

National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-057	Author: T. McDonald	Effective Date: 06May2016 Review Frequency: 3 yrs	Version 1
Title: Beamline 4-ID Radiological Interlock Test			Technical

Attachment A

NSLS-II Beamline 4-ID Radiological Interlock Test Checklist

Test Reason: <i>Initial Test</i>	Test Result: <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed
	Test Type: <input type="checkbox"/> Pre-Certification <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Partial
Test Date: <i>5/16-5/25/2016</i>	Start Time: _____ Finish Time: _____
Tester 1: <i>Thomas McDonald ; Brian Heneveld</i>	Assistant 1: <i>Accelerator Division Staff</i>
Tester 2: <i>Robert Chmel ; Gabrielle Stone</i>	Assistant 2: _____
Tester 1 Signature: <i>Thomas P. McDonald</i>	Tester 2 Signature: <i>Robert Chmel</i>
*Reviewer 1:	Reviewer 1 sig.:
Reviewer 2:	Reviewer 2 sig.:
** Safety Signature 4-ID (Beamline HMI) A Chain: <i>4301450C</i> B Chain: <i>4FF47C15</i>	Previous 4-ID SS# _____ Date: / / A Chain: _____ B Chain: _____
** Safety Signature Pentant 2 Beamline (SR HMI) A Chain: <i>DDF9 2804</i> B Chain: <i>44401A39</i>	Previous Pentant 2 SS# _____ Date: / / A Chain: _____ B Chain: _____

* A review by an Accelerator Safety Systems Engineer and a designated specialist (Reviewer 2) is only required upon a Test failure.
 **If Current Safety Signature number (found in top left corner on HMI) is different from previous number, contact the Accelerator Safety Systems Cognizant Engineer.

PREPARATION:

I. All hutch door switches have been evaluated by Mechanical Engineering for proper positioning	✓
II. Inform Control Room Lead Operator that testing will be done	✓
III. Obtain Beamline enable and PPS reset keys from Control Room	✓
IV. Verify that beamline vacuum and water interlocks are satisfied	✓
V. Place muffler on beam imminent sounder	✓
VI. Request Lead Operator enable Master shutters	✓

A1 **Verify System Lockouts**

- Gun HVPS output cable connector ✓
- Linac modulator line cords (3) OR Booster Dipole F PS 480 V ✓
- Booster RF HVPS 480 V OR Booster low level RF drive termination ✓
- SR System C low level RF drive termination OR SR System C RF output connection to cavity ✓
- SR System D low level RF drive termination OR SR System D RF output connection to cavity ✓

A2 **Verify Search and Time Beam Imminent Alarm**

Repeat steps for each 4-ID Hutch

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	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Verify that search path is free from obstacles and line of sight is clear in search mirrors in accordance with PS-C-XFD-PRC-010, <i>Beamline Enclosure Search and Secure and Breaking Security Procedure</i>	✓	✓	✓	✓
<i>Close all hutch secondary doors</i>	✓	✓	✓	✓
"Entry Permitted" signs ON (2 signs on A and D)	✓	✓	✓	✓
<i>Using the keypad, lock the closed doors</i>	✓	✓	✓	✓
<i>Press SB1</i>	✓	✓	✓	✓
SB1 illuminates	✓	✓	✓	✓
Search sounder sounds	✓	✓	✓	✓
Search yellow beacon flashing	✓	✓	✓	✓
<i>Press SB2</i>	✓		✓	✓
SB2 illuminates	✓		✓	✓
<i>Exit hutch and close main door</i>	✓	✓	✓	✓
<i>Press SBE and begin timing</i>	✓	✓	✓	✓
Beam imminent alarm sounds for 30 seconds	✓	✓	✓	✓
After warning, (FOE, B, C, D) Interlocked A and B ON (green), HMI	✓	✓	✓	✓
"Interlocked" signs ON (2 signs on A and D)	✓	✓	✓	✓
Maglock A and B ON (green), all doors, HMI	✓	✓	✓	✓
<i>Press the SBE/Access Button</i>	✓	✓	✓	✓
"Interlocked" signs OFF, "Entry Permitted" signs are ON	✓	✓	✓	✓
FOE, B, C, D Interlocked A and B OFF, HMI	✓	✓	✓	✓
Maglock A OFF (may require opening Maglock on key pad)	✓	✓	✓	✓
<i>Open door</i>	✓	✓	✓	✓
Door opens, Maglock B OFF door	✓	✓	✓	✓

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A3 **Out of Sequence Search**

Repeat steps for each 4-ID hutch (B hutch has only one interior SB)

Press SB2

SB2 does not illuminate

Press SB1

SB1 illuminates

Close hutch door and press SBE

Hutch does NOT secure

<u>A</u>	<u>C</u>	<u>D</u>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A4 **Search Timeout**

Repeat steps for each 4-ID hutch

Press first search button and **begin timing**

Complete search **without pressing Final Search button**

Search sounders off in 2 minutes

Press Final Search button

Search does not complete

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A5 **Shutter Enable**

Place actuators on FOE door switches and attach Maglock devices

Beamline Online A and B OFF

Enable beamline with key and perform a reset

Beamline Online A and B ON (**green**)

Search the FOE

FE Shutter Permits A and B ON **after** Beam

Imminent Warning

Open FE shutters

FE Shutters A and B indicate open (**green**)

2 "Beam On" signs are ON

Close FE shutters

FE Shutters A and B indicate closed (**red**)

<input checked="" type="checkbox"/>

A6 **Emergency Stops (ES) FOE (A hutch)**

For each ES search hutch

Open FE Shutters from keypad

FE Shutters A and B open (**green**)

FOE Interlocked A and B ON (**green**)

FE Shutter Permit A and B ON (**green**)

FE Critical Device Permits A and B ON

Upstream Right Maglock A ON (**green**)

<u>ES1</u>	<u>ES2</u>	<u>ES3</u>	<u>ES4</u>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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Upstream Left Maglock A ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Downstream Right Maglock A ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Downstream Left Maglock A ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Upstream Right Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Upstream Left Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Downstream Right Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Downstream Left Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Pull out ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A7 Emergency Stops (ES) B Hutch

For each ES search hutch	ES1	ES2	ES3
<i>Open FE and LIS1 Shutters from keypad</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Right Maglock ON A and B (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LIS1 Shutter Permit A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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Pull out ES

ES Sum Latch OFF

Reset fault

ES Sum Latch ON (**green**)

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A8 Emergency Stops (ES) C Hutch

For each ES search hutch. Beam stop is closed

Open FE, LIS1 and LIS3 Shutters from keypad

FE Shutters A and B open (**green**)

LIS3 Shutter A and B open (**green**)

C Interlocked A and B ON (**green**)

LIS3 Shutter Permit A and B ON (**green**)

FE Critical Device Permits A and B ON

Right Maglock ON A and B (**green**)

Left Maglock ON A and B (**green**)

Press ES

FE Shutters A and B closed (**red**)

LIS3 Shutter A and B closed (**red**)

C Interlocked A and B OFF

LIS3 Shutter Permit A and B OFF

FE Critical Device Permits A and B OFF

Right Maglock A OFF

Left Maglock A OFF

Pull out ES

ES Sum Latch OFF

Reset fault

ES Sum Latch ON (**green**)

ES1	ES2	ES3	ES4
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A9 Emergency Stops (ES) D Hutch

For each ES search hutch. Beam stop is open

Open FE, LIS1 and LIS3 Shutters from keypad

FE Shutters A and B open (**green**)

LIS3 Shutter A and B open (**green**)

D Interlocked A and B ON (**green**)

ES1	ES2	ES3	ES4
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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L1S3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Right Maglock ON A and B (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Left Maglock ON A and B (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear Right Maglock ON A and B (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear Left Maglock ON A and B (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Press ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
D Interlocked A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
L1S3 Shutter Permit A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Right Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front Left Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear Right Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear Left Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Pull out ES</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ES Sum Latch ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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A10 Hutch A Labyrinth 1 Switches and Latches

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1). Latch trips on both A and B Permits. **Note:** B chain reed and push button switches must be cycled together for reset.

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Latch</u>
<i>Search hutch</i>	✓	✓	✓	✓	✓
<i>Open FE Shutters from keypad</i>	✓	✓	✓	✓	✓
FE Shutter A and B open (green)	✓	✓	✓	✓	✓
FOE Interlocked A and B ON (green)	✓	✓	✓	✓	✓
FE Shutter Permit A and B ON (green)	✓	✓	✓	✓	✓
Cable Lab 1 Switch/Latch A and B ON (green)	✓	✓	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓	✓	✓
<i>Remove one switch actuator</i>	✓	✓	✓	✓	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	✓	✓	✓	✓
FOE Interlocked A and B OFF	✓	✓	✓	✓	✓
FE Shutter Permit OFF	✓	✓	✓	✓	✓
FE Shutter A and B closed (red)	✓	✓	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓	✓	✓
<i>Replace switch actuator and reset fault</i>	✓	✓	✓	✓	✓
Remove labyrinth actuators and close labyrinth door					✓

A11 Hutch B Labyrinth 1 Switches and Latches

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1). Latch trips on both A and B Permits. **Note:** B chain reed and push button switches must be cycled together for reset.

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Latch</u>
<i>Search hutch</i>	✓	↓	✓	↓	✓
<i>Open FE and LIS1 Shutters from keypad</i>	✓	↓	✓	↓	✓
LIS1 Shutter A and B open (green)	✓	↓	✓	↓	✓
B Interlocked A and B ON (green)	✓	↓	✓	↓	✓
LIS1 Shutter Permit A and B ON (green)	✓	↓	✓	↓	✓
Cable Lab 1 Switch/Latch A and B ON (green)	✓	↓	✓	↓	✓

ONLY 1 SET OF SWITCHES
ON THIS LABYRINTH
Y.M. 5/25/16

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FE Critical Device Permits A and B ON	✓	—	✓	—	✓
<i>Remove one switch actuator</i>	✓	—	✓	—	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	—	✓	—	✓
B Interlocked OFF	✓	—	✓	—	✓
L1S1 Shutter Permit OFF	✓	—	✓	—	✓
L1S1 Shutter A and B closed (red)	✓	—	✓	—	✓
FE Critical Device Permits A and B OFF	✓	—	✓	—	✓
<i>Replace switch actuator and reset fault</i>	✓	↓	✓	↓	✓
Remove labyrinth actuators and close labyrinth door	✓	—	✓	—	✓

A12 **Hutch C Labyrinth 1 Switches and Latches**

ONLY 1 SET OF SWITCHES 17M 5/25/16 ✓

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1). Latch trips on both A and B Permits. **Note:** B chain reed and push button switches must be cycled together for reset.

Beam stop is closed, D hutch not secure	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Latch</u>
<i>Search hutch</i>	✓	—	✓	—	✓
<i>Open FE, L1S1 and L1S3 Shutters from keypad</i>	✓	—	✓	—	✓
L1S3 Shutter A and B open (green)	✓	—	✓	—	✓
C Interlocked A and B ON (green)	✓	—	✓	—	✓
L1S3 Shutter Permit A and B ON (green)	✓	—	✓	—	✓
Cable Lab 1 Switch/Latch A and B ON (green)	✓	—	✓	—	✓
FE Critical Device Permits A and B ON	✓	—	✓	—	✓
<i>Remove one switch actuator</i>	✓	—	✓	—	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	—	✓	—	✓
C Interlocked OFF	✓	—	✓	—	✓
L1S3 Shutter Permit OFF	✓	—	✓	—	✓
L1S3 Shutter A and B closed (red)	✓	—	✓	—	✓
FE Critical Device Permits A and B OFF	✓	—	✓	—	✓
<i>Replace switch actuator and reset fault</i>	✓	↓	✓	↓	✓
Remove labyrinth actuators and close labyrinth door	✓	—	✓	—	✓

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A13 Hutch D Labyrinth 1 Switches and Latches

ONLY 2 set of switches from 5/25/16

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1). Latch trips on both A and B Permits. **Note:** B chain reed and push button switches must be cycled together for reset.

Beam stop is open	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Latch</u>
Search hutch	✓	—	✓	—	✓
Open FE, LIS1 and LIS3 Shutters from keypad	✓	—	✓	—	✓
LIS3 Shutter A and B open (green)	✓	—	✓	—	✓
D Interlocked A and B ON (green)	✓	—	✓	—	✓
LIS3 Shutter Permit A and B ON (green)	✓	—	✓	—	✓
Cable Lab 1 Switch/Latch A and B ON (green)	✓	—	✓	—	✓
FE Critical Device Permits A and B ON	✓	—	✓	—	✓
Remove one switch actuator	✓	—	✓	—	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	—	✓	—	✓
D Interlocked OFF	✓	—	✓	—	✓
LIS3 Shutter Permit OFF	✓	—	✓	—	✓
LIS3 Shutter A and B closed (red)	✓	—	✓	—	✓
FE Critical Device Permits A and B OFF	✓	—	✓	—	✓
Replace switch actuator and reset fault	✓	—	✓	—	✓
Remove labyrinth actuators and close labyrinth door	✓	—	✓	—	✓

A14 Hutch D Labyrinth 2 Switches and Latches

ONLY 1 set of switches from 5/25/16

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1). Latch trips on both A and B Permits. **Note:** B chain reed and push button switches must be cycled together for reset.

Beam stop is open	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Latch</u>
Search hutch	✓	—	✓	—	✓
Open FE, LIS1 and LIS3 Shutters from keypad	✓	—	✓	—	✓
LIS3 Shutter A and B open (green)	✓	—	✓	—	✓
D Interlocked A and B ON (green)	✓	—	✓	—	✓
LIS3 Shutter Permit A and B ON (green)	✓	—	✓	—	✓
Cable Lab 2 Switch/Latch A and B ON (green)	✓	—	✓	—	✓

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FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cable Lab 2 Switch/Latch Permit OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
D Interlocked OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Remove labyrinth actuators and close labyrinth door	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

A15 FOE Upstream Right Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
FOE Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>				
FOE Interlocked OFF	<input checked="" type="checkbox"/>				
FE Shutter Permit OFF	<input checked="" type="checkbox"/>				
FOE Door Switch Sum OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door	<input checked="" type="checkbox"/>				

A16 FOE Upstream Left Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

A1 A2 B1 B2 Reed

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<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
FOE Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>				
FOE Interlocked OFF	<input checked="" type="checkbox"/>				
FE Shutter Permit OFF	<input checked="" type="checkbox"/>				
FOE Door Switch Sum OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A17 FOE Downstream Right Door Switches

Place actuators on the door switches and Maglock.



Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
FOE Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>				
FOE Interlocked OFF	<input checked="" type="checkbox"/>				

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FE Shutter Permit OFF	<input checked="" type="checkbox"/>				
FOE Door Switch Sum OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A18 FOE Downstream Left Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
FOE Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>				
FOE Interlocked OFF	<input checked="" type="checkbox"/>				
FE Shutter Permit OFF	<input checked="" type="checkbox"/>				
FOE Door Switch Sum OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A19 B Hutch Right Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

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	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE and L1S1 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
L1S1 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
B Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
L1S1 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
B Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
L1S1 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
B Interlocked OFF	<input checked="" type="checkbox"/>				
L1S1 Shutter Permit OFF	<input checked="" type="checkbox"/>				
B Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>
A20 C Hutch Right Door Switches					
Place actuators on the door switches and Maglock.					<input checked="" type="checkbox"/>
Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).					
Beam stop is closed, D hutch not secure	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE, L1S1 and L1S3 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
C Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
C Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				

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L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
C Interlocked OFF	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
C Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A21 C Hutch Left Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

Beam stop is closed, D hutch not secure	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE, L1S1 and L1S3 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
C Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
C Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
C Interlocked OFF	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
C Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A22 Beam Stop

Place actuators on the beam stop switches and latch.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

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L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
D Interlocked OFF	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
D Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A24 D Hutch Front Left Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
Open beam stop, C hutch secure	<input checked="" type="checkbox"/>				
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE, L1S1 and L1S3 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
D Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
D Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
D Interlocked OFF	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
D Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A25 D Hutch Rear Right Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

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	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
Open beam stop, C hutch secure	<input checked="" type="checkbox"/>				
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE, LIS1 and LIS3 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
LIS3 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
D Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
LIS3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
D Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				
LIS3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
D Interlocked OFF	<input checked="" type="checkbox"/>				
LIS3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
D Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door	<input checked="" type="checkbox"/>				

A26 D Hutch Rear Left Door Switches

Place actuators on the door switches and Maglock.

Check the corresponding permits for each switch tested (e.g., A Permit for switch A1).

	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>Reed</u>
Open beam stop, C hutch secure	<input checked="" type="checkbox"/>				
<i>Search hutch</i>	<input checked="" type="checkbox"/>				
<i>Open FE, LIS1 and LIS3 Shutters from keypad</i>	<input checked="" type="checkbox"/>				
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>				
LIS3 Shutter A and B open (green)	<input checked="" type="checkbox"/>				
D Interlocked A and B ON (green)	<input checked="" type="checkbox"/>				
LIS3 Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>				
D Door Switch Sum A and B ON (green)	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>				
<i>Remove one switch actuator</i>	<input checked="" type="checkbox"/>				

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L1S3 Shutter A and B closed (red)	<input checked="" type="checkbox"/>				
D Interlocked OFF	<input checked="" type="checkbox"/>				
L1S3 Shutter Permit OFF	<input checked="" type="checkbox"/>				
D Door Switch Sum Permit OFF	<input checked="" type="checkbox"/>				
FE Critical Device Permits A and B OFF	<input checked="" type="checkbox"/>				
<i>Replace switch actuator and reset fault</i>	<input checked="" type="checkbox"/>				
Remove actuators and close door					<input checked="" type="checkbox"/>

A27 Magnetic Lock Test (FOE)

Connect the FOE test box (Attachment B Figure B4) to the PPS cabinet (Attachment B Figure B7). Use the box to turn ON the Maglocks (set switches to "Normal").

Repeat steps for each door: Upstream Right (USR), Upstream Left (USL), Downstream Right (DSR) and Downstream Left (DSL).

	<u>USR</u>	<u>USL</u>	<u>DSR</u>	<u>DSL</u>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Door Maglock A and B ON (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Open FE Shutters</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FOE test box, turn OFF Maglock</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Door Maglock A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Shutters closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FOE Interlocked A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permit A OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Turn On Maglock and reset fault</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Search hutch</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FE Shutter test fixture, Open FE Shutters</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Critical Device Permits A and B ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using FOE test box, turn OFF Maglock</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Within 3 seconds: FE Critical Devices Permits A Chain OFF</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reset fault	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Disconnect FOE test box</i>				<input checked="" type="checkbox"/>

A28 Magnetic Lock Test (B Hutch)

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Connect the FOE test box (Attachment B Figure B4) to the PPS cabinet (Attachment B Figure B7). Use the box to turn ON the Maglocks (set switches to "Normal").



Complete steps for Right (R) door

- | | <u>R</u> |
|--|-------------------------------------|
| <i>Search hutch</i> | <input checked="" type="checkbox"/> |
| B Interlocked A and B ON (green) | <input checked="" type="checkbox"/> |
| L1S1 Shutter Permit A and B ON (green) | <input checked="" type="checkbox"/> |
| Door Maglock A and B ON (green) | <input checked="" type="checkbox"/> |
| <i>Open FE and L1S1 Shutters</i> | <input checked="" type="checkbox"/> |
| Shutters open (green) | <input checked="" type="checkbox"/> |
| <i>Using FOE test box, turn OFF Maglock</i> | <input checked="" type="checkbox"/> |
| Door Maglock A OFF | <input checked="" type="checkbox"/> |
| Shutters closed (red) | <input checked="" type="checkbox"/> |
| B Interlocked A OFF | <input checked="" type="checkbox"/> |
| L1S1 Shutter Permit A OFF | <input checked="" type="checkbox"/> |
| <i>Turn On Maglock and reset fault</i> | <input checked="" type="checkbox"/> |
| <i>Search hutch</i> | <input checked="" type="checkbox"/> |
| <i>Using FE Shutter test fixture, Open FE Shutters</i> | <input checked="" type="checkbox"/> |
| FE Critical Device Permits A and B ON | <input checked="" type="checkbox"/> |
| <i>Using FOE test box, turn OFF Maglock</i> | <input checked="" type="checkbox"/> |
| <i>Within 3 seconds: FE Critical Devices Permits A Chain OFF</i> | <input checked="" type="checkbox"/> |
| <i>Disconnect FOE test box and reset fault</i> | <input checked="" type="checkbox"/> |

A29 Magnetic Lock Test (C Hutch)

Connect the FOE test box (Attachment B Figure B4) to the PPS cabinet (Attachment B Figure B7). Use the box to turn ON the Maglocks (set switches to "Normal").



Repeat steps for each door: Right (R), Left (L)

- | | <u>R</u> | <u>L</u> |
|---|-------------------------------------|-------------------------------------|
| <i>Search hutch</i> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| C Interlocked A and B ON (green) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| L1S3 Shutter Permit A and B ON (green) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Door Maglock A and B ON (green) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| <i>Open FE, L1S1 and L1S3 Shutters</i> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Shutters open (green) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

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Using Shutter test fixture, Open FE Shutters

FE Critical Device Permits A and B ON

Using FOE test box, turn OFF Maglock

Within 3 seconds:

FE Critical Devices Permits A Chain OFF

Rest fault

Disconnect FOE test box

✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓

A31 **Water Interlock**

Water flow meters are located on top of the hutch (Figure 1).



Figure 1: Water Meters

The PPS Water Safety Test Amplifiers (STA) are located in the cabinet to the upper right of the meters on top of the hutch (Figure 2).

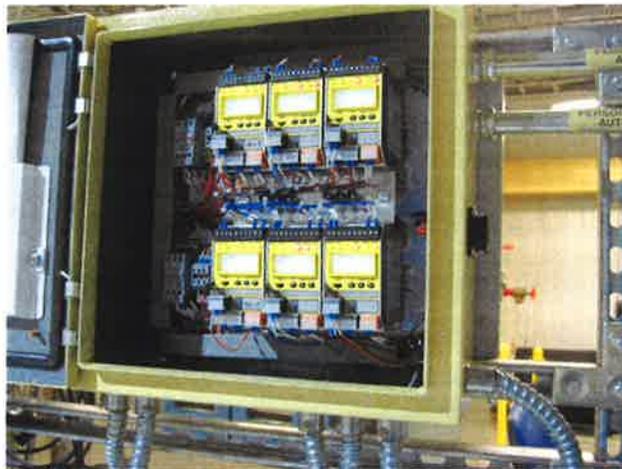


Figure 2: PPS Water STAs

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Title: Beamline 4-ID Radiological Interlock Test			Technical

Record the pretest water flows for the PPS meters in GPM.

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= <u>1.54</u>	B1= <u>1.68</u>	A STA1= <u>1.54</u>	B STA1= <u>1.68</u>
A2= <u>1.57</u>	B2= <u>1.67</u>	A STA2= <u>1.57</u>	B STA2= <u>1.67</u>
A3 For future Use	B3 For future Use		

The current programmed trip settings for the amplifiers are in column 1. The STA readouts for each tested A and B chain STAs will be recorded in columns 3 and 4. These recordings should be within 15% of the programmed trip point (column 2).

Trip Points	Trip Points (- 15 %)	Recorded A Trip	Recorded B Trip
PPS 1: ^{1.4} 1.5 GPM	1.3 GPM	A STA1= <u>1.4</u>	B STA1= <u>1.4</u>
PPS 2: ^{1.4} 1.5 GPM	1.3 GPM	A STA2= <u>1.4</u>	B STA2= <u>1.4</u>
PPS 3: TBD			

Repeat each step for all water flow meters

	PPS1	PPS2
<i>Open FE Shutters</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B open (green)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water Permits A and B ON (green), HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permits A and B ON (green), HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Using the valve, lower water flow to trip point</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutters A and B closed (red)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
In 5 seconds: FE Shutter Permits A and B OFF, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water Permits A and B OFF, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Recorded STA A and B levels above; within 15%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Return water flow to pretest values</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water Permits A and B remain OFF, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Reset fault at PPS cabinet</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water Permits ON (green), HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FE Shutter Permits A and B ON (green), HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A32 **Water Safety Test Amplifier Faults**

Repeat each step for all water flow meters

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	<u>PPS1</u>	<u>PPS2</u>
<i>Open FE Shutters with keypad</i>	✓	✓
FE Shutters A and B open (green)	✓	✓
Water Permits A and B ON (green), HMI	✓	✓
FE Shutter Permits A and B ON (green), HMI	✓	✓
<i>Press A chain fault/reset button</i>	✓	✓
FE Shutters A and B closed (red)	✓	✓
Water Permit A OFF, HMI	✓	✓
In 5 seconds: FE Shutter Permit A OFF, HMI	✓	✓
<i>Reset fault</i>	✓	✓
<i>Open FE Shutters with keypad</i>	✓	✓
FE Shutters A and B open (green)	✓	✓
Water Permits A and B ON (green), HMI	✓	✓
FE Shutter Permits A and B ON (green), HMI	✓	✓
<i>Press B chain fault/reset button</i>	✓	✓
FE Shutters A and B closed (red)	✓	✓
Water Permit B OFF, HMI	✓	✓
In 5 seconds: FE Shutter Permit B OFF, HMI	✓	✓
<i>Reset fault</i>	✓	✓

A33 **PPS Aperture**

The PPS Aperture Transmitter meters are located inside the FOE (Figure 3). The STAs are located in the PPS cabinet outside of the FOE (Figure 4).

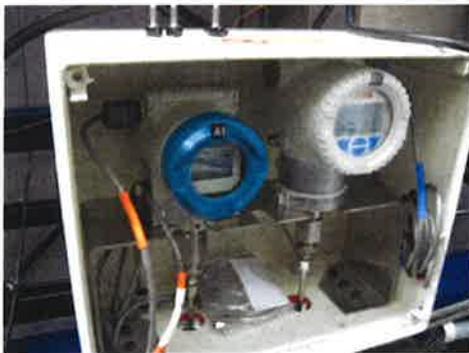


Figure 3: PPS Aperture Transmitters



Figure 4: PPS Aperture STAs

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Record the Transmitter meter readings (absolute pressure):

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= <u>33.1</u>	B1= <u>33.07</u>	A STA1= <u>33.07</u>	B STA1= <u>33.08</u>

Qualified Beamline Staff will adjust the valve to lower the absolute pressure (trip point at 18 psia).

Open FE Shutters

FE Shutters A and B open (**green**)

Aperture Low Press. A and B ON (**green**), HMI

FE Critical Device Permits A and B ON (**green**), HMI

Using the valve, lower pressure to below trip point at 18 psia

Both A and B chains trip within 5% of 18 psia (>17.1)

A 17.2 B 17.2

FE Shutters A and B closed (**red**)

FE Critical Device Permits A and B OFF, HMI

Aperture Low Press. A and B OFF, HMI

Qualified Beamline Staff return pressure to pretest values

Aperture Low Press. A and B ON (**green**), HMI

Reset fault at I/O Box

FE Critical Device Permits A and B ON (**green**), HMI

A34 **PPS Aperture (Module Fault)**

Repeat for A and B chain STAs

Open FE Shutters

FE Shutters A and B open (**green**)

Aperture Module Fault A and B ON (**green**), HMI

FE Critical Device Permits A and B ON (**green**), HMI

Generate a trip amplifier fault

FE Shutters A and B closed (**red**)

FE Critical Device Permits A and B OFF, HMI

Aperture Module Fault OFF (**red**), HMI

Return trip amplifier to operating condition

Aperture Module Fault A and B ON (**green**), HMI

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Title: Beamline 4-ID Radiological Interlock Test			Technical

Close shutters

✓

Reset fault

FE Critical Devices Permits A and B ON (**green**), HMI

✓

A38 Beamline Enable Key (Opening Shutter Without Key Trips SR RF and Dipole PS)

Remove beamline enable key

Beamline Online A and B OFF

✓

Search FOE

FOE Interlocked A and B ON (**green**), HMI

✓

FE Critical Devices Permits A and B ON (**green**), HMI

✓

Using FE Shutter test fixture, Open FE Shutters

FE Critical Devices Permits A and B OFF

✓

Replace beamline enable key and reset faults

Beamline Online A and B ON (**green**)

✓

Live Testing

A39 Reach Back FOE Door Switches

Secure P1 through P5

SR Secure, A and B chain, SR HMI

✓

Place actuators on FOE hutch downstream left door switches and Maglock

✓

Search hutch

FOE Interlocked A and B ON (**green**), HMI

✓

FE Critical Devices Permits A and B ON (**green**), HMI

✓

Check Control Room SR HMI (MCR beamline 1)

FE Critical Device Permit A and B ON (**green**) SR HMI

✓

Check I/O Box 4 Beamline Enable Panel

FE Critical Devices Permits A and B LEDs ON

✓

Check I/O Box 28 Beamline Enable Panel

FE Critical Device Permit Sum A and B LEDs ON

✓

FE Shutters Closed A and B LEDs ON

✓

Check Dipole PS (positive) Beamline Interface

A and B Permits ON, Dipole PS Pos. Interface

✓

Check Dipole PS (negative) Beamline Interface

A and B Permits ON, Dipole PS Neg. Interface

✓

Check SR RF System C HVPS Beamline Interface

A and B Permits ON, SR RF System C HVPS Interface

✓

Check SR RF System D HVPS Beamline Interface

A and B Permits ON, SR RF System D HVPS Interface

✓

Operator enables SR Dipole PS

SR Dipole PS is ON

✓

Operator enables SR RF System C HVPS

SR RF HVPS C is ON

✓

Operator enables SR RF System D HVPS

SR RF HVPS D is ON

✓

Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)

✓

FE Shutters Open

✓

Remove an "A chain" door switch actuator from beamline hutch door

✓

FOE Interlocked OFF A, HMI

✓

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	FE Critical Devices Permits A chain OFF, HMI	<input checked="" type="checkbox"/>
<i>Check I/O Box 4 Beamline Enable Panel</i>	FE Critical Devices Permit A LED OFF	<input checked="" type="checkbox"/>
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A LED OFF	<input checked="" type="checkbox"/>
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A (red), SR HMI	<input checked="" type="checkbox"/>
<i>Check SR RF System C HVPS Beamline Interface</i>	A Permits OFF, SR RF System C HVPS Interface	<input checked="" type="checkbox"/>
<i>Check SR RF System D HVPS Beamline Interface</i>	A Permits OFF, SR RF System D HVPS Interface	<input checked="" type="checkbox"/>
<i>Check Dipole PS (positive) Beamline Interface</i>	A Permits OFF, Dipole PS Pos. Interface	<input checked="" type="checkbox"/>
<i>Check Dipole PS (negative) Beamline Interface</i>	A Permits OFF, Dipole PS Neg. Interface	<input checked="" type="checkbox"/>
	SR RF System C HVPS is OFF	<input checked="" type="checkbox"/>
	SR RF System D HVPS is OFF	<input checked="" type="checkbox"/>
	SR Dipole PS is OFF	<input checked="" type="checkbox"/>
<i>Close FE Shutter with test fixtures</i>	Shutters closed	<input checked="" type="checkbox"/>
<i>Replace A chain door switch holder and reset fault(s)</i>		<input checked="" type="checkbox"/>
<i>Search hutch</i>		<input checked="" type="checkbox"/>
	FOE Interlocked A and B ON (green), HMI	<input checked="" type="checkbox"/>
	FE Critical Devices Permits A and B ON (green), HMI	<input checked="" type="checkbox"/>
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A and B ON (green), SR HMI	<input checked="" type="checkbox"/>
<i>Check I/O Box 4 Beamline Enable Panel</i>	FE Critical Device Permit Sum A and B LEDs ON	<input checked="" type="checkbox"/>
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Shutters Closed A and B LEDs ON	<input checked="" type="checkbox"/>
<i>Check Dipole PS (positive) Beamline Interface</i>	A and B Permits ON, Dipole PS Pos. Interface	<input checked="" type="checkbox"/>
<i>Check Dipole PS (negative) Beamline Interface</i>	A and B Permits ON, Dipole PS Neg. Interface	<input checked="" type="checkbox"/>
<i>Check SR RF System C HVPS Beamline Interface</i>	A and B Permits ON, SR RF System C HVPS Interface	<input checked="" type="checkbox"/>
<i>Check SR RF System D HVPS Beamline Interface</i>	A and B Permits ON, SR RF System D HVPS Interface	<input checked="" type="checkbox"/>
<i>Operator enables SR Dipole PS</i>	SR Dipole PS is ON	<input checked="" type="checkbox"/>
<i>Operator enables SR RF System C HVPS</i>	SR RF System C HVPS is ON	<input checked="" type="checkbox"/>
<i>Operator enables SR RF System D HVPS</i>	SR RF System D HVPS is ON	<input checked="" type="checkbox"/>
<i>Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)</i>		<input checked="" type="checkbox"/>
	FE Shutters Open	<input checked="" type="checkbox"/>

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Remove "B chain" switch actuator	FOE Interlocked B OFF, HMI	✓
	FE Critical Devices Permits B OFF, HMI	✓
<i>Check I/O Box 4 Beamline Enable Panel</i>	FE Critical Devices Permit B LED OFF	✓
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permits B OFF (red), SR HMI	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum B LED OFF	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	B Permits OFF, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	B Permits OFF, SR RF System D HVPS Interface	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	B Permits OFF, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	B Permits OFF, Dipole PS Neg. Interface	✓
	SR Dipole is OFF	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
<i>Close FE Shutters with test fixture</i>		✓
<i>Remove beamline hutch switch holders and Maglock actuator</i>		✓

A40 **Water Interlock (Live)**

<i>Search FOE</i>	FOE Interlocked A and B ON (green), HMI	✓
	FE Shutter Permits A and B ON (green), HMI	✓
	FE Critical Devices Permits A and B ON (green), HMI	✓
<i>Check I/O Box 4 Beamline Enable Panel</i>	FE Critical Devices Permits A and B LEDs ON	✓
<i>Check I/O Box 28 Beamline Enable Panel</i>	FE Critical Device Permit Sum A and B LEDs ON	✓
<i>Check Control Room SR HMI (MCR beamline 1)</i>	FE Critical Device Permit A and B ON (green), SR HMI	✓
<i>Check Dipole PS (positive) Beamline Interface</i>	A and B Permits ON, Dipole PS Pos. Interface	✓
<i>Check Dipole PS (negative) Beamline Interface</i>	A and B Permits ON, Dipole PS Neg. Interface	✓
<i>Check SR RF System C HVPS Beamline Interface</i>	A and B Permits ON, SR RF System C HVPS Interface	✓
<i>Check SR RF System D HVPS Beamline Interface</i>	A and B Permits ON, SR RF System D HVPS Interface	✓
<i>Operator enables SR Dipole PS</i>	SR Dipole PS is ON	✓
<i>Operator enables SR RF System C HVPS</i>	SR RF System C HVPS is ON	✓
<i>Operator enables SR RF System D HVPS</i>	SR RF System D HVPS is ON	✓

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Using FE Shutter test fixture, turn on air and open Photon then SSs

FE Shutters indicate Open (**green**), HMI

Using water trip points in Step A31, lower flow to one meter

Water Permits A and B OFF, HMI

FE Shutter Permits A and B OFF, HMI

Within 3 seconds

FE Critical Devices Permits A and B OFF, HMI

Check I/O Box 4 Beamline Enable Panel

FE Critical Devices Permit A and B OFF

Check I/O Box 28 Beamline Enable Panel

FE Critical Device Permit Sum A and B LED OFF

Check Control Room SR HMI (MCR beamline 1)

FE Critical Device Permit A and B OFF, SR HMI

Check SR RF System C HVPS Beamline Interface

A and B Permits OFF, SR RF System C HVPS Interface

Check SR RF System D HVPS Beamline Interface

A and B Permits OFF, SR RF System D HVPS Interface

Check Dipole PS (positive) Beamline Interface

A and B Permits OFF, Dipole PS Pos. Interface

Check Dipole PS (negative) Beamline Interface

A and B Permits OFF, Dipole PS Neg. Interface

SR RF System C HVPS is OFF

SR RF System D HVPS is OFF

SR Dipole PS is OFF

Close FE Shutters with test fixture

Shutters closed

Return water flow to recorded level

Reset fault(s)

A41 Observe All Shutters Closed Sum

Check I/O Box 28 Beamline Enable Panel

FE Shutters closed A chain light ON

FE Shutters closed B chain light ON

Using FE Shutter test fixture open both FE SSs and then Photon Shutter

FE Shutters open (**green**), HMI

Check I/O Box 28 Beamline Enable Panel

FE Shutters closed A chain light OFF

FE Shutters closed B chain light OFF

Close FE Shutters and remove test device

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Doc No. PS-C-XFD-PRC-057	Author: T. McDonald	Effective Date: 06May2016 Review Frequency: 3 yrs	Version 1
Title: Beamline 4-ID Radiological Interlock Test			Technical

A42 **FOE Area Radiation Monitor**

Refer to PS-C-ASD-PRC-008, *NSLS-II Area Radiation Monitor PPS Test and complete Attachment D, NSLS-II Beamline (FOE) Area Radiation Monitor Checklist.*

FRM 4-ID Test Checklist Completed

✓

A43 **Test Completion**

Inspect all hutch doors and labyrinths to ensure all PPS switch and Maglock actuators have been removed

✓

Return Beamline enable key and Beamline PPS reset key to the Control Room

✓

Remove muffler from beam imminent sounder

✓

Ensure PPS cabinets are secure and locked; challenge locks

✓

Remove all LOTO

✓

Inform Lead Operator that testing is complete

✓

- END ATTACHMENT A -

Addendum to 4-ID Initial Radiological Interlock test Certification (Certified May 2016)

AI PPS Aperture

Record the Transmitter meter readings (absolute pressure):

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= <u>30.2</u>	B1= <u>30.2</u>	A STA1= <u>30.2</u>	B STA1= <u>30.2</u>

Qualified Beamline Staff will adjust the valve to lower the absolute pressure (trip point at 18 psia).

Aperture Low Press. A and B ON (**green**), HMI ✓

Using the valve, turn to below trip point at 18 psia ✓

Both A and B chains trip within 5% of 18 psia (>17.1) STA (psia) A 18 B 18 ✓

Aperture Low Press. A and B OFF, HMI ✓

Qualified Beamline Staff return pressure to pretest values ✓

Aperture Low Press. A and B ON (**green**), HMI ✓

Test Result:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Failed
--------------	--	---------------------------------

Tested By: Thomas Miller Date: 6/21/15

Tested By: Thomas Miller Date: 6/21/2016

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National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-ASD-PRC-008	Author: T. McDonald	Effective Date: 17 April 2015 Review Frequency: 3 yrs	Version 4
Title: NSLS-II Area Radiation Monitor PPS Test			Technical

Attachment D

NSLS-II Beamline (FOE) Area Radiation Monitor Checklist

Note: Signatures below indicate that the test has been completed.

Monitor # <i>FRM004</i>	ID # <i>IN07372</i>	Beamline: <i>4-ID</i>
Test Reason: <input type="checkbox"/> Beamline Certification <input type="checkbox"/> Replacement/Repair		<i>Certification</i>
Test Date: <i>5/24/10</i>	Test Result	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed
Tester: <i>Tom McDonald</i>	RCD:	<i>John Aloj</i>
Tester Signature: <i>Tom McDonald</i>	RCD Signature:	<i>John Aloj</i>

Fail Alarm: Place checkmark (✓) in checkbox (☐) for each correct response.

	Local Expected Observation	HMI/CR Expected Observation	Linac HMI	CR HMI
Operator turns on Gun	Gun HVPS is ON <input checked="" type="checkbox"/>	Gun Contactor ON A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RCD Disables Monitor		Alarm sounds in Control Room		<input checked="" type="checkbox"/>
	Fail alarm ON HMI (yellow border around ARM icon)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Silence CR Alarm		Alarm silences		<input checked="" type="checkbox"/>
Gun turns OFF	Gun HVPS is OFF <input checked="" type="checkbox"/>	Gun Contactor OFF A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal	Gun HVPS remains OFF <input checked="" type="checkbox"/>	Fail alarm remains ON HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reset fault in Control Room		Monitor normal HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
RCD ensures ARM is locked	ARM is locked <input checked="" type="checkbox"/>			

Low Alarm: Place checkmark (✓) in checkbox (☐) for each correct response.

	Local Expected Observation	HMI/CR Expected Observation	Beamline HMI	CR HMI/EPICS
Opens FE shutter (w/keypad)	FE Shutters open <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until low alarm	Yellow light on Monitor <input checked="" type="checkbox"/>	Radiation level increases on EPICS		<input checked="" type="checkbox"/>
	FE Shutters Closed <input checked="" type="checkbox"/>	Alarm sounds in Control Room		<input checked="" type="checkbox"/>
		Low level alarm ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	FE Critical Device Permit A chain ON		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until low alarm	Yellow light on Monitor <input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
	FE Critical Device Permit A chain OFF		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

High Alarm: Place checkmark (✓) in checkbox (☐) for each correct response.

	Local Expected Observation	HMI/CR Expected Observation	Linac HMI	CR HMI/EPICS
Operator turns on Gun	Gun HVPS is ON <input checked="" type="checkbox"/>	Gun Contactor ON A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apply source until high alarm	Red light on Monitor <input checked="" type="checkbox"/>	Radiation level increases on EPICS		<input checked="" type="checkbox"/>
	Monitor alarm sounds	Alarm sounds in Control Room		<input checked="" type="checkbox"/>
		High level alarm ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Silence Alarm		Alarm silences		<input checked="" type="checkbox"/>
Gun turns OFF	Gun HVPS is OFF <input checked="" type="checkbox"/>	Gun Contactor OFF A Chain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Return monitor to normal	Gun HVPS remains OFF <input checked="" type="checkbox"/>	High level alarm remains ON, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reset fault in Control Room		Monitor normal, HMI	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Description of Test Failures (if any): _____