

ACCELERATOR DIVISION DEPARTMENTAL PROCEDURE

RF DEPARTMENT

ADDP-RF-2016-0007

Booster R.F. Solid State RF Amplifier LOCKOUT/TAGOUT PROCEDURE

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PURPOSE AND SCOPE

1.0 The purpose of this Accelerator Division Department Procedure (ADDP) is to outline and detail the conduct of LOCKOUT/TAGOUT (LOTO) for the maintenance of Main Injector Radio Frequency **Solid State RF Amplifiers**. This power supply needs to be locked out when working on the supply or the cavity (tunnel).

2.0 PERFORMANCE OF MAINTENANCE ACTIVITIES

The Solid-State RF Amplifiers are located in the Booster East and West Galleries next to the RF Station's RMU racks.

This equipment has a lockable, 480 V. circuit breaker located in breaker panels as shown in Attachment 1. There is a 120 V. line cord connected to a twist lock plug that is located above the station.

3.0 AUTHORIZED PERSONNEL

An Accelerator Division employee is authorized to perform this LOTO procedure if he/she has necessary **knowledge** and **current training**.

Lists of employees who are authorized to perform this procedure are to be maintained by the RF Department Head.

4.0 THE NECESSITY OF WRITTEN LOTO PROCEDURE

This requires a written procedure because:

1. There are two energy sources
2. A single lockout device won't lock out the equipment

5.0 THE STEPS OF LOCKOUT/TAGOUT PRIOR TO MAINTENANCE ACTIVITY

The authorized employee performs the following steps prior to performance of maintenance activity.

5.1 **Prepare:** The authorized employee shall understand the hazards involved and how to control them. If an authorized employee does not have this knowledge, he/she is not qualified to perform the LOTO procedure or maintenance activity.

5.2 **Notify:** The authorized employee should, as necessary, notify affected area personnel of the LOTO and maintenance activity. Affected personnel include those who might normally use the equipment or who would be affected by the unavailability of the equipment. Maintenance activities in the Accelerator Division normally require notification of the Crew Chief in the Main Control Room (x3721).

5.3 **Shut Down:** The authorized employee shall shut down or turn off the equipment or system by using the normal stopping procedure.

Place the power supply in local and press the off button on the control unit which is located on the front panel.

5.4 **Isolate:** The authorized employee shall isolate the Solid-State RF Amplifier from the energy source.

1. Locate the 480 Volt circuit breaker associated with the Solid-State RF Amplifier (SSA) and move the handle to the off position (see Panel list Attachment 1).
2. PPE Requirements - Wear Class 0 PPE as follows:
 - a. Long sleeve cotton shirt
 - b. Hearing protection
 - c. Safety glasses
 - d. Leather insulating gloves
3. Locate the 120 V. line cord and remove it from its socket above the station.
4. Alternate LOTO for isolating 480 Volt power to the Solid-State Amplifier is to: Disconnect the Solid-State Amplifier's 480-volt Crouse-Hinds plug from the socket located above the back of the Solid-State Amplifier. This gives line of sight for the Crouse-Hinds plug and completely isolates the Solid-State Amplifier from the 480-volt power source. Note: Steps 1 & 2 above must still be followed.

5.5 **Lock and Tag Out:** The authorized employee shall lock and tag out the energy isolating device. The lock installed shall be red in color and have only one key. The authorized employee shall keep the single key in his/her exclusive control at all times from application until return to service or shift change. An approved DANGER - DO NOT OPERATE tag, properly filled out, and should be securely attached to the lock.

5.6 **Relieve/Restrain Stored Hazardous Energy:**

N/A

5.7 **Verify:** The authorized employee shall check by conclusive test that the source of energy has been isolated from the equipment and that the equipment is inoperable. Place a meter at the 480V input leads at the back of the ESS power supply to verify there is no input voltage. Measure phase to phase voltage and phase to ground. As an additional precaution the 480V Crouse-Hinds welding plug can be removed from its socket above the station (See 5.4.4 above).

The equipment is now locked out and tagged out. Service and maintenance activity may begin.

6.0 SPECIAL REQUIREMENTS FOR SHIFT/PERSONNEL CHANGE

N/A

7.0 THE FIVE STEPS FOR RETURN TO SERVICE

The authorized employee must perform the following five steps prior to returning the equipment to service after service or maintenance activity.

7.1 **Check Equipment:** Check the equipment and the immediate area around it to ensure that nonessential items and tools are cleared and that the equipment is ready for safe operation.

7.2 **Check Work Area:** Check the work area to ensure that all employees are safely positioned or removed from the area as necessary and/or appropriate.

7.3 **Verify:** Verify that all controls for the equipment are in the neutral or off position.

7.4 **Remove Padlocks and Tags and Reenergize:** The authorized employee who installed the lock and tag shall remove them and reconnect the equipment to the energy source from which it was isolated. Note that this action, for some equipment, may result in the immediate operation of the equipment.

7.5 **Notify:** The authorized employee should, as necessary, notify affected area personnel of the completion of maintenance and LOTO activity. If the Crew Chief in the Main Control Room was notified prior to the activity, he/she should be notified of the completion of the activity.

This completes the requirements for returning the equipment to service.

8.0 PROCEDURE TRAINING REQUIREMENTS

Authorized employees are required to have had LOTO training (Level 1 and Level 2) and have read and understand this LOTO procedure. Personnel using this procedure shall be trained on the job. After reviewing this document, the employee shall perform the steps accompanied by an authorized employee with previous experience.

9.0 PROCEDURE DISTRIBUTION

A single controlled copy of this procedure shall be assigned and distributed to:

- The Accelerator Division Operations Department Head

Attachment I

Booster Solid State RF Amplifier Breaker Locations		
	Booster East Gallery Panelboard	Located at end of Transfer Hall to Booster Esast Gallery
Station #	PHP-BE5	
1	1-3-5	
2	2-4-6	
3	7-9-11	
4	8-10-12	
5	13-15-17	
6	14-16-18	
20	26-28-30	
19	25-27-29	
7	19-21-23	
8	20-22-24	
	Booster West Gallery Panelboard	Located in West end of Linac
Station #	DHP-L4-1-1	
17	1-3-5	
18	2-4-6	
9	7-9-11	
10	8-10-12	
11	13-15-17	
12	14-16-18	
	Booster West Gallery Panelboard	Located in Booster Period 24
Station #	DHP-BW-1-1	
13	1-3-5	
14	2-4-6	
15	7-9-11	
16	8-10-12	
	Booster West Gallery Panelboard	Located in BWG-124
Station #	DHP-L4-1-2	
21	25-27-29	
22	19-21-23	