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National Synchrotron Light Source II, Brookhaven National Laboratory			
Doc No. PS-C-ASD-PRC-129	Author: T. McDonald	Effective Date: 08Jan2016 Review Frequency: 3 yrs	Version 5
Title: NSLS-II Storage Ring Radiological Interlock Test			Technical

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VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	First Issue.	31Jan2014
2	Updated after precertification testing by Accelerator Safety Systems Group; Validation waived by Author, T. McDonald and Conduct of Operations Manager, L. Hill.	14Mar2014
3	Updated after inconsistencies identified during initial certification (March 2014): Gun and modulators observed during all live tests, A and B chain observations for Access request test steps modified to concur with current PLC programming, energy limiter trip amplifier tests added in Pentant 2 checklist, Magnet test mode steps requiring gun operation deleted, updated SR dipole current setpoints on energy limiter test steps, added injection energy limiter test to Pentant 3 checklist; updated reviewer titles; general formatting; added reference to the Document Control Procedure to sections 7 and 9; Validation waived by Author, T. McDonald and Conduct of Operations Manager, L. Hill.	18Apr2014
4	Revised wording in Purpose and Scope: to indicate certifications can occur up to the last day of the month due; Centrally Controlled LOTO will disable electron beam if due date expires. Added LOTO of Booster RF and SR low level RF drive. LOTO of the SR dipole only performed during specified checklist steps. Revised retrieving Quick search keys from Control Room to RF system kirk key bank. Revised all checklists: removed references to Building 725; added steps to connect/disconnect test jumpers for SR Dipole PS interface boxes; revised search sequence test steps to utilize quick search feature. Added "Assistants" to Responsibilities (3.2). General formatting throughout.	22May2015
4	MPC No.1 Change to add check that PPS cabinets are secure and locked (6.1.8, Attachment A [A40], B [B50], C [C39], D [D35] and E [E41]).	13Nov2015
5	Revised for installation of RF System "C" into the SR PPS and associated modifications.	08Jan2016

ACRONYMS

ABM	Authorization Basis Manager	ISA	Injector Service Area
ASE	Accelerator Safety Envelope	LOTO	Lockout/Tagout
BNL	Brookhaven National Laboratory	LTB	Linac to Booster
BTS	Booster to Storage Ring	NSLS-II	National Synchrotron Light Source II
CR	Control Room	PLC	Programmable Logic Controller
DPSI	Dipole Power Supply Interface	PPS	Employee Protection System
ESH	Environment, Safety, and Health	PS	Power Supply
HII	Human Interlock Interface	RF	Radio Frequency
HMI	Human Machine Interface	RFPSI	Radio Frequency Power Supply Interface
HV	High Voltage	SBMS	Standards Based Management System
HVPS	High Voltage Power Supply	SR	Storage Ring
I/O	Input/Output		

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1 PURPOSE AND SCOPE

The purpose of this procedure is to provide instructions for testing and certifying the radiological interlock system for the BNL NSLS-II Storage Ring. The system will be re-tested every six months, in accordance with the SBMS Program Description: *Radiological Control Manual* and SBMS Subject Area, *Interlock Safety for High Risk Hazards*. Certification must be completed sometime during, but no later than, the last day of the calendar month in which it is due. Any PPS going beyond the last day of the month in which it is due will have Centrally Controlled LOTO applied to prohibit operation with electron beam until certification is complete. Testing will also be required after a change in wiring, components, or programming in accordance with PS-ESH-PRM-3.4.1, *Procedure for Safety System Work Permits* and the guidelines for certification specified in PS-C-ASD-SPC-SR-PPS-001, *Storage Ring Employee Protection System (SPPS) Design Description*. Changes to the system shall be performed in accordance with PS-C-ASD-PRC-057, *NSLS-II PPS Configuration Management*.

2 DEFINITIONS

None.

3 RESPONSIBILITIES

3.1 Testers

- 3.1.1 Coordinate and perform radiological interlock certification testing.
- 3.1.2 Delegate radiological interlock testing step actions to personnel acting as Assistants.
- 3.1.3 Complete attached test checklists, as required.

3.2 Assistants

- 3.2.1 Assist the Tester in performing the storage ring interlock test step actions when directed by the Tester.
- 3.2.2 Report all radiological interlock test observations to the Tester.

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3.3 Accelerator Safety Systems Engineers and Technicians

3.3.1 Provide technical support throughout testing.

3.4 Primary Authorized Employees

3.4.1 Apply LOTO in accordance with this procedure.

3.5 Configuration Management Specialist

3.5.1 Posts completed test checklists on the SharePoint Document Center.

4 PREREQUISITES

4.1 At least one Tester shall be ESH Staff.

4.2 Assistants shall be designated by the Testers.

5 PRECAUTIONS AND LIMITATIONS

5.1 All steps in this procedure that require LOTO of systems/equipment for servicing and maintenance activities shall be performed in accordance with SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance*.

5.2 All steps in this procedure that require LOTO for any purpose other than servicing and maintenance shall be performed in accordance with PS-C-ASD-PRC-005, *Centrally Controlled Lockout/Tagout (LOTO) Procedure*.

5.3 Mufflers shall be used to reduce noise during testing by placing them on the right hand HII sounders (6 per pentant).

5.4 The radiological interlock system for the storage ring is a credited control in accordance with the ASE. Any deviation or discrepancy from an expected test result may be a violation of the ASE and shall be reported to the ABM as soon as practical.

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5.5 All steps in test checklists (Attachments A through E) that require a search shall be performed in accordance with the appropriate procedure as follows:

- Berm in accordance with PS-C-ESH-PRC-004, *Procedure for NSLS-II Injector Berm Search and Secure, and Breaking Injector Berm Security*
- Linac in accordance with PS-C-PRC-LIN-SS-001, *Procedure for NSLS-II Linac Search and Secure, and Breaking Security*
- Booster in accordance with PS-C-ESH-PRC-016, *Procedure for NSLS-II Booster Search and Secure, and Breaking Security*
- Storage Ring in accordance with PS-C-ASD-PRC-111, *Procedure for NSLS-II Storage Ring Search and Secure, and Breaking Security*

6 PROCEDURE

6.1 Test and Certify Radiological Interlocks

Note: Two Testers are required to test and certify the storage ring radiological interlocks.

6.1.1 Testers notify the Lead Operator that a test of the storage ring radiological interlocks will be performed.

6.1.2 Testers obtain the Storage Ring Pentant Quick Search keys for each pentant being tested from the RF kirk key bank located behind the RF HVPS.

6.1.3 Primary Authorized Employees apply LOTO to the following:

- Gun HVPS output cable connector in accordance with SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance* to ensure no signal output to the electron gun cage
- Three linac modulator power supply line cords OR Booster Dipole F Power Supply in accordance with SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance*
- Booster RF HVPS OR Booster low level RF drive termination OR Booster RF output connection to cavity in accordance with PS-C-ASD-PRC-047, *NSLS-II Booster Ring Radio Frequency System High Voltage Power Supply (BR-HVPS) Lockout/Tagout (LOTO)*

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- SR System “C” RF HVPS in accordance with PS-C-ASD-PRC-048, *NSLS-II Storage Ring Radio Frequency (RF) System High Voltage Power Supply (HVPS) Lockout/Tagout (LOTO)*
- SR System “C” low level RF drive termination OR SR System “C” RF output connection to cavity in accordance with SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance*
- SR System “D” RF HVPS in accordance with PS-C-ASD-PRC-048, *NSLS-II Storage Ring Radio Frequency (RF) System High Voltage Power Supply (HVPS) Lockout/Tagout (LOTO)*
- SR System “D” low level RF drive termination OR SR System “D” RF output connection to cavity in accordance with SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance*

Note: The Gun HVPS output cable connector will remain locked and tagged for the full duration of the test. The other LOTOs will be removed during specified test steps.

6.1.4 Tester applies LOTO to each of the following in accordance with PS-C-ASD-PRC-005, *Centrally Controlled Lockout/Tagout (LOTO) Procedure*:

- Gun HVPS output cable connector
- Three linac modulator power supply line cords OR Booster Dipole F Power Supply
- Booster RF HVPS OR Booster low level RF drive termination OR Booster RF output connection to cavity
- SR RF System “C” HVPS
- SR System “C” low level RF drive termination OR SR System “C” RF output connection to cavity
- SR RF System “D” HVPS
- SR System “D” low level RF drive termination OR SR System “D” RF output connection to cavity

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Note: A test checklist is designated for each of the five pentants, as follows:

- Attachment A, *NSLS-II Storage Ring Pentant 1 Radiological Interlock Test Checklist*
- Attachment B, *NSLS-II Storage Ring Pentant 2 Radiological Interlock Test Checklist*
- Attachment C, *NSLS-II Storage Ring Pentant 3 Radiological Interlock Test Checklist*
- Attachment D, *NSLS-II Storage Ring Pentant 4 Radiological Interlock Test Checklist*
- Attachment E, *NSLS-II Storage Ring Pentant 5 Radiological Interlock Test Checklist*

Note: With the exception of LOTO checklist items, checklist items (i.e., tests) specified in Attachments A through E may be performed without the completion of all of the other specified checklist items (i.e., partial radiological interlock test).

6.1.5 Testers use the appropriate test checklist (Attachments A through E) to test and certify the specific pentant radiological interlocks.

- a. IF the correct corresponding observation has been made, THEN make a checkmark (✓) for each step.
- b. IF any step results in an undesired event or outcome, THEN contact the Accelerator Safety Systems Engineer and/or Technician.
- c. IF the undesired outcome or event requires a change to wiring, component(s), or PLC programming, THEN make a checkmark (✓) in the Test Result "Failed" box at the top of the test checklist.
- d. IF the test checklist is fully completed with desirable outcomes, THEN make a checkmark (✓) in the Test Result "Passed" box at the top of the test checklist.

6.1.6 Testers notify the Lead Operator that the test of the specific pentant radiological interlocks is completed and the resulting outcome (i.e., Passed or Failed).

6.1.7 Testers remove LOTO from each of the following in accordance with PS-C-ASD-PRC-005, *Centrally Controlled Lockout/Tagout (LOTO) Procedure*:

- Gun HVPS output cable connector

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- Three linac modulator power supply line cords OR Booster Dipole F Power Supply
- Booster RF HVPS OR Booster low level RF drive termination OR Booster RF output connection to cavity
- SR RF System "C" HVPS
- SR System C low level RF drive termination OR SR System "C" RF output connection to cavity
- SR RF System "D" HVPS
- SR System D low level RF drive termination OR SR System "D" RF output connection to cavity

6.1.8 Testers ensure all Booster PPS cabinets are secure and locked.

6.1.9 Testers return the Storage Ring Pentant Quick Search keys to the RF kirk key bank located behind the RF HVPS.

6.1.10 Testers notify the Primary Authorized Employee for each of the following systems that interlock testing is complete and removal of LOTO may be performed:

- Gun HVPS output cable connector
- Three linac modulator power supply line cords OR Booster Dipole F Power Supply
- Booster RF HVPS OR Booster low level RF drive termination OR Booster RF output connection to cavity
- SR RF System "C" HVPS
- SR System "C" low level RF drive termination OR SR System "C" RF output connection to cavity
- SR RF System "D" HVPS
- SR System "D" low level RF drive termination OR SR System "D" RF output connection to cavity

6.1.11 Testers provide the completed test checklist to the Configuration Management Specialist for posting on the SharePoint Document Center.

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6.2 Alarms and Faults

6.2.1 Clear any existing faults:

- a. IF fault(s) cannot be cleared, THEN contact the Accelerator Safety Systems Staff.

6.2.2 Silence alarms by pressing the “alarm silence” button on the Control Room HMI.

7 REFERENCES

- 7.1 PS-C-ASD-PRC-005, *Centrally Controlled Lockout/Tagout (LOTO) Procedure*
- 7.2 PS-C-ASD-PRC-048, *NSLS-II Storage Ring Radio Frequency (RF) System High Voltage Power Supply (HVPS) Lockout/Tagout (LOTO)*
- 7.3 PS-C-ASD-PRC-057, *NSLS-II PPS Configuration Management*
- 7.4 PS-C-ASD-SPC-SR-PPS-001, *Storage Ring Employee Protection System (SPPS) Design Description*
- 7.5 PS-C-ESH-PRC-004, *Procedure for NSLS-II Injector Berm Search and Secure, and Breaking Injector Berm Security*
- 7.6 PS-C-ESH-PRC-016, *Procedure for NSLS-II Booster Search and Secure, and Breaking Security*
- 7.7 PS-C-ASD-PRC-111, *Procedure for NSLS-II Storage Ring Search and Secure, and Breaking Security*
- 7.8 PS-C-PRC-LIN-SS-001, *Procedure for NSLS-II Linac Search and Secure, and Breaking Security*
- 7.9 PS-ESH-PRM-3.4.1, *Procedure for Safety System Work Permits*
- 7.10 SBMS Program Description: *Radiological Control Manual*
- 7.11 SBMS Subject Area, *Interlock Safety for High Risk Hazards*
- 7.12 SBMS Subject Area, *Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance*

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- 7.13 PS-C-CMD-PRC-002, *Records Management Procedure*
- 7.14 PS-C-ASD-PRC-143, *NSLS-II Storage Ring Main Dipole Centrally Controlled Lockout/Tagout (LOTO)*
- 7.15 PS-C-ASD-PRC-047, *NSLS-II Booster Ring Radio Frequency System High Voltage Power Supply (BR-HVPS) Lockout/Tagout (LOTO)*
- 7.16 PS-C-ASD-PRC-008, *NSLS-II Area Radiation Monitor PPS Test*

8 ATTACHMENTS

Attachment A, *NSLS-II Storage Ring Pentant 1 Radiological Interlock Test Checklist*

Attachment B, *NSLS-II Storage Ring Pentant 2 Radiological Interlock Test Checklist*

Attachment C, *NSLS-II Storage Ring Pentant 3 Radiological Interlock Test Checklist*

Attachment D, *NSLS-II Storage Ring Pentant 4 Radiological Interlock Test Checklist*

Attachment E, *NSLS-II Storage Ring Pentant 5 Radiological Interlock Test Checklist*

9 DOCUMENTATION

The following documents are generated as a result of this procedure, and shall be maintained in accordance with PS-C-CMD-PRC-002, *Records Management Procedure*:

- NSLS-II Storage Ring Pentant 1 Radiological Interlock Test Checklist
- NSLS-II Storage Ring Pentant 2 Radiological Interlock Test Checklist
- NSLS-II Storage Ring Pentant 3 Radiological Interlock Test Checklist
- NSLS-II Storage Ring Pentant 4 Radiological Interlock Test Checklist
- NSLS-II Storage Ring Pentant 5 Radiological Interlock Test Checklist

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Attachment A

NSLS-II Storage Ring Pentant 1 Radiological Interlock Test Checklist

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed		
	Test Type:	<input type="checkbox"/> Pre-Certification	<input type="checkbox"/> Certification <input type="checkbox"/> Partial
Test Date:	Start Time:	Finish Time:	
Tester 1:	Assistant 1:		
Tester 2:	Assistant 2:		
Tester 1 Signature:	Tester 2 Signature:		
*Reviewer 1:	Reviewer 1 sig.:		
Reviewer 2:	Reviewer 2 sig.:		
** Safety Signature Pentant 1(PLC)	Previous Pentant 1 PLC SS#	Date: / /	
A Chain: B Chain:	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.

Each numbered item below indicates a set of action items for the test procedure. The Tester will either perform the action, or delegate the action to the Assistant(s). For each step a checkmark (✓) should be made if the correct corresponding observation has been made.

	<u>Action Taken</u>	<u>Observation, Location</u>	✓
A1	Verify System Lockouts and Connect Dipole Test Jumpers Gun HVPS Output Cable Connector Modulator PS line cords (3) <u>OR</u> Booster Dipole F PS Booster RF HVPS <u>OR</u> booster low level RF drive termination <u>OR</u> Booster RF output connection to cavity SR System C RF HVPS SR System C low level RF drive termination <u>OR</u> SR System C RF output connection to cavity SR System D RF HVPS SR System D low level RF drive termination <u>OR</u> SR System D RF output connection to cavity Apply mufflers to the right hand HII side sounders 6 Connect the 4 test jumpers to the SR Dipole Power Supply interface boxes		_____ _____ _____ _____ _____ _____ _____ _____
A2	Secure Enclosures Secure the injector berm area Secure the linac Secure the booster ring Note: All Mode Search Verifications can be completed using the Quick Search feature	Berm secured, Linac HMI Linac secured, Linac HMI Booster secured, Booster HMI	_____ _____ _____
A3	Verify Pentant 1 Single Pentant Search (Mode 1) Check HMI on 740 Pentant I/O Box or CR Three Searchers enter Service Building 1 Press P1-SB1 Service Bldg. 1	Pentant 1 not secured A and B chain (grey), HMI Light on search button illuminates	_____ _____ _____

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<u>Action Taken</u>	<u>Observation, Location</u>	✓
	Search sounder alarm sounds	_____
	Overhead lighting flashes during search	_____
One searcher remains on P5 side of gate 1		_____
Close gate 1 and press SB2	Light on search button illuminates	_____
Press SB3 on HII 1	Light on search button illuminates	_____
	Amber HII 1 search beacon is ON	_____
Press SB4 on HII 2	Light on search button illuminates	_____
	Amber HII 2 search beacon is ON	_____
Press SB5 on HII 3	Light on search button illuminates	_____
	Amber HII 3 search beacon is ON	_____
Searchers <i>simultaneously</i> press P1-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
	Light on SB1 (Service Bldg.) illuminates	_____
	Light on SB6 illuminates	_____
	Amber HII 4 search beacon is ON	_____
Press SB7 on HII 5	Light on search button illuminates	_____
	Amber HII 5 search beacon is ON	_____
Press SB8 on HII 6	Light on search button illuminates	_____
	Amber HII 6 search beacon is ON	_____
One searcher remains on P2 side of gate		_____
Close Pentant Gate 2		_____
Press SBSP	Light on search button illuminates	_____
Press P1-SB1	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates	_____
	Maglock engages/locks- check door	_____
	Service Bldg. 1 Maglock A and B (green), HMI	_____
	Gate 1 switches A and B ON (green), HMI	_____
	Gate 1 Maglock A and B ON (green), HMI	_____
	Gate 2 Maglock A and B ON (green), HMI	_____
	Gate 2 switches A and B ON (green), HMI	_____
<i>After beam imminent warning sounds:</i>	Service Bldg. Door sign illuminates (A and B sect.)	_____
(<u>Note</u> : Beam imminent timed in step A4)	Pentant 1 Secured A and B chain, HMI	_____
	Gate 1 sign illuminates (A and B sect.)	_____
	Gate 2 sign illuminates (A and B sect.)	_____
Request Operator grant access permit for P1		_____
Press Access Request button at Serv. Building Door 1 if necessary (other pentants secure)	Pentant 1 unsecured A and B chain, HMI	_____
Open Door	No alarm sounds in Control Room	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
A4	Verify Pentant 1 Starting Multiple Pentant Search (Mode 2) and Time Beam Imminent Warning		
	Check HMI status	Pentant 1 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 1		_____
	Press P1-SB1 in Pentant 1 Service Bldg.1	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
		Overhead lighting flashes during search	_____
	Close Gate 1 and press SB2	Light on search button illuminates	_____
	Press SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P1-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 2		_____
	Reach through Gate 2 Press SB9 and <i>begin timing audible alarm</i>		_____
		Light on search button illuminates	_____
		Maglock engages/check gate	_____
		Service Bldg 1 Maglock A and B ON (green), HMI	_____
		Gate 2 Maglock A and B ON (green), HMI	_____
		Gate 1 switches A and B (green), HMI	_____
		Gate 2 switches A and B (green), HMI	_____
		Beam Imminent alarm sounds for 60 seconds	_____
	<i>After beam imminent warning sounds:</i>		_____
		Pentant 1 Secured A and B chain, HMI	_____
A5	Operations Enable Switch (Pentant 1 Main I/O box)		
		Pentant 1 Secured A and B chain (green), HMI	_____
	Rotate the operation enable switch to OFF	Pentant 1 NOT Secured A and B chain (grey), HMI	_____
	Attempt to secure Pentant 1	Pentant 1 will not secure	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	Rotate the Operation enable switch to ON		_____
	Reset the fault at the Pentant 1 I/O box		_____
A6	Verify Pentant 1 Continuing Multiple Pentant Search (Mode 3) and Time Red Beacons		_____
	Check HMI on 740 Pentant I/O Box or CR	Pentant 1 not secured A and B chain (grey), HMI	_____
	Close Gate 1 and press SB2	Light on search button illuminates	_____
	Press P1-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P1-SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P1-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 2		_____
	Reach through gate 2 Press SB9 and <i>begin timing the Red Beacons on HII devices (6)</i>		_____
		Light on search button illuminates	_____
		Maglock engages/locks- check door	_____
		Service Bldg 1 Maglock A and B (green), HMI	_____
		Gate 2 Maglock A and B (green), HMI	_____
		Gate 1 switches A and B (green), HMI	_____
		Gate 2 switches A and B (green), HMI	_____
	<i>After Beam Imminent alarm:</i>	Pentant 1 Secured A and B chain, HMI	_____
		Red Beacons (6) flash for 60 seconds	_____
		HII Red area Secure A and B lights illuminated	_____
	Request Operator grant access permit for P1		_____
		Pentant 1 unsecured A and B chain, HMI	_____
	Open Gate	No alarm sounds in Control Room	_____
A7	Verify Pentant 1 Completing Multiple Pentant Search (Mode 4)		_____
	Check HMI on 740 Pentant I/O Box or CR	Pentant 1 not secured A and B chain (grey), HMI	_____
	Close Gate 1 and press SB2	Light on search button illuminates	_____
	Press P1-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P1- SB4 on HII 2	Light on search button illuminates	_____

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	Amber HII 2 search beacon is ON	_____
Press SB5 on HII 3	Light on search button illuminates	_____
	Amber HII 3 search beacon is ON	_____
Searchers <i>simultaneously</i> press P1-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates	_____
	Light on SB6 illuminates	_____
Press SB7 on HII 5	Amber HII 4 search beacon is ON	_____
	Light on search button illuminates	_____
	Amber HII 5 search beacon is ON	_____
Press SB8 on HII 6	Light on search button illuminates	_____
	Amber HII 6 search beacon is ON	_____
Close Pentant Gate 2		_____
Press SBSB	Light on search button illuminates	_____
Press P1-SB1 at Service Building Door	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates	_____
After Beam Imminent alarm:	Pendant 1 Secured A and B chain, HMI	_____
A8		
<u>Access Pentant and Check HII</u>		
Request Operator grant access permit for P1	If other pentants secure the Access Request button at Service Bldg. 1 illuminates	_____
Press Access Request button at Service Building Door if necessary (other pentants secure)	P1 Service Bldg. Door Maglock Off (grey), HMI	_____
	Pendant not secured A and B chain (grey), HMI	_____
	Door is open	_____
Check HII indicators	Red Beacons OFF	_____
	Red Secure A and B lights OFF	_____
	Green HII "Beam Disabled" lights illuminated	_____
Proceed to P1-SB2		_____
A9		
<u>Search Timeout (Mode 2)</u>		
Press P1-SB2 in Pentant 1 and begin <i>timing</i>	Light on search button illuminates	_____
	Search sounder alarm sounds	_____
Complete search in sequence <i>without</i> pressing SB9		_____
	Light and sounders go out in 12 minutes	_____
Press SB9	Mode 2 Search does not complete	_____
A10		
<u>Skip the Two Button Simultaneous Press (Mode 1) using Quick Search</u>		
Close Gates and doors and put into Quick Search		_____
Press SB1	Light on search button illuminates	_____
Press SB2	Light on search button illuminates	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	Press SB3	Light on search button illuminates	___
	Press SB4	Light on search button illuminates	___
	Press SB5	Light on search button illuminates	___
	Press SB1		___
	Press SB6		___
	Press SB7		___
	Press SB8		___
	Press SB9	Pendant 1 does NOT Secure on A OR B chains	___
A11	Emergency Stop Aborts Search Complete a normal search using ANY Mode <i>Before</i> the beam imminent warning sounder stops, Press an Emergency Stop	Mode used = Beam imminent warning stops Red Beacons are NOT flashing Pendant does not secure on either chain, HMI	___ ___ ___ ___
A12	A Chain Entrance Door Switches Service Building 1 Place holders on the A chain Service Building 1 Door switches (4) and attach actuator on Magnetic lock Close Pendant gates 1 and 2 Perform all actions and make observations for both door A chain switches A1 and A2		___ ___
	Quick Search Pendant 1 (A chain)	Pendant 1 secured A chain (green), HMI Service Bldg 1 Door SW A chain ON (green), HMI	<u>A1</u> <u>A2</u> ___ ___ ___ ___
	Remove holder from Service Building 1 stationary door switch	Pendant 1 unsecured A chain (grey), HMI Service Bldg 1 Door SW A chain OFF (grey), HMI	___ ___ ___ ___
	Replace holder on stationary door		___ ___
	Quick Search Pendant 1 (A chain)	Pendant 1 secured A chain (green), HMI Service Bldg 1 Door SW A chain ON (green), HMI	<u>A1</u> <u>A2</u> ___ ___ ___ ___
	Remove holder from Service Building 1 active door switch	Pendant 1 unsecured A chain (grey), HMI Service Bldg 1 Door SW A chain OFF (grey), HMI	___ ___ ___ ___
	Replace holder on active door		___ ___
A13	Pendant 1 A Chain Quick Search Timeout Quick search Pendant 1 and <i>begin timing</i>	Pendant 1 secured A chain (green), HMI Pendant 1 unsecured in 5 minutes (grey), HMI	___ ___ ___
	Remove A chain switch holders		___

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	<u>Action Taken</u>	<u>Observation, Location</u>	<input checked="" type="checkbox"/>
A14	B Chain Entrance Door Switches Service Building 1		
	Place holders on the B chain Service Building 1 Door switches (4)		_____
	Close Pentant gates		_____
	Perform all actions and make observations for both door B chain switches B1 and B2		
			<u>B1</u> <u>B2</u>
	Quick Search Pentant 1 (B chain)	Pentant 1 secured B chain (green), HMI	_____
		Service Bldg 1 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 1 stationary door switch	Pentant 1 unsecured B chain (grey), HMI	_____
		Service Bldg 1 Door SW B chain OFF (grey), HMI	_____
	Replace holder on stationary door		_____
			<u>B1</u> <u>B2</u>
	Quick Search Pentant 1 (B chain)	Pentant 1 secured B chain (green), HMI	_____
	Service Bldg 1 Door SW B chain ON (green), HMI	_____	
Remove holder from Service Building 1 active door switch	Pentant 1 unsecured B chain (grey), HMI	_____	
	Service Bldg 1 Door SW B chain OFF (grey), HMI	_____	
Replace holder on active door		_____	
A15	Pentant 1 B Chain Quick Search Timeout		
	Quick Search Pentant 1 and <i>begin timing</i>	Pentant 1 secured B chain Pentant 1 unsecured in 5 minutes	_____ _____
A16	Service Building 1 Door Emergency Egress		
	Attach B chain Maglock Actuator with tape		_____
	Person proceeds to Exit (ring side)		_____
	Perform B chain Pentant 1 quick search	Pentant 1 secured B chain ON (green), HMI	_____
		Service Bldg 1 Door Maglock B chain ON (green), HMI	_____
	Remove actuator	Service Bldg 1 Door Maglock B chain OFF (grey), HMI	_____
		Pentant 1 unsecured (grey), HMI	_____
	Remove B chain switches		_____
	Close door		_____
	Perform A chain Pentant 1 search	Pentant 1 secured A chain (green), HMI	_____
		Service Bldg 1 Door Maglock A chain ON (green), HMI	_____
	Press in door push bar without opening door	Service Bldg 1 Door Maglock A chain OFF (grey), HMI	_____
	Pentant 1 unsecured (grey), HMI	_____	
Open door	Door opens	_____	
Close door and stay outside of ring		_____	

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
A17	Service Building 1 P1 Emergency Access Button		
	Perform A chain Pentant 1 quick search	Pendant 1 secured A chain	_____
		Service Bldg 1 Door Maglock A chain ON (green), HMI	_____
	Press in P1 emergency access button	Service Bldg 1 Door Maglock A chain OFF (grey), HMI	_____
		Pendant 1 unsecured, HMI	_____
	Pull out P1 emergency access button	Emergency Stop Latch A chain OFF (grey), HMI	_____
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI	_____
	Perform B chain Pentant 1 search	Pendant 1 secured B chain	_____
		Serv. Bldg 1 Door Maglock B chain ON (green), HMI	_____
	Press in P1 emergency access button	Service Bldg 1 Door Maglock B chain OFF (grey), HMI	_____
		Pendant 1 unsecured, HMI	_____
	Pull out P1 emergency access button	Emergency Stop Latch B chain OFF (grey), HMI	_____
Open door	Door opens	_____	
Reset fault and latch	Emergency Stop Latch B chain ON (green), HMI	_____	
Close door	All gates and doors closed	_____	
A18	Pendant 1 HII Emergency Stops		
	Repeat all steps for each HII:		
	A Chain:		
		<u>HII-1</u> <u>HII-2</u> <u>HII-3</u> <u>HII-4</u> <u>HII-5</u> <u>HII-6</u>	
	Quick search Pendant 1 on A Chain	_____	_____
	Pendant 1 secured A chain (green), HMI	_____	_____
	Emergency Stop Latch A chain ON (green), HMI	_____	_____
	Press in Emergency Stop	_____	_____
	Pendant 1 unsecured A chain (grey), HMI	_____	_____
	Pull out Emergency Stop	_____	_____
	Emergency Stop Latch A chain OFF (grey), HMI	_____	_____
	Reset fault and latch at Pendant 1 I/O box	_____	_____
	Emergency Stop Latch A chain ON (green), HMI	_____	_____
B Chain:			
	<u>HII-1</u> <u>HII-2</u> <u>HII-3</u> <u>HII-4</u> <u>HII-5</u> <u>HII-6</u>		
Quick search Pendant 1 on B Chain	_____	_____	
Pendant 1 secured B chain (green), HMI	_____	_____	
Emergency Stop Latch B chain ON (green), HMI	_____	_____	
Press in Emergency Stop	_____	_____	
Pendant 1 unsecured B chain (grey), HMI	_____	_____	
Pull out Emergency Stop	_____	_____	
Emergency Stop Latch B chain OFF (grey), HMI	_____	_____	

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	<u>Action Taken</u>	<u>Observation, Location</u>		<input checked="" type="checkbox"/>
	Reset fault and latch at Pentant 1 I/O box			
	Emergency Stop Latch B chain ON (green), HMI			
A19	<u>Pendant 1 Gate 1 Switches</u>			
	Proceed to the gate between pentants 5 and 1			
	Place holders on the A chain gate switches			
	Perform all actions and make observations for both Gate 1 A chain switches A1 and A2			
			<u>A1</u>	<u>A2</u>
	Quick Search Pentant 5 (A chain)	Pendant 5 secured A chain (green), HMI		
	Quick Search Pentant 1 (A chain)	Pendant 1 secured A chain (green), HMI		
		Gate 1 SW A chain ON (green), HMI		
	Remove holder from Gate A chain switch			
		Pendant 1 unsecured A chain (grey), HMI		
		Gate 1 SW A chain OFF (grey), HMI		
	Remove Gate A chain switch holders			
	Place holders on the B chain gate switches			
	Perform all actions and make observations for both Gate 1 B chain switches B1 and B2			
			<u>B1</u>	<u>B2</u>
	Quick Search Pentant 5 (B chain)	Pendant 5 secured B chain (green), HMI		
	Quick Search Pentant 1 (B chain)	Pendant 1 secured B chain (green), HMI		
		Gate 1 SW B chain ON (green), HMI		
	Remove holder from Gate 1 B switch			
		Pendant 1 unsecured B chain (grey), HMI		
		Gate 1 SW B chain OFF (grey), HMI		
	Remove switch holders and close gate			
A20	<u>Gate 1 P1 Emergency Access (in Pentant 5)</u>			
	Quick Search Pentant 1 on A Chain	Pendant 1 Secured A chain (green), HMI		
		Emergency Stop Latch A chain, (green), HMI		
		Gate 1 Maglock A chain ON (green), HMI		
	Press the Gate 1 P1 Emergency Access button	Pendant 1 unsecured (grey), HMI		
		Gate 1 Maglock A chain OFF (grey), HMI		
	Pull out Gate 1 P1 Emergency Access button	Emergency Stop Latch A chain OFF (grey), HMI		
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI		
	Quick Search Pentant 1 on B Chain	Pendant 1 Secured B chain, (green), HMI		
		Emergency Stop Latch B chain, (green), HMI		
		Gate 1 Maglock B chain ON (green), HMI		

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	<u>Action Taken</u>	<u>Observation, Location</u>	✓
	Press the Gate 1 P1 Emergency Access button	Pendant 1 unsecured (grey), HMI	_____
	Pull out Gate 1 P1 Emergency Access Button	Gate 1 Maglock B chain OFF (grey), HMI	_____
	Reset fault and latch	Emergency Stop Latch A chain OFF (grey), HMI	_____
		Emergency Stop Latch A chain ON (green), HMI	_____
A21	Gate 1 Push Bar Test		
	Quick search Pendant 1 on A chain	Pendant 1 Secure A chain (green), HMI	_____
		Gate 1 Maglock A chain ON (green), HMI	_____
	Push in gate push bar without opening gate	Pendant 1 NOT Secure A chain, HMI	_____
		Gate 1 Maglock A chain OFF (grey), HMI	_____
	Release push bar		_____
	Attach B chain Maglock Actuator with tape		_____
	Place holders on B chain door switches		_____
	Quick search Pendant 1 on B chain	Pendant 1 Secure B chain (green), HMI	_____
		Gate 1 Maglock B chain ON (green), HMI	_____
	Remove actuator	Pendant 1 NOT Secure B chain (OFF), HMI	_____
		Gate 1 Maglock B chain OFF (grey), HMI	_____
	Remove holders and close gate		_____
A22	Gate 2 Switches		
	Proceed to the gate between pentants 4 and 5		_____
	Place holders on the A chain gate switches		_____
	Perform all actions and make observations for both Gate 2 A chain switches A1 and A2		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pendant 2 (A chain)	Pendant 2 secured A chain (green), HMI	_____
	Quick Search Pendant 1 (A chain)	Pendant 1 secured A chain (green), HMI	_____
		Gate 2 SW A chain ON (green), HMI	_____
	Remove holder from Gate 2 switch		_____
		Pendant 1 unsecured A chain (grey), HMI	_____
		Gate 2 SW A chain OFF (grey), HMI	_____
	Remove Gate 2 A chain switch holders		_____
	Place holders on the B chain gate switches		_____
	Perform all actions and make observations for both Gate 2 B chain switches B1 and B2		_____
			<u>B1</u> <u>B2</u>
	Quick Search Pendant 2 (B chain)	Pendant 2 secured B chain (green), HMI	_____
	Quick Search Pendant 1 (B chain)	Pendant 1 secured B chain (green), HMI	_____
		Gate 2 SW B chain ON (green), HMI	_____

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	Remove holder from Gate 2 switch	Pentant 1 unsecured B chain (grey), HMI	___	___
		Gate 2 SW B chain OFF (grey), HMI	___	___
	Remove switch holders and close gate		___	
A23	Gate 2 Emergency Access button (in Pentant 2)			
	Quick Search Pentant 1 on A Chain	Pentant 1 Secured A chain, (green), HMI	___	
		Emergency Stop Latch A chain, (green), HMI	___	
		Gate 2 Maglock A chain ON (green), HMI	___	
	Press the Gate 2 P1 Emergency Access Button	Pentant 1 unsecured (grey), HMI	___	
		Gate 2 Maglock A chain OFF (grey), HMI	___	
	Pull out Gate 2 P1 Emergency Access Button	Emergency Stop Latch A chain OFF (grey), HMI	___	
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI	___	
	Quick Search Pentant 1 on B Chain	Pentant 1 Secured B chain, (green) HMI	___	
		Emergency Stop Latch B chain (green), HMI	___	
		Gate 2 Maglock B chain ON (green), HMI	___	
	Press the Gate 2 P1 Emergency Access Button	Pentant 1 unsecured (grey), HMI	___	
		Gate 2 Maglock B chain OFF (grey), HMI	___	
	Pull out Gate 2 P1 Emergency Access Button	Emergency Stop Latch B chain OFF (grey), HMI	___	
	Reset fault and latch	Emergency Stop Latch B chain ON (green), HMI	___	
A24	Gate 2 Push Bar			
	Quick search Pentant 1 on A chain	Pentant 1 Secure A chain (green), HMI	___	
		Gate 2 Maglock A chain ON (green), HMI	___	
	Push in gate push bar without opening gate	Pentant 1 NOT Secure A chain (grey), HMI	___	
		Gate 2 Maglock A chain OFF (grey), HMI	___	
	Release push bar		___	
	Attach B chain Maglock Actuator with tape		___	
	Place holders on B chain door switches		___	
	Quick search Pentant 1 on B chain	Pentant 1 Secure B chain (green), HMI	___	
		Gate 2 Maglock B chain ON (green), HMI	___	
	Remove actuator	Pentant 1 NOT Secure B chain (grey), HMI	___	
		Gate 2 Maglock B chain OFF (grey), HMI	___	

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A25 Pentant 1 Maintenance Doors A Chain

Place A chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

	<u>23ID</u>	<u>24ID</u>	<u>25ID</u>	<u>26ID</u>	<u>27ID</u>	<u>28ID</u>
Quick Search Pentant 1 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A1	_____	_____	_____	_____	_____	_____
Pentant 1 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 1 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A2	_____	_____	_____	_____	_____	_____
Pentant 1 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A2	_____	_____	_____	_____	_____	_____
Remove actuators	_____	_____	_____	_____	_____	_____

A26 Pentant 1 Maintenance Doors B Chain

Place B chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

	<u>23ID</u>	<u>24ID</u>	<u>25ID</u>	<u>26ID</u>	<u>27ID</u>	<u>28ID</u>
Quick Search Pentant 1 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B1	_____	_____	_____	_____	_____	_____
Pentant 1 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in B1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 1 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B2	_____	_____	_____	_____	_____	_____
Pentant 1 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____

Remove actuators and ensure all Pentant 1 Maintenance door connectors are on

A27 Pentant Access Allowed only with Dipole (Negative) PS Contactors OFF

Primary Authorized Power Supply Employee LOTOs SR Dipole Power Supply

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	<u>Action Taken</u>	<u>Observation, Location</u>	
	Secure all Pentants	SR secure for OPS, HMI	_____
	Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Negative PS cabinet door open	_____
	Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 1 door remains locked on A chain, HMI	_____
	Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button illuminates at Service Building	_____
	Press Access Request button at Service Building when lit	Pendant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Primary Authorized Power Supply Employee releases the B chain contactor		_____
	Close cabinet door		_____
A28	Pendant Access Allowed only with Dipole (Positive) PS Contactors OFF		_____
	Primary Authorized Power Supply Employee LOTOs SR Dipole Power Supply		_____
	Secure all Pentants	SR secure for OPS, HMI	_____
	Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Positive PS cabinet door open	_____
	Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver		_____
	Request Operator press P1 Access request button	Access permit button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 1 door remains locked on A chain, HMI	_____
	Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button illuminates at Service Building	_____
	Press Access Request button at Service Building when lit	Pendant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Primary Authorized Power Supply Employee releases the B chain contactor		_____
	Close cabinet door		_____
A29	Pendant Access Allowed only with SR System C RF HVPS Contactors OFF		_____
	Primary Authorized Power Supply Employee LOTOs SR System C RF power supply		_____
	Secure all Pentants	SR secure for OPS, HMI	_____
	Primary Authorized RF Group Employee open cabinet door to access the A chain contactor	PS cabinet door open	_____
	Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 1 door remains locked on A chain, HMI	_____
	Primary Authorized RF Group Employee push in the B chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button illuminates at Service Building	_____

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	Press Access Request button a Service Building when lit	Pentant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Primary Authorized RF Group Employee releases the B chain contactor		_____
	Close cabinet door		_____
A30	<i>Pentant Access Allowed only with SR System D RF HVPS Contactors OFF</i>		
	Primary Authorized Power Supply Employee LOTOs SR RF System D power supply		_____
	Secure all Pentants	SR secure for OPS, HMI	_____
	Primary Authorized RF Group Employee open cabinet door to access the A chain contactor	PS cabinet door open	_____
	Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 1 door remains locked on A chain, HMI	_____
	Primary Authorized RF Group Employee push in the B chain contactor with a screwdriver		_____
	Request Operator press P1 Access Request button	Access Request button illuminates at Service Building	_____
	Press Access Request button a Service Building when lit	Pentant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Primary Authorized RF Group Employee releases the B chain contactor		_____
	Close cabinet door		_____
A31	<i>Pentant Access Allowed only with BTS Shutter Closed</i>		
	Request Operator open the BTS shutter	BTS Shutter opens	_____
	Request Operator press P1 Access Request button	Access Request button at P1 Serv. Bldg. does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
	Operator closes shutter	BTS shutter closed	_____
	Request Operator press P1 Access Request button	Access Request button illuminates outside P1 Service Building Door main entrance	_____
A32	<i>Pentant Access Allowed Only with BTS B2 Bending Magnet OFF</i>		
	Using shunt test box, apply current to the # 1 BTS B2 shunt box		_____
	Request Operator press P1 Access Request button	Access Request button at P1 Serv. Bldg. illuminates	_____
	Press the button at Service Building	Pentant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Remove test box		_____
	Using shunt test box, apply current to the # 2 BTS B2 shunt box		_____
	Request Operator press P1 Access Request button	Access Request button at P1 Serv. Bldg. illuminates	_____
	Press the button at Service Building	Pentant remains secure on A and B chain	_____
		Serv. Bldg. 1 door remains locked on B chain, HMI	_____
	Remove test box		_____
A33	<i>Magnet Test Mode Breaks Security</i>		
		<input type="checkbox"/> Completed on Pentant 3 Test	_____
		Pentant 1 Secure A and B chains (green), HMI	_____

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Rotate Magnet Test key in place on Pentant 2 Mezzanine	Magnet Test Mode A and B ON (green), HMI	_____
	Pentant 1 unsecured A and B chain (grey), HMI	_____
	Dipole Permits A and B ON (green), HMI	_____
Request Operator turn on Dipole PS	Dipole PS is ON	_____
Press in Pentant Emergency Stop	Dipole PS is OFF	_____
	Dipole Permits A and B OFF (grey), HMI	_____
Pullout Emergency Stop	Emergency Stop Latched and Dipole PS remains OFF	_____
Reset fault and remove Magnet Test key	Magnet Test Mode A and B OFF (grey), HMI	_____
	Dipole Permit A and B OFF (grey), HMI	_____

A34 **Live Test of Storage Ring Door Switches**

WARNING: Do not permit Employee to enter the Storage Ring unless authorized by the Tester who will verify the area is safe to enter.

**Place Barrier "CAUTION: DO NOT ENTER" tape across entry path.
Post a Watch Outside Service Building Door 1 Main Door Entrance.**

The watch shall not allow Employee to enter the pentant unless authorized by the Tester.

Place switch holders on the active P1 Service Building Door switches(4) and attach magnetic lock device		_____
Secure Pentant 1 through 5	SR Secure for OPS ON, HMI	_____
<i>Accelerator Safety Systems Staff disables limiters (set to 0) or check if completed on concurrent test</i>		
Request Operator turn on Gun HVPS, Modulator HV, set LTB B1 and B2 bending magnet to injection energy, turn on SR RF HVPS and SR Dipole PS		_____
	Gun UPA-100 is ON, gun cabinet	_____
	Modulators contactor ON, Linac HMI	_____
	SR Dipole PS is ON	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	"A Chain Contactor Open" light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	"B Chain Contactor Open" light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	"A Chain Contactor Open" light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	"B Chain Contactor Open" light is OFF	_____
	RF HVPS System C and D are ON	_____
Check RF PS Interfaces, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check RF Systems C AND D	A2 Permit is ON C AND D	_____
	"A Chain Contactor Open" light OFF C AND D	_____
	B1 Permit is ON System C AND D	_____

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	B2 Permit is ON System C AND D	_____
	“B Chain Contactor Open” light is OFF C AND D	_____
Turn on the BTS B2 bending magnet and set to injection energy	Bending magnet B2 ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Remove A1 switch holder	Pendant 1 unsecured A Chain (grey), HMI	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	Gun Permits A OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, A chain	_____
	SR RF HVPS shuts OFF, A chain	_____
	Modulators OFF, A chain	_____
Check Dipole PS Positive PS Interface, DPSI	BTS shutter closed, HMI	_____
	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interfaces, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check RF Systems C AND D	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Replace switch holder		_____
Secure Pendant 1	All Pendants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
	Gun Permits A and B ON (green), linac HMI	_____
Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy		_____

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	Gun UPA-100 is ON, gun cabinet	_____
	Modulators contactor ON, Linac HMI	_____
	SR Dipole PS is ON	_____
	SR System C and D RF HVPS ON	_____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
	SR System C and D RF HVPS ON C AND D	_____
Check RF PS Interfaces, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check RF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF	_____
Remove B1 switch holder	Pendants unsecured B Chain (grey), HMI	_____
	SR Secure For OPS B chain OFF (grey), HMI	_____
	Gun Permits B OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, B chain	_____
	SR System C AND D RF HVPS shuts OFF, B chain C AND D	_____
	Modulators OFF, B chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____

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	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check RF PS Interfaces, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check RF Systems C AND D	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Remove switch holders and close door		_____
Secure Pentant 1	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
A35 Live Pentant 1 Maintenance Doors		
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C and D HVPS is ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove an A chain switch from Pentant 1 Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C and D HVPS is OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun and Modulators OFF on A chain	_____
Replace A chain switch and perform a reset		_____
Search Pentant 1	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____

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	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C and D HVPS is ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove a B chain switch from Pentant 1 Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS B chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF B chain (grey), HMI	_____
	SR RF Systems C and D HVPS is OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF on B chain	_____
	Modulators are OFF on B chain	_____
Replace B chain switch and perform a reset		
Search Pentant 1	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
A36 Live Pentant 1 Emergency Stop		
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Press in Emergency Stop at Service Building 1 entrance	SR secure to Booster A and B chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF	_____
	Modulators are OFF	_____
Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____

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<p>Reset fault and latch at Pentant 1 I/O box Secure Pentant 1</p> <p>A37 Control Room Emergency Stop Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter</p> <p>Press in Emergency Stop in the Control Room</p> <p>Pull out Emergency Stop Reset fault and latch in the control room</p> <p>A38 Ignition Key (drops critical devices but not search) Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter</p> <p>Remove the SR Ignition Key</p> <p>A39 Return Energy Limiters Replace the Ignition Key</p> <p>A40 Area Radiation Monitors This test step may be completed at any time during the testing process but MUST be completed for</p>	<p>Emergency Stop Latch A and B ON (green), HMI _____</p> <p>All Pentants secure A and B (green), HMI _____</p> <p>SR Secure For OPS A chain ON (green), HMI _____</p> <p><input type="checkbox"/> Completed on Pentant # _____ Test</p> <p>SR Dipole PS is ON _____</p> <p>SR RF Systems C AND D are ON _____</p> <p>SR RF Permits ON A and B chain (green), HMI _____</p> <p>BTS shutter Open, HMI _____</p> <p>SR Secure For OPS A chain OFF (grey), HMI _____</p> <p>SR Dipole PS is OFF _____</p> <p>SR Dipole Permits OFF A chain (grey), HMI _____</p> <p>SR RF Systems C AND D are OFF _____</p> <p>SR RF Permits OFF (grey), HMI _____</p> <p>BTS shutter Closed, HMI _____</p> <p>Emergency Stop Latch A and B OFF (grey), HMI _____</p> <p>Emergency Stop Latch A and B ON (green), HMI _____</p> <p><input type="checkbox"/> Completed on Pentant # _____ Test</p> <p>SR Dipole PS is ON _____</p> <p>SR Dipole Permits ON A and B chain (green), HMI _____</p> <p>SR RF Systems C AND D are ON _____</p> <p>SR RF Permits ON A and B chain (green), HMI _____</p> <p>BTS shutter Open, HMI _____</p> <p>SR Dipole PS is OFF _____</p> <p>SR Dipole Permits OFF A chain (grey), HMI _____</p> <p>SR RF Systems C AND D are OFF _____</p> <p>SR RF Permits OFF (grey), HMI _____</p> <p>BTS shutter Closed, HMI _____</p> <p>SR Secure to Booster A and B _____</p> <p><input type="checkbox"/> Check if completed on concurrent test See Pentant 2 Checklist Steps B41 and B42 _____</p>
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PPS test certification. Refer to PS-C-ASD-PRC-008, NSLS-II Area Radiation Monitor PPS Test and complete Attachment C, NSLS-II Storage Ring Area Radiation Monitor Checklist for Monitors SRM-23 through SRM-28

- Area Radiation Monitor SRM-23 Test completed _____
- Area Radiation Monitor SRM-24 Test completed _____
- Area Radiation Monitor SRM-25 Test completed _____
- Area Radiation Monitor SRM-26 Test completed _____
- Area Radiation Monitor SRM-27 Test completed _____
- Area Radiation Monitor SRM-28 Test completed _____

A41 Test Completion

- Account for all switch holders/actuators _____
- If testing is complete Accelerator Safety Systems Staff restores energy limiter values and complete Pentant 2 steps; B41 SR Injection Energy Limit and B42 Top Energy Interlock (may be completed on concurrent test) _____
- Remove the 4 test jumpers to the SR Dipole power supply interface boxes if testing is complete. _____
- Ensure PPS cabinets are secure and locked; challenge locks _____
- Remove LOTO from ALL Linac, Booster and SR devices if testing is complete. _____
- Remove sound mufflers from HII devices (6) _____
- Request Operator make log entry stating Pentant 1 test is complete. _____

- END OF ATTACHMENT A-

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Attachment B

NSLS-II Storage Ring Pentant 2 Radiological Interlock Test Checklist

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed		
	Test Type: <input type="checkbox"/> Pre-Certification	<input type="checkbox"/> Certification	<input type="checkbox"/> Partial
Test Date:	Start Time:	Finish Time:	
Tester 1:	Assistant 1:		
Tester 2:	Assistant 2:		
Tester 1 Signature:	Tester 2 Signature:		
*Reviewer 1:	Reviewer 1 sig.:		
Reviewer 2:	Reviewer 2 sig.:		
** Safety Signature Pentant 2(PLC)	Previous Pentant 2 PLC SS#	Date: / /	
A Chain:	B Chain:	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 System cognizant engineer.

Each numbered item below indicates a set of action items for the test procedure. The Tester will either perform the action, or delegate the action to the Assistant(s). For each step a checkmark (✓) should be made if the correct corresponding observation has been made.

	<u>Action Taken</u>	<u>Observation, Location</u>	✓
B1	Verify System Lockouts and Connect Dipole Test Jumpers		✓
	Gun HVPS Output Cable Connector		_____
	Modulator PS line cords (3) <u>OR</u> Booster Dipole F PS		_____
	Booster RF HVPS <u>OR</u> booster low level RF drive termination <u>OR</u> Booster RF output connection to cavity		_____
	SR System C RF HVPS		_____
	SR System C low level RF drive termination <u>OR</u> System C SR RF output connection to cavity		_____
	SR System D RF HVPS		_____
	SR System D low level RF drive termination <u>OR</u> SR System D RF output connection to cavity		_____
	Apply mufflers to the right hand HII side sounders 6		_____
	Connect the 4 test jumpers to the SR Dipole Power Supply interface boxes		_____
B2	Secure enclosures		_____
	Secure the injector berm area	Berm secured, Linac HMI	_____
	Secure the linac	Linac secured, Linac HMI	_____
	Secure the booster ring	Booster secured, Booster HMI	_____
	Note: All Mode Search Verifications can be completed using the Quick Search feature		
B3	Verify Pentant 2 Single Pentant Search (Mode 1)		_____
	Check HMI on 740 Pentant I/O Box <u>OR</u> CR	Pentant 2 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 2		_____
	Press P2-SB1 Service Bldg. 2	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
		Overhead lighting flashes during search	_____

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<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
One searcher remains on P1 side of Gate 2		_____
Close Gate 2 and press SB2	Light on search button illuminates	_____
Press SB3 on HII 1	Light on search button illuminates Amber HII 1 search beacon is ON	_____ _____
Searchers <i>simultaneously</i> press P2-SB1 (ISA door) and SB4 on HII 2 until the lights illuminate	Light on SB1 (ISA) illuminates Light on SB4 illuminates	_____ _____
Press SB5 on HII 3	Light on search button illuminates Amber HII 3 search beacon is ON	_____ _____
Searchers <i>simultaneously</i> press P2-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates Light on SB6 illuminates Amber HII 4 search beacon is ON	_____ _____ _____
Press SB7 on HII 5	Light on search button illuminates Amber HII 5 search beacon is ON	_____ _____
Press SB8 on HII 6	Light on search button illuminates Amber HII 6 search beacon is ON	_____ _____
One searcher remains on P3 side of gate		_____
Close Pentant Gate 3		_____
Press SBSP	Light on search button illuminates	_____
Press P2-SB1	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates Maglock engages/locks- check door Service Bldg 2 Maglock A and B (green), HMI ISA Maglock A and B (green), HMI Gate 2 switches A and B ON (green), HMI Gate 2 Maglock A and B ON (green), HMI Gate 3 Maglock A and B ON (green), HMI Gate 3 switches A and B ON (green), HMI	_____ _____ _____ _____ _____ _____ _____ _____ _____
<i>After beam imminent warning sounds:</i>	Service Bldg Door sign illuminates (A and B sect.) ISA door sign illuminates (A and B sect.)	_____ _____
(Note: beam imminent timed in step B4)	Pentant 2 Secured A and B chain, HMI Gate 3 sign illuminates (A and B sect.) Gate 2 sign illuminates (A and B sect.)	_____ _____ _____
Request operator grant access permit for P2		_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	Press Access Request button at Serv. Building Door 2, if necessary (other pentants secure)	Pendant 2 unsecured A and B chain, HMI	_____
	Open Door	No alarm sounds in Control Room	_____
B4	Verify Pendant 2 Starting Multiple Pendant Search (Mode 2) and time Beam imminent warning		
	Check HMI on 740 Pendant I/O Box or CR	Pendant 2 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 2		_____
	Press P2-SB1 in Pendant 2 Service Bldg. 2	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
		Overhead lighting flashes during search	_____
	Close Gate 2 and press SB2	Light on search button illuminates	_____
	Press SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P2-SB1 (ISA door) and SB4 on HII 2 until the lights illuminate		_____
		Light on SB1 (ISA) illuminates	_____
		Light on SB4 illuminates	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P2-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close gate	Gate closed	_____
	Reach through Gate 3 Press SB9 and <i>begin timing audible alarm</i>	Light on search button illuminates	_____
		Maglock engages/check gate	_____
		Service Bldg 2 Maglock A and B ON (green), HMI	_____
		ISA Door A and B Maglock ON (green), HMI	_____
		Gate 2 Maglock A and B ON (green), HMI	_____
		Gate 3 Maglock A and B ON (green), HMI	_____
		Gate 2 switches A and B (green), HMI	_____
		Gate 3 switches A and B (green), HMI	_____
		Beam Imminent alarm sounds for 60 seconds	_____
	<i>After beam imminent warning sounds:</i>	Pendant 2 Secured A and B chain, HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
B5	Operations Enable Switch (Pentant 2 Main I/O box)		
	Rotate the operations enable switch to OFF	Pentant 2 Secured A and B chain, (green), HMI	_____
	Attempt to secure Pentant 2	Pentant 2 NOT Secured A and B chain (grey), HMI	_____
	Rotate the operations enable switch to ON	Pentant 2 will not secure	_____
	Reset the fault at the Pentant 2 I/O box		_____
B6	Verify Pentant 2 Continuing Multiple Pentant Search (Mode 3) and time Red Beacons		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 2 not secured A and B chain (grey), HMI	_____
	Close Gate 2 and press SB2	Light on search button illuminates	_____
	Press P2-SB3 on HII 1	Light on search button illuminates	_____
	Searchers <i>simultaneously</i> press P2-SB1 (ISA door) and SB4 on HII 2 until the lights illuminate	Amber HII 1 search beacon is ON	_____
		Light on SB1 (ISA) illuminates	_____
		Light on SB4 illuminates	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
	Searchers <i>simultaneously</i> press P2-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Amber HII 3 search beacon is ON	_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 3		_____
	Reach through Gate 3 Press SB9 and <i>begin timing the Red Beacons on HII devices (6)</i>	Light on search button illuminates	_____
		Maglock engages/locks- check door	_____
		Service Bldg 2 Maglock A and B (green), HMI	_____
		ISA Door Maglock A and B (green), HMI	_____
		ISA Door SW A and B (green), HMI	_____
		Gate 2 Maglock A and B (green), HMI	_____
		Gate 2 switches A and B (green), HMI	_____
		Gate 3 Maglock A and B (green), HMI	_____
		Gate 3 switches A and B (green), HMI	_____
	After Beam Imminent alarm:	Pentant 2 Secured A and B chain, HMI	_____
		Red Beacons (6) flash for 60 seconds	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
		HII Red area Secure A and B lights illuminated	_____
	Request Operator grant access permit for P2		_____
		Pentant 2 unsecured A and B chain, HMI	_____
	Open gate	No alarm sounds in Control Room	_____
B7	Verify Pentant 2 Completing Multiple Pentant Search (Mode 4)		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 2 not secured A and B chain (grey), HMI	_____
	Close Gate 3 and press SB2	Light on search button illuminates	_____
	Press P2-SB3 on HII 1	Light on search button illuminates	_____
	Searchers <i>simultaneously</i> press P2-SB1 (ISA door) and SB4 on HII 2 until the lights illuminate	Amber HII 1 search beacon is ON	_____
		Light on SB1 (ISA) illuminates	_____
		Light on SB4 illuminates	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P2-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 2		
	Press SBSP	Light on search button illuminates	_____
	Press P2-SB1 at Service Building Door	Light illuminates on SB1	_____
	Exit through Service Building Door		
	Press SBE	Light on SBE illuminates	_____
	After Beam Imminent alarm:	Pentant 2 Secured A and B chain, HMI	_____
B8	Access Pentant and check HII (6)		
	Request Operator grant access permit for P2	If other Pentants secure the Access Request button at Service Bldg. 2 illuminates	_____
	Press Access Request button at Service Building Door if necessary (other pentants secure)	P2 Service Bldg. Door Maglock OFF (grey), HMI	_____
		Pentant 2 not secured A and B chain (grey), HMI	_____
		Door is open	_____
	Check HII indicators	Red Beacons OFF	_____
		Red Secure A and B lights OFF	_____
		Green HII "Beam Disabled" lights illuminated	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	Proceed to P2-SB2		_____
B9	Search Timeout (Mode 2)		_____
	Press P2-SB2 in Pentant 2 and begin <i>timing</i>	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
	Complete search in sequence <i>without</i> pressing SB9	Light and sounders go out in 12 minutes	_____
	Press SB9	Mode 2 Search does not complete	_____
B10	Skip the Two Button Simultaneous Press (Mode 1) using Quick Search		_____
	Close gates and doors and put into Quick Search		_____
	Press SB1	Light on search button illuminates	_____
	Press SB2	Light on search button illuminates	_____
	Press SB3	Light on search button illuminates	_____
	Press SB4	Light on search button illuminates	_____
	Press SB5	Light on search button illuminates	_____
	Press SB1		_____
	Press SB6		_____
	Press SB7		_____
	Press SB8		_____
	Press SB9	Pentant 2 does NOT Secure on A or B chains	_____
B11	Emergency Stop Aborts Search		_____
	Complete a normal search using ANY Mode	Mode used =	_____
	<i>Before</i> the beam imminent warning sounder stops,		_____
	Press an Emergency Stop	Beam imminent warning stops	_____
		Red Beacons are NOT flashing	_____
		Pentant does not secure on either chain, HMI	_____
B12	A Chain Entrance Door Switches Service Building 2		_____
	Place holders on the A chain Service Building 2 Door switches (4) and attach actuator on Magnetic lock		_____
	Close Pentant gates 2 and 3		_____
	Perform all actions and make observations for both door A chain switches A1 and A2		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 2 (A chain)	Pentant 2 secured A chain (green), HMI	_____
		Service Bldg 2 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 2 stationary door switch	Pentant 2 unsecured A chain (grey), HMI	_____
		Service Bldg 2 Door SW A chain OFF (grey), HMI	_____
	Replace holder on stationary door		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 2 (A chain)	Pentant 2 secured A chain (green), HMI	_____
		Service Bldg 2 Door SW A chain ON (green), HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>	
	Remove holder from Service Building 2 active door switch	Pentant 2 unsecured A chain (grey), HMI	___	___
		Service Bldg 2 Door SW A chain OFF (grey), HMI	___	___
	Replace holder on active door		___	___
B13	<u>Pentant 2 A Chain Quick Search Timeout</u>			
	Quick search Pentant 2 and <i>begin timing</i>	Pentant 2 secured A chain (green), HMI	___	
		Pentant 2 unsecured in 5 minutes (grey), HMI	___	
	Remove A chain switch holders		___	
B14	<u>B Chain Entrance Door Switches Service Building 2</u>			
	Place holders on the B chain Service Building 2 Door switches (4)		___	
	Close Pentant gates		___	
	Perform all actions and make observations for both door B chain switches B1 and B2			
			<u>B1</u>	<u>B2</u>
	Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI	___	___
		SR secure to Booster B chain ON (green), HMI	___	___
		Dipole Permit B ON (green), HMI	___	___
		Service Bldg 2 Door SW A chain ON (green), HMI	___	___
	Remove holder from Service Building 2 stationary door switch	Pentant 2 unsecured B chain (grey), HMI	___	___
		Service Bldg 2 Door SW B chain OFF (grey), HMI	___	___
	Replace holder on stationary door		___	___
			<u>B1</u>	<u>B2</u>
	Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI	___	___
		Service Bldg 2 Door SW B chain ON (green), HMI	___	___
	Remove holder from Service Building 2 active door switch	Pentant 2 unsecured B chain (grey), HMI	___	___
		Service Bldg 2 Door SW B chain OFF (grey), HMI	___	___
	Replace holder on active door		___	___
B15	<u>Pentant 2 B Chain Quick Search Timeout</u>			
	Quick search Pentant 2 and <i>begin timing</i>	Pentant 2 secured B chain	___	
		Pentant 2 unsecured in 5 minutes	___	
B16	<u>Service Building 2 Door Emergency Egress</u>			
	Person proceeds to Exit (ring side)		___	
	Attach B chain Maglock Actuator with tape		___	
	Perform B chain Pentant 2 quick search	Pentant 2 secured B chain ON (green), HMI	___	
		Service Bldg 2 Door Maglock B chain ON (green), HMI	___	

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<u>Action Taken</u>	<u>Observation, Location</u>	✓
Remove actuator	Service Bldg 2 Door Maglock B chain OFF (grey), HMI	___
	Pendant 2 unsecured (grey), HMI	___
Close door		___
Perform A chain Pendant 2 search	Pendant 2 secured A chain (green), HMI	___
	Service Bldg 2 Door Maglock A chain ON (green), HMI	___
Press in door push bar without opening door	Service Bldg 2 Door Maglock A chain OFF (grey), HMI	___
	Pendant 2 unsecured (grey), HMI	___
Open door	Door opens	___
Close door and stay outside of ring		___
B17	<u>Service Building Door P2 Emergency Access button</u>	
Perform A chain Pendant 2 quick search	Pendant 2 secured A chain	___
	Service Bldg 2 Door Maglock A chain ON (green), HMI	___
Press in external emergency access button	Service Bldg 2 Door Maglock A chain OFF (grey), HMI	___
	Pendant 2 unsecured, HMI	___
Pull out emergency access button	Emergency Stop Latch A chain OFF (grey), HMI	___
Reset fault	Emergency Stop Latch A chain ON (green), HMI	___
Perform B chain Pendant 2 search	Pendant 2 secured B chain	___
	Serv. Bldg 2 Door Maglock B chain ON (green), HMI	___
Press in emergency access button	Service Bldg 2 Door Maglock B chain OFF (grey), HMI	___
	Pendant 2 unsecured, HMI	___
Pull out emergency access button	Emergency Stop Latch B chain OFF (grey), HMI	___
Open door	Door opens	___
Reset fault	Emergency Stop Latch B chain ON (green), HMI	___
Close door	All gates and doors closed	___
B18	<u>A Chain ISA Door Switches</u>	
Place holders on the A chain ISA Door switches (2) and attach actuator on Magnetic lock		___
Close Pendant gates 2 and 3		___
Perform all actions and make observations for both door A chain switches A1 and A2		
		<u>A1</u> <u>A2</u>
Quick Search Pendant 2 (A chain)	Pendant 2 secured A chain (green), HMI	___
	ISA Door SW A chain ON (green), HMI	___
Remove holder from ISA door switch	Pendant 2 unsecured A chain (grey), HMI	___
	ISA Door SW A chain OFF (grey), HMI	___
Replace holder on ISA Door		___

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	<u>Action Taken</u>	<u>Observation, Location</u>	<input checked="" type="checkbox"/>
B19	<u>B Chain ISA Door Switches</u> Place holders on the B chain ISA Door switches (2) and attach actuator on Magnetic lock Close Pentant gates 2 and 3 Perform all actions and make observations for both door B chain switches B1 and B2		
	Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI ISA Door SW B chain ON (green), HMI	<u> </u> <u> </u>
	Remove holder from ISA door switch	Pentant 2 unsecured B chain (grey), HMI ISA Door SW B chain OFF (grey), HMI	<u> </u> <u> </u>
	Replace holder on ISA Door		<u> </u> <u> </u>
B20	<u>ISA 2 Door Push Bar</u> Person proceeds inside ISA (ring side) Attach B chain Maglock Actuator with tape Perform B chain Pentant 2 quick search		
	Remove actuator	ISA door Maglock B chain OFF (grey), HMI Pentant 2 unsecured (grey), HMI	<u> </u> <u> </u>
	Close door		<u> </u>
	Perform A chain Pentant 2 search	Pentant 2 secured A chain (green), HMI ISA Maglock A chain ON (green), HMI	<u> </u> <u> </u>
	Press in door push bar without opening door	ISA Door Maglock A chain OFF (grey), HMI Pentant 2 unsecured (grey), HMI	<u> </u> <u> </u>
	Open door	Door opens	<u> </u>
	Close door and stay outside of ring		<u> </u>
B21	<u>ISA Door Emergency Access button</u> Perform A chain Pentant 2 quick search		
	Press in emergency access button	Pentant 2 secured A chain ISA Door Maglock A chain ON (green), HMI ISA Door Maglock A chain OFF (grey), HMI Pentant 2 unsecured, HMI	<u> </u> <u> </u> <u> </u> <u> </u>
	Pull out emergency access button	Emergency Stop Latch A chain OFF (grey), HMI	<u> </u>
	Reset emergency stop fault	Emergency Stop Latch A chain ON (green), HMI	<u> </u>
	Perform B chain Pentant 2 search	Pentant 2 secured B chain ISA Door Maglock B chain ON (green), HMI	<u> </u> <u> </u>
	Press in emergency stop	ISA Door Maglock B chain OFF (grey), HMI Pentant 2 unsecured, HMI	<u> </u> <u> </u>
	Pull out emergency stop	Emergency Stop Latch B chain OFF (grey), HMI	<u> </u>

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		<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
		Open door	Door opens	_____
		Reset emergency stop	Emergency Stop Latch B chain ON (green), HMI	_____
		Close door	All gates and doors closed	_____
B22		<u>Pendant 2 HII Emergency stops</u>		
		Repeat all steps for each HII		
		<i>A Chain:</i>		
			<u>HII-1</u> <u>HII-2</u> <u>HII-3</u> <u>HII-4</u> <u>HII-5</u> <u>HII-6</u>	
		Quick search Pendant 2 on A Chain	_____	_____
		Pendant 2 secured A chain (green), HMI	_____	_____
		Emergency Stop Latch A chain ON (green), HMI	_____	_____
		Press in emergency stop	_____	_____
		Pendant 2 unsecured A chain (grey), HMI	_____	_____
		Pull out emergency stop	_____	_____
		Emergency Stop Latch A chain OFF (grey), HMI	_____	_____
		Reset fault and latch at Pendant 2 I/O box	_____	_____
		Emergency Stop Latch A chain ON (green), HMI	_____	_____
		<i>B Chain:</i>		
			<u>HII-1</u> <u>HII-2</u> <u>HII-3</u> <u>HII-4</u> <u>HII-5</u> <u>HII-6</u>	
		Quick search Pendant 2 on B Chain	_____	_____
		Pendant 2 secured B chain (green), HMI	_____	_____
		Emergency Stop Latch B chain ON (green), HMI	_____	_____
		Press in emergency stop	_____	_____
		Pendant 2 unsecured B chain (grey), HMI	_____	_____
		Pull out emergency stop	_____	_____
		Emergency Stop Latch B chain OFF (grey), HMI	_____	_____
		Reset fault and latch at Pendant 2 I/O box	_____	_____
		Emergency Stop Latch B chain ON (green), HMI	_____	_____
B23		<u>Pendant 2 Gate 3 Switches</u>		
		Proceed to the gate between pentants 2 and 3		_____
		Place holders on the A chain gate switches		_____
		Perform all actions and make observations for both Gate 3 A chain switches A1 and A2		
				<u>A1</u> <u>A2</u>
		Quick Search Pentant 3 (A chain)	Pendant 3 secured A chain (green), HMI	_____
		Quick Search Pentant 2 (A chain)	Pendant 2 secured A chain (green), HMI	_____
			Gate 3 SW A chain ON (green), HMI	_____
		Remove holder from Gate A chain switch		_____
			Pendant 2 unsecured A chain (grey), HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>			
			✓	___	___
		Gate 3 SW A chain OFF (grey), HMI		___	___
	Remove Gate A chain switch holders			___	___
	Place holders on the B chain gate switches			___	___
	Perform all actions and make observations for both Gate 3 B chain switches B1 and B2				
				B1	B2
	Quick Search Pentant 3 (B chain)	Pentant 3 secured B chain (green), HMI		___	___
	Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI		___	___
		Gate 3 SW B chain ON (green), HMI		___	___
	Remove holder from Gate 3 B switch			___	___
		Pentant 2 unsecured B chain (grey), HMI		___	___
		Gate 3 SW B chain ON (green), HMI		___	___
	Remove switch holders and close gate			___	___
B24	Gate 3 Emergency Access (in Pentant 2)				
	Quick Search Pentant 2 on A Chain	Pentant 2 Secure A chain (green), HMI		___	___
		Emergency Stop Latch A chain (green), HMI		___	___
		Gate 3 Maglock A chain ON (green), HMI		___	___
	Press the Gate 3 Emergency stop	Pentant 2 unsecured (grey), HMI		___	___
		Gate 3 Maglock A chain OFF (grey), HMI		___	___
	Pull out Gate 3 Emergency stop	Emergency Stop Latch A chain OFF (grey), HMI		___	___
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI		___	___
	Quick Search Pentant 2 on B Chain	Pentant 2 Secured B chain (green), HMI		___	___
		Emergency Stop Latch B chain, (green), HMI		___	___
		Gate 3 Maglock B chain ON (green), HMI		___	___
	Press the Gate 3 Emergency stop	Pentant 2 unsecured (grey), HMI		___	___
		Gate 3 Maglock B chain OFF (grey), HMI		___	___
	Pull out Gate 3 Emergency stop	Emergency Stop Latch A chain OFF (grey), HMI		___	___
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI		___	___
B25	Gate 3 Push Bar Test				
	Quick Search Pentant 2 on A chain	Pentant 2 Secure A chain (green), HMI		___	___
		Gate 3 Maglock A chain ON (green), HMI		___	___
	Push in gate Push Bar without opening gate	Pentant 2 NOT Secure A chain, HMI		___	___
		Gate 3 Maglock A chain OFF (grey), HMI		___	___
	Release Push bar			___	___
	Attach B chain Maglock Actuator with tape			___	___

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	<u>Action Taken</u>	<u>Observation, Location</u>	✓
	Apply holders to B chain switches		_____
	Quick search Pentant 2 on B chain	Pentant 2 Secure B chain, (green) HMI	_____
		Gate 3 Maglock B chain ON (green), HMI	_____
	Remove actuator	Pentant 2 NOT Secure B chain (grey), HMI	_____
		Gate 3 Maglock B chain OFF (grey), HMI	_____
	Remove holders and close gate		_____
B26	Gate 2 Switches		
	Proceed to the gate between pentants 1 and 2		_____
	Place holders on the A chain gate switches		_____
	Perform all actions and make observations for both Gate 2 A chain switches A1 and A2		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 1 (A chain)	Pentant 1 secured A chain (green), HMI	_____
	Quick Search Pentant 2 (A chain)	Pentant 2 secured A chain (green), HMI	_____
		Gate 2 SW A chain ON (green), HMI	_____
	Remove holder from Gate 2 switch		_____
		Pentant 2 unsecured A chain (grey), HMI	_____
		Gate 2 SW A chain OFF (grey), HMI	_____
	Remove Gate 2 A chain switch holders		_____
	Place holders on the B chain gate switches		_____
	Perform all actions and make observations for both Gate 2 B chain switches B1 and B2		_____
			<u>B1</u> <u>B2</u>
	Quick Search Pentant 1 (A chain)	Pentant 1 secured B chain (green), HMI	_____
	Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI	_____
		Gate 2 SW B chain ON (green), HMI	_____
	Remove holder from Gate 2 switch		_____
		Pentant 2 unsecured B chain (grey), HMI	_____
		Gate 2 SW B chain OFF (grey), HMI	_____
	Remove switch holders and close gate		_____
B27	Pentant 2 Maintenance Doors A Chain		
	Place A chain actuators into each Maintenance Door connectors and complete all steps for each Door (MD)		_____
		<u>29ID</u> <u>30ID</u> <u>1ID</u> <u>2ID</u> <u>3ID</u> <u>4ID</u>	
	Quick Search Pentant 2 on A chain		_____
	Pentant secured on A chain (green), HMI		_____
	Sum of Maint Doors A chain ON (green), HMI		_____
	Remove Actuator in switch A1		_____

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Pendant 2 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A1	_____	_____	_____	_____	_____	_____
Quick Search Pendant 2 on A chain	_____	_____	_____	_____	_____	_____
Pendant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A2	_____	_____	_____	_____	_____	_____
Pendant 2 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A2	_____	_____	_____	_____	_____	_____
Remove actuators	_____	_____	_____	_____	_____	_____

B28 **Pendant 2 Maintenance Doors B Chain**

Place B chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

	<u>29ID</u>	<u>30ID</u>	<u>1ID</u>	<u>2ID</u>	<u>3ID</u>	<u>4ID</u>
Quick Search Pendant 2 on B chain	_____	_____	_____	_____	_____	_____
Pendant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B1	_____	_____	_____	_____	_____	_____
Pendant 2 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in B1	_____	_____	_____	_____	_____	_____
Quick Search Pendant 2 on B chain	_____	_____	_____	_____	_____	_____
Pendant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B2	_____	_____	_____	_____	_____	_____
Pendant 2 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Remove actuators and ensure all Pendant 2 Maintenance door connectors are ON	_____	_____	_____	_____	_____	_____

B29 **Pendant Access Allowed only with Dipole (Negative) PS Contactors OFF**

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply	_____
Secure all Pentants	SR secure for OPS, HMI
Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Negative PS cabinet door open
Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver	_____
Request Operator press P2 Access Request button	Access Request button does not illuminate

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Request Operator press P2 Access Request button	Access Request button illuminates	_____
Press Access Request button at Service Building when lit	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 2 door remains locked on B chain, HMI	_____

Primary Authorized RF Employee releases the B chain contactor		_____
Close cabinet door		_____
Remove LOTO from SR System C RF HVPS		_____

B32 *Pendant Access Allowed only with SR System D RF HVPS Contactors OFF*

Primary Authorized Power Supply Employee LOTOs SR SR System D RF power supply		_____
Secure all Pendants	SR secure for OPS, HMI	_____

Primary Authorized RF Group Employee open cabinet door to access the A chain contactor	PS cabinet door open	_____
--	----------------------	-------

Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver		_____
Request Operator press P1 Access Request button	Access Request button does not illuminate	_____
	Access Request with critical device On alarm, HMI	_____
	Serv. Bldg. 1 door remains locked on A chain, HMI	_____

Primary Authorized RF Group Employee push in the B chain contactor with a screwdriver		_____
Request Operator press P1 Access Request button	Access Request button illuminates at Service Building	_____
Press Access Request button at Service Building when lit	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 1 door remains locked on B chain, HMI	_____

Primary Authorized RF Group Employee releases the B chain contactor		_____
Close cabinet door		_____

B33 *Pendant Access Allowed only with BTS Shutter Closed*

Request Operator open the BTS shutter	BTS Shutter opens	_____
Request Operator press P2 Access Request button	Access Request button at P2 Serv. Bldg. does not illuminate	_____
	Access Request with critical device On alarm, HMI	_____
Operator closes shutter	BTS shutter closed	_____
Request Operator press P2 Access Request button	Access Request button illuminates outside P2 Service Building Door main entrance	_____

B34 *Pendant Access Allowed Only with BTS B2 Bending Magnet OFF*

Using shunt test box, apply current to the # 1 BTS B2 shunt box		_____
Request Operator press P2 Access Request button	Access Request button at P2 Serv. Bldg. illuminates	_____
Press the button at Service Building	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 2 door remains locked on B chain, HMI	_____

Remove test box		_____
Using shunt test box, apply current to the # 2 BTS B2 shunt box		_____
Request Operator press P2 Access Request button	Access Request button at P2 Serv. Bldg. illuminates	_____
Press the button at Service Building	Pendant remains secure on A and B chain	_____

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		Serv. Bldg. 2 door remains locked on B chain, HMI	_____
	Remove test box		_____
B35	Magnet Test Mode Breaks Security	<input type="checkbox"/> Completed on Pentant 3 Test	_____
	Rotate Magnet Test key in place on Pentant 2 Mezzanine	Pentant 2 Secure A and B chains (green), HMI	_____
		Magnet Test Mode A and B ON (green), HMI	_____
		Pentant 2 unsecured A and B chain (grey), HMI	_____
		Dipole Permits A and B ON (green), HMI	_____
	Request Operator turn on Dipole PS	Dipole PS is ON	_____
	Press in Pentant Emergency Stop	Dipole PS is OFF	_____
		Dipole Permits A and B OFF (grey), HMI	_____
	Pull out Emergency Stop	Emergency Stop Latched and Dipole PS remains OFF	_____
	Reset fault and remove Magnet Test key	Magnet Test Mode A and B OFF (grey), HMI	_____
		Dipole Permit A and B OFF (grey), HMI	_____
B36	Live Test of Storage Ring Door Switches		_____
	WARNING: Do not permit Employee from entering the Storage Ring unless authorized by the Tester who will verify the area is safe to enter.		
	Place Barrier "CAUTION: DO NOT ENTER" tape across entry path.		
	Post a Watch Outside Service Building Door 2 Main Door Entrance.		
	The watch shall not allow Employee to enter the pentant unless authorized by the Tester.		
	Place switch holders on the active P2 Service Building Door switches (4) OR ISA Door and attach magnetic lock device		_____
	<i>Accelerator Safety Systems Staff disables limiters (set to 0) or check if completed on concurrent test</i>		
	Secure the SR	All Pentants secure A and B (green), HMI	_____
		SR Secure for OPS A chain ON (green), HMI	_____
		Gun Permits A and B ON (green), linac HMI	_____
	Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy		_____
		Gun UPA-100 is ON, gun cabinet	_____
		Modulators contactor ON, Linac HMI	_____
		SR Dipole PS is ON	_____
		SR System C and D RF HVPS ON	_____
	Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
		A2 Permit is ON	_____
		"A Chain Contactor Open" light is OFF	_____
		B1 Permit is ON	_____
		B2 Permit is ON	_____
		"B Chain Contactor Open" light is OFF	_____
	Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____

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	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
	SR System C and D RF HVPS ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SR RF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF C AND D	_____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Remove A1 switch holder	Pendants unsecured A Chain (grey), HMI	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	Gun Permits A OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, A chain	_____
	SR RF HVPS shuts OFF, A chain	_____
	Modulators OFF, A chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check SR RF Systems C AND D	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____

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	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Replace switch holder		_____
Secure Pentant 2	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
	Gun Permits A and B ON (green), linac HMI	_____
Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy		_____
	Gun UPA-100 is ON, gun cabinet	_____
	Modulators contactor ON, Linac HMI	_____
	SR Dipole PS is ON	_____
	SR System C and D RF HVPS ON	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
	SR System C and D RF HVPS ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SR RF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF C AND D	_____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Remove B1 switch holder	Pentants unsecured B chain (grey), HMI	_____
	SR Secure For OPS B chain OFF (grey), HMI	_____
	Gun Permits B OFF (grey), Linac HMI	_____

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	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, B chain	_____
	SR RF HVPS shuts OFF, B chain	_____
	Modulators OFF, B chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check SR RF Systems C AND D	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Remove switch holders and close door		_____
Secure Pentant 2	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
B37 Live Pentant 2 Maintenance Doors		_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove an A chain switch from Pentant 2 Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____

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	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF on A chain	_____
	Modulators are OFF on A chain	_____
Replace A chain switch and perform a reset		_____
Search Pentant 2	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter.		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove a B chain switch from Pentant 2		_____
Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS B chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF B chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF on B chain	_____
	Modulators are OFF on B chain	_____
Replace B chain switch and perform a reset		_____
Search Pentant 2	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
B38 <u>Live Pentant 2 Emergency Stop</u>		_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____

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<p>Press in Emergency Stop at Service Building 2 entrance</p>	<p>Modulators are ON _____</p> <p>SR Secure For OPS OFF (grey), HMI _____</p> <p>SR Dipole PS is OFF _____</p> <p>SR Dipole both Permits OFF (grey), HMI _____</p> <p>SR RF Systems C AND D are OFF _____</p> <p>SR RF Permits OFF (grey), HMI _____</p> <p>BTS shutter Closed, HMI _____</p> <p>Gun is OFF _____</p> <p>Modulators OFF _____</p>
<p>Pull out Emergency Stop</p> <p>Reset fault and latch at Pentant 2 I/O box</p> <p>Secure Pentant 2</p>	<p>Emergency Stop Latch A and B OFF (grey), HMI _____</p> <p>Emergency Stop Latch A and B ON (green), HMI _____</p> <p>All Pentants secure A and B (green), HMI _____</p> <p>SR secure to Booster A and B chain ON (green), HMI _____</p>
<p>B39 Control Room Emergency Stop</p> <p>Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter</p>	<p><input type="checkbox"/> Completed on Pentant # _____ Test</p> <p>SR Dipole PS is ON _____</p> <p>SR Dipole Permits ON A and B chain (green), HMI _____</p> <p>SR RF Systems C AND D are ON _____</p> <p>SR RF Permits ON A and B chain (green), HMI _____</p> <p>BTS shutter Open, HMI _____</p>
<p>Press in Emergency Stop in the Control Room</p>	<p>SR Secure For OPS A chain OFF (grey), HMI _____</p> <p>SR Dipole PS is OFF _____</p> <p>SR Dipole Permits OFF A chain (grey), HMI _____</p> <p>SR RF Systems C AND D are OFF _____</p> <p>SR RF Permits OFF (grey), HMI _____</p> <p>BTS shutter Closed, HMI _____</p>
<p>Pull out Emergency Stop</p> <p>Reset fault and latch in the control room</p>	<p>Emergency Stop Latch A and B OFF (grey), HMI _____</p> <p>Emergency Stop Latch A and B ON (green), HMI _____</p>
<p>B40 Ignition Key (drops critical devices but not search)</p> <p>Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter</p>	<p><input type="checkbox"/> Completed on Pentant # _____ Test</p> <p>SR Dipole PS is ON _____</p> <p>SR Dipole Permits ON A and B chain (green), HMI _____</p> <p>SR RF Systems C AND D are ON _____</p> <p>SR RF Permits ON A and B chain (green), HMI _____</p> <p>BTS shutter Open, HMI _____</p>

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Remove the SR Ignition key

- SR Dipole PS is OFF _____
- SR Dipole Permits OFF A chain (grey), HMI _____
- SR RF Systems C AND D are OFF _____
- SR RF Permits OFF (grey), HMI _____
- BTS shutter Closed, HMI _____
- SR Secure to Booster A and B _____

Replace the Ignition Key

B41 **Storage Ring Vacuum Interlock (Gun trips off on A chain)** **Check if already completed on Booster test**

- Secure P1 through P5 Storage Ring Secure, A and B chain, HMI _____
- Operator turns on: Gun HVPS, Modulators. Open the LTB shutter and set LTB B1 and B2 at injection energy. _____
- Turn on Booster RF HVPS and Dipole F (no setpoint). _____
- Gun HVPS is ON _____
- Gun Permits A and B ON (green), linac HMI _____
- (3) Modulators UPA-100 are ON _____
- Modulator Permits A and B ON (green), HMI _____
- LTB shutter is OPEN _____
- LTB B1 PS is ON _____
- LTB B2 PS is ON at injection energy (65 A) _____

Operator opens BTS shutter and turns on the Dipoles to the following currents

- Booster B1 PS set to **219.3 A** _____
- Booster B2 PS set to **298.0 A** _____
- Storage Ring Dipole set to **364 A** _____

Vacuum group member trips Storage Ring Vacuum interlock (i.e., valve or ion gauge)

- Gun HVPS is OFF _____
- Gun Permits A chain OFF (grey), linac HMI _____

Vacuum group restores SR vacuum interlock condition

B42 **SR Injection Energy Limit (2.0 - 3.3 GeV)** **Check if already completed on Booster test**
Accelerator Safety System Staff return energy limiters to Operations

- Secure all pentants Storage ring secure to booster _____
- Operator turns on Gun HVPS Gun HVPS is ON _____
- Gun Permits A and B ON (green), linac HMI _____
- SR Injector Energy Limiter A and B ON (green) _____
- Storage ring Dipole PS at **364 A** _____
- Request Operator set Dipole to **356.72 A** Storage ring Dipole PS at **356.72 A** _____
- Gun HVPS is OFF _____
- Gun Permits A and B OFF (grey), linac HMI _____

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Request Operator return Dipole to 364 A Reset energy limiter by performing a reset in the Control Room	SR Injector Energy Limiter A and B OFF (grey) Storage ring Dipole PS at 364 A	_____
Operator turns on Gun HVPS	SR Injector Energy Limiter A and B ON (green) Gun HVPS is ON	_____
Request Operator set Dipole to 371.28 A	Gun Permits A and B ON (green), linac HMI Storage ring Dipole PS at 371.28 A Gun HVPS is OFF	_____
Request Operator return Dipole to 364 A Reset energy limiter by performing a reset in the Control Room	Gun Permits A and B OFF (grey), linac HMI SR Injector Energy Limiter A and B OFF (grey) Storage ring Dipole PS at 364 A	_____
	SR Injector Energy Limiter A and B ON (green)	_____

B43 **Top Energy Interlock**

Request operator: set Dipole Power Supply to injection energy	Dipole Current set at injection energy 364 A	_____
Turn on the SR Systems C and D RF HVPS	SR System C and D RF HVPS ON	_____
	RF A and B Permits are ON (green), HMI	_____
Raise the Dipole PS set point to 372.8 A	Dipole PS at 372.8 A (3.3 GeV value)	_____
	SR Systems C and D RF HVPS shuts OFF	_____
	RF A and B permits OFF (grey), HMI	_____
Return Dipole PS to injection energy setpoint	Dipole at 364 A	_____

B44 **Area Radiation Monitors**

This test step may be completed at any time during the testing process but MUST be completed for PPS test certification. Refer to PS-C-ASD-PRC-008, NSLS-II Area Radiation Monitor PPS Test and complete Attachment C, NSLS-II Storage Ring Area Radiation Monitor Checklist for Monitors SRM-29 through SRM-4.

Area Radiation Monitor SRM-29 Test completed	❑ Completed on Booster test	_____
Area Radiation Monitor SRM-30 Test completed	❑ Completed on Booster test	_____
Area Radiation Monitor SRM-1 Test completed	❑ Completed on Booster test	_____
Area Radiation Monitor SRM-2 Test completed	❑ Completed on Booster test	_____
Area Radiation Monitor SRM-3 Test completed	❑ Completed on Booster test	_____
Area Radiation Monitor SRM-4 Test completed	❑ Completed on Booster test	_____

Energy Limiter Trip Amplifier (Steps B44-B49)

Use the Figures below as a reference for the energy limiter trip amplifier test steps (B44-B49). For each step, the following conditions must exist: LTB shutter open, BTS shutter open, Gun ON, SR Dipole at **364 A** and SR RF ON.

B45 **STA A1 Connector (A chain trips RF- Top Energy)**

All Pentants Secure	SR Secure for OPS, HMI	_____
---------------------	------------------------	-------

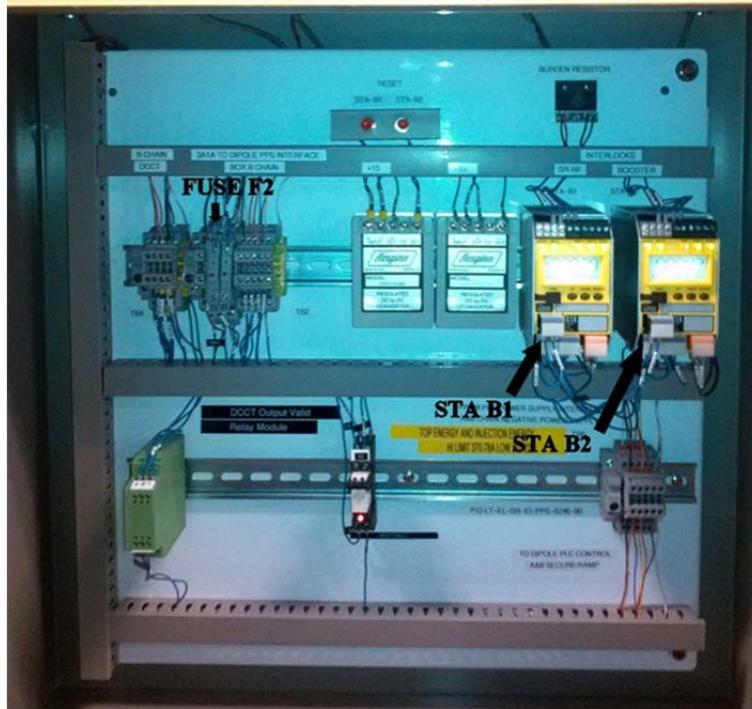
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		Gun HVPS is ON	_____
		SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove STA A1	SR RF is OFF, A chain permits OFF, RFPSI C AND D	_____
	Replace STA A1		_____
B46	<i>Fuse F1 (A Chain trips RF and Gun- Top Energy)</i>		
	Request Operator turn on RF HVPS	Gun HVPS is ON, A and B permits ON, HMI	_____
		SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove Fuse F1	Gun HVPS is OFF, A permits OFF, HMI	_____
		SR RF is OFF, A chain permits OFF, RFPSI C AND D	_____
	Replace Fuse		_____
B47	<i>STA A2 Connector (A chain trips Gun- Injection Energy)</i>		
	Request Operator turn on RF and Gun HVPS	Gun HVPS is ON, A and B permits ON, HMI	_____
		SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove STA A2 connector	Gun HVPS is OFF, A permits OFF, HMI	_____

B48	<i>STA B1 Connector (B chain trips RF- Top Energy)</i>		
	All Pentants Secure	SR Secure for OPS, HMI	_____
	Request Operator turn on Gun HVPS	Gun HVPS is ON	_____
	Check SR RF Systems C AND D	SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove STA B1	SR RF is OFF, A chain permits OFF, RFPSI C AND D	_____
	Replace STA B1		_____
B49	<i>Fuse F2 (B Chain trips RF and Gun- Top Energy)</i>		
	Request Operator turn on RF HVPS	Gun HVPS is ON, A and B permits ON, HMI	_____
	Check SR RF Systems C AND D	SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove Fuse F2	Gun HVPS is OFF, B permits OFF, HMI	_____
		SR RF is OFF, B chain permits OFF, RFPSI C AND D	_____
	Replace Fuse F2		_____
B50	<i>STA B2 Connector (B chain trips Gun- Injection Energy)</i>		
	Request Operator turn on RF and Gun HVPS	Gun HVPS is ON, A and B permits ON, HMI	_____
	Check SR RF Systems C AND D	SR RF is ON, A and B permits ON, RFPSI C AND D	_____
	Remove STA B2 connector	Gun HVPS is OFF, B permits OFF, HMI	_____
	Replace connector		_____

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B Chain Fuse and Connector Locations

B51 **Test Completion**

- Account for all switch holders/actuators
- Remove LOTO from ALL Linac, Booster and SR devices if testing is complete
- Disconnect the 4 test jumpers to the SR Dipole power supply interface boxes.
- Ensure PPS cabinets are secure and locked; challenge locks
- Remove sound mufflers from HII devices (6)
- Request Operator make log entry stating Pentant 2 test is complete.

- END OF ATTACHMENT B -

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Attachment C

NSLS-II Storage Ring Pentant 3 Radiological Interlock Test Checklist

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed		
	Test Type: <input type="checkbox"/> Pre-Certification	<input type="checkbox"/> Certification	<input type="checkbox"/> Partial
Test Date:	Start Time:	Finish Time:	
Tester 1:	Assistant 1:		
Tester 2:	Assistant 2:		
Tester 1 Signature:	Tester 2 Signature:		
*Reviewer 1:	Reviewer 1 sig.:		
Reviewer 2:	Reviewer 2 sig.:		
** Safety Signature Pentant 3(PLC)	Previous Pentant 3 PLC SS#	Date: / /	
A Chain:	B Chain:	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.

Each numbered item below indicates a set of action items for the test procedure. The Tester will either perform the action, or delegate the action to the Assistant(s). For each step a checkmark (✓) should be made if the correct corresponding observation has been made.

	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
C1	Verify System Lockouts and Connect Dipole Test Jumpers		
	Gun HVPS Output Cable Connector		_____
	Modulator PS line cords (3) <u>OR</u> Booster Dipole F PS		_____
	Booster RF HVPS <u>OR</u> booster low level RF drive termination <u>OR</u> Booster RF output connection to cavity		_____
	SR System C RF HVPS		_____
	SR System C low level RF drive termination <u>OR</u> System C SR RF output connection to cavity		_____
	SR System D RF HVPS		_____
	SR System D low level RF drive termination <u>OR</u> SR System D RF output connection to cavity		_____
	Apply mufflers to the right hand HII side sounders 6		_____
	Connect the 4 test jumpers to the SR Dipole Power Supply interface boxes		_____
C2	Secure enclosures		
	Secure the injector berm area	Berm secured, Linac HMI	_____
	Secure the linac	Linac secured, Linac HMI	_____
	Secure the booster ring	Booster secured, Booster HMI	_____
	Note: All Mode Search Verifications can be completed using the Quick Search feature		
C3	Verify Pentant 3 Single Pentant Search (Mode 1)		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 3 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 3		_____

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<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
Press P3-SB1 Service Bldg. 3	Light on search button illuminates Search sounder alarm sounds Overhead lighting flashes during search	_____ _____ _____
One searcher remains on P2 side of Gate 3		_____
Close Gate 3 and press SB2	Light on search button illuminates	_____
Press SB3 on HII 1	Light on search button illuminates Amber HII 1 search beacon is ON	_____ _____
Press SB4 on HII 2	Light on search button illuminates Amber HII 2 search beacon is ON	_____ _____
Press SB5 on HII 3	Light on search button illuminates Amber HII 3 search beacon is ON	_____ _____
Searchers <i>simultaneously</i> press P3-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates Light on SB6 illuminates Amber HII 4 search beacon is ON	_____ _____ _____
Press SB7 on HII 5	Light on search button illuminates Amber HII 5 search beacon is ON	_____ _____
Press SB8 on HII 6	Light on search button illuminates Amber HII 6 search beacon is ON	_____ _____
One searcher remains on P4 side of gate		_____
Close Pentant Gate 4		_____
Press SBSP	Light on search button illuminates	_____
Press P3-SB1	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates Maglock engages/locks- check door Service Bldg 3 Maglock A and B (green), HMI Gate 3 switches A and B ON (green), HMI Gate 3 Maglock A and B ON (green), HMI Gate 4 Maglock A and B ON (green), HMI Gate 4 switches A and B ON (green), HMI	_____ _____ _____ _____ _____ _____ _____
<i>After beam imminent warning sounds:</i> (Note: beam imminent timed in step C4)	Service Bldg Door sign illuminates (A and B sect.) Pentant 3 Secured A and B chain, HMI Gate 3 sign illuminates (A and B sect.) Gate 4 sign illuminates (A and B sect.)	_____ _____ _____ _____
Request operator grant access permit for P3		_____
Press Access Request button at Serv. Building Door 3	Pentant 3 unsecured A and B chain, HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	if necessary (other pentants secure)		_____
	Open Door	No alarm sounds in Control Room	_____
C4	Verify Pentant 3 Starting Multiple Pentant Search (Mode 2) and time Beam imminent warning		_____
	Check HMI on 740 Pentant I/O Box or CR	Pentant 3 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 3		_____
	Press P3-SB1 in Pentant 3 Service Bldg.	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
		Overhead lighting flashes during search	_____
	Close Gate 3 and press SB2	Light on search button illuminates	_____
	Press SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P3-SB1(Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 4		_____
	Reach through Gate 4 Press SB9 and <i>begin timing audible alarm</i>	Light on search button illuminates	_____
		Maglock engages/check gate	_____
		Service Bldg 1 Maglock A and B ON (green), HMI	_____
		Gate 4 Maglock A and B ON (green), HMI	_____
		Gate 3 switches A and B (green), HMI	_____
		Gate 4 switches A and B (green), HMI	_____
		Beam Imminent alarm sounds for 60 seconds	_____
	<i>After beam imminent warning sounds:</i>		_____
		Pentant 3 Secured A and B chain, HMI	_____
		Gate 4 sign illuminates (A and B sect.)	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
C5	Operations Enable Switch (Pentant 3 Main I/O box)		
	Pentant 3 Secured A and B chain (green), HMI		_____
	Rotate the operations enable switch to OFF	Pentant 3 NOT Secured A and B chain (grey), HMI	_____
	Attempt to secure Pentant 3	Pentant 3 will not secure	_____
	Rotate the operations enable switch to ON		_____
	Reset the fault at the Pentant 1 I/O box		_____
C6	Verify Pentant 3 Continuing Multiple Pentant Search (Mode 3) and time Red Beacons		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 3 not secured A and B chain (grey), HMI	_____
	Close Gate 3 and press SB2	Light on search button illuminates	_____
	Press P3-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P3-SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P3-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 4		_____
	Reach through Gate 4 Press SB9 and <i>begin timing the Red Beacons on HII devices (6)</i>		_____
		Light on search button illuminates	_____
		Maglock engages/locks- check door	_____
		Service Bldg 3 Maglock A and B (green), HMI	_____
		Gate 4 Maglock A and B (green), HMI	_____
		Gate 3 switches A and B (green), HMI	_____
		Gate 4 switches A and B (green), HMI	_____
	After Beam Imminent alarm:	Pentant 3 Secured A and B chain, HMI	_____
		Red Beacons (6) flash for 60 seconds	_____
		HII Red area Secure A and B lights illuminated	_____
	Request operator grant access permit for P3		_____
		Pentant 3 unsecured A and B chain, HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	✓ _____
	Open gate	No alarm sounds in Control Room	_____
C7	Verify Pentant 3 Completing Multiple Pentant Search (Mode 4)		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 3 not secured A and B chain (grey), HMI	_____
	Close Gate 3 and press SB2	Light on search button illuminates	_____
	Press P3-SB3 on HII 1	Light on search button illuminates Amber HII 1 search beacon is ON	_____
	Press P3-SB4 on HII 2	Light on search button illuminates Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P3-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates Light on SB6 illuminates Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 4		_____
	Press SBSP	Light on search button illuminates	_____
	Press P3-SB1 at Service Building Door	Light illuminates on SB1	_____
	Exit through Service Building Door		_____
	Press SBE	Light on SBE illuminates	_____
	After Beam Imminent alarm:	Pentant 3 Secured A and B chain, HMI	_____
C8	Access Pentant and check HII (6)		
	Request Operator grant access permit for P3	If other pentants secure the Access Request button at Service Bldg. 3 illuminates	_____
	Press Access Request button at Service Building Door if necessary (other pentants secure)	P3 Service Bldg. Door Maglock OFF (grey), HMI Pentant 3 not secured A and B chain (grey), HMI Door is open	_____
	Check HII indicators	Red Beacons OFF Red Secure A and B lights OFF Green HII "Beam Disabled" lights illuminated	_____
	Proceed to P3-SB2		_____
C9	Search Timeout (Mode 2)		
	Press P3-SB2 in Pentant 3 and begin <i>timing</i>	Light on search button illuminates	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
		Search sounder alarm sounds	_____
	Complete search in sequence <i>without</i> pressing SB9		_____
		Light and sounders go out in 12 minutes	_____
	Press SB9	Mode 2 Search does not complete	_____
C10	Skip the Two Button Simultaneous Press (Mode 1) using Quick Search		
	Close gates and doors and put into Quick Search		_____
	Press SB1	Light on search button illuminates	_____
	Press SB2	Light on search button illuminates	_____
	Press SB3	Light on search button illuminates	_____
	Press SB4	Light on search button illuminates	_____
	Press SB5	Light on search button illuminates	_____
	Press SB1		_____
	Press SB6		_____
	Press SB7		_____
	Press SB8		_____
	Press SB9	Pendant 3 does NOT Secure on A or B chains	_____
C11	Emergency Stop Aborts Search		
	Complete a normal search using ANY Mode	Mode used =	_____
	Before the beam imminent warning sounder stops, press an Emergency Stop	Beam imminent warning stops	_____
		Red Beacons are NOT flashing	_____
		Pendant 3 does not secure on either chain, HMI	_____
C12	A Chain Entrance Door Switches Service Building 3		
	Place holders on the A chain Service Building 3 Door switches (4) and attach actuator on Magnetic lock		_____
	Close Pendant gates 3 and 4		_____
	Perform all actions and make observations for both door A chain switches A1 and A2		
			<u>A1</u> <u>A2</u>
	Quick Search Pendant 3 (A chain)	Pendant 3 secured A chain (green), HMI	_____
		Service Bldg 3 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 3 stationary door switch	Pendant 3 unsecured A chain (grey), HMI	_____
		Service Bldg 3 Door SW A chain OFF (grey), HMI	_____
	Replace holder on stationary door		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pendant 3 (A chain)	Pendant 3 secured A chain (green), HMI	_____
		Service Bldg 3 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 3 active door switch		_____
		Pendant 3 unsecured A chain (grey), HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>	
	Replace holder on active door	Service Bldg 3 Door SW A chain OFF (grey), HMI	___	___
C13	Pendant 3 A Chain Quick Search Timeout Quick search Pendant 3 and <i>begin timing</i>	Pendant 3 secured A chain (green), HMI Pendant 3 unsecured in 5 minutes (grey), HMI	___	___
	Remove A chain switch holders		___	___
C14	B Chain Entrance Door Switches Service Building 3 Place holders on the B chain Service Building 3 Door switches (4) Close Pendant gates		___	___
	Perform all actions and make observations for both door B chain switches B1 and B2			
	Quick Search Pendant 3 (B chain)	Pendant 3 secured B chain (green), HMI	___	___
	Remove holder from Service Building 3 stationary door switch	Service Bldg 3 Door SW A chain ON (green), HMI Pendant 3 unsecured B chain (grey), HMI	___	___
	Replace holder on stationary door	Service Bldg 3 Door SW B chain OFF (grey), HMI	___	___
	Quick Search Pendant 3 (B chain)	Pendant 3 secured B chain (green), HMI	___	___
	Remove holder from Service Building 3 active door switch	Service Bldg 3 Door SW B chain ON (green), HMI Pendant 3 unsecured B chain (grey), HMI	___	___
	Replace holder on active door	Service Bldg 3 Door SW B chain OFF (grey), HMI	___	___
C15	Pendant 3 B Chain Quick Search Timeout Quick search Pendant 3 and <i>begin timing</i>	Pendant 3 secured B chain Pendant 3 unsecured in 5 minutes	___	___
C16	Service Building 3 Door Emergency Egress Attach B chain Maglock Actuator with tape Person proceeds to Exit (ring side) Perform B chain Pendant 3 quick search	Pendant 3 secured B chain ON (green), HMI Service Bldg 3 Door Maglock B chain ON (green), HMI	___	___
	Remove actuator	Service Bldg 3 Door Maglock B chain OFF (grey), HMI Pendant 3 unsecured (grey), HMI	___	___

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<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
Remove holders and close door		_____
Perform A chain Pentant 3 search	Pentant 3 secured A chain (green), HMI	_____
	Service Bldg 3 Door Maglock A chain ON (green), HMI	_____
Press in door push bar without opening door	Service Bldg 3 Door Maglock A chain OFF (grey), HMI	_____
	Pentant 3 unsecured (grey), HMI	_____
Open door	Door opens	_____
Close door and stay outside of ring		_____
C17 Service Building 3 Door P3 Emergency Egress		
Perform A chain Pentant 3 quick search	Pentant 3 secured A chain	_____
	Service Bldg 3 Door Maglock A chain ON (green), HMI	_____
Press in external emergency egress button	Service Bldg 3 Door Maglock A chain OFF (grey), HMI	_____
	Pentant 3 unsecured, HMI	_____
Pull out external emergency egress button	Emergency Stop Latch A chain OFF (grey), HMI	_____
Reset emergency stop latch and fault	Emergency Stop Latch A chain ON (green), HMI	_____
Perform B chain Pentant 3 search	Pentant 3 secured B chain	_____
	Serv. Bldg 3 Door Maglock B chain ON (green), HMI	_____
Press in external emergency egress button	Service Bldg 3 Door Maglock B chain OFF (grey), HMI	_____
	Pentant 3 unsecured, HMI	_____
Pull out external emergency egress button	Emergency Stop Latch B chain OFF (grey), HMI	_____
Open door	Door opens	_____
Reset emergency stop latch and fault	Emergency Stop Latch B chain ON (green), HMI	_____
Close door	All gates and doors closed	_____
C18 Pentant 3 HII Emergency stops		
Repeat all steps for each HII		
A Chain:		
	<u>HII-1</u>	<u>HII-2</u>
	<u>HII-3</u>	<u>HII-4</u>
	<u>HII-5</u>	<u>HII-6</u>
Quick search Pentant 3 on A Chain	_____	_____
Pentant 3 secured A chain (green), HMI	_____	_____
Emergency Stop Latch A chain ON (green), HMI	_____	_____
Press in emergency stop	_____	_____
Pentant 3 unsecured A chain (grey), HMI	_____	_____
Pull out emergency stop	_____	_____
Emergency Stop Latch A chain OFF (grey), HMI	_____	_____
Reset fault and latch at Pentant 3 I/O box	_____	_____
Emergency Stop Latch A chain ON (green), HMI	_____	_____

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Action Taken

Observation, Location

✓

B Chain:

	<u>HII-1</u>	<u>HII-2</u>	<u>HII-3</u>	<u>HII-4</u>	<u>HII-5</u>	<u>HII-6</u>
Quick search Pentant 3 on B Chain	_____	_____	_____	_____	_____	_____
Pentant 3 secured B chain (green), HMI	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Press in emergency stop	_____	_____	_____	_____	_____	_____
Pentant 3 unsecured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Pull out emergency stop	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Reset fault and latch at Pentant 3 I/O box	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____

C19 Pentant 3 Gate 3 Switches

Proceed to the gate between pentants 3 and 4		_____
Place holders on the A chain gate switches		_____
Perform all actions and make observations for both Gate 3 A chain switches A1 and A2		
		<u>A1</u> <u>A2</u>
Quick Search Pentant 2 (A chain)	Pentant 2 secured A chain (green), HMI	_____
Quick Search Pentant 3 (A chain)	Pentant 3 secured A chain (green), HMI	_____
	Gate 3 SW A chain ON (green), HMI	_____
Remove holder from Gate A chain switch		_____
	Pentant 3 unsecured A chain (grey), HMI	_____
	Gate 3 SW A chain OFF (grey), HMI	_____
Remove Gate A chain switch holders		_____
Place holders on the B chain gate switches		_____
Perform all actions and make observations for both Gate 3 B chain switches B1 and B2		
		<u>B1</u> <u>B2</u>
Quick Search Pentant 2 (B chain)	Pentant 2 secured B chain (green), HMI	_____
Quick Search Pentant 3 (B chain)	Pentant 3 secured B chain (green), HMI	_____
	Gate 3 SW B chain ON (green), HMI	_____
Remove holder from Gate 3 B switch		_____
	Pentant 3 unsecured B chain (grey), HMI	_____
	Gate 3 SW B chain ON (green), HMI	_____
Remove switch holders and close gate		_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
C20	Gate 4 Switches		
	Proceed to the gate between pentants 4 and 5		_____
	Place holders on the A chain gate switches		_____
	Perform all actions and make observations for both Gate 4 A chain switches A1 and A2		
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 2 (A chain)	Pentant 2 secured A chain (green), HMI	_____
	Quick Search Pentant 3 (A chain)	Pentant 3 secured A chain (green), HMI	_____
		Gate 4 SW A chain ON (green), HMI	_____
	Remove holder from Gate 4 switch		_____
		Pentant 3 unsecured A chain (grey), HMI	_____
		Gate 4 SW A chain OFF (grey), HMI	_____
	Remove Gate 4 A chain switch holders		_____
	Place holders on the B chain gate switches		_____
	Perform all actions and make observations for both Gate 4 B chain switches B1 and B2		
			<u>B1</u> <u>B2</u>
	Quick Search Pentant 2 (A chain)	Pentant 2 secured B chain (green), HMI	_____
	Quick Search Pentant 3 (B chain)	Pentant 3 secured B chain (green), HMI	_____
		Gate 4 SW B chain ON (green), HMI	_____
	Remove holder from Gate 4 switch		_____
		Pentant 3 unsecured B chain (grey), HMI	_____
		Gate 4 SW B chain OFF (grey), HMI	_____
	Remove switch holders and close gate		_____
C21	Gate 4 Emergency Stop (in Pentant 4)		
	Quick Search Pentant 3 on A Chain	Pentant 3 Secured A chain (green), HMI	_____
		Emergency Stop Latch A chain (green), HMI	_____
		Gate 4 Maglock A chain ON (green), HMI	_____
	Press the Gate 4 Emergency stop	Pentant 3 unsecured (grey), HMI	_____
		Gate 4 Maglock A chain OFF (grey), HMI	_____
	Pull out Gate 4 Emergency stop	Emergency Stop Latch A chain OFF (grey), HMI	_____
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI	_____
	Quick Search Pentant 3 on B Chain	Pentant 3 Secured B chain (green), HMI	_____
		Emergency Stop Latch B chain (green), HMI	_____
		Gate 4 Maglock B chain ON (green), HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<input checked="" type="checkbox"/>
	Press the Gate 4 Emergency stop	Pendant 3 unsecured (grey), HMI	_____
	Pull out Gate 4 Emergency stop	Gate 4 Maglock B chain OFF (grey), HMI	_____
	Reset fault and latch	Emergency Stop Latch B chain OFF (grey), HMI	_____
	Emergency Stop Latch B chain ON (green), HMI		_____
C22	Gate 4 Push Bar		
	Quick search Pendant 3 on A chain	Pendant 3 Secure A chain (green), HMI	_____
	Gate 4 Maglock A chain ON (green), HMI		_____
	Push in gate Push Bar without opening gate		_____
	Release Push bar	Pendant 3 NOT Secure A chain (grey), HMI	_____
	Put holders on B chain switches	Gate 4 Maglock A chain OFF (grey), HMI	_____
	Attach B chain Maglock Actuator with tape		_____
	Quick search Pendant 4 on B chain		_____
	Push in gate Push Bar without opening gate	Pendant 3 Secure B chain (green), HMI	_____
	Remove actuator	Gate 4 Maglock B chain ON (green), HMI	_____
	Release Push bar	Pendant 3 NOT Secure B chain (grey), HMI	_____
		Gate 4 Maglock B chain OFF (grey), HMI	_____
C23	Pendant 3 Maintenance Doors A Chain		
	Place A chain actuators into each Maintenance door connectors and complete all steps for each Maintenance Door (MD)		_____
		<u>5ID</u> <u>6ID</u> <u>7ID</u> <u>8ID</u> <u>9ID</u> <u>10ID</u>	
	Quick Search Pendant 3 on A chain	_____	_____
	Pendant secured on A chain (green), HMI	_____	_____
	Sum of Maint Doors A chain ON (green), HMI	_____	_____
	Remove Actuator in switch A1	_____	_____
	Pendant 3 Not secured A chain (grey), HMI	_____	_____
	Sum of Maint Doors A chain OFF (grey), HMI	_____	_____
	Replace actuator in A1	_____	_____
	Quick Search Pendant 3 on A chain	_____	_____
	Pendant secured on A chain (green), HMI	_____	_____
	Sum of Maint Doors A chain ON (green), HMI	_____	_____
	Remove Actuator in switch A2	_____	_____
	Pendant 3 Not secured A chain (grey), HMI	_____	_____
	Sum of Maint Doors A chain OFF (grey), HMI	_____	_____
	Replace actuator in A2	_____	_____

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Remove actuators _____

C24 Pentant 3 Maintenance Doors B Chain

Place B chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

	<u>5ID</u>	<u>6ID</u>	<u>7ID</u>	<u>8ID</u>	<u>9ID</u>	<u>10ID</u>
Quick Search Pentant 3 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B1	_____	_____	_____	_____	_____	_____
Pentant 3 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in B1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 3 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B2	_____	_____	_____	_____	_____	_____
Pentant 3 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Remove actuators and ensure all Pentant 3 Maintenance door connectors are on	_____	_____	_____	_____	_____	_____

C25 Pentant Access Allowed only with Dipole (Negative) PS Contactors OFF

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply	_____
Secure all Pentants	SR secure for OPS, HMI
Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Negative PS cabinet door open
Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver	_____
Request Operator press P3 Access Request button	Access Request button does not illuminate
	Access Request with critical device On alarm, HMI
	Serv. Bldg. 3 door remains locked on A chain, HMI
Primary Authorized Power Supply Employee releases the A chain contactor	_____
Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver	_____
Request Operator press P3 Access Request button	Access Request button illuminates
Press Access Request button at Service Building when lit	Pentant remains secure on A and B chain
	Serv. Bldg. 3 door remains locked on B chain, HMI
Primary Authorized Power Supply Employee releases the B chain contactor	_____
Close cabinet door	_____

C26 Pentant Access Allowed only with Dipole (Positive) PS Contactors OFF

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Primary Authorized Power supply Employee LOTOs SR Dipole power supply _____
 Secure all Pentants SR secure for OPS, HMI _____
 Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor Positive PS cabinet door open _____
 Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver _____

Request Operator press P3 Access Request button Access Request button does not illuminate _____
 Access Request with critical device On alarm, HMI _____
 Serv. Bldg. 3 door remains locked on A chain, HMI _____

Primary Authorized Power Supply Employee releases the A chain contactor _____
 Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver _____

Request Operator press P3 Access Request button Access Request button illuminates at Service Building _____
 Press Access button at Service Building when lit Pentant remains secure on A and B chain _____
 Serv. Bldg. 3 door remains locked on B chain, HMI _____

Primary Authorized Power Supply Employee releases the B chain contactor _____
 Close cabinet door _____
 Remove LOTO from SR Dipole Power supply _____

C27 Pentant Access Allowed only with SR System C RF HVPS Contactors OFF

Primary Authorized RF Employee apply LOTO on SR RF System C HVPS _____
 Primary Authorized RF Employee open cabinet door to access the A chain contactor _____
 Primary Authorized RF Employee push in the RF HVPS A chain contactor with a screwdriver Access permit light goes out _____

Request Operator press P3 Access Request button Access Request button does not illuminate _____
 Access Request with critical device On alarm, HMI _____
 Serv. Bldg. 3 door remains locked on A chain, HMI _____

Primary Authorized RF Employee releases the A chain contactor _____
 Primary Authorized RF Employee push in the RF HVPS B chain contactor with a screwdriver _____

Request Operator press P3 Access Request button Access Request button does not illuminate _____
 Access Request with critical device On alarm, HMI _____
 Serv. Bldg. 3 door remains locked on B chain, HMI _____

Primary Authorized RF Employee releases the B chain contactor _____
 Close cabinet door _____

C28 Pentant Access Allowed only with SR System D RF HVPS Contactors OFF

Primary Authorized RF Employee apply LOTO on SR System D RF HVPS _____
 Primary Authorized RF Employee open cabinet door to access the A chain contactor _____

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Primary Authorized RF Employee push in the RF HVPS A chain contactor with a screwdriver Access permit light goes out _____
 Request Operator press P3 Access Request button Access Request button does not illuminate _____
 Alarm sounds in the Control Room _____
 Access Request with critical device On alarm, HMI _____
 Serv. Bldg. 3 door remains locked on A chain, HMI _____

Primary Authorized RF Employee releases the A chain contactor _____
 Primary Authorized RF Employee push in the RF HVPS B chain contactor with a screwdriver _____
 Request Operator press P3 Access Request button Access Request button does not illuminate _____
 Access Request with critical device On alarm, HMI _____
 Serv. Bldg. 3 door remains locked on B chain, HMI _____

Primary Authorized RF Employee releases the B chain contactor _____
 Close cabinet door _____

C29 Pentant Access Allowed only with BTS Shutter Closed

Request Operator open the BTS shutter BTS Shutter opens _____
 Request Operator press P3 Access Request button Access permit button at P3 Serv. Bldg. does not illuminate _____
 Access Request with critical device On alarm, HMI _____
 Operator closes shutter BTS shutter closed _____
 Request Operator press P3 Access Request button Access Request button illuminates outside P1 Service Building Door main entrance _____

C30 Pentant Access Allowed Only with BTS B2 Bending Magnet OFF

Using shunt test box, apply current to the # 1 BTS B2 shunt box _____
 Request Operator press P3 Access Request button Access Request button at P3 Serv. Bldg. illuminates _____
 Press the button at Service Building Pentant remains secure on A and B chain _____
 Serv. Bldg. 3 door remains locked on B chain, HMI _____
 Remove test box _____
 Using shunt test box, apply current to the # 2 BTS B2 shunt box _____
 Request Operator press P3 Access Request button Access Request button at P3 Serv. Bldg. illuminates _____
 Press the button at Service Building Pentant remains secure on A and B chain _____
 Serv. Bldg. 3 door remains locked on B chain, HMI _____

C31 Magnet Test Mode (Drops security, P1-P5 Emergency stops, Search disabled in Test mode)

All Pentants Secure A and B, HMI _____
 C AND D RF Permit A and B chain ON (green), HMI _____
 Dipole Permit A and B chain ON (green), HMI _____
 Request Operator open BTS shutter BTS Shutter open, HMI _____
 Rotate Magnet Test Key at I/O Box 3 All Pentants Unsecured A and B, HMI _____
 BTS Shutter Closed, HMI _____
 C AND D RF Permit A and B chain OFF (grey), HMI _____

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Reset fault and latch

Dipole Permit A and B chain OFF (grey), HMI _____

Dipole Permit A and B chain ON (**green**), HMI _____

Gun Permits A and B OFF (grey), HMI _____

BTS Shutter Closed, HMI _____

C AND D RF Permit A and B chain OFF (grey), HMI _____

Perform each step below using one emergency stop in each pentant (P1-P5)

		<u>P1</u>	<u>P2</u>	<u>P3</u>	<u>P4</u>	<u>P5</u>
	Dipole Permits ON (green), HMI	_____	_____	_____	_____	_____
Press an Emergency Stop	Dipole Permits A and B OFF	_____	_____	_____	_____	_____
Pull out Emergency Stop	Dipole B Permit remains OFF (grey), HMI	_____	_____	_____	_____	_____
Reset fault	Dipole Permits ON (green), HMI	_____	_____	_____	_____	_____
Attempt pentant search	Search cannot be completed	_____	_____	_____	_____	_____

C32 Live Test of Storage Ring Door Switches

WARNING: Do not permit Employee from entering the Storage Ring unless authorized by the Tester who will verify the area is safe to enter.

Place Barrier "CAUTION: DO NOT ENTER" tape across entry path OR

Post a Watch Outside Service Building Door 3 Main Door Entrance.

The watch shall not allow Employee to enter the pentant unless authorized by the Tester.

Place switch holders on the active P3 Service Building Door switches(4) and attach magnetic lock device _____

Accelerator Safety Systems Staff disables limiters (set to 0) or check if completed on concurrent test _____

Secure the SR All Pentants secure A and B (**green**), HMI _____

SR Secure for OPS A chain ON (**green**), HMI _____

Gun Permits A and B ON (**green**), linac HMI _____

Request Operator turn on Gun HVPS, Modulator HV, set LT B1 and B2 bending magnet to injection energy, turn on SR RF HVPS and SR Dipole PS _____

Gun UPA-100 is ON, gun cabinet _____

Modulators contactor ON, Linac HMI _____

SR Dipole PS is ON _____

SR System C and D RF HVPS ON _____

Check Dipole PS Positive PS Interface, DPSI A1 Permit is ON _____

A2 Permit is ON _____

"A Chain Contactor Open" light is OFF _____

B1 Permit is ON _____

B2 Permit is ON _____

"B Chain Contactor Open" light is OFF _____

Check Dipole PS Negative PS Interface, DPSI A1 Permit is ON _____

A2 Permit is ON _____

"A Chain Contactor Open" light is OFF _____

B1 Permit is ON _____

B2 Permit is ON _____

"B Chain Contactor Open" light is OFF _____

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	SR System C and D RF HVPS ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SR RF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF C AND D	_____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Remove A1 switch holder	Pendants unsecured A chain (grey), HMI	_____
	SR Secure for OPS A chain OFF (grey), HMI	_____
	Gun Permits A OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, A chain	_____
	SR RF HVPS shuts OFF, A chain	_____
	Modulators OFF, A chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check SR RF Systems C AND D	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Replace switch holder		_____

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Secure Pentant 3	All Pentants secure A and B (green), HMI SR Secure for OPS A chain ON (green), HMI Gun Permits A and B ON (green), linac HMI	_____ _____ _____
Request Operator turn on Gun HVPS, Modulator HV, set LTB B1 and B2 bending magnet to injection energy, turn on SR RF HVPS and SR Dipole PS	Gun UPA-100 is ON, gun cabinet Modulators contactor ON, Linac HMI SR Dipole PS is ON SR System C and D RF HVPS ON	_____ _____ _____ _____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON A2 Permit is ON "A Chain Contactor Open" light is OFF B1 Permit is ON B2 Permit is ON "B Chain Contactor Open" light is OFF	_____ _____ _____ _____ _____ _____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON A2 Permit is ON "A Chain Contactor Open" light is OFF B1 Permit is ON B2 Permit is ON "B Chain Contactor Open" light is OFF SR System C and D RF HVPS ON	_____ _____ _____ _____ _____ _____ _____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SR RF Systems C AND D	A2 Permit is ON C AND D "A Chain Contactor Open" light is OFF C AND D B1 Permit is ON C AND D B2 Permit is ON C AND D "B Chain Contactor Open" light is OFF C AND D	_____ _____ _____ _____ _____
Remove B1 switch holder	Pentants unsecured B chain (grey), HMI SR Secure for OPS B chain OFF (grey), HMI Gun Permits B OFF (grey), Linac HMI Gun UPA-100 is OFF, gun cabinet SR Dipole PS shuts OFF, B chain SR RF HVPS shuts OFF, B chain Modulators OFF, B chain BTS shutter closed, HMI	_____ _____ _____ _____ _____ _____ _____ _____

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	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Remove switch holders and close door		_____
Secure Pentant 3	All Pentants secure A and B (green), HMI	_____
	SR Secure for OPS A chain ON (green), HMI	_____
C33 Live Pentant 3 Maintenance Doors		_____
Request Operator turn on Gun HVPS, Modulator HV, set LTB B1 and B2 bending magnet to injection energy, turn on SR RF HVPS and SR Dipole PS	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove an A chain switch from Pentant 3 Maintenance door	Maintenance door = _____	_____
	SR Secure for OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF on A chain	_____

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	Modulators are OFF on A chain	_____
Replace A chain switch and perform a reset		_____
Search Pentant 3	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove a B chain switch from Pentant 3		_____
Maintenance door	Maintenance door = _____	_____
	SR Secure for OPS B chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF B chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF Permits C AND D OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF on B chain	_____
	Modulators are OFF on B chain	_____
Replace B chain switch and perform a reset		_____
Search Pentant 3	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
C34 Live Pentant 3 Emergency Stop		_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Press in Emergency Stop at Service Building 3 entrance		_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF (grey), HMI	_____

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		SR RF Systems C AND D are OFF	_____
		SR RF Permits OFF (grey), HMI	_____
		BTS shutter Closed, HMI	_____
		Gun HVPS is OFF	_____
		Modulators are OFF	_____
	Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____
	Reset fault and latch at Pentant 3 I/O box	Emergency Stop Latch A and B ON (green), HMI	_____
	Secure Pentant 3	All Pentants secure A and B (green), HMI	_____
		SR Secure For OPS A chain ON (green), HMI	_____
C35	Control Room Emergency Stop	<input type="checkbox"/> Completed on Pentant # _____ Test	_____
	Request Operator Turn on SR RF HVPS, SR		_____
	Dipole PS and open BTS shutter		_____
		SR Dipole PS is ON	_____
		SR Dipole Permits ON A and B chain (green), HMI	_____
		SR RF Systems C AND D are ON	_____
		SR RF Permits ON A and B chain (green), HMI	_____
		BTS shutter Open, HMI	_____
	Press in Emergency Stop in the Control Room		_____
		SR Dipole PS is OFF	_____
		SR Dipole Permits OFF A chain (grey), HMI	_____
		SR RF Systems C AND D are OFF	_____
		SR RF C AND D Permits OFF (grey), HMI	_____
		BTS shutter Closed, HMI	_____
	Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____
	Reset fault and latch in the Control Room	Emergency Stop Latch A and B ON (green), HMI	_____
C36	Ignition Key (drops critical devices but not search)	<input type="checkbox"/> Completed on Pentant # _____ Test	_____
	Request Operator Turn on SR RF HVPS, SR		_____
	Dipole PS and open BTS shutter		_____
		SR Dipole PS is ON	_____
		SR Dipole Permits ON A and B chain (green), HMI	_____
		SR RF Systems C AND D are ON	_____
		SR RF Permits ON A and B chain (green), HMI	_____
		BTS shutter Open, HMI	_____
	Remove the SR Ignition Key		_____
		SR Dipole PS is OFF	_____
		SR Dipole Permits OFF A chain (grey), HMI	_____
		SR RF Systems C AND D are OFF	_____
		SR RF Permits OFF (grey), HMI	_____
		BTS shutter Closed, HMI	_____
		SR Secure to Booster A and B	_____

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- Replace the Ignition Key _____
- C37 **Top Energy Interlock turns OFF RF** **Completed on Concurrent test** _____
- Accelerator Safety Systems Staff returns limiters to Operational values* _____
- Request Operator turn on RF HVPS and Dipole PS. Set Dipole PS to **364 A** _____
- SR System C and D RF HVPS ON _____
- RF Permits A and B ON, (green), HMI _____
- Request Operator set Dipole PS to **371.28 A** _____
- SR System C and D RF HVPPS is OFF _____
- SR System C and D RF Permits A and B OFF (grey), HMI _____
- Reset fault and turn OFF Dipole _____
- C38 **SR Injection Energy Limit (2.0 - 3.3 GeV)** **Completed on Concurrent test** _____
- Secure all pentants _____
- Operator turns on Gun HVPS _____
- Storage ring secure to booster _____
- Gun HVPS is ON _____
- Gun Permits A and B ON (green), linac HMI _____
- SR Injector Energy Limiter A and B ON (green) _____
- Storage ring Dipole PS at **364 A** _____
- Request Operator set Dipole to **356.72 A** _____
- Storage ring Dipole PS at **356.72 A** _____
- Gun HVPS is OFF _____
- Gun Permits A and B OFF (grey), linac HMI _____
- SR Injector Energy Limiter A and B OFF (grey) _____
- Request Operator return Dipole to **364 A** _____
- Storage ring Dipole PS at **364 A** _____
- Reset energy limiter by performing a reset in the Control Room _____
- SR Injector Energy Limiter A and B ON (green) _____
- Operator turns on Gun HVPS _____
- Gun HVPS is ON _____
- Gun Permits A and B ON (green), linac HMI _____
- Request Operator set Dipole to **371.28 A** _____
- Storage ring Dipole PS at **371.28 A** _____
- Gun HVPS is OFF _____
- Gun Permits A and B OFF (grey), linac HMI _____
- SR Injector Energy Limiter A and B OFF (grey) _____
- Request Operator return Dipole to **364 A** _____
- Storage ring Dipole PS at **364 A** _____
- Reset energy limiter by performing a reset in the Control Room _____
- SR Injector Energy Limiter A and B ON (green) _____
- C39 **Area Radiation Monitors**
- This test step may be completed at any time during the testing process but MUST be completed for PPS test certification. Refer to PS-C-ASD-PRC-008, NSLS-II Area Radiation Monitor PPS Test and complete Attachment C, NSLS-II Storage Ring Area Radiation Monitor Checklist for Monitors SRM-5 through SRM-10 .**
- Area Radiation Monitor SRM-5 Test completed _____
- Area Radiation Monitor SRM-6 Test completed _____
- Area Radiation Monitor SRM-7 Test completed _____

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Area Radiation Monitor SRM-8 Test completed _____
 Area Radiation Monitor SRM-9 Test completed _____
 Area Radiation Monitor SRM-10 Test completed _____

C40 **Test Completion**

Account for all switch holders/actuators _____
 Remove LOTO from ALL Linac, Booster and SR devices if testing is complete _____
 Ensure PPS cabinets are secure and locked; challenge locks _____
 Disconnect the 4 test jumpers to the SR Dipole power supply interface boxes. _____
 Remove sound mufflers from HII devices (6) _____
 Request Operator make log entry stating Pentant 3 test is complete. _____

- END OF ATTACHMENT C -

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Attachment D

NSLS-II Storage Ring Pentant 4 Radiological Interlock Test Checklist

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed
	Test Type: <input type="checkbox"/> Pre-Certification <input type="checkbox"/> Certification <input type="checkbox"/> Partial
Test Date:	Start Time: _____ Finish Time: _____
Tester 1:	Assistant 1: _____
Tester 2:	Assistant 2: _____
Tester 1 Signature:	Tester 2 Signature: _____
*Reviewer 1:	Reviewer 1 sig.: _____
Reviewer 2:	Reviewer 2 sig.: _____
** Safety Signature Pentant 4(PLC) A Chain: _____ B Chain: _____	Previous Pentant 4 PLC 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.

Each numbered item below indicates a set of action items for the test procedure. The Tester will either perform the action, or delegate the action to the Assistant(s). For each step a checkmark (✓) should be made if the correct corresponding observation has been made.

	<u>Action Taken</u>	<u>Observation, Location</u>	✓
D1	<u>Verify System Lockouts and Connect Dipole Test Jumpers</u>		
	Gun HVPS Output Cable Connector		_____
	Modulator PS line cords (3) <u>OR</u> Booster Dipole F PS		_____
	Booster RF HVPS <u>OR</u> booster low level RF drive termination <u>OR</u> Booster RF output connection to cavity		_____
	SR System C RF HVPS		_____
	SR System C low level RF drive termination <u>OR</u> System C SR RF output connection to cavity		_____
	SR System D RF HVPS		_____
	SR System D low level RF drive termination <u>OR</u> SR System D RF output connection to cavity		_____
	Apply mufflers to the right hand HII side sounders 6		_____
	Connect the 4 test jumpers to the SR Dipole Power Supply interface boxes		_____
D2	<u>Secure enclosures</u>		
	Secure the injector berm area	Berm secured, Linac HMI	_____
	Secure the linac	Linac secured, Linac HMI	_____
	Secure the booster ring	Booster secured, Booster HMI	_____
	Note: All Mode Search Verifications can be completed using the Quick Search feature		
D3	<u>Verify Pentant 4 Single Pentant Search (Mode 1)</u>		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 4 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 4		_____
	Press P4-SB1 Service Bldg. 4	Light on search button illuminates	_____
		Search sounder alarm sounds	_____

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<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
	Overhead lighting flashes during search	_____
One searcher remains on P3 side of gate 4		_____
Close gate 4 and press SB2	Light on search button illuminates	_____
Press P4-SB3 on HII 1	Light on search button illuminates	_____
	Amber HII 1 search beacon is ON	_____
Press P4-SB4 on HII 2	Light on search button illuminates	_____
	Amber HII 2 search beacon is ON	_____
Press SB5 on HII 3	Light on search button illuminates	_____
	Amber HII 3 search beacon is ON	_____
Searchers <i>simultaneously</i> press P4-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
	Light on SB1 (Service Bldg.) illuminates	_____
	Light on SB6 illuminates	_____
	Amber HII 4 search beacon is ON	_____
Press SB7 on HII 5	Light on search button illuminates	_____
	Amber HII 5 search beacon is ON	_____
Press SB8 on HII 6	Light on search button illuminates	_____
	Amber HII 6 search beacon is ON	_____
One searcher remains on P5 side of gate		_____
Close Pentant Gate 5		_____
Press SBSP	Light on search button illuminates	_____
Press P4-SB1	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates	_____
	Maglock engages/locks- check door	_____
	Service Bldg 1 Maglock A and B (green), HMI	_____
	Gate 4 switches A and B ON (green), HMI	_____
	Gate 5 Maglock A and B ON (green), HMI	_____
	Gate 5 switches A and B ON (green), HMI	_____
<i>After beam imminent warning sounds:</i>	Service Bldg Door sign illuminates (A and B sect.)	_____
(Note: beam imminent timed in step D4)	Pentant 4 Secured A and B chain, HMI	_____
	Gate 4 sign illuminates (A and B sect.)	_____
	Gate 5 sign illuminates (A and B sect.)	_____
Request operator grant access permit for P4		_____
Press Access Request button at Serv. Building Door 4 if necessary (other pentants secure)	Pentant 4 unsecured A and B chain, HMI	_____
Open Door	No alarm sounds in Control Room	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
D4	Verify Pentant 4 Starting Multiple Pentant Search (Mode 2) and time Beam imminent warning		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 4 not secured A and B chain (grey), HMI	___
	Three Searchers enter Service Building 4		___
	Press SB1 in pentant 4 Service Bldg.4	Light on search button illuminates	___
		Search sounder alarm sounds	___
		Overhead lighting flashes during search	___
	Close gate 4 and press SB2	Light on search button illuminates	___
	Press SB3 on HII 1	Light on search button illuminates	___
		Amber HII 1 search beacon is ON	___
	Press SB4 on HII 2	Light on search button illuminates	___
		Amber HII 2 search beacon is ON	___
	Press SB5 on HII 3	Light on search button illuminates	___
		Amber HII 3 search beacon is ON	___
	Searchers <i>simultaneously</i> press P4-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		___
		Light on SB1 (Service Bldg.) illuminates	___
		Light on SB6 illuminates	___
		Amber HII 4 search beacon is ON	___
	Press SB7 on HII 5	Light on search button illuminates	___
		Amber HII 5 search beacon is ON	___
	Press SB8 on HII 6	Light on search button illuminates	___
		Amber HII 6 search beacon is ON	___
	Close Pentant Gate 5		___
	Reach through gate 5 Press SB9 and <i>begin timing audible alarm</i>		___
		Light on search button illuminates	___
		Maglock engages/check gate	___
		Service Bldg 4 Maglock A and B ON (green), HMI	___
		Gate 5 Maglock A and B ON (green), HMI	___
		Gate 4 switches A and B (green), HMI	___
		Gate 5 switches A and B (green), HMI	___
		Beam Imminent alarm sounds for 60 seconds	___
	<i>After beam imminent warning sounds:</i>		
		Pentant 4 Secured A and B chain, HMI	___
		Gate 5 sign illuminates (A and B sect.)	___

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	<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
D5	Operations Enable Switch (Pentant 4 Main I/O box)		
	Rotate the operations enable switch to OFF	Pentant 4 Secured A and B chain (green), HMI	_____
	Attempt to secure Pentant 4	Pentant 4 NOT Secured A and B chain, (grey) HMI	_____
	Rotate the operations enable switch to ON	Pentant 4 will not secure	_____
	Reset the fault at the Pentant 4 I/O box		_____
D6	Verify Pentant 4 Continuing Multiple Pentant Search (Mode 3) and time Red Beacons		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 4 not secured A and B chain (grey), HMI	_____
	Close gate 4 and press SB2	Light on search button illuminates	_____
	Press P4-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P4- SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P4-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 5		_____
	Reach through gate 2 Press SB9 and <i>begin timing the Red Beacons on HII devices (6)</i>	Light on search button illuminates	_____
		Maglock engages/locks- check door	_____
		Service Bldg 4 Maglock A and B (green), HMI	_____
		Gate 5 Maglock A and B (green), HMI	_____
		Gate 4 switches A and B (green), HMI	_____
		Gate 5 switches A and B (green), HMI	_____
	After Beam Imminent alarm:	Pentant 4 Secured A and B chain, HMI	_____
		Red Beacons (6) flash for 60 seconds	_____
		HII Red area Secure A and B lights illuminated	_____
	Request operator grant access permit for P4		_____

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	Pentant 4 not secured A and B chain (grey), HMI	_____
	Open gate	No alarm sounds in Control Room
D7	Verify Pentant 4 Completing Multiple Pentant Search (Mode 4)	_____
	Check HMI on 740 Pentant I/O Box or CR	Pentant 4 not secured A and B chain (grey), HMI
	Close gate 4 and press SB2	Light on search button illuminates
	Press P4-SB3 on HII 1	Light on search button illuminates
		Amber HII 1 search beacon is ON
	Press P4-SB4 on HII 2	Light on search button illuminates
		Amber HII 2 search beacon is ON
	Press SB5 on HII 3	Light on search button illuminates
		Amber HII 3 search beacon is ON
	Searchers <i>simultaneously</i> press P4-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	_____
		Light on SB1 (Service Bldg.) illuminates
		Light on SB6 illuminates
		Amber HII 4 search beacon is ON
	Press SB7 on HII 5	Light on search button illuminates
		Amber HII 5 search beacon is ON
	Press SB8 on HII 6	Light on search button illuminates
		Amber HII 6 search beacon is ON
	Close Pentant Gate 5	_____
	Press SBSP	Light on search button illuminates
	Press P4-SB1 at Service Building Door	Light illuminates on SB1
	Exit through Service Building Door	_____
	Press- SBE	Light on SBE illuminates
	After Beam Imminent alarm:	Pentant 4 Secured A and B chain, HMI
D8	Access Pentant and check HII (6)	_____
	Request Operator grant access permit for P4	If other pentants secure the Access Request button at Service Bldg. 4 illuminates
	Press Access Request button at Service Building Door if necessary (other pentants secure)	P4 Service Bldg. Door Maglock Off (grey), HMI
		Pentant 4 not secured A and B chain (grey), HMI
		Door is open
	Check HII indicators	Red Beacons OFF
		Red Secure A and B lights OFF
		Green HII "Beam Disabled" lights illuminated
	Proceed to P4-SB2	_____
D9	Search Timeout (Mode 2)	_____
	Press P4-SB2 in Pentant 4 and begin <i>timing</i>	Light on search button illuminates

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	Search sounder alarm sounds	_____	
	Complete search in sequence <i>without</i> pressing SB9	_____	
	Light and sounders go out in 12 minutes	_____	
	Press SB9	_____	
	Mode 2 Search does not complete	_____	
D10	<u>Skip the Two Button Simultaneous Press (Mode 1) using Quick Search</u>		
	Close gates and doors and put into Quick Search	_____	
	Press SB1	_____	
	Light on search button illuminates	_____	
	Press SB2	_____	
	Light on search button illuminates	_____	
	Press SB3	_____	
	Light on search button illuminates	_____	
	Press SB4	_____	
	Light on search button illuminates	_____	
	Press SB5	_____	
	Light on search button illuminates	_____	
	Press SB1	_____	
	Press SB6	_____	
	Press SB7	_____	
	Press SB8	_____	
	Press SB9	_____	
	Pentant 4 does NOT Secure on A or B chains	_____	
D11	<u>Emergency Stop Aborts Search</u>		
	Complete a normal search using ANY Mode	_____	Mode used =
	<i>Before</i> the beam imminent warning sounder stops,		
	Press an Emergency Stop	_____	
	Beam imminent warning stops	_____	
	Red Beacons are NOT flashing	_____	
	Pentant does not secure on either chain	_____	
D12	<u>A Chain Entrance Door Switches Service Building 4</u>		
	Place holders on the A chain Service Building 4 Door switches (4) and attach actuator on Magnetic lock	_____	
	Close Pentant gates 1 and 5	_____	
	Perform all actions and make observations for both door A chain switches A1 and A2		
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 4 (A chain)	_____	_____
	Pentant 4 secured A chain (green), HMI	_____	_____
	SR Secure for OPS A chain ON (green), HMI	_____	_____
	Service Bldg 4 Door SW A chain ON (green), HMI	_____	_____
	Remove holder from Service Building 4 stationary door switch	_____	_____
	Pentant 4 unsecured A chain (grey), HMI	_____	_____
	Service Bldg 4 Door SW A chain OFF (grey), HMI	_____	_____
	Replace holder on stationary door	_____	_____
			<u>A1</u> <u>A2</u>
	Quick Search Pentant 4 (A chain)	_____	_____
	Pentant 4 secured A chain (green), HMI	_____	_____
	Service Bldg 4 Door SW A chain ON (green), HMI	_____	_____
	Remove holder from Service Building 4 active door switch	_____	_____

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		Pentant 4 unsecured A chain (grey), HMI	_____	_____
		Service Bldg 4 Door SW A chain OFF (grey), HMI	_____	_____
	Replace holder on active door		_____	_____
D13	Pentant 4 A Chain Quick Search Timeout			
	Quick search Pentant 4 and <i>begin timing</i>	Pentant 4 secured A chain (green), HMI	_____	
		Pentant 4 unsecured in 5 minutes (grey), HMI	_____	
	Remove A chain switch holders		_____	
D14	B Chain Entrance Door Switches Service Building 4			
	Place holders on the B chain Service Building 4 Door switches (4)		_____	
	Close Pentant gates			

	Perform all actions and make observations for both door B chain switches B1 and B2			
				<u>B1</u> <u>B2</u>
	Quick Search Pentant 4 (B chain)	Pentant 4 secured B chain (green), HMI	_____	_____
		Service Bldg 4 Door SW A chain ON (green), HMI	_____	_____
	Remove holder from Service building 4 stationary door switch	Pentant 4 unsecured B chain (grey), HMI	_____	_____
		Service Bldg 4 Door SW B chain OFF (grey), HMI	_____	_____
	Replace holder on stationary door		_____	_____
				<u>B1</u> <u>B2</u>
	Quick Search Pentant 4 (B chain)	Pentant 4 secured B chain (green), HMI	_____	_____
		Service Bldg Door 4 SW B chain ON (green), HMI	_____	_____
	Remove holder from Service building 4 active door switch	Pentant 4 unsecured B chain (grey), HMI	_____	_____
		Service Bldg 4 Door SW B chain OFF (grey), HMI	_____	_____
	Replace holder on active door		_____	_____
D15	Pentant 4 B Chain Quick Search Timeout			
	Quick search Pentant 4 and <i>begin timing</i>	Pentant 4 secured B chain	_____	
		Pentant 4 unsecured in 5 minutes	_____	
D16	Service Building 4 Door Emergency Egress			
	Attach B chain Maglock Actuator with tape		_____	
	Perform B chain Pentant 4 quick search	Pentant 4 secured B chain ON (green), HMI	_____	
		Serv.Bldg 4 Door Maglock B chain ON (green), HMI	_____	

	Remove actuator	Serv.Bldg 4 Door Maglock B chain OFF (grey), HMI	_____	
		Pentant 4 unsecured (grey), HMI	_____	

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B Chain:

	<u>HII-1</u>	<u>HII-2</u>	<u>HII-3</u>	<u>HII-4</u>	<u>HII-5</u>	<u>HII-6</u>
Quick search Pentant 4 on B Chain	_____	_____	_____	_____	_____	_____
Pentant 4 secured B chain (green), HMI	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Press in emergency stop	_____	_____	_____	_____	_____	_____
Pentant 4 unsecured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Pull out emergency stop	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Reset fault and latch at Pentant 4 I/O box	_____	_____	_____	_____	_____	_____
Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____

D19 **Pentant 4 Gate 4 Switches**

Proceed to the gate between pentants 3 and 4		_____	
Place holders on the A chain gate switches		_____	
Perform all actions and make observations for both gate 4 A chain switches A1 and A2			<u>A1</u> <u>A2</u>
Quick Search Pentant 3 (A chain)		_____	_____
Quick Search Pentant 4 (A chain)	Pentant 4 secured A chain (green), HMI	_____	_____
	Gate 4 SW A chain ON (green), HMI	_____	_____
Remove holder from Gate 1 switch		_____	_____
	Pentant 4 unsecured A chain (grey), HMI	_____	_____
	Gate 4 SW A chain OFF (grey), HMI	_____	_____
Remove Gate A chain switch holders		_____	_____
Place holders on the B chain gate switches		_____	_____
Perform all actions and make observations for both gate 4 B chain switches B1 and B2			<u>B1</u> <u>B2</u>
Quick Search Pentant 3 (B chain)		_____	_____
Quick Search Pentant 4 (B chain)	Pentant 4 secured B chain (green), HMI	_____	_____
	Gate 4 SW B chain ON (green), HMI	_____	_____
Remove holder from Gate 4 B switch		_____	_____
	Pentant 4 unsecured B chain (grey), HMI	_____	_____
	Gate 4 SW B chain ON (green), HMI	_____	_____
Remove switch holders and close gate		_____	_____

D20 **Gate 5 Switches**

Proceed to the gate between pentants 4 and 5		_____	
Place holders on the A chain gate switches		_____	
Perform all actions and make observations for both gate 5 A chain switches A1 and A2			<u>A1</u> <u>A2</u>
Quick Search Pentant 5 (A chain)	Pentant 5 secured A chain (green), HMI	_____	_____

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Quick Search Pentant 4 (A chain)	Pentant 4 secured A chain (green), HMI	_____	_____
	Gate 5 SW A chain ON (green), HMI	_____	_____
Remove holder from Gate 5 switch		_____	_____
	Pentant 4 unsecured A chain (grey), HMI	_____	_____
	Gate 5 SW A chain OFF (grey), HMI	_____	_____
Remove Gate 2 A chain switch holders		_____	_____
Place holders on the B chain gate switches		_____	_____
Perform all actions and make observations for both gate 1 B chain switches B1 and B2			
			<u>B1</u> <u>B2</u>
Quick Search Pentant 5 (A chain)	Pentant 5 secured B chain (green), HMI	_____	_____
Quick Search Pentant 4 (B chain)	Pentant 4 secured B chain (green), HMI	_____	_____
	Gate 5 SW B chain ON (green), HMI	_____	_____
Remove holder from Gate 5 switch		_____	_____
	Pentant 4 unsecured B chain (grey), HMI	_____	_____
	Gate 5 SW B chain OFF (grey), HMI	_____	_____
Remove switch holders and close gate		_____	_____

D21 **Pentant 4 Maintenance Doors A Chain**

Place A chain actuators into each Maintenance door connectors and complete all steps for each Maintenance Door (MD)

	<u>11ID</u>	<u>12ID</u>	<u>13ID</u>	<u>14ID</u>	<u>15ID</u>	<u>16ID</u>
Quick Search Pentant 4 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A1	_____	_____	_____	_____	_____	_____
Pentant 4 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 4 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A2	_____	_____	_____	_____	_____	_____
Pentant 4 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A2	_____	_____	_____	_____	_____	_____
Remove actuators						_____

D22 **Pentant 4 Maintenance Doors B Chain**

Place B chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

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	<u>11ID</u>	<u>12ID</u>	<u>13ID</u>	<u>14ID</u>	<u>15ID</u>	<u>16ID</u>
Quick Search Pentant 4 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B1	_____	_____	_____	_____	_____	_____
Pentant 4 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in B1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 4 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B2	_____	_____	_____	_____	_____	_____
Pentant 4 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Remove actuators and ensure all Pentant 4 Maintenance door connectors are on	_____	_____	_____	_____	_____	_____

D23 Pentant Access Allowed only with Dipole (Negative) PS Contactors OFF

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply	_____
Secure all Pentants	SR secure for OPS, HMI
Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Negative PS cabinet door open
Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver	_____
Request Operator press P4 Access Request button	Access Request button does not illuminate
	Access Request with critical device On alarm, HMI
	Serv. Bldg. 4 door remains locked on A chain, HMI
Primary Authorized Power Supply Employee releases the A chain contactor	_____
Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver	_____
Request Operator press P4 Access Request button	Access Request button illuminates
Press Access Request button a Service Building when lit	Pentant remains secure on A and B chain
	Serv. Bldg. 4 door remains locked on B chain, HMI
Primary Authorized Power Supply Employee releases the B chain contactor	_____
Close cabinet door	_____

D24 Pentant Access Allowed only with Dipole (Positive) PS Contactors OFF

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply	_____
Secure all Pentants	SR secure for OPS, HMI
Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor	Positive PS cabinet door open

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	Access Request with critical device On alarm, HMI	_____
	Serv. Bldg. 4 door remains locked on A chain, HMI	_____
	Primary Authorized RF Employee releases the A chain contactor	_____
	Primary Authorized RF Employee push in the RF HVPS B chain contactor with a screwdriver	_____
	Request Operator press P4 Access request button	_____
	Access Request button illuminates	_____
	Press Access Request button a Service Building when lit	_____
	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 4 door remains locked on B chain, HMI	_____
	Primary Authorized RF Employee releases the B chain contactor	_____
	Close cabinet door	_____
	Remove LOTO from SR RF HVPS	_____
D27	<i>Pendant Access Allowed only with BTS Shutter Closed</i>	
	Request Operator open the BTS shutter	_____
	BTS Shutter opens	_____
	Request Operator press P4 Access Request button	_____
	Access Request button at P4 Serv. Bldg. does not illuminate	_____
	Operator closes shutter	_____
	Access Request with critical device On alarm, HMI	_____
	BTS shutter closed	_____
	Request Operator press P4 Access Request button	_____
	Access Request button illuminates outside P4 Service Building Door main entrance	_____
D28	<i>Pendant Access Allowed Only with BTS B2 Bending Magnet OFF</i>	
	Using shunt test box, apply current to the # 1 BTS B2 shunt box	_____
	Request Operator press P4 Access Request button	_____
	Access Request button at P4 Serv. Bldg. illuminates	_____
	Press the button at Service Building	_____
	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 4 door remains locked on B chain, HMI	_____
	Disconnect shunt box from shunt 1	_____
	Using shunt test box, apply current to the # 2 BTS B2 shunt box	_____
	Request Operator press P4 Access Request button	_____
	Access Request button at P4 Serv. Bldg. illuminates	_____
	Press the button at Service Building	_____
	Pendant remains secure on A and B chain	_____
	Serv. Bldg. 4 door remains locked on B chain, HMI	_____
	Disconnect shunt box from shunt 2, clear fault	_____
D29	<i>Magnet Test Mode Breaks Security</i>	
	<input type="checkbox"/> Completed on Pentant 3 Test	
	Pendant 1 Secure A and B chains (green), HMI	_____
	Rotate Magnet Test key in place on Pentant 2 Mezzanine	_____
	Magnet Test Mode A and B ON (green), HMI	_____
	Pendant 1 unsecured A and B chain (grey), HMI	_____
	Dipole Permits A and B ON (green), HMI	_____
	Request Operator turn on Dipole PS	_____
	Dipole PS is ON	_____
	Press in Pentant Emergency Stop	_____
	Dipole PS is OFF	_____
	Dipole Permits A and B OFF (grey), HMI	_____
	Pullout Emergency Stop	_____
	Emergency Stop Latched and Dipole PS remains OFF	_____
	Reset fault and remove Magnet Test key	_____
	Magnet Test Mode A and B OFF (grey), HMI	_____

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	Dipole Permit A and B OFF (grey), HMI	_____
D30	Live Test of Storage Ring Door Switches	
	WARNING: Do not permit Employee from entering the Storage Ring unless authorized by the Tester who will verify the area is safe to enter.	
	Place Barrier "CAUTION: DO NOT ENTER" tape across entry path.	
	Post a Watch Outside Service Building Door 4 Main Door Entrance.	
	The watch shall not allow Employee to enter the pentant unless authorized by the Tester.	_____
	Place switch holders on the active P4 Service Building Door switches(4) and attach magnetic lock device	_____
	Secure the SR	_____
	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
	Gun Permits A and B ON (green), linac HMI	_____
	Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy	_____
	Gun UPA-100 is ON, gun cabinet	_____
	Modulators contactor ON, Linac HMI	_____
	SR Dipole PS is ON	_____
	SR System C and D RF HVPS ON	_____
	Turn on the BTS bending magnet and set to injection energy	_____
	Bending magnet ON, HMI	_____
	Open the BTS Shutter	_____
	Shutter is open, HMI	_____
	Check Dipole PS Positive PS Interface, DPSI	_____
	A1 Permit is ON	_____
	A2 Permit is ON	_____
	"A Chain Contactor Open" light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	"B Chain Contactor Open" light is OFF	_____
	Check Dipole PS Negative PS Interface, DPSI	_____
	A1 Permit is ON	_____
	A2 Permit is ON	_____
	"A Chain Contactor Open" light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	"B Chain Contactor Open" light is OFF	_____
	Check RF PS Interface, RFPSI RF Building	_____
	Check SR RF Systems C AND D	_____
	A1 Permit is ON C AND D	_____
	A2 Permit is ON C AND D	_____
	"A Chain Contactor Open" light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	"B Chain Contactor Open" light is OFF C AND D	_____
	Remove A1 switch holder	_____
	Pentants unsecured A Chain (grey). HMI	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____

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	Gun Permits A OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, A chain	_____
	SR RF HVPS shuts OFF, A chain	_____
	Modulators OFF, A chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Replace switch holder		_____
Secure Pentant 4	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
	Gun Permits A and B ON (green), linac HMI	_____
Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnets to injection energy		_____
	Gun UPA-100 is ON, gun cabinet	_____
	Modulators contactor ON, Linac HMI	_____
	SR Dipole PS is ON	_____
	SR System C and D RF HVPS ON	_____
Turn on the BTS bending magnet and set to injection energy	Bending magnet ON, HMI	_____
Open the BTS Shutter	Shutter is open, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____

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	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SR RF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF	_____
Remove B1 switch holder	Pendants unsecured B Chain (grey), HMI	_____
	SR Secure For OPS B chain OFF (grey), HMI	_____
	Gun Permits B OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, B chain	_____
	SR C AND D RF HVPS shuts OFF, B chain	_____
	Modulators OFF, B chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is OFF C AND D	_____
Check SR RF Systems C AND D	A2 Permit is OFF C AND D	_____

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	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Remove switch holders and close door		_____
Secure Pentant 4	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
D31	Live Pentant 4 Maintenance Doors	
	Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter	
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove an A chain switch from pentant 4		_____
Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF A chain	_____
	Modulators are OFF A chain	_____
Replace A chain switch and perform a reset		_____
Search Pentant 4	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF Permits C AND D ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____

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Remove a B chain switch from pentant 4
Maintenance door

Maintenance door = _____
 SR Secure For OPS B chain OFF (grey), HMI _____
 SR Dipole PS is OFF _____
 SR Dipole Permits OFF B chain (grey), HMI _____
 SR RF Systems C AND D are OFF _____
 SR RF Permits C AND D OFF (grey), HMI _____
 BTS shutter Closed, HMI _____
 Gun HVPS is OFF B chain _____
 Modulators are OFF B chain _____

Replace B chain switch and perform a reset

D32 **Live Pentant 4 Emergency Stop**

Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter

SR Dipole PS is ON _____
 SR Dipole Permits ON A and B chain (green), HMI _____
 SR RF Systems C AND D are ON _____
 SR RF Permits C AND D ON A and B chain (green), HMI _____
 BTS shutter Open, HMI _____
 Gun HVPS is ON _____
 Modulators are ON _____

Press in Emergency Stop at Service Building 4
entrance

SR Secure For OPS A chain OFF (grey), HMI _____
 SR Dipole PS is OFF _____
 SR Dipole Permits OFF A chain (grey), HMI _____
 SR RF Systems C AND D are OFF _____
 SR RF C AND D Permits OFF (grey), HMI _____
 BTS shutter Closed, HMI _____
 Gun HVPS is OFF _____
 Modulators are OFF _____

Pull out Emergency Stop
 Reset fault and latch at Pentant 4 I/O box
 Secure Pentant 4

Emergency Stop Latch A and B OFF (grey), HMI _____
 Emergency Stop Latch A and B ON (green), HMI _____
 All Pentants secure A and B (green), HMI _____
 SR Secure for OPS A chain ON (green), HMI _____

D33 **Control Room Emergency Stop**

Request Operator turn on SR RF HVPS, SR Dipole PS and open BTS shutter

Completed on Pentant # _____ Test
 SR Dipole PS is ON _____
 SR Dipole Permits ON A and B chain (green), HMI _____
 SR RF Systems C AND D are ON _____

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	SR RF C AND D Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
Press in Emergency Stop in the Control Room		_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____
Reset fault and latch in the Control Room	Emergency Stop Latch A and B ON (green), HMI	_____

D34 **Ignition Key (drops critical devices but not search)** **Completed on Pentant # _____ Test**

Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter

	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF C AND D Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
Remove the SR Ignition Key		_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	SR Secure to Booster A and B	_____
Replace the Ignition Key		_____

D35 **Area Radiation Monitors**

This test step may be completed at any time during the testing process but MUST be completed for PPS test certification. Refer to PS-C-ASD-PRC-008, NSLS-II Area Radiation Monitor PPS Test and complete Attachment C, NSLS-II Storage Ring Area Radiation Monitor Checklist for Monitors SRM-11 through SRM-16 .

Area Radiation Monitor SRM-11 Test completed		_____
Area Radiation Monitor SRM-12 Test completed		_____
Area Radiation Monitor SRM-13 Test completed		_____
Area Radiation Monitor SRM-14 Test completed		_____
Area Radiation Monitor SRM-15 Test completed		_____
Area Radiation Monitor SRM-16 Test completed		_____

D36 **Test Completion**

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- Account for all switch holders/actuators _____
- If testing is complete: Accelerator Safety Systems staff restores energy limiter values and complete Pentant 2 steps; B41 SR Injection Energy Limit and B42 Top Energy Interlock (may be completed on concurrent test) _____
- Remove LOTO from ALL Linac, Booster and SR devices if testing is complete _____
- Ensure PPS cabinets are secure and locked; challenge locks _____
- Disconnect the 4 test jumpers to the SR Dipole power supply interface boxes. _____
- Remove sound mufflers from HII devices (6) _____
- Request Operator make log entry stating Pentant 4 is complete.. _____

- END OF ATTACHMENT D -

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Attachment E

NSLS-II Storage Ring Pentant 5 Radiological Interlock Test Checklist

Test Reason:	Test Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed		
	Test Type: <input type="checkbox"/> Pre-Certification	<input type="checkbox"/> Certification	<input type="checkbox"/> Partial
Test Date:	Start Time:	Finish Time:	
Tester 1:	Assistant 1:		
Tester 2:	Assistant 2:		
Tester 1 Signature:	Tester 2 Signature:		
*Reviewer 1:	Reviewer 1 sig.:		
Reviewer 2:	Reviewer 2 sig.:		
** Safety Signature Pentant 5(PLC)	Previous Pentant 5 PLC SS#	Date: / /	
A Chain:	B Chain:	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 EEngineer.

Each numbered item below indicates a set of action items for the test procedure. The Tester will either perform the action, or delegate the action to the Assistant(s). For each step a checkmark (✓) should be made if the correct corresponding observation has been made.

	<u>Action Taken</u>	<u>Observation, Location</u>	✓
E1	Verify System Lockouts and Connect Dipole Test Jumpers Gun HVPS Output Cable Connector Modulator PS line cords (3) <u>OR</u> Booster Dipole F PS Booster RF HVPS <u>OR</u> booster low level RF drive termination <u>OR</u> Booster RF output connection to cavity SR System C RF HVPS SR System C low level RF drive termination <u>OR</u> System C SR RF output connection to cavity SR System D RF HVPS SR System D low level RF drive termination <u>OR</u> SR System D RF output connection to cavity Apply mufflers to the right hand HII side sounders 6 Connect the 4 test jumpers to the SR Dipole Power Supply interface boxes		_____ _____ _____ _____ _____ _____ _____ _____
E2	Secure enclosures Secure the injector berm area Secure the linac Secure the booster ring Note: All Mode Search Verifications can be completed using the Quick Search feature	Berm secured, Linac HMI Linac secured, Linac HMI Booster secured, Booster HMI	_____ _____ _____
E3	Verify Pentant 5 Single Pentant Search (Mode 1) Check HMI on 740 Pentant I/O Box or CR	Pentant 5 not secured A and B chain (grey), HMI	_____

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<u>Action Taken</u>	<u>Observation, Location</u>	<u>✓</u>
Three Searchers enter Service Building 5		_____
Press P5-SB1 Service Bldg. 5	Light on search button illuminates	_____
	Search sounder alarm sounds	_____
	Overhead lighting flashes during search	_____
One searcher remains on P4 side of Gate 5		_____
Close Gate 5 and press SB2	Light on search button illuminates	_____
Press SB3 on HII 1	Light on search button illuminates	_____
	Amber HII 1 search beacon is ON	_____
Press SB4 on HII 2	Light on search button illuminates	_____
	Amber HII 2 search beacon is ON	_____
Press SB5 on HII 3	Light on search button illuminates	_____
	Amber HII 3 search beacon is ON	_____
Searchers <i>simultaneously</i> press P5-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
	Light on SB1 (Service Bldg.) illuminates	_____
	Light on SB6 illuminates	_____
	Amber HII 4 search beacon is ON	_____
Press SB7 on HII 5	Light on search button illuminates	_____
	Amber HII 5 search beacon is ON	_____
Press SB8 on HII 6	Light on search button illuminates	_____
	Amber HII 6 search beacon is ON	_____
One searcher remains on P1 side of gate		_____
Close Pentant Gate 1		_____
Press SBSP	Light on search button illuminates	_____
Press P5-SB1	Light illuminates on SB1	_____
Exit through Service Building Door		_____
Press SBE	Light on SBE illuminates	_____
	Maglock engages/locks- check door	_____
	Service Bldg. 5 Maglock A and B (green), HMI	_____
	Gate 5 switches A and B ON (green), HMI	_____
	Gate 5 Maglock A and B ON (green), HMI	_____
	Gate 1 switches A and B ON (green), HMI	_____
<i>After beam imminent warning sounds:</i>	Service Bldg Door sign illuminates (A and B sect.)	_____
(Note: beam imminent timed in step E4)	Pentant 5 Secured A and B chain, HMI	_____
	Gate 5 sign illuminates (A and B sect.)	_____
	Gate 1 sign illuminates (A and B sect.)	_____
Request Operator grant access permit for P5		_____
Press Access Request button at Serv. Building Door 5	Pentant 5 unsecured A and B chain, HMI	_____

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	<u>Action Taken</u>	<u>Observation, Location</u>	✓
	if necessary (other pentants secure)		_____
	Open Door	No alarm sounds in Control Room	_____
E4	Verify Pentant 5 Starting Multiple Pentant Search (Mode 2) and time Beam imminent warning		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 5 not secured A and B chain (grey), HMI	_____
	Three Searchers enter Service Building 5		_____
	Press P5-SB1 in Pentant 5 Service Bldg. 5	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
		Overhead lighting flashes during search	_____
	Close Gate 5 and press SB2	Light on search button illuminates	_____
	Press SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P5-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		_____
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 1		_____
	Reach through Gate 1 Press SB9 and <i>begin timing audible alarm</i>		_____
		Light on search button illuminates	_____
		Maglock engages/check gate	_____
		Service Bldg. 5 Maglock A and B ON (green), HMI	_____
		Gate 1 Maglock A and B ON (green), HMI	_____
		Gate 5 switches A and B (green), HMI	_____
		Gate 1 switches A and B (green), HMI	_____
		Beam Imminent alarm sounds for 60 seconds	_____
	<i>After beam imminent warning sounds:</i>		
		Pentant 5 Secured A and B chain, HMI	_____
		Gate 1 sign illuminates (A and B sect.)	_____

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E5	Operations Enable Switch (Pendant 5 Main I/O box)		
		Pendant 5 Secured A and B chain, (green) HMI	_____
	Rotate the operations enable switch to OFF	Pendant 5 NOT Secured A and B chain (grey), HMI	_____
	Attempt to secure Pendant 5	Pendant 5 will not secure	_____
	Rotate the operations enable switch to ON		_____
	Reset the fault at the Pendant 5 I/O box		_____
E6	Verify Pendant 5 Continuing Multiple Pendant Search (Mode 3) and time Red Beacons		
	Check HMI on 740 Pendant I/O Box or CR	Pendant 5 not secured A and B chain (grey), HMI	_____
	Close Gate 5 and press SB2	Light on search button illuminates	_____
	Press P5-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P5-SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P5-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate	Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pendant Gate 1		_____
	Reach through Gate 1 press SB9 and <i>begin timing the Red Beacons on HII devices (6)</i>	Light on search button illuminates	_____
		Maglock engages/locks- check door	_____
		Service Bldg. 5 Maglock A and B (green), HMI	_____
		Gate 1 Maglock A and B (green), HMI	_____
		Gate 5 switches A and B (green), HMI	_____
		Gate 1 switches A and B (green), HMI	_____
	After Beam Imminent alarm:	Pendant 5 Secured A and B chain, HMI	_____
		Red Beacons (6) flash for 60 seconds	_____
		HII Red area Secure A and B lights illuminated	_____
	Request Operator grant access permit for P5		_____
		Pendant 5 not secured A and B chain (grey), HMI	_____
	Open Gate	No alarm sounds in control room	_____

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E7	Verify Pentant 5 Completing Multiple Pentant Search (Mode 4)		
	Check HMI on 740 Pentant I/O Box or CR	Pentant 5 not secured A and B chain (grey), HMI	_____
	Close Gate 5 and press SB2	Light on search button illuminates	_____
	Press P5-SB3 on HII 1	Light on search button illuminates	_____
		Amber HII 1 search beacon is ON	_____
	Press P5-SB4 on HII 2	Light on search button illuminates	_____
		Amber HII 2 search beacon is ON	_____
	Press SB5 on HII 3	Light on search button illuminates	_____
		Amber HII 3 search beacon is ON	_____
	Searchers <i>simultaneously</i> press P5-SB1 (Service Bldg.) and SB6 on HII 4 until the lights illuminate		
		Light on SB1 (Service Bldg.) illuminates	_____
		Light on SB6 illuminates	_____
		Amber HII 4 search beacon is ON	_____
	Press SB7 on HII 5	Light on search button illuminates	_____
		Amber HII 5 search beacon is ON	_____
	Press SB8 on HII 6	Light on search button illuminates	_____
		Amber HII 6 search beacon is ON	_____
	Close Pentant Gate 1		
	Press SBSP	Light on search button illuminates	_____
	Press P5-SB1 at Service Building Door	Light illuminates on SB1	_____
	Exit through Service Building Door		
	Press SBE	Light on SBE illuminates	_____
	After Beam Imminent alarm:	Pentant 5 Secured A and B chain, HMI	_____
E8	Access Pentant and check HII (6)		
	Request Operator grant access permit for P5	If other pentants secure the Access Request button at Service Bldg. 5 illuminates	_____
	Press Access Request button at Service Building Door if necessary (other pentants secure)	P5 Service Bldg. Door Maglock Off (grey), HMI	_____
		Pentant 5 not secured A and B chain (grey), HMI	_____
		Door is open	_____
	Check HII indicators	Red Beacons OFF	_____
		Red Secure A and B lights OFF	_____
		Green HII "Beam Disabled" lights illuminated	_____
	Proceed to P5-SB2		_____
E9	Search Timeout (Mode 2)		
	Press P5-SB2 in Pentant 5 and begin <i>timing</i>	Light on search button illuminates	_____
		Search sounder alarm sounds	_____
	Complete search in sequence <i>without</i> pressing SB9		_____

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		Light and sounders go out in 12 minutes	_____
	Press SB9	Mode 2 Search does not complete	_____
E10	Skip the Two Button Simultaneous Press (Mode 1) using Quick Search		
	Close gates and doors and put into Quick Search		
	Press SB1	Light on search button illuminates	_____
	Press SB2	Light on search button illuminates	_____
	Press SB3	Light on search button illuminates	_____
	Press SB4	Light on search button illuminates	_____
	Press SB5	Light on search button illuminates	_____
	Press SB1		_____
	Press SB6		_____
	Press SB7		_____
	Press SB8		_____
	Press SB9	Pendant 5 does NOT Secure on A or B chains	_____
E11	Emergency Stop Aborts Search		
	Complete a normal search using ANY Mode	Mode used =	_____
	<i>Before</i> the beam imminent warning sounder stops,		
	Press an Emergency Stop	Beam imminent warning stops	_____
		Red Beacons are NOT flashing	_____
		Pendant does not secure on either chain, HMI	_____
E12	A Chain Entrance Door Switches Service Building 5		
	Place holders on the A chain Service Building 5 Door switches (4) and attach actuator on Magnetic lock		
	Close Pendant gates 4 and 5		
	Perform all actions and make observations for both door A chain switches A1 and A2		
			<u>A1</u> <u>A2</u>
	Quick Search Pendant 5 (A chain)	Pendant 5 secured A chain (green), HMI	_____
		Service Bldg. 5 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 5 stationary door switch	Pendant 5 unsecured A chain (grey), HMI	_____
		Service Bldg. 5 Door SW A chain OFF (grey), HMI	_____
	Replace holder on stationary door		_____
			<u>A1</u> <u>A2</u>
	Quick Search Pendant 5 (A chain)	Pendant 5 secured A chain (green), HMI	_____
		Service Bldg. 5 Door SW A chain ON (green), HMI	_____
	Remove holder from Service Building 5 active door switch		_____
		Pendant 5 unsecured A chain (grey), HMI	_____
		Service Bldg. 5 Door SW A chain OFF (grey), HMI	_____
	Replace holder on active door		_____

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E13	<i>Pentant 5 A Chain Quick Search Timeout</i>			
	Quick search Pentant 5 and <i>begin timing</i>	Pentant 5 secured A chain (green), HMI		_____
		Pentant 5 unsecured in 5 minutes (grey), HMI		_____
	Remove A chain switch holders			_____
 E14	<i>B Chain Entrance Door Switches Service Building 5</i>			
	Place holders on the B chain Service Building 5 Door switches (4)			_____
	Close Pentant gates			_____
	Perform all actions and make observations for both door B chain switches B1 and B2			
			<u>B1</u>	<u>B2</u>
	Quick Search Pentant 5 (B chain)	Pentant 5 secured B chain (green), HMI	_____	_____
	Remove holder from Service Building 5 stationary door switch	Service Bldg. 5 Door SW A chain ON (green), HMI	_____	_____
		Pentant 5 unsecured B chain (grey), HMI	_____	_____
	Replace holder on stationary door	Service Bldg. 5 Door SW B chain OFF (grey), HMI	_____	_____
			<u>B1</u>	<u>B2</u>
	Quick Search Pentant 5 (B chain)	Pentant 5 secured B chain (green), HMI	_____	_____
	Remove holder from Service Building 5 active door switch	Service Bldg. 5 Door SW B chain ON (green), HMI	_____	_____
		Pentant 5 unsecured B chain (grey), HMI	_____	_____
	Replace holder on active door	Service Bldg. 5 Door SW B chain OFF (grey), HMI	_____	_____
 E15	<i>Pentant 5 B Chain Quick Search Timeout</i>			
	Quick search Pentant 5 and <i>begin timing</i>	Pentant 5 secured B chain		_____
		Pentant 5 unsecured in 5 minutes		_____
 E16	<i>Service Building 5 Door Emergency Egress</i>			
	Attach B chain Maglock Actuator with tape			_____
	Perform B chain Pentant 5 quick search	Pentant 5 secured B chain ON (green), HMI		_____
		Service Bldg. 5 Door Maglock B chain ON (green), HMI		_____
	Remove actuator	Service Bldg. 5 Door Maglock B chain OFF (grey), HMI		_____
		Pentant 5 unsecured (grey), HMI		_____
	Close door			_____
	Perform A chain Pentant 5 search	Pentant 5 secured A chain (green), HMI		_____
		Service Bldg. 5 Door Maglock A chain ON (green), HMI		_____

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	Press in door push bar without opening door	Service Bldg. 5 Door Maglock A chain OFF (grey), HMI	_____
		Pentant 5 unsecured (grey), HMI	_____
	Open door	Door opens	_____
	Close door and stay outside of ring		_____
E17	Service Building 5 Door Emergency Stop		
	Perform A chain Pentant 5 quick search	Pentant 5 secured A chain	_____
		Service Bldg. 5 Door Maglock A chain ON (green), HMI	_____
	Press in external emergency stop	Service Bldg. 5 Door Maglock A chain OFF (grey), HMI	_____
		Pentant 5 unsecured, HMI	_____
	Pull out emergency stop	Emergency Stop Latch A chain OFF (grey), HMI	_____
	Reset emergency stop	Emergency Stop Latch A chain ON (green), HMI	_____
	Perform B chain Pentant 5 search	Pentant 5 secured B chain	_____
		Serv. Bldg. 5 Door Maglock B chain ON (green), HMI	_____
	Press in emergency stop	Service Bldg. 5 Door Maglock B chain OFF (grey), HMI	_____
		Pentant 5 unsecured, HMI	_____
	Pull out emergency stop	Emergency Stop Latch B chain OFF (grey), HMI	_____
	Open door	Door opens	_____
	Reset emergency stop	Emergency Stop Latch B chain ON (green), HMI	_____
	Close door	All gates and doors closed	_____
E18	Pentant 5 HII Emergency stops		
	Repeat all steps for each HII		
	<i>A Chain:</i>		
		<u>HII-1</u>	<u>HII-2</u>
		<u>HII-3</u>	<u>HII-4</u>
		<u>HII-5</u>	<u>HII-6</u>
	Quick search Pentant 5 on A Chain	_____	_____
	Pentant 5 secured A chain (green), HMI	_____	_____
	Emergency Stop Latch A chain ON (green), HMI	_____	_____
	Press in emergency stop	_____	_____
	Pentant 5 unsecured A chain (grey), HMI	_____	_____
	Pull out emergency stop	_____	_____
	Emergency Stop Latch A chain OFF (grey), HMI	_____	_____
	Reset fault and latch at Pentant 5 I/O box	_____	_____
	Emergency Stop Latch A chain ON (green), HMI	_____	_____

B Chain:

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		<u>HII-1</u>	<u>HII-2</u>	<u>HII-3</u>	<u>HII-4</u>	<u>HII-5</u>	<u>HII-6</u>		
	Quick search Pentant 5 on B Chain	_____	_____	_____	_____	_____	_____		
	Pentant 5 secured B chain (green), HMI	_____	_____	_____	_____	_____	_____		
	Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____		
	Press in emergency stop	_____	_____	_____	_____	_____	_____		
	Pentant 5 unsecured B chain (grey), HMI	_____	_____	_____	_____	_____	_____		
	Pull out emergency stop	_____	_____	_____	_____	_____	_____		
	Emergency Stop Latch B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____		
	Reset fault and latch at Pentant 5 I/O box	_____	_____	_____	_____	_____	_____		
	Emergency Stop Latch B chain ON (green), HMI	_____	_____	_____	_____	_____	_____		
E19	<u>Pentant 5 Gate 5 Switches</u>								
	Proceed to the gate between pentants 4 and 5								_____
	Place holders on the A chain gate switches								_____
	Perform all actions and make observations for both Gate 5 A chain switches A1 and A2								
								<u>A1</u>	<u>A2</u>
	Quick Search Pentant 4 (A chain)							_____	_____
	Quick Search Pentant 5 (A chain)							Pentant 5 secured A chain (green), HMI	_____
								Gate 5 SW A chain ON (green), HMI	_____
	Remove holder from Gate A chain switch								_____
								Pentant 5 unsecured A chain (grey), HMI	_____
								Gate 5 SW A chain OFF (grey), HMI	_____
	Remove Gate A chain switch holders								_____
	Place holders on the B chain gate switches								_____
	Perform all actions and make observations for both Gate 5 B chain switches B1 and B2								
								<u>B1</u>	<u>B2</u>
	Quick Search Pentant 4 (B chain)							_____	_____
	Quick Search Pentant 5 (B chain)							Pentant 5 secured B chain (green), HMI	_____
								Gate 5 SW B chain ON (green), HMI	_____
	Remove holder from Gate 5 B switch								_____
								Pentant 5 unsecured B chain (grey), HMI	_____
								Gate 5 SW B chain OFF (grey), HMI	_____
	Remove switch holders and close gate								_____
E20	<u>Gate 5 Emergency Stop (in Pentant 5)</u>								
	Quick Search Pentant 5 on A Chain							Pentant 5 Secured A chain (green), HMI	_____
								Emergency Stop Latch A chain (green), HMI	_____
								Gate 5 Maglock A chain ON (green), HMI	_____
	Press the Gate 5 Emergency stop							Pentant 5 unsecured (grey), HMI	_____
								Gate 5 Maglock A chain OFF (grey), HMI	_____
	Pull out Gate 5 Emergency stop							Emergency Stop Latch A chain OFF (grey), HMI	_____

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	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI	_____	
	Quick Search Pentant 5 on B Chain	Pendant 5 Secured B chain (green), HMI	_____	
		Emergency Stop Latch B chain, (green), HMI	_____	
		Gate 5 Maglock B chain ON (green), HMI	_____	
	Press the Gate 5 emergency stop	Pendant 5 unsecured (grey), HMI	_____	
		Gate 5 Maglock B chain OFF (grey), HMI	_____	
	Pull out Gate 5 Emergency stop	Emergency Stop Latch A chain OFF (grey), HMI	_____	
	Reset fault and latch	Emergency Stop Latch A chain ON (green), HMI	_____	
E21	Gate 5 Push Bar Test			
	Quick Search Pentant 5 on A chain	Pendant 5 Secure A chain (green), HMI	_____	
		Gate 5 Maglock A chain ON (green), HMI	_____	
	Push in gate Push Bar without opening gate	Pendant 5 NOT Secure A chain, HMI	_____	
		Gate 5 Maglock A chain OFF (grey), HMI	_____	
	Release Push bar		_____	
	Place holders on B chain switches		_____	
	Attach B chain Maglock Actuator with tape		_____	
	Quick search Pentant 5 on B chain	Pendant 5 Secure B chain (green), HMI	_____	
		Gate 5 Maglock B chain ON (green), HMI	_____	
		Pendant 5 NOT Secure B chain (OFF), HMI	_____	
		Gate 5 Maglock B chain OFF (grey), HMI	_____	
	Release Push bar		_____	
	Remove holders and close gate		_____	
E22	Gate 1 Switches			
	Proceed to the gate between pentants 5 and 1		_____	
	Place holders on the A chain gate switches		_____	
	Perform all actions and make observations for both Gate 1 A chain switches A1 and A2			<u>A1</u> <u>A2</u>
	Quick Search Pentant 1 (A chain)	Pendant 1 secured A chain (green), HMI	_____	_____
	Quick Search Pentant 5 (A chain)	Pendant 5 secured A chain (green), HMI	_____	_____
		Gate 1 SW A chain ON (green), HMI	_____	_____
	Remove holder from Gate 1 switch		_____	_____
		Pendant 5 unsecured A chain (grey), HMI	_____	_____
		Gate 1 SW A chain OFF (grey), HMI	_____	_____
	Place holders on the B chain gate switches		_____	
	Perform all actions and make observations for both Gate 1 B chain switches B1 and B2			

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B1 **B2**

Quick Search Pentant 1 (A chain)	Pentant 1 secured B chain (green), HMI	_____	_____
Quick Search Pentant 5 (B chain)	Pentant 5 secured B chain (green), HMI	_____	_____
	Gate 1 SW B chain ON (green), HMI	_____	_____
Remove holder from Gate 1 switch		_____	_____
	Pentant 5 unsecured B chain (grey), HMI	_____	_____
	Gate 1 SW B chain OFF (grey), HMI	_____	_____
Remove switch holders and close gate		_____	_____

E23 **Pentant 5 Maintenance Doors A Chain**

Place A chain actuators into each Maintenance door connectors and complete all steps for each Maintenance Door (MD)

	<u>17ID</u>	<u>18ID</u>	<u>19ID</u>	<u>20ID</u>	<u>21ID</u>	<u>22ID</u>
Quick Search Pentant 5 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A1	_____	_____	_____	_____	_____	_____
Pentant 5 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 5 on A chain	_____	_____	_____	_____	_____	_____
Pentant secured on A chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch A2	_____	_____	_____	_____	_____	_____
Pentant 5 Not secured A chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors A chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in A2	_____	_____	_____	_____	_____	_____
Remove actuators	_____	_____	_____	_____	_____	_____

E24 **Pentant 5 Maintenance Doors B Chain**

Place B chain actuators into each Maintenance door connector and complete all steps for each Maintenance Door (MD)

	<u>17ID</u>	<u>18ID</u>	<u>19ID</u>	<u>20ID</u>	<u>21ID</u>	<u>22ID</u>
Quick Search Pentant 5 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain ON (green), HMI	_____	_____	_____	_____	_____	_____
Remove Actuator in switch B1	_____	_____	_____	_____	_____	_____
Pentant 5 Not secured B chain (grey), HMI	_____	_____	_____	_____	_____	_____
Sum of Maint Doors B chain OFF (grey), HMI	_____	_____	_____	_____	_____	_____
Replace actuator in B1	_____	_____	_____	_____	_____	_____
Quick Search Pentant 5 on B chain	_____	_____	_____	_____	_____	_____
Pentant secured on B chain (green), HMI	_____	_____	_____	_____	_____	_____

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Sum of Maint Doors B chain ON (green), HMI _____

Remove Actuator in switch B2 _____

Pendant 5 Not secured B chain (grey), HMI _____

Sum of Maint Doors B chain OFF (grey), HMI _____

Remove actuators and ensure all Pendant 5 Maintenance door connectors are on _____

E25 *Pendant Access Allowed only with Dipole (Negative) PS Contactors OFF*

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply _____

Secure all Pendants SR secure for OPS, HMI _____

Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor Negative PS door cabinet open _____

Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver _____

Request Operator press P5 Access Request button Access Request button does not illuminate _____

Access Request with critical device On alarm, HMI Serv. Bldg. 5 door remains locked on A chain, HMI _____

Primary Authorized Power Supply Employee releases the A chain contactor _____

Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver _____

Request Operator press P5 Access Request button Access Request button illuminates _____

Press Access request button at Service Building when lit Pendant remains secure on A and B chain _____

Serv. Bldg. 5 door remains locked on B chain, HMI _____

Primary Authorized Power Supply Employee releases the B chain contactor _____

Close cabinet door _____

E26 *Pendant Access Allowed only with Dipole (Positive) PS Contactors OFF*

Primary Authorized Power Supply Employee LOTOs SR Dipole power supply _____

Secure all Pendants SR secure for OPS, HMI _____

Primary Authorized Power Supply Employee open cabinet door to access the A chain contactor Positive PS cabinet door open _____

Primary Authorized Power Supply Employee push in the A chain contactor with a screwdriver _____

Request Operator press P5 Access Request button Access request button does not illuminate _____

Access Request with critical device On alarm, HMI Serv. Bldg. 5 door remains locked on A chain, HMI _____

Primary Authorized Power Supply Employee releases the A chain contactor _____

Primary Authorized Power Supply Employee push in the B chain contactor with a screwdriver _____

Request Operator press P5 Access Request button Access Request button illuminates _____

Press Access Request button at Service Building when lit Pendant remains secure on A and B chain _____

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		Serv. Bldg. 5 door remains locked on B chain, HMI	_____
		Primary Authorized Power Supply Employee releases the B chain contactor	_____
		Close cabinet door	_____
		Remove LOTO from SR Dipole Power Supply	_____
E27		Pendant Access Allowed only with SR System C RF HVPS Contactors OFF	_____
		Primary Authorized RF Employee applies LOTO to RF HVPS	_____
		Primary Authorized RF Employee open cabinet door to access the A chain contactor	_____
		Primary Authorized RF Employee push in the RF HVPS A chain contactor with a screwdriver	_____
		Request Operator press P5 Access Request button	_____
		Access Request button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 5 door remains locked on A chain, HMI	_____
		Primary Authorized RF Employee releases the A chain contactor	_____
		Primary Authorized RF Employee push in the RF HVPS B chain contactor with a screwdriver	_____
		Request Operator press P5 Access Request button	_____
		Access Request button illuminates	_____
		Press Access Request button at Service Building	_____
		when lit	_____
		Pendant remains secure on A and B chain	_____
		Serv. Bldg. 5 door remains locked on B chain, HMI	_____
		Primary Authorized RF Employee releases the B chain contactor	_____
		Close cabinet door	_____
E28		Pendant Access Allowed only with SR System D RF HVPS Contactors OFF	_____
		Primary Authorized RF Employee applies LOTO to RF HVPS	_____
		Primary Authorized RF Employee open cabinet door to access the A chain contactor	_____
		Primary Authorized RF Employee push in the RF HVPS A chain contactor with a screwdriver	_____
		Request Operator press P5 Access Request button	_____
		Access Request button does not illuminate	_____
		Access Request with critical device On alarm, HMI	_____
		Serv. Bldg. 5 door remains locked on A chain, HMI	_____
		Primary Authorized RF Employee releases the A chain contactor	_____
		Primary Authorized RF Employee push in the RF HVPS B chain contactor with a screwdriver	_____
		Request Operator press P5 Access Request button	_____
		Access Request button illuminates	_____
		Press Access Request button at Service Building	_____
		when lit	_____
		Pendant remains secure on A and B chain	_____
		Serv. Bldg. 5 door remains locked on B chain, HMI	_____
		Primary Authorized RF Employee releases the B chain contactor	_____
		Close cabinet door	_____
E29		Pendant Access Allowed only with BTS Shutter Closed	_____
		Request Operator open the BTS shutter	_____
		BTS Shutter opens	_____
		Request Operator press P5 Access Request button	_____
		Access Request button at P5 Serv. Bldg. does not illuminate	_____

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	Operator closes shutter	Access Request with critical device On alarm, HMI	_____
		BTS shutter closed	_____
	Request Operator press P5 Access Request button	Access Request button illuminates outside P5 Service Building Door main entrance	_____
E30	<i>Pendant Access Allowed Only with BTS B2 Bending Magnet OFF</i>		
	Using shunt test box, apply current to the # 1 BTS B2 shunt box		_____
	Request Operator press P5 Access Request button	Access Request button at P5 Serv. Bldg. illuminates	_____
	Press the button at Service Building	Pendant remains secure on A and B chain	_____
		Serv. Bldg. 5 door remains locked on B chain, HMI	_____
	Disconnect shunt box from shunt 1		_____
	Using shunt test box, apply current to the # 2 BTS B2 shunt box		_____
	Request Operator press P5 Access Request button	Access Request button at P5 Serv. Bldg. illuminates	_____
	Press the button at Service Building	Pendant remains secure on A and B chain	_____
		Serv. Bldg. 5 door remains locked on B chain, HMI	_____
	Disconnect shunt box from shunt 2		_____
E31	<i>Magnet Test Mode Breaks Security</i>	<input type="checkbox"/> Completed on Pendant 3 Test	
		Pendant 1 Secure A and B chains (green), HMI	_____
	Rotate Magnet Test key in place on Pendant 2 Mezzanine		_____
		Magnet Test Mode A and B ON (green), HMI	_____
		Pendant 1 unsecured A and B chain (grey), HMI	_____
		Dipole Permits A and B ON (green), HMI	_____
	Request Operator turn on Dipole PS	Dipole PS is ON	_____
	Press in Pendant Emergency Stop	Dipole PS is OFF	_____
		Dipole Permits A and B OFF (grey), HMI	_____
	Pull out Emergency Stop	Emergency Stop Latched and Dipole PS remains OFF	_____
	Reset fault and remove Magnet Test key	Magnet Test Mode A and B OFF (grey), HMI	_____
		Dipole Permit A and B OFF (grey), HMI	_____
		<i>Caution: Failure to OPEN Q1 for Waveguide Switch test can result in damage to the power supply</i>	
E32	<i>System C Waveguide Switch Test (Cavity Mode)</i>		
	Secure the Storage Ring	Pendants 1 through 5 are secure	_____
	A Primary Authorized RF Employee performs the following steps:		
	a. Disconnect System C low level RF drive to the SR System C RF HVPS		
	b. In the AC contactor enclosure: Turn OFF AC switch Q1		
	c. Locate relay K10 and place the manual operator in the ACTUATED position (manual operator is flipped up).		
	d. Close the AC contactor enclosure and secure with appropriate latch tool.		_____
	Install J1 Interlock test connectors on the A and B Chain Power Supply Interface Boxes		_____

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Remove tester LOTO from the SR RF-1-PS-C breaker.		_____
The Primary Authorized RF Employee removes their LOTO and turns ON the SR RF-1-PS-C breaker. The A and B contactors will turn on but there will be <i>no dc output</i> of the power supply.		_____
Place actuators into the System C Cavity Mode waveguide switches 1A and 1B		_____
Reset at I/O Box		_____
	Gun Permits A and B ON, Linac HMI	_____
Request Operator open the BTS shutter	Shutter Open	_____
Observe System C RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
Observe System D RF HVPS Interfaces	D RF HVPS Interface "A1 Permit" light is ON	_____
	D RF HVPS Interface "A2 Permit" light is ON	_____
	D RF HVPS Interface "B1 Permit" light is ON	_____
	D RF HVPS Interface "B2 Permit" light is ON	_____
	RF in Cavity Mode, HMI	_____
Remove the actuator from the 1A switch		_____
Observe System C RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is ON	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is OFF	_____
	RF HVPS Interface "A2 Permit" light is OFF	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
Observe System D RF HVPS Interfaces	D RF HVPS Interface "A1 Permit" light is OFF	_____
	D RF HVPS Interface "A2 Permit" light is OFF	_____
	D RF HVPS Interface "B1 Permit" light is ON	_____
	D RF HVPS Interface "B2 Permit" light is ON	_____
	Gun Permits A Permit OFF, Linac HMI	_____
	BTS Shutter Closes	_____
Request Operator open the BTS shutter	Shutter does not open	_____
Replace the actuator in the 1A switch		_____
Reset at I/O box		_____
Observe System C RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____

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Observe System D RF HVPS Interfaces	D RF HVPS Interface "A1 Permit" light is ON	_____
	D RF HVPS Interface "A2 Permit" light is ON	_____
	D RF HVPS Interface "B1 Permit" light is ON	_____
	D RF HVPS Interface "B2 Permit" light is ON	_____

Remove the actuator from the 1B switch		_____
Observe System C RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is ON	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is OFF	_____
	RF HVPS Interface "B2 Permit" light is OFF	_____
	D RF HVPS Interface "A1 Permit" light is ON	_____
	D RF HVPS Interface "A2 Permit" light is ON	_____
	D RF HVPS Interface "B1 Permit" light is OFF	_____
	D RF HVPS Interface "B2 Permit" light is OFF	_____

Request Operator open the BTS shutter	Shutter does not open	_____
Remove actuators from the # 1 switches		_____

E33 System C RF Waveguide Switch Test (Test Load Mode)

Place actuators into the System C waveguide switches 3A and 3B		_____
Reset at I/O Box	RF in Test Mode, HMI	_____
Request Operator open the BTS shutter	Shutter does not open	_____

RF HVPS Interface "A chain Contactor Open" is OFF	_____
RF HVPS Interface "B chain Contactor Open" is OFF	_____
RF HVPS Interface "A1 Permit" light is ON	_____
RF HVPS Interface "A2 Permit" light is ON	_____
RF HVPS Interface "B1 Permit" light is ON	_____
RF HVPS Interface "B2 Permit" light is ON	_____

Remove the actuator from the 3A switch	RF HVPS Interface "A chain Contactor Open" is ON	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is OFF	_____
	RF HVPS Interface "A2 Permit" light is OFF	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____

Replace the actuator in the 3A switch		_____
Reset at I/O box	RF HVPS Interface "A chain Contactor Open" is OFF	_____

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	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
Remove the actuator from the 3B switch	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is ON	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is OFF	_____
	RF HVPS Interface "B2 Permit" light is OFF	_____
Remove actuators from the # 3 switches		_____
Primary Authorized RF Employee LOTO the system C RF HVPS and return Q1 to the ON position		_____
Remove the J1 Test Plugs from the System C RF HVPS Interface boxes		_____
Primary Authorized RF Employee remove LOTO from the System C RF HVPS		_____
<u>Caution: Failure to OPEN Q1 for Waveguide Switch test can result in damage to the power supply</u>		_____
E34	<u>System D Waveguide Switch Test (Cavity Mode)</u>	_____
A Primary Authorized RF Employee performs the following steps:		_____
a. Disconnect System D low level RF drive to the SR System D RF HVPS		_____
b. In the AC contactor enclosure: Turn OFF AC switch Q1		_____
c. Locate relay K10 and place the manual operator in the ACTUATED position (manual operator is flipped up).		_____
d. Close the AC contactor enclosure and secure with appropriate latch tool.		_____
Install J1 Interlock test connectors on the A and B Chain Power Supply Interface Boxes		_____
Remove tester LOTO from the SR RF-1-PS-D breaker.		_____
The Primary Authorized RF Employee removes their LOTO and turns ON the SR RF-1-PS-D breaker. The A and B contactors will turn on but there will be no dc output of the power supply.		_____
Place actuators into the System D Cavity Mode waveguide switches 1A and 1B		_____
Reset at I/O Box		_____
	Gun Permits A and B ON, Linac HMI	_____
Request Operator open the BTS shutter	Shutter Open	_____
Observe System D RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
	RF in Cavity Mode, HMI	_____
Observe System C RF HVPS Interfaces	C RF HVPS Interface "A1 Permit" light is ON	_____

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	C RF HVPS Interface "A2 Permit" light is ON	_____
	C RF HVPS Interface "B1 Permit" light is ON	_____
	C RF HVPS Interface "B2 Permit" light is ON	_____
Remove the actuator from the 1A switch		_____
Observe System D RF HVPS Interfaces	RF HVPS Interface "A chain Contactor Open" is ON	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is OFF	_____
	RF HVPS Interface "A2 Permit" light is OFF	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
	Gun Permits A Permit OFF, Linac HMI	_____
Observe System C RF HVPS Interfaces	C RF HVPS Interface "A1 Permit" light is OFF	_____
	C RF HVPS Interface "A2 Permit" light is OFF	_____
	C RF HVPS Interface "B1 Permit" light is ON	_____
	C RF HVPS Interface "B2 Permit" light is ON	_____
	BTS Shutter Closes	_____
Request Operator open the BTS shutter	Shutter does not open	_____
Replace the actuator in the 1A switch		_____
Reset at I/O box	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is OFF	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is ON	_____
	RF HVPS Interface "B2 Permit" light is ON	_____
Observe System C RF HVPS Interfaces	C RF HVPS Interface "A1 Permit" light is ON	_____
	C RF HVPS Interface "A2 Permit" light is ON	_____
	C RF HVPS Interface "B1 Permit" light is ON	_____
	C RF HVPS Interface "B2 Permit" light is ON	_____
Remove the actuator from the 1B switch	RF HVPS Interface "A chain Contactor Open" is OFF	_____
	RF HVPS Interface "B chain Contactor Open" is ON	_____
	RF HVPS Interface "A1 Permit" light is ON	_____
	RF HVPS Interface "A2 Permit" light is ON	_____
	RF HVPS Interface "B1 Permit" light is OFF	_____
	RF HVPS Interface "B2 Permit" light is OFF	_____
Observe System C RF HVPS Interfaces	C RF HVPS Interface "A1 Permit" light is ON	_____
	C RF HVPS Interface "A2 Permit" light is ON	_____
	C RF HVPS Interface "B1 Permit" light is OFF	_____
	C RF HVPS Interface "B2 Permit" light is OFF	_____

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	Request Operator open the BTS shutter	Shutter does not open	_____
	Remove actuators from the # 1 switches		_____
E35	System D RF Waveguide Switch Test (Test Load Mode)		_____
	Place actuators into the waveguide switches 3A and 3B		_____
	Reset at I/O Box	RF in Test Mode, HMI	_____
	Request Operator open the BTS shutter	Shutter does not open	_____
	Observe System D RF HVPS Interfaces		_____
		RF HVPS Interface "A chain Contactor Open" is OFF	_____
		RF HVPS Interface "B chain Contactor Open" is OFF	_____
		RF HVPS Interface "A1 Permit" light is ON	_____
		RF HVPS Interface "A2 Permit" light is ON	_____
		RF HVPS Interface "B1 Permit" light is ON	_____
		RF HVPS Interface "B2 Permit" light is ON	_____
	Remove the actuator from the 3A switch	RF HVPS Interface "A chain Contactor Open" is ON	_____
		RF HVPS Interface "B chain Contactor Open" is OFF	_____
		RF HVPS Interface "A1 Permit" light is OFF	_____
		RF HVPS Interface "A2 Permit" light is OFF	_____
		RF HVPS Interface "B1 Permit" light is ON	_____
		RF HVPS Interface "B2 Permit" light is ON	_____
	Replace the actuator in the 3A switch		_____
	Reset at I/O box	RF HVPS Interface "A chain Contactor Open" is OFF	_____
		RF HVPS Interface "B chain Contactor Open" is OFF	_____
		RF HVPS Interface "A1 Permit" light is ON	_____
		RF HVPS Interface "A2 Permit" light is ON	_____
		RF HVPS Interface "B1 Permit" light is ON	_____
		RF HVPS Interface "B2 Permit" light is ON	_____
	Remove the actuator from the 3B switch	RF HVPS Interface "A chain Contactor Open" is OFF	_____
		RF HVPS Interface "B chain Contactor Open" is ON	_____
		RF HVPS Interface "A1 Permit" light is ON	_____
		RF HVPS Interface "A2 Permit" light is ON	_____
		RF HVPS Interface "B1 Permit" light is OFF	_____
		RF HVPS Interface "B2 Permit" light is OFF	_____
	Remove actuators from the # 3 switches		_____
	Primary Authorized RF Employee LOTO the system D RF HVPS and return Q1 to the ON position		_____
	Remove the J1 Test Plugs from the System D RF HVPS Interface boxes		_____
	Primary Authorized RF Employee remove LOTO from the System D RF HVPS		_____
E36	Blockhouse Waveguide Switch Test		_____

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- Place waveguide switches into either Cavity Mode in both Systems C and D _____
- Perform a reset
 - System C RF permits ON, RFPSI _____
 - System D RF permits ON, RFPSI _____
- Attempt to turn on Systems C AND D
 - Systems C AND D turn ON _____
- Turn System C AND D OFF
 - Systems C AND D turn OFF _____
- Remove Cavity Mode Waveguide switches and put actuators into the Blockhouse Waveguide System C switches _____
- Perform a reset
 - System C RF permits OFF, RFPSI _____
 - System D RF permits OFF, RFPSI _____
- Attempt to turn on Systems C AND D
 - Systems C AND D do NOT turn ON _____
- Remove actuator from Blockhouse Waveguide switches. _____
- Return System C AND D to Cavity Mode _____
- Perform a reset
 - System C RF permits ON, RFPSI _____
 - System D RF permits ON, RFPSI _____
- E37 Remove Transfer Bank Key System C** _____
- Attempt to turn on System C
 - System C turns ON _____
- Turn System C OFF
 - System C turns OFF _____
- Cycle the Control Room SR Quick Search Test key in place _____



System C Storage Ring Quick Search Box

- Attempt to turn on System C
 - System C does NOT turn ON _____
- Return SR QuickSearch key _____
- Perform a reset _____
- Attempt to turn on System C
 - System C turns ON _____
- Turn System C OFF
 - System C turns OFF _____
- E38 Remove Transfer Bank Key System D** _____
- Cycle Quick Search C from System C and transfer to System D RF Test/QS Box _____
- Attempt to turn on System D
 - System D turns ON _____
- Turn System D OFF
 - System D turns OFF _____
- Cycle the Control Room SR Quick Search Test key in place _____

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System D RF Test/ Quick Search Transfer Box

- | | | |
|-----------------------------|---------------------------|-------|
| Attempt to turn on System D | System D does NOT turn ON | _____ |
| Return SR QuickSearch key | | _____ |
| Perform a reset | | _____ |
| Attempt to turn on System D | System D turns ON | _____ |
| Turn System D OFF | System D turns OFF | _____ |
| Remove Quick Search keys | | _____ |

E39 Live Test of Storage Ring Door Switches

WARNING: Do not permit Employee from entering the Storage Ring unless authorized by the Tester who will verify the area is safe to enter.

Place Barrier "CAUTION: DO NOT ENTER" tape across entry path.

Post a Watch Outside Service Building Door 5 Main Door Entrance.

The watch shall not allow Employee to enter the pentant unless authorized by the Tester.

Place switch holders on the active P5 Service Building Door switches(4) and attach magnetic lock device _____

Secure the SR All Pentants secure A and B (green), HMI _____

SR Secure For OPS A chain ON (green), HMI _____

Gun Permits A and B ON (green), linac HMI _____

Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy _____

Gun UPA-100 is ON, gun cabinet _____

Modulators contactor ON, Linac HMI _____

SR Dipole PS is ON _____

SR System C and D RF HVPS ON _____

Turn on the BTS bending magnet and set to injection energy Bending magnet ON, HMI _____

Open the BTS Shutter Shutter is open, HMI _____

Check Dipole PS Positive PS Interface, DPSI A1 Permit is ON _____

A2 Permit is ON _____

"A Chain Contactor Open" light is OFF _____

B1 Permit is ON _____

B2 Permit is ON _____

"B Chain Contactor Open" light is OFF _____

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Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interfaces, RFPSI RF Building Check SR RF Systems C AND D	A1 Permit is ON C AND D	_____
	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF	_____
Remove A1 switch holder	Pendants unsecured A Chain (grey). HMI	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	Gun Permits A OFF (grey), Linac HMI	_____
	Gun UPA-100 is OFF, gun cabinet	_____
	SR Dipole PS shuts OFF, A chain	_____
	SR RF HVPS shuts OFF, A chain C AND D	_____
	Modulators OFF, A chain	_____
	BTS shutter closed, HMI	_____
Check Dipole PS Positive PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is OFF	_____
	A2 Permit is OFF	_____
	“A Chain Contactor Open” light is ON	_____
	B1 Permit is ON	_____
	B2 Permit is ON	_____
	“B Chain Contactor Open” light is OFF	_____
Check RF PS Interface, RFPSI RF Building Check SR RF Systems C AND D	A1 Permit is OFF C AND D	_____
	A2 Permit is OFF C AND D	_____
	“A Chain Contactor Open” light is ON C AND D	_____
	B1 Permit is ON C AND D	_____
	B2 Permit is ON C AND D	_____
	“B Chain Contactor Open” light is OFF C AND D	_____
Replace switch holder		_____

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Secure Pentant 5	All Pentants secure A and B (green), HMI SR Secure for OPS A chain ON (green), HMI Gun Permits A and B ON (green), linac HMI	_____ _____ _____
Request Operator turn on Gun HVPS, Modulator HV and set B1 and B2 bending magnet to injection energy	Gun UPA-100 is ON, gun cabinet Modulators contactor ON, Linac HMI SR Dipole PS is ON SR System C and D RF HVPS ON	_____ _____ _____ _____
Turn on the BTS bending magnet and set to injection energy Open the BTS Shutter Check Dipole PS Positive PS Interface, DPSI	Bending magnet ON, HMI Shutter is open, HMI A1 Permit is ON A2 Permit is ON "A Chain Contactor Open" light is OFF B1 Permit is ON B2 Permit is ON "B Chain Contactor Open" light is OFF	_____ _____ _____ _____ _____ _____ _____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON A2 Permit is ON "A Chain Contactor Open" light is OFF B1 Permit is ON B2 Permit is ON "B Chain Contactor Open" light is OFF	_____ _____ _____ _____ _____ _____
Check RF PS Interface, RFPSI RF Building Check SR RF Systems C AND D	A1 Permit is ON C AND D A2 Permit is ON C AND D "A Chain Contactor Open" light is OFF C AND D B1 Permit is ON C AND D B2 Permit is ON C AND D "B Chain Contactor Open" light is OFF C AND D	_____ _____ _____ _____ _____ _____
Remove B1 switch holder	Pentants unsecured B chain (grey), HMI SR Secure for OPS B chain OFF (grey), HMI Gun Permits B OFF (grey), Linac HMI Gun UPA-100 is OFF, gun cabinet SR Dipole PS shuts OFF, B chain SR C AND D RF HVPS shuts OFF, B chain Modulators OFF, B chain BTS shutter closed, HMI	_____ _____ _____ _____ _____ _____ _____ _____

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Title: NSLS-II Storage Ring Radiological Interlock Test			Technical

Check Dipole PS Positive PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check Dipole PS Negative PS Interface, DPSI	A1 Permit is ON	_____
	A2 Permit is ON	_____
	“A Chain Contactor Open” light is OFF	_____
	B1 Permit is OFF	_____
	B2 Permit is OFF	_____
	“B Chain Contactor Open” light is ON	_____
Check RF PS Interface, RFPSI RF Building	A1 Permit is ON C AND D	_____
Check SRRF Systems C AND D	A2 Permit is ON C AND D	_____
	“A Chain Contactor Open” light is OFF C AND D	_____
	B1 Permit is OFF C AND D	_____
	B2 Permit is OFF C AND D	_____
	“B Chain Contactor Open” light is ON C AND D	_____
Remove switch holders and close door		_____
Secure Pentant 5	All Pentants secure A and B (green), HMI	_____
	SR Secure for OPS A chain ON (green), HMI	_____
E40		
Live Pentant 5 Maintenance Doors		
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF C AND D Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove an A chain switch from Pentant 5 Maintenance door	Maintenance door = _____	_____
	SR Secure For OPS A chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____

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	Gun HVPS is OFF A chain	_____
	Modulators are OFF A chain	_____
Replace A chain switch and perform a reset		_____
Search Pentant 5	All Pentants secure A and B (green), HMI	_____
	SR Secure For OPS A chain ON (green), HMI	_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF C AND D Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Remove a B chain switch from Pentant 5		_____
Maintenance door	Maintenance door = _____	_____
	SR Secure for OPS B chain OFF (grey), HMI	_____
	SR Dipole PS is OFF	_____
	SR Dipole Permits OFF B chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	Gun HVPS is OFF B chain	_____
	Modulators are OFF B chain	_____
Replace B chain switch and perform a reset		_____
Search Pentant 5	All Pentants secure A and B (green), HMI	_____
	SR Secure for OPS A chain ON (green), HMI	_____
E41 Live Pentant 5 Emergency Stop		_____
Request Operator turn on gun, Modulators, SR RF HVPS, SR Dipole PS, LTB and BTS B2 magnets, open LTB and BTS shutter		_____
	SR Dipole PS is ON	_____
	SR Dipole Permits ON A and B chain (green), HMI	_____
	SR RF Systems C AND D are ON	_____
	SR RF C AND D Permits ON A and B chain (green), HMI	_____
	BTS shutter Open, HMI	_____
	Gun HVPS is ON	_____
	Modulators are ON	_____
Press in Emergency Stop at Service Building 5 entrance		_____
	SR Secure For OPS A chain OFF (grey), HMI	_____

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		SR Dipole PS is OFF	_____
		SR Dipole Permits OFF (grey), HMI	_____
		SR RF Systems C AND D are OFF	_____
		SR RF C AND D Permits OFF (grey), HMI	_____
		BTS shutter Closed, HMI	_____
		Gun HVPS is OFF	_____
		Modulators are OFF	_____
	Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____
	Reset fault and latch at Pentant 5 I/O box	Emergency Stop Latch A and B ON (green), HMI	_____
	Secure Pentant 5	All Pentants secure A and B (green), HMI	_____
		SR Secure for OPS A chain ON (green), HMI	_____
E42	Control Room Emergency Stop	<input type="checkbox"/> Completed on Pentant # _____ Test	_____
	Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter		
		SR Dipole PS is ON	_____
		SR Dipole Permits ON A and B chain (green), HMI	_____
		SR RF Systems C AND D are ON	_____
		SR RF C AND D Permits ON A and B chain (green), HMI	_____
		BTS shutter Open, HMI	_____
	Press in Emergency Stop in the Control Room		
		SR Secure For OPS A chain OFF (grey), HMI	_____
		SR Dipole PS is OFF	_____
		SR Dipole Permits OFF A chain (grey), HMI	_____
		SR RF Systems C AND D are OFF	_____
		SR RF C AND D Permits OFF (grey), HMI	_____
		BTS shutter Closed, HMI	_____
	Pull out Emergency Stop	Emergency Stop Latch A and B OFF (grey), HMI	_____
	Reset fault and latch in the Control Room	Emergency Stop Latch A and B ON (green), HMI	_____
E43	Ignition Key (drops critical devices but not search)	<input type="checkbox"/> Completed on Pentant # _____ Test	_____
	Request Operator Turn on SR RF HVPS, SR Dipole PS and open BTS shutter		
		SR Dipole PS is ON	_____
		SR Dipole Permits ON A and B chain (green), HMI	_____
		SR RF Systems C AND D are ON	_____
		SR RF C AND D Permits ON A and B chain (green), HMI	_____
		BTS shutter Open, HMI	_____
	Remove the SR Ignition Key		
		SR Dipole PS is OFF	_____

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	SR Dipole Permits OFF A chain (grey), HMI	_____
	SR RF Systems C AND D are OFF	_____
	SR RF C AND D Permits OFF (grey), HMI	_____
	BTS shutter Closed, HMI	_____
	SR Secure to Booster A and B	_____
	Replace the Ignition Key	_____
E44	RF Test Mode opening BTS shutter shuts off the Gun	
	Break security in the Booster ring. Connect the shutter test device to BTS shutter and run extension cord to the ISA.	
	Secure the booster	Booster secure, Booster HMI _____
	Secure Pentants 5 and 1	Pentants 5 and 1 secure _____

		Gun permits A and B chain ON (green) linac HMI _____
	Rotate the RF Test Mode key	_____
		System C Permits A and B chain ON (green), HMI _____
		System D Permits A and B chain ON (green), HMI _____
	Request Operator turn on the Gun HVPS	Gun HVPS is ON _____
	Actuate the BTS shutter with testing device	BTS shutter is OPEN, Booster HMI _____
		Gun HVPS is OFF _____
		Gun A chain permit OFF (grey), linac HMI _____
	Close the shutter, break security in the booster and remove shutter testing device.	_____
E45	RF Test Mode Pentants 5 and 1 Secure	
	Cycle the RF Test Key out of place	
		System C and D RF Permits A and B OFF, HMI _____
	Attempt to turn on Systems C and D	Systems C and D do NOT turn ON _____
	Turn RF test key to Test	_____
	Perform a Reset	System C and D RF Permits A and B ON, HMI _____
	Attempt to turn on Systems C and D	Systems C and D are ON _____
	Press Control Room Emergency Stop	_____
		RF C AND D Permits A and B OFF, HMI _____
	Pull out Emergency Stop	RF C AND D HVPS remain Off _____
	Reset fault and latch in Control Room	System C and D RF Permits A and B ON, HMI _____
	Break Security in Pentant 1 or 5	System C and D RF Permits A and B OFF, HMI _____
	Put waveguide switches into test load mode	_____
	Perform a reset	System C and D RF Permits A and B ON, HMI _____
	Remove Test Load wave guide switches	System C and D RF Permits A and B OFF, HMI _____
	Remove the RF test key and return to Control room	_____
E46	Area Radiation Monitors	
	This test step may be completed at any time during the testing process but MUST be completed for PPS	

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test certification. Refer to PS-C-ASD-PRC-008, NSLS-II Area Radiation Monitor PPS Test and complete Attachment C, NSLS-II Storage Ring Area Radiation Monitor Checklist for Monitors SRM-17 through SRM-22 .

- Area Radiation Monitor SRM-17 Test completed _____
- Area Radiation Monitor SRM-18 Test completed _____
- Area Radiation Monitor SRM-19 Test completed _____
- Area Radiation Monitor SRM-20 Test completed _____
- Area Radiation Monitor SRM-21 Test completed _____
- Area Radiation Monitor SRM-22 Test completed _____

E47 Test Completion

- Account for all switch holders/actuators _____
- If testing is complete Accelerator Safety Systems staff restores energy limiter values and complete Pentant 2 steps SR Injection Energy Limit and Top Energy Interlock (may be completed on concurrent test) _____
- Remove LOTO from ALL Linac, Booster and SR devices if testing is complete _____
- Ensure PPS cabinets are secure and locked; challenge locks _____
- Disconnect the 4 test jumpers to the SR Dipole power supply interface boxes. _____
- Remove sound mufflers from HII devices (6) _____
- Request Operator makes log entry stating Pentant 5 test is complete. _____

- END OF ATTACHMENT E-