V)	AVDD2 (V)	DVDD (V)	Temp (C)	Status
SMT_IB_SW0A08-A	0.405	0.153	0.079	5.850	4.160	5.460	101.604	NORMAL
SMT_IB_SW0A08-B	0.381	0.161	0.075	5.817	4.128	5.428	101.604	N
SMT_IB_SW0A08-C	0.389	0.157	0.106	5.850	4.160	5.428	101.604	N
SMT_IB_SW0A08-D	0.393	0.165	0.075	5.850	4.160	5.460	101.604	N
SMT_IB_SW0A08-E	0.381	0.157	0.071	5.850	4.128	5.428	101.604	N
SMT_IB_SW0A08-F	0.365	0.181	0.079	5.883	4.160	5.428	101.604	N
SMT_IB_SW0A08-G	0.000	0.000	0.000	0.130	0.130	0.130	101.604	ERROR
SMT_IB_SW0A08-H	0.000	0.000	0.004	0.098	0.098	0.098	101.604	ERROR

HDIs DVDD current GUI

• Check that the GUI is updating (e.g. from the GUI title bar date/time) if NOT kill it and restart it

• You should only see a small number of HDIs with a purple or red color. Some of the causes for this to happen can be:

- if only 2 to 4 HDIs become purple or red in a row (i.e. Interface Board), this usually means the corresponding HDIs need to be redownloaded. To figure out what VRB they correspond to, you can either click on the corresponding cell in the DVDD current GUI or look at the IB/VRB map posted close to the SMT monitors

- if HDIs are purple and red everywhere, it may mean that the HDIs are not read out:

  - check with the DAQ shifter that all the SMT readout crates are in a global run

  - if they are not, ask him/her to include them

  - if for some reason the global DAQ has to run without the SMT crates:

    - if the DAQ shifters allows it, start a SEQ only run with your own **taker**, after having prepared the SEQ only trigger file with the **crater** GUI

    - if the DAQ is down or the DAQ shifter does not want you to start your own taker, **turn on the pulsers** from the main page of the download GUI. DO NOT FORGET to turn OFF the pulser whenever the SMT crates are put back in a global run.

IB Power Supplies GUI

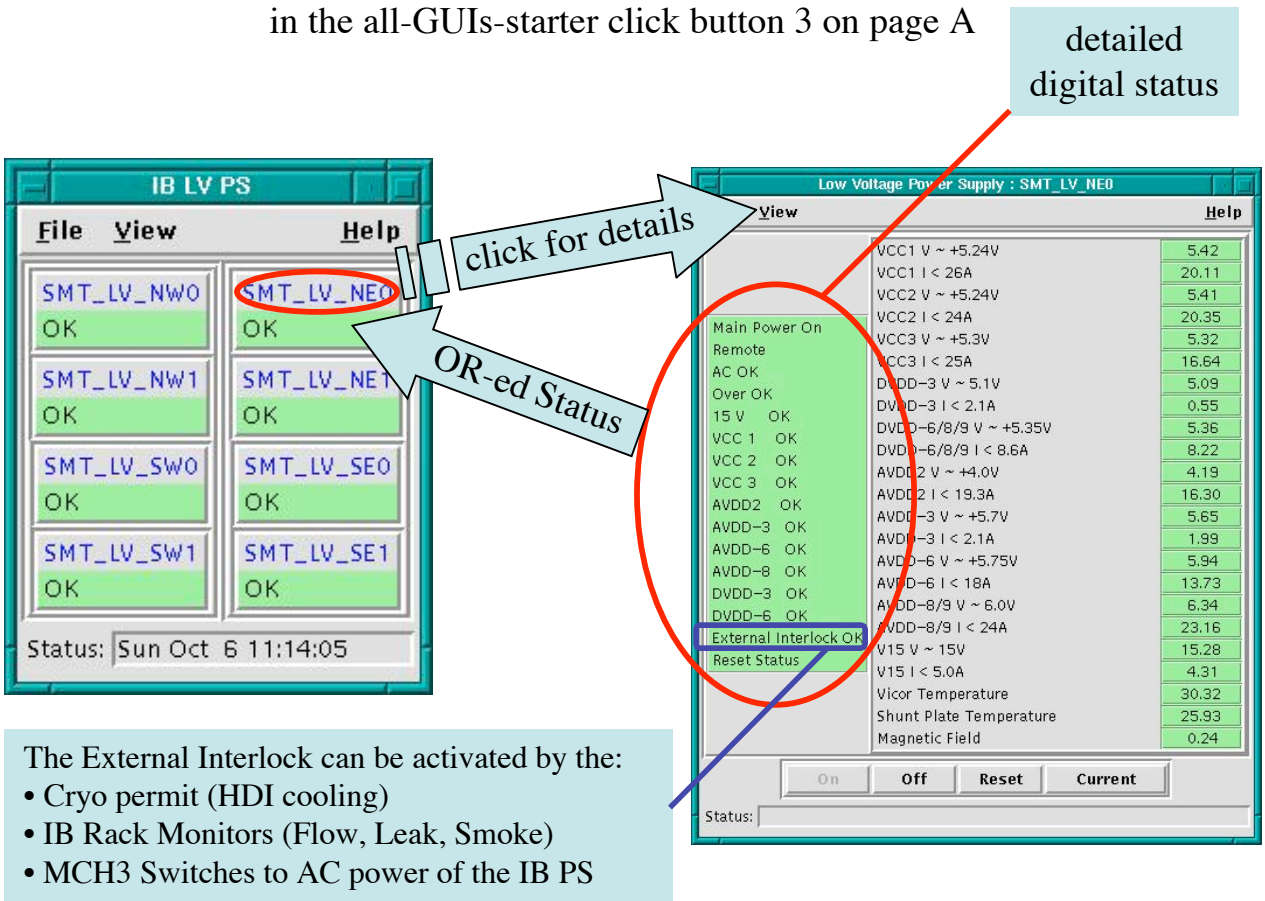
There are 8 sets of IB Power Supplies. One set for each IB crate. Each set of power supplies is comprised of: 1 15V PS for IB 1553 circuitry, 3 VCC PS to power the IB ICs (1 for the 1st 7 boards, 1 for the next 6 boards, and 1 for the last 5 boards), and 6 PS to supply power to the SVX chips (1 AVDD2 PS, 2 DVDD PS [1 for 3 chippers and 1 for 6,8 and 9-chippers], 3 AVDD PS [1 for 3 chippers, 1 for 6 chippers and 1 for 8 and 9 chippers])

To start the IB Power supply GUIs, open a d0smt shell window:

```
> setup d0online
> cd ~/monitoring
> ./IBLVsmall.py &
```

or

in the all-GUIs-starter click button 3 on page A



The External Interlock can be activated by the:
- Cryo permit (HDI cooling)
- IB Rack Monitors (Flow, Leak, Smoke)
- MCH3 Switches to AC power of the IB PS

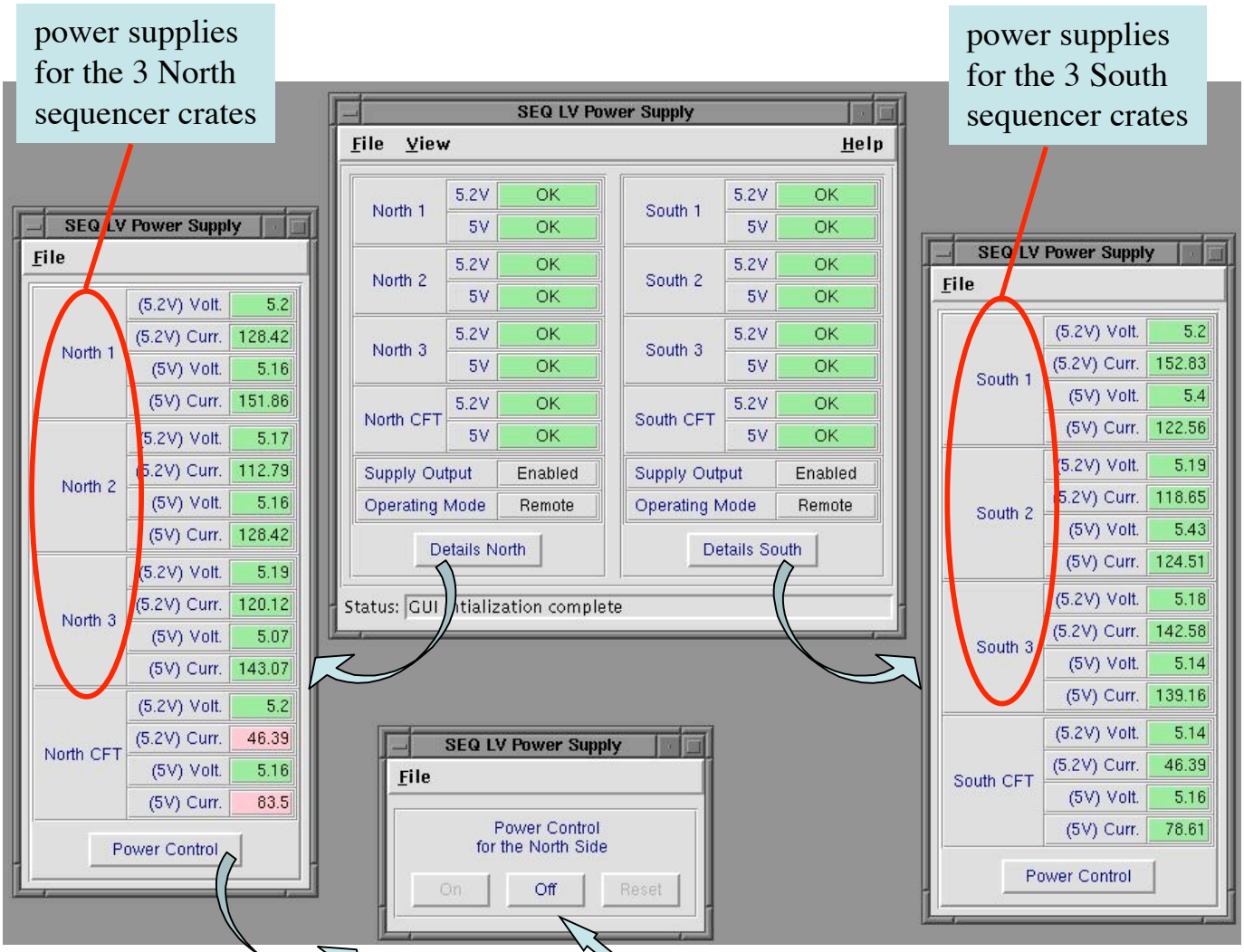
SEQ Power Supplies GUI

To start the Sequencer Power supply GUI, open a d0smt shell window:

```
> setup d0online
> cd ~/monitoring
> ./seq_gui.py &
```

or

in the all-GUIs-starter click button 6 on page A



IB Temperature GUI

All IB crates have a set of 3 pairs of temperature sensors inserted beween some of their IBs. The sensors are read out through IB channels which are not used for HDIs.

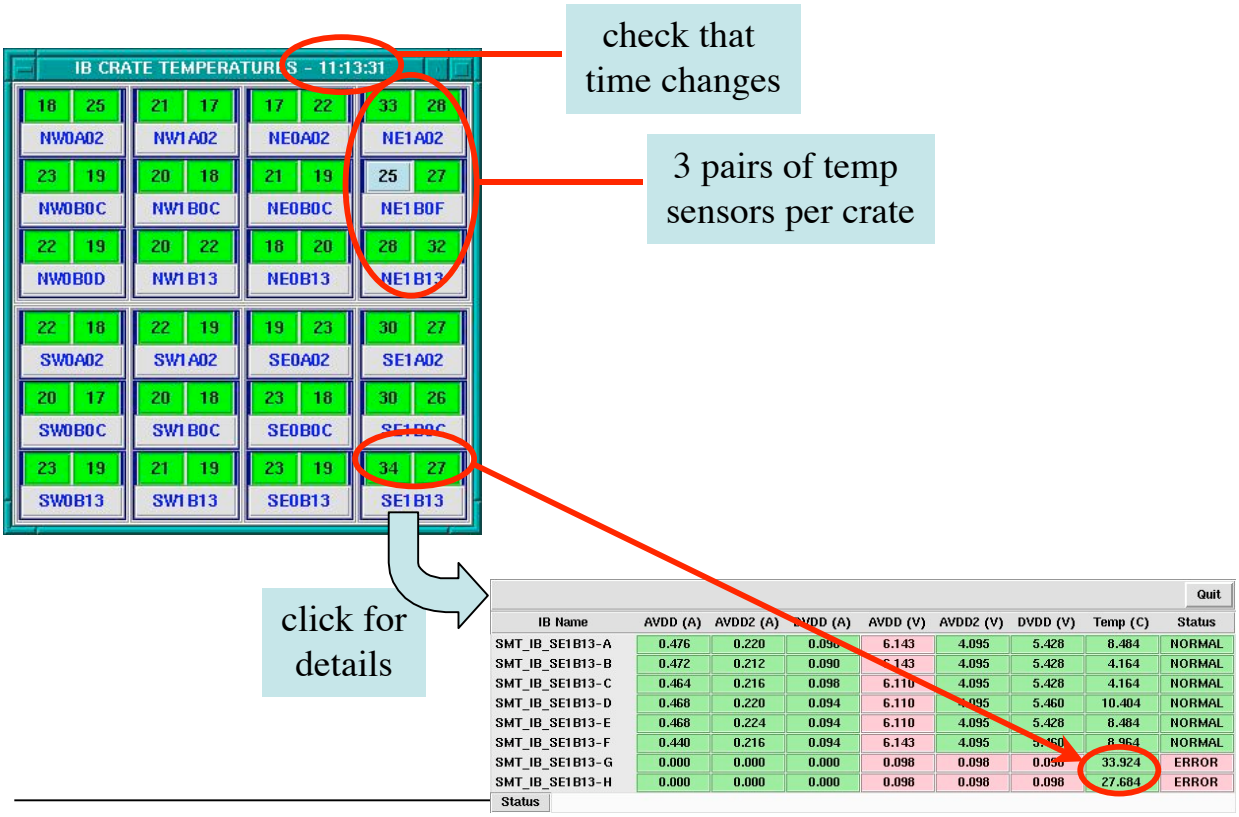
If 3 or more temperatures out of 6 in a crate are over 35 degC, we consider that there is problably a cooling problem on that crate. In that case the GUI will automatically switch off the LV power supplies of that crate. So it is really IMPERATIVE to check from time to time that this gui is updating.

To start the IB Temperature GUI, open a d0smt shell window:

> setup d0online
> cd ~/monitoring
> ./IBdegC.py &

or

in the all-GUIs-starter click button 4 on page A



Utility Scripts and GUIs

To prepare to run the utility GUIs:, open a d0smt shell window:

> setup d0online

> cd ~/monitoring

Since some of these utility GUIs can be launched from the all-GUIs-starter, you may want to start it too:

> ./startguis.py &

Some of the most useful utility GUIs are:

- information about what VRB, IB, SEQ, HV pod(s) a specific HDI (e.g. B2-3-5) is connected to:

> ./show_det_info.py B2-3-5 & or >./list_det_info.py B2-3-5 &

- information about what is connected to a specific HV pod (e.g. 100P):

> ./show_hv_info.py 100 &

(rem: you must drop the P or N from the end of the pod name)

- information about a specific IB channel (e.g. SW0A02-C)

> ./show_IB_info.py SW0A02-C &

- information about specific fiber input (e.g. fiber 2 [possible choices: 1, 2, 3 or 4]) of a specific VRB (e.g. VRB 13 in crate 6B)

> ./show_VRB_info.py VRB_6B13

- information about a specific VRB channel (e.g. channel 2 [possible choices: 0 thru 7]) of a specific VRB (e.g. VRB 13 in crate 6B):

> ./show_VRBchan_info VRB_6B13 2

Utility Scripts and GUIs

• script to check **fast** and **slow** archivers:

> cd ~
> archiverchecks.sh &

or

in the all-GUIs-starter click button 7 on page D

```
> executing: /home/d0smt/archiverchecks.sh &

-------------------
FAST ARCHIVER CHECKS
-------------------

  Archiver processes on d0ol28 (there should be three):

/usr/bin/X11/xauth:  creating new authority file /tmp/Xauth3152_3842
d0smt     9484     1  0 Oct18 ?        00:45:28 /d0usr/products/chan_archiver/v1
d0smt     9485  9484  0 Oct18 ?        00:00:06 /d0usr/products/chan_archiver/v1
d0smt     9486  9485  1 Oct18 ?        01:23:47 /d0usr/products/chan_archiver/v1

  Archive file on d0ol28 (should have a current time stamp):

/usr/bin/X11/xauth:  creating new authority file /tmp/Xauth3152_3935
-rw-r--r--    1 d0smt    D0smt    30450331 Oct 23 11:04 20021023-000000

-------------------
SLOW ARCHIVER CHECKS
-------------------

  Archiver processes on d0ol03 (there should be three):

/usr/bin/X11/xauth:  creating new authority file /tmp/Xauth3152_16008
d0smt    11756     1  0 Oct21 ?        00:16:50 /d0usr/products/chan_archiver/v1
d0smt    11757 11756  0 Oct21 ?        00:00:02 /d0usr/products/chan_archiver/v1
d0smt    11758 11757  0 Oct21 ?        00:07:24 /d0usr/products/chan_archiver/v1

  Archive file on d0ol03 (should have a current time stamp):

/usr/bin/X11/xauth:  creating new authority file /tmp/Xauth3152_16103
-rw-r--r--    1 d0smt    D0smt    68762015 Oct 23 11:04 20021023-000000

------------------------------------------------------------------
Archive checks complete - if different from expected, look
in the 'channel archiver' section of the SMT Shift Instructions
for information on how to proceed
------------------------------------------------------------------
>
```

there should be 3 processes

date and time should be current

there should be 3 processes

date and time should be current

If this is not the cas, follow the instructions in the « Archiver » section to stop and restart the problematic archiver(s)

Listing Scripts and GUIs

• list of HDIs which are turned off

> ./listDisabledHDIs.py & ← script style

or

> ./show_disabled_hdis.py & ← GUI style

or

in the all-GUIs-starter click button 6 on page D

File View Help

List of IB channels not enabled as of: Wed Oct 23 11:02:22 2002

IB channel name	Device name	Status	DBstat	Comment
SMT_IB_SE0A02-F	B6-2-6	0x20	0	known
SMT_IB_SE0A03-E	B6-3-6	0x20	0	known
SMT_IB_SE0A05-E	B5-5-12	0x20	0	known
SMT_IB_SE0A06-C	B5-2-6	0x20	1	known
SMT_IB_SE0A07-A	B4-7-10	0x20	0	known
SMT_IB_SE0B0C-F	B6-2-1	0x20	0	known
SMT_IB_SE0B11-C	B5-8-2	0x20	2	known
SMT_IB_SE1A04-A	B5-3-2	0x20	2	known
SMT_IB_SE1A0A-E	H3-2-4	0x20	2	known
SMT_IB_SE1B0C-B	F8-2-1	0x20	0	known
SMT_IB_SE1B0D-G	F8-1-3	0x20	2	known
SMT_IB_SE1B0F-F	F10-2-2	0x20	0	known
SMT_IB_SE1B11-H	H4-2-3	0x20	8	known
SMT_IB_SE1B12-F	F12-2-4	0x20	0	known
SMT_IB_SE1B14-B	H4-2-6	0x20	2	known
SMT_IB_SE1B14-H	H4-2-7	0x20	0	known
SMT_IB_SW0A02-B	B6-6-5	0x20	2	known
SMT_IB_SW0A04-A	B5-3-3	0x20	0	***NEW***
SMT_IB_SW0A04-B	B4-3-3	0x20	2	known
SMT_IB_SW0A04-C	B5-4-3	0x20	0	known

Status:

Listing Scripts and GUIs

• list information about HV

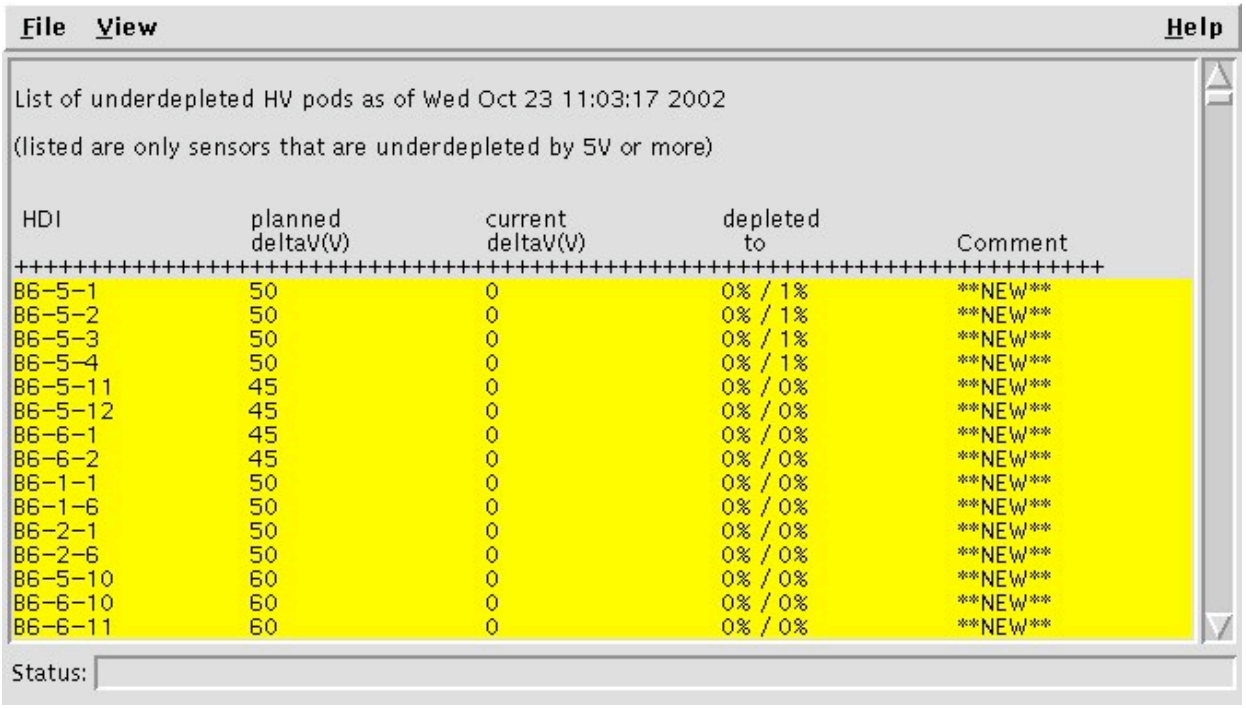
> ./list_underdepleted_hdi.py & ⟵ script style

or

> ./show_underdepleted_hdis.py & ⟵ GUI style

or

in the all-GUIs-starter click button 7 on page D

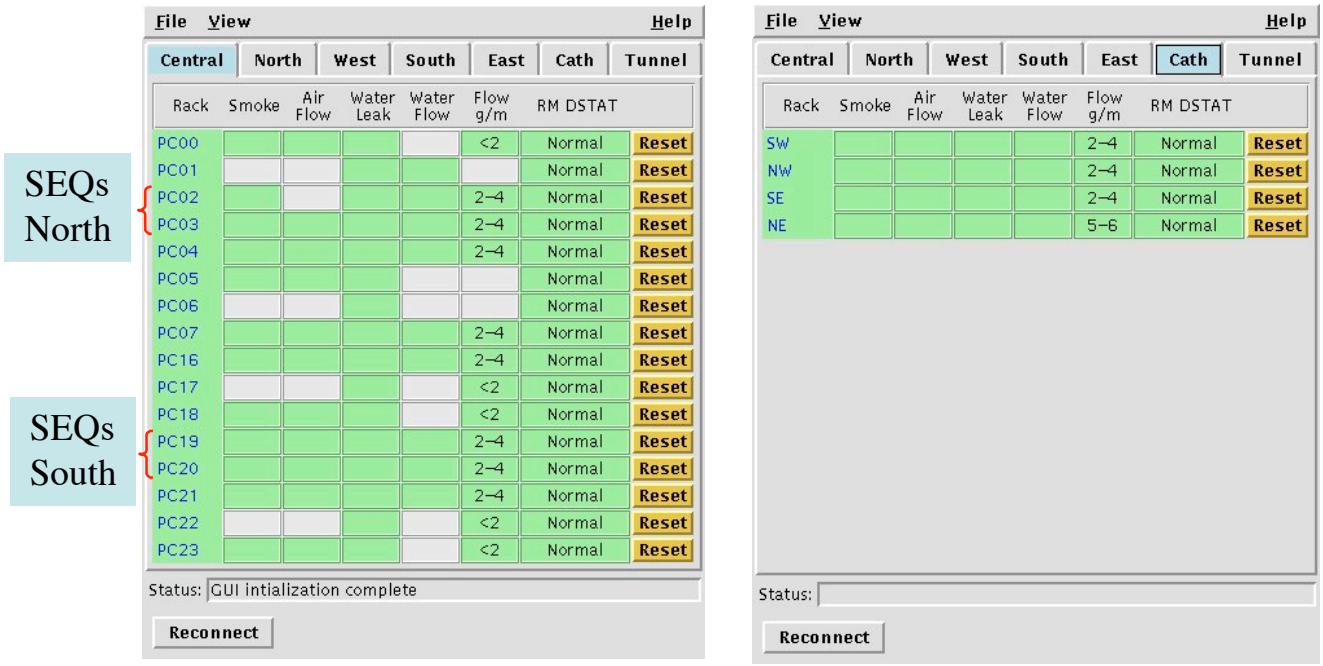


Rack Monitor Interface GUI

To start the Rack Monitor Interface GUI, open a d0smt shell window:

> setup d0online
> cd /online/config/ctl
> ./pfm.rmi &

or in the all-GUIs-starter click button 7 on page A



Central Platform RMs
Sequencer Crates

Cathedral RMs
Interface Board Crates

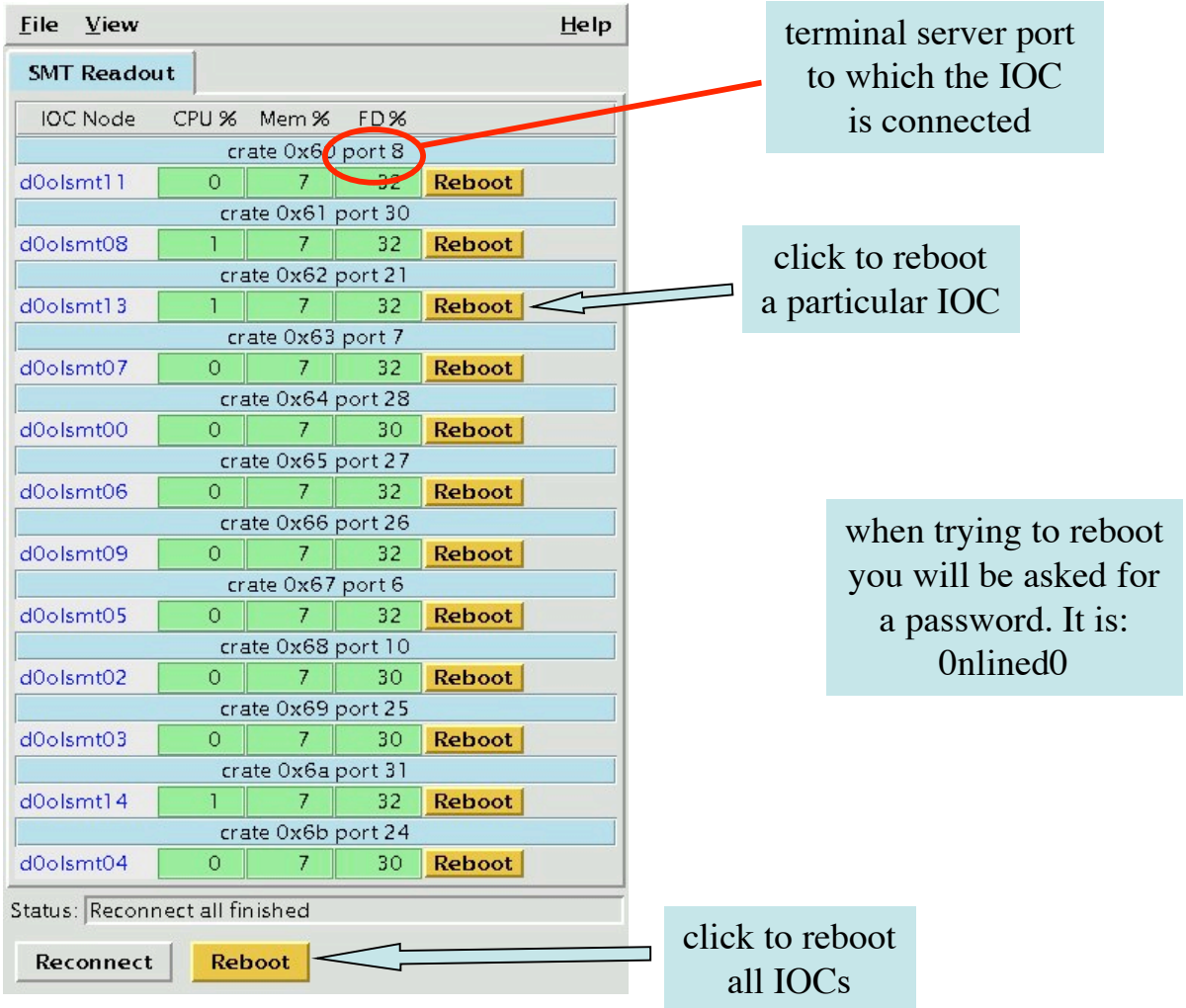
Read Out Crates IOCs

To run the Read Out Crate IOC GUI, open a d0smt shell window:

> setup d0online
> cd ~/onl_smtnew/util
> ./smtreadout.ioc &

or

in the all-GUIs-starter click button 6 on page C



Read Out Crates IOCs

To connect to a particular IOC (e.g. IOC of crate 65 i.e. port 27):

```
[d0smt@d0ol28 ~]$ telnet t-d0-mch2
Trying 131.225.231.47...
Connected to t-d0-mch2.fnal.gov (131.225.231.47).
Escape character is '^]'.

login: ioc
password:
digi> connect 27

-> i
```

0nlined0

list process in the IOC

bad state for a process to be in

NAME	ENTRY	TID	PRI	STATUS	PC	SP	ERRNO	DELAY
tExcTask	excTask	3dff098	0	PEND	190c64	3dfefc0	3006b	0
tLogTask	logTask	3dfc720	0	PEND	190c64	3dfc658	0	0
tShell	shell	3a2c7e0	1	READY	173b7c	3a2c468	30065	0
tRlogind	rlogind	3ddbe38	2	PEND	1701b8	3ddba78	0	0
tTelnetd	telnetd	3dd9f10	2	PEND	1701b8	3dd9db0	0	0
tRdbTask	rdbTask	3dd73f0	20	PEND	1701b8	3dd7290	d0003	0
tAioIoTask1	aioIoTask	3df09d0	50	PEND	17062c	3df0928	0	0
tAioIoTask0	aioIoTask	3de97c8	50	PEND	17062c	3de9720	0	0
tNetTask	netTask	3ddf638	50	PEND	1701b8	3ddf588	0	0
tAioWait	aioWaitTask	3df7bd8	51	PEND	1701b8	3df7a80	0	0
ts_Casync	3c52e34	3da81d0	70	DELAY	173130	3da7e70	3d0004	856
scan1	3c56324	3a9c608	70	DELAY	173130	3a9c578	0	1
cbHigh	callbackTask	3b84430	71	PEND	1701b8	3b84368	0	0
scan2	3c56324	3aa1e20	71	DELAY	173130	3aa1d90	0	2
scan6	3c56324	3aa7638	72	DELAY	173130	3aa75a8	0	2
scan12	3c56324	3aace50	73	DELAY	173130	3aacdc0	0	3
scan30	3c56324	3ab2668	74	DELAY	173130	3ab25d8	0	16
cbMedium	callbackTask	3dad9c8	75	PEND	1701b8	3dad900	0	0
scan60	3c56324	3ab7e80	75	DELAY	173130	3ab7df0	0	36
scan120	3c56324	3abd698	76	DELAY	173130	3abd608	0	31
scan300	3c56324	3ac2eb0	77	DELAY	173130	3ac2e20	0	146
scan600	3c56324	3ac86c8	78	DELAY	173130	3ac8638	0	141
cbLow	callbackTask	3cfd2e0	85	SUSPEND	3d2b20c	3cfd168	0	0
scanOnce	3c56048	3ace318	85	PEND	1701b8	3ace250	0	0
EV dbCaLinkevent_task		3b67850	87	PEND	1701b8	3b677a8	3006b	0
dbCaLink	dbCaTask	3b7ec38	88	PEND	1701b8	3b7eb80	3006b	0
tPortmapd	portmapd	3dd8980	100	PEND	1701b8	3dd8810	16	0
synchServersynchServer		3a34af8	101	PEND	15b5e4	3a34870	1c0001	0

1553 Controller Crates IOC mapping (MCH3 Rack 300 terminal server t-d0-mch3)

Quad	IOC	1553 Port	Devices Connected	Cable info	Termnl Port
SW	d0olctl57	0	10 SEQ PC19-0A - Sequencers	black #1	
		1	10 SEQ PC19-0B - Sequencers	black #2	
		2	10 SEQ PC20-1B -Sequencers	black #8	34
*		3	3 South SEQC – Seq. Controllers (South)	black #9	
		4	18 IB SW-0	black #17 (G)	
		5	18 IB SW-1	black #18 (H)	
SE	d0olctl56	0	10 SEQ PC20-0A - Sequencers	black #5	
		1	10 SEQ PC20-0B -Sequencers	black #6	
		2	10 SEQ PC20-1A – Sequencers	black #7	1
*		3	4 East RMI (IB power supplies/East)	black #19 (A)	
		4	18 IB SE-0	black #20 (C)	
		5	18 IB SE-1	black #21 (D)	
NW	d0olctl60	0	10 SEQ PC03-0A - Sequencers	black #10	
		1	10 SEQ PC03-0B - Sequencers	black #11	
		2	10 SEQ PC03-1A -Sequencers	black #12	36
*		3	4 West RMI (IB power supplies /West)	black (green H)	
		4	18 IB NW-0	black #22 (I)	
		5	18 IB NW-1	black #23 (J)	
NE	d0olctl59	0	10 SEQ PC03-1B - Sequencers	black #14	
		1	10 SEQ PC04-0A - Sequencers	black #15	
		2	10 SEQ PC04-0B - Sequencers	black #16	6
*		3	3 North SEQC – Seq. Controllers (North)	black #13	
		4	18 IB NE-0	black #24 (E)	
		5	18 IB NE-1	black #25 (F)	
* South	d0olctl58	0	SEQ/SEQC Power Supplies South	blue AFE 8&9A	42
* North	d0olctl55	4	SEQ/SEQC Power Supplies North	blue #10	10

* This entries are NOT quadrant specific , i.e. they span two quadrants

Read Out Crates IOC mapping (MCH2 – terminal server t-d0-mch2)

VRB crate name	IOC name	IOC port
60	d0olsmt11	8
61	d0olsmt08	30
62	d0olsmt13	21
63	d0olsmt07	7
64	d0olsmt00	28
65	d0olsmt06	27
66	d0olsmt09	26
67	d0olsmt05	6
68	d0olsmt02	10
69	d0olsmt03	25
6A	d0olsmt14	31
6B	d0olsmt04	24

HV Crates IOC mapping (MCH2, terminal server t-d0-mch2)

HV crate name	IOC name	IOC port
smts1	d0olctl08	9
smts2	d0olctl48	22
smts3	d0olctl49	23
smts4	d0olctl25	13
smts9	d0olctl36	41
smtn5	d0olctl23	3
smtn6	d0olctl52	4
smtn7	d0olctl51	1
smtn8	d0olctl53	11
smtnA	d0olctl35	42

Download GUI

1. Contact Harald Fox for any questions about the Download GUI:
   - 847-414-4044
   - x5222

To monitor the status of an SBC

Log on to the SBC by :

> ssh –l d0runsu d0sbc**nnn** (where **nnn** is the number of the SBC)
the password is “data_acq”

>getInfo.sh

SDAQ / Calibrations

Page Section

SDAQ / Calibrations
Quick Guide

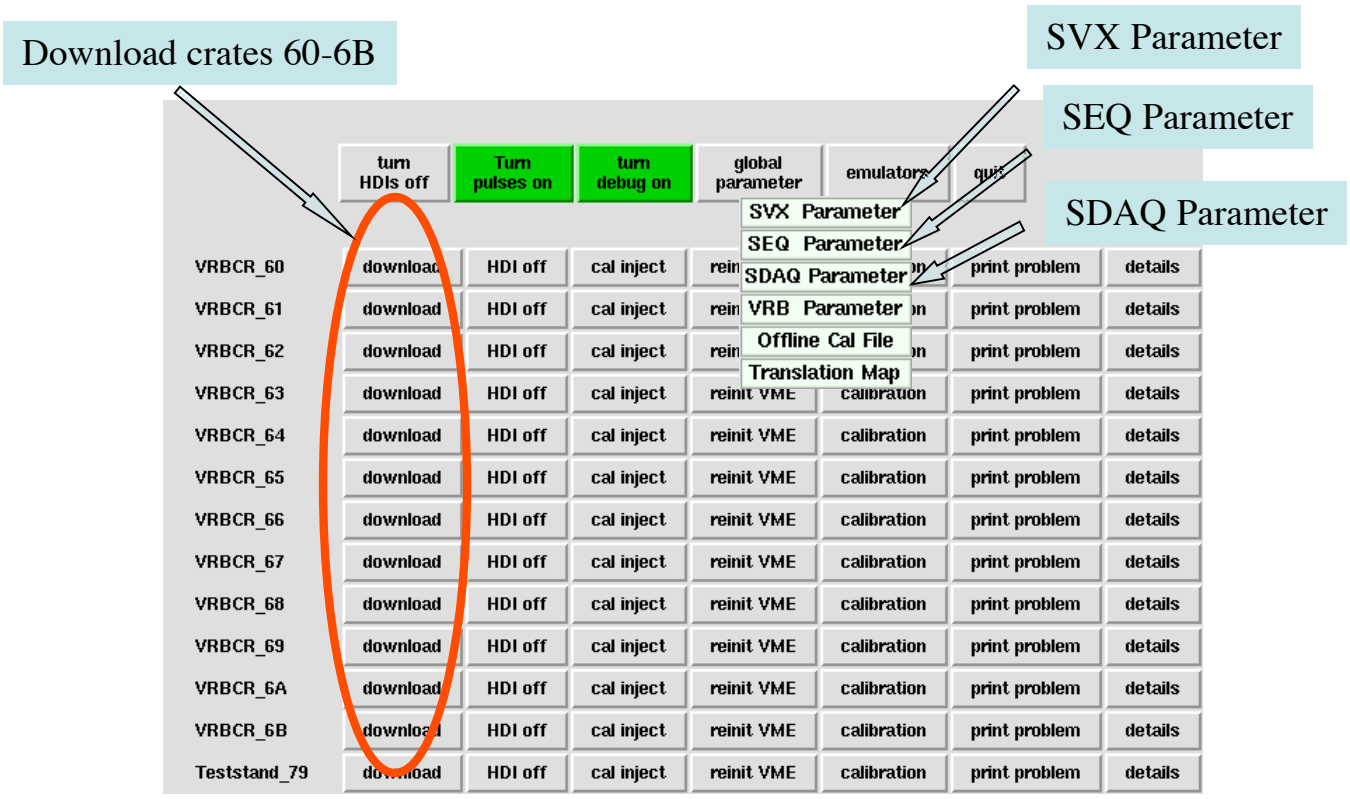
1. Take SMT out of the Global run.
2. Start a SEQ only run.
3. Make sure the HV is off.
4. Set the SVX parameters for read all mode, check the SEQ and SDAQ parameters and download the SMT.
5. Power cycle the readout crates and reinit them.
6. Bring the HV up.
7. Take an SDAQ run and follow the progress on the SDAQ GUI and the Calibration Manager GUI.
8. When data taking is finished switch pulses on. Do not free the trigger!
9. Bring the HV down and turn it off.
10. Set the SVX parameters to read neighbor.
11. Download the detector in sparse readout mode.
12. Wait until the data of all crates is committed to the database.
13. Free the trigger, turn pulses off and hand SMT over.
14. Make an entry in the log book and in the file ~d0smt/Calibration/CalibrationRuns.txt
15. Make a root tuple out of the calibration data.

For experts only:

13. Process the data to make new thresholds.
14. Download the new thresholds.
15. Install the new thresholds for examine.
16. Transfer the pedestal information to the offline database.

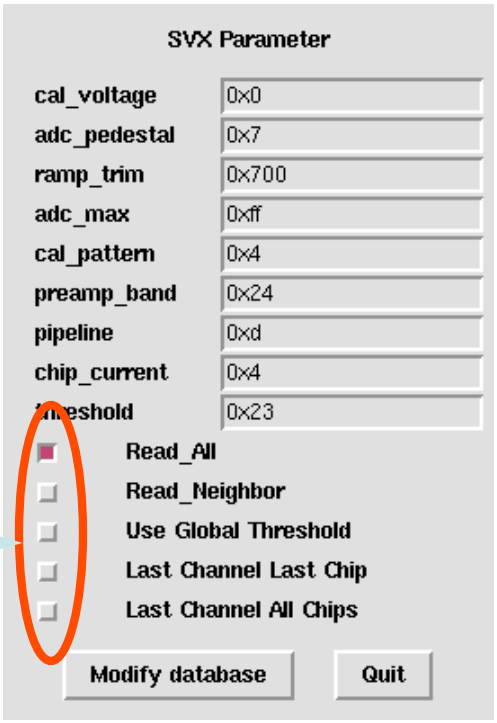
SDAQ / Calibration

1. **Take SMT out of the Global run.** The Calibration run is an SDAQ run. It does not involve or need the L3. It can go on in parallel while experts work on the L3 and it is out of the system. It needs however the L1 system and the COOR / Calibration manager / SDAQ supervisor infrastructure.
2. **Start a SEQ only run.** The preparation for the SDAQ run will take a while. The best way to ensure that HDI currents stay low is to have a SEQ only run going. While this is strictly speaking not an SDAQ run also this run does not need the L3. See the Section on PDAQ / Taker / Crater for instruction on how to start a SEQ only run.
3. **Make sure the HV is off.** We need to download the detector. This is only possible when the HV is off.
4. **Set the SVX parameters for read all mode, check the SEQ and SDAQ parameters and download the SMT:**

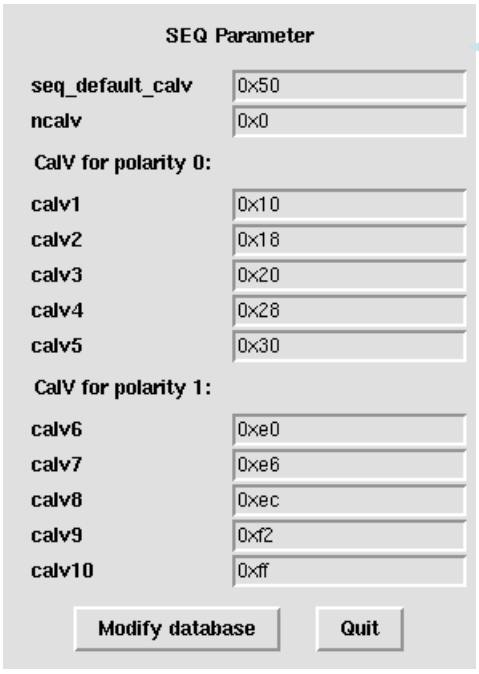


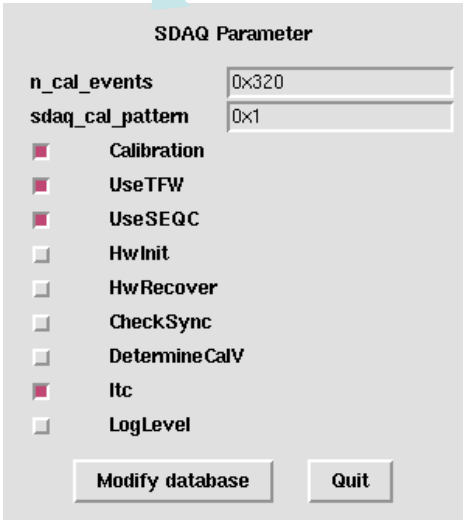
SDAQ / Calibration

This is the button configuration for SDAQ runs. Set this configuration before you download the detector.



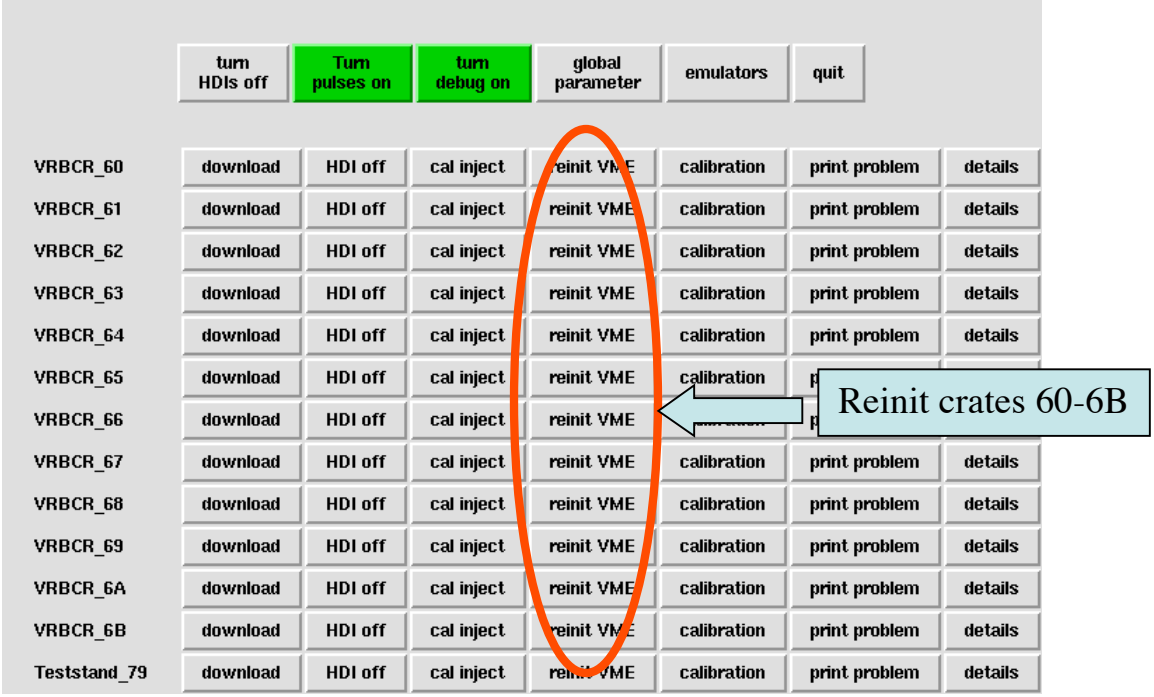
These are the standard configurations. Normally no modification is needed. Just check.





SDAQ / Calibration

5. **Power cycle the readout crates and reinit them.** The VME crates are located in MCH2 and are labeled 0x60 (SMT0_0) through 0x6B (SMT5_1). The power switches are located above the crates. Switch the power off, wait a few seconds and switch it on again. Back in the control room you may have to wait a minute before all crates are back on. Then reinit the crates from the download GUI:

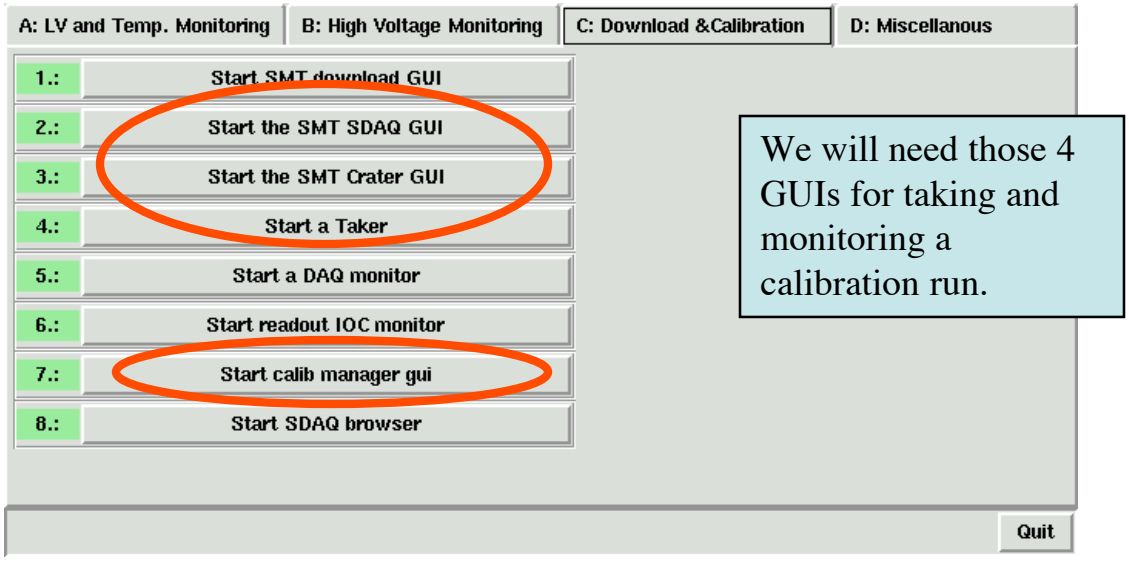


6. **Bring the HV up.** Check the HV section on how to turn the HV on and on how to ramp it up.

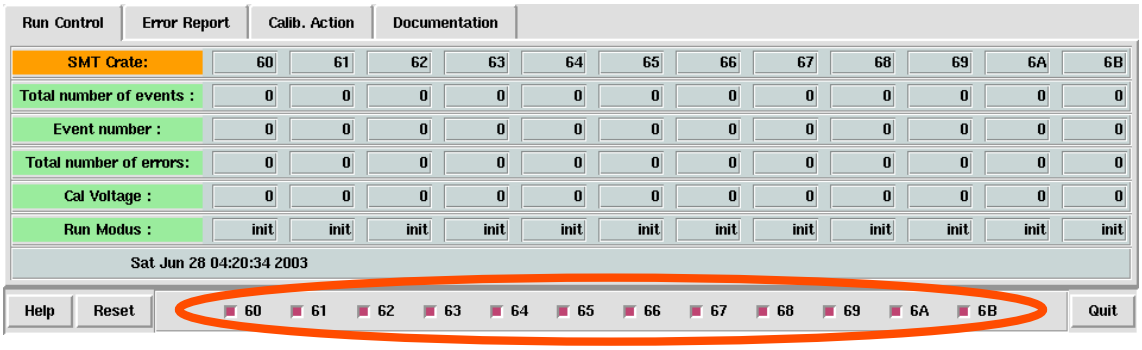
SDAQ / Calibration

7. Take an SDAQ run and follow the progress on the SDAQ and calibration manager GUI.

1. Start all necessary GUIs from the All-GUIs-starter:

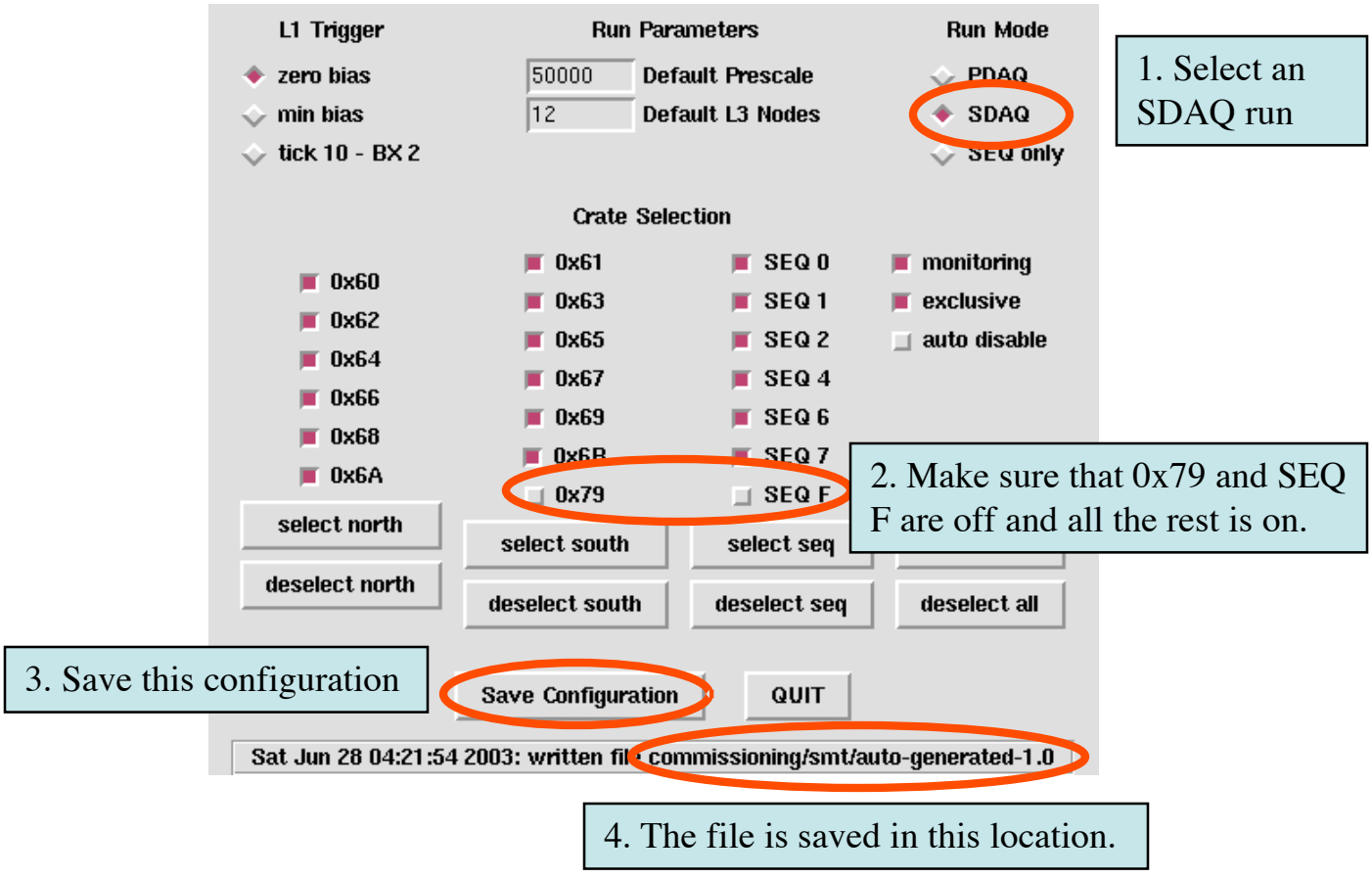


2. Select all the crates in the SDAQ GUI:



SDAQ / Calibration

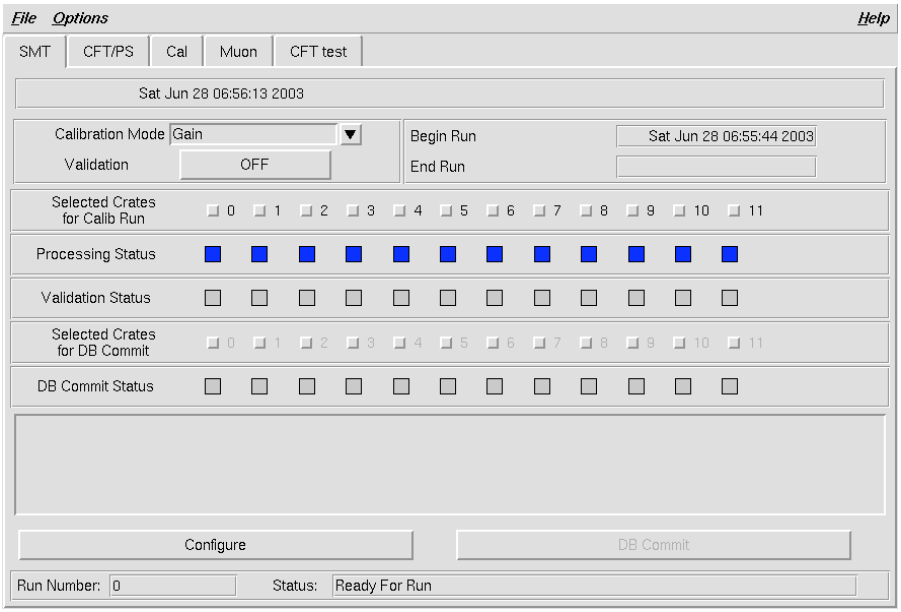
3. Create a run configuration using the SMT crater GUI:



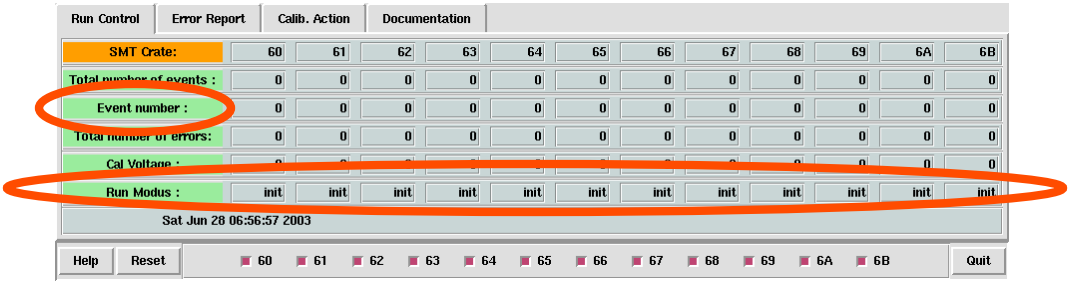
4. End the SEQ all run and choose the new configuration in the Taker window (see the Section PDAQ/Taker/Crater for details).

SDAQ / Calibration

5. After the SDAQ run is configured the Calibration Manager GUI should look like this:

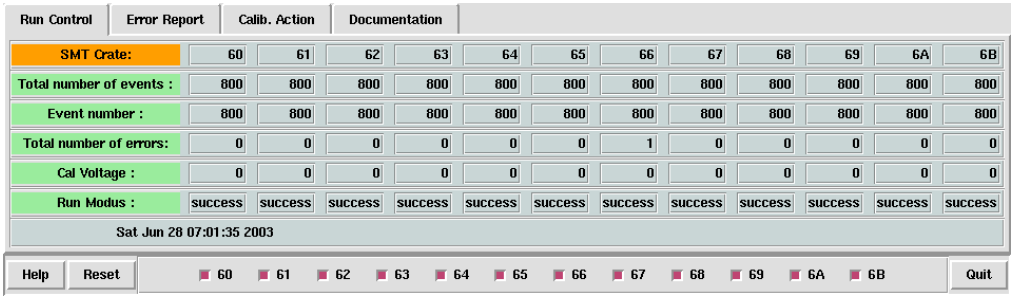


6. Start the Calibration run on the Taker. Follow the progress on the SDAQ GUI. The line “Run Modus” should change from “off” to “init”:

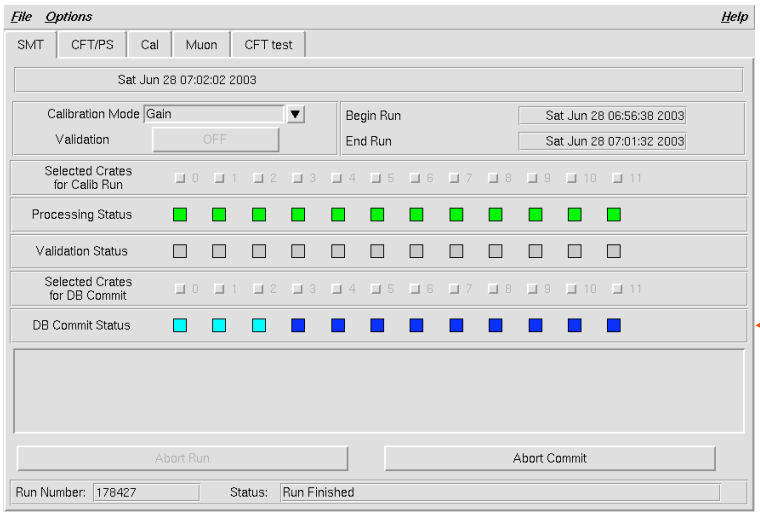


7. The “Run Modus” should then change to “ped”, “Total number of events” should read 800 and ”Event number” should steadily increase to 800. Once this is achieved the “Run Modus” should go from “db commit” to “success”. The final result should look like this:

SDAQ / Calibration



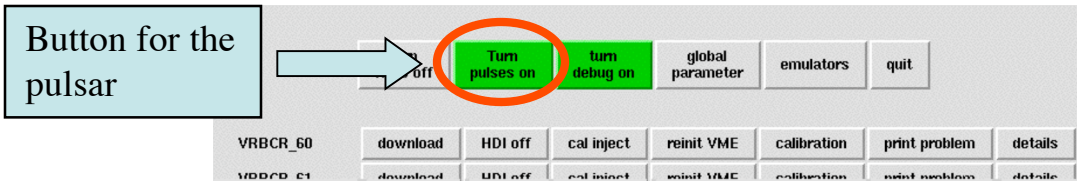
8. The Calibration Manager now receives data from the crate. The GUI looks like this:



Wait for Green (see next page)

9. At this point the data taking part is finished. The run has been automatically stopped by the Calibration Manager. However, it is important that the trigger is not "freed" in the Taker as long as the commit is not yet finished.

8. Start the SMT pulsar from the download GUI.



SDAQ / Calibration

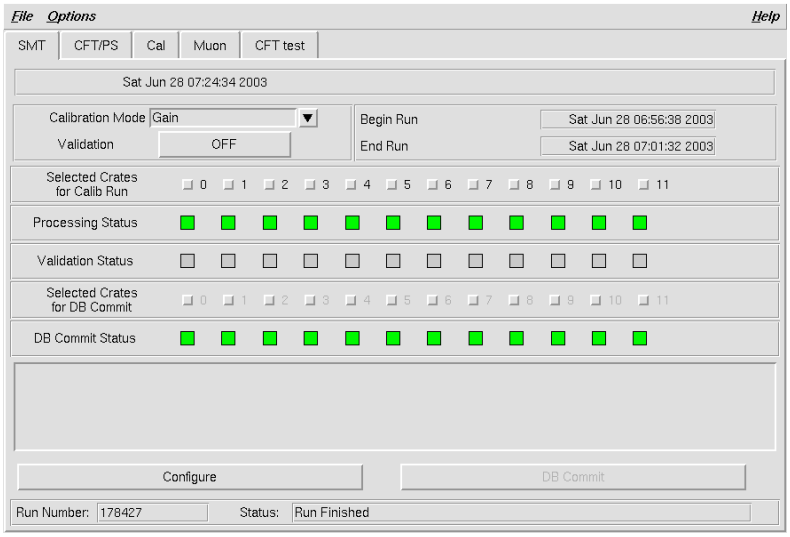
9. **Bring the HV down and turn it off.**

10. **Set the SVX parameters back to data taking mode:**

This is the configuration for physics data taking.

11. **Download the SMT with the new configuration.**

12. **Wait until all data is committed to the database:**



13. **Free the trigger in the Taker window and hand SMT back to the DAQ shifter for the global run.** Congratulations! We now have a new calibration run bagged.

SDAQ / Calibration

14. Make an entry in the logbook and in file ~d0smt/Calibration/CalibrationRuns.txt

15. Make a root tuple out of the calibration data. Go to the directory:

1. `cd /home/d0smt/smt_ped_tools_new/runs`
2. `../smt_ped_tools/scripts/rootFromRun #runnumber`
3. As summary you will see the number of strips extracted from the database when the process finishes. Sometimes it happens that the process doesn't exit gracefully. It then consumes loads of memory and CPU time. In this case try to kill the process with an interrupt (^C) or an explicit kill command.

SDAQ / Calibration Troubleshooting

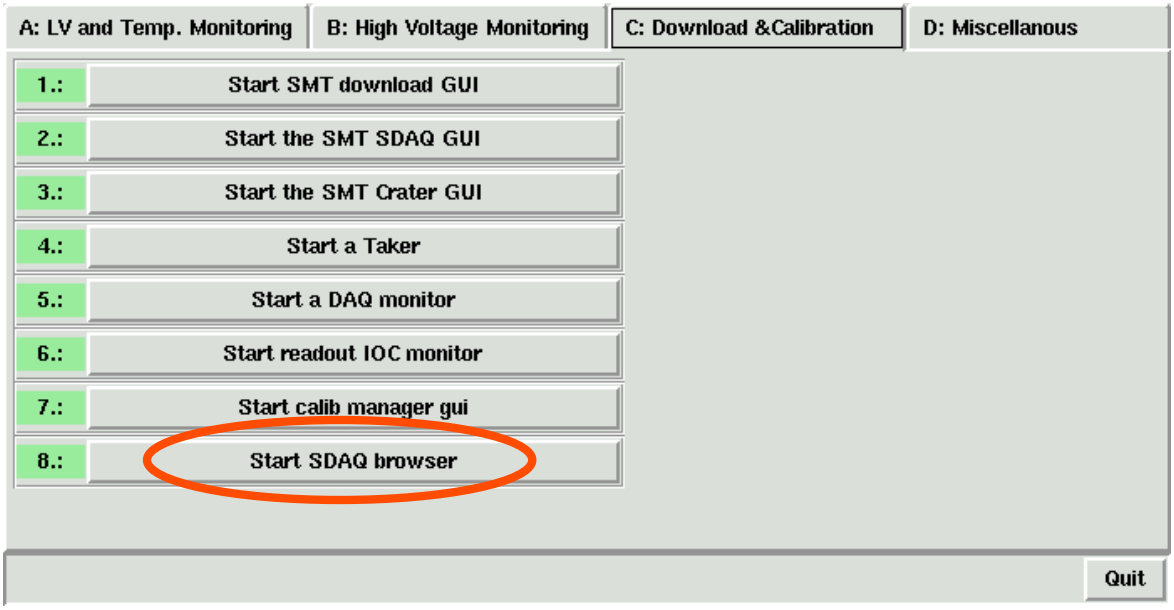
1. The typical problem is the status "error" in the status line of the SDAQ GUI. Abort the run from the Calibration Manager GUI. **Do not stop the run from the Taker.** Free the trigger (Taker), reboot or power cycle the corresponding crate and try again.
2. We had 2 occurrences where above error message would show up permanently for a random crates. The problem was fixed power cycling the 1553 controller crates in MCH3. **Caution: After power cycling those crates a download from scratch is necessary.** The 1553 controllers lose the memory of the power bits. Those need to be written again with a download. For that the HV must be off!
3. Sometimes crates are Front End Busy at the beginning of the "ped" stage. In that case a (few) sclinit may help (ask the DAQ shifter). It is advantageous when no other run is started/stopped during the calibration run.

SDAQ / Calibration Expert Guide

For Experts only:

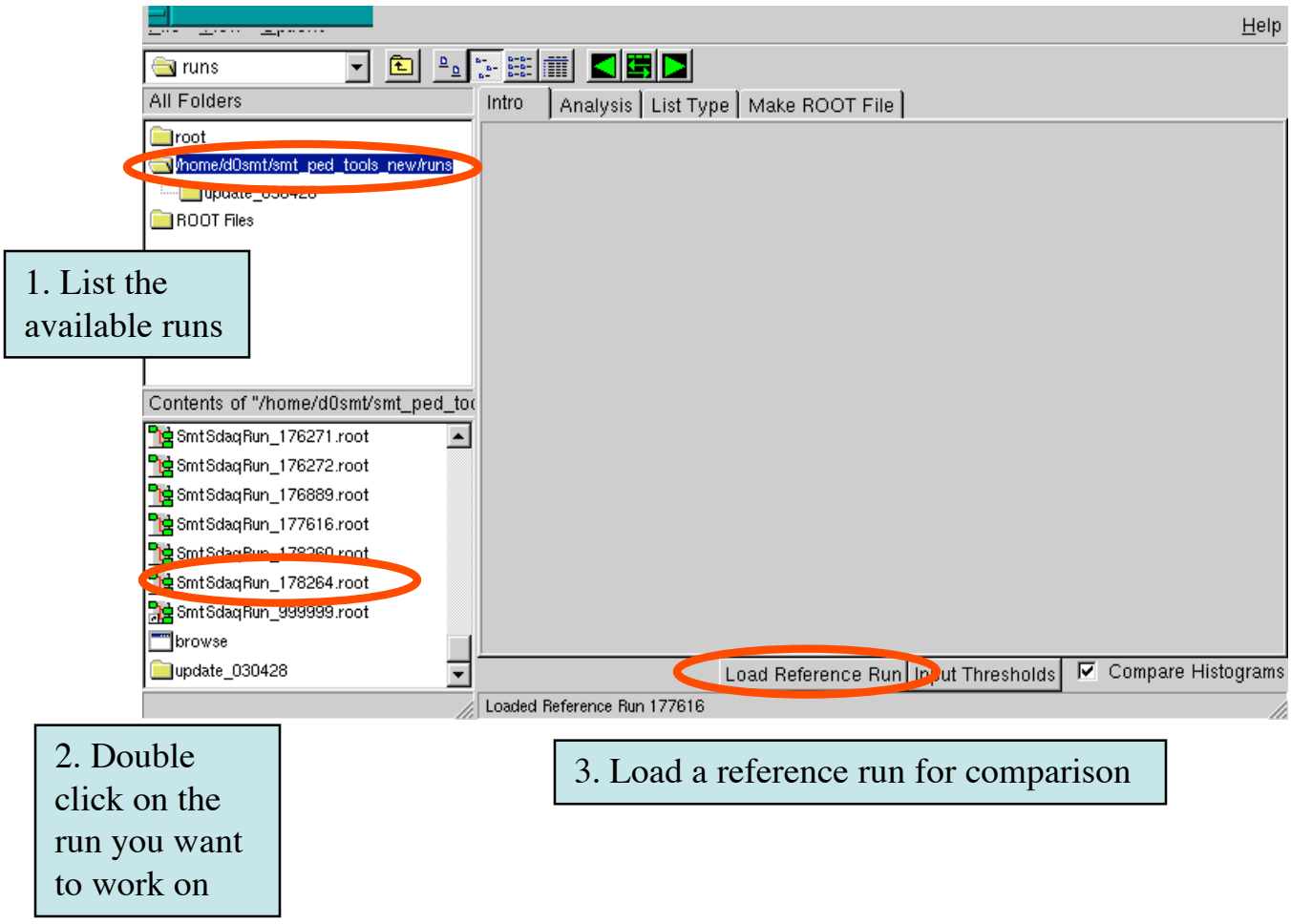
16. Process the data to make new thresholds.

1. Start the SDAQ browser from the All-GUIs-starter.



SDAQ / Calibration Expert Guide

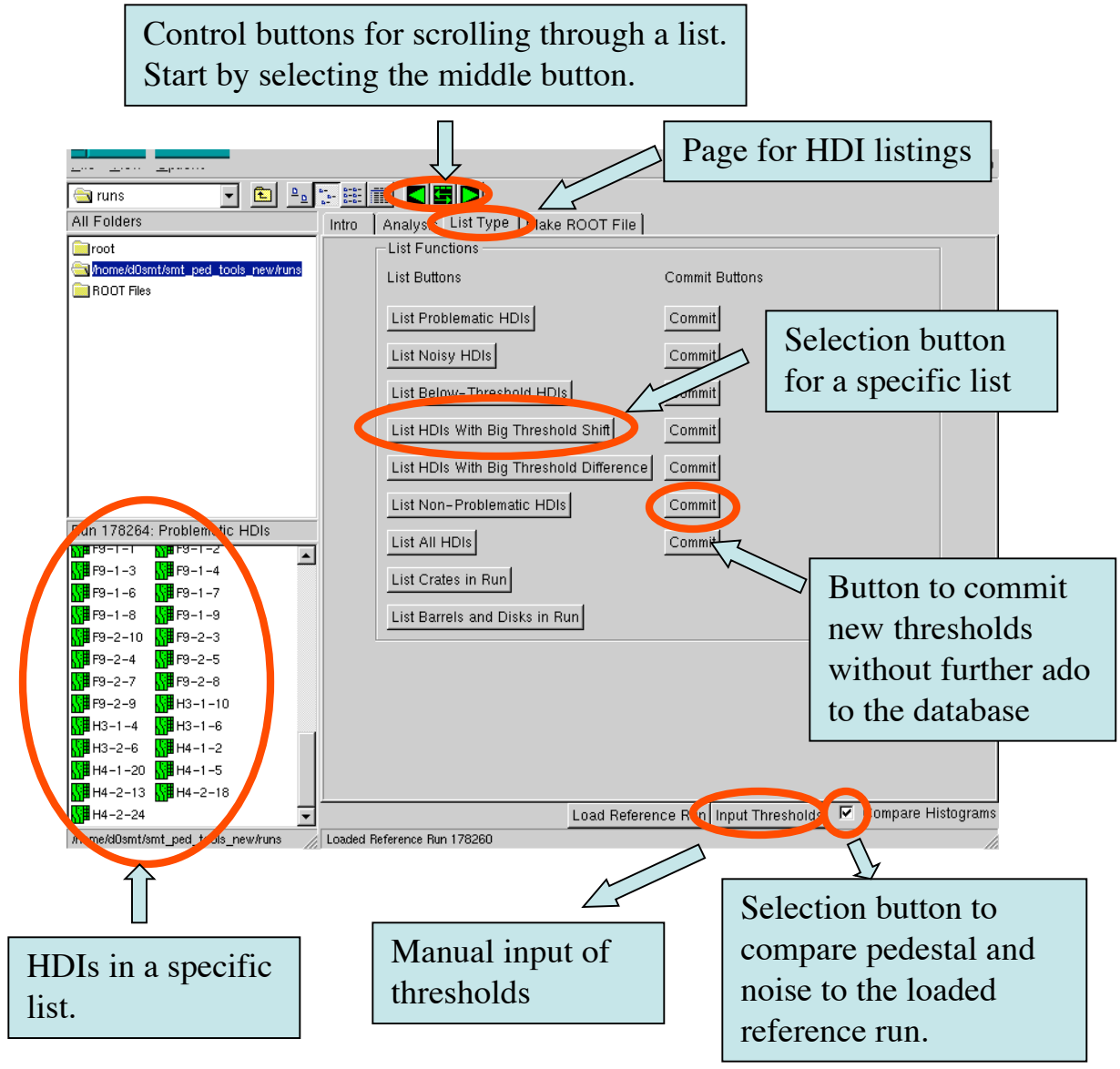
2. Load the SDAQ run you want to investigate. This is usually the most recent run. Watch the text window for error messages. Try again in case of problems.



3. Load the reference run. This is usually the last SDAQ run that was used for producing new thresholds. The SDAQ Browser has the ability to compare pedestal and noise for 2 different SDAQ runs.

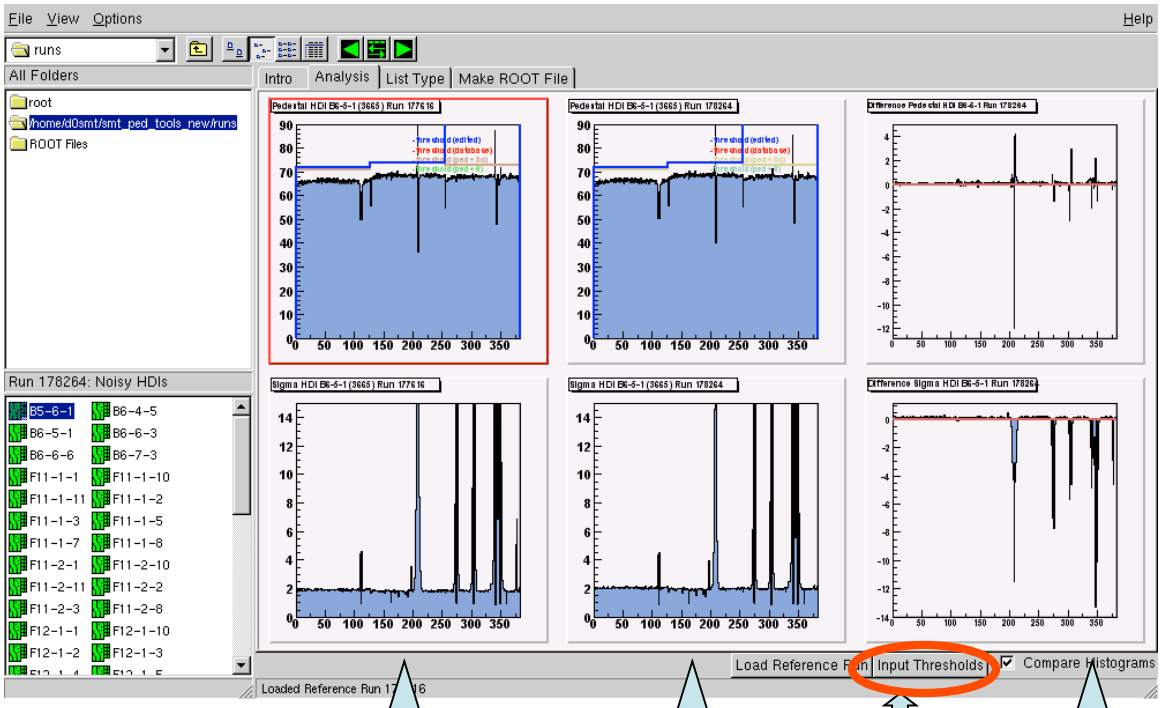
SDAQ / Calibration Expert Guide

4. List the problematic HDIs. The program calculates new thresholds from the pedestal and noise data. The SDAQ browser automatically identifies HDIs with different problems and groups them accordingly. One can either look at individual HDIs and decide what to do or implement the new thresholds for a whole group.

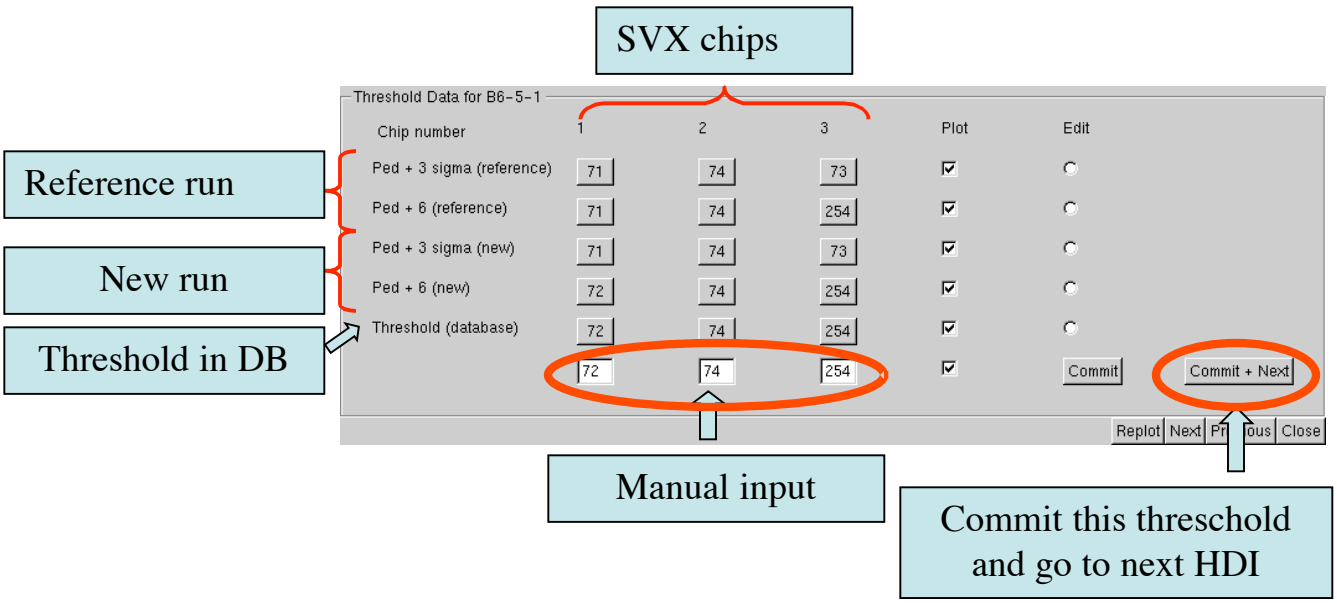


SDAQ / Calibration Expert Guide

5. Go through the list of HDIs with big threshold shift and add new thresholds to the database. Select “List HDIs With Big Threshold Shift”, start viewing by pressing the middle control button, and manipulate thresholds by selecting “Input Thresholds”.



SDAQ / Calibration Expert Guide

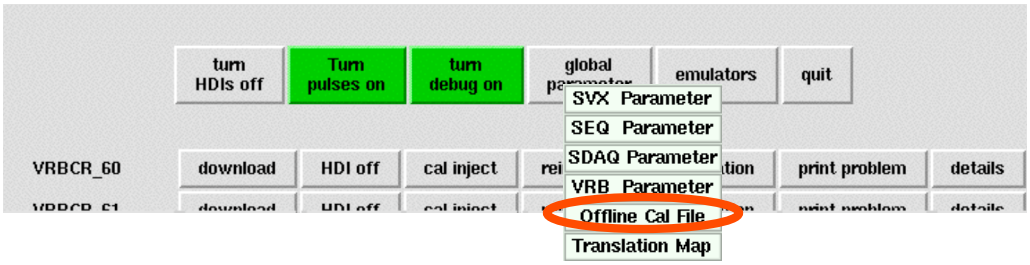


6. Go through the list of HDIs with many strips below threshold and add new thresholds to the database.
7. Commit new thresholds with big threshold difference to the database. There are 2 algorithms implemented to calculate the new threshold: average Pedestal + 6 ADC counts and average pedestal + 3 x average noise. We see a large difference between the methods for noisy HDIs. The automatic calculation for noisy HDIs is fairly good. We can therefore do a global commit for this group.
8. Commit new thresholds for noisy HDIs to the database.
9. Commit new thresholds for non-problematic HDIs to the database.

15. **Download the new thresholds.** It is probably best (but not necessary) to restart the download GUI for this.

SDAQ / Calibration Expert Guide

16. **Install the new thresholds for examine.** Select "Global Parameter" and "Offline Cal File" from a download GUI that you don't need for other purposes. This process takes a lot of time. For each of the crates a output file is written to `/online/data/smt/outcal_0x*.txt` These files need to be linked to `/online/data/smt/cal_0x*.txt` Edit the file `SmtConfiguration.rcp` in `/online/examines/pxx.xx.xx/smt_examine/smt_config/rcp/` accordingly.

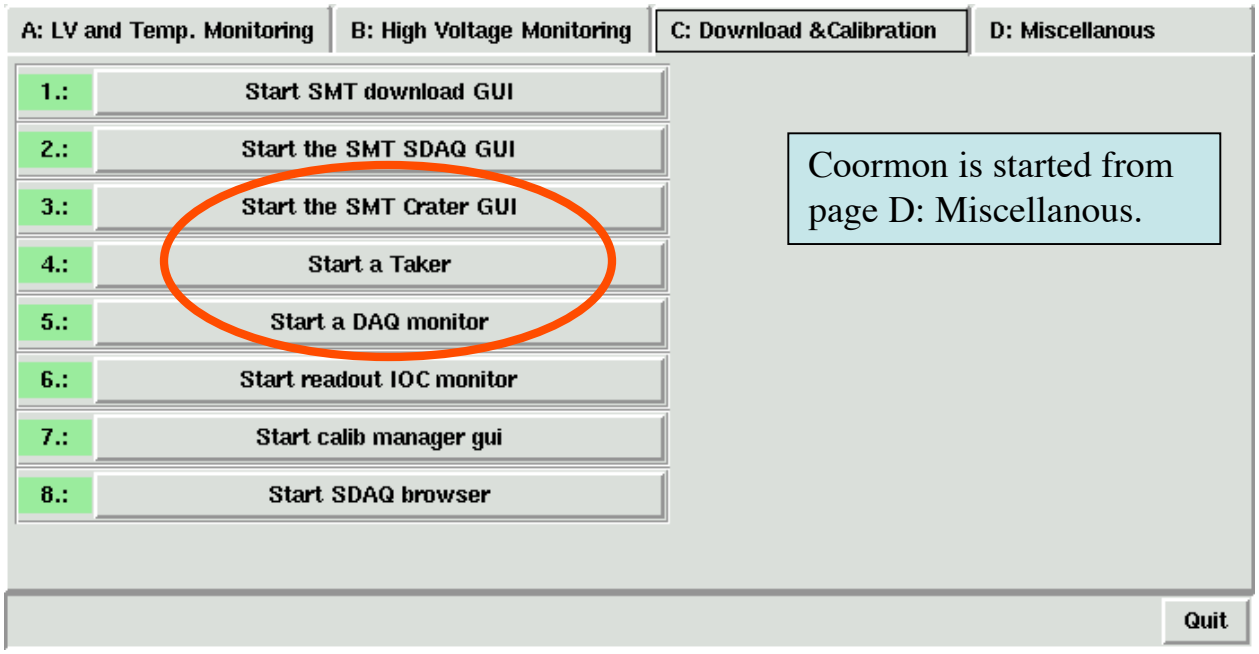


17. **Transfer the pedestal information to the offline database.** Follow the instructions in http://www-d0.fnal.gov/~yasuda/smt_transfer.html

PDAQ / Crater / Taker

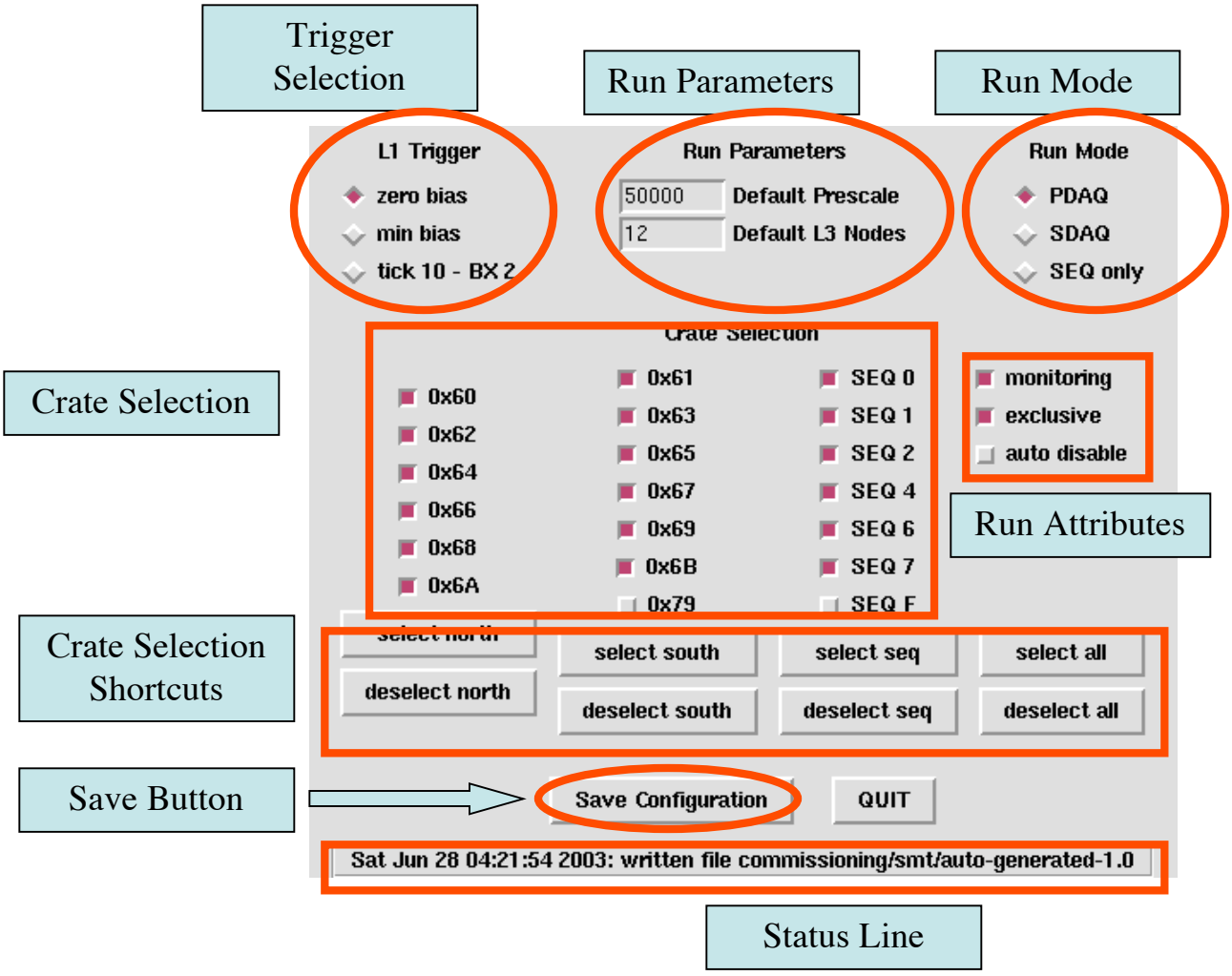
There are only few occasions where a SMT shifter needs to take a PDAQ run. Those are mostly special runs for investigating an SMT specific problem. With some justification you may also count a SEQ only run as PDAQ run. This kind of run does not need the L3 infrastructure. Data is not shipped to the front-end crates. Those runs are useful when SMT cannot be part of the global run or when there is a L3 problem and the SMT needs to be read out to keep the HDI currents stable.

The tools used to start and control a run are SMT Crater, Taker, Coormon and the DAQ Monitor. They are all started from the All-GUIs-starter:



SMT Crater

SMT Crater. This GUI is used to configure any of the runs that SMT needs.



SMT Crater

- **Run Mode:** The most important selection.
  1. **PDAQ:** For special runs where the data should go through L3 to tape. Prescale and number of L3 nodes should be adjusted to the needs of the run.
  2. **SDAQ:** This is the run type used for calibration.
  3. **SEQ only:** This run is mainly used to keep the HDI current when there is no global run or SMT does not participate in the global run. This run is especially useful during downloads, when preparing a calibration run. None of the VME readout crates should participate in the run. L3 is not used. This run is close to an SDAQ run.
- **Trigger Selection:** One can chose between 3 different L1 triggers:
  1. **Zero bias:** This is the default. The trigger is quasi randomly distributed (depends on the prescale factor) over any possible bunch crossing.
  2. **Min bias:** Any bunch crossing with interaction is triggered on.
  3. **Tick 10 – BX2:** This is the ticksel2 and triggers only on one specific tick, at the moment tick 10 corresponding to bunch crossing 2. Dan Edmunds can change the tick number easily.
- **Run Parameters:**
  1. The **prescale** should be adjusted according to the desired output rate. The zero bias L1 has a rate of 1.7MHz. The default prescale of 50000 gives an output rate of just above 30Hz. The prescale must not be a multiple of 3 or 59, otherwise the selected tick numbers are not quasi random. The prescale can be adjusted later from the Taker.
  2. The number of **L3 nodes** should be increased depending on how many crates are read out and whether SMT is zero suppressed or not. Talk to the DAQ shifter. If the load on the L3 is too high the readout can get stuck. The number of L3 nodes can be adjusted later from the Taker. The number of L3 nodes has no effect for SEQ only and SDAQ runs.

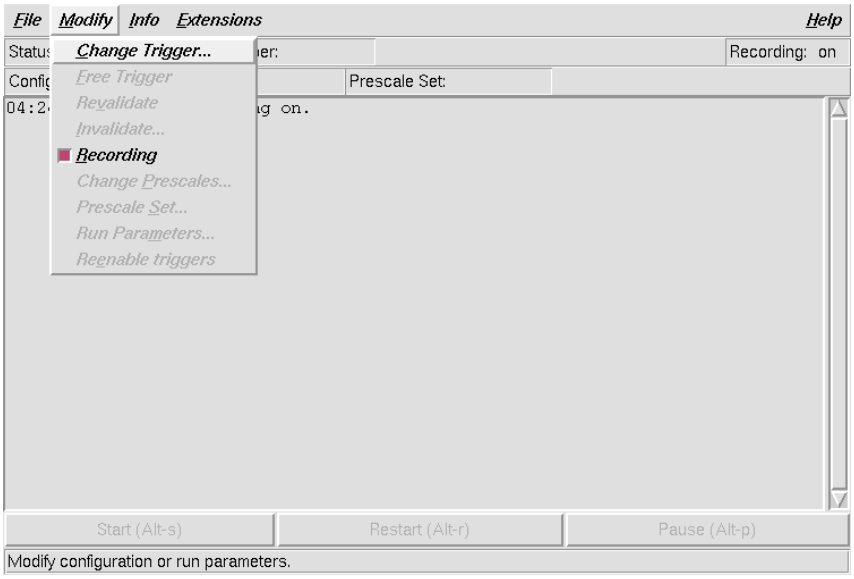
SMT Crater

- **Crate Selection:** Select here which crates should participate in the special run. Note that 1 SEQ crates corresponds to 2 VRB crates. When a VRB crate is selected the corresponding SEQ crate is selected automatically. If a SEQ only run is chosen the selection is done automatically. Note that crate 0x79 and the corresponding crate SEQ F are located in the test stand in MCH3. Don't use these crates under normal conditions.
- **Crate Selection Shortcuts:** Some buttons to make the crate selection quicker.
- **Run Attributes:**
  1. **Monitoring:** Adds a monitoring flag to PDAQ runs. The online monitoring is run in parallel on the readout crates.
  2. **Exclusive:** The selected crates are requested exclusively for this run. No other run using these crates can be configured. If a run is already configured with one of the selected crates then configuring the new run will fail. This flag should be set in most cases.
  3. **Auto disable**: This flag may be used to issue single triggers. The run is automatically disabled after a trigger fired. The run can be enabled for a single trigger from the Taker. Currently this function has no use.
- **Save Button:** Writes the configuration file.
- **Status Line:** Gives the date, time and location of the last configuration file written out. The location is used again for the Taker.

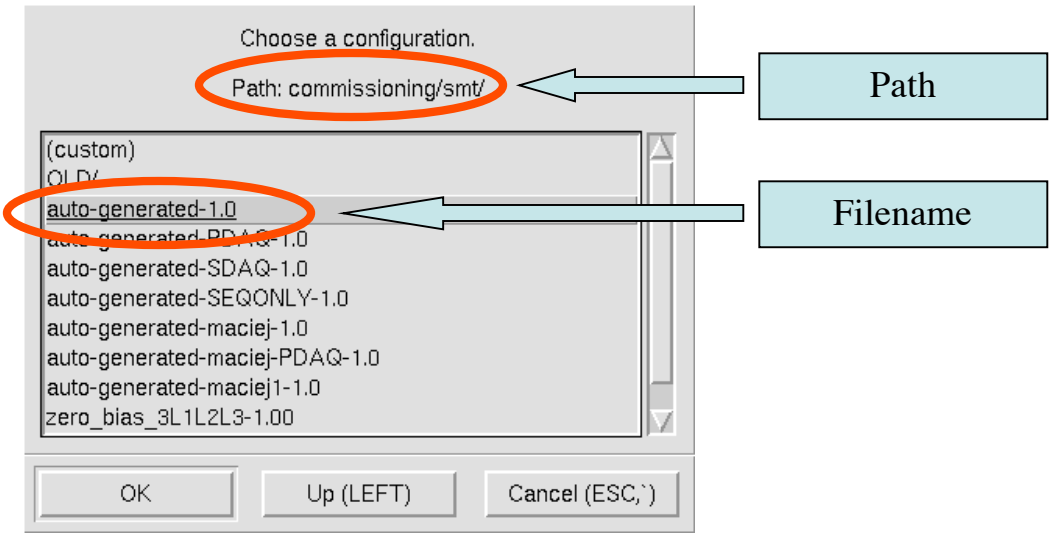
Taker

Runs are started and controlled from the Taker GUI:

1. Load the configuration file created with SMT Crater. Select <Modify>→ <Change Trigger…>



2. Select the path and filename that was stated in the SMT Crater Status Line. The current values are below. Select <OK>. Check the Taker window for error messages.



Taker

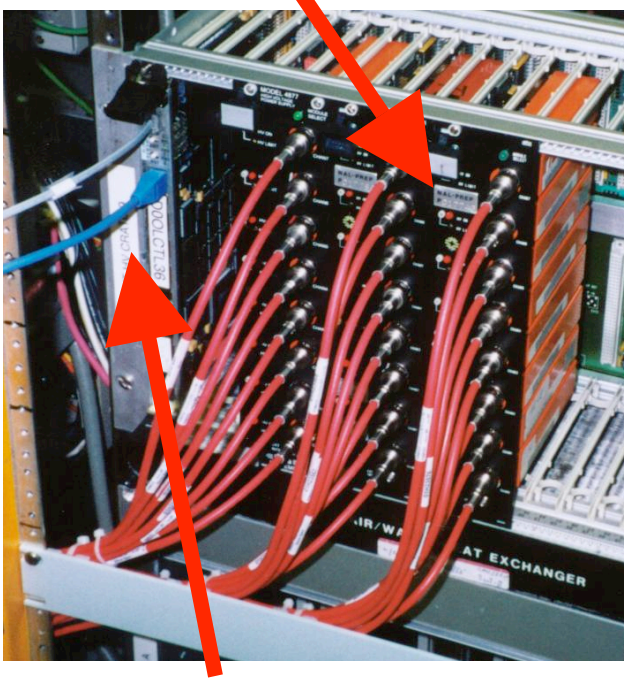
3. Make sure that recording is switched on/off according to your needs (Menu <Modify>). Without recording on (default) the data will not be written to tape.
4. You may change the prescales or the number of L3 nodes (<Modify> → <Run Parameters>).
5. Start the run with the <Start> button at the bottom of the Taker window.
6. Make sure that the number of events written into the status line at the bottom of the Taker window is increasing.
7. Stop the run when the desired number of events is reached.
8. Free the trigger from the <Modify> Menu.

High Voltage

Page Section

Description of the HV System

The high voltage (HV) system is used to deplete/bias the sensors used in the SMT. The power supplies used for this can be found in MCH2. There are a total of 440 HV pods of the BiRa 4877 type in three different racks and 10 crates.



A HV crate consists of a power PC (PPC) for monitoring and control and up to 6 HV modules, each with 8 HV pods. The HV is distributed via a system of fanout and breakout boxes and the interface boards

SMT sensors are grouped together in HV groups, which can consist of up to four sensors. In the case of double-sided sensors, a positive and a negative HV pod are serving the HV group.

The HV pods can be monitored and controlled by a number of GUI's in the control room. It is normally not necessary to take any action in MCH2.

Shifter Tasks

The SMT shifter is responsible for the stable operation of the SMT HV system. This encompasses:

1. Ramp-up and ramp-down of high-voltage at appropriate times.
2. Monitoring of high voltage parameters.
3. Monitoring of and reactions on HV alarm conditions.
4. Reset of HV trips.
5. Documentation of the current HV configuration.
6. Documentation of any HV related problems.

Most of these tasks can be done by using a set of GUI's and scripts that are described later.

When to Ramp HV Up

HV can be turned **ON** if the detectors are powered under two conditions:

1. No Beam: If there is no beam of any kind in the Tevatron, then it is safe to bias powered detectors. Verify with the shift captain that there will be no beam for at least 10 minutes, and that MCR will call before injecting beam. Biasing is typically done at such times for commissioning or calibration studies like SDAQ runs.
2. Clean, Stable Beam: This is the case *after* shot setup, injection and scraping have been *successfully* completed. Check with the shift captain to confirm the status of the beam. Normally the shift captain will give the command to start ramping up the HV.

When to Ramp HV Down

The time needed to ramp down the high voltage should be a little more than 3 minutes.
HV must be turned **OFF** *before*:

1 Shot Injection: The detectors cannot be biased when beam is first put into the Tevatron. During shot setup, check with the shift captain to ascertain the accelerator schedule, and start turning off the HV at least 4 minutes before injection.

2 End of Store: HV must be turned off before the beam is dumped. Again, check the schedule with the shift captain, and start turning the HV off several minutes before the end of store. Normally the shift captain will give the command to ramp down the high voltage.

3 Turning on the detector: Whenever a HDI has to be switched on (e.g. after a LV trip), the high voltage corresponding to this HDI has to be ramped down and switched off.

4 Beam Studies: No HV during any accelerator studies.

5 Beam manipulation during stores that might result in higher losses (e.g. rescraping).

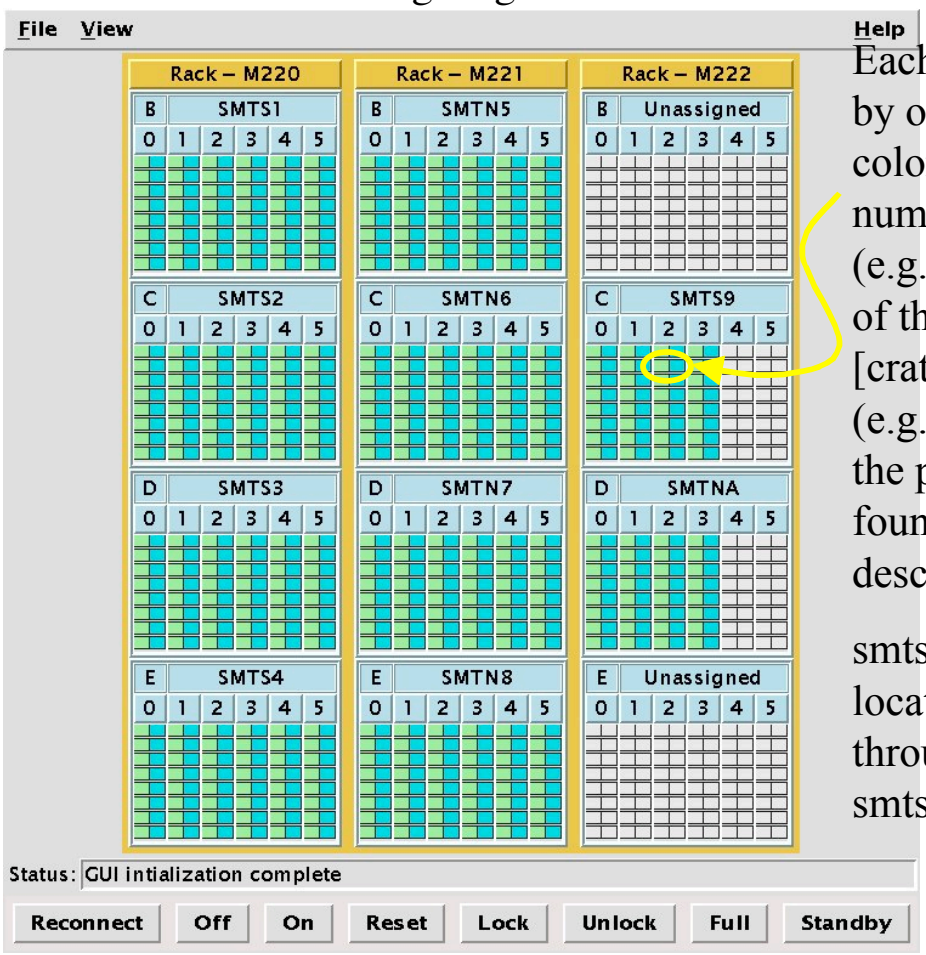
6 Work on HV system: obvious...

Global HV Monitoring & Control

To run the global HV GUI:
Open a terminal window on the upper SMT monitor, and then

```
> setup d0online
> cd /online/config/smt/hv
> ./smt.hvg &
```

Or from the "startgui" gui B.3.



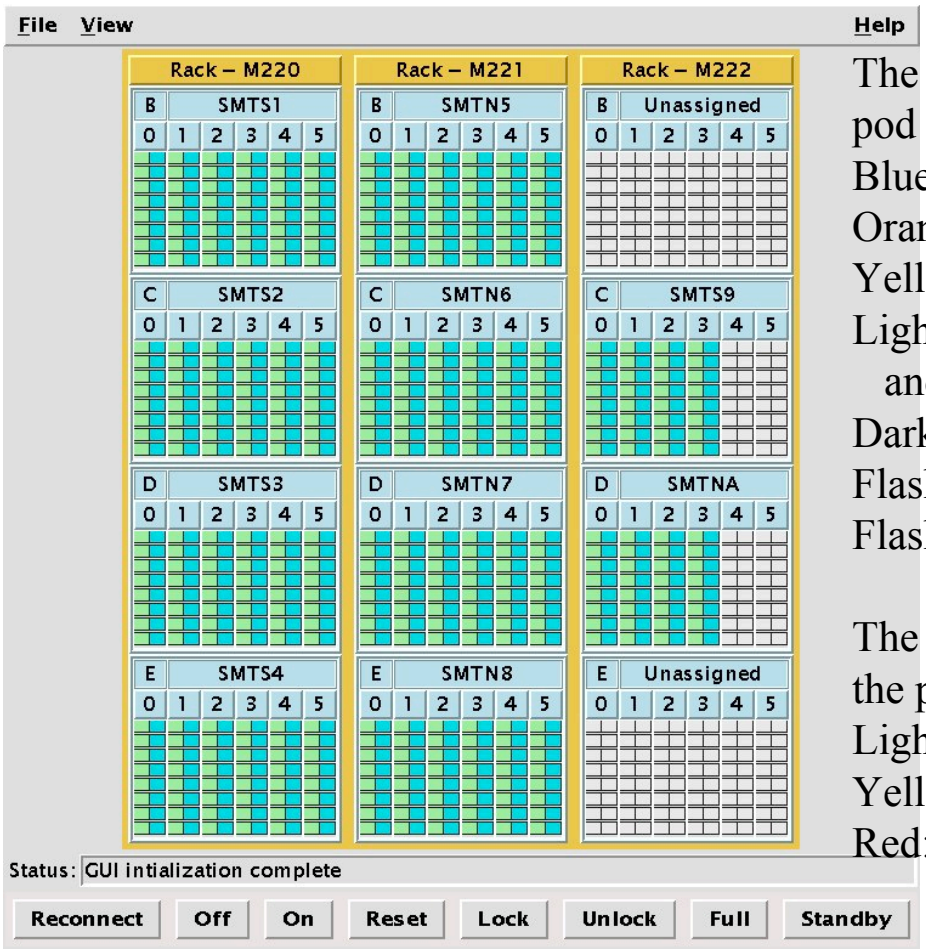
This is a representation of all the HV crates in MCH2.

Each HV pod is represented by one of eight pairs of colored boxes under a module number (e.g. “2”) in a crate (e.g. smts9). A pod’s name is of the form [crate][module][pod][polarity] (e.g. the circled pod is 926P, the polarity (P/N) can be found in the Channel HV gui described later).

smts1 through smts4 are located in rack M220, smtn5 through smtn8 in M221 and smts9 & smtnA in M222.

Remark: There is no crate B in M222, although there is a power supply for it that is not used. It might be possible that the DAQ shifter complains about this power supply, since it is in his checklist. It does not affect any SMT operations if this power supply is switched off.

Global HV Monitoring & Control



The right colored box for each pod indicates the pod status:
Blue: turned OFF
Orange: turned ON
Yellow: ramping
Light Green: OK, ramped up and holding at set voltage
Dark Green: locked
Flashing Red: tripped
Flashing Black: disabled

The left colored box indicates the pod's alarm status:
Light Green: OK
Yellow: Minor Alarm
Red: Major Alarm

Standby: set and ramp all pods to 0 V

Full: set and ramp all pods to 100%

Unlock: unlock locked pods

Lock: lock pods at current settings

Reset: reset tripped pods

On: turn on pods

Off: turn off pods

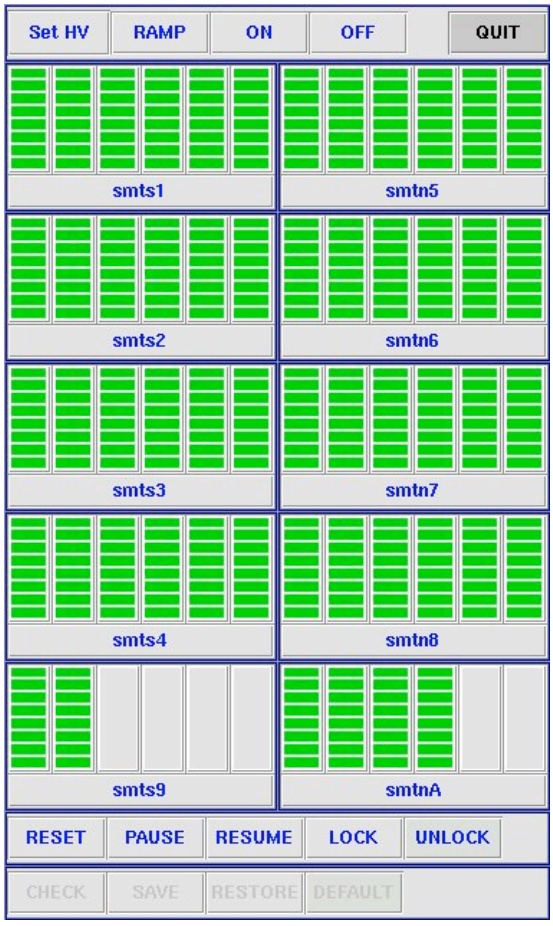
Reconnect: reconnect to the monitoring process

Old Global HV Monitoring & Control

To run the old global HV GUI:
Open a terminal window on the upper SMT monitor, and then

```
> setup d0online
> cd /online/config/smt/hv/OLD
> ./hv_det_mod.py smtAll.hvd &
```

Or from the "startgui" gui B.1.



This is a representation of all the HV crates in MCH2.

Each colored rectangle represents one HV pod, and each crate is designated by its name (e.g. smts1).

smts1 through smts4 are located in rack M220, smtn5 through smtn8 in M221 and smts9 & smtnA in M222.

Note: Global HV operations are preferably carried out using the new Global HV GUI (previous section). The reason that the old Global HV GUI must be running is to provide SMT HV status signals to the Control Room LED status board.

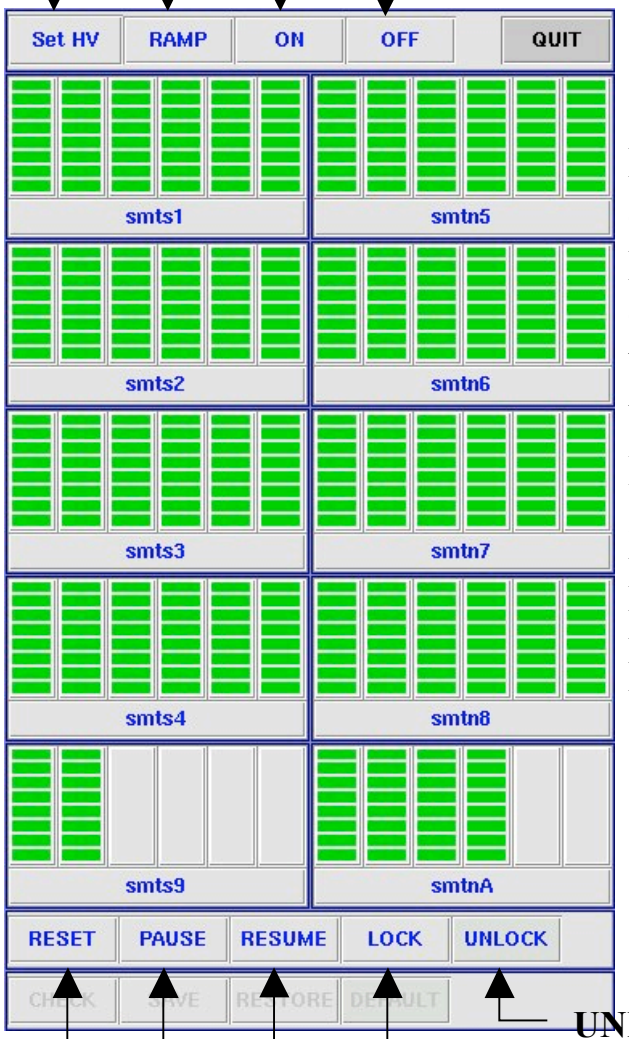
Old Global HV Monitoring & Control

Set HV: pull-down menu to define set voltages

RAMP: start ramping pods to set voltages

ON: turn on pods

OFF: turn off pods



Pod states are indicated by color:
Blue: turned OFF
Orange: turned ON
Yellow: ramping
White: paused
Light Green: OK, ramped up and holding at set voltage
Dark Green: locked
Flashing Red: tripped
Flashing Black: disabled

UNLOCK: unlock locked pods

LOCK: lock pods at current settings

RESUME: resume paused ramping

PAUSE: pause ramping

RESET: reset tripped pods

Global HV Ramping Procedure

1. Start the Global HV crate GUI

   > setup d0online
   > cd /online/config/smt/hv
   > ./smt.hvg &
   Or from the "startgui" gui B.3.

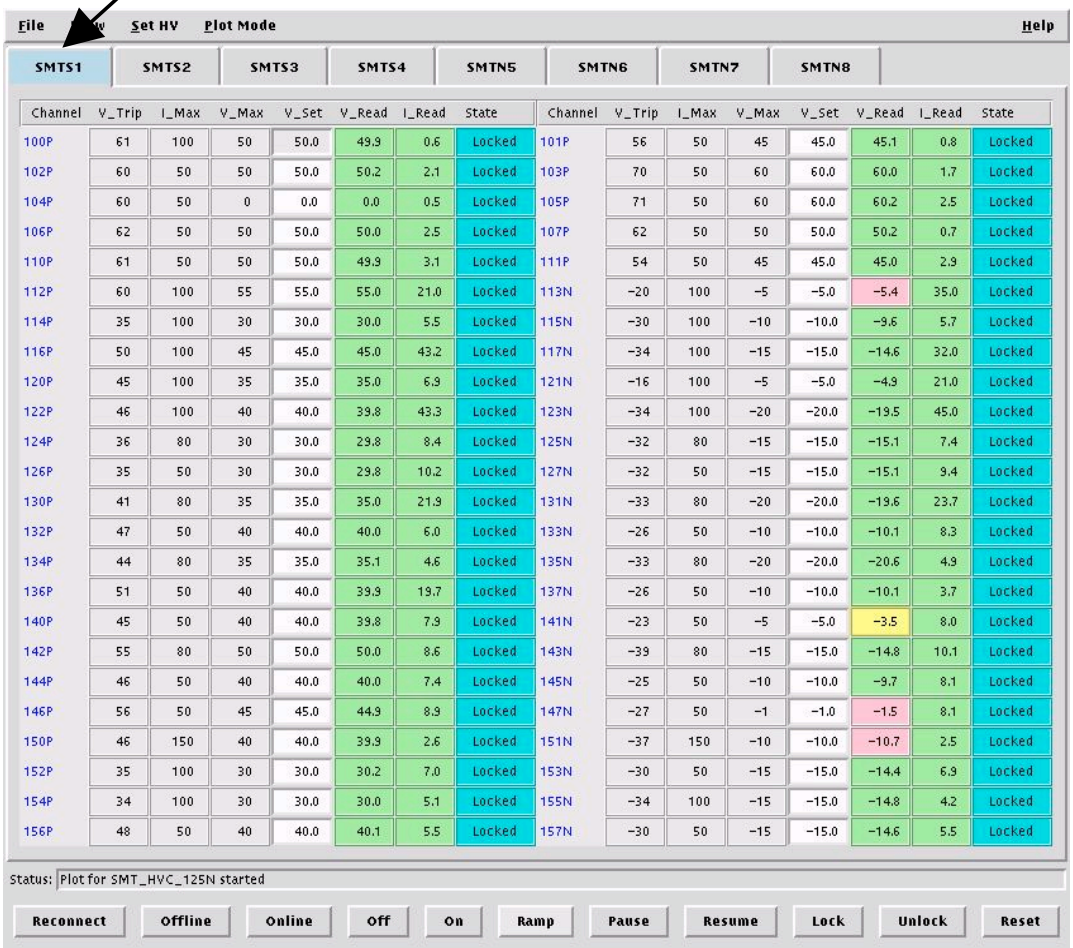
2. Ramp-Up:
   a) Turn on all pods: click the **On** button
   b) Check whether all pods go into the ON-state, or if any are tripped. If any pods are tripped, reset the trips by clicking the **Reset** button.
   c) Start ramping to full voltage: click the **Full** button
   d) If any pods trip (i.e. start flashing red), click the **Reset** button immediately, and then click **Full** again.
   e) When all pods are fully ramped and holding (i.e. light green), lock the pods: click the **Lock** button.

3. Ramp-Down:
   a) Unlock all pods: click the **Unlock** button
   b) Start ramping to 0 V: click the **Standby** button
   c) When all pods have ramped down to less than 5 V, turn off the pods: click the **Off** button.

Channel HV Monitoring & Control

The Channel GUI is particularly useful for working with individual pods and troubleshooting (resetting trips, tracking currents, etc.).

A page for each HV crate



Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State	Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State
100P	61	100	50	50.0	49.9	0.6	Locked	101P	56	50	45	45.0	45.1	0.8	Locked
102P	60	50	50	50.0	50.2	2.1	Locked	103P	70	50	60	60.0	60.0	1.7	Locked
104P	60	50	0	0.0	0.0	0.5	Locked	105P	71	50	60	60.0	60.2	2.5	Locked
106P	62	50	50	50.0	50.0	2.5	Locked	107P	62	50	50	50.0	50.2	0.7	Locked
110P	61	50	50	50.0	49.9	3.1	Locked	111P	54	50	45	45.0	45.0	2.9	Locked
112P	60	100	55	55.0	55.0	21.0	Locked	113N	-20	100	-5	-5.0	-5.4	35.0	Locked
114P	35	100	30	30.0	30.0	5.5	Locked	115N	-30	100	-10	-10.0	-9.6	5.7	Locked
116P	50	100	45	45.0	45.0	43.2	Locked	117N	-34	100	-15	-15.0	-14.6	32.0	Locked
120P	45	100	35	35.0	35.0	6.9	Locked	121N	-16	100	-5	-5.0	-4.9	21.0	Locked
122P	46	100	40	40.0	39.8	43.3	Locked	123N	-34	100	-20	-20.0	-19.5	45.0	Locked
124P	36	80	30	30.0	29.8	8.4	Locked	125N	-32	80	-15	-15.0	-15.1	7.4	Locked
126P	35	50	30	30.0	29.8	10.2	Locked	127N	-32	50	-15	-15.0	-15.1	9.4	Locked
130P	41	80	35	35.0	35.0	21.9	Locked	131N	-33	80	-20	-20.0	-19.6	23.7	Locked
132P	47	50	40	40.0	40.0	6.0	Locked	133N	-26	50	-10	-10.0	-10.1	8.3	Locked
134P	44	80	35	35.0	35.1	4.6	Locked	135N	-33	80	-20	-20.0	-20.6	4.9	Locked
136P	51	50	40	40.0	39.9	19.7	Locked	137N	-26	50	-10	-10.0	-10.1	3.7	Locked
140P	45	50	40	40.0	39.8	7.9	Locked	141N	-23	50	-5	-5.0	-3.5	8.0	Locked
142P	55	80	50	50.0	50.0	8.6	Locked	143N	-39	80	-15	-15.0	-14.8	10.1	Locked
144P	46	50	40	40.0	40.0	7.4	Locked	145N	-25	50	-10	-10.0	-9.7	8.1	Locked
146P	56	50	45	45.0	44.9	8.9	Locked	147N	-27	50	-1	-1.0	-1.5	8.1	Locked
150P	46	150	40	40.0	39.9	2.6	Locked	151N	-37	150	-10	-10.0	-10.7	2.5	Locked
152P	35	100	30	30.0	30.2	7.0	Locked	153N	-30	50	-15	-15.0	-14.4	6.9	Locked
154P	34	100	30	30.0	30.0	5.1	Locked	155N	-34	100	-15	-15.0	-14.8	4.2	Locked
156P	48	50	40	40.0	40.1	5.5	Locked	157N	-30	50	-15	-15.0	-14.6	5.5	Locked

To run this GUI: > setup d0online

> cd /online/config/smt/hv

> ./smt.hvc

Or from the "startgui" gui B.2.

Channel HV Monitoring & Control

State: shows current state of the HV pod

I_Read: bias current reading

V_Read: bias voltage reading

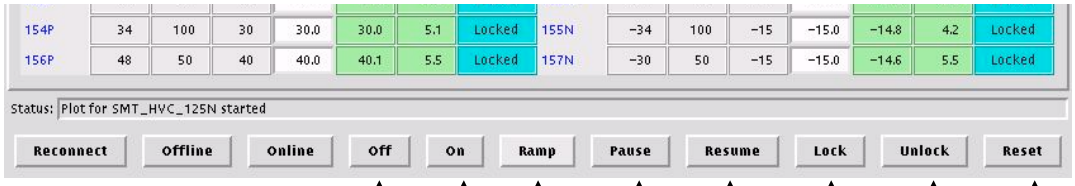
V_Set: bias voltage set point

V_Max: bias voltage maximum
(i.e. bias voltage for full depletion)

I_Max: bias current trip point

V_Trip: bias voltage hardware trip point

Channel: HV pod name, last character gives polarity (P/N)



Off: turn off pods

On: turn on pods

Ramp: start ramping

Pause: pause ramping

Resume: resume paused ramping

Lock: lock pods at current setting

Unlock: unlock locked pods

Reset: reset tripped pods

Channel HV Monitoring & Control
States & Actions

Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State	Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State
100P	62	100	50	50.0	49.9	2.3	Locked	101P	55	50	45	45.0	45.0	-0.9	Locked
102P	60	100	50	50.0	50.1	2.1	Locked	103P	70	50	60	60.0	59.8	1.5	Locked
104P	60	50	0	0.0	0.1	0.5	Locked	105P	71	50	60	60.0	60.1	2.5	Locked
106P	62	100	50	50.0	50.0	2.4	Locked	107P	62	50	50	50.0	49.7	0.6	Locked
110P	60	50	50	50.0	49.9	3.1	Locked	111P	54	50	45	45.0	45.0	3.0	Locked
112P	60	100	55	55.0	54.9	22.4	Locked	113N	-20	100	-5	-5.0	-4.2	33.0	Locked
114P	35	100	30	30.0	29.2	5.4	Locked	115N	-30	100	-10	-10.0	-9.4	5.7	Locked
116P	50	100	45	45.0	44.7	42.1	Locked	117N	-34	100	-15	-15.0	-14.3	31.7	Locked
120P	45	100	35	35.0	35.2	6.7	Locked	121N	-16	100	-5	-5.0	-4.5	20.8	Locked
122P	46	130	40	40.0	39.4	48.2	Locked	123N	-34	130	-20	-20.0	-19.3	50.3	Locked
124P	36	80	30	30.0	29.3	5.0	Locked	125N	-32	80	-15	0.0	0.3	-0.6	Off
126P	35	50	30	0.0	11.4	0.5	Paused	127N	-32	50	-15	0.0	12.9	0.1	CX OC
130P	41	80	35	35.0	21.5	22.2	Ramp	131N	-33	80	-20	0.0	1.5	6.8	On
132P	47	50	40	40.0	38.0	4.1	Locked	133N	-26	50	-10	0.0	1.2	3.5	Holding
134P	44	80	35	35.0	34.2	4.2	Locked	135N	-33	80	-20	-20.0	-19.6	4.8	Locked

Off: turned off, options from this state are:
- **On**: turn on the pod
- **Disable**: disable the pod

On: turned on but not ramped, options from this state are:
- **Off**: turn off the pod
- **Ramp**: ramp the pod to **V_Set**

Ramp: ramping to **V_Set**, options from this state are:
- **Off**: turn off the pod
- **Pause**: pause the ramping

Paused: ramping has paused, options from this state are:
- **Off**: turn off the pod
- **Resume**: resume ramping to **V_Set**

Holding: ramping to **V_Set** completed, options from this state are:
- **Off**: turn off the pod
- **Ramp**: ramp to **V_Set**
- **Lock**: lock the pod at its current setting

Locked: locked at current setting, options from this state are:
- **Unlock**: unlock the pod

CX OC/CX OV/CX: tripped (overcurrent/overvoltage/group-trip), options from this state are:
- **Reset**: reset the pod to **On**

Disabled: disabled, options from this state are:
- **Enable**: enable the pod

Pod states can be changed globally using the buttons at the bottom of the GUI, or individually by clicking on a pod's **State** box.

Underdepletion Script

Some of the SMT sensors can't hold the full bias voltage they were originally designed for. These devices can be biased only to a smaller fraction of the original V_max. These fractions have already been taken into account when setting the current V_max-values. To keep track of underdepleted devices, there is a script that prints out a list of these.

This script is automatically run every time a Begin Run checklist or a Configuration Change checklist are entered into the logbook.

The script can be run manually by typing:

```
> setup d0online
> cd ~/monitoring
> ./list_underdepleted_hdi.py
```

A typical output of the underdepletion script is shown on the next page.

Warning: The underdepletion script does not check whether a F6-HDI is enabled or not. In case of a switched off F6-HDI, the corresponding F8-HDI is without bias as well, since only the F6'ers receive the bias for a F-wedge.

Underdepletion List

List of underdepleted HV pods as of Sun Apr 21 16:08:43 2002
(listed are only sensors that are underdepleted by 5V or more)

HDI	planned deltaV(V)	current deltaV(V)	depleted to	Comment
H3-1-21	60	0	0% / 0%	known
H3-2-21	60	0	0% / 0%	known
H4-1-22	80	71	89% / 110%	known
H4-2-22	80	71	89% / 110%	known
F12-2-8	80	63	79% / 98%	known
H3-2-11	60	23	39% / 52%	known
F6-2-5	50	42	85% / 122%	known
F6-2-7	50	42	85% / 122%	known
H1-1-6	80	72	90% / 111%	known
H1-2-6	80	72	90% / 111%	known
H2-1-22	75	66	88% / 110%	known
H2-2-22	75	66	88% / 110%	known
H1-1-18	60	52	87% / 116%	known
H1-2-18	60	52	87% / 116%	known
F4-2-4	80	71	89% / 110%	known
H2-1-24	60	47	79% / 105%	known
H2-2-24	60	47	79% / 105%	known
H1-1-23	85	67	78% / 95%	known
H1-2-23	85	67	78% / 95%	known
H1-1-17	80	68	85% / 105%	known
H1-2-17	80	68	85% / 105%	known
H1-1-13	60	22	38% / 51%	known
B3-4-1	70	46	67% / 85%	known
B6-7-10	46	34	75% / 112%	known
B5-3-1	66	33	51% / 66%	known
B5-8-11	46	33	73% / 109%	known
H3-1-19	80	55	69% / 85%	known
H3-2-24	80	70	88% / 108%	known
H3-1-24	80	23	29% / 36%	known
H3-2-12	60	30	50% / 67%	known
F9-2-8	80	73	92% / 113%	known
H3-2-19	80	56	71% / 87%	known
H3-1-12	60	22	37% / 50%	known
H3-2-18	60	22	38% / 51%	known
F6-2-3	50	39	78% / 112%	known
F6-2-6	50	23	46% / 66%	known
B3-5-3	50	21	42% / 61%	known
H2-2-20	60	17	29% / 39%	known

number of slightly underdepleted sensors (between 5V and 10V below originally planned deltaV)
ladders: 0
F-wedges: 4
H-wedges: 9
number of significantly underdepleted sensors (more than 10V below originally planned deltaV)
ladders: 5
F-wedges: 3
H-wedges: 17
WARNING: This list doesn't include switched off F6-HDI's.. In this case the corresponding F8 is not biased as well...

HV Alarms & Alarm Display

The SMT HV system is connected to the Significant Event System, which means that alarms are being sent if the voltages or currents are exceeding normal bounds.

These alarms can be monitored using the alarm-display. You can start the SMT alarm display by typing:
> setup d0online
> start_alarm_display -c /home/d0smt/smt.ses &
Or from the "startgui" gui D.3.

File View Settings Help

Group Name	MAJOR	MINOR	INVALID	DISABLED	GOOD
HV	397	899	0	0	0
LV	0	2	2	0	596
IB	0	0	0	0	0
Occupancy	0	0	0	0	0
Dead	0	0	0	0	0
all	397	901	41	0	817

Status: Connection to server opened

Each of the buttons in this GUI contains the number of alarms at the different severity levels for the corresponding row. The different alarm-levels are the following (alarms other than those in row 'HV' are not described here):

Major alarms:
There is a problem that has to be fixed. For the high voltage, this could mean one of the following things:

- HV off: There are ~400 major HV alarms when the HV is turned off. They are voltage alarms for pods for which V_max is greater than ±5V.
- HV trip: A HV pod has tripped of for some reason. In this case you will see in total 4 alarms per tripped pod in the alarm column because of linked alarms.
- Bias-current is very close to the trip-point (less than 5uA).
- Voltage is larger than V_max+5V
- Voltage is smaller than V_max-5V

A major alarm from a HV trip will also pause a run. A message will come via the speakers at the DAQ-shifters console indicating that the run is being paused.

HV Alarms & Alarm Display

Minor alarms:

This is a warning that something might be wrong and the corresponding channel should be monitored closely. For the HV, this can mean one of the following things:

- HV off: There are ~900 minor HV alarms when the HV is turned off. 864 are related to the *state* of being **OFF** (two alarms for each of the 432 pods). The rest are minor voltage alarms for pods for which V_max is within ±5V.
- Slightly too high bias-current (within 10uA of trip-point).
- Voltage is larger than V_max+3V
- Voltage is smaller than V_max-3V

Invalid alarms:

A read or a write has failed. (Not yet seen for HV alarms !)

Disabled Alarms:

It is possible to disable a alarm. It will then not show up again anywhere else than in the 'Disabled' column, unless it is re-enabled. Do not disable an alarm without a reason.

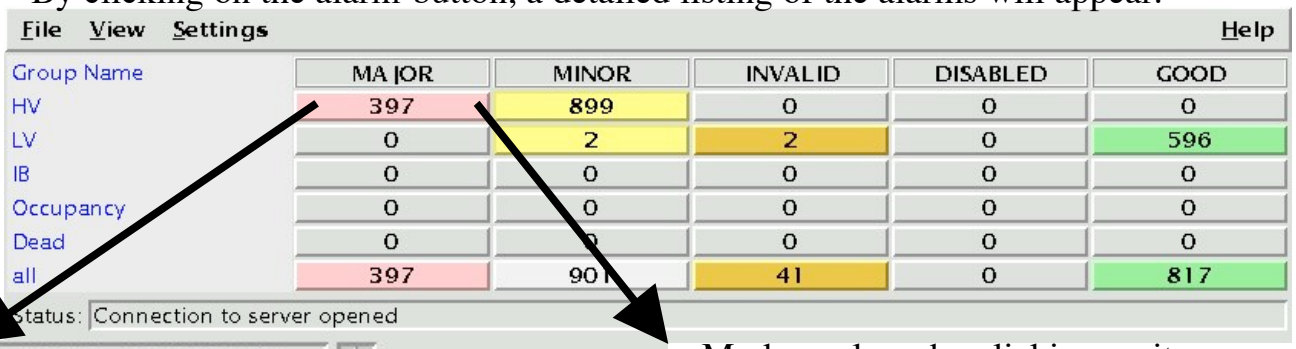
Good Alarms:

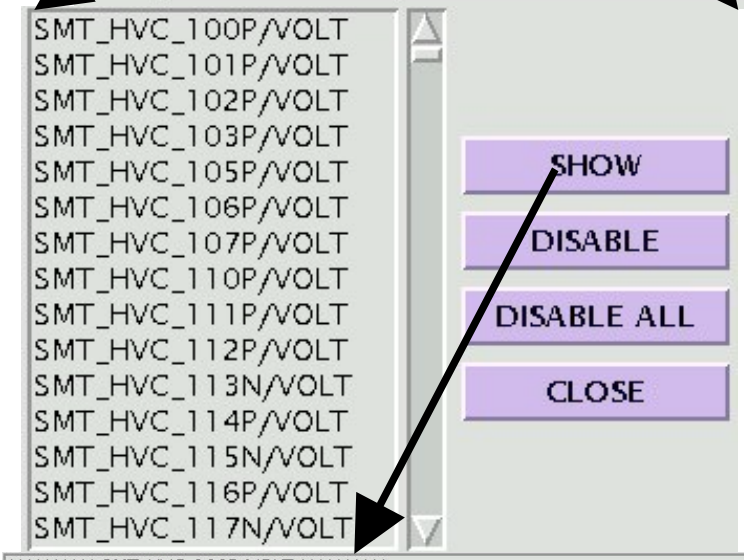
If an alarm condition has been resolved, the alarm will go into the GOOD-column where it will disappear after 5 minutes. Seeing an increase in the number of good alarms without having done something (like ramping the HV up) is an indication that there is a alarm-condition that goes away after a short time-period. This might be the case if the bias-current is not yet fully at the alarm-limit but oscillating around it.

In the example alarm display on the previous page, all HV pods were off.

HV Alarms & Alarm Display

By clicking on the alarm-button, a detailed listing of the alarms will appear.





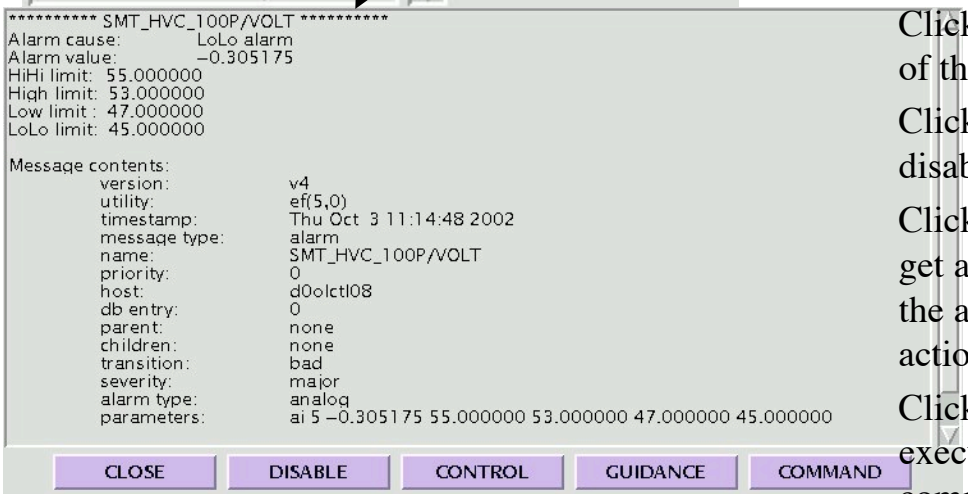
Mark an alarm by clicking on it.

Click on **SHOW** to get detailed information about the marked alarm.

Click on **DISABLE** to disable the marked alarm.

Click on **DISABLE ALL** to disable all alarms listed here.

Click on **CLOSE** to get rid of the window again.



In the details window:

Click on **CLOSE** to get rid of the window.

Click on **DISABLE** to disable the alarm.

Click on **GUIDANCE** to get a message that explains the alarm and proposed actions (*not yet implemented*).

Click on **COMMAND** to execute a predefined command (*not yet implemented*).

Troubleshooting
HV Pod Trips

Symptoms:

Blinking red field in global HV GUI

Pod in tripped state in the channel HV GUI

Major run-pausing alarm in the significant event system.

Types of trips:

Overcurrent trip (CXOC): current exceeded the bias current trip point.

Overvoltage trip (CXOV): voltage exceeded the bias voltage hardware trip point

Fix:

For most trips, all that is required is:

- Start monitoring the currents and voltages of the affected pod(s) with StripTool (left-click on the pod name in the channel HV gui).
- Reset the tripped pods: click the **Reset** button
- Ramp the reset pods: click the **Ramp** button.
- Lock the pods when they go into 'holding': click the **Lock** button.
- Note the trip in the logbook together with information about the circumstances of the trip (e.g. tripped while downloading HDI's, trip-indications (CX ??) ...).

Risers:

Some pods exhibit a behavior of slowly rising currents. Eventually, the currents for such pods will rise to alarm and trip levels. They can be identified in StripTool by a current trace that is generally steady and high with a slightly increasing slope. If one of these risers trips, it will usually be necessary to increase the alarm and trip limits for the tripped pod (and its partner for double-sided devices) before returning to long-term stable operation:

- >cd ~/onl_smtnew/util
  >./increaseHVlim.py &
  _ Or from the "startgui" gui B.4.

Troubleshooting
HV Pod Trips

- Enter the pod name and new limits
- Click **Increase IMAX by 10 μA**
  - Do not raise a pod by more than 30 μA total without checking with the On-call Expert.
  - Click **Read set values** if you just want to read back the current value and IMAX
- Click **Quit**
- Note the limit increase in the logbook.

Unstable pods:

Some HV trips are caused by unstable channels in the fanout boxes. These are identified by the presence of non-oscillating instabilities of the current as seen in the StripTool plot. These will most likely trip again soon after recovering from the first trip. If a pod trips after it has been identified as unstable:

- Disable the tripped pod (and its partner for double-sided detectors)
- Disable the HDI's biased by the disabled pods
  - Find the associated HDI's
    >cd ~/ monitoring
    >show_hvinfo.py <pod name>
  - Disable the HDI's in the download gui
- Have the DAQ shifter start a new run

Ramp-up trips:

If a pod trips during ramp-up before it reaches its full voltage,

- Start monitoring the currents and voltages of the affected pod(s) with StripTool (left-click on the pod name in the channel HV gui).
- Try the following solutions ***in order*** until one or none is successful:
  1. Ramp in small steps of 10% each to reach 100%.
  2. If the trip is on overcurrent (CXOC), increase the current trip limit
     - >cd ~/onl_smtnew/util
       >./increaseHVlim.py &
       - Or from the "startgui" gui B.4.
     - Enter the pod name and new limits

Troubleshooting
HV Pod Trips

- Click **Increase IMAX by 10 µA**
  - Do not raise a pod by more than 30 µA total without checking with the On-call Expert.
  - Click **Read set values** if you just want to read back the current value and IMAX
- Click **Quit**
- Note the limit increase in the logbook.

3. Contact the On-call Expert

- Note the trip in the logbook together with information about the circumstances of the trip (e.g. tripped while downloading HDI's, trip-indications (CX ??)...).

Turn-on Trips:

Sometimes a lot of HV pods immediately trip without ramping then when turning a crate **On**. Resets from the global GUI or crate GUI will not reset these trips. To reset pods tripped in this manner:

- Click on the crate name in the global HV GUI. A detail window will pop up showing all the HV pods in this crate.
- Click on the **Reset** button in this detail GUI.
- Try multiple times if this should not help immediately.
- Note the occurrence in the logbook.

IMPORTANT

If the high voltage configuration has to be changed for any reason (e.g. underdepletion or disabling of a pod), a new run must be started to have a known situation on a run-by-run basis.

Troubleshooting
HV Crate Trips

Symptoms: flashing red crate name in the global HV GUI

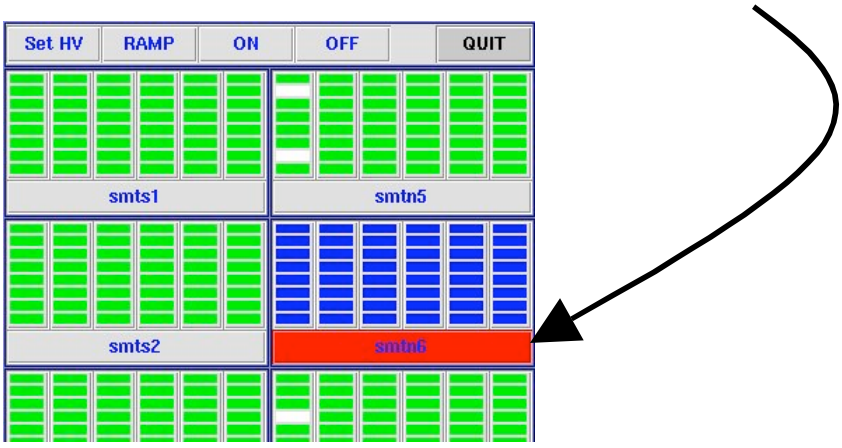
Fix: Before taking any other action, do the following:

1. Check the appropriate crate in the crate HV GUI
2. If all HV-pods can be seen (try a reconnect first), restart the global HV GUI, since this is a glitch in the GUI.
3. Note the occurrence in the logbook

If this does not help, the HV crate is most likely really tripped. In al likelihood the trip is due to a Rack Monitor trip in the HV rack (M220, M221, or M222).

To reset a crate:

1. Identify and correct the cause of the crate trip
   - Go to MCH2 and check if the RM has tripped. If so, press the **Reset Alarms** button to reset the RM.
2. Click on the flashing crate name in the global HV GUI



3. Click **Reset** in the window that pops up.
4. Ramp the HV up again if necessary (it is possible that all HV-pods in this crate are off now).
5. Note the occurrence in the logbook.

Troubleshooting
Minor HV Alarm

Minor HV alarm

Symptoms: entry in the minor alarm column of the alarm display

Fix: It is normal to have ~900 minor HV alarms if the HV is off. If the minor alarms do not correspond to this case, do the following:

1. Find out the alarm-condition, by clicking on the alarm in the alarm-display
2. If the alarm is on the bias-current:
   a) Check in the crate GUI, if this is a real alarm condition (see section on alarm-limits).
   b) If yes, start monitoring the bias current with StripTool.
3. If the alarm is on the bias-voltage:
   a) Check in the crate GUI, if this is really the case (see section on alarm-limits).
   b) If yes, start monitoring the voltage with StripTool.
4. Make a note in the logbook.

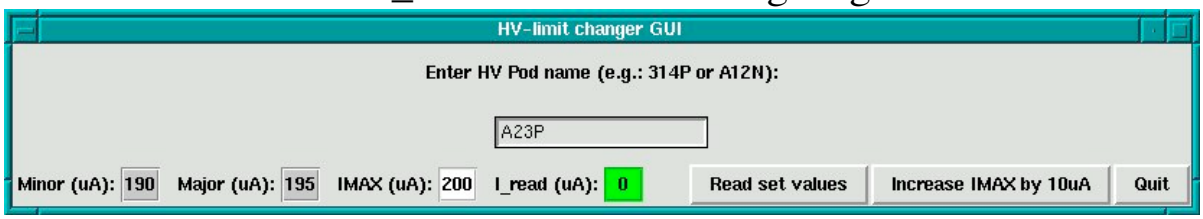
Troubleshooting
Major HV Alarm

Major HV alarm

Symptoms: entry in the major alarm column of the alarm display

Fix: Do the following:

1. First check for tripped HV pods in the global HV GUI.
2. Find out the alarm-condition, by clicking on the alarm in the alarm-display
3. If the alarm is on the bias-current:
   a) Check in the crate GUI, if this is really the case (see section on alarm-limits).
   b) If this HV-pod was already being monitored, and this monitoring indicates that the bias-current will reach the trip-point, the current alarm and trip limits should be increased. Do this as follows:
      - >cd ~/onl_smtnew/util
        >./increaseHVlim.py &
        - Or from the "startgui" gui B.4.



      - Enter the pod name and new limits
      - Click **Increase IMAX by 10 µA**
        - Do not raise a pod by more than 30 µA total without checking with the On-call Expert.
        - Click **Read set values** if you just want to read back the current value and IMAX
      - Click **Quit**
      - Note the limit increase in the logbook.

Troubleshooting
Major HV Alarm

c) If this HV-pod was not being monitored before, start a StripTool on it. If this indicates that the pod will reach the trip-point soon, take the same action as above.

4. If the alarm is on the voltage:
   a) Check in the crate GUI, if this is really the case (see section on alarm-limits).
   b) If the correspond HV-pod is OFF, turn it on and try to ramp it to 100%. Turn on the partner pod as well in case of a HV pair.
   c) If this does not help, call an expert and/or Ben Abraham (*pod malfunction*).
5. Note everything in the logbook and run the 'underdepletion' script.

Troubleshooting
StripTool

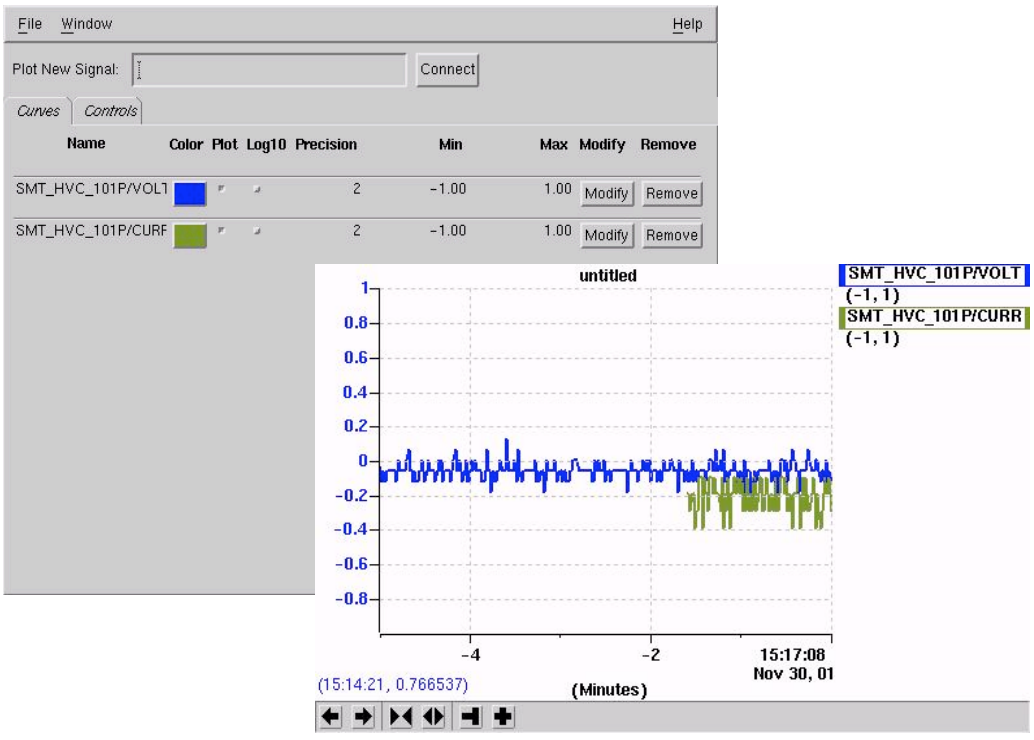
The StripTool utility allows tracking of bias voltages and currents. This is very useful for debugging problem HV channels. A StripTool chart can be launched from the command line by:

> setup d0online

> StripTool &

In the Control window, enter a signal name (e.g. SMT_HVC_101P/VOLT, SMT_HVC_101P/CURR) and click **Connect** to start the graph. Plotting parameters can be modified in the Control GUI.

StripTool charts for HV pods can also be launched automatically from the Crate HV GUI by left-clicking on a HV pod's name in the **Channel** field. The Control window can be opened again by right-clicking inside the plot-range and choosing "Controls Dialog". It is also advisable to set the ringbuffer size to 64000 samples.

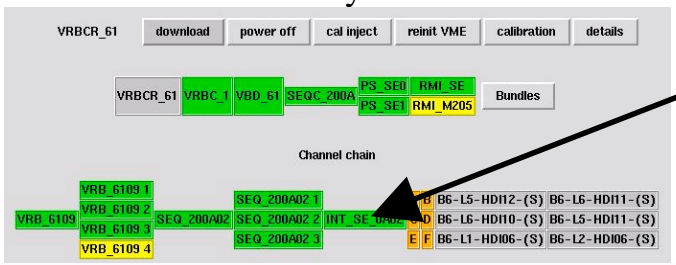


HV Information

Finding HV Info for a Particular Device

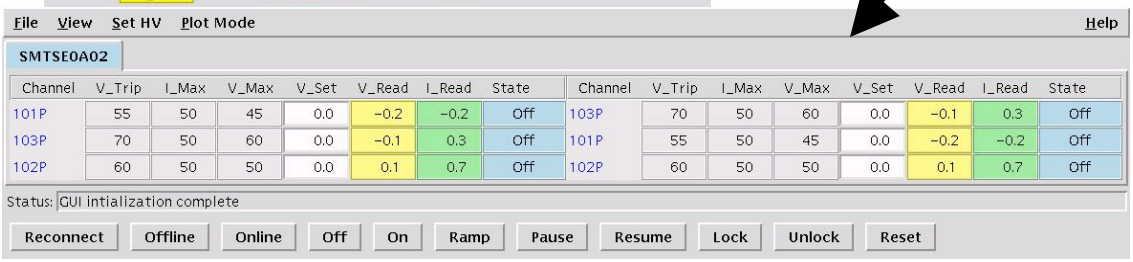
There are a couple of ways to obtain HV information for a particular channel. Either of the following may be more useful depending on what you are doing.

Download GUI: If you are working with the download GUI, then you can conveniently find HV information for a complete interface board.



Click this, select **HV GUI**…

…and get this…



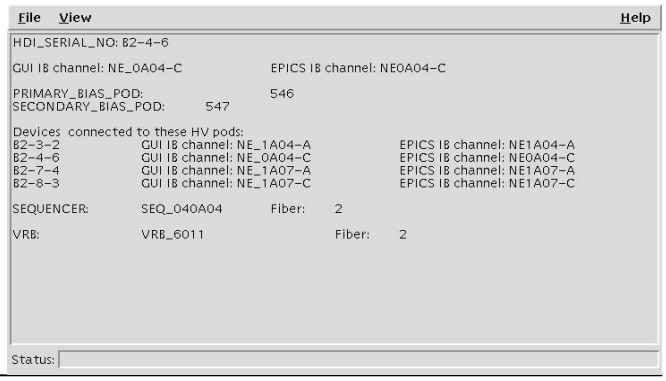
…giving HV information and control for each channel on that interface board.

A HV GUI for the entire VRB crate can be obtained by left-clicking on the VRBCR_# button and selecting **HV GUI**. **Note:** 8-chippers don't receive bias, so the HV GUI will empty for these.

Command line: HV information for a particular detector or IB channel (e.g. B2-4-6 or SMT_IB_NE0A04-C) can be obtained by:

```
>cd ~d0smt/monitoring
>show_IB_info.py SMT_IB_NE0A04-C
        or
>show_det_info.py B2-4-6
```

which will produce a window, which shows the HV pods connected to that detector/channel, and the other detectors/channels connected to those pods.



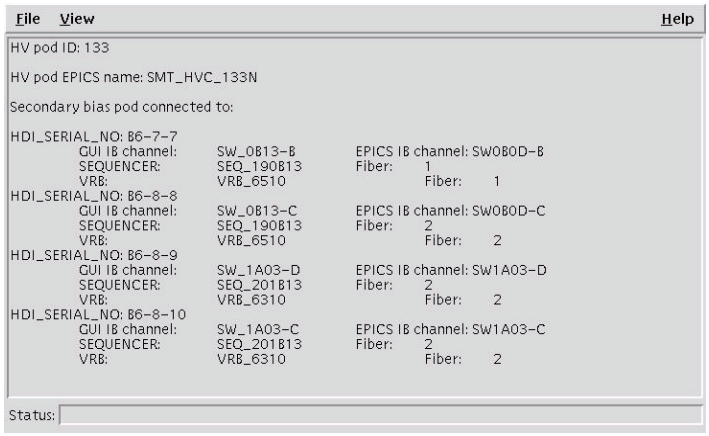
HV Information

Finding Device Info for a Particular Pod

Command line: A window showing the devices connected to a particular HV pod (e.g. 133N) can be obtained by:

>cd ~d0smt/monitoring

>show_hv_info.py 133



Alarm Display

Several portions of the SMT system are connected to the Significant Event System. This means that for those sub-systems, alarms are sent if various operating parameters exceed normal bounds.

These alarms can be monitored using the alarm-display. You can start the SMT alarm display by typing:
> setup d0online
> start_alarm_display -c /home/d0smt/smt.ses &
Or from the "startgui" gui D.3.

File View Settings Help

Group Name	MAJOR	MINOR	INVALID	DISABLED	GOOD
HV	397	899	0	0	0
LV	0	2	2	0	596
IB	0	0	0	0	0
Occupancy	0	0	0	0	0
Dead	0	0	0	0	0
all	397	901	41	0	817

Status: Connection to server opened

Each of the buttons in this GUI contains the number of alarms at the different severity levels for the corresponding row. The different alarm-levels are the following:

Major alarms:
There is a problem that has to be fixed. Many (but not all) major alarms will pause a run. A message will come via the speakers at the DAQ-shifters console indicating that the run is being paused.

Minor alarms:
This is a warning that something might be wrong and the corresponding system should be monitored closely. The source of the alarm should be identified and understood.

Invalid alarms:
A read or a write has failed.

Alarm Display

Disabled Alarms:

It is possible to disable an alarm. It will then not show up again anywhere else than in the 'Disabled' column, unless it is re-enabled. Consequently, a disabled alarm loses the ability to pause a run. Do not disable an alarm without first contacting the Expert On-Call.

Good Alarms:

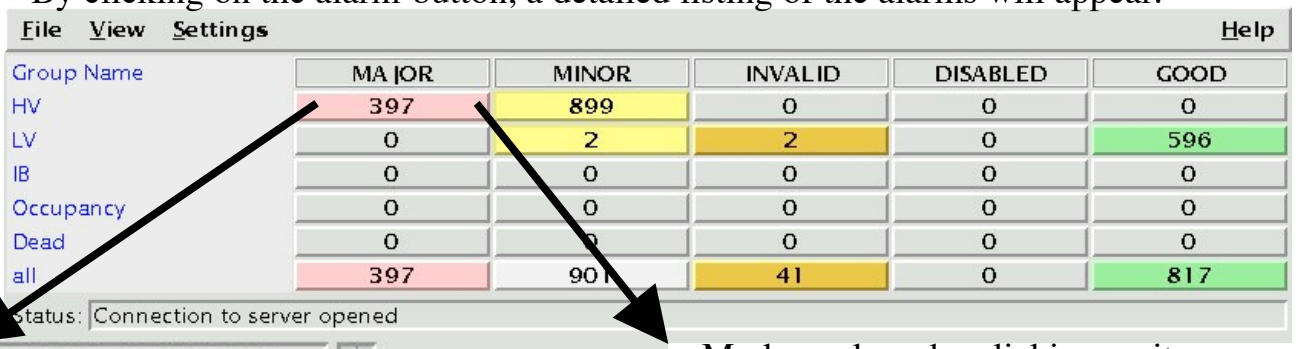
If an alarm condition has been resolved, the alarm will go into the GOOD-column where it will disappear after 5 minutes. Seeing an increase in the number of good alarms without having done something (like ramping the HV up) is an indication that there is a alarm-condition that goes away after a short time-period. For example, this might be the case if a bias-current is not yet fully at the alarm-limit but oscillating around it.

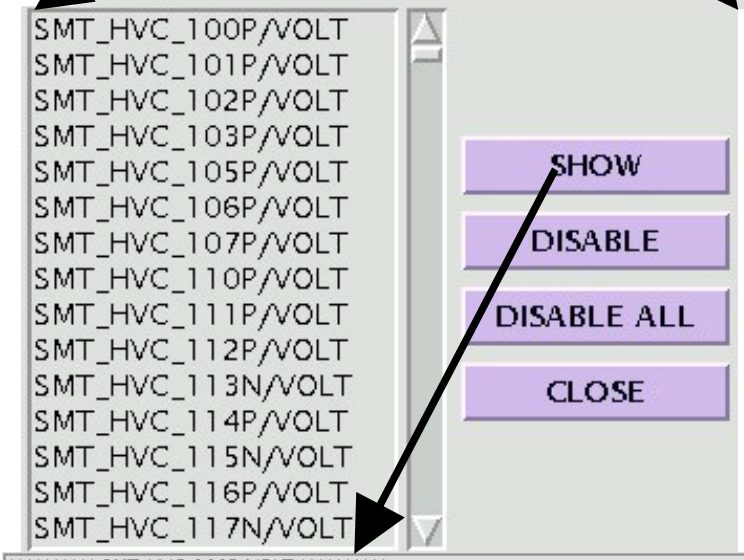
Details about diagnosis and treatment for various alarms can be found in the SMT Shift Instruction sections for the corresponding sub-systems:

Alarm Group Name	Shift Instruction Section
HV	High Voltage
LV	Low Voltage Supplies
IB	Download gui, IB Temperature gui
Occupancy	Monitoring
Dead	Monitoring

Alarm Display

By clicking on the alarm-button, a detailed listing of the alarms will appear.





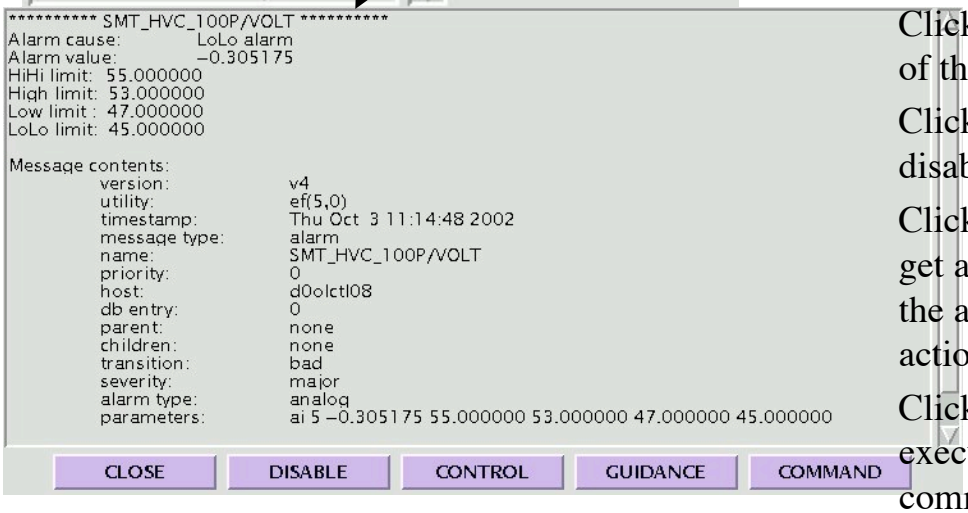
Mark an alarm by clicking on it.

Click on **SHOW** to get detailed information about the marked alarm.

Click on **DISABLE** to disable the marked alarm.

Click on **DISABLE ALL** to disable all alarms listed here.

Click on **CLOSE** to get rid of the window again.



In the details window:

Click on **CLOSE** to get rid of the window.

Click on **DISABLE** to disable the alarm.

Click on **GUIDANCE** to get a message that explains the alarm and proposed actions.

Click on **COMMAND** to execute a predefined command.

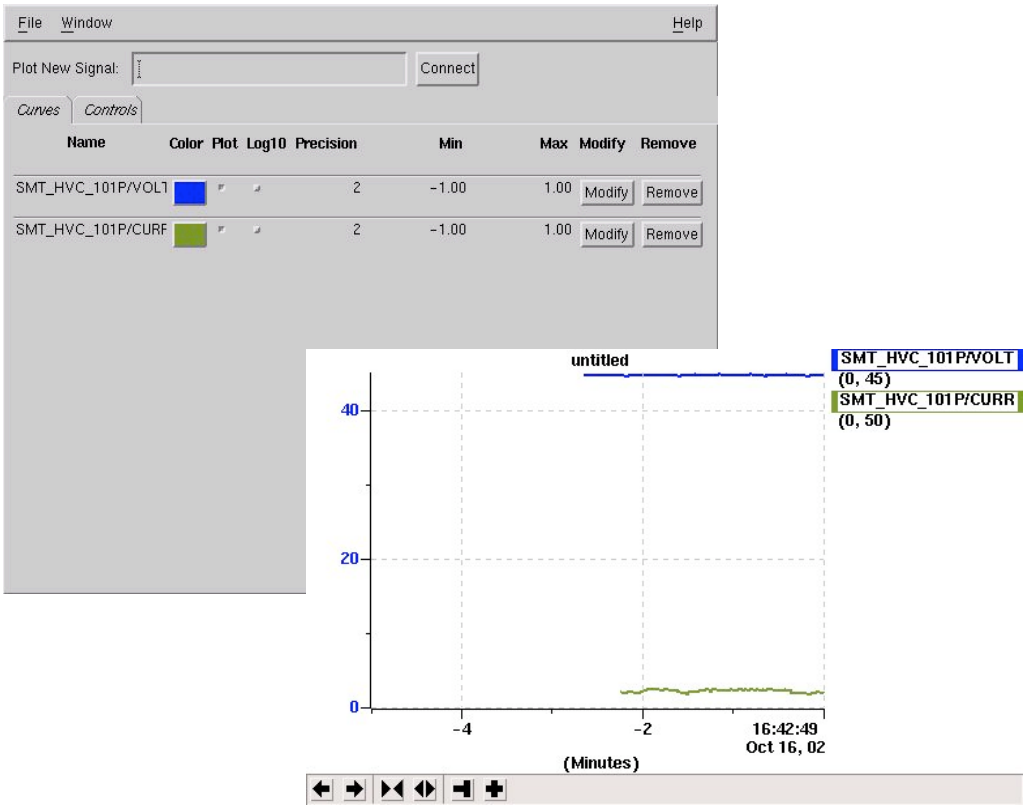
StripTool

The StripTool utility allows tracking of SMT voltages, currents, temperatures and other miscellaneous parameters that are saved as EPICS variables. This is very useful for debugging various problems. A StripTool chart can be launched from the command line by:

> setup d0online

> StripTool &

On the **Curves** page of the Control window, enter a signal name (e.g. SMT_HVC_101P/VOLT, see next page) and click **Connect** to start the graph. Plotting parameters can be modified in the **Controls** page of the Control window. It is advisable to set the **Ring Buffer** size to 64000 samples. If the Control window is dismissed, it can be opened again by right-clicking inside the plot-range and choosing **Controls Dialog**.



StripTool
EPICS Variable Names

An incomplete list of EPICS variables of the SMT system available for StripTool use is given below.

EPICS Variable Name	Wild Card Completions	Variable Meaning
SMT_HVC_****/CURR	**** = HV pod name, e.g. 102P, 347N	HV pod bias current
SMT_HVC_****/VOLT	**** = HV pod name, e.g. 102P, 347N	HV pod bias voltage
SMT_IB_******-*/I_AVDD	******-* = IB-channel, e.g. SW1B14-A	IB channel AVDD current
SMT_IB_******-*/I_AVDD2	******-* = IB-channel, e.g. SW1B14-A	IB channel AVDD2 current
SMT_IB_******-*/I_DVDD	******-* = IB-channel, e.g. SW1B14-A	IB channel DVDD current
SMT_IB_******-A/TEMP	****** = IB, e.g. SW1B14	IB channel A temperature
SMT_IB_******-*/TEMP	******-* = IB-channel, e.g. SW1B14-B	IB channel B-H temperature
SMT_IB_******-*/V_AVDD	******-* = IB-channel, e.g. SW1B14-A	IB channel AVDD voltage
SMT_IB_******-*/V_AVDD2	******-* = IB-channel, e.g. SW1B14-A	IB channel AVDD2 voltage
SMT_IB_******-*/V_DVDD	******-* = IB-channel, e.g. SW1B14-A	IB channel DVDD voltage
SMT_LVSEQ_*/*-+52V-STAT	*/* = side/supply number, e.g. N/2	sequencer LV power supply +52V status
SMT_LVSEQ_*/*-+52VI	*/* = side/supply number, e.g. N/2	sequencer LV power supply +52V current
SMT_LVSEQ_*/*-+52VV	*/* = side/supply number, e.g. N/2	sequencer LV power supply +52V voltage
SMT_LVSEQ_*/*-+5V-STAT	*/* = side/supply number, e.g. N/2	sequencer LV power supply +5V status
SMT_LVSEQ_*/*-+5VI	*/* = side/supply number, e.g. N/2	sequencer LV power supply +5V current
SMT_LVSEQ_*/*-+5VV	*/* = side/supply number, e.g. N/2	sequencer LV power supply +5V voltage
SMT_LV_***/IAVDD-3	*** = IB crate power supply, e.g. NE0	IB LV power supply 3-chip AVDD current
SMT_LV_***/IAVDD-6	*** = IB crate power supply, e.g. NE0	IB LV power supply 6-chip AVDD current
SMT_LV_***/IAVDD-89	*** = IB crate power supply, e.g. NE0	IB LV power supply 8/9-chip AVDD current
SMT_LV_***/IAVDD2	*** = IB crate power supply, e.g. NE0	IB LV power supply AVDD2 current
SMT_LV_***/IDVDD2-3	*** = IB crate power supply, e.g. NE0	IB LV power supply 3-chip DVDD current
SMT_LV_***/IDVDD-689	*** = IB crate power supply, e.g. NE0	IB LV power supply 6/8/9-chip DVDD current
SMT_LV_***/IV15	*** = IB crate power supply, e.g. NE0	IB LV power supply 15V current
SMT_LV_***/IVCC1	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC1 current
SMT_LV_***/IVCC2	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC2 current
SMT_LV_***/IVCC3	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC3 current

StripTool
EPICS Variable Names

An incomplete list of EPICS variables of the SMT system available for StripTool use is given below.

EPICS Variable Name	Wild Card Completions	Variable Meaning
SMT_LV_***/MF	*** = IB crate power supply, e.g. NE0	IB LV power supply magnetic field
SMT_LV_***/SPT	*** = IB crate power supply, e.g. NE0	IB LV power supply shunt plate temperature
SMT_LV_***/STAT	*** = IB crate power supply, e.g. NE0	IB LV power supply status
SMT_LV_***/UAVDD-3	*** = IB crate power supply, e.g. NE0	IB LV power supply 3-chip AVDD voltage
SMT_LV_***/UAVDD-6	*** = IB crate power supply, e.g. NE0	IB LV power supply 6-chip AVDD voltage
SMT_LV_***/UAVDD-89	*** = IB crate power supply, e.g. NE0	IB LV power supply 8/9-chip AVDD voltage
SMT_LV_***/UAVDD2	*** = IB crate power supply, e.g. NE0	IB LV power supply AVDD2 voltage
SMT_LV_***/UDVDD2-3	*** = IB crate power supply, e.g. NE0	IB LV power supply 3-chip DVDD voltage
SMT_LV_***/UDVDD-689	*** = IB crate power supply, e.g. NE0	IB LV power supply 6/8/9-chip DVDD voltage
SMT_LV_***/UV15	*** = IB crate power supply, e.g. NE0	IB LV power supply 15V voltage
SMT_LV_***/UVCC1	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC1 voltage
SMT_LV_***/UVCC2	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC2 voltage
SMT_LV_***/UVCC3	*** = IB crate power supply, e.g. NE0	IB LV power supply VCC3 voltage
SMT_LV_***/VT	*** = IB crate power supply, e.g. NE0	IB LV power supply Vicor temperature

SMT Event Display

CONTENTS

HOW TO RUN THE PROGRAM

The online SMT Event Display is run with a different command according to the current run type. To run it during normal data-taking, open a new terminal window and type

Go to d0ol22 (if not on that machine do >setup d0online and >d0ssh d0ol22)

> setup d0online

> start_daq smt_event_display all

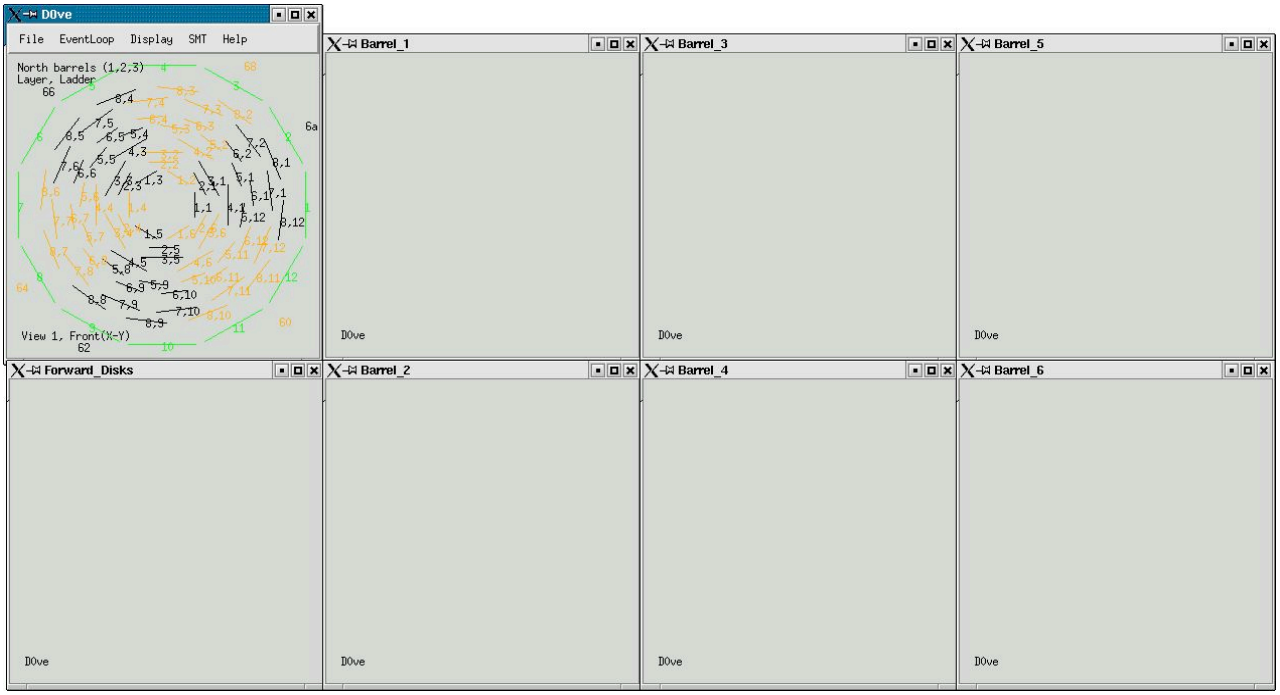
If there is a zero-bias run then use the option 'zb' instead of 'all', ie...

> start_daq smt_event_display zb

When the DAQ shifter is taking a special run then you should give 'special' as the argument but if you are unsure of what to use then you can try 'anything'. This last option receives any data from the first ten runs being taken by the DAQ shifter, regardless of the run type.

After launching the program, the following windows should be displayed (see next page):

SMT Event Display



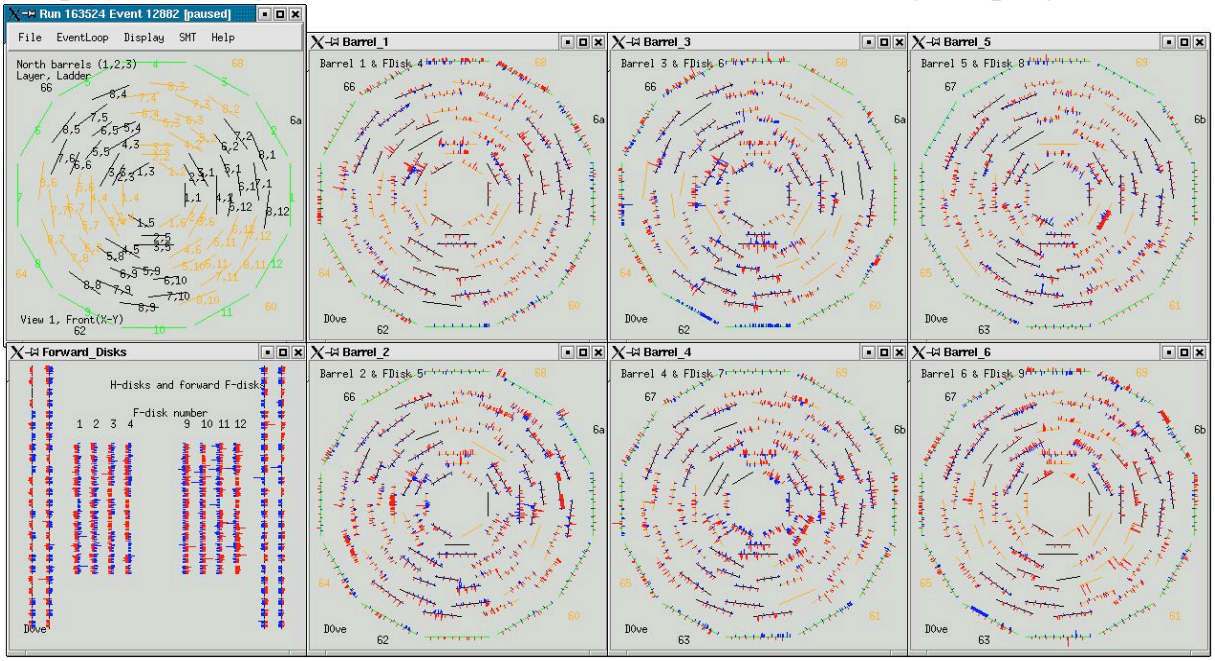
There are two ways to process events in the SMT Event Display. Selecting 'Start/Resume' from the EventLoop menu (or pressing return in any of the event display windows) will start a continuous event loop. Doing this a second time will pause the event loop. The default time between events is 5 seconds but this can be changed by selecting 'set pause interval' from the EventLoop menu and entering the desired interval, in seconds.

Selecting 'pause/step' from the EventLoop menu (or pressing space in any of the event display windows) will request the next available event. This allows the user to look at events one at a time.

SMT Event Display

THE DISPLAY

During operation, the SMT Event Display uses eight graphical windows to display data within the silicon detector (as shown below). Six of these are used to display the six barrels and the associated f-disks. One displays the forward f-disks and h-disks. The remaining window contains a key to the barrel display, showing ladder numbers, and a menu for controlling the program.



Each barrel is displayed in the r-phi plane with the ladders drawn in groups of black or orange, depending on which VRB crate they are connected to. Crate numbers are written on the outside of the barrel.The corresponding f-disk is also drawn on the outside of the barrel with each wedge coloured green. All ladders are pictured as being axially aligned, even though some stereo ladders are offset from the axial plane by 2 degrees or 90 degrees in the real detector. This representation should still be useful for diagnostic purposes.

The forward disks display window lays all wedges out in a straight line with 12 wedges per f-disk and 24 wedges per h-disk. Again, this representation is geometrically incorrect but diagnostically convenient.

All detector signals are shown in red for p-side chips and in blue for n-side chips. The length of the line is proportional to the amplitude of the signal recorded, up to a maximum of 256 ADC counts.

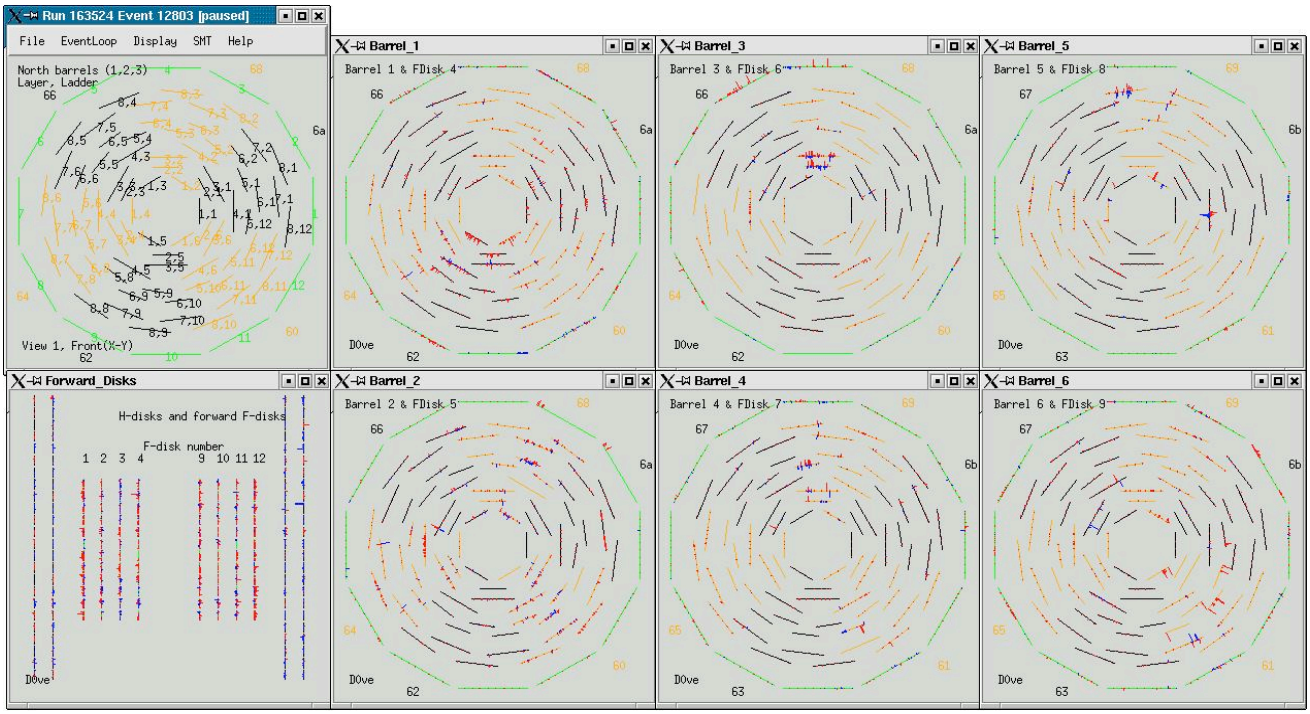
SMT Event Display

The main window containing the barrel key can be reconfigured by making selections in the 'SMT' menu. The South and North barrel keys and the six barrel readouts can be added / overlaid and removed from the window which allows the user to see 'tracks' which cross more than one barrel.

MODES OF OPERATION

The event display runs in one of a number of calibration modes (default is STATIC, explained below) which determine how the data is processed before being displayed. The user can select the desired calibration mode from the 'SMT -> Configurator Mode' menu.These modes are listed below.

STATIC	The signal as measured by the detector is displayed. A global pedestal is also subtracted but this is currently set to zero (example shown on previous page.)
GENERIC	SDAQ chip pedestals from the database are subtracted before the data are displayed (example below.)



SMT Event Display

GENERIC_MIXED	GENERIC mode is applied to those VRB crates operating in sparse readout mode while DYNAMIC mode is applied to those crates operating in all readout mode.
DYNAMIC	Pedestals are calculated on a chip-by-chip basis and then subtracted.
ONLINE_DB	Pedestals are imported from the database on a strip-by-strip basis and subtracted.
ONLINE_FILE	Pedestals are imported from a file on a strip-by-strip basis and subtracted.
MIXED	ONLINE_FILE mode is applied to those VRB crates operating in sparse readout mode while DYNAMIC mode is applied to those crates operating in all readout mode.

PRINTING OPTIONS

The event display output can be printed to a postscript file by selecting one of the options in the 'File -> PS print' menu. Individual displays can be saved to file or the option exists to save all displays at once, to either a single file or separate files.

SMT Examine

Page Section

SMT Examine

Running SMT Examine

To run SMT Examine in the Control Room, you should be on **d0ol63** and logged in as *d0smt*. *(if not on d0ol63 do >setup d0online and >d0ssh d0ol63)*

Type commands:

setup d0online

start_daq smt_examine runtype

*runtype = **all** for physics data taking* examine
*runtype = **zb** for zero bias run*
*runtype = **special** for a special SMT run*
*runtype = **anything** in the unknown situation*

In case of any problems, look in the *error.log* file and refer to errors and warnings section to understand what kind of error caused the problem.

To run **occupancy monitor** type **start_daq smt_occupancy**

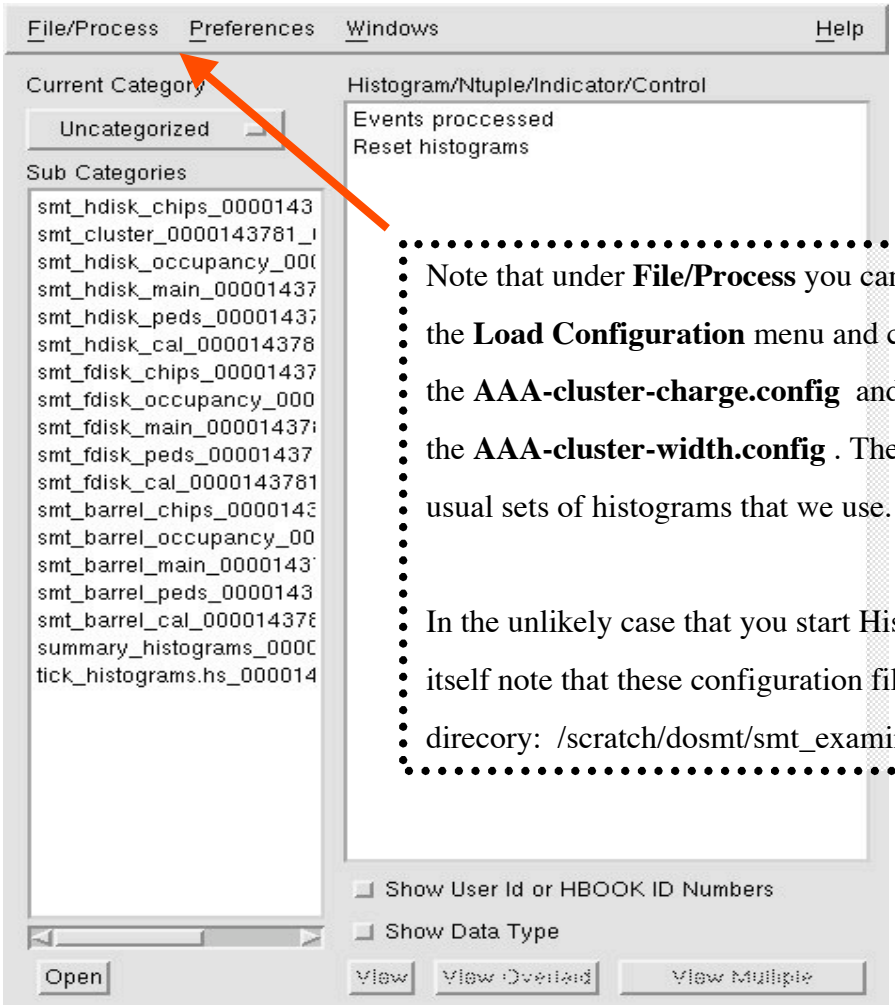
Note: occupancy monitor runs only together with smt_examine because it uses smt_examine output.

SMT Examine

How to Use Histoscope

(While reading this section keep referring to Sections 3 and 4)

- A histoscope window looks like the following(Window1):



Note that under **File/Process** you can choose the **Load Configuration** menu and choose the **AAA-cluster-charge.config** and/or the **AAA-cluster-width.config** . These are the usual sets of histograms that we use.

In the unlikely case that you start Histoscope by itself note that these configuration files are in the direcory: /scratch/dosmt/smt_examine/*

- If histoscope is running already, such a window should be present.
- You can see a list of histoscope files on the left part of the window. Each file name has the run number in it. An idea of the content of these files can be had by reading Section 3. Barrel, Fdisk, Hdisk files have similar names like

  smt_barrel_occupancy.hs

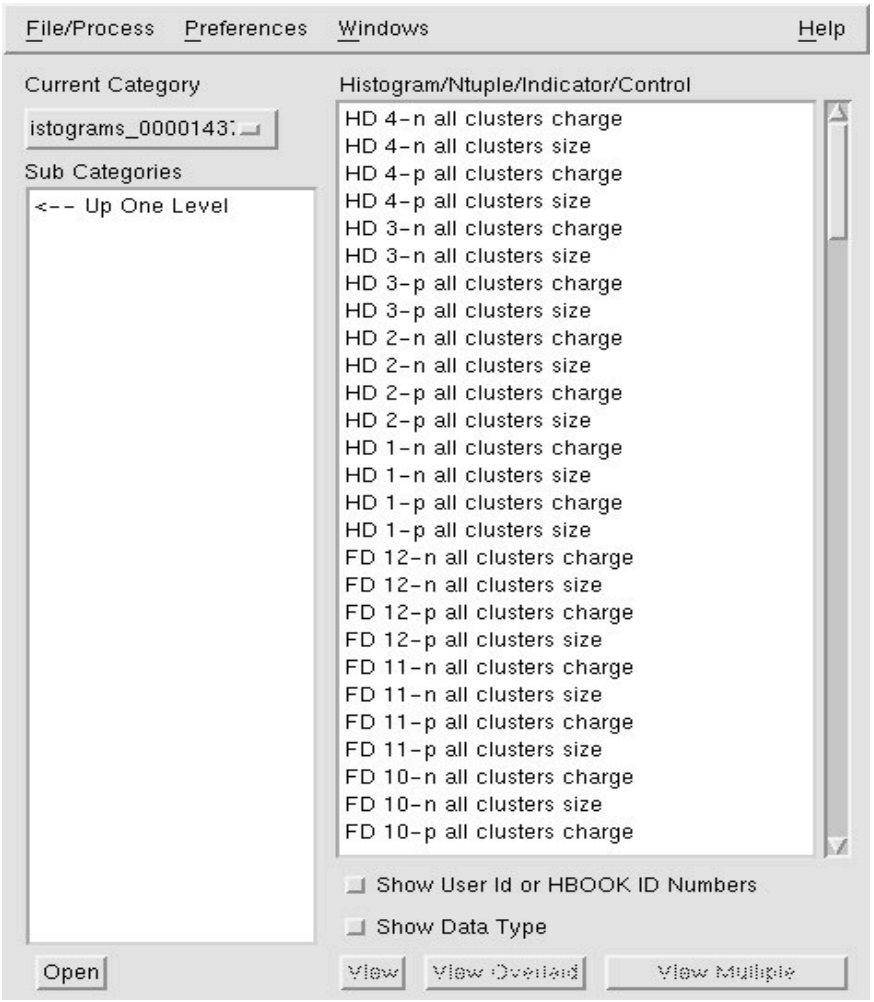
  smt_fdisk_occupancy.hs

SMT Examine

How to Use Histoscope

smt_hdisk_occupancy.hs

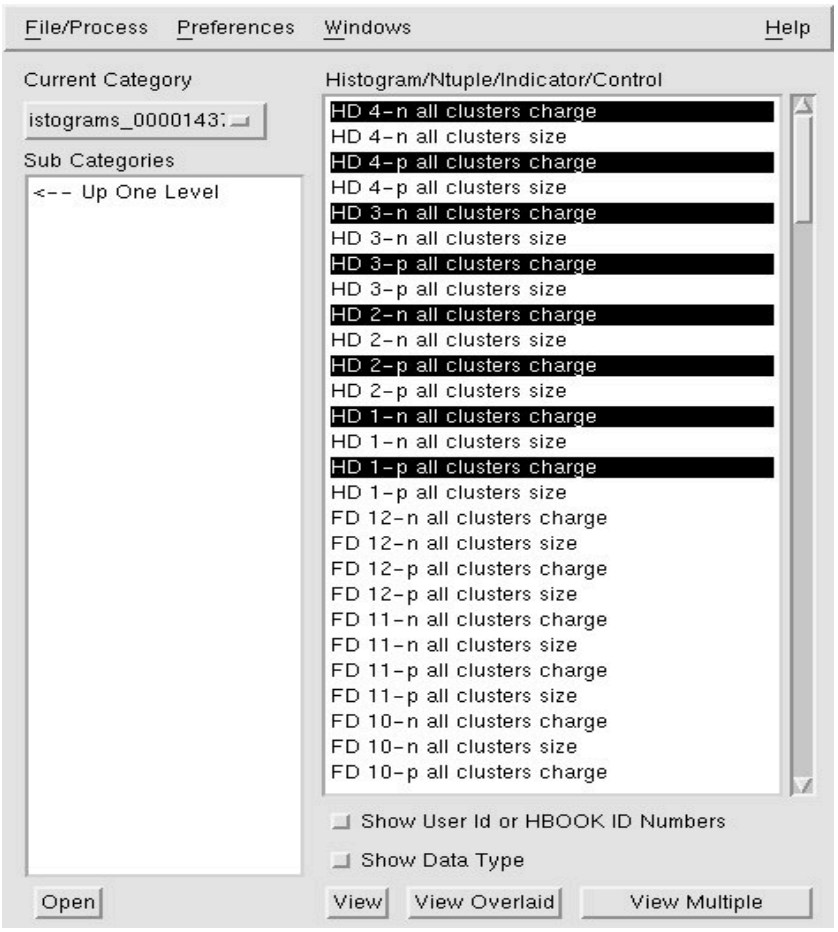
- Examine uses first 100 events to identify noisy strips and remove them further from cluster reconstruction. During this calibration cluster histograms are not filled. Usually they become available after 15 minutes of running. A shifter should first look at summary_histograms.hs file. These are the only plots that we are interested in saving besides the plots of the devices that you may find causing anomalous “spikes” in these cluster distributions.
- Double click on its name. After this action the histoscope window would like the following(Window 2):



SMT Examine

How to Use Histoscope

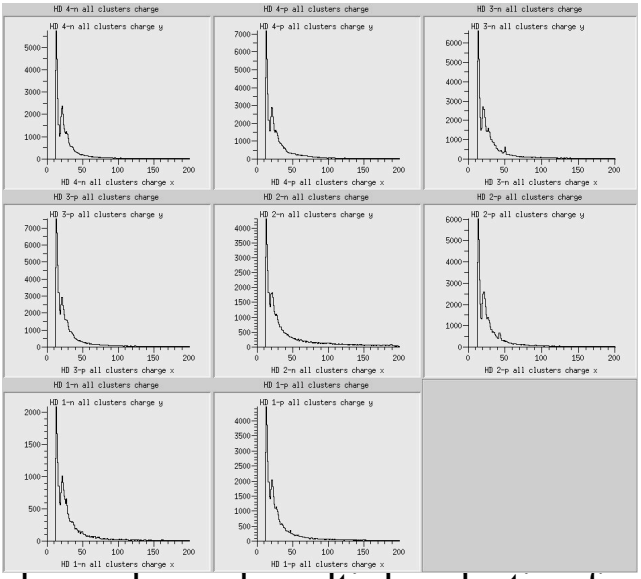
- By clicking on the "← up one level", you can go back to Window 1.
- Scroll down the window. It has plots of cluster size and cluster charge distributions for ladders/wedges of barrel, fdisk and hdisk. You can double click on the plot names to see them. A histoscope window will pop up showing the clicked plot.
- You can make a multiple seletion also i.e. seeing more than one plot in a single window. Press "Ctrl" button and select for example hdisk cluster distributions the cluster charge distributions. After making selection, release the "Ctrl" button and click on "View Multiple" button in the histoscope window. At this instant you do this the histoscope window would look like the following(Window3):



SMT Examine

How to Use Histoscope

- The result of above step would be a window(Window 4) like(for Hdisk). The contents of the plot this Window 4 are not important. This is just to show how the window looks like.



- You should also make such multiple selection for fdisk and barrel separately. Simply select all the plot in which you find "cluster charge" and hit "view multiple" button.
- You should store plots of in the directory :

  /home/d0smt/SHIFTS/*year*/*month*/*date*/*shift*

  For e.g. /home/d0smt/SHIFTS/2002/mar/01/owl

- HOW TO SAVE THE PLOT WINDOW (Window 4) in a file
  - Go to the directory

    /home/d0smt/SHIFTS/*year*/*month*/*date*/*shift*
  - At the command prompt type(hdisk.jpg is just a file name)

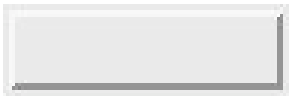
    import hdisk.jpg
  - Go to the "Window 4" and click on the top with middle button of the mouse. You will see that prompt returns in the the window where you typed " import hdisk.jpg". See if the file is there.

SMT Examine

How to Use Histoscope

- HOW TO RESET HISTOSCOPE

  Double click on “Reset histograms” in Window 1. A very small window like the following pops up.

  Left-mouse-hit on it. All histoscope plots would be reset.

- HOW TO LOOK AT THE NUMBER OF EVENTS PROCESSED

  Double click on “Events processed” in Window 1. A small window pops up like

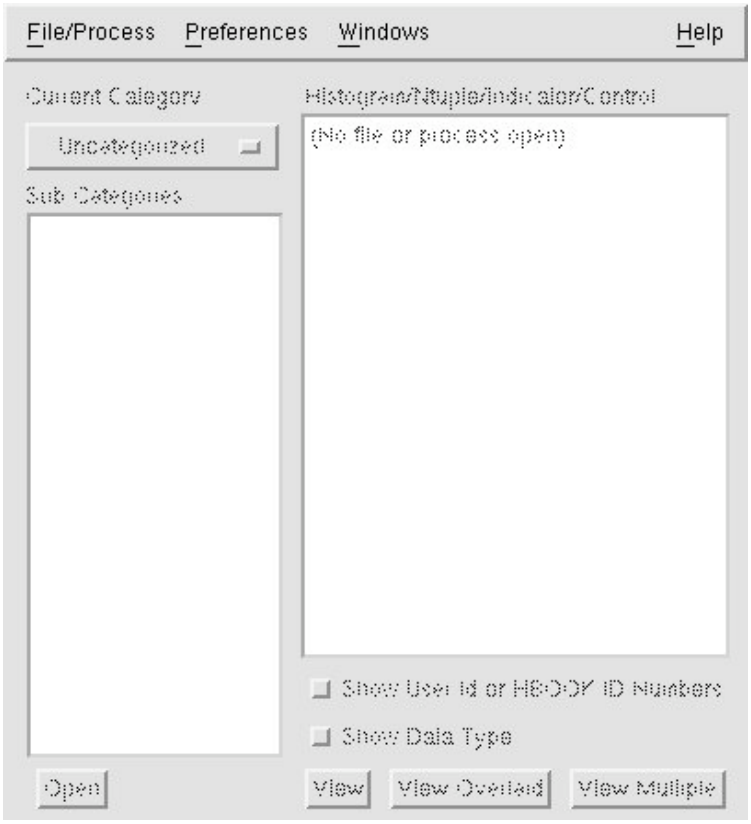
  

  Here 30 are the number of events processed.

SMT Examine

How to Use Histoscope

- If you close this window by mistake you can open an x-window and start histoscope by typing
  - setup histo
  - *histo&*
- After typing histo& , histoscope will open like the following window. From "File/Process" connect to the process running examine. Wait for a while till this window looks like Window 1.



SMT Examine

Monitoring Data Quality

1. Summary cluster distributions

- Open *summary_histograms.hs* and look at *Summary cluster charge distributions* (see SMT Examine Histograms section). Compare histograms with the reference plots. If you do not see significant deviations in shape from the reference plots go to 2.
- If you observe an unusual shape or additional peaks in Landau distributions open *smt_cluster.hs* file and look at the individual ladder/wedge cluster charge distributions for a barrel/disk that shows the problem. Find the device responsible for it and make a log book entry. Look at the corresponding histogram for the position of the first strip in cluster. Are there any significant peaks?
- Open *smt_barrel_occupancy.hs* (or the corresponding disk data file) and look at the occupancy vs event dependence for the ladder/wedge under consideration. Does the device have consistent high occupancy? Make an entry in the log book.
- Open *smt_barrel_main.hs* (or the corresponding disk data file) and look at the number of fired strips distribution and the number of entries in each strip for the ladder/wedge under consideration. Does the device have many fired strips in each event? Does the entry histogram show high peaks in some channels? Make an entry in the log book.
- Open *smt_barrel_peds.hs* (or the corresponding disk data file) and look at the pedestal vs channel snapshot histograms for the ladder/wedge under consideration. Compare p- and n-side response. Are there correlations between the charge detected on two sides? If no clusters observed check the list of underdepleted ladders:
  - cd ~/monitoring
    setup d0online
    list_underdepleted_hv.py
  - Make an entry in the log book.
- Open *smt_barrel_chips.hs* (or the corresponding disk data file) and look at the pedestal distributions for each chip of the ladder/wedge under consideration. If you are running in GENERIC mode (default for smt_examine in the Control Romm) the distributions have to have a peak at zero from neighbour readout and a tail towards higher pulses from the real clusters. Are the chip pedestals consistent with this shape? Is the problem (if any) observed in one chip? Make an entry in the log book.

SMT Examine

Monitoring Data Quality

2. Summary entries histograms

- Open *summary_histograms.hs* and look at *Summary entries and average pulse histograms* (see SMT Examine Histograms section). Compare histograms with the reference plots and with the list of disabled HDIs. Make an entry in the log book.
- To make the list:
  - as d0smt,

    cd ~/monitoring
    ./listDisabledHDIs.py

SMT Examine

SMT Examine Histograms

During usual operation, SMTExamine produces 6 histogram files for each SMT subsystem (barrel, F-disks, H-disks), one summary file and two files containing cluster level plots. This document briefly describes the histograms that can be found in each file.

Summary Plots

File *summary_histograms.hs* contains

summary cluster charge distributions
summary cluster size distributions
histograms for number of entries per ladder/wedge
histograms for average pulse height per ladder/wedge

Summary cluster charge distributions

Cluster charge distributions are presented for each barrel.
Histograms are split by detector type and side (3-chip ladders, 6-chip ladders p/n side and 9-chip ladders p/n side).
Summary charge distributions are expected to have Landau shape.
Any deviations from this shape like extra peaks can be usually traced down using detailed cluster plots from *smt_cluster_xxxxx.hs* file (see below **Cluster plots** section)

Barrel cluster histogram names:
"Bar nb-side ladtype cluster charge"
"Bar nb-side ladtype cluster size"
where nb - barrel # (1,...,6)
side - p or n
ladtype - L3,L9 (for nb = 1,6); L6,L9 (for nb = 2,3,4,5)

F-disk cluster histogram names:
"FD nd-side cluster charge"
"FD nb-side cluster size"
where nd - F-disk # (1,...,12)
side - p or n

SMT Examine

SMT Examine Histograms

H-disk cluster histogram names:
"HD nd-side cluster charge"
"HD nb-side cluster size"
where nd - H-disk # (1,...,4)
side - p or n

Summary entries and average pulse histograms

For each barrel/disk side if at least one channel of a ladder/wedge is read out in an event the entry histogram is filled with 1 for this ladder/wedge. If the entry histogram showes zero or very small number of entries for some ladder/wedge the device is either not read out (disabled) or has some problems with calibration or thresholds.
For each barrel/disk side for each event average pulse height per ladder/wedge enters the average pulse histogram.
Histograms are arranged in the following way: entries for ladder *lad* from layer *lyr* go into channel number *20*(lyr-1)+lad+1* of the histogram containing all ladders of a particular barrel side. For example, number of entries for ladders 1 through 12 belonging to layer 5 barrel 4 p-side can be found in "Bar 4 p-side ladders entries" histogram in channels 81 through 92.
Average pulse height histograms for barrels are arranged similarly. Each F-disk(H-disk) histogram contains entries for wedges 1 through 12 (1 through 24) in channels 1 though 12 (1 through 24).

Barrel entries and average pulse histogram names:
"Bar nb-side ladders entries"
"Bar nb-side ladders average pulse"
where nb - barrel # (1,...,6)
side - p or n

F-disk entries and average pulse histogram names:
"FD nd all wegdes entries"
"FD nb all wedges average pulses"
where nd - F-disk # (1,...,12)

SMT Examine

SMT Examine Histograms

H-disk entries and average pulse histogram names:
"HD nd all wegdes entries"
"HD nb all wedges average pulses"
where nd - H-disk # (1,...,4)
side - p or n

Summary cluster charge distributions and summary entries histograms are the main histograms that characterize SMT performance, efficiency and data quality. These histograms have to be looked at by a shifter and compared to the reference plots.

Cluster Plots

File *smt_cluster.hs* contains cluster charge distribution and the position of the first strip of the reconstructed cluster for each barrel ladder and each F- and H- disk wedge (p- and n-side separately).

Barrel cluster histogram names:
"Bar nb-lyr-lad-side cluster charge"
"Bar nb-lyr-lad-side first strip of cluster"
where nb - barrel # (1,...,6)
lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n

F-disk clusters histogram names:
"FD nd-nw-side cluster charge"
"FD nd-nw-side first strip of cluster"
where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n

H-disk clusters histogram names:
"HD nd-nw-side cluster charge"
"HD nd-nw-side first strip of cluster"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n

SMT Examine

SMT Examine Histograms

Cluster charge distribution shapes have to represent Landau distrubution. For most of the ladders/wedges you'll see the peak at small cluster charge indicating the average noise contribution. Any other deviations from the Landau distribution is a signal of the problem.

Histograms containing the cluster first strip position are filled to ultimately show the noisy strips. If the ladder/wedge does not have any noisy strips the distribution has to be uniform. The peaks in certain channels indicate that this channel initiates fake (noisy) clusters at a rate higher than the real ones.

Tick plots

File *tick_histograms.hs* contains cluster charge distribution split by barrel/disk, ladder/wedge type (see above) and side filled for each bunch crossing (tick) separately. These histograms appeared to be useful to make sure that the number of clusters and cluster charge for all bunch crossings are similar.

Barrel tick histogram names:
"Bar nb-side-XX-YY ladtype clusters charge"
where nb - barrel # (1,...,6)
side - p or n
ladtype - L3,L9 (for nb = 1,6); L6,L9 (for nb = 2,3,4,5)
XX - superbunch number (X0,X1,X2)
YY - bunch number (01,...,12)

F-disk tick histogram names:
"FD nd-side-XX-YY clusters charge"
where nd - disk # (1,...,12)
side - p or n

H-disk tick histogram names:
"HD nd-side-XX-YY clusters charge"
where nd - disk # (1,...,4)
side - p or n

SMT Examine

SMT Examine Histograms

Occupancy plots

Files
smt_barrel_occupancy.hs
smt_fdisk_occupancy.hs
smt_hdisk_occupancy.hs
contain occupancy vs event distributions for each ladder/wedge. Occupancy is defined as a percentage of the channels which were read out per ladder/wedge. The expected average occupancy is about 5%. Occupancy fluctuations above 30% indicate high common mode noise or many noisy channels on the ladder/wedge. Persistent high occupancy can be a result of the wrong threshold downloaded into the chip.

Barrel occupancy histogram names:
"Bar nb-lyr-lad-side occupancy vs event"
where nb - barrel # (1,...,6)
lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n

F-disk occupancy histogram names:
"FD nd-nw-side occupancy vs event"
where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n

H-disk occupancy histogram names:
"HD nd-nw-side occupancy vs event"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n

Main plots

Files
smt_barrel_main.hs
smt_fdisk_main.hs
smt_hdisk_main.hs

SMT Examine

SMT Examine Histograms

for each ladder/wedge contain number of entries vs channel number histograms and the distributions of the number of fired strips. First set of histograms allows to track down the channels that are readout more often than the others (noisy channels) while running in srapse mode of the SVX chip. The second set is another way to represent the occupancy.

Barrel channel entries histogram names:
"Bar nb-lyr-lad-side entries"
"Bar nb-lyr-lad-side fired channels"
where nb - barrel # (1,...,6)
lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n

F-disk channel entries histogram names:
"FD nd-nw-side entries"
"FD nd-nw-side fired channels"
where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n

H-disk channel entries histogram names:
"HD nd-nw-side entries"
"HD nd-nw-side fired channels"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n

Pedestal plots

Files
smt_barrel_peds.hs
smt_fdisk_peds.hs
smt_hdisk_peds.hs
contain average pedestal vs channel number histograms for each ladder/wedge. They also contain pedestal vs channel histograms updated for each event, in other words, the detector response snapshot. The last set of histogram is useful to observe charge

SMT Examine

SMT Examine Histograms

correlations between p- and n-side of the same detector when a real particle goes through it.

Barrel pedestal histogram names:
"Bar nb-lyr-lad-side average pulse"
"Bar nb-lyr-lad-side event pulse"
where nb - barrel # (1,...,6)
lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n

F-disk pedestal histogram names:
"FD nd-nw-side average pulse"
"FD nd-nw-side event pulse"
where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n

H-disk pedestal histogram names:
"HD nd-nw-side average pulse"
"HD nd-nw-side event pulse"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n

Standard deviation plots

Files
smt_barrel_sigma.hs
smt_fdisk_sigma.hs
smt_hdisk_sigma.hs
contain sigma of pedestal vs channel number histograms for each ladder/wedge. These histograms are useful to identify the noisy channels (channels with large sigma) of each ladder/wedge. They make sense if data was taken in the readall mode of SVX chip and was processed in STATIC mode (see SmtRawUnp2Data.rcp) .

Barrel sigma histogram names:
"Bar nb-lyr-lad-side std dev"
where nb - barrel # (1,...,6)

SMT Examine

SMT Examine Histograms

lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n

F-disk sigma histogram names:

"FD nd-nw-side std dev"
where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n

H-disk sigma histogram names:

"HD nd-nw-side std dev"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n

Chip pedestal distributions

Files
smt_barrel_chips.hs
smt_fdisk_chips.hs
smt_hdisk_chips.hs
contain chip pedestal distributions and average chip pedestal vs event for each chip of ladder/wedge. The first set of histograms is used to study total noise. The second set allows to extract common mode noise if data is taken in r eadall mode of SVX chip and processed in STATIC mode (see SmtRawUnp2Data.rcp) .

Barrel chip pedestal histogram names:

"Bar nb-lyr-lad-side-chip nc pedestal"
"Bar nb-lyr-lad-side-chip nc average pulse vs event"
where nb - barrel # (1,...,6)
lyr - layer # (1,..., 8)
lad - ladder # (1,...,12)
side - p or n
nc - chip #

F-disk chip pedestal histogram names:

"FD nd-nw-side-chip nc pedestal"
"FD nd-nw-side-chip nc average pulse vs event"

SMT Examine

SMT Examine Histograms

where nd - disk # (1,...,12)
nw - wedge # (1,..., 12)
side - p or n
nc - chip #

H-disk chip pedestal histogram names:

"HD nd-nw-side-chip nc pedestal"
"HD nd-nw-side-chip nc average pulse vs event"
where nd - disk # (1,...,4)
nw - wedge # (1,..., 24)
side - p or n
nc - chip #

Calibration histograms

Files
smt_barrel_cal.hs
smt_fdisk_cal.hs
smt_hdisk_cal.hs
contain histograms used to make the list of the noisy channels when smt_examine starts.

Occupancy GUI

This process has to run at the same machine that examine runs on, since it uses the output of the examine on an event by event basis. Thus you should run it on d0ol63 as well (see the examine section to see how to do this).

To start it do (on d0ol63)

>setup d0online

>start_daq smt_occupancy

Note that under the ‘display’ menu you can select the

Average occupancy or the occupancy on an event-by-event basis.

Monitoring
Shifter Instructions

Silicon detector monitoring is a multi-host system. It's purpose is to collect data describing current status of hardware generate and send alarm messages to Significant Event System.

Monitoring system consists of the following applications:

- Linux box multit-threaded application
- frontend processor VxWorks server
- Java servlets

Note for experts:

Logfiles for the SDAQ processors are in

/mnt/nobackup/ioc/ppc/mv2304/d0olsmtxx

What to do when

If you need to stop monitoring:

- login to 'd0ol28' as 'd0run'
- cd '/home/d0run/onlineMonitoring'
- source 'STOP_MONITORING.tcsh'
- check if there are not processes: 'ps -aux | grep SMTDataStore'
- if you see any 'SMTDataStore' kill them: kill -9 'process_number'

If you need to start monitoring:

- login to 'd0ol28' as 'd0run',
- cd '/home/d0run/onlineMonitoring'
- setup d0online
- check if there are not processes: 'ps -aux | grep SMTDataStore'

Monitoring
Shifter Instructions

- if you see any 'SMTDataStore' kill them: kill -9 'process_number'
- restart monitoring: source START_MONITORING.tcsh
- check if you can access 'http://www-d0ol.fnal.gov/smtMonitoring/'

If a new message has been sent to Significant Event System:

- confirm that examine reports the same problem
- get more information about problematic HDI/CHIP:
  - using GUI on the left hand side interesting part of the ditector(crate/VBR/HDI) select intersting part of the detector (crate/VRB/HDI)
  - using GUI on the right hand side of the 'http://www-d0ol.fnal.gov/smtMonitoring/' select information you need (singnal/hit number/ occupancy)
  - look for problems: no events, signal 'zero', high occupancy

If you think that monitoring does not send information about faulty system to Significant Event System:

- on the page http://www-d0ol.fnal.gov/smtMonitoring/ check 'IOC DATA UPDATE TIME' and 'SES UPDATE TIME' . Both times should be close to current time. The first one informs when that last data transfer has been done from IOC whereas the second one displays date when the last message has been sent to Significant Event System.
  - if data is not collected from an IOC and you are not an expert: PAUSE the run, reboot PowerPC, start monitoring for the IOC from SMT GUI

Monitoring
Shifter Instructions

- If data is not collected from an IOC and you are an EXPERT: login to the that IOC, look for suspended processes (VxWork command 'i'), look into log file /home/d0run/onlineMonitoring/IOC_d0olsmtXX_ConnectionLog.txt
- If messages are not sent to Significant Event System and you are not an expert check if SES runs whith no problems, eg. if other application can send data to SES. If only monitoring cannot talk to SES restart monitoring.
- If messages are not sent to Significant Event System and you are an EXPERT check log files /home/d0run/onlineMonitoring/SESLog.txt and /home/d0run/onlineMonitoring/IOC_d0olsmtXX_ConnectionLog.txt. Information is sent to SES only if there is new data comming from IOC. If IOC connections are broken SES messages are suspended.

Monitoring
What experts should know

Linux box application consists of the following threads:

- IOCConnection thread that collects data from frontend processor servers (actually, that is a set of threads. One thread collects data from a one IOC)
- shmServer thread that serves data to Java servlet queries
- SESConnection thread that sends alarms to Significant Event System

When application starts it creates data structure to store SMT hardware data. Data structure is created based on the current online database content. OCI Oracle functions are used to get information about all the SMT crates, VRBs, HDIs and chips from online Oracle database. Each HDI and chip have tables to discribe signals, hit count and occupancy. The 'OCIConnection' thread waits for incomming connection requests from frontend processors. As soon as these connection requests appear they are accepted and every 1 minute (currently set) data request is sent to frontend processors by OCIConnection thread. Received data is stored in previously created data stucture. Connections are socket based.

The 'shmServer' thread serves data to Java servlet requests. Connection is socked based. A new socket connection is opened for a new data request. Connection is closed as soon as requested data is served. There are two files written to a disk for each data request. An

Monitoring
What experts should know

html file and php file. An html file contains information about how many separated images are in the php file. php file contains real data and on a base of that file histograms are created on fly in the WWW browser. After a data request has been succesfully completed names of existing html files including a new created one are sent to java servlet client. Java servlet displayes them in the browser.

The two threads 'shmServer' and 'OCIConnection' share the same data structures. They are synchronized using set of semaphores. There is one semaphore created to synchronize access to each SMT crate data.

The 'SESConnection' thread checks hardware data every 10,000 events (currently set) and generates alarms if occupancy exceeds 25% (currently set) or if an HDI or a chip are dead (signal from all the strips is zero). Messages are generated based on the content of the same data structure that is used by 'OCIConnection' thread as well. There is an semaphore used to ensure that the data structure is not overwitten while check is being done.

Monitoring
What experts should know

Java servlets (www-d0ol/smtMonitoring) are served by WWW server and are used to display the data histograms (signal, hit count, occupancy).

Using the GUI, shown on the left hand side of the WWW page, you can select interesting parts of the detecor. Information can be obtained only for those HDIs that are NOT marked as 'disabled'. Below the tree like menu of existing SMT hardware there is a list of 'IOC DATA UPDATE TIME' which tells you when the last data was collected from a particular IOC. Based on that time one can easily figure out if data base containes updated data for a current run.

There is 'SES UPDATETIME' list for all IOCs below already mentioned'IOC DATA UPDATE TIME' list. Dates and times in that list inform when the last hardware check was done and when the last message was sent to Significant Event System.

The GUI on right hand side of WWW page allows to obtain information about SMT hardware in text and graphical formats.

Monitoring
What experts should know

Meaning of selection criteria for text like output:

- Level -- what level hardware should be selected on
- WhatInformation
  - DEAD_HARDWARE -- hardware is concidered dead if there is no signal from any of SVX channels
  - FAULTY_HARDWARE -- hardware is concidered faulty if there is at least one SVX channel with no signal
  - SIGNAL_DATA -- signal mean values
  - HITCOUNT_DATA -- hit number
  - OCCUPANCY_DATA -- occupancy numbers
- DataSet
  - FULL_SET -- output based on all the collected data from the beginning of the run
  - TMP_SET -- output based on tmp data
- CrateName
- VRBName
- HDIName
- SVXNumber

Before you push the 'DataAction', you must make your selections. The easiest way to fill in the CrateName, VRBName and HDIName it to click on a crate, then VRB and then HDI in the left hand WWW window. If you want something at the SVX level you use the pull down menu under SVXNumber. After 'DataAction' is pushed

Monitoring
What experts should know

selected data will appear in a scrollable widged that is going to be drawn below that button.

To display data in a form of histograms one needs to select/fill table below 'SMT MONITORING GRAPHICS'.

Meaning of selection criteria for graphics type output.

- Level -- what level hardware should be selected on
- Type
  - HDI_SVX_TYPE -- data for SVXes and for HDIs (adds all SVX's belonging to the HDI)
  - HDI_TYPE -- only data for HDI's
  - SVX_TYPE -- only data for SVX's
  - VRB_TYPE -- some data are available for VRB's
- WhatInformation
  - SIG_HIT_GRAPH -- signal and hit distributions
  - SIGNAL_GRAPH -- only signal distributions
  - HITCOUNT_GRAPH -- onlt hit distributions
  - OCCUPANCY_GRAPH -- occupancy plots
  - ERROR_GRAPH
  - BITPATTERN_GRAPH
  - MISSING_BITS_GRAPG
  - EVENT_SIZE_GRAPG
  - EVENT_BUFF_GRAPG

Monitoring
What experts should know

  - BUNCH_SIG_HIT_GRAPH
  - BUNCH_SIG_GRAPH
  - BUNCH_HIT_GRAPH
- DataSet
  - FULL_SET -- output based on all the collected data from the beginning of the run
  - TMP_SET -- output based on tmp data
- CrateName
- VRBName
- HDIName

After button 'DataAction' is pushed selected data will appear in new browser widget.

Frontend processor server: is a part of SMT frontend processor code. As soon as 'SMT Monitoring' is turned ON in CREATOR window SDAQ Supervisor passes all the run commands from COOR to frontend processors. At the begin of each run commands INIT and START are sent to SMT frontend processor. When INIT command comes initialization procedure is called. When START commands comes data collection starts. As soon as initialization is completed monitoring server tries to connect to Linux box application (IOCConnection thread) . At that point IOCConnection process

Monitoring
What experts should know

takes over and asks server for data every 1min (currently set). Connection is socket based. As soon as run is stopped command STOP is passed via SDAQ Supervisor to frontend and monitoring server breaks connection.

Hardware data for monitoring purposes can be collected from:

- VRB spy memory (A24/D16 transfer). At a time on a request only data from one HDI is stored in VRB spy memory. Handshake is described in VRB documentation. That procedure is very slow and it is not currently used.
- onl_smtcalib/ssdaq/smtStore/monitoringbuffer and an interrupt is generated. That interrupt is cought by PowerPc and data is copied via VME backplane. That procedure is very efficient and is currently used.

Collected hardware data is unpacked and stored in to histograms for each HDI and each chip. On a request from IOCConnection thread that data is copied to a buffer and sent back to IOCConnection thread.

Current setup.
The whole software is stored in cvs repository in the following directories:

- onl_smtcalib/ssdaq/smtStore/monitoring -- Linux box C++ code
- onl_smtcalib/ssdaq/smtStore/servlet -- Linux box Java servlets
- onl_smtcalib/ssdaq/smtStore/frontend -- frontend C code for VXWorks

Monitoring
What experts should know

SMT online monitoring application runs on 'd0ol28.fnal.gov' D0 online host from 'd0run' account. Application is located in directory '~d0run/onlineMonitoring'.

Since graphs are created using PHP software PHP library needs to be supported by WWW server. Current version installed is 'php-4.1.2'.

For graphs creation an additional packed 'jpgraph-1.6.1' (written is PHP) was used. It is installed on a disc accessible from online cluster in directory `/d0usr/products/jpgraph'. There are links created in the application to the above mentioned location.

SMT online monitoring application should be started/ stopped using official d0 scrit start_daq/stop_daq Usage of that script ensures that only one instance of application runs at a time.

There are several log files created in dir `~d0run/onlineMonitoring/'

- IOC_d0olsmtXX_ConnectionLog.txt -- stores information about data collection from SMT IOCs
- DataServerLog.txt -- stores information about requests from Java servlets
- SESLog.txt -- stores information about hardware checks and messages sent to Significant Event System

Every time application is stopped log files are copied to '/projects/smtMonitoring/log/' directory with current date and time. All 'html' and 'php' files that contain created graphs are in directory '/projects/smtMonitoring/jpgraph_cache'.

Monitoring
What experts should know

Files older then 1 month are purged from both directories '/projects/smtMonitoring/log/' and '/projects/smtMonitoring/jpgraph_cache' by an automatic cron job.

Compilation and Linking.

In order to compile C++ code ('onl_smtcalib/ssdaq/smtStore/monitoring') one needs to 'setup D0RunII p13.10.00' or later if backward compatible.

In order to compile Java servlets ('onl_smtcalib/ssdaq/smtStore/servlet') one needs to: 'setup tomcat' and 'setup java v1_3_1_02'. Compilation is done automatically by 'makefile'. Copiled files 'class' are copied to `www/WEB-INF/classes/' and library 'jar' is copied to 'www/WEB-INF/lib/'. After successful compilation one needs to copy 'class' and 'jar' files to a well known location of 'tomcat' server. Currently that are: '/projects/elog/jakarta-tomcat-3.2.1/webapps/smtMonitoring/WEB-INF/classes/' and '/projects/elog/jakarta-tomcat-3.2.1/webapps/smtMonitoring/WEB-INF/lib/'

In order to compile frontend part change directory to 'onl_smtcalib/ssdaq/smtStore/frontend' and use existing makefile that will make the whole job for you.

The Archivers

Page Section

The Archivers
Introduction

The procedures outlined here are to be carried out either every shift (checking and restarting the Archivers, if required), or once a week, during the Friday day and/or evening shifts (saving the Archiver data and restarting the Archivers)

Written June 5, 2003 P. Rapidis

1. Philosophy

1. What gets saved and why :

We have three processes of the Archiver running, they record periodically data gathered by the control system (via the 1553 link).

The fast Archiver records data at 1 Hz rate and this data is primarily used to diagnose transients that may cause us problems. This system has proven invaluable in diagnosing power supply glitches that have plagued us in the past. This data is of no long term importance and thus only a week's worth of stored data is saved on a scratch disk. Every week we stop the process, clean up the stored data and restart it.

The slow Archiver records parameters at a much slower rate (from a few times a minute to once an hour) that may be of some importance in monitoring the long term performance of the detector – these are primarily the bias voltages (HV) of the HDI's, their power consumption,

The Archivers
Introduction

and environmental variables (temperatures, water flows, magnetic fields …). These pieces of data get saved for long term perusal; they get transferred onto tapes via the SAM system. The transfer onto the SAM data tapes, the erasing of the old data, and the restarting of the process is also done once a week. If for some reason the slow Archiver gets stopped (e.g. it terminates abnormally) earlier in a the week, then the recovery procedure should be a transfer of the older data to SAM followed by a restarting of the process (I.e. follow the procedure for the weekly saving of data for this process).

The Radmon Archiver records parameters related to the radiation loss detectors (the fingers) and to the BLM's at the end of the D0 detector, both at a low rate (once a minute for temperatures and integrated doses) and at a fast rate (1 Hz, for instatneous loss rates) If for some reason the Radmon Archiver gets stopped (e.g. it terminates abnormally) earlier in a the week, then the recovery procedure should be a transfer of the older data to SAM followed by a restarting of the process (I.e. follow the procedure for the weekly saving of data for this process).

The Archivers Introduction

A detailed list of variables being saved:

Fast Archiver:
http://d0server1.fnal.gov/projects/silicon/www/Archiver/fastlist.htm
Slow Archiver:
http://d0server1.fnal.gov/projects/silicon/www/Archiver/slowlist.htm
Radmon Archiver
(ask the radiation loss experts)

A general note – at some steps you will be asked to see if a file has a current date. Please be cognizant of the fact that the Archiver (esp. the slow Archiver) may be up to a few minutes late in updating the output files. So be somewhat generous when interpreting the date stamp information

The Archivers
To be done once a shift

1. Make sure the fast Archiver is running

It is assumed that you are signed on as d0smt on an online machine and you have done a >setup d0online

1. Either you can issue the command

```
>d0ssh d0ol28  'ps _efm | grep d0smt | grep archi | grep _v grep'
```

and check that you see three jobs running;

also check if the archive file is updating by

```
>d0ssh d0ol28  'ls _l /scratch/smt/psarchive | grep
                `date +%Y%m%d`'
```

and check if the file with a name like 200ymmdd-000000 (where ymmdd are today's year, month, and date) has a current time stamp.

Easier step

or execute the script (is also in startguis line D9):

```
>/home/d0smt/archiverchecks.sh
```

which does the above (and more) for you

2. If things look OK go on to checking the slow Archiver.

The Archivers
To be done once a shift

3. If the fast Archiver is dead you should kill any malfunctioning jobs, clean up the lock file, and restart it. This is done by doing :

   Sign on d0ol28 as d0smt by doing :

```
>d0ssh d0ol28   ← if needed
>setup d0online              ← if needed
>setup chan_archiver
>stop chan_archiver _p 4820
>cd /scratch/smt/psarchive
>rm archive_active.lck ← done if this file exists
```

   kill any leftover jobs found in step 1 via

```
>kill _9 <pid> ← get the process id number from step 1
```

   restart the fast Archiver by doing

```
>start_chan_archiver _p 4820 _w . _c ps_config
```

   You must be in the /scratch/smt/psarchive directory, and just for your information 4820 is the port number

   check (after a couple of minutes) if the fast Archiver is running by repeating the tests of step 1.

The Archivers
To be done once a shift

2. Make sure the slow Archiver is running

   1. Either you can issue the command

```
>d0ssh d0ol03   'ps _efm | grep d0smt | grep archi | grep _v grep'
```

      and check that you see three jobs running;

      also check if the archive file is updating by

```
>d0ssh d0ol03   'ls _l /projects/archive/smt/current | grep
    `date +%Y%m%d`'
```

      and check if the file with a name like 200ymmdd-000000 (where ymmdd are today's year, month, and date) has a current time stamp.

Easier step

      or execute the script (is also in startguis line D9):

```
>/home/d0smt/archiverchecks.sh
```

      which does the above (and more) for you.

   2. If things look OK then you are done with the slow archiver, go on to check the radmon archiver …
   3. If the slow Archiver is dead, then follow the procedure used to back up the slow Archiver data (which should be done once a week, **or** in an exceptional circumstance, such as the one you are facing now).

The Archivers
To be done once a shift

3. Make sure the Radmon Archiver is running

Either you can issue the command

```
>d0ssh d0ol23   'ps _efm | grep d0rad | grep archi | grep _v grep'
```

and check that you see three jobs running; also check if the archive file is updating by

```
>d0ssh d0ol23   'ls _l /projects/archive/radmon/current | grep
   `date +%Y%m%d`'
```

and check if the file with a name like 200ymmdd-000000 (where ymmdd are today's year, month, and date) has a current time stamp.

Easier step

or execute the script (is also in startguis line D9):

```
>/home/d0smt/archiverchecks.sh
```

which does the above (and more) for you.

If things look OK then you are done, go do something else now !

If the Radmon Archiver is dead, then follow the procedure used to back up the Radmon Archiver data (which should be done once a week, **or** in an exceptional circumstance, such as the one you are facing now).

The Archivers
To be done once a week

These procedures are to be done once a week (Friday day and/or evening shift).

Steps I and II will also be needed in the situation of a malfunctioning slow/Radmon Archiver.

The are five distinct operations here.

Ia and Ib) We save the data of the slow/Radmon Archiver by copying the data to a temporary location, *tar*ing it and *gzip*ing it. The original directory is cleared and the slow/Radmon Archiver is restarted.

IIa and IIb) The *tar*/*gzip*ed file is transferred to SAM, and upon a successful SAM transfer the *tar*/*gzip*ed file is deleted. (These two operations are to be done once a week and in the case of a malfunctioning slow/Radmon Archiver).

III) In addition, for the fast Archiver, we delete the older data of the fast archiver from a backup directory, copy its current data to the backup directory, clean up the current data directory and restart the fast Archiver.

The Archivers
To be done once a week

The old instructions have been removed. To find instructions for running the weekly archiver backup, please refer to the hard copy of the instructions in the control room. There are two pages of instructions written by Petros describing how to run the necessary scripts. Please read the instructions completely before beginning. If you have questions or problems, please page the on-call expert.

The Archivers
Plotting archiver data

For devices being archived by the **slow** archiver use any of the online machines and do :

> setup d0online

> setup chan_archiver

> Xarr.py /projects/archive/smt/xxxxxx/dir.200ymmdd-hhmmss &

(xxxxxx can be either 'current' or 'previous', and y,mm,dd,hh,mm,ss stand for the year, month, day, hour, minute, and second when this archive file started)

For devices being archived by the **fast** archiver use **ONLY** the d0ol28 machine :

> setup d0online ← on d0ol28 !!!

> setup chan_archiver

> Xarr.py /scratch/smt/psarchive/xxxxxx/dir.200ymmdd-hhmmss &

(xxxxxx can be either 'psarchive' or 'old', and y,mm,dd,hh,mm,ss stand

for the year, month, day, hour, minute, and second when this archive file started)

The control of the display program is quite obvious, but you may need to know

the name of the device you wish to plot, such lists can be found in this book or

on the web at

http://d0server1.fnal.gov/projects/Silicon/www/Archiver/fastlist.htm

http://d0server1.fnal.gov/projects/Silicon/www/Archiver/slowlist.htm

for the fast and the slow archiver respectively.

Data Integrity Monitoring

The data integrity examine is only to be run on d0ol65. Open a d0smt terminal on that machine, and then run the script:

/online/examines/scripts/smt_error_examine.sh

There is a note on the rightmost display of d0ol65 showing the command.
Remember to reset the counters at the beginning of the store.

MCH Walkthrough

1. Contact Aurelio Juste for any questions about MCH Walkthroughs:
   - 722-0033
   - x6565

D0 Radiation Monitoring

Shift Procedure for SMT Radiation Monitoring

SMT radiation dose is monitored through two systems: BLMs (Beam Loss Monitors) and Fingers (silicon diode detectors residing inside the SMT). The BLM system is the primary protection system. It generates alarm and abort signals according to preset thresholds. Both the instantaneous and integrated doses are recorded and can be monitored through ACNET interface of the system (E35). One of the integrating devices (D0BRUT) is monitored by MCR for making manual trip decisions for integrated doses. The SMT Finger system provides detailed dose monitoring through EPICS and can be used to analyze losses in more detail than the BLM system.

Startup

- Start E35 ACNET page for BLM monitoring (if it's already not running) on the ACNET console.
- Start StripChart for BLM HV:
  - from /projects/D0rad/shift
  - Linux:onl-> setup d0online
  - Linux:onl-> ./blm_bias.sh &;

Monitoring

- On E35 page, make sure that all the devices are enabled: green EN should show for each device. A LAM state indicates an alarm condition. If this occurs call the experts.
- At the start of shot setup or store, note down the integrated dose values from the E35 page in the logbook. Monitor the change in these values and inform the shift captain if any of the values reaches the manual abort threshold (shot setup: 2krad, store: 3krad). Shift captain would then request MCR to abort the beam. D0-OP_SMT-010 (D0 Silicon Detector Radiation Protection) gives instructions on beam alarm and aborts.
- If BLM HV goes out of bound (<1200V or >2200V) call the expert.

Experts

Cristina Galea x2177
galea@fnal.gov
or
Miruna Anastasoaie
miruna@fnal.gov

Ronald Lipton
x4132
(630)266-8242 (pager)
lipton@fnal.gov

Paging

When you have trouble with the detector and don't know what to do, the first thing you should do is page the SMT On-call Expert.

To page the SMT On-call Expert
you have to:

- Dial: 9 218 8764
- Wait for a signal
- Enter: 8800#
- You will hear another signal - that is it! Hang up and wait for the On-call expert to call you back.

Other Pager numbers:
Breese Quinn: 266-0565
Michael Weber: 266-0561
Eric Kajfasz: 218-9774
Harald Fox: 847-414-4044
Petros Rapidis: 905-4069
RADMON On-call expert: 218-9437