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Operational Safety Procedure Review and Approval Form # 136852
(See [ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure \(OSP\) and Temporary OSP Procedure](#) for Instructions)

Type:	<i>LOTO-COMPLEX</i> Click for OSP/TOSP Procedure Form Click for LOSP Procedure Form Click for LOTO-COMPLEX Information Click for LOTO-GROUP Information		
Serial Number:	<i>ENG-22-136852-LTTI</i>		
Issue Date:	<i>7/19/2022</i>		
Expiration Date:	<i>6/19/2023</i>		
Title:	<i>De-energizing Big Box supplies (BBS) and applying Lock Out, Tag Out (LOTO)</i>		
Location: (where work is being performed) Building Floor Plans	<i>67 - North Access - 107 38 - South Access - 107 204 - Tagger Area - 204 98 - Physics Fabrication - 1B 98 - Physics Fabrication - 8 98 - Physics Fabrication - 9 18 - Low Energy Recirculator Facility (LERF) 36 - General Purpose Building - 102 101 - Experimental Hall A 94 - Experimental Hall B 96 - Experimental Hall C 203 - Experimental Hall D</i>	Location Detail: (specifics about where in the selected location(s) the work is being performed)	<i>CEBAF, Hall A, Hall B, Hall C, Hall D, LERF and Teststands</i>
Risk Classification: (See ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment)	Without mitigation measures (3 or 4):		3
	With mitigation measures in place (N, 1, or 2):		1
Reason:	This document is written to mitigate hazard issues that are : <i>Determined to have an unmitigated Risk code of 3 or 4</i>		
Owning Organization:	<i>EESDCP</i>		
Document Owner(s):	<i>Kumar, Onish (okumar@jlab.org) Primary Coleman, James (colemanj@jlab.org)</i>		

Supplemental Technical Validations

50V or Greater: De-energized Work (Bonnie Rodriguez, Phillip Stanley)
Mode 1: Class 1, 2, and 3 Electrical Equipment (Bonnie Rodriguez, Phillip Stanley)
Mode 2: Class 1 Equipment (Bonnie Rodriguez, Phillip Stanley)
Mode 2: Class 2 and 3 Equipment (Bonnie Rodriguez, Phillip Stanley)
Lock, Tag, Try (Bonnie Rodriguez, Phillip Stanley)

Other Hazards:
Electrical (Omar Garza)

Document History

Revision <input type="checkbox"/>	Reason for revision or update <input type="checkbox"/>	Serial number of superseded document <input type="checkbox"/>
1	In section 1 there was a typo which referenced SBS not BBS.	

Lessons Learned	Lessons Learned relating to the hazard issues noted above have been reviewed.
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Comments for reviewers/approvers: <input type="checkbox"/>	
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Attachments

Procedure: **OSP Document BBS box supplies LOTO_rev1_2022.pdf**
 THA: **THA Document BBS box supplies LOTO_rev1_2022.pdf**
 Additional Files:

Review Signatures

Person : Subject Matter Expert : Electrical	Signed on 7/19/2022 9:17:16 AM by Omar Garza (garza@jlab.org)
Subject Matter Expert : Electricity->50V or Greater: De-energized Work	Signed on 7/19/2022 9:32:11 AM by Phillip Stanley (pstanley@jlab.org)
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Approval Signatures

Division Safety Officer : EESDCP	Signed on 7/19/2022 10:41:10 AM by Will Oren (oren@jlab.org)
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Supervisor : Lock, Tag, Try Supervisor	Signed on 7/19/2022 10:41:10 AM by Will Oren (oren@jlab.org)

Operational Safety Procedure Form

(See [ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure \(OSP\) and Temporary OSP Procedure](#) for instructions.)

Click
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Title:	De-energizing Big Box supplies (BBS) and applying Lock Out, Tag Out (LOTO)		
Location:	CEBAF (North & South Access buildings, Tagger Service building, BSY service building), Hall A, Hall B, Hall C, Hall D, LERF, and test stand	Type:	<input checked="" type="checkbox"/> OSP <input type="checkbox"/> TOSP
Risk Classification (per Task Hazard Analysis attached) (See ESH&Q Manual Chapter 3210 Appendix T3 Risk Code Assignment.)	Highest Risk Code Before Mitigation		3
	Highest Risk Code after Mitigation (N, 1, or 2):		1
Owning Organization:	Engineering, EES DC Power	Date:	07/08/2022
Document Owner(s):	O.Kumar, J.Coleman		

DEFINE THE SCOPE OF WORK

1. Purpose of the Procedure – Describe in detail the reason for the procedure (what is being done and why).

This procedure guides qualified personnel through the process of de-energizing and applying Lock Out, Tag Out (LOTO) for switch mode style of Danfysik box power supplies. These supplies are labeled as BBS (Big Box Supplies) on the front panel to avoid confusion with the lower power capacity SBS (Small Box Supplies), which are similar in appearance. All box supplies have permanently installed built-in voltage test metering, which is used to verify that power to the supply has been turned OFF. LOTO is performed using standard JLab-approved methods and locking devices.

Typical tasks requiring LOTO of BBS include:

1. Working on magnets powered by box supply – including flushing magnets, inspection, regular maintenance
2. Inspecting input AC or output DC wiring
3. Troubleshooting power supply faults
4. Conducting preventative maintenance during scheduled downtime
5. Test stand operation and activities

2. Scope – include all operations, people, and/or areas that the procedure will affect.

DC power personnel will be trained on this procedure

3. Description of the Facility – include building, floor plans and layout of the experiment or operation.

CEBAF (North & South Access buildings, Tagger Service building, BSY service building), Hall A, Hall B, Hall C, Hall D, LERF, and test stand

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

1. Electrical:

Box power supplies are Class 3 electronic equipment as determined by Jefferson Lab's *ES&H Manual*, Chapter 6210.

Input AC voltage: 480VAC, three phase, with large fault currents

Output DC: Upto 2000 volts DC rail-to-rail, upto 850 Amps

Stored energy in capacitors upto 10kilo-Joules

WARNING: If the power supply does not have a V.V.U or the V.V.U is not functioning properly, you *must* STOP work and contact your work supervisor. Your supervisor must direct you to a different OSP that allows for performing Lock Out, Tag Out (LOTO) under Class 3 Mode 2 conditions without a V.V.U

2. Mechanical

- a. Wiring within box supplies is tightly spaced and care must be taken to keep wires from being cut or damaged
- b. There are some sharp edges on buss-bars and supports within the box supplies
- c. The top of the cabinet contains a large rotary fan fed by the 110 VAC
- d. Heatsinks or components may be warm to the touch if the cooling water is not sufficient

3. Other

- a. LCW supply and return pipes are connected on the sides and top of the PS.

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

DC power group leader, DC power Deputy group leader, Head of EES

5.2 Who is responsible for key tasks

All qualified, trained and authorized DC power personnel may lead this task.

5.3 Who analyzes the special or unusual hazards including elevated work, chemicals, gases, fire or sparks (See [ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure](#))

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

N/A

6.2 Barriers (magnetic, hearing, elevated or crane work, etc.)

480 VAC three phase input to the box supplies are in a metal enclosure with more than 4 screws holding sides in place.

6.3 Interlocks

Interlocked doors prevents access to high voltage energized terminals. The door interlocks will turn off main contactor if tripped and limit the voltage to the control power transformer and the line side of the Main Contactor and soft start contactor.

6.4 Monitoring systems

Diagnostic readbacks to Epics, permanently built in analog diagnostic suite to monitor system voltages and currents, local voltage and current panel meters and 480 VAC Voltage Verification Unit with LED indications

6.5 Ventilation

N/A

6.6 Other (Electrical, ODH, Trip, Ladder) (Attach related Temporary Work Permits or Safety Reviews as appropriate.)

Built in automatic capacitor discharge circuit to dissipate stored energy in capacitors.

Please note: MEDCON conditions may require additional OSP.

7. List of Safety Equipment:

7.1 List of Safety Equipment:

1. Minimum Personal Protective Equipment (PPE) required:
 - Long sleeve shirt
 - Long pants
 - Closed toe shoes
 - Safety Glasses
 - Electrically Insulating Leather Gloves
2. When exercising circuit breakers or disconnect switches without an inspection or maintenance certification Minimum PPE required:
 - NFPA70E HRC/Category II PPE including 8cal/cm² rated clothing
 - AR long-sleeve shirt and pants or coveralls
 - Flash suit hood, or AR face shield and AR balaclava
 - Leather gloves
 - Safety glasses
 - Hearing Protection

7.2 Special Tools:

- Digital Multimeter
- Pen or marker (for filling out tags)
- Red LOTO Coordinator lock
- One LOTO lock for each person performing the work
- One "DANGER" Tag for each person performing the work with person's name and contact information on it
- LOTO hasp for multiple locks
- Box power supply door key
- Discharge stick (available in the MCC; optional if working on a load [magnet] powered by the supply)
- Flat blade screw driver (for door latch screws)
- Red and White stripped danger tape

8. Associated Administrative Controls

Training on this document, training and qualification on BBS box supply system, qualified electrical worker status.

9. Training

9.1 What are the Training Requirements (See [List of Training Skills](#))

- a. Lock Out, Tag Out (LOTO) Training
- b. Qualified Electrical Worker (QEW) training including NFPA70E
- c. Equipment-Specific Training
- d. CPR (SAF105) is required for Engineering Division personnel performing this procedure (optional for others).

DEVELOP THE PROCEDURE

10. Operating Guidelines

Pre-Requisites

1. Verify that the box power supply you are about to safe out is, in fact, a BBS-style power supply as indicated by the BBS label affixed to the front of the supply. SBS-style supplies look similar and are covered under a separate procedure.
2. For equipment connected to the accelerator, authorization in the form of an approved ATLI task (or a task from one of the ATLI clones) must be obtained before starting this procedure.
3. Two people are required to perform this procedure; one performs the work, while the other serves as a Safety Watch. Each *must* have the following training and knowledge.
 - Lock Out, Tag Out (LOTO) Training (ESC007)
 - Qualified Electrical Worker (QEW) training including NFPA70E (ESC001 through ESC008)
 - Equipment-Specific Training
 - CPR (SAF105) is required for Engineering Division personnel performing this procedure (optional for others).
4. The Safety Watch must:
 - Have a thorough knowledge of the specific procedure to be followed.
 - Have no other duties that preclude continually observing, coaching, and monitoring for potential mistakes, while maintaining visual and audible contact.
 - Approach no closer to the equipment than 60"
 - Ensure that unqualified persons do not enter the work area.
 - Know the location and operation of disconnects and shutdown controls.
 - Be able to safely disengage an injured worker from the hazard.
 - Have a ready means of alerting emergency-rescue personnel (e.g., a nearby telephone).
 - Know the location of the nearest AED.
 - Wear the minimum PPE as described above.

11. Notification of Affected Personnel (who, how, and when include building manager, safety warden, and area coordinator)

DC power personnel will be approved by line supervisor or work supervisor on ATLAS. Other work groups will have to notify DC Power if working on loads associated with each power supply. Work groups will co-ordinate to have the de-energization completed by an approved DC power person and verify the absence of energy.

12. List the Steps Required to Execute the Procedure: from start to finish.

This procedure is divided into the following sections:

- Section 1.0 Securing Power to the Box Power Supply and Multiple Energy Sources
- Section 2.0 Locking Out the Box Power Supply
- Section 3.0 For Work INSIDE the Supply or connected load – Dissipating Stored Energy
- Section 4.0 For Work on Magnet LOADS Connected to the Supply
- Section 5.0 Restoring Power to the Box Power Supply

1.0 Securing Power to the Box Power Supply and Multiple Energy Sources

WARNING: HIGH VOLTAGE! DO NOT work inside the box power supply or on a load (i.e., a magnet powered by the supply) until power has been secured (including from multiple energy sources), LOTO has been applied as required by the Jefferson Lab LOTO policy, and the appropriate discharge procedure has been performed.

1. Identify the power supply you want to turn off and get approval for the Work plan. Each power supply has a list of magnets and shunts, connected to that supply, affixed to the front of the power supply.
2. If necessary, Turn OFF and apply LOTO to all interconnected devices (i.e., multiple energy sources) before beginning work on the box supply; use ES&H Manual, Chapter 6110, appendix T1 (see Figure 1-1, to right). Possible energy sources are listed below and also identified by labels on the equipment (see Figure 1-2, below, for examples).

- LAM1C, LAM3C

Figure 1-1: ES&H Chapter 6110, Appendix T1



Figure 1-2: Multiple Energy Source Label Examples

3. Has all interconnected equipment been de-energized and LOTO applied?
 - YES NO** → **A.** ALL multiple energy sources **MUST** be de-energized. Repeat 2, above.
4. Is the **OFF** button LED lit AND do the **Output Voltage** and **Output Current** readbacks display zero (see Figure 1-3, below)?
 - NO YES** → **A.** This indicates that the power supply is already OFF. Skip to Section 2.0. Locking Out the Box Power Supply
5. Turn OFF the box supply as follows. Refer to Figure 1-3, below, as needed.

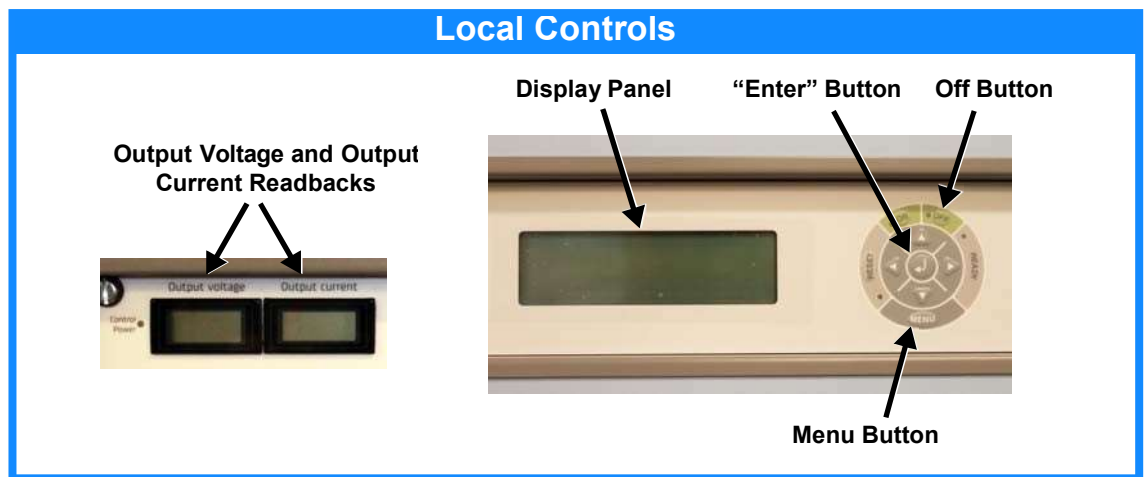


Figure 1-3: Box Supply Local Controls

- a. Press the **Menu** button, and using the left/right arrow buttons, find the **CMD** (Command) drop down menu on the display panel.

- b. Press **Enter** (the center “arrow” button).
- c. Use the up/down arrows to choose the **LOC** option, and then press **Enter** (the center “arrow” button). This places the supply in **Local** mode; the *LOCAL/REMOTE* status should appear on the display.
- d. Press the **Menu** button, and using the left/right arrow buttons, move to the **Current Set** selection.
- e. Press **Enter** (the center “arrow” button).
- f. Using the up/down arrow buttons, set the current to **Zero** and wait for the output current to ramp down to zero.
- g. Turn OFF the box power supply by pressing the **Off** button. You will hear the main contactor shut off.
- h. Check the **Output Voltage** and **Output Current** panel meters, they should both read zero. Did both meters reach zero?
YES **NO** → **A.** Abort the procedure and contact EES DC for guidance.
- i. You are now ready to begin the LOTO portion of this procedure. Go to Section 2.0. Locking Out the Box Power Supply.

2.0 Locking Out the Box Power Supply

1. Will you be working on the 480Vac incoming power?
YES **NO** → **A.** Go to Step 8.
2. Using the “Fed From” label information on the power supply find the 480VAC circuit breaker that feeds the unit. Did you find the circuit breaker?
YES **NO** → **A.** Abort the procedure and contact EES DC for circuit breaker location.
3. Does the power supply have one of the Voltage Verification Unit’s (V.V.U’s) as shown in Figure 2-1, below?

YES NO → A. Abort the procedure and contact EES DC for an alternate LOTO process.

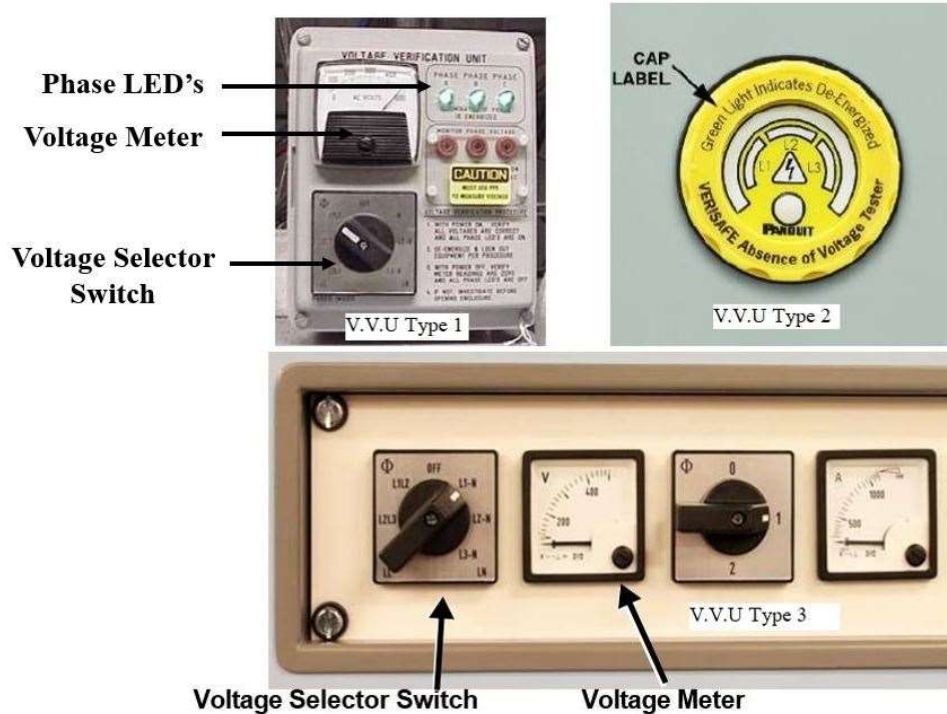


Figure 2-1: Possible V.V.U Configurations

- Don the PPE, then slowly rotate the Voltage Selector Switch through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 480 ± 25 VAC at each position and lamp indicators (if present) on the V.V.U Panel are lit at all times (see Figure 2-1, above). If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 277 ± 15 VAC. (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U Type 2 then press the button in the center of the V.V.U and wait for the V.V.U to respond, V.V.U should respond by lighting L1, L2, L3 LED to red (Energized). Did you get all the required indications?

NOTE: This step verifies that all meters and lamps are functioning properly.

YES NO → A. Abort the procedure and contact EES DC for an alternate LOTO process.

SAFETY WATCH: Position the Safety Watch outside the Limited Approach Boundary

CAUTION: Stand to the side and as far away as possible when switching the circuit breaker in the following step.

- Now switch circuit breaker to the “OFF” position and then secure the circuit breaker with appropriate number of JLAB Approved LOTO hasps, locks and tags. (Red LOTO coordinator lock should be used if a coordinator is performing the LOTO)

- Go back to the box supply and slowly rotate the Voltage Selector Switch through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 0.0 ± 10 VAC at each position and lamp indicators (if present) on the V.V.U Panel are *NOT* lit at all times (see Figure 2-1, above). If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 0.0 ± 10 VAC (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U type 2 then press the button at the center for the V.V.U and wait for it to respond, V.V.U should respond by lighting L1, L2, L3 LED to green (De-energized). Did you get all the required indications?

NOTE: This step verifies that outside sources of electrical energy have been disconnected.

YES NO → **A.** Abort the procedure and contact EES DC for an alternate LOTO process.

- LOTO and removal of power sources from the box supply is complete. You must dissipate stored energy in the supply before proceeding with your work. Go to Section 3.0. The stored energy dissipation process, on page 10.
- Don the PPE, then slowly rotate the Voltage Selector Switch through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 480 ± 25 VAC at each position and lamp indicators (if present) on the V.V.U Panel are lit at all times (see Figure 2-1, above). If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 277 ± 15 VAC. (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U Type 2 then press the button on the center of the V.V.U and wait for the V.V.U to respond, V.V.U should respond by lighting L1, L2, L3 LED to red (Energized). Did you get all the required indications?

NOTE: This step verifies that all meters and lamps are functioning properly.

YES NO → **A.** Abort the procedure and contact EES DC for an alternate LOTO process.

SAFETY WATCH: Position the Safety Watch outside the Limited Approach Boundary

CAUTION: Stand to the side and as far away as possible when switching the circuit breaker in the following step.

WARNING: DO NOT open the disconnect switch in load conditions. In case of an emergency, engage the mushroom style E-stop button located on the front of each power supply.

- Rotate the disconnect switch to the **OFF** (0) position (see Figure 2-2, below).



Figure 2-2: Disconnect Switch (all configurations not shown)

- Secure the disconnect switch in the **OFF** position with the appropriate number of JLab-

Approved LOTO hasps, locks and tags. (Red LOTO coordinator lock should be used if a coordinator is performing the LOTO)

11. Slowly rotate the Voltage Selector Switch through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 0.0 ± 10 VAC at each position and lamp indicators (if present) on the V.V.U Panel are *NOT* lit at all times (see Figure 2-1, above). If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 0.0 ± 10 VAC (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U type 2 then press the button at the center for the V.V.U and wait for it to respond, V.V.U should respond by lighting L1, L2, L3 LED to green (De-energized). Did you get all the required indications?

NOTE: This step verifies that outside sources of electrical energy have been disconnected.

YES NO → A. Abort the procedure and contact EES DC for an alternate LOTO process.

12. LOTO and removal of power sources from the box supply is complete. You must dissipate stored energy in the supply before proceeding with your work. Go to Section 3.0. The stored energy dissipation process, on page 10.

3.0 Dissipating Stored Energy for WORK Inside the Power Supply or connected Loads

NOTE: The following steps use a discharge method to dissipate any stored energy so the box supply and load is safe for service or repair. LOTO must be completed first per Section 2.0. Each power supply has built in circuitry that automatically discharges capacitor banks by bleeding off accumulated charge. The application of discharge sticks is a secondary manual method of ensuring capacitor discharge in case the built in circuitry has failed. Both the discharge circuit and the discharge stick are inspected and maintained annually as part of normal DC Power work process.

WARNING: Stored energy up to 5 kilojoules per capacitor bank is possible under certain fault conditions, with a maximum of 600 VDC across the capacitors.

1. Wait at least two minutes after the LOTO process has been completed. This allows all energy-storing devices to discharge completely.

SAFETY WATCH & BARRIER: Setup an electrical hazard barrier using red and white striped danger tape at limited approach boundary and then Position the Safety Watch outside barrier.

2. While wearing PPE, using a box supply enclosure key (available to qualified worker) and a screwdriver, open the door panel where the discharge points and the discharge sticks are located. On some supplies they are in the front, some in the back and some have two discharge points front and back or both on back (see Figure 3-1). Labels on the cabinet door identify the locations of the discharge points and sticks.

Discharge points,
read labels for Hi-Z
or Low-Z

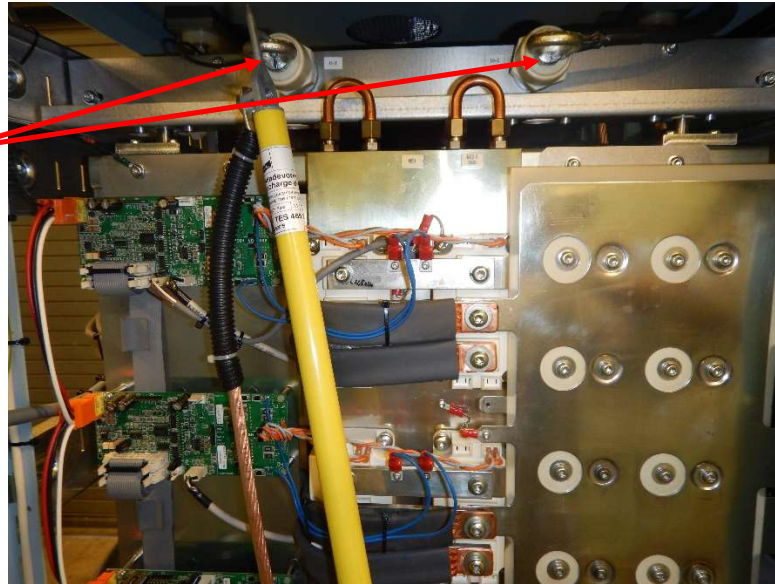


Figure 3-1: Discharge Points

3. Grasping the discharge stick **ONLY BY THE HANDLE** (*do not come in contact with the metal lead*), apply the metal end of the stick to the **Hi-Z** discharge point and hold it there for at least 15 seconds.
4. Apply the metal end of the stick to the **Low-Z** discharge point and hold it there for at least 10 seconds. Leave the discharge stick hanging from the **Low-Z** discharge point.

Please Note: If work needs to be done near the Low-Z discharge point then worker may remove the stick (once LOTO is complete) and then short **Low-Z** point and the discharge stick using alligator clip leads.

5. Using a CAT III or better digital multimeter measure the voltage from the + and – output leads to ground. Were the measured voltages less than 1 VDC?
YES NO → **A.** Abort the procedure and contact EES DC for guidance.
6. All stored energy within the supply has been dissipated. It is safe to perform work on the power supply or connected loads.
7. STEP COMPLETE

4.0 For Work on Magnet LOADS Connected to the Supply

NOTE: LOTO must first be completed per Section 2.0. In addition to LOTO, PSS interlocks should turn off the output of the power supply. If not interlocked with PSS, the magnet leads will have covers to prevent inadvertent contact with leads.

1. Turn off the associated “Klixon” thermal interlock chassis which provides 24Volts for the interlock query.
2. Proceed to the magnet location in the tunnel.

WARNING: A magnet's name does not always logically correspond to the power supply powering the magnet (e.g., an Arc 5 magnet might be powered by an Arc 3 power supply).

3. Locate the identification label attached to the body of the magnet, and verify that the magnet is powered by the supply you have locked out. If there is no label or there is conflicting

information concerning the power source, contact supervisor for assistance before proceeding.

4. An optional measure is to repeat zero voltage measurement at the magnet leads to verify zero energy.
5. Another optional measure is to ground the magnet terminal to copper grounding buss using a ground stick obtainable from MCC (See Figure 4-1). RETURN THE GROUNDING STICK TO THE MCC CONTROL ROOM AFTER YOU COMPLETE YOUR WORK.

Clamp the grounding lead to the copper buss



Touch positive and negative terminals

Figure 4-1: Clamp the Grounding Lead, then touch the positive and negative leads

6. STEP COMPLETE. To re-energize the power supply refer to Back-Out procedure

13. Back Out Procedure(s) i.e. steps necessary to restore the equipment/area to a safe level.

5.0 Restoring Power to the Box Power Supply

CAUTION: Be sure to remove the discharge stick from the power dissipation point and return it to its storage location BEFORE restoring power to the box power supply. Do NOT forget this step as potential damage to equipment may occur.

1. Return the discharge stick(s) to its storage holder inside the door of the supply. You will hear an audible “click” from the interlock switch when the stick is in the proper position. Did you hear the click?

YES NO →
 ↓

A. Re-adjust the discharge stick before proceeding. The supply will not energize if the interlock switch is not closed.

2. Using a box supply enclosure key and a screwdriver, close and secure all box supply panels and doors.
3. Is the power supply connected to accelerator magnets?

YES NO →
 ↓

A. Get permission from the Lead Test Coordinator before proceeding to Step 4, below.

4. Get permission from the Crew Chief to apply 480 VAC to the box power supply.
5. Was work done at incoming 480VAC?

YES NO →
 ↓

A. Go to Step 12.

6. Using the “Fed From” label information on the power supply find the 480VAC circuit

breaker that feeds the unit. Did you find the circuit breaker?

YES NO → A. Abort the procedure and contact EES DC for circuit breaker location.

7. Remove personal LOTO locks and tags from the circuit breaker.

SAFETY WATCH: Position the Safety Watch outside the Limited Approach Boundary

CAUTION: Stand to the side and as far away as possible when rotating the disconnect switch in the following step.

8. Don the PPE, Now switch the circuit breaker to the “ON” position.
9. Go back to the box supply and Slowly rotate the VVU Voltage Selector Switch (see Figure 2-1) through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 480 ± 25 VAC at each position and lamp indicators (if present) on the VVU Panel are lit at all times. If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 277 ± 15 VAC. (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U Type 2 then press the button on the center of the V.V.U and wait for the V.V.U to respond, V.V.U should respond by lighting L1, L2, L3 LED to red (Energized). Did you get all the required indications?

YES NO → A. Contact EES DC for guidance.

10. Rotate the Voltage Selector Switch to the **0** position (This is valid for V.V.U Type 1 only).
11. Now Go to Step 16.
12. Remove personal LOTO locks and tags from the disconnect switch.

SAFETY WATCH: Position the Safety Watch outside the Limited Approach Boundary

CAUTION: Stand to the side and as far away as possible when rotating the disconnect switch in the following step.

13. Don the PPE, Rotate the disconnect switch to the **ON** (1) position (see Figure 2-2).
14. Slowly rotate the V.V.U Voltage Selector Switch (see Figure 2-1) through positions 1, 2, and 3 (or L1L2, L2L3, and L1L3), verifying that the Voltage Display Meter reads 480 ± 25 VAC at each position and lamp indicators (if present) on the V.V.U Panel are lit at all times. If the switch has positions for L1-N, L2-N and L3-N, rotate through these positions and verify the readings are 277 ± 15 VAC. (Use above step for V.V.U Type 1 & 3). If the equipment has V.V.U Type 2 then press the button on the center of the V.V.U and wait for the V.V.U to respond, V.V.U should respond by lighting L1, L2, L3 LED to red (Energized). Did you get all the required indications?

YES NO → A. Contact EES DC for guidance.

15. Rotate the Voltage Selector Switch to the **0** position (This is valid for V.V.U Type 1 only).
16. Return the box supply to operation as follows (refer to Figure 5-1, below).

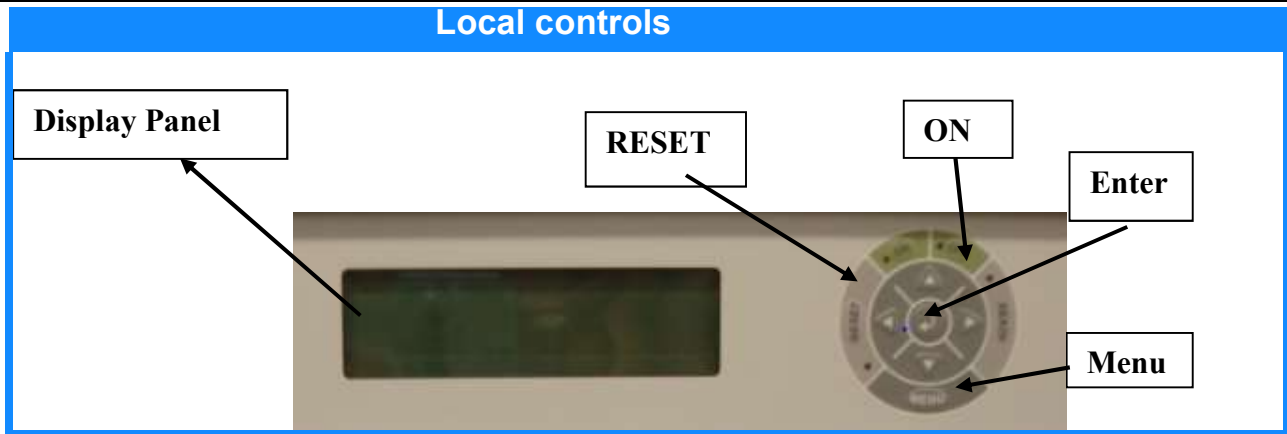


Figure 5-1: Local Supply Controls

17. Are you ready to turn control of the supply over to the MCC (this is the normal procedure if you were just working on a power supply load)?



A. Put the power supply in **Local** mode as follows

- Press the Menu button and using the left/right arrow buttons, find the CMD drop down menu on the display panel
- Press Enter
- Use the up/down arrows and choose the LOC option and press Enter to place the supply in Local mode; the Local/Remote status should appear on the display

B. Reset any fault by pressing the RESET button. Troubleshoot faults that do not clear

C. Press the ON button

D. Enter a setpoint

E. Test settings locally and go to step 18 to turn control over to MCC if needed

18. Contact the MCC and have them remotely restore the power supply to its operating setpoint.

19. If necessary, return the box supply enclosure key.

20. Make an appropriate ELog entry and complete any associated ATLI task.

21. PROCEDURE COMPLETE.

14. Special environmental control requirements:

14.1 List materials, chemicals, gasses that could impact the environment (ensure these are considered when choosing Subject Mater Experts) and explore [EMP-04 Project/Activity/Experiment Environmental Review](#) below

14.2 Environmental impacts (See [EMP-04 Project/Activity/Experiment Environmental Review](#))

14.3 Abatement steps (secondary containment or special packaging requirements)

15. Unusual/Emergency Procedures (e.g., loss of power, spills, fire, etc.)

In the event of injury, or an immediate emergency exists, call **911** and also notify:

- Guards (x5822)
- Occupational Medicine (x7539)
- Crew Chief (x7045) (if inside the fence)

In case of an injury follow standard JLAB procedures. Initial response cards are located with each phone for appropriate emergency phone numbers. Additional information can be found at https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-24400/*.pdf.

16. Instrument Calibration Requirements (e.g., safety system/device recertification, RF probe calibration)

V.V.U. checks during schedule maintenance periods

17. Inspection Schedules

Maintenance program for circuit breakers and disconnect switches. Inspection and maintenance schedules for capacitor discharge sticks and capacitor discharge circuitry.

18. References/Associated/Relevant Documentation

Danfysik manuals and schematics

19. List of Records Generated (Include Location / Review and Approved procedure)

Training records. Approval and qualification records

Submit Procedure for Review and Approval (See [ES&H Manual Chapter 3310 Appendix T1 OSP & TOSP Instructions – Section 4.2 Submit Draft Procedure for Initial Review](#)):

- Convert this document to .pdf
- Open electronic cover sheet:
https://mis.jlab.org/mis/apps/mis_forms/operational_safety_procedure_form.cfm
- Complete the form
- Upload the pdf document and associated Task Hazard Analysis (also in .pdf format)

Distribution: Copies to Affected Area, Authors, Division Safety Officer

Expiration: Forward to ESH&Q Document Control

Form Revision Summary

Revision 1.5 – 04/11/18 – Training section moved from section 5 Authority and Responsibility to section 9 Training

Revision 1.4 – 06/20/16 – Repositioned “Scope of Work” to clarify processes

Qualifying Periodic Review – 02/19/14 – No substantive changes required

Revision 1.3 – 11/27/13 – Added “Owning Organization” to more accurately reflect laboratory operations.

Revision 1.2 – 09/15/12 – Update form to conform to electronic review.

Revision 1.1 – 04/03/12 – Risk Code 0 switched to N to be consistent with [3210 T3 Risk Code Assignment](#).

Revision 1.0 – 12/01/11 – Added reasoning for OSP to aid in appropriate review determination.

Revision 0.0 – 10/05/09 – Updated to reflect current laboratory operations

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning	04/11/18	04/11/21	1.5

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Task Hazard Analysis (THA) Worksheet

(See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

Click
For Word

Author:	O.Kumar, J.Coleman	Date:	07/08/2021	Task #: If applicable	
Complete all information. Use as many sheets as necessary					
Task Title:	De-energizing Big box supplies (BBS) and applying Lock Out, Tag Out (LOTO)	Task Location:	CEBAF (North & South Access buildings, Tagger Service building, BSY service building), Hall A, Hall B, Hall C, Hall D, LERF, and test stand		
Division:	Engineering	Department:	EES DC Power	Frequency of use:	Multiple times a week
Lead Worker:	Qualified and approved DC power personnel				
Mitigation already in place: Standard Protecting Measures Work Control Documents	Doors are interlocked and have lock and key to prevent access to hazardous voltages, permanently installed discharge circuit for capacitor banks, PSS interlocks for CEBAF magnet loads, power supply interlocks, interlocks to associated shunt chassis to turn off power if tripped, permanently installed Voltage Verification Unit (V.V.U) to verify incoming AC voltage has been turned off, additional manual discharge stick to prevent capacitor from charging while de-energized				

Sequence of Task Steps	Task Steps/Potential Hazards	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation)
1.	Identify power supply and set output current to zero	L	L	N	N	Training on BBS power supply local and remote controls and readbacks	N
2.	Turn off AC input voltage and use V.V.U. to verify power is removed. Hazards 480VAC three phase input voltage with possibility for fault currents and ARC flash. DC output upto 2000V, 875Amps. Mechanical hazards of sharp edges and heat.	H	L	3	Use electrical PPE and voltage verification units to positively remove energy source	This procedure, equipment specific training, NFPA-70E, Qualified Electrical Worker Training (ESC001, ESC002, ESC003, ESC004, ESC005, ESC006, ESC007, ESC008) & CPR training, circuit mitigations already in place. Proper inspection of circuit breakers and disconnect switches.	1

Task Hazard Analysis (THA) Worksheet

(See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

Sequence of Task Steps	Task Steps/Potential Hazards	<u>Consequence Level</u>	<u>Probability Level</u>	<u>Risk Code</u> (before mitigation)	Proposed Mitigation (Required for <u>Risk Code</u> >2)	Safety Procedures/ Practices/Controls/Training	<u>Risk Code</u> (after mitigation)
3.	Use discharge stick to keep capacitors discharged and de-energized until work is complete. Hazards are stored energy in capacitors > 10 Joules upto 10kJoules. Mechanical hazards of sharp edges and tight spaces within cabinets.	M	L	3	Use redundant “discharge stick” across capacitors to keep them from accumulating charge. Wear PPE to mitigate mechanical hazards	This procedure, equipment specific training, NFPA-70E, Qualified Electrical Worker Training (ESC001, ESC002, ESC003, ESC004, ESC005, ESC006, ESC007, ESC008) & CPR training.	1
4.	Restore power for use	H	L	3	Use electrical PPE and V.V.U	This procedure, equipment specific training, NFPA-70E, Qualified Electrical Worker Training (ESC001, ESC002, ESC003, ESC004, ESC005, ESC006, ESC007, ESC008), & CPR training, circuit mitigations already in place	1

Highest Risk Code before Mitigation:

3

Highest Risk Code after Mitigation:

1

When completed, if the analysis indicates that the Risk Code before mitigation for any steps is “medium” or higher (RC≥3), then a formal [Work Control Document](#) (WCD) is developed for the task. Attach this completed Task Hazard Analysis Worksheet. Have the package reviewed and approved prior to beginning work. (See [ES&H Manual Chapter 3310 Operational Safety Procedure Program](#).)

Task Hazard Analysis (THA) Worksheet

(See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

Form Revision Summary

Periodic Review – 08/29/18 – No changes per TPOC

Periodic Review – 08/13/15 – No changes per TPOC

Revision 0.1 – 06/19/12 - Triennial Review. Update to format.

Revision 0.0 – 10/05/09 – Written to document current laboratory operational procedure.

ISSUING AUTHORITY	TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning	08/29/18	08/29/21	0.1

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