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*Approval signatures on file with master copy.

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Revision Log

Test Reason:	Test Result: ☐ Passed ☐ Failed	
	Test Type: ☐ Full ☐ Partial	
Test Date:	Start Time:	Finish Time:
Tester 1:	Assistant 1:	
Tester 2:	Assistant 2:	

PREPARATION:

- Inform control room operator that test will be done. _____
- This test procedure may only be used when the X15A beamline is setup for use of the RGD as approved by the NSLS Safety Officer and the NSLS Interlock Working Group. _____
- Assure a qualified operator of the radiation generating device is available to aid in conducting the test for the last part of this test procedure. _____
- A Facility Support Representative must be available for the last part of the test to survey the hutch area when first turning on the X-Ray generating device to assure the radiation levels are acceptable prior to completing the test. _____
- X15A output indicator test box is required (refer to figure 3). _____
- Assure the X-Ray generator/Radiation Generating Device (RGD) is switched OFF and apply LOTO to the RGD power cord plug as per the SBMS Lockout/Tagout subject area. _____
- Assure the GE interlock door device is mounted on the hutch doors (refer to figure 1). _____
- Operational Notes:
  1. The Hutch Kirk Key may be rotated at any time, doing this will shut off the X-Ray power supply. For equipment protection purposes, turn off the power supply prior to rotating and removing the key.
  2. When completing the search sequence, only rotate the Hutch Kirk key after the warning sound is complete. Rotating the key during the warning sound can cause a power supply door fault.
  3. Test box indicators: Red LED ON = ok and Red LED OFF = fault. _____

1. *Search Sequence*:
   Search the hutch
   The overhead lights go out _____
   The red interior light comes on _____
   The audible alarm sounds for 13 to 15 seconds minimum _____
   The interlock indicator comes ON _____
   The XRAYS ON sign turns ON _____
2. Open hutch door
   The interlock indicator goes out _____
   The XRAYS ON sign goes out _____
3. Press CS-1, close hutch door and wait.
   Hutch interior lights come on in not more than 20 seconds. _____
   Press CS-E.
   Interlock does not activate _____

4. Plug the X15A test box into the J100 AND J101 connector. Press interior search buttons in order, close door, press CS-E, note that alarm comes on, open and close door, press CS-E again. (This must all be done in less than the timeout interval noted in step 3)

   Interlock does not activate _____

5. Place latch device on door lock so key can be removed. Place switch holders on door switches. Transfer door key to the hutch Solenoid Release Unit (SRU), However Do Not Turn the Key at this point.

6. Search hutch. Wait until the audible alarm times out and then Turn key Clockwise in the hutch SRU.

   Interlock indicator is illuminated _____
   X-Rays ON sign is illuminated _____

7. *Emergency Stops*:

   Press the Emergency Stop Button. **ES1**

   The Chain 'A' and Chain 'B' test box light goes out _____
   The Emergency Stop (ES) indicator comes on _____

   Attempt to reset emergency stop indicator on panel using SOR key.

   The emergency stop indicator cannot be reset _____

   Reset E-Stop switch in hutch using SOR key.
   Attempt to reset emergency stop indicator on panel.

   The ES latch is reset. _____
   Upon ES Reset, Chain A indicator on the test box is OFF. _____
   Upon ES Reset, Chain B indicator on the test box is ON. _____

8. *Door Switches:*

   Remove door key from hutch SRU. Search the hutch then replace the key in the SRU and turn clockwise into position.

   Remove the holder on door switch 2

	Door 1	Door 2
The A chain indicator on the test box is ON	_____	_____
The B chain indicator on the test box is OFF	_____	_____

   Replace the holder on door switch 2

The B chain indicator on the test box is ON	_____	_____

9. Remove the holder on door switch 1

The A chain indicator on the test box is OFF	_____	_____
The B chain indicator on the test box is ON	_____	_____
The Interlock indicator is OFF	_____	_____
The 'X-Rays ON' sign is OFF	_____	_____

10. Replace the holder on door switch 1. Remove the hutch SRU key. Search the hutch and then replace the hutch SRU key after the audible alarm timeout is completed.

The A chain indicator on the test box is ON	_____	_____
The B chain indicator on the test box is ON	_____	_____
The Interlock indicator is ON	_____	_____
The X-Ray generator ON sign is Illuminated	_____	_____

11. *Hutch Solenoid Release Unit:*
Turn the hutch Kirk Key counter clock wise (for removal).

The A chain indicator on the test box is OFF _____

The B chain indicator on the test box is OFF _____

The Interlocked sign is ON. _____

The 'X-Rays On' sign is ON. _____

12. *Door Switch Function*: Remove the holders from the switches. Remove the latch device from the door lock(s). Stand inside the hutch and open and close the door.

Both door switches operate freely and each makes a "click" when door is opened _____ _____

Caution - Before continuing to the next step note the following:

- **Do not enable or power the X-Ray generator with any holders on the door switches - the generator can produce harmful radiation.**
- **The hutch must be closed and secured to operate the X-Ray generator and no person shall be permitted in the hutch while the X-Ray Generator Device is ON for any reason during the remaining steps of this test procedure.**
- A qualified X-Ray generating device operator must be present and assist in the final steps of the test. _____
- A Facility Support Representative must be available to conduct radiation surveys around the hutch. _____

13. Remove the test box from J100 and J101. Plug the Interlock connection from the GE X-Ray generator power supply into J100 and J101. _____

14. Search the hutch – assure no person remains inside. Wait for the timeout to complete before turning the hutch key in the SRU. _____

15. After the search completes and the "X-Rays ON" sign is illuminated on the hutch, Remove the Lock and Tag from the RGD power cord plug. _____

Request the qualified RGD operator to turn the X-Ray generator ON but at a low anode voltage of **5 kV** and low current of **0.1mA**.

16. Verify with the operator that all safety interlocks have been satisfied on the RGD Display. Press the 'A chain' test switch (refer to figure 2).

The X-Ray generator shuts off and a "door contact 1 opened" fault is indicated on RGD display. _____

Release the test button and have the operator reset the generator and turn the X-Ray generator ON but at a low anode voltage of **5 kV** and low current of **0.1mA**.
Note: A reset may be needed to clear the door faults on the GE RGD display panel. To reset this fault during test mode press both A and B switches simultaneously and release.

17. Verify with the operator that all safety interlocks have been satisfied on the RGD Display. Press the 'B chain' test switch.
    The X-Ray generator shuts off and a "door contact 2 opened" fault is indicated on RGD display. _____
    Release the test button and have the operator reset the generator and turn the X-Ray generator ON but at a low anode voltage of **5 kV** and low current of **0.1mA**.

18. *Hutch Solenoid Release Unit:* Verify with the operator that all safety interlocks have been satisfied on the RGD Display.
    Rotate the hutch Kirk Key counterclockwise.
    The X-Ray generator shuts off and "door contact 1 and 2 opened" is indicated on the RGD display. _____
19. Open hutch door to break hutch security. _____
20. Replace the cover on the switch test box and Take possession of the X15A Indicator Test box. _____

    Do not remove the J100 and 101 connectors from the hutch logic box.

Appendix:

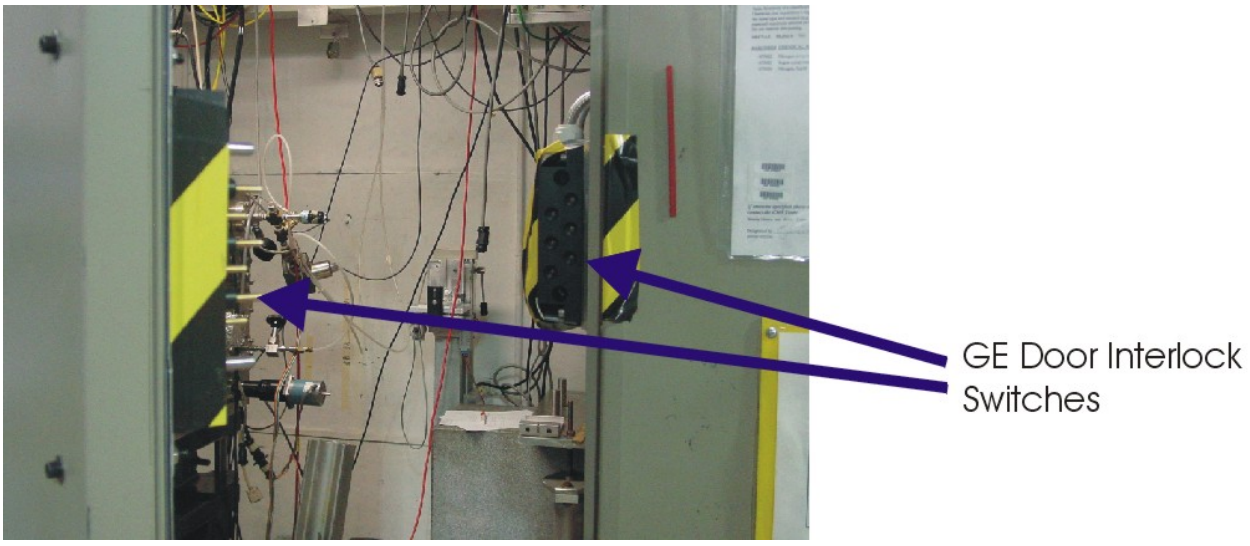

Figure 1

Figure 2: Switch Test Box

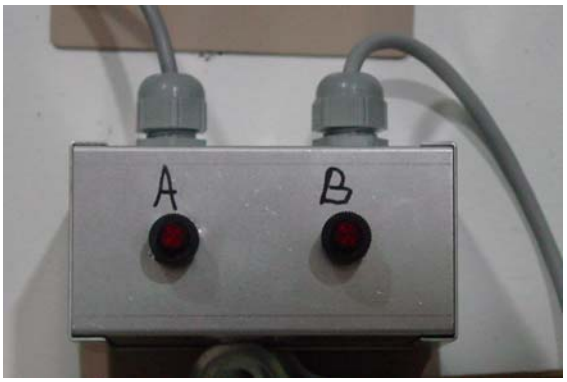

Figure 3: Indicator Test Box

Figure 4: XRAYS ON sign

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