When to Turn HV ON

HV can be turned **ON** after 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. 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.

When to Turn HV OFF

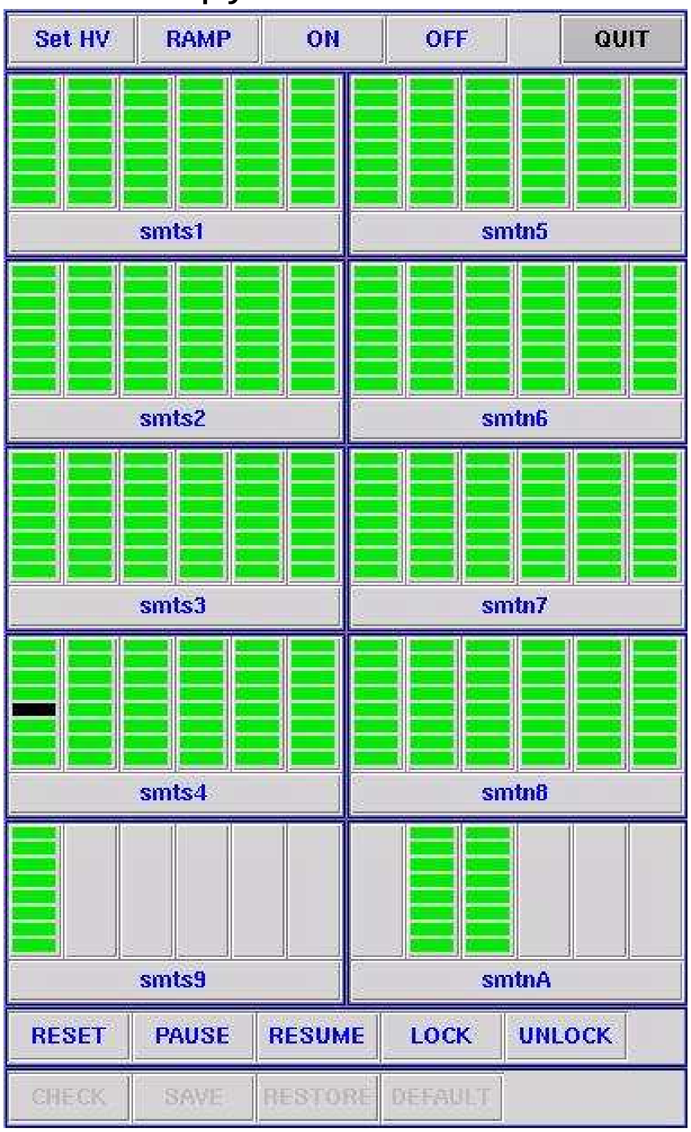
HV must be turned **OFF** *before*:

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 20 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.
3. Beam Studies: No HV during any accelerator studies.

Global HV Monitoring & Control GUI

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

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



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). Note that smts9 and smtnA are actually one crate with some South pods and some North pods.

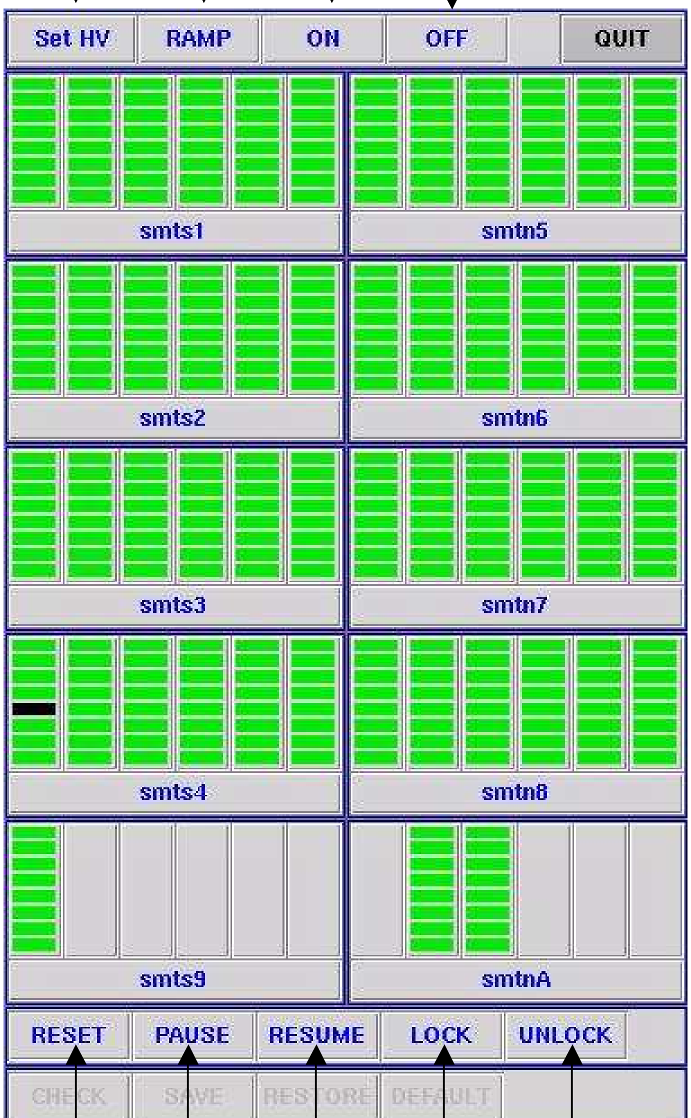
Global HV Monitoring & Control GUI

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

Ramping Procedure

1. Start the Global HV crate GUI

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

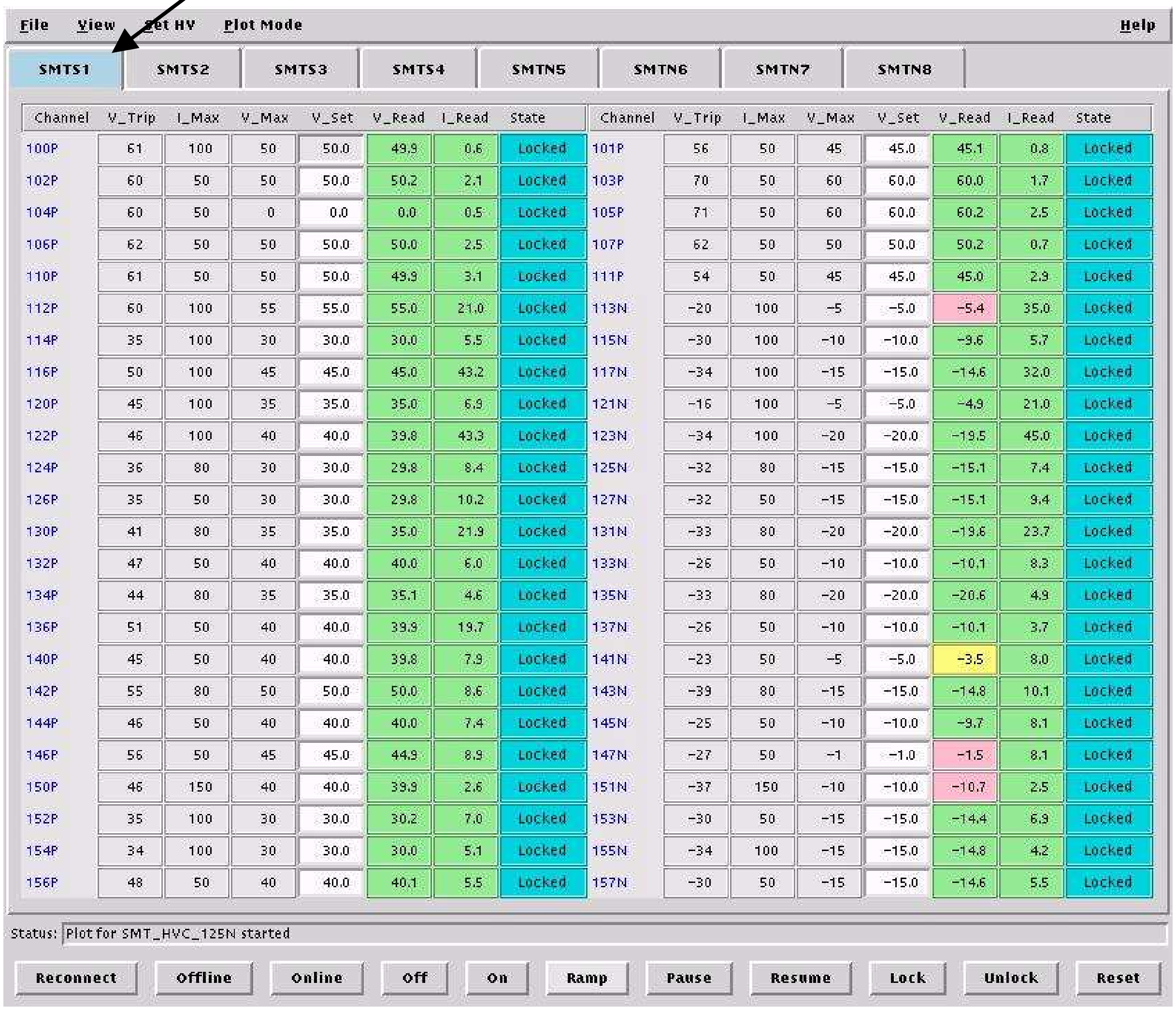
2. Ramp-Up:
   a) Turn on all pods: click the **ON** button
   b) Set the target ramping voltage for all pods: use the **Set HV** pull-down menu and select "**100% + underdepletion list**"
   c) Start ramping: click the **RAMP** button
   d) If any pods trip (i.e. start flashing red), click the **RESET** button *immediately*, and then click **RAMP** again.
   e) When all pods are fully ramped and holding (i.e. green), lock the pods: click the **LOCK** button.

3. Ramp-Down:
   a) Unlock all pods: click the **UNLOCK** button
   b) Set the target ramping voltage to "**0%**" with the **Set HV** pull-down menu.
   c) Start ramping: click the **RAMP** button
   d) If any pods enter a **PAUSED** state (i.e. white), click the **RESUME** button to continue ramping.
   e) When all pods have ramped down to less than 5 V, turn off the pods: click the **OFF** button*

Crate HV Monitoring & Control GUI

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

A page for each HV crate

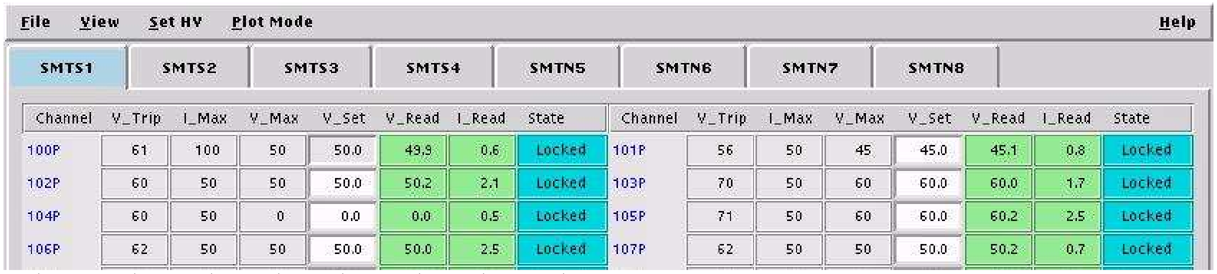


Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State	Channel	V_Trip	I_Max	V_Max	V_Set	V_Read	I_Read	State
100P	61	100	50	50.0	49.9	0.6	Locked	101P	56	50	45	45.0	45.1	0.8	Locked
102P	60	50	50	50.0	50.2	2.1	Locked	103P	70	50	60	60.0	60.0	1.7	Locked
104P	60	50	0	0.0	0.0	0.5	Locked	105P	71	50	60	60.0	60.2	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
```

Crate HV Monitoring & Control GUI



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

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

Crate HV Monitoring & Control GUI

States and 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

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: tripped (overcurrent/overvoltage), options from this state are:

- **Reset**: reset the pod to **On**

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.

Troubleshooting

Trips

Some pods may trip while ramping up, holding, or ramping down. For most trips, all that is required is:

a) Reset the tripped pods: click the **Reset** button
b) Ramp the reset pods: click the **Ramp** button.

Sometimes if a tripped pod is not reset quickly, **V_Read** drifts to a voltage of the opposite polarity. In these cases, the pod is serving double-sided detectors, and is being pulled to the opposite side voltage. The tripped pod cannot be reset until its partner has been ramped down.

a) Ramp down the tripped pod's partner (this may take several minutes). Be sure to **Lock** all other pods if using the **Set HV** pull-down menu, or else enter the target value for the voltage directly into the pod's **V_Set** field.
b) Reset the tripped pod: click the **Reset** button.
c) Set the pods' target voltages with **Set HV** or **V_Set**.
d) Ramp the pods: click the **Ramp** button.

If a pod cannot be ramped to its full (or underdepletion – see next section) voltage, ramp it to as high a percentage as possible without causing a trip. In the unlikely case that a pod for a double-sided detector cannot be ramped at all, do not turn the pod **Off**. Set the voltage to 0 V and **Ramp**. If the pod is turned **Off**, it will drift to the opposite side voltage resulting in no bias at all for the detector.

Underdepleted Detectors

Some detectors cannot be ramped to full depletion. There is a list of HV pods that are only to be ramped to a fraction of full depletion. These fractions are automatically loaded when "**100% + underdepletion list**" is selected from the Global HV GUI **Set HV** menu. However, when ramping pods individually or with the Crate HV GUI, check the list and only ramp underdepletion pods to the indicated percentage. Then, **Lock** those pods so that they will not be ramped further.

Troubleshooting

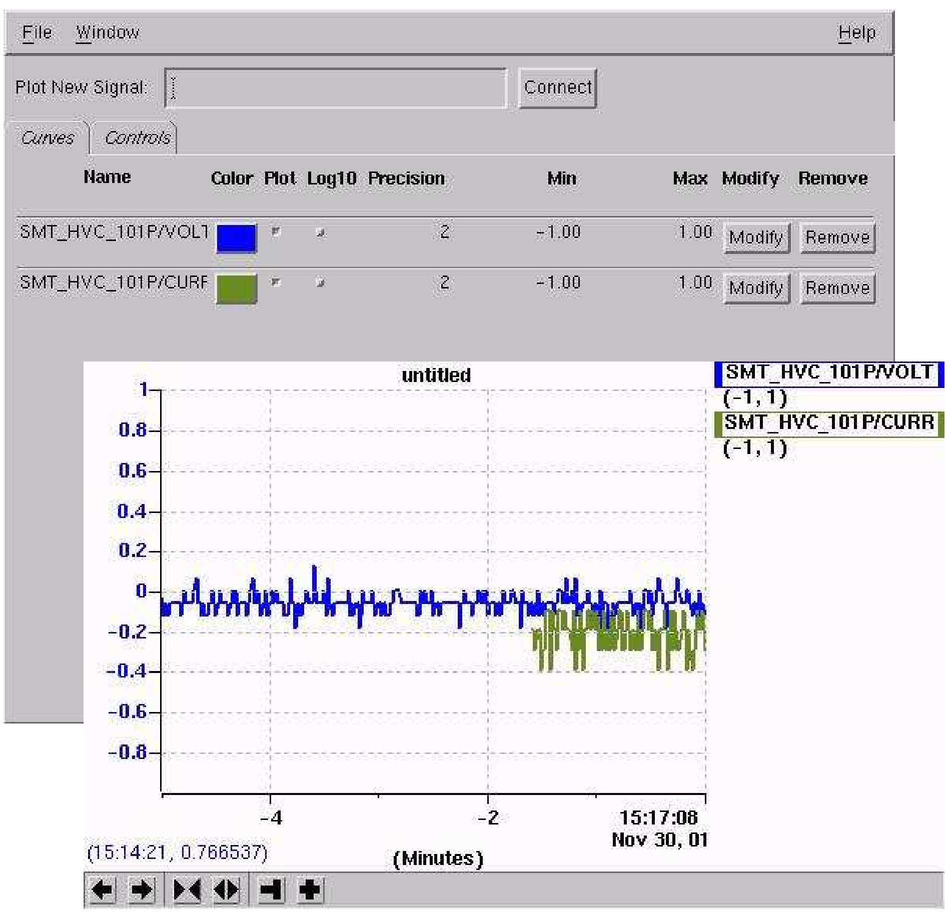
StripTool

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.

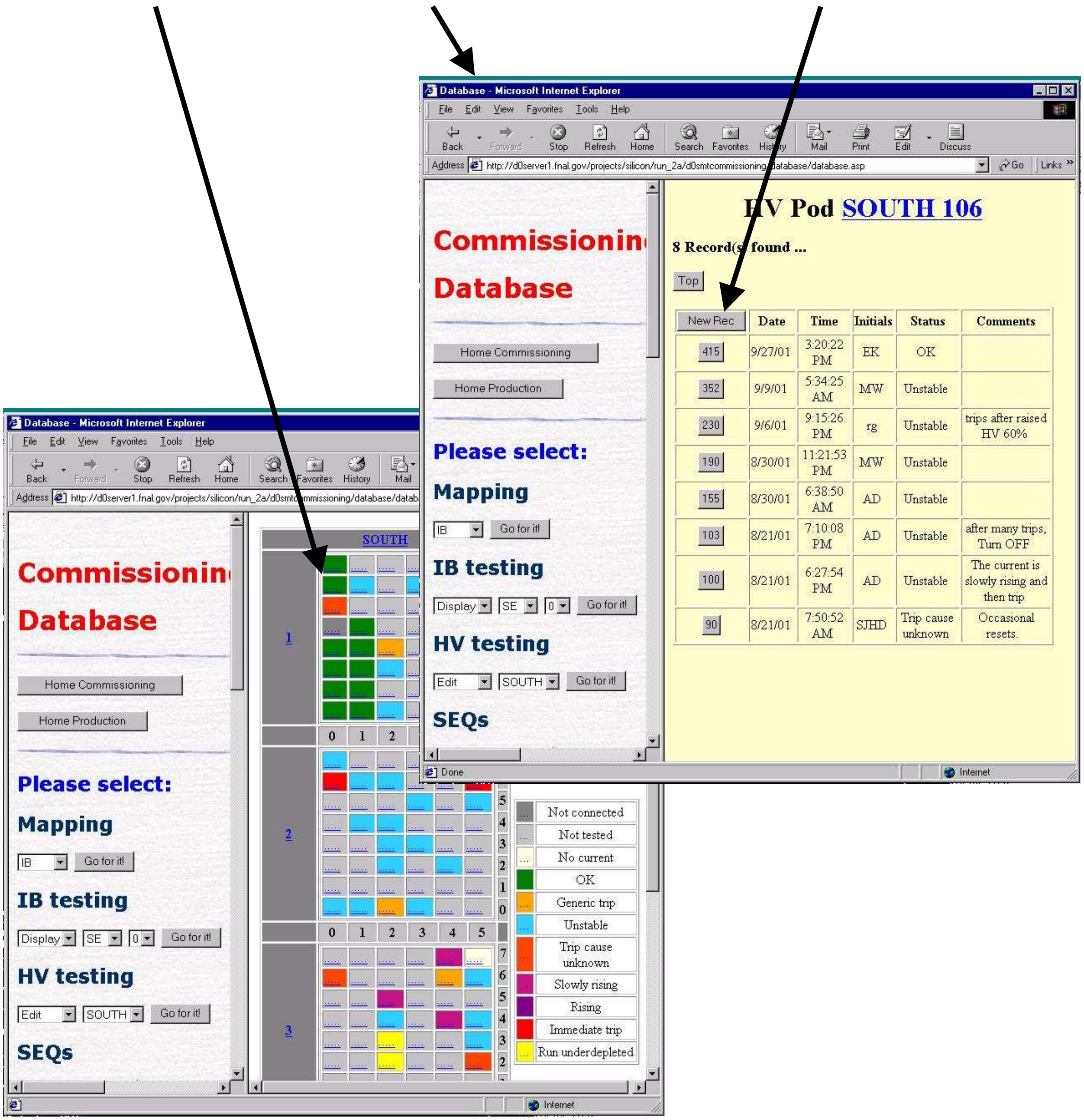


Troubleshooting

Logging Information/Problems

Any information related to actions taken with the HV system should be logged in the electronic logbook. In addition, problems with particular HV pods should be entered into the Commissioning DB (http://d0server1.fnal.gov/projects/silicon/run_2a/d0smtcommissioning/database/database.asp).

Click on a pod to pull up its history, and then enter a "**New Rec**".

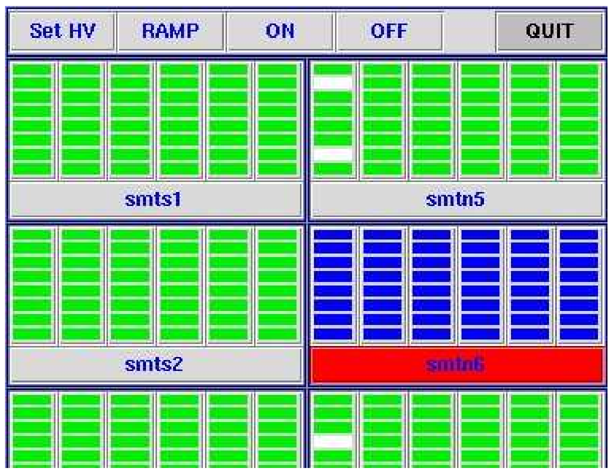


Troubleshooting

Resetting a Tripped HV Crate

A HV crate trip is indicated by a flashing red crate name bar in the global HV GUI. In all likelihood the trip is due to a Rack Monitor trip in the HV rack (M220,M221, or M222). To reset a crate:

- 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.
- Click on the flashing crate name in the global HV GUI
- Click **Reset** in the window that pops up.



Resetting Pods Tripped During Crate Turn On

Sometimes when a whole crate is turned **On**, a lot of the HV pods will immediately trip without ramping them. 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.

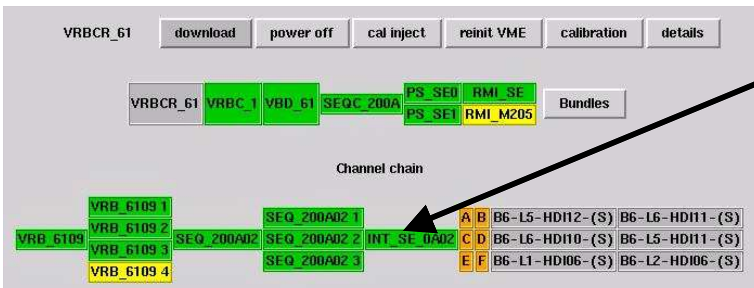
Finding HV Pod/Channel Info

Finding HV information for a particular device

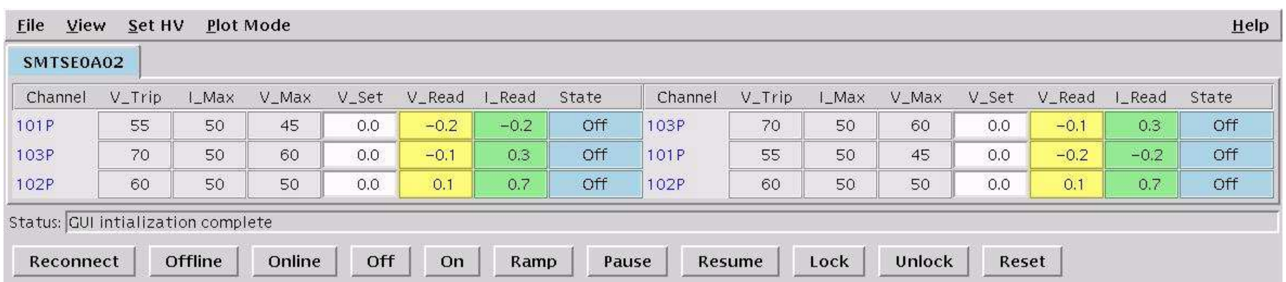
There are several ways to obtain HV information for a particular channel. Either of the following may be more useful depending on what you are doing.

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

Click this…



…and get this…



interface board. A HV GUI for the entire VRB crate can be obtained by left-clicking on the VRBCR_# button and selecting "HV GUI".

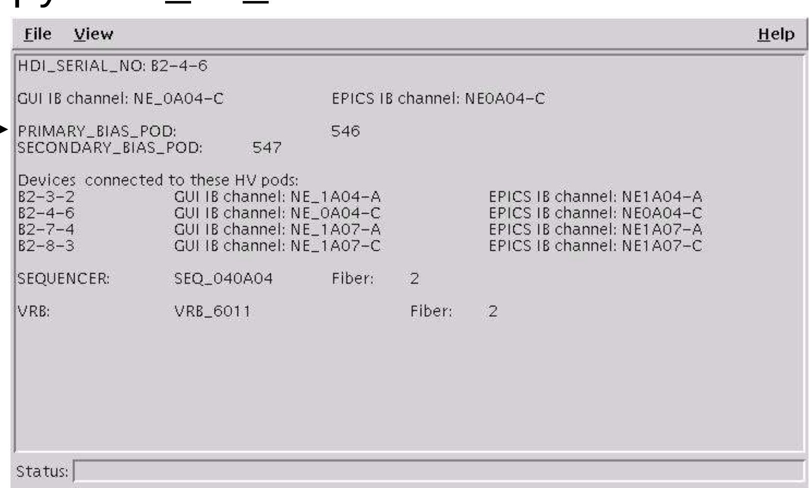
- Command line: HV information for a particular detector or IB channel (e.g. B2-4-6 or SMT_IB_NE0A04-C) can be obtained by:

```
> cd ~d0smt/monitoring
> show_det_info.py B2-4-6
```

or

```
> show_IB_info.py SMT_IB_NE0A04-C
```

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



Finding HV Pod/Channel Info

Finding HV information for a particular device

- Commissioning DB:

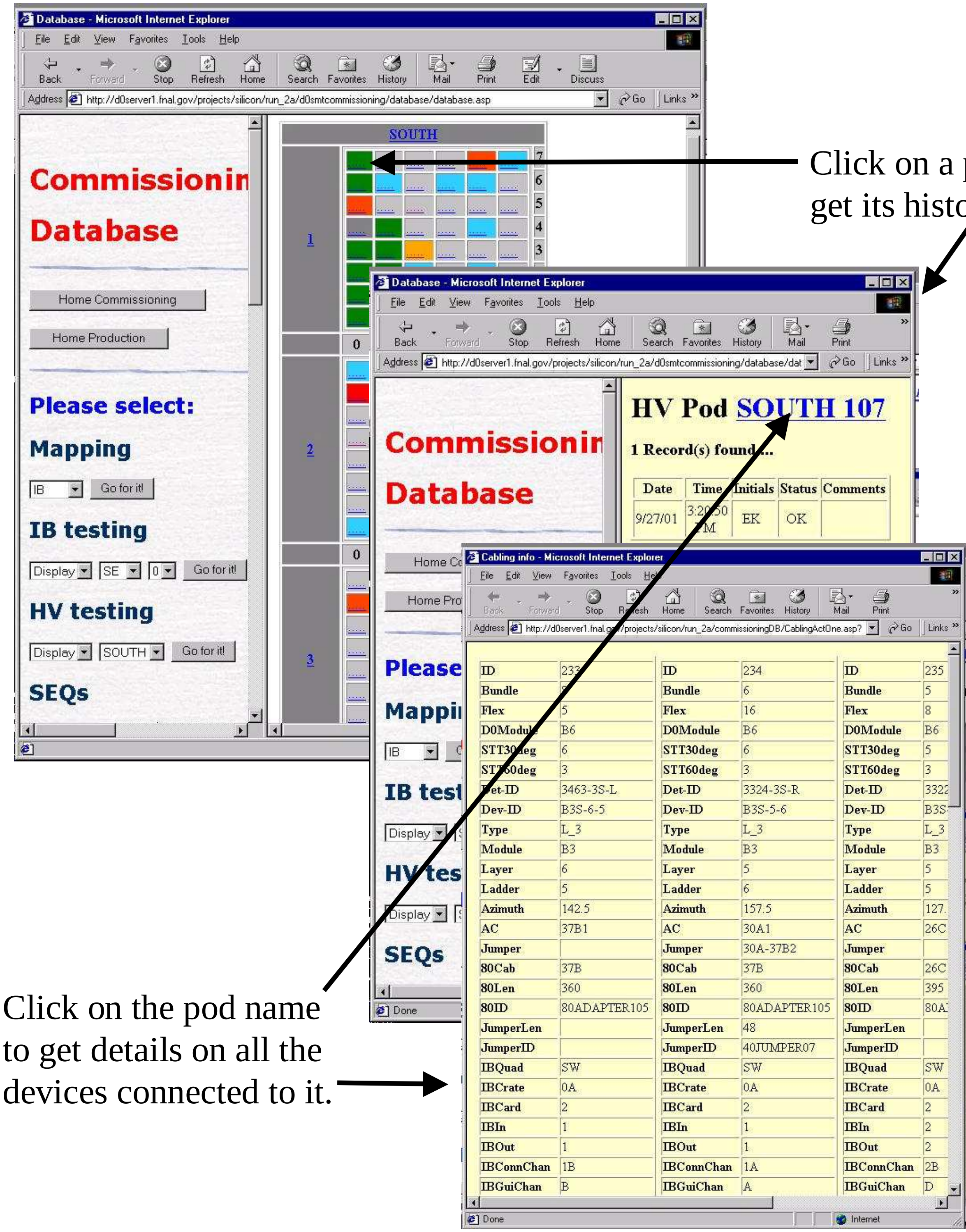
Web DB Pics go Here

Finding HV Pod/Channel Info

Finding device information for particular HV pods

•Commissioning DB: from the “HV testing” display…

(http://d0server1.fnal.gov/projects/silicon/run_2a/d0smtcommissioning/database/database.asp)



Click on a pod, to get its history.

Click on the pod name to get details on all the devices connected to it.

Finding HV Pod/Channel Info

Finding device information for particular HV pods

- 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
```