

THE LOADLOCK SYSTEM USE MANUAL

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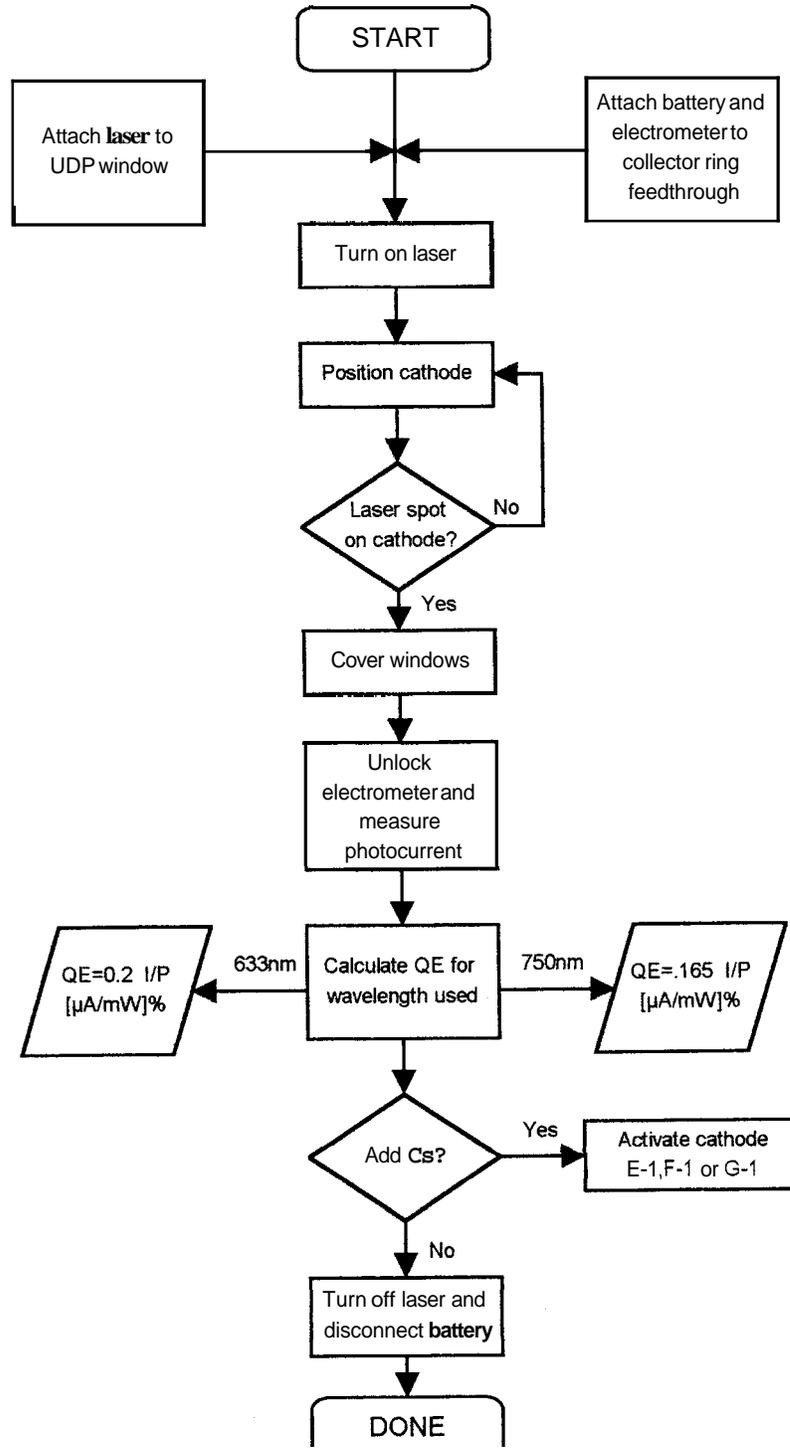
INTRODUCTION

LoadLock is a photocathode processing/insertion unit for the SLAC polarized electron guns. It retains vacuum integrity when disconnected from a gun, therefore, a single LoadLock can serve a succession of guns.

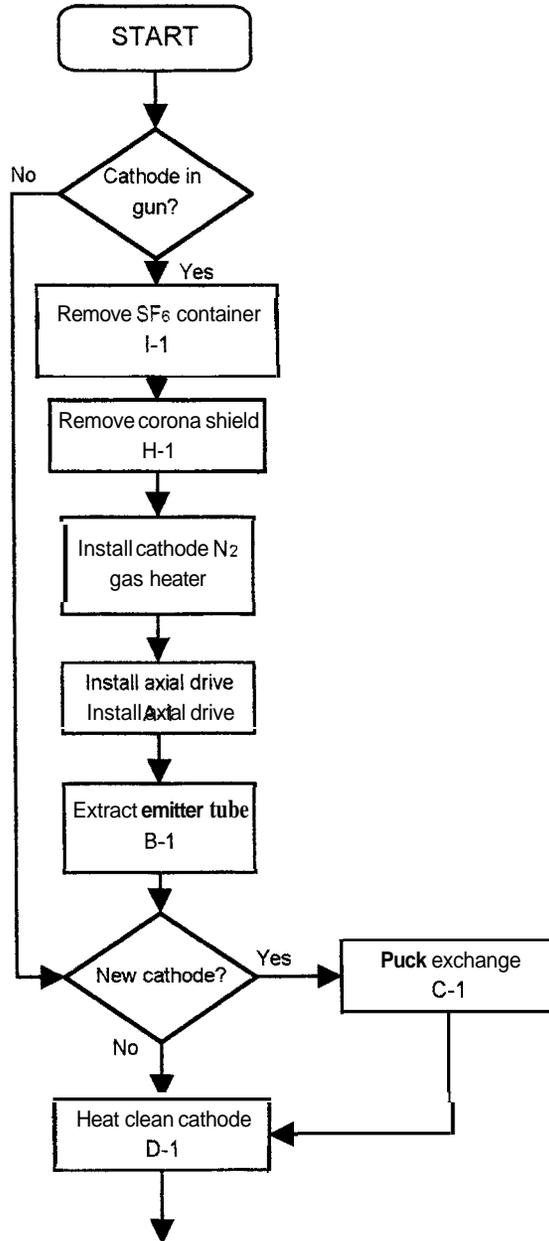
The unit consists of a number of sub-units. These are:

- 1) A vacuum chamber, the unidecapus (UDP), containing pumping, Cs and NF₃ sources, and a transfer fork system for moving pucks between the cathode emitter tube and a tray containing extra pucks. Windows allow viewing as well as light to enter and illuminate the cathode during activation.
- 2) A puck tray connected to the UDP by an isolation valve, which allows a total of four pucks from which to choose.
- 3) An emitter tube inside a long transfer bellows. The cathode puck is snapped onto the downstream end and is inserted into the gun after cathode activation. The air side of the tube may contain a heater or cooler mechanism. This tube passes through the UDP on its way to the gun.
- 4) A mechanical drive unit, the axial drive, which is coupled to the emitter tube bellows and supports it during transfer into the gun. The axial drive is disconnected from LoadLock for gun high voltage operation.
- 5) A corona shield which surrounds the UDP, emitter tube and puck tray after the cathode is inserted into the gun. This presents a smooth corona-free surface for high voltage operation.
- 6) An SF₆ can which surrounds the corona shield for high voltage operation. It contains an insulating gas in dynamic flow, which may be dry air, N₂ or SF₆.
- 7) A short vacuum spool which mechanically connects LoadLock and a gun together.

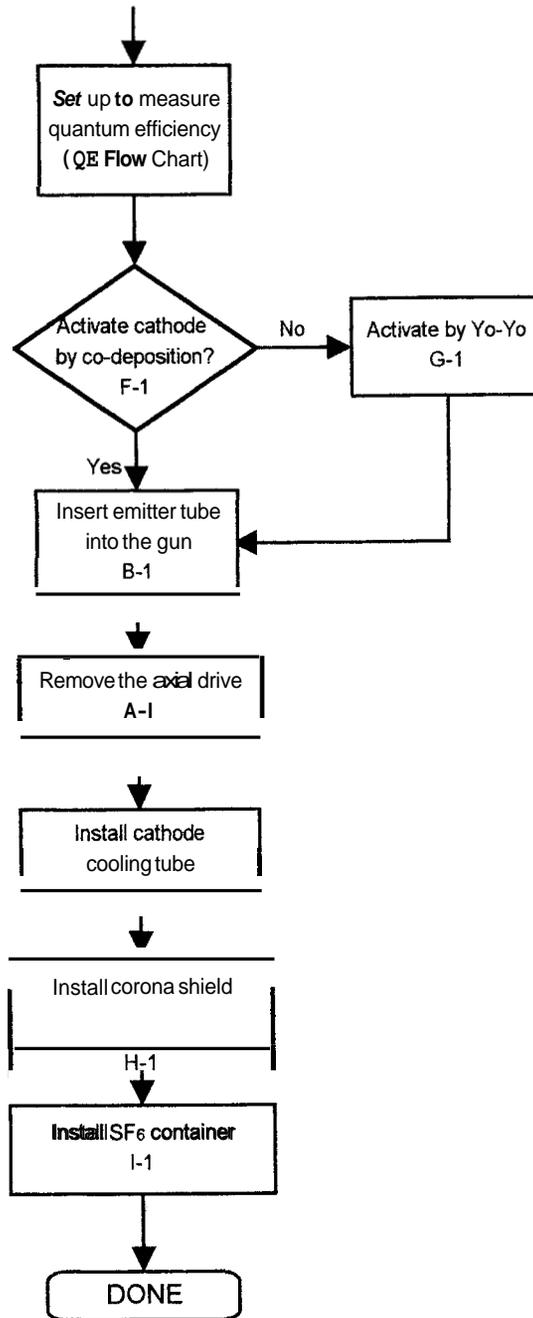
MEASURE QUANTUM EFFICIENCY



CATHODE ACTIVATION



CATHODE ACTIVATION (CONT'D)



3.23 Installing/Removing Load Lock Axial Drive

This section has been approved by:	Date:
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Originator:	Date:
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3.23.1 Introduction

The axial drive is installed after the SF6 and corona shields have been removed. Conversely, the drive on its lift cart must be removed to install the SF6 container (but not necessarily the corona shield). The axial drive lift cart need not be removed from the drive after installation, as long as it does not apply an uplift force.

3.23.2 Axial Drive Removal

Reverse the following procedure to remove the axial drive.

Note: *Before installing the drive, change the emitter heating or cooling units, as desired.*

Step 1: First, remove the cathode chill lines, if installed.

Caution! **Avoid side stress on the emitter tube.**

Step 2: Maneuver the drive (on its cart) under the UDP and parallel to the gun beam line. Raise the drive and move into alignment blocks at downstream end and into trough at upstream end. Lower into place and bolt drive flange to the gun deck. At this point, the cart should exert no upload on the drive. Secure the earthquake restraint clamp(s) at the upstream end of the drive.

Step 3: Open the emitter tube iris fully and lock it open with its set screws. Remove the safety cables securing ends of emitter tube bellows.

Step 4: Move emitter tower to emitter tube flange, taking care to route heater cables and puck tray through the tower keyway.

Step 5: Install 3/8-16 bolts connecting tower to the emitter tube flange assembly. Loosen alignment tube sliders at upstream end using opposing wrench technique and slide downstream for storage.

Step 6: Extract the emitter tube while watching for proper clearance of the tube inside the UDP and for the puck tray through the tower keyway.

3.24 Extracting/Inserting the Emitter Tube

This section has been approved by:	Date:
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Originator:	Date:
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3.24.1 Introduction

Before extracting the emitter tube, install the emitter heating or cooling units as desired. Before extracting or installing, open the Iris Diaphragm.

3.24.2 Extraction procedure

- Step 1: Wipe the rails of the axial drive clean with a dry rag or lint-free cloth.
- Step 2: Slowly and steadily back out the emitter tube out of the gun to the puck loading or unloading position. Watch the force gauge for sudden movement toward zero pounds, which indicates a tube hang-up. Check frequently to ensure that the tube is centered vertically and horizontally. Either may be adjusted with the pair of fine thread screws at the upstream end of the transfer car.
- Step 3: Close the gun and Load Lock VAT gate valves if processing of cathodes are to take place.

3.24.3 Insertion procedure

- Step 1: Clean rails.
- Step 2: Open Load Lock and Gun VAT gate valves.
- Step 3: Follow step 2 of extraction procedure, except a tube hang-up will show as a sudden force increase on the force gauge.
- Step 4: After the emitter tube is re-inserted into the gun, be sure to close the Iris Diaphragm around the tube (GENTLY) and lock its set screws.

3.25 Cathode Puck Exchange

This section has been approved by:	Date:
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3.25.1 Introduction

It is assumed that the emitter tube is at the puck load/unload position, i.e., where the transfer fork is in-line with the mating grooves in the puck side. If the strongbacks are in place on the transfer fork unit, remove the window side one and replace it with its screw drive. Then remove the second strongback.

3.25.2 Removal/Exchange

- Step 1: Puck removal and exchange then proceeds:
Tighten the two 1/4-20 force gauge car bolts. This is only temporary during puck removal or attachment to keep the emitter tube from being driven directly by the force gauge and potentially damaging the gauge.
- Step 2: The puck tray must be retracted from the UDP so that the forks may move freely. Run the fork up to the emitter tube using the hand or power drive. Watch carefully through the windows.
- Step 3: Work the fork and emitter tube bellows to get the fork engaged onto the puck. Note that the fork is in place on the puck when the small tab on the fork just touches the bottom (chin) of the puck and the top of the fork is in engagement in the upper fork guide. The tab prevents the puck from sliding down on the fork when it is free of the tube. The fork guide supports the top end of the fork, preventing bending during puck disengagement.
- Step 4: Slowly move the transfer car upstream, which disconnects the puck from the emitter tube. Move the tube upstream an inch or so. Use manual or power drive to lower the fork with puck into the bottom port. Take care entering the port to avoid a hang-up of the fork separator disk on the port corner.
- Step 5: Make sure the tray VAT valve is fully open. Once the area is clear, slowly and carefully (ABSOLUTELY NO POWER DRIVES) insert the puck tray into the UDP until a desired empty puck position is above the puck on the fork.

Raise the fork with puck into the open tray space and use both motions (tray and fork) to work the puck onto the empty station.

- Step 6 Lower the fork, now puckless, to below the tray and move the tray to the desired new puck, or back out the tray if it is to be fitted with new pucks. Raise the fork to remove the new puck and then lower it (now with puck) again into the port. Back out the puck tray again with manual-only motion.
- Step 7: Raise the fork with puck to the emitter tube position and install the puck, again moving the tube slowly.
- Step 8: Loosen the two 1/4-20 screws on the force gauge car.

3.26

Heat Cleaning a Cathode

This section has been approved by:	Date:
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3.26.1 Purpose

To heat clean a cathode using the emitter tube heater.

- Step 1: The N₂ gas heater must be in place prior to extracting the emitter tube from the gun. This is the only position in which there is sufficient clearance to install or remove the heater. If a 22.5 mm diameter cathode is used, return the fork to the puck tray and fetch the radiation reflector from the tray prior to Step 2. Return the reflector to the tray prior to a cathode exchange.
- Step 2: Position the puck on the emitter tube to lie about 0.5" upstream of the fork assembly. This permits use of the fork to push on the puck after it gets to temperature and leaves sufficient room behind the fork to allow the emitter tube to grow thermally during temperature ramp-up without prematurely pressing on the fork and bending it.
- Step 3: Raise the fork until the ceramic inserts in the fork face are in-line with the puck face. The ceramic will be in contact with the puck later, at temperature. Check to make sure that the dial force gauge is activated, i.e., the two restraining 1/4-20 screws next to it are loose.
- Step 4: Connect a source of DRY N₂ to the tube heater assembly and a 120 VAC variac to the 120/240 volt transformer that connects to the emitter tube heater leads. The N₂ gas flows through a copper coil with an LN₂ bucket around it, which is empty for heating. LN₂ will be used during the cooling phase of the cleaning procedure. Set the N₂ flow to 10-20 SCFH. Connect a type K thermocouple (TC) readout to the emitter tube TC.
- Step 5: Close and latch the gun VAT valve. Make sure the puck tray is retracted and close, but do not latch the other two VAT valves.
- Step 6: Begin heating. Set the variac to about 50 volts for 1 minute and then raise to 80 volts. Allow the temperature to rise watching the heater TC. During the

rise, the tube will grow in length and may require retraction upstream to avoid touching the forks. Do not engage against the forks until the heater TC is above 750°C (about 20-30 minutes, depending on N2 flow rate). Then, watching the dial force gauge, move the puck into the fork with about 2-3 lbs pressure. This will show on the gauge as a REDUCTION in force. Check the gauge every 5 minutes and retract the tube as needed to maintain the specified force. Adjust the variac 1 or 2 volts at a time to stay between 800 and 810°C. Push the TC forward occasionally to be sure it contacts the inside end of the emitter tube. When the puck first engages the fork, the TC will drop 20°C or so. Correct with the variac, as needed.

- Step 7: After about 10 minutes of fork engagement and 800°C TC temperature, the GaAs will be near 600°C. Continue monitoring for one hour. During this period, it is a good idea to momentarily open the cesiator valve to vent its gas while the cathode is hot and relatively insensitive.
- Step 8: After one hour, turn off variac and raise N2 flow to 50 SCFH. When the TC reads 500-600°C, fill the LN2 bucket. At 60-70°C, remove the bucket. At 35-40°C, begin cathode activation. Sometime during the cool down, retract the tube and lower the fork several inches to clear the cathode for insertion into the gun.

3.26.2 Heat Cleaning

To heat clean using the electron bombardment heater (currently available only in Load Lock #2):

Note: *The above procedure is still relevant except the fork is not used to engage the puck.*

- Step 1: Move the puck to the e-beam heater assembly with the heater filament concentric about the puck OD and half-way back on the puck length. There should be no line of sight of the filament to the face of the cathode.
- Step 2: Connect the filament supply to the e-beam heater feedthrough using the special e-beam cable. Connect red lead to red, black to black. Connect the high voltage power supply to the filament supply front panel positive sense lead and ground alligator clip to the chassis ground jack.
- Step 3: Slowly set the filament supply to a negative output (ccw on the voltage dial) of about 9 amps. Set the HV supply to negative output and raise to 500 volts. While monitoring the HV current output, raise the filament current until the HV current output is 40 mA. This will correspond to about 12.5 A on the filament supply.
- Step 4: Now also heat with the emitter tube heater, as described above, adjusting the emitter tube position as required to stay centralized in the e-beam heater.

At the end of the one hour heating time, remove HV and filament current, turn off variac and restore the collector cable to the filament feedthrough. Continue with step 8, above.

3.27 Cathode Activation

This section has been approved by:	Date:
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Originator:	Date:
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3.27.1 Introduction

There are two methods of activating cathodes using NF₃ and Cs, so-called co-deposition and yo-yo. Although the method employed can be a matter of preference (even conscience), it is usually determined by the Cs source capability. Yo-yo requires a high deposition rate source that has a nearly instantaneous shutoff. In Load Lock, this is possible with the removable cap on a hot effusion cell. It is also possible, in principle, with a channel-type cesiator set at a high deposition (high heating current) rate. The methods will assume a Load Lock effusion cell.

3.27.2 Procedure

- Step 1: Position the cathode surface to coincide with the center of the Load Lock side viewport. Attach the 0.72 mW HeNe laser to the angled viewport of the UDP and set it to illuminate the center of the cathode. Connect the fiber optic white light to the top viewport of the UDP and set it to minimum intensity. Both white and HeNe are on initially during activation.
- Step 2: Connect a 40-70 volt battery to the collector ring feedthrough, positive side to collector, negative side to an electrometer. On Load Lock #1, the feedthrough connection is a BNC, on unit #2 use the collector cable between feedthrough and battery BNC. Follow the color code on the cable connection. The electrometer output is sent to a chart recorder set at a chart speed of 1 cm/min or so.
- Step 3: Unload the torque on the effusion cell valve at room temperature but leave it closed.

Proceed as follows:

- Raise the the effusion cell temperature during the heat cleaning of the cathode to its use temperature.

- For co-deposition, use 85°C on the tail and 190°C on the valve.
- For yo-yo, use 96°C on the tail and 200°C on the valve.

Note: *These numbers are only guidelines and change somewhat with each cesiator assembly.*

- Open the cesiator valve briefly to the UDP during cathode heat cleaning to exhaust its gases.

Step 4: Cesium begins when the cathode emitter tube TC reaches about 35-40°C following heat cleaning and cooldown. Set the electrometer to the 10E-9 A scale, the recorder on, open the cesiator valve and uncap the cesiator tube.

Step 5: Follow the procedure appropriate for co-deposition or yo-yo.

Step 6: After completion of the activation, be sure to torque the cesiator valve, close and record the closure torque on the valve tag.

ACTIVATING BY CO-DEPOSITION

It is assumed that the conditions of "Cathode Activation" have been met, in particular, the cesiator temperature is 85oC on the tail and 190oC on the valve. Both white light and HeNe are on initially.

Open the Cs valve and uncap the cesiator tube. Usually the photocurrent will rise within one minute unless the effusion cell has not been used previously. In that case, up to an hour may be required. Allow the current to rise until it reaches about one microamp. Turn off the white light and use only the HeNe. When the current tops out, open the NF3 valve (about four turns, check the tag on the valve) and adjust the flow rate to maximize the rate of rise of the photocurrent.

As the cathode activation proceeds, progressively higher pressures (10E-9 torr scale) of NF3 will be required. Terminate the activation when adjusting the NF3 rate no longer is beneficial and the photocurrent tops out. Close the NF3 valve, cap the cesiator and close the Cs valve. After a few minutes, uncap the cesiator tube to see if there is further improvement. Sufficient Cs is in the tube to check this without opening the Cs valve.

Do not leave the collector voltage on longer than is necessary as the electron-induced desorption from the collector ring will poison the cathode. The quantum efficiency is calculated for HeNe by:

$$QE (\%) = 0.2 [I (\text{microamp}) / P (\text{milliwatts})]$$

ACTIVATING BY YO-YO

It is assumed that the conditions of "Cathode Activation" have been met, in particular, the cesiator temperature is 960C on the tail and 2000C on the valve. Both white light and HeNe are on initially.

Open the Cs valve and uncap the cesiator tube. Usually the photocurrent will rise within one minute unless the effusion cell has not been used previously. In that case, up to an hour may be required. Allow the current to rise until it reaches about one microamp. Turn off the white light and use only the HeNe. As the current tops out, cap the Cs tube (leave the valve open), open the NF3 valve (about four turns, check the tag on the leak valve) and adjust the flow rate for rapid rise of the photocurrent.

Now, as the current peaks, uncap the Cs tube and let the current die to 2/3 of its peak. Leave the NF3 valve alone. Cap the Cs and repeat the cycle (ten times or so) until there is essentially no further gain in the overall peak.

On the last cycle, when the current drops to 2/3, cap the Cs and close the Cs valve. When the current peaks, close the NF3 valve. After a while (several minutes), try a little Cs from the warm cesiator tube by uncapping. If the current drops sharply, try some NF3. In either case, end with mild over-cesiation. A good yo-yo activation should take no more than 30 minutes.

Do not leave the collector voltage on longer than is necessary as the electron-induced desorption from the collector ring will poison the cathode. The quantum efficiency is calculated for HeNe by:

$$QE (\%) = 0.2[I(\text{microamp})/P(\text{milliwatts})]$$

3.28 Removing/Installing the Corona Shields

This section has been approved by:	Date:
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Originator:	Date:
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3.28.1 Introduction

Removing the corona shields is described. Installation is essentially the reverse process.

- Step 1: Ground the corona shield and G10 aluminum alignment spool with a grounded cable or ground hook.
- Step 2: Remove the tape covering the screw heads and at the join of the top and bottom shield halves. Use appropriate solvent, if necessary, to remove traces of the tape adhesive.
- Step 3: Insert a supporting jack under the shields near the upstream end. Remove the two screws securing the corona top halves at the upstream end of the corona. Remove the screws from the top corona collar and lift away (upward) the top shield.
- Step 4: Position the grounding straps on the UDP and the G10 aluminum alignment spool.
- Step 5: If cooling lines are present, remove them by using the opposing wrench technique to loosen the swagelock connectors. Take care not to apply a torque to the emitter tube flange. Install the stainless steel bypass on the cooling line ends while flushing with the cathode cooling gas.
- Step 6: Note that, for the beam current meter to function, the UDP must not short to the inside of the corona. Mylar sheet is used to electrically isolate the following items: ion pump magnet, battery-operated ion pump power supply (if used), puck tray bottom, NEG pump valve driver.
- Step 7: Remove lower half screws from the bottom corona collar. Swing down and away to remove the lower corona.

Step 8: When storing, protect the corona shields from scratches and denting to the exterior surfaces.

3.29 Removing/Installing the SF6 Container

This section has been approved by:	Date:
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Originator:	Date:
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3.29.1 Introduction

Removing the SF6 container is described but installation is essentially the reverse of removal.

- Step 1: Turn off high voltage. Install a jack under the SF6 container and remove the suspension cable, if at CID.
- Step 2: Disconnect gas fill and drain lines from top and bottom of container. Cover all connections with clean aluminum foil.
- Step 3: Remove nuts and washers from top half at the SF6 spool piece. Remove bolts, nuts and washers from horizontal flange.
- Step 4: Slide back, lift and remove the top half.
- Step 5: Ground strap the now-exposed corona shield and G10 aluminum alignment spool.
- Step 6: Disconnect the high voltage cable from the corona exterior by removing the three screws holding the brass cable plate to the corona side. Remove the bolts holding the cable pillbox feedthrough to the lower SF6 container. Slide out the cable and ground it appropriately.
- Step 7: Remove nuts and washers from the lower SF6 container half at the SF6 spool piece. Supporting the container at the sides, remove the rear pedestal support. Slide back and swing out the container.
- Step 8: When storing, protect the SF6 containers from scratches to the O-ring mating surfaces and container interiors.

3.30 Cathode Tray Refill and Bakeout

This section has been approved by:	Date:
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Originator:	Date:
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3.20.1 Introduction

If the puck tray is still attached to the UDP, follow these steps for removal.

- Step 1: Fully retract the tray from the UDP using the hand wheel drive not the power drive. Fully retracted is positioning the upstream bearing at the upstream end of its track.
- Step 2: Close and latch the cathode tray VAT valve. If the emitter tube is in the gun, do a retraction and close the gun VAT valve for safety in case of an air leak in the tray VAT valve. The valve should be closed and latched 24 hour prior to tray removal, if possible. Minor leaks in the valve seal have shown themselves to be self healing over time.
- Step 3: Bleed the tray up to dry filtered N₂ while watching the UDP ion pump supply current for any indication of a leak through the valve. After reaching atmospheric pressure in the tray, remove the nuts from the VAT valve studs on the tray side of the valve, while supporting the tray. Remove the tray and cover the VAT flange with clean foil or a flange to prevent dust entry. Cover the tray opening with clean foil. When the tray is removed to a clean area, the pucks may be removed for replacement. Old cathodes are removed for archiving with Earl Hoyt. Used pucks should be boiled in distilled water to remove Cs traces. Water is followed by a hot methanol rinse and 80°C air bake. Note that the radiation reflector is most conveniently mounted in position #1 (furthest from the tray vacuum flange).
- Step 4: After mounting new cathodes, replace the pucks into the tray, cover with foil after fully retracting the bearing to the end of its track, as in step 3 above.

- Step 5: Replace the used gaskets on the pumpout double-sided flange with new 1.5" ID silver-plated soft copper gaskets. Use new nuts on the valve studs and fully tighten the nuts until both sides of the double-sided flange are face-to-face without a visible gap. This ensures that the tray will move into the system without scraping the port insides.
- Step 6: Following flange tightening, pump the tray using a mini-conflat flanged bellows or copper pinchoff tube connected to an oil-less pump. Pump to high vacuum with an ion or turbo pump. The tray should now be baked out to 250°C with the Glas-Col mantle installed.
- Step 7: First install the top tray strongback. Remove the screw drive and install the bottom strongback. Lay a thermocouple inside the lower strongback about mid-bellows. Hose clamp a second TC to the mini-valve flange cuff. Slip on both heating mantles and secure with the velcro straps, while ensuring that the thermocouples remain in place. Use two 120 volts variacs to control the mantle temperature. Use 45 volts on the long mantle and 75 volts on the small one. Temperatures will be 250°C and 225°C, respectively.
- Step 8: Raise the temperature of the tray and valve to 250°C in about one hour. Hold at temperature for six hours. It takes about one hour to drop to 120°C or so. At that point, close the mini-valve and pinch off the copper tube, if used.
- Step 9: Open the VAT valve, blow clean the bellows external convolutions, install the drive, and transfer the puck as detailed in "Exchange Cathodes".

INSULATING GAS SUBSYSTEM

To connect the insulating gas subsystem to LoadLock and begin flow, contact the Experimental Facilities Department.

INSTALLING/REMOVING THE AXIAL DRIVE AT CID

The axial drive is installed after the SF6 cans and corona shields have been removed. Conversely, the drive on its lift cart must be removed to install the SF6 container (but not necessarily the corona shield). The axial drive lift cart need not be removed from the drive, after drive installation, as long as it does not apply an uplift force.

- 1) Move the HV power supply and resistor box down the aisle to allow access for the drive installation.
- 2) Install two dial indicators:
 - one at the straight-through valve at the downstream end of the gun;
 - one at the bottom of the SF6 cylinder;
 - set the indicators for a zero reading.
- 3) Measure the distance from the bottom of the SF6 flange to the floor at the point of the rear cable support attachment, typically about 64.75". Record the measurement.
- 4) Install the tripod floor jack under the SF6 can belly, remove the support cable, and remove the top half of the SF6 can.
- 5) Check the dial indicator's maximum reading, which should not exceed .010" at the SF6 cylinder and .002" at the valve. If exceeded, compensate to zero using the jack screws under the side flanges of the SF6 cylinder.
CAUTION!! - Turn both jack screws the same amount.
- 6) Remove the lower half of the SF6 can. Return to Item 5 and repeat.
- 7) Remove the top half of the corona shield, return to Item 5 and repeat. Remove the bottom half of the corona shield, return to Item 5 and repeat.
Consult page A-1 - "Installing/Removing the Axial Drive in the Gun Lab" for details concerning the following steps.
- 8) Remove the cathode chill lines and install the cathode heater. CAUTION!! - avoid applying a side load to the emitter tube.

- 9) Install the axial drive using the lift cart. The Downstream flange of the reddish-brown drive support beam rests on the gun table aluminum support beam. The flange right side nests into the corner toward the aisle. Apply one "C" clamp on the right side tightly and one on the left side loosely. The upstream end of the drive support beam rests in the steel window box mounted in the CID wall. It registers against the aluminum angle and has its bottom on the swivel pad.
- 10) Continue with the procedures detailed on page A-1.
- 11) Continue with procedures on page B-1, "Extracting/ Inserting the Emitter Tube From the Gun".
- 12) When doing the re-installation of the the corona shield and SF6 can, check Item 5. When doing the SF6 can cable support attachment, check Item 3.

3.32 Preparing a Gun for Load Lock

This section has been approved by:	Date:
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Originator:	Date:
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3.32.1 Purpose

Four elements are necessary to configure a gun properly for Load Lock.

- 1) A 2.75" OD ratable CFF flange with a 1.625" OD x .063" wall seamless tube at the upstream end of the gun. This gives a clear 1.5" bore into the gun.
- 2) A 1.5" ID 0.1% Ag-alloy OFHC gasket for item 1.
- 3) A VAT manually-actuated all-metal gate valve, model 48032-CE01.
- 4) VAT-manufactured metric studs for item 2, with nuts. Stud size is modified at SLAC to 1.2" length, 9/16" and 5/16" threaded end portions. These should be Ag-plated at SLAC.

Step 1: Mount the valve to the gun using the 1.5" ID gasket and new studs. Make sure that the flange gap is fully closed.

Step 2: The valve position is with the actuator handle at 3 o'clock (⌚) looking downstream from the gun end. Valves are marked with an arrow on their body, showing the poppet-seal end. Connect the opposite end to the gun. This assures that the valve bellows is not exposed to air during connection to Load Lock.

Step 3: Studs are inserted with the short threaded end into the valve body.

3.32.3 For Gun Bakeout

Step 1: Flange the arrow side of the gate valve and open the valve.

Note: As always, care must be taken not to introduce dust into the valve or gun.

Step 2: Following bakeout, close and latch the VAT gate valve prior to flange removal.

Step 3: Remove the flange and leak-check the now-closed VAT valve poppet seal, prior to removal of the gun from the bake station.

3.33 Attaching Load Lock to a Gun

This section has been approved by:	Date:
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Originator:	Date:
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3.33.3 Introduction

Connecting or disconnecting Load Lock to a polarized gun is not a typical user task. Contact Tom Galetto to carry out this procedure.

3.33.4 Purpose

The gun and Load Lock units are connected together with a combination bellows/pumpout/iris diaphragm spool.

- Gaskets for both sides of the spool are 1.5" ID Ag-plated soft OFE copper. The spool is baked to 250°C after connection for a minimum of six hours.
- Both VAT gate valves on each end of the spool are closed during bakeout and not reopened before the spool temperature drops to 120°C or below. Pumping during bakeout may be done with ion or turbo pumps.

GLOSSARY

- Axial drive** - Mechanical unit consisting of a supported pair of steel rails upon which traverses a car/tower. The car is fastened to the cathode emitter tube for insertion into the gun.
- Car/tower** - Vertical mechanical structure containing bearings in its base which roll on the rails of the axial drive.
- Corona shield** - Mated pair of aluminum shells which fit over vacuum portion of LoadLock for high voltage operation.
- Gaskets** - Two kinds are used, both 1.5" ID. A standard hard 0.1% Ag alloy copper for all parts except the puck tray which uses a softer unalloyed gasket. This reduces knife-edge foldover on the tray VAT valve.
- Iris diaphragm** - Leaf-style unit mounted inside the spool which couples LoadLock and the gun together. Closes around the emitter tube during high voltage operation. Separates gun and LoadLock atmospheres.
- E-beam heating** - A flange-mounted unit for cathode heat cleaning, consisting of a rhenium ring filament and electron repeller. Used to add extra heating power for processing large area cathodes.
- Puck** - Molybdenum cylinder to which cathode wafers are mounted using a Ta retainer ring. Snap onto the emitter tube for insertion into the gun.
- Radiation reflector** - A frame-mounted titanium sheet, normally stored on Puck Tray position #1, which is used to enhance the heating efficiency of

large (22.5 mm diameter) cathodes by installing it on the transfer fork prior to the heat-cleaning procedure. The reflector faces the cathode surface during heating.

SF6 can - Mounts around corona shield for insulating gas containment.

Thermocouple - Two types are used: type K, in the emitter tube, cesiator, and for bakeout; type J, in the NEG pump heater unit.

UDP - Unidecapus (literally, "eleven-armed"), vacuum chamber containing services for activating cathodes.

Up/downstream - Downstream is the direction of the electron movement in the gun/accelerator.