

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*:

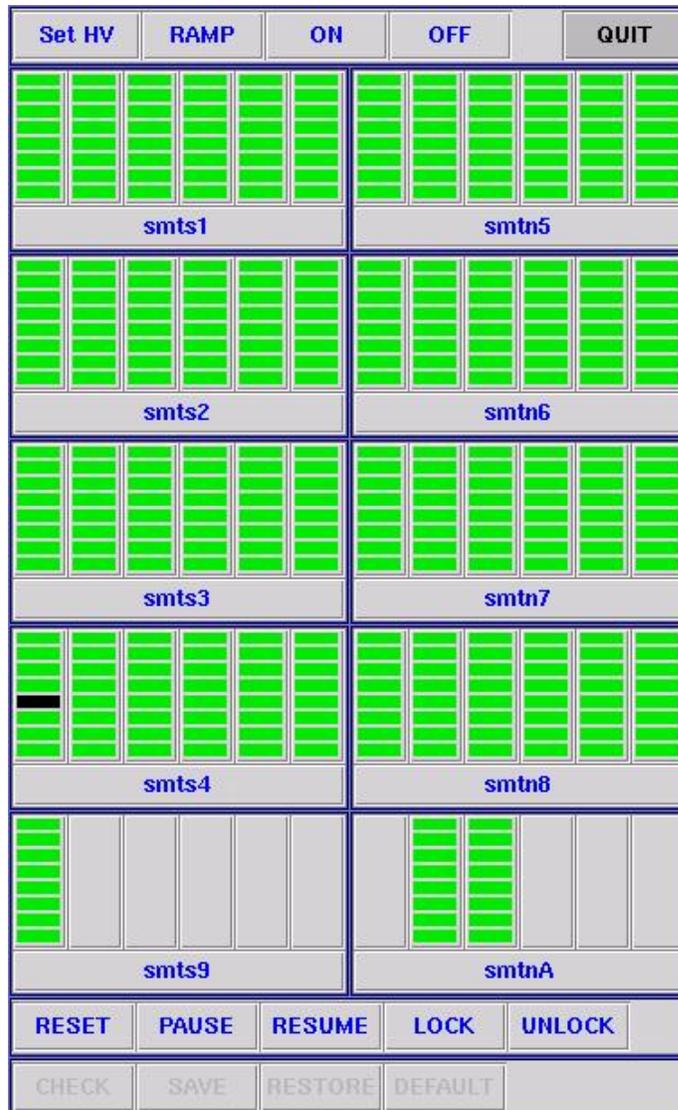
1. Shot Injection: The detectors cannot be biased when beam is first put into the Tevatron. During shot setup, check with the shift captain to ascertain the accelerator schedule, and start turning off the HV at least 20 minutes before injection.
2. End of Store: HV must be turned off before the beam 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

RESET: reset tripped pods

PAUSE: pause ramping

RESUME: resume paused ramping

LOCK: lock pods at current settings

UNLOCK: unlock locked 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

The screenshot displays the Crate HV Monitoring & Control GUI. The interface includes a menu bar with 'File', 'View', 'Set HV', 'Plot Mode', and 'Help'. Below the menu is a tabbed interface with tabs for SMTS1 through SMTN8. The main area is a table with columns for Channel, V_Trip, I_Max, V_Max, V_Set, V_Read, I_Read, and State. The table is divided into two sections, SMTS1 and SMTN8. The State column is highlighted in cyan for 'Locked' and pink for 'Unlocked'. A status bar at the bottom shows 'Plot for SMT_HVC_125N started' and a row of control buttons: Reconnect, Offline, Online, Off, On, Ramp, Pause, Resume, Lock, Unlock, Reset.

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

SMTS1								SMTS2								SMTS3								SMTS4								SMTS5								SMTN6								SMTN7								SMTN8							
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	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	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	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																																																

- **Channel:** HV pod name
- **V_Trip:** bias voltage hardware trip point
- **I_Max:** bias current trip point
- **V_Max:** bias voltage maximum (i.e. bias voltage for full depletion)
- **V_Set:** bias voltage set point
- **V_Read:** bias voltage reading
- **I_Read:** bias current reading
- **State:** shows current state of the HV pod

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

Status: Plot for SMT_HVC_125N started

Reconnect	Offline	Online	Off	On	Ramp	Pause	Resume	Lock	Unlock	Reset
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- 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

File View Set HV Plot Mode Help															
SMTS1		SMTS2		SMTS3		SMTS4		SMTS5		SMTN6		SMTN7		SMTN8	
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”.

The screenshot shows two windows from the Commissioning Database. The left window displays a grid of HV pods for 'SOUTH' with a legend for their status. The right window shows the history for 'HV Pod SOUTH 106' with 8 records found.

Commissioning Database

Home Commissioning
Home Production

Please select:
Mapping
IB [] Go for it!

IB testing
Display [] SE [] 0 [] Go for it!

HV testing
Edit [] SOUTH [] Go for it!

SEQs

HV Pod SOUTH 106
8 Record(s) found ...

New Rec	Date	Time	Initials	Status	Comments
415	9/27/01	3:20:22 PM	EK	OK	
352	9/9/01	5:34:25 AM	MW	Unstable	
230	9/6/01	9:15:26 PM	rg	Unstable	trips after raised HV 60%
190	8/30/01	11:21:53 PM	MW	Unstable	
155	8/30/01	6:38:50 AM	AD	Unstable	
103	8/21/01	7:10:08 PM	AD	Unstable	after many trips, Turn OFF
100	8/21/01	6:27:54 PM	AD	Unstable	The current is slowly rising and then trip
90	8/21/01	7:50:52 AM	SJHD	Trip cause unknown	Occasional resets.

Legend:

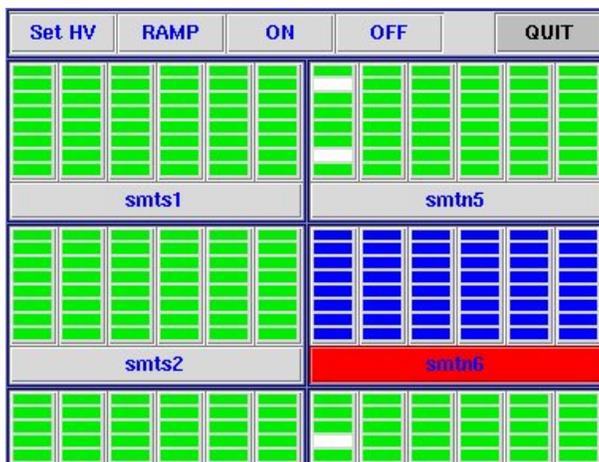
- Not connected
- Not tested
- No current
- OK
- Generic trip
- Unstable
- Trip cause unknown
- Slowly rising
- Rising
- Immediate trip
- Run underdepleted

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.

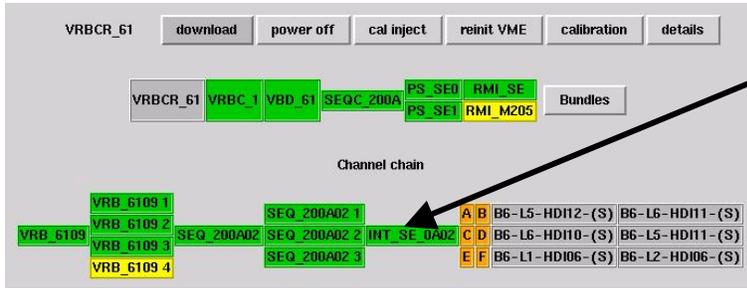
Finding HV Pod/Channel Info

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...

SMTSE0A02															
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
101P	55	50	45	0.0	-0.2	-0.2	Off	103P	70	50	60	0.0	-0.1	0.3	Off
103P	70	50	60	0.0	-0.1	0.3	Off	101P	55	50	45	0.0	-0.2	-0.2	Off
102P	60	50	50	0.0	0.1	0.7	Off	102P	60	50	50	0.0	0.1	0.7	Off

Status: GUI initialization complete

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.

File		View		Help	
HDI_SERIAL_NO: B2-4-6					
GUI IB channel: NE_0A04-C		EPICS IB channel: NE0A04-C			
PRIMARY_BIAS_POD:		546			
SECONDARY_BIAS_POD:		547			
Devices connected to these HV pods:					
B2-3-2	GUI IB channel: NE_1A04-A	EPICS IB channel: NE1A04-A			
B2-4-6	GUI IB channel: NE_0A04-C	EPICS IB channel: NE0A04-C			
B2-7-4	GUI IB channel: NE_1A07-A	EPICS IB channel: NE1A07-A			
B2-8-3	GUI IB channel: NE_1A07-C	EPICS IB channel: NE1A07-C			
SEQUENCER:	SEQ_040A04	Fiber:	2		
VRB:	VRB_6011	Fiber:	2		

Status:

Finding HV Pod/Channel Info

Finding HV information for a particular device

- Commissioning DB:

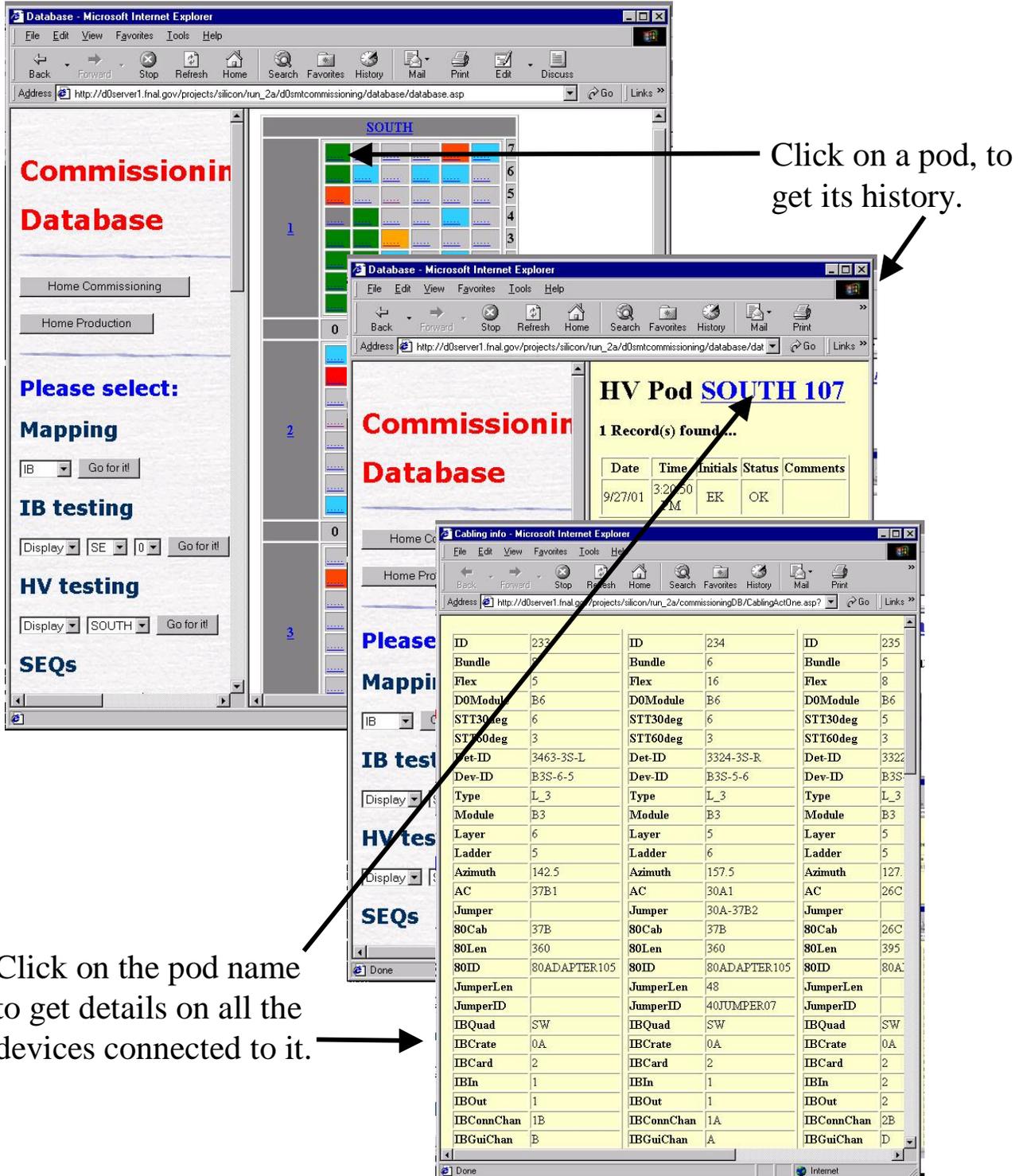
Web DB Pics go Here

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.

Commissioning Database

Home Commissioning

Home Production

Please select:

Mapping

IB testing

HV testing

SEQs

HV Pod SOUTH 107

1 Record(s) found...

Date	Time	Initials	Status	Comments
9/27/01	3:20:50 AM	EK	OK	

Cabling info

ID	233	ID	234	ID	235
Bundle	5	Bundle	6	Bundle	5
Flex	5	Flex	16	Flex	8
DOModule	B6	DOModule	B6	DOModule	B6
STT30deg	6	STT30deg	6	STT30deg	5
STT60deg	3	STT60deg	3	STT60deg	3
Det-ID	3463-3S-L	Det-ID	3324-3S-R	Det-ID	3322
Dev-ID	B3S-6-5	Dev-ID	B3S-5-6	Dev-ID	B3S
Type	L_3	Type	L_3	Type	L_3
Module	B3	Module	B3	Module	B3
Layer	6	Layer	5	Layer	5
Ladder	5	Ladder	6	Ladder	5
Azimuth	142.5	Azimuth	157.5	Azimuth	127
AC	37B1	AC	30A1	AC	26C
Jumper		Jumper	30A-37B2	Jumper	
80Cab	37B	80Cab	37B	80Cab	26C
80Len	360	80Len	360	80Len	395
80ID	80ADAPTER105	80ID	80ADAPTER105	80ID	80A
JumperLen		JumperLen	48	JumperLen	
JumperID		JumperID	40JUMPER07	JumperID	
IBQuad	SW	IBQuad	SW	IBQuad	SW
IBCrate	0A	IBCrate	0A	IBCrate	0A
IBCard	2	IBCard	2	IBCard	2
IBIn	1	IBIn	1	IBIn	2
IBOut	1	IBOut	1	IBOut	2
IBConnChan	1B	IBConnChan	1A	IBConnChan	2B
IBGuiChan	B	IBGuiChan	A	IBGuiChan	D

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
```

```
File View Help  
HV pod ID: 133  
HV pod EPICS name: SMT_HVC_133N  
Secondary bias pod connected to:  
HDI_SERIAL_NO: 86-7-7  
  GUI IB channel: SW_0B13-B      EPICS IB channel: SW0B0D-B  
  SEQUENCER:     SEQ_190B13     Fiber: 1  
  VRB:           VRB_6510      Fiber: 1  
HDI_SERIAL_NO: 86-8-8  
  GUI IB channel: SW_0B13-C      EPICS IB channel: SW0B0D-C  
  SEQUENCER:     SEQ_190B13     Fiber: 2  
  VRB:           VRB_6510      Fiber: 2  
HDI_SERIAL_NO: 86-8-9  
  GUI IB channel: SW_1A03-D      EPICS IB channel: SW1A03-D  
  SEQUENCER:     SEQ_201B13     Fiber: 2  
  VRB:           VRB_6310      Fiber: 2  
HDI_SERIAL_NO: 86-8-10  
  GUI IB channel: SW_1A03-C      EPICS IB channel: SW1A03-C  
  SEQUENCER:     SEQ_201B13     Fiber: 2  
  VRB:           VRB_6310      Fiber: 2  
Status: 
```