SSD Operation Guide
Run IV

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L.Martin/J.Baudot

1. Legend

Important things are in **bold characters**.
Commands to be used at the Unix or VxWorks prompt are in *italic blue*.
MEDM (slow control) buttons are in **bold green**.

2. Introduction

This document gives a quick access to the most important information to operate the SSD. More detailed documents will be posted on the SSD web server. To get an overview on the SSD one can read the SSD section of the STAR NIM paper (http://star.bnl.gov/~jhthomas/NimWeb/ssd/ssd_nim.pdf).

The most important informations to operate the SSD are described in :

- **section 7 (starting the SSD from scratch)**
- **section 8 (make sure the SSD is ready for data taking)**
- **section 9 (checking the yellow squares)**
- **section 12 (bringing back the connection to the VME board)**
- **section 14 (tricks and tips)**
- **sections 15, 16 and 17 give details on the SSD slow control panels.**

3. The SSD during the Run IV

The asymptotic SSD is made of 20 ladders with 16 detection modules each assembled into a barrel shape in between the SVT outermost layer and the TPC inner field cage. During the summer 2003, 10 ladders have been installed in STAR : a group of 5 ladders at 12 o'clock and a group at 6 o'clock. Each module is made of double-sided silicon wafer with an independent readout for both sides (the so-called P-side and N-side). Four readout boards (installed on the TPC wheels) allow to control and collect data from the ladders. Each rdo board control 5 half-ladders (either the P-side or N-side).

4. The SSD Slow Control in brief

The Sun workstation ssdsun01.starp.bnl.gov is the main machine for operating the SSD. It is sitting next to the SVT computers in the control room. The user should be logged on this machine

under the login name "ssd". The password to login is indicated on the computer screen. If you are in console mode (after a reboot for instance) type *openwin* to start the window manager (Fvwm).

If one is connecting to the sun workstation from an other computer (ssdlinux01.starp.bnl.gov) via a *ssh*, one should not start the window manager and go directly to the next step below.

The core of the system is a VME board (ssdvme.starp.bnl.gov) running epics under VxWorks installed in the SSD rack on the South platform. The main window of the SSD slow control allows to bring the SSD ON in few clicks. See the end of this document for a description of the SSD slow control panels. If absent, one can open the main SSD slow control panel by typing *ssdsc* in any terminal window.

During the SSD initialization, it is useful to have a connection to the VME board to check for error messages. A serial link can be established by typing *vmeserie* in any terminal. This link is unique so one has to make sure that one is not up already. If the serial link has not been started directly from the ssdsun01 station itself do *ps -fu ssd | grep 'telnet'* to identify and kill the process associated to this old link (*kill -9 process_pid*).

5. The SSD Cooling system

The SSD ladders and the readout boards are air-cooled. The air is taken from the IFC, pulled through the ladders, the rdo boards and released to the WAH. Four vortecs (transvector airflow amplifier) installed on the Pole Tips use 7 bars compressed air and induce and an air flow of the order of 1 liter/s in the ladders and the rdo boxes. A solenoid valve controls the compressed air flow before the vortecs. This valve is slow controlled by the SVT system installed on the North platform.
The pressure of the compressed air is monitored and displayed on the main SSD panel. Its value should be around 115 psi (±10 psi). The temperature on the SSD readout boards is also monitored by the Slow control. After the SSD is initialized, the average temperature is around 50ºC on these boards.

One should keep in mind that the valve is closed by default (especially after a power failure) and its status should be checked first in case of troubles with the SSD cooling system. The valve is controlled on the channel 8 of the SVT Power Network Switch. Consult the SVT Operation guide for the procedure to check its status.

6. The SSD and the interlocks

The SSD interlock system is closely linked to the SGIS. It uses a custom-made relay driven system integrated in the SSD slow control crate located on the STAR south platform. The SSD power supplies can be turn on only if the IFC permissive (from SGIS) is granted. The SSD slow control window does not show the status of the interlock signal yet but since the permissive used by the SSD is commonly used by the other subsystems one can check that it is granted on the other slow control windows.

7. How to turn ON the SSD

This section lists the few steps/checks one has to go through to initialize the SSD.

a. Make sure the SSD air cooling system is ON by checking the pressure on the main panel.
b. Make sure that the ladder LV and rdo board LV are ON. If not, turn them **ON**. After a reboot of the VME board (produced by a power failure for example) the rdo LV are switched OFF by default.
c. Make sure the SSD is in the "FULL CONTROL" mode. If not,click on **Full Control** to switch from the "Acquisition" mode to the "Full Control" mode.
d. Start the initialization by clicking on **Start SSD**. The status bar should iteratively display the following messages :
    1. "Checking Readout boards"
    2. "Loading FPGA program"
    3. "Loading Front End parameters"
    4. "Reading Costar chips"
    5. "All ladders are ready"
    6. "Acquisition mode"
e. It takes between 5 to 10 minutes to get the full SSD initialized and ready to take data.
f. Check on the main panel that all the rdo boards and ladders have been successfully initialized (everything should be green). It happens that some ladders are not correctly initialized at this stage. In that case, repeat this sequence from the step d.
g. Check that the readout boards are ready to take data (see section 17).

8. How to check that the SSD is ready to take data

- All the status buttons on the main slow control panel should be green except those expressively mentioned. **For instance at the moment(02/01/04), the rdo 2N is not working.**
- The 3 power supply should be ON.
- The SSD should be in "Acquisition" mode

9. Some ladders have lost their bias (yellow squares)

At the moment, for an unknown reason, the SSD FEE chips are losing their biasing parameters randomly. In that case, the LV current status button should turn to yellow (see the sections 15 and 16 below).
If one or several are yellow, the FEE chips can be quickly biased again prior the beginning of a run. First click on **Full Control** to select the CONTROL mode and then click on **start SSD**. After one or two minutes, the LV current status buttons should turn green and the slow control should itself switch to the "Acquisition" mode.
THIS CHECK MUST BE DONE AT THE BEGINNING OF EACH RUN.

10.What to do during beam fill/beam dump ?

Once all the electronics have been initialized, it takes between 30 minutes and 1 hour for the temperatures to get stabilized. In order to avoid this long stabilization period and temperature variations, when the beam is dumped or during a fill, **most of the SSD electronics should stay**

ON. Only the ladder HV should be turned OFF. Turning ON or OFF the ladder HV has basically no effect on the SSD temperatures. It takes only few seconds for the ladder HV to ramp up or to ramp down.

Otherwise the HV MUST be ON all the time (for a pedestal run or a physics run).

11.How to turn OFF the SSD ?

At the end of the data taking period or when the beam is not expected before several hours (during a long scheduled access for instance), one can turn OFF the SSD by simply turning OFF the 3 groups of power supply buttons (ladder LV, ladder HV, rdo LV).

12.Lost connection with the VME board ?

When the connection with the SSD VME board is lost, all the slow control channels monitored from the Sun workstation turn into white. It can also happen that the system get frozen or respond badly to a slow control action. In that case, it may be necessary to reboot the VME cpu.

If the serial connection is still on (one can check by typing *enter* and getting the prompt ->) one can type *reboot* to restart the VME board.

Like most of the STAR subsystems, the VME crate hosting the SSD vme board can be controlled by slow control via the CANBUS. The same procedure applies for the SSD to reboot the VME by this mean. Click on the **expert** button to open the SSD expert window. Near the bottom, one can find the Icon made by the STAR Slow control group to access the VME crate information. Click on the **pink small button** to starts the VME crate panel and click on the **SysReset** button.

13.Whom to wake up ?

Two SSD experts have been identified so far :
Lilian Martin (SUBATECH - Nantes)
Lab : +33 2 51 85 84 68
Home : +33 2 40 63 48 72
Cell : +33 6 88 06 45 32

Jerome Baudot (IReS - Strasbourg)
Lab : +33 3 88 10 66 32
Home : +33 3 88 44 56 72

The expert on duty is posted on the upper left corner of the main ssd web page (http://star.in2p3.fr). If the detector operator thinks that something important related to the SSD must be communicated, please post a message on the SSD hypernews forum.

14.Tricks and tips

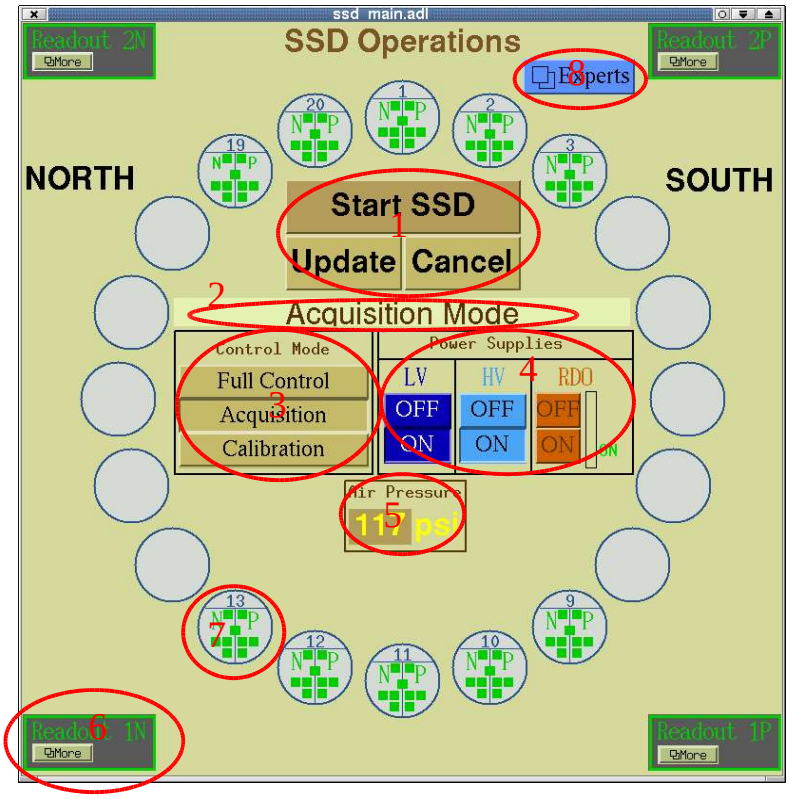
Slow Control related

- **VME REBOOT :** After a reboot of the VME board, the RDO power supply is forced to be OFF which means that the FPGA on the rdo boards have lost their code and must be loaded again. In that case it is more or less like starting from scratch to set up the SSD and one must follow the sequence given in section 7.
- **STATUS BAR** : It happens that the status bar in the main panel freezes in a given state (usually "Aquisition mode"). If you suspect that the status bar is frozen you can check it by clicking back and forth on the **Full Control** and **Acquisition** buttons. If they react normally it means that you still have the control of the SSD. In tha case, just do not rely on the information displayed by the status bar. This is a minor problem and do not prevent the operator to operate the SSD. The information displayed by the status bar is recorded by a state machine running on the vme board. This state machine would return in a normal state at the next vme reboot.

Computer related

- **WRONG COLORS** : The colors of the EPICS windows can get wrong on the SUN, not just one color but all of them, background, foreground... It is probably related to the use of a private color map by an other application or the main color map is redefined. You can try to close any other application running on the SUN (Netscape is a good candidate). If it doesn't help, you may start an **xterm** session on the SUN from the nearby ssdlinux01 Linux machine and launch the **ssdsc** program there.
- **SSDSUN01 REBOOT** : One does not usually reboot the Sun Workstation but accidental reboot or a power failure can lead the computer in a not normal state. After a reboot, the computer asks you for a login and a password. Once you are logged in, you should be in a console mode. Type **openwin** to launch the Window manager. Once the window manager is started, **click right or left** to open the fvwm menu and click on **Xterm** and **SSD Control** to start an xterm and launch the slow control GUI.
  If you monitor the SSD from the ssdlinux01 Linux box, in a xterm type **ssh ssd@ssdsun01.starp.bnl.gov** to start an ssh connection to the Sun workstation and then **ssdsc** to start the slow control GUI.

15.The SSD Slow Control Main Window



1 - The main buttons :

- **Start SSD** : start the full SSD initialization chain
- **Update** : resume the initialization after a manual intervention
- **Cancel** : abort the current initialization

2 - The status bar : displays the current mode or various steps and error messages during the initialization

3 - The control buttons :

- **Full control** : the SSD is in control mode. **Mandatory for the initialization**
- **Acquisition** : the SSD is in acquisition mode. **Mandatory to take data**
- **Calibration** : the SSD is in calibration mode. Useful to do gain calibration. Not necessary to take pedestal data. **Not implemented yet**

4 - The power supply panel : Allows to turn **ON/OFF** the ladder LV, ladder HV and the rdo boards LV. They all must be ON during data taking. The HV can be turned OFF in some cases (see section 10).

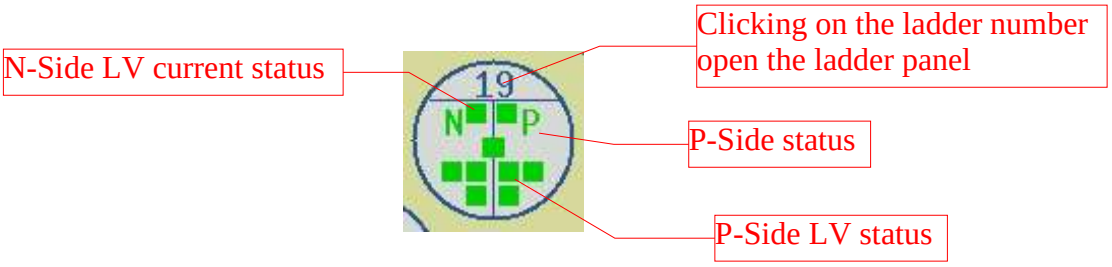
5 - The SSD cooling status : Gives the compressed air pressure before the vortecs. It should be around 115 psi (± 10 psi).

6 - The readout board X status : Gives a summary of the readout board status. Clicking on the **More** button brings up the rdo summary panel (see section 17).

7 - The ladder X status : Gives a summary of the ladder status. See the section 16 for a more detailed explanation.

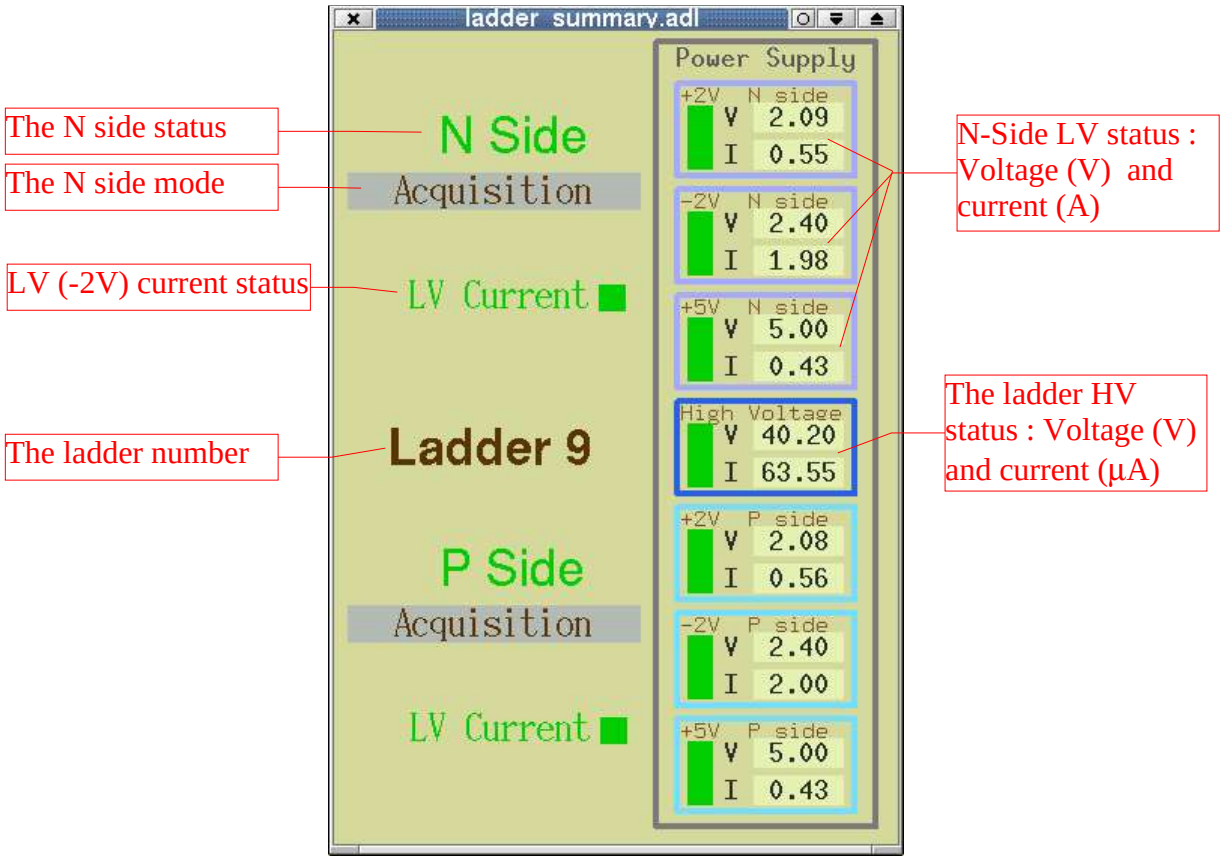
8 - The **expert** button : Brings up the SSD expert panel. Should be used by the operator only upon request from one SSD expert or to Reset the VME crate (see section 12).

16.The SSD Ladder status



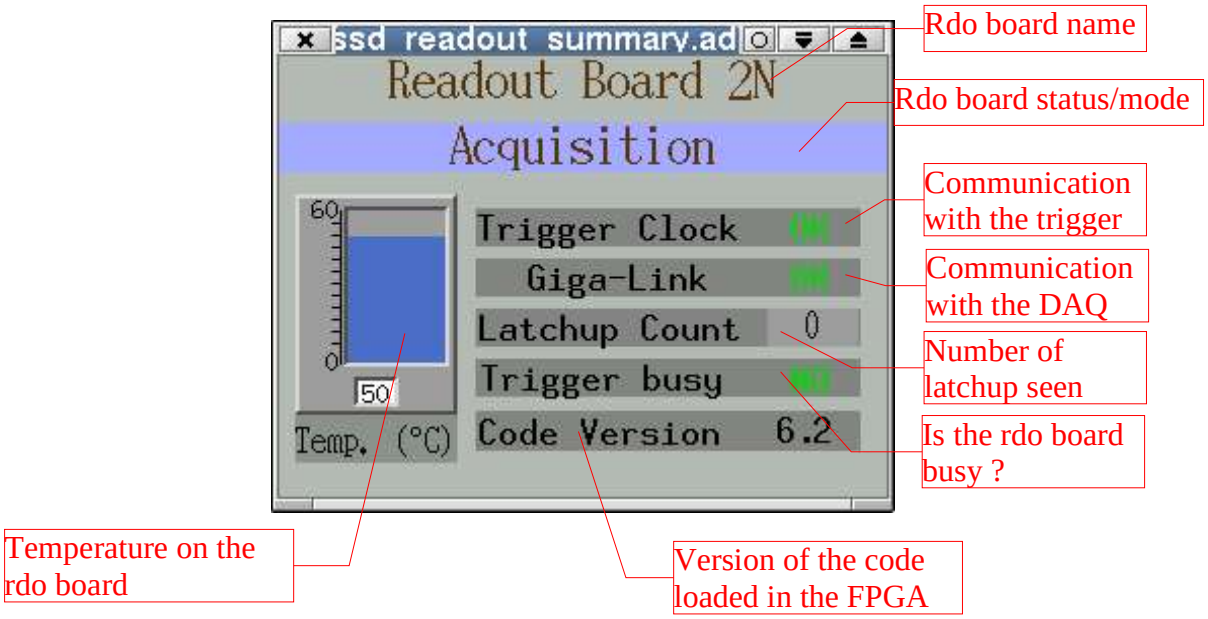
On the main SSD slow control panel, the monitored information on a ladder is summarized in the circle above. The information is symmetrically displayed for the N-side (left) and the P-side (right).

This information is detailed a bit more in the ladder summary panel below. One can open this panel by clicking on the ladder **Number** in the small grey circle above.



17.The SSD readout status

The readout summary panel for each rdo board can be opened by clicking on the **More** buttons on the main panel. This panel is shown on the picture below :



The rdo is ready to take data if :

- The board is in the "Acquisition mode".
- Both the "Trigger Clock" and "Giga-link" channels show a green "OK".
- The temperature on the boards should also be stabilized between 40 and 60°C.