Hazards associated with the gas system and how to mitigate them

Do not enter the gas shack if the rotating red light at the entrance is on. This warns of an oxygen deficiency.

In General the Gas Mixing shack can be a hazardous place – BE AWARE OF YOUR ENVIRONMENT..

There are hazardous gas detectors that will cut off any gas flow at 10% of the lower explosive limit and oxygen deficiency monitors that will alarm if there is a less than 19% oxygen level.

Gas bottles are a hazard to move. Breaking the stem on a gas bottle can cause flying debris

Never move a bottle without the cap fastened. Always earthquake brace bottles at two points in the place they are to be used or stored. Always keep control of the bottle with two hands while moving.

The gases used in the calibration routine present a cryogenic hazard.

Be certain that the bottle is plumbed into the correct gas circuit and the fittings are tight before opening. When removing a bottle be certain to valve off the gas; At the bottle first, at the gas panel second. Slowly bleed the lines before disconnecting.

There is a marked step up both on to the gas pad and into the gas shack.

Be aware. It easy to trip while making a step into empty space when coming out of either one.

Side of racks must be removed.

To access some of the valves the side of the rack should be removed. This can fall rapidly and cause alarm or an injury. The rack side panel should be supported by one hand while turning the locking screw. Two hands should be used to lift and carry the side panel out of the way.

Transition from Rest (He:Isobutane) to Rest (Helium)

Name: _____

Date: _____ Time: _____

- ❑ Stop monitoring Gain Chamber (stop DAQ, power down HV).
- ❑ Select Rest mode.
- ❑ Close VVM-45 (circulation loop).
- ❑ Open VVM_46 (exhaust).
- ❑ Open VVM-44.
- ❑ Close VVM-101.
- ❑ Turn off heater.
- ❑ Open VVM-36 (He orifice bypass).
- ❑ Increase exhaust purge N_2 flow to 300 l/hr.
- ❑ Increase Helium inlet pressure GRADUALLY to 1780 mbar (initially 1600, adjust later).
- ❑ Open VVM-88 and VVM-87. Note which is already open _____.
- ❑ Set all mass flowmeters to Zero.
- ❑ Set circulation flowmeter to 8 lt/min.
- ❑ Switch on both compressor regulators. Note which is already on _____.
- ❑ Set controller you just turned on to MANUAL, 30%. (adjust later).
- ❑ Open Helium hi-flow rotameter one turn (adjust later to > 30 l/min).
- ❑ Decrease BPR-1 to minimum(CCW).
- ❑ In the Mode panel, activate super user mode.

  In the valve control panel, switch to VME mode, open VVPC–2, VVPC–3, VVPC–4, VVPC-6, VVPC–7, close VVPC-11
- ❑ In the valve control panel, pump panel, Start compressors.
- ❑ Immediately adjust BPR-2 to keep circulation pressure in range
- ❑ Select "output" sample point.
- ❑ Slowly increase He Hi flow rotameter and manual compressor regulator until flush flow is ~40 L/min
- ❑ Keep an eye on BPR-2 and circulation pressure.
- ❑ *Flush for 3 volume change (8-9 hours)* **(till HAD sensor in return line reads < 10% LEL).**
- ❑ Decrease He inlet pressure to 1000 mbar (nominal value).
- ❑ Select Rest mode.
- ❑ Open VVM 101.

- ❑ Close VVM 44.
- ❑ Close VVM 87 or 88, whichever you previously opened(see above).
- ❑ Open VVM 45.
- ❑ Close VVM 46.
- ❑ Switch off compressor regulator you previously turned on(see above).
- ❑ Close helium high flow rotameter.
- ❑ Close VVM-36.
- ❑ Check all mass flowmeters are set to Zero.
- ❑ Reduce exhaust N2 flow to 100 l/hr.
- ❑ Reset BPR 1 and BPR 2 to nominal (if possible).

Access Checklist—Permit-Required Confined Space

Name of Access Supervisor _____

Date _____

- ❒ This access will not involve removing a rear endplate feedthrough. *If a feedthrough is to be removed, the chamber must contain air. Use "Access Checklist—Confined Space Permit NOT Required"*
- ❒ Inform Joe Kenny at x3517, pager (650) 570 8742, that we will be requesting an access.
- ❒ Record current rear bulkhead N_2 flow: Rear _____
- ❒ Switch bulkhead flush from N_2 to air using VVT–8; lock and retain key.
- ❒ Set air flow to 100 l/min (or the current flow, whichever is greater) on rear rotameter
- ❒ Record time: _____
- ❒ Bulkhead air has been flowing at least 20 minutes. Time: _____
- ❒ All people who will enter the access region have received access training. Names:

_____ _____

_____ _____

_____ _____

- ❒ Contact Joe Kenny and request access permit. *The access supervisor must remain close to the tunnel entrance throughout the access.*
- ❒ Turn on air pump.
- ❒ Use the oxygen deficiency monitor with the extension tube to sample the air in the access region. Oxygen level measured: _____
- ❒ Complete and post 8-hour permit.
- ❒ Measure the Oxygen level again after the bulkheads have been opened.
- ❒ If you are working on the rear endplate high voltage printed circuit boards or wiring, lock off the HV supply using the "Lock-Off HV" procedure.

If the region is to be unoccupied while the bulkheads are open, ensure that the "danger—do not enter" sign is placed at the entrance.

Upon completion of access—Prior to insertion of plug iron:

- ❒ Search access-region for tools.
- ❒ Turn off air pump.
- ❒ Switch rear bulkhead flush from air to N_2
- ❒ Set N_2 flow to previous value.
- ❒ Inform run coordinator or shift leader that access is complete.

Access Checklist—Confined Space Permit NOT Required

This checklist is to be used only if:

- *the atmosphere in the chamber has been switched to air AND*
- *the work will not require the use volatile organic solvents AND*
- *no other group will be working in the Electronics Region at the same time.*

Name of Access Supervisor _____

Date _____

❒ The gas system is in Rest Mode (O_2 Present) and the chamber contains air.

❒ Record current rear bulkhead N_2 flow: Rear _____

❒ Switch rear bulkhead flush from N_2 to air; lock and retain key.

❒ Set air flow to 100 l/min (or the current flow, whichever is greater) on rear rotameter

❒ Record time: _____

❒ Bulkhead air has been flowing at least 20 minutes. Time: _____

❒ All people who will enter the access region have received access training. Names:

_____ _____

_____ _____

_____ _____

❒ Turn on air pump.

❒ Use the oxygen deficiency monitor with the extension tube to sample the air in the access region. Oxygen level measured: _____

❒ Complete and post 8-hour permit.

❒ Measure the Oxygen level again after the bulkheads have been opened Oxygen level measured: _____

❒ If you are working on the rear endplate high voltage printed circuit boards or wiring, lock off the HV supply using the "Lock-Off HV" procedure.

Upon completion of access and reinsertion of plug iron:

❒ Search access-region for tools.

❒ Turn off air pump.

❒ Switch rear bulkhead flush from air to N_2

❒ Set N_2 flow to previous value.

Inform run coordinator or shift leader that access is complete.

BaBar
Drift Chamber
Low Voltage Power Supply

Purpose

This document defines the procedure for removing AC power and discharging electrical hazards from the above equipment.

Scope

The document will locate the appropriate circuit breakers for lock and tag and will specify a procedure to be followed for implementing the current lock and tag procedure as specified in the *Lock and Tag Program for the Control of Hazardous Energy* (SLAC-I-730-0A10Z-001).

Distribution

(1) copy BaBar Safety web page Master File
(1) copy IR-2 control room
(1) copy posted at equipment

Note: *Please check for the latest changes before using this procedure. Please review SLAC's lock and tag procedure for general rules, which may not be covered in this procedure.*

Equipment Lock and Tag Procedures

I. Equipment Identification - ELP/2

General Description

The BaBar Drift Chamber uses one low voltage power supply delivers 300 amperes at 10 volts to the electronics which is located on the rear end plate. The power supply is located in the IR 2 electronics building, B620B, rack 11. Two 250MCM cables deliver the power to the rear end plate power distribution buses. Lock and Tag is required when service is required at the power supply terminals or on the rear end plate power distribution buses.

Manufacturer

Electronic Measurements Inc.

Equipment Number(s)

- Model 20T250

Location of Equipment Evaluated

- IR-2, B620B, RK 11, ELEVATION 11

II. Operator Controls

- Computer Control System (Remote) - N/A
- equipment control (Local)
- power Breaker panel 2PB620B-04, CKT# 38,40,42, which is located in building B620B rack 01.

III. Energy Sources - ELP/3

Energy Sources

Electrical	208 V AC, 3 Ø
Steam	N/A
Hydraulic	N/A
Pneumatic	N/A
Natural Gas	N/A
Other	N/A
Stored Energy Sources	Filter capacitors

1

Sources and Location:	The power supply has a three phase circuit breaker on the front panel located in B620B, rack 11, elevation 11.
Lockable (Y/N):	YES
Lock or Control Device:	Multi-lock clip, padlock, and tag.

2

Sources and Location:	The disconnect circuit breaker is a 208VAC three phase breaker, number 2PB620B-04, breakers 38, 40, 42, which is located in building B620B, attached to rack 01.
Lockable (Y/N):	YES
Lock or Control Device:	Multi-lock clip, padlock, and tag.

Equipment Lock and Tag Procedures

IV. Shutdown Procedures - ELP/4

1

Action Step:	Turn off the circuit breaker on front panel of power supply.
Lock Type and Location:	N/A
Verify De-energized State:	YES
How:	Observe that the equipment goes off by observing the front panel red light goes out and that both the voltage and current meters display are blank.

2

Action Step:	Turn off circuit breaker 2PB620B-04, breakers 38, 40, 42.
Lock Type and Location:	Multi-pole circuit breaker, padlock, and tag.
Verify De-energized State:	yes
How:	Turn the power supply front panel circuit breaker, located in rack 11, on. Verify the equipment did not turn on by observing the front panel red light is off and that both the voltage and current meters are blank. Turn the power supply front panel circuit breaker off.

V. Start-up Procedure - ELP/5

1

Action Step:	Clear tools and personnel and secure barriers.

2

Action Step:	Secure equipment for operating. Insure that the all protection covers are properly installed.
Energy Source Activated:	N/A

3

Action Step:	Remove lock and tag and multi-lock clip from breaker. Close the breaker number 2PB620B-4, breakers 38, 40, 42.
Energy Source Activated:	N/A

4

Action Step:	Power up equipment
Energy Source Activated:	N/A

Equipment Lock and Tag Procedures

VI. Affected and Authorized Employees - ELP/6

- Technicians
- Engineers
- Physicists

BaBar
Drift Chamber
High Voltage Power Supply

Purpose

This document defines the procedure for removing AC power and discharging electrical hazards from the above equipment. This procedure is NOT a SLAC lock and tag procedure. The red lock and tag padlock may not be used. This lockout is to protect personnel from "startle" hazard. This hazard can occur when personnel are working on the following equipment:
(1) The rear endplate high voltage printed circuit boards and wiring.
(2) Any time when the power supply or filter chassis is disconnected.
(3) The forward end when the endplate covers are removed.

Scope

The document will locate the appropriate controls for lock out of the equipment.

Distribution

(1) copy BaBar Safety web page Master File
(1) copy IR-2 control room
(1) copy posted at equipment

Note: *Please check for the latest changes before using this procedure.*

Equipment Administrative Lockout Procedures

I. Equipment Identification - ELP/2

General Description

The BaBar Drift Chamber uses one high voltage power supply mainframe and one filter chassis, that delivers 350, 900 and 2,000 volts at 40 micro-amperes to the sense and field wire in drift chamber volume. The power supply and the filter chassis are located in the IR 2 electronics building, B620B, rack 11. The cables deliver the voltage to the rear end plate bulkhead. Lockout is required when personnel service the power supply, cabling, the rear end plate distribution printed circuit boards or when the forward endplate covers are removed.

Manufacturer

High voltage mainframe - CAEN.
Filter chassis - SLAC

Equipment Number

- Model SY527
- 350-707-50

Location of Equipment Evaluated

- High voltage mainframe - IR-2, B620B, RK 11, ELEVATION 26
- Filter chassis - IR-2, B620B, RK 11, mounted on rear, ELEVATION 20

II. Operator Controls

- Computer Control System (Remote) - N/A
- equipment control (Local)
- power - 110VAC power cord plugged into the quad 110VAC distribution box which is located in the rear of rack 11 in building B620B.

Equipment Administrative Lockout Procedures

III. Energy Sources - ELP/3

Energy Sources

Electrical	115 V AC, 1 Ø
Steam	N/A
Hydraulic	N/A
Pneumatic	N/A
Natural Gas	N/A
Other	N/A
Stored Energy Sources	Filter capacitors

1

Sources and Location: The power supply has front panel key switch.

Lockable (Y/N): NO

2

Sources and Location:

The power source is the 110VAC power cord which is plugged into the quad power distribution box mounted in the rear of rack 11.

Lockable (Y/N): YES

Lock or Control Device:

Plug Hugger, Bradey CAT# 65673,
SLAC stores # 42-301-005-01. This device must be painted yellow.

Equipment Administrative Lockout Procedures

IV. Shutdown Procedures - ELP/4

1

Action Step:	Turn off the key on front panel of power supply.
Lock Type and Location:	N/A
Verify De-energized State:	YES
How:	Observe that the equipment goes off by observing the front panel LCD display clears and that the red light located on the rear of the CAEN SY527 goes out. The red light will take about a minute to go out which is the time required for the system to discharge.

2

Action Step:	Remove the CAEN SY527 chassis 100VAC power plug from the quad power distribution box mounted in the rear of rack 11.
Lock Type and Location:	Attach the Yellow Plug Hugger the power plug. Add lockout tag to plug.
Verify De-energized State:	yes
How:	Turn the front panel key to local. Verify the equipment did not turn on by observing the front panel LCD display does not display after a minute. Turn the power supply front panel key off.

Equipment Administrative Lockout Procedures

V. Start-up Procedure - ELP/5

1

Action Step: Clear tools and personnel and secure barriers.

2

Action Step: Secure equipment for operating. Insure that the all protection covers are properly installed.

Energy Source Activated: N/A

3

Action Step: Remove Plug Hugger, and tag from power plug.

Energy Source Activated: Turn the key switch on which is located on the power supply mainframe front panel.

4

Action Step: Power up equipment

Energy Source Activated: N/A

Equipment Administrative Lockout Procedures

VI. Affected and Authorized Employees - ELP/6

- Technicians
- Engineers
- Physicists