

# Personnel Safety System Operator Training

## Table of Contents

Table of Contents	2
<b>Part 2a: <u>PSS OPERATIONS</u></b>	<b>4</b>
<b>SAFETY SYSTEM OPERATIONS</b>	<b>6</b>
<b>Safety System Console</b>	<b>7</b>
<b>PSS Display</b>	<b>8</b>
Access State Color Code	13
Description of PLC screen Icons	14
<b>EPICS Display</b>	<b>15</b>
<b>Video Monitor Operation</b>	<b>16</b>
System Description	16
Guide to MUX Controls	17
Basic Display Modes	18
Selecting Monitor B	20
Channel Assignments	21
<b>PA System</b>	<b>22</b>
<b>Access Control Panel</b>	<b>23</b>
<b>Access Control Key Control Panel</b>	<b>24</b>
<b>Top Stop Panel</b>	<b>25</b>
<b>BCM Operation</b>	<b>26</b>
<b>General Notes on PSS Operations:</b>	<b>27</b>
<b>General Notes on PSS Operation - Magnet Control</b>	<b>28</b>

# PSS Operator Training

February, 2007

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<b>Magnet Control (cont.)</b>	<b>29</b>
<b>Beam Stopper Operation</b>	<b>30</b>
<b>SSO PROCEDURES:</b>	<b>31</b>
<b>Sweep Mode</b>	<b>32</b>
<b>Sweep Mode</b>	<b>33</b>
<b>Duties of the Sweep Team:</b>	<b>34</b>
<b>Duties of the SSO:</b>	<b>35</b>
<b>Duties of the SSO:</b>	<b>36</b>
<b>SSO Duties: Prior to the sweep...</b>	<b>37</b>
<b>SSO Duties: At the start of the sweep:</b>	<b>38</b>
<b>SSO Duties: During the Sweep</b>	<b>39</b>
<b>SSO Duties: At the end of the Sweep</b>	<b>40</b>
<b>Controlled Access Mode</b>	<b>41</b>
<b>Controlled Access Mode</b>	<b>42</b>
<b>SSO Duties: Before the access...</b>	<b>43</b>
<b>SSO Duties: During the Access</b>	<b>44</b>
<b>SSO Duties: During the Access - Continued</b>	<b>45</b>
<b>SSO Duties: To process personnel out of the tunnel</b>	<b>46</b>

## Part 2a: PSS OPERATIONS

PSS Operations generally fall into three categories:

## 1.0 Safety System Operation

- Administrative access control procedures performed by Safety System Operator
- Safety System User's Manual

## 2.0 PSS Certification Procedures

- Testing of each PSS sensor, interlock, and function.
- Supervised by an Operations Crew Chief
- May be supervised by a member of the Division EH&S staff
- Documentation available in PSS Engineer's office

## 3.0 PSS Configuration Control

- Control of changes to the PSS, including hardware, software, and procedures.
- Covered by:  
“JEFFERSON LAB PERSONNEL SAFETY SYSTEM CONFIGURATION CONTROL POLICY”

## **SAFETY SYSTEM OPERATIONS**

Safety System operations are used to establish an exclusion area and ensure the safe entry in to, and exit from, a controlled area.

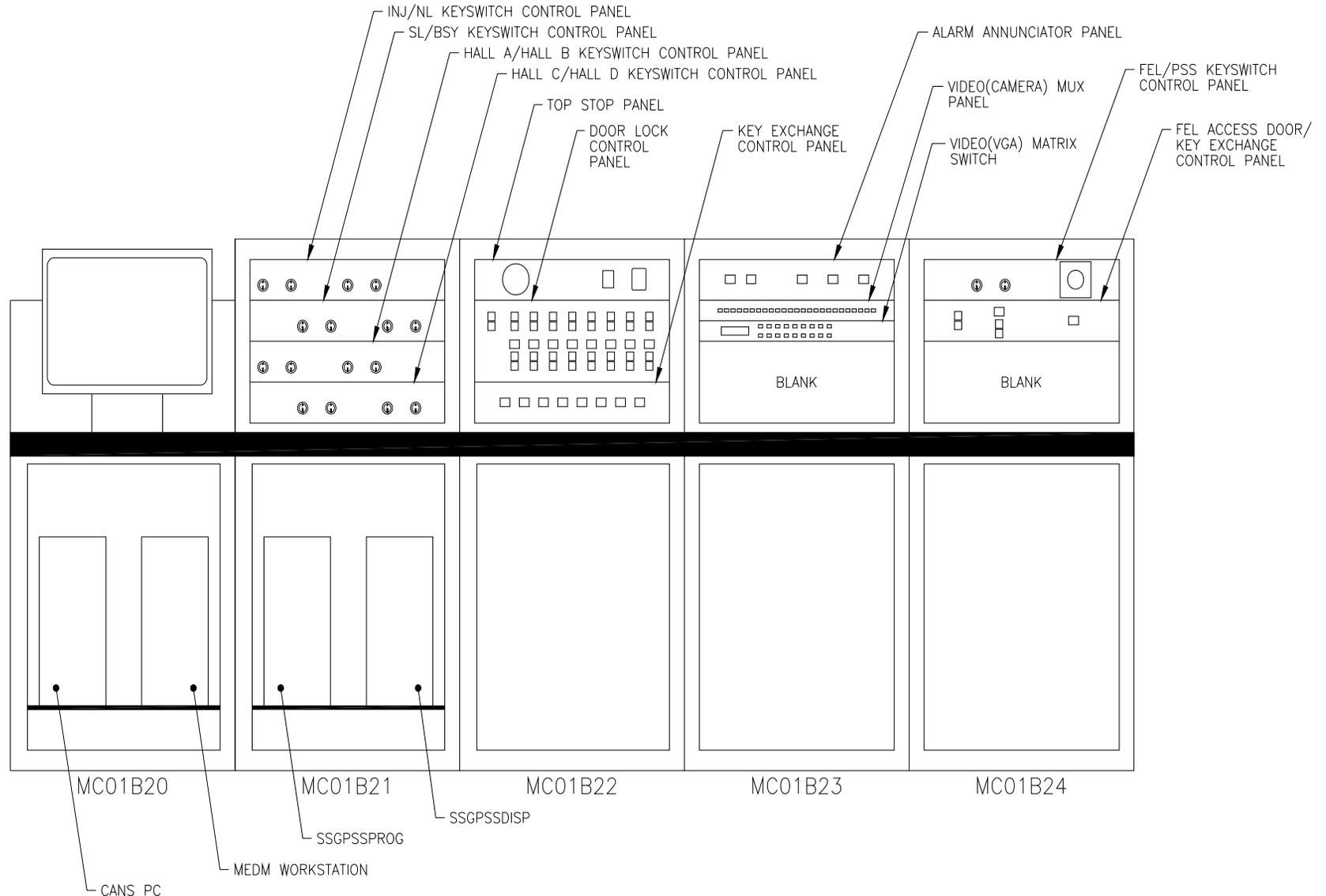
Operations include Sweep, Controlled Access, changing of operating modes, and alarm response.

Each Operations shift has at least one qualified Safety System Operator (SSO).

Safety System Operators must meet the following qualifications:

- Complete a period of on the job training under the supervision of a certified SSO. The training is to include performance of Sweep and Controlled Access Operations. During the training period the SSO trainee must demonstrate knowledge of proper safety system operational procedures.
- Achieve a score of 80 % or better on a Safety System Operator Test

## Safety System Console



## ***PSS Display***

The PSS display computer shows the state and status of the PLC inputs of each PSS segment. Areas on a site map may be selected with the mouse to bring up the status of a given area. The FEL is shown as an outline of the FEL building on the right side of the site map.

There are several types of display screens used in the operation of the PSS:

- Overview screen - shows the status of each tunnel segment on the accelerator site. Any other screen may be accessed from this screen.
- "PLC" screen - shows the status of each of the basic PSS devices.
- "SSI" screen (Safety System Interface) - shows the status of the Gun, Magnet supplies, and the RF HPAs that interface to the PSS.
- "OPS" screen - Represents all of the above in a text-based format.

# PSS Operator Training

February, 2007

NLINAC.grf

### North Linac - PLC

#### Crash Switches

	A	B
R/S 04	●	●
R/S 05	●	●
R/S 06	●	●
R/S 07	●	●
R/S 08	●	●
R/S 09	●	●
R/S 10	●	●
R/S 11	●	●
R/S 12	●	●
R/S 13	●	●
R/S 14	●	●
R/S 15	●	●
R/S 16	●	●
R/S 17	●	●
R/S 18	●	●
R/S 19	●	●
R/S 20	●	●
R/S 21	●	●
R/S 22	●	●
R/S 23	●	●
R/S 24	●	●
R/S 25	●	●
R/S 26	●	●
R/S 56	●	●
R/S 57	●	●
R/S 58	●	●
R/S 59	●	●
R/S 60	●	●
MCC	●	●

#### Sweep Sequence

	A	B
R/S 60	●	●
R/S 04	●	●
R/S 56	●	●
R/S 57	●	●
R/S 58	●	●
R/S 59	●	●
R/S 06	●	●
R/S 07	●	●
R/S 08	●	●
R/S 09	●	●
R/S 10	●	●
R/S 11	●	●
R/S 12	●	●
R/S 13	●	●
R/S 14	●	●
R/S 15	●	●
R/S 16	●	●
R/S 17	●	●
R/S 18	●	●
R/S 19	●	●
R/S 20	●	●
R/S 21	●	●
R/S 22	●	●
R/S 23	●	●
R/S 24	●	●
R/S 25	●	●
R/S 26	●	●
R/S 05	●	●

#### North Access

	A	B
Door 1	●	●
Door 2	●	●
Exch Key	●	●
Fire Door (1)	●	●
Fire Door (2)	●	●
Hatch 1	●	●
Hatch 2	●	●
Hatch 3	●	●
Hatch 4	●	●
Elev. Sw.	●	●

#### Exit Stairs

	A	B
#1 Door (1)	●	●
#1 Door (2)	●	●
#1 Fire Door (1)	●	●
#1 Fire Door (2)	●	●
#2 Door (1)	●	●
#2 Door (2)	●	●
#2 Fire Door (1)	●	●
#2 Fire Door (2)	●	●

#### Gates

	A	B
Injector	●	●
West Arc	●	●
East Arc	●	●

#### Injector / North Linac Beam State

Injector	North Linac	
A	B	A
●	●	Restricted Access
●	●	Sweep
●	●	Sweep Complete
●	●	Controlled Access
●	●	Power Permit
●	●	<b>Beam Permit</b>
●	●	St. Mode
●	●	Rec. Mode

#### Fast Electronics

	A	B
Inj. BCM Fault	●	●
EA BCM Fault	●	●

#### Radiation Monitors

	A	B
03 N. Access	●	●
04 N.L. Bldg.	●	●
01-2 Inj Gate - G	●	●
01-3 Inj Gate - N	●	●

#### ODH Power

INJ - CB1	●
INJ - CB2	●
INJ - CB3	●
INJ - CB4	●
MCC - CB1	●
MCC - CB2	●
MCC - CB3	●
NL - CB1	●
NL - CB2	●
NL - CB3	●

Beam Mode Logic

Controlled Access

Injector PLC

N. Linac SSI

S. Linac SSI

**NORTHSSI.grf**

## North Linac - SSI

### Inj RF / Magnets

	Zone	Chain		W. Press.		Off/Safe			
		A	B	A	B	A	B		
RF01	OLD2								
RF02	OLD3	●	●	●	●	●	●		
RF03	OLD4	●	●	●	●	●	●		
1/4 Cryo Contactor - Source								●	●
1/4 Cryo Contactor - Ground								●	●
MBLOR03								●	●
MBLOR04								●	●
MB00106								●	●

### North Linac RF Status

SSI	Zone	Chain		Ready		Off/Safe	
		A	B	A	B	A	B
RF04	NL02	●	●	●	●	●	●
RF05	NL03	●	●	●	●	●	●
RF06	NL04	●	●	●	●	●	●
RF07	NL05	●	●	●	●	●	●
RF08	NL06	●	●	●	●	●	●
RF09	NL07	●	●	●	●	●	●
RF10	NL08	●	●	●	●	●	●
RF11	NL09	●	●	●	●	●	●
RF12	NL10	●	●	●	●	●	●
RF13	NL11	●	●	●	●	●	●
RF14	NL12	●	●	●	●	●	●
RF15	NL13	●	●	●	●	●	●
RF16	NL14	●	●	●	●	●	●
RF17	NL15	●	●	●	●	●	●
RF18	NL16	●	●	●	●	●	●
RF19	NL17	●	●	●	●	●	●
RF20	NL18	●	●	●	●	●	●
RF21	NL19	●	●	●	●	●	●
RF22	NL20	●	●	●	●	●	●
RF23	NL21	●	●	●	●	●	●

### Magnet Box Supply Status

	A	B
MG01 Chain Intact	●	●
MG01A Off/Safe MNL27-DOG1E	●	●
MG01B Off/Safe MNL27-DOG3E	●	●
MG01C Off/Safe MNL27-DOG5E	●	●
MG01D Off/Safe MNL27-DOG7E	●	●
MG01E Off/Safe MNL27-DOG9E	●	●
MG02 Chain Intact	●	●
MG02A Off/Safe MSA02-ARC1A	●	●
MG02B Off/Safe MSA02-ARC3A	●	●
MG02C Off/Safe MSA02-ARC5A	●	●
MG02D Off/Safe MSA02-ARC7A	●	●
MG02E Off/Safe MSA02-ARC9A	●	●
MG02F Off/Safe MSA02-RSEP9A	●	●
MG05 Chain Intact	●	●
MG05A Off/Safe MNA02-ARC2A	●	●
MG05B Off/Safe MNA02-ARC4A	●	●
MG05C Off/Safe MNA02-ARC6A	●	●
MG05D Off/Safe MNA02-ARC8A	●	●
MG05E Off/Safe MNA02-RSEP8A	●	●

### Injector / North Linac Beam State

Injector	North Linac	
A	B	A
●	●	Restricted Access
●	●	Sweep
●	●	Sweep Complete
●	●	Controlled Access
●	●	Power Permit
<b>Beam Permit</b>		
●	●	St. Mode
●	●	Rec. Mode

### East Arc Transfer Switch

	A	B
North Linac	●	●
Recirculate	●	●
Straight	●	●
South Linac	●	●
Recirculate	●	●
Straight	●	●

### East Arc Beam Stopper

Pressure	In	Out	Permit
A	A	A	A
●	●	●	●

### Inj / NL Beam Stoppers

	In	Out	Permit
	A	A	A
A3	●	●	●
A4	●	●	●
ILD	●	●	●

Beam Mode Logic
Controlled Access
Injector PLC
N. Linac PLC
S. Linac SSI

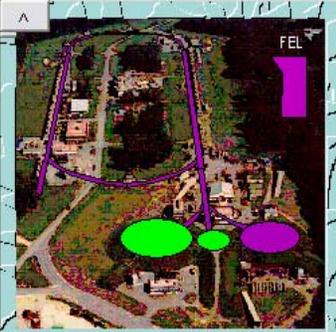
# PSS Operator Training

February, 2007

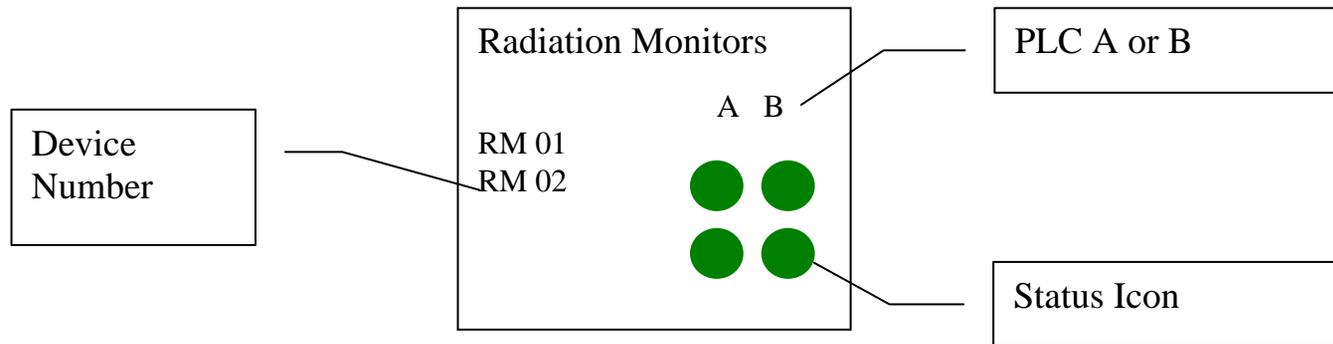
OPSINJ.grf

## INJECTOR - OPS

Run/Safe Boxes		Access Room		Magnet Status			Gate		Beam State			
Crash R/S 02 R/S 03 R/S 01	Sweep <b>COMPLETE</b>	Door 1 Position	<b>CLOSED</b>	Permit	Status	Injector <b>CLOSED</b>	<b>Beam Permit</b>					
	<b>OK</b>	Door 2 Position	<b>CLOSED</b>	MBLOR03	<b>ON</b>				<b>ON</b>			
	<b>COMPLETE</b>	Exch Key	<b>IN</b>	MBLOR04	<b>ON</b>				<b>ON</b>			
<b>OK</b>	<b>COMPLETE</b>				500 keV Spect	<b>Straight</b>						
Radiation Monitors				RF Status			Beam Stops		Crash Switch			
		Fire Door Position	<b>CLOSED</b>	Waveguide			Permit	Position	MCC Crash <b>OK</b>			
		Fire Door Latch	<b>CLOSED</b>	Zone	Permit	Pressure	Status	ILD			<b>ON</b>	<b>OUT</b>
		Inj Hatch	<b>CLOSED</b>	1/4 Cryo	<b>ON</b>		<b>ON</b>	A3			<b>OUT</b>	<b>OUT</b>
				0L02	<b>ON</b>	<b>OK</b>	<b>ON</b>	A4			<b>OUT</b>	<b>OUT</b>
				0L03			<b>ON</b>	<b>Diagnostic Screens</b>				
				0L04			<b>ON</b>					
							Gun					
							Status					
							Gun HV PS	<b>ON</b>	Beam Mode	N. Linac		
							Spare HVPS	<b>OFF</b>	Cntrd. Access	S. Linac		
							Laser Bypass	<b>NORMAL</b>	Injector PLC			
									NLinac PLC			



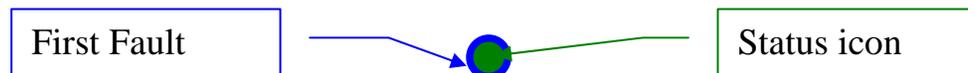
The status of each PSS input is shown on the PLC screen. Inputs are grouped by function. The PSS system A and System B inputs are shown separately as a circular icon.



A **GREEN** icon means the device is in the OK or safe condition. ●  
A **RED** icon means the device is in the fault or unsafe condition. ●

During normal operation of the PSS system most of the icons should be **GREEN**. The “Off/Safe” icons may be **RED** only when the PSS is in “Power Permit” or “Beam Permit” modes and a high voltage power supply is turned on.

When the PSS system faults to a lower access state, the status of the PLC inputs is latched. Any PLC inputs which are “fault” or “unsafe” (**red**) at the time the system latches are displayed on the PLC screen as “First Faults.”



The first fault shows up on the display screen as a blue ring around the input status icon. The latched first fault stays on until the PSS is switched to another access mode.

## Access State Color Code

Restricted Access	= Green
Sweep Sweep Complete Controlled Access	= Yellow
Power Permit	= Red
Beam Permit	= Magenta

The beam state of each area is also given in text.

## Description of PLC screen Icons

<i>Type of Signal</i>	<i>Description</i>	<i>What <b>Green</b> Means</i>	<i>What <b>Red</b> Means</i>	<i>What <b>First Fault</b> means</i>
Sweep Sequence	Shows “operational” status of each Run/safe box in the order of the sweep pattern.	Box is armed	Box is not armed. Sweep Required.	No first fault on this signal.
Crash Switches	Shows the status of each crash switch. Includes control room crash switches.	Switch is not crashed.	Switch is crashed. Should be in “Restricted Access”	Indicates that this switch was pushed when the system crashed.
Radiation Monitors	Shows fault status of each CARM.	CARM is OK.	CARM is in alarm state.	CARM dropped System to Power Permit.
OFF/Safe	Shows on/off status of device that gets a permissive from PSS. Includes HV power supplies and laser shutter.	Device is OFF or Closed.	Device is ON.	This device was on when system dropped to lower state.
Chain (Intact)	Shows status of connection between PLC and field interface chassis.	Connection OK	Chassis disconnected.	This device dropped PSS to “Restricted Access.”
Ready	Shows status of RF HPA Waveguide Pressure switch.	Pressure OK	Waveguide is not pressurized. Could be open.	Waveguide Pressure dropped system to “Power Permit.”
Bypass	Shows status of Drive Laser Shutter bypass switch.	Shutter Not Bypassed.	Shutter Bypassed. Cannot switch to Beam Permit.	Shutter Bypass dropped system to “Power Permit.”
Doors	Shows Open/Closed status of doors	Door Closed	Door Open	Open Door caused system to drop to “Restricted Access.”
Exchange Key	Shows if exchange key is in or out of master slot.	Exchange key is IN.	Exchange Key is OUT. Cannot switch to “Power Permit”.	Exchange key was OUT when the system dropped.

## ***EPICS Display***

The EPICS display is used by the SSO to control the Gun, RF HPA's, magnet box supplies, beam stoppers/diffusers, and the In Line Dump when configuring for Controlled Access or a beam-operating mode. It is there for basic control and may not override any PSS function.

There are also EPICS displays for the PSS status and the ODH monitoring system in each area.

## ***Video Monitor Operation***

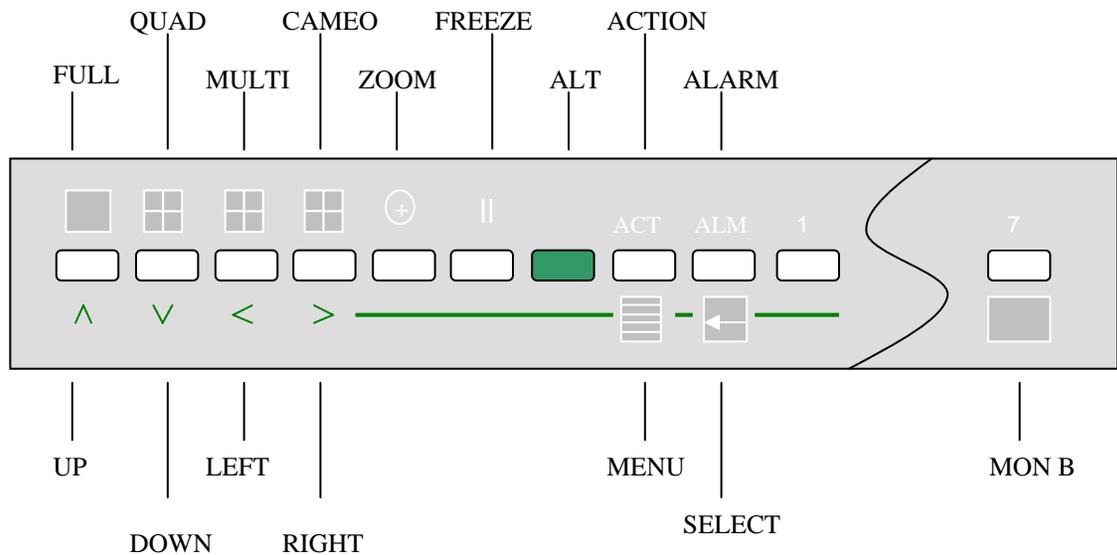
### **System Description**

The PSS Video System is used to observe accesses into the accelerator tunnel, endstations, and FEL cave areas. This system includes two flat panel monitors, a video multiplexer, and up to sixteen color cameras located in access areas around the accelerator site. The flat panel monitors are located on the MCC Control room's east wall and are designated as **A** (left) and **B** (right). Access rooms are selected and viewed on these displays by use of the video multiplexer (MUX) located in the PSS Console.

Each Access room has at least one video camera. The linac and BSY access areas have two monitors, one in the room and one at the top of the tunnel stair.

The location of each camera and the local telephone extension are displayed on each camera's image.

## Guide to MUX Controls



Partial front panel for LTC 2682/90 Multiplexer

## Basic Display Modes

All modes apply to Monitor A as a default.

*They can also be applied to Monitor B as described in 2.2.*

### Full screen

FULL shows one camera, full screen on one monitor (A or B).

Press the FULL screen key once, then select the desired camera using the numerical keys.

### Quad Screen

QUAD divides the screen into 4 separate areas. Press the QUAD screen key once to enable this feature. Press this key repeatedly to cycle through various camera combinations.

### Multi-screen

MULTI shows one of five different camera combinations on one monitor. These include: 4+3, 8+2, 12+1, 3x3, and 4x4. Press this key repeatedly to cycle through various display options.

## **Cameo**

When in QUAD or MULTI mode, the screen area where a camera is displayed is called a Cameo. Cameras can be assigned to any selected cameo as follows:

- Press the ALT key, then press the SELECT key.
- The first cameo will be selected and show a flashing camera title.
- Press the desired Camera key.
- That camera will be assigned to the cameo and the next cameo will automatically be selected.
- Repeat the process until all cameos have been assigned a camera.
- When done, press the ALT key to exit.

## **Zoom**

The active camera will be displayed with a 4:1 zoom factor. Using the arrow keys in this mode allows for panning around the selected image.

## **Freeze**

FREEZE holds the selected camera image on either FULL or Cameo modes. To release, press the FREEZE key again.

## Selecting Monitor B

To select Monitor B, press the ALT key, then the B key (7). Now all basic functions and modes will be applied to Monitor B. To return to Monitor A, Press the ALT key, then the B key again.

## Channel Assignments

Camera	Location		Nearest Phone #
1	Injector Access Room		5167
2	Injector Stairwell		5167
3	North Access Room		5181
4	North Linac Stairwell		5181
5	South Access Room		5180
6	South Linac Stairwell		5180
7	BSY Access Room		5179
8	BSY Stairwell		5119
9	Hall A Access Room		5276
9	Hall A Personnel Tunnel		5277
11	Hall B Access Room		5251
11	Hall B Personnel Tunnel		
13	Hall C Access Room		5843
14	Hall C Personnel Tunnel		
15	FEL Access Room		
16	FEL Personnel Tunnel		

## ***PA System***

It is used to make machine status announcements throughout the accelerator service buildings, endstations, and tunnel enclosure. The PA system is not to be used as a personal paging system.

To make a general announcement use one of the speed dial buttons at the bottom of the handset keyboard.

In the event of failure of the handset an emergency microphone is located in the back of the PSS safety console (rack 24). It should be plugged into the Top Stop panel at the top of rack 22. (See page 9 of this document for rack and panel layout.)

When making announcements speak slowly and clearly. A significant echo is present in some areas that tends to garble some announcements.

## **Access Control Panel**

The access control panel is used to operate the access room magnetic locks and remotely release the controlled access exchange key.

The magnetic lock controls are push button switches that toggle the “Lock” command to the doors on and off. The PLC will automatically lock the doors if the area is unsafe. Above each lock control switch is a lock status lamp. The lamp will be on continuously if the door is closed and locked. The lamp will blink if the door should be locked but is not.

Above the Door 2 (D2) lock status lamp is the yellow “Exit Request” lamp. This lamp will flash if Door 2 is locked and the exit request button is pushed. It is located on the inside of Door 2, and alerts the SSO that someone wishes to exit the tunnel.

The Exchange key control is used to release the master exchange key during a Controlled Access. The release function will only work in Controlled Access mode and its status is display with a white lamp.

## ***Access Control Key Control Panel***

The Access Control key panel is used to change the access state of the tunnel. The same keyset that is used for changing the tunnel access state is also used to arm the Run/Safe boxes during a tunnel sweep.

There are two key switches on the panel for each PSS segment.

The first switch has the “Restricted Access” and “Sweep” key positions.

In the Restricted Access position the key is captured. Power is removed from the second switch that controls the higher access states. The key may only be removed in the “Sweep” position.

The second switch controls the “Sweep”, “Controlled Access”, “Power Permit”, and “Beam Permit” access states. The key may only be removed in the “Sweep” position.

## ***Top Stop Panel***

This panel holds the **TOP STOP** crash switch. This switch will crash **ALL** PSS segments to Restricted Access. The TOP STOP should only be used in an emergency or when operations personnel feel there are personnel in imminent danger.

This includes:

- Suspicion of unauthorized personnel in the tunnel
- Loss of control over personnel entering/exiting the tunnel
- Report of energized equipment while an area is in an access mode
- The need for emergency crashing of the tunnel gate maglocks

The receptacle for the Emergency Microphone is also on this panel.

## ***BCM Operation***

The BCM system is automatically configured to protect any inserted beam stopper.

A BCM fault is automatically reset when the PSS segment containing the BCM fault is switched from Power Permit back to Beam Permit.

A BCM Fault can also be locally reset from the front panel of the BCM electronics.

“Operation” of the PSS BCM system entails performing periodic self-checks as well as reading BCM health and fault status.

NOTE: BCM fault status is directly related to the position of the Beam Stop(s).

## ***General Notes on PSS Operations:***

### Equipment Operation

The electron gun, RF HPAs, magnet box supplies, and beam stoppers may only be activated with a permissive from the Personnel Safety System. In each case the PSS is not the primary controller of a device but may inhibit the device from operating.

### Electron Gun

May only be operated when the Injector is in Beam Permit. One of the four valid Gun Permit Modes must be present. Any fault in an area that is used for Beam Permit will cause loss of Beam Permit in the Injector.

### RF High Power Amplifier

HPA permissives are done in groups of five. They may only be operated if there are no interlock faults in an HPA group and the segment is in Power Permit.

### High Power Magnet Box Supplies

Box supply permissives may depend on the operating mode of adjacent sectors.

## **General Notes on PSS Operation - Magnet Control**

Control of arc magnet DC power is one means of ensuring beam does not reach an occupied area. The following is a list of Box Supply permissives:

- Beam to 500keV Spectrometer  
MBO0L06      500keV Spec.
- Beam to In Line Dump
  - MG01A      E. Arc Dogleg Pass 1      - N. Linac zone 27
  - MG02A      E. Arc Pass 1      - S. access building
- Beam to BSY Dump
  - MG01A-E E. Arc Doglegs      - N. Linac zone 27
  - MG02A-E E. Arc Pass 1,3,5,7,9      - S. access building
  - MG05A-DW. Arc Pass 2,4,6,8      - N. access building
  - MG06A, FBSY Dump      - BS04 service building
  - MG07A Hall A Lambertson      - BS04 service building

## ***Magnet Control (cont.)***

- Beam to Halls

MG01A E. Arc Doglegs

MG02B-E E. Arc Pass 3,5,7,9

MG05A-DW. Arc Pass 2,4,6,8

MG06A, FBSY Dump

MG06B Hall A X-port line

MG06C Hall B X-port line

MG06D Hall C X-port line

- N. Linac zone 27

- S. access building

- N. access building

- BS04 service building

- BS04 service building\*\*

- BS04 service building\*\*

- BS04 service building\*\*

\*\* Permissive if Hall in Power Permit

## ***Beam Stopper Operation***

The BSY beam stoppers may only be operated (extracted) when both the BSY and the associated experimental hall are in Power Permit.

Insertion/extraction of the beam stoppers will cause a loss of beam permit due to the fact that when the stopper is in motion it is neither in nor out, which is a fault condition.

Likewise, the East Arc Beam Stopper can only be operated when both the North Linac and South Linac are in “Power Permit”.

Each stopper is also equipped with an internal gas chamber. The chamber is intended to detect the presence of a hole in the stopper (burn through). If this occurred the PSS would drop out of Beam Permit.

NOTE: BCM fault status is directly related to the position of the Beam Stop(s).

## **SSO PROCEDURES:**

## ***Sweep Mode***

The tunnel sweep is an administrative procedure used to ensure that no personnel are present in the tunnel before going to Power or Beam Permit. It allows the area to transition from an uncontrolled access area to a controlled access area.

Prior to operation, the beam enclosure is searched by 2 personnel. These “sweepers” ensure that no one is in the enclosure. One of these sweepers must have experience in sweeping the area and must be familiar with the sweep pattern.

The sweep is performed using a predetermined pattern that minimizes the chance that personnel are overlooked or are able to evade the sweepers. The PSS Users Manual contains a map and flow chart that the sweep team may take with them to confirm the proper sweep procedure and pattern.

## ***Sweep Mode***

Run/Safe boxes are distributed throughout each tunnel segment. The boxes contain status lamps, an emergency crash switch, and a key switch used to arm the box.

The sweep pattern is preprogrammed in the PLC logic. Run/Safe boxes will not arm out of sequence.

The last Run/Safe box in the sweep pattern is always at the access area. This forces the sweep team to double back in some areas.

If the sweeper leaves the line of sight of the last Run/Safe box a guard is posted to ensure that no one enters the area that has been swept.

## ***Duties of the Sweep Team:***

Ensure that the exit stairs are key locked (TUN-7 Key) prior to a sweep. The SSO should confirm with the sweep team that the doors are locked.

Thoroughly search an area for personnel. During the sweep, the team members must assume that there may be personnel who did not hear announcements or are incapacitated. The team should also make a reasonable effort to search areas where personnel may be hiding in order to avoid detection.

If anyone is found in the tunnel during a sweep, the person(s) must accompany the sweep team through out the remainder of the sweep. The sweep team should contact the SSO so that they can record the names of the personnel who were found.

Do not perform any other tasks when doing a tunnel Sweep.

## ***Duties of the SSO:***

- Stamps the safety system log with the “Sweep” stamp.
- Fills out the stamp information as necessary.
- Confirms that that all doors to the enclosure are closed before the sweep.
- Confirms that the area is in the “Sweep” mode.
- Ensures that at least one member of the sweep team is qualified to sweep the area.
- Announces that a sweep is about to take place.
- Controls the enclosure entry and exit of the sweep team.
- Monitors the progress of the sweep team.
- Records the names of anyone found in the enclosure during the sweep.

## ***Duties of the SSO:***

The SSO should make sure that at least one of the sweepers is a qualified lead sweeper. This is someone who is familiar with the sweep procedures for the area and has swept the area at least once. A list of qualified lead sweepers is kept on the Safety System Group website.

([http://www.jlab.org/accel/ssg/Pss/qualified\\_sweeper.pdf](http://www.jlab.org/accel/ssg/Pss/qualified_sweeper.pdf))

The Safety System Operator (SSO) should ensure that the sweep is performed in a timely manner. If work needs to be done in the tunnel before beam operations it should be done either before the sweep or in Controlled Access Mode after the sweep.

## ***SSO Duties: Prior to the sweep...***

A “Sweep Log” stamp is provided for entering sweep data into the PSS log book.

If the tunnel requires a radiation survey, then this must be done before the sweep.  
A survey cannot be done during a sweep.

Assemble a sweep team.

Check to make sure that at least one of the sweepers is on the qualified sweeper list.

Make sure that the exit doors are confirmed as locked.

Make sure that all tunnel gates are closed.

Make an announcement 15 minutes before the beginning of the sweep...

***“Attention, Attention, a sweep of the \_\_\_\_\_ area of the tunnel will be taking place in 15 minutes. Please exit the area immediately.” - Repeat***

Enter the time of the announcement on the Sweep stamp.

## ***SSO Duties: At the start of the sweep:***

Repeat the announcement 5 minutes prior to the start of a sweep.  
Enter the time of the announcement on the Sweep stamp.

Lock the access area magnetic door locks.  
Give the lead sweeper the access control key for the area to be swept.  
Unlock the outer access door (D1) and allow the sweep team to enter.

Lock Door 1

Contact the sweep team using the phone or intercom system.  
Log the names of the sweepers  
Verify proof of dosimetry  
Confirm ODH training

Unlock door 2, allow the sweep team to enter the tunnel.

Lock Door 2

## ***SSO Duties: During the Sweep***

Monitor the progress of the sweep team.

Make sure the sweep is progressing.

Contact the sweep team if there is an unusually long delay between arming run/safe boxes.

Be ready to contact the sweep team at the end of the sweep.

Record the names of any personnel found in the tunnel during the sweep.

NOTE: Hall A and C detector huts:

The team has a preset maximum time allowed to close the detector hut door - 5 minutes for Hall C, 8 minutes for Hall A. After this time the hut Run/Safe box will drop out if the door remains open.

## ***SSO Duties: At the end of the Sweep***

Establish contact with the sweep team before they arm the last box.

**The sweepers have 30 seconds to exit the tunnel after arming the last box.**

Tell the sweep team to arm the last Run/Safe box

Unlock door 2, allow the sweep team to enter

Confirm that door 2 is closed, then lock door 2

Unlock door 1, allow the sweep team to exit

Lock Door 1

Take the sweep key from the sweep team and place it in the Access Control Key Switch

Log the sweep as complete.

## ***Controlled Access Mode***

Controlled Access Mode is used to allow a limited number of personnel to access the tunnel. If it becomes necessary for large groups to make an access, then the machine should be taken to Restricted Access Mode.

In Controlled Access mode it is up to the Safety System Operator to ensure that all personnel are properly logged in and out of the tunnel.

The SSO must also make sure that each person entering the tunnel has current dosimetry and an Exchange Key. The SSO will ask each entrant if they have current ODH training (if necessary for the area).

As long as the master key is in the master socket, none of the exchange keys can be removed.

## ***Controlled Access Mode***

The safety system operator releases the master key by pushing the appropriate switch at the PSS console. The key will only release when the machine segment is in Controlled Access mode.

Once one of the exchange keys is removed, the master key is locked into the exchange key bank.

As there are only 10 keys per access room, the number of personnel allowed entry to each segment during Controlled Access is limited.

The inner access room door (D2) will remain automatically locked until the master exchange key is removed.

## ***SSO Duties: Before the access...***

Determine if a radiation survey of the area is required. Before allowing general personnel into the tunnel, it must be surveyed for radiation hazards.

Make sure that all HV devices in the area to be accessed are OFF.

***Failing to verify that all high voltage devices read “OFF/Safe” before switching to Controlled Access could result in dropping the tunnel to Restricted Access.***

Insert Beam Stoppers, if required.

Switch the segment access state to Controlled Access.

## ***SSO Duties: During the Access***

Unlock door 1 (outer door) and allow the group to enter.

Lock Door 1

Establish contact with the controlled access group using the phone.

Release the master controlled access exchange key

Record the names of each member of the group

Verify each person has dosimetry

Verify each person is ODH trained (except for BSY where ODH training not required)

## ***SSO Duties: During the Access - Continued***

Verify each person has an exchange key. Record the key number.

***Each person entering the enclosure must have an exchange key.***

Unlock Door 2 and allow the group to enter the tunnel.

Lock Door 2.

Record the time that personnel entered the tunnel.

## ***SSO Duties: To process personnel out of the tunnel***

Unlock Door 2 (inner door).

Allow personnel to enter access room.

Lock Door 2

Contact personnel in the access area

Allow personnel to return exchange keys

Record the time the personnel exited

When the last person returns their exchange key, have them return the master key to its control box.

Open Door 1 (outer door), allow the personnel to exit.

Lock Door 1.