

This instruction covers the set-up and use of the Lesker E-Beam Evaporator.

1. SAFETY REQUIREMENTS

- 1.1 Safety glasses must be worn whenever in the cleanroom, except when using a microscope or when wearing protective goggles.
- 1.2 Information regarding the hazardous materials used in the cleanroom can be found through MSDS documentation located in the gowning room.
- 1.3 When handling hazardous liquids and chemicals, Personal Protective Equipment must be worn.
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2. EQUIPMENT

- 2.1 Lesker Main Chamber
- 2.2 Vacuum control Panel
- 2.3 Temescal Power Supply
- 2.4 Temescal control panel

Lesker Evaporator

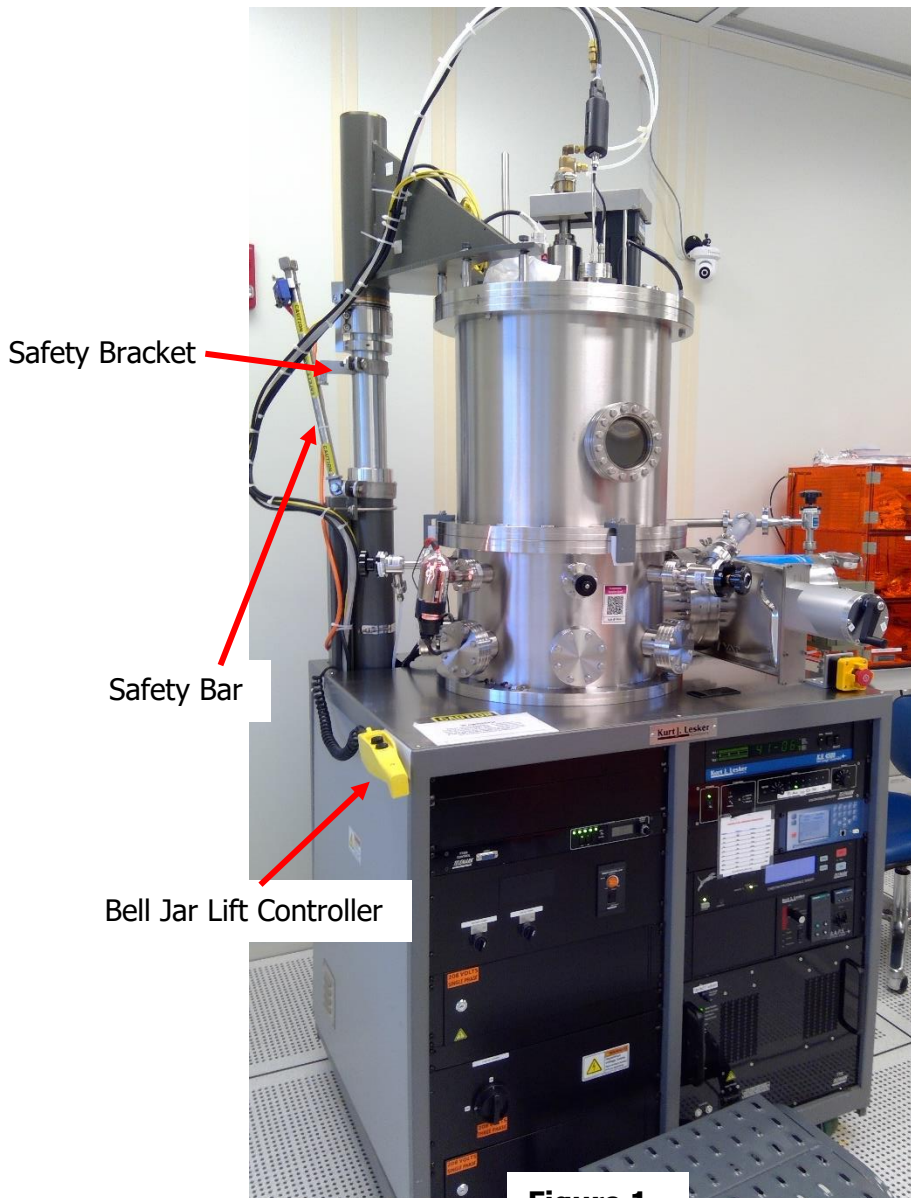


Figure 1

3. SOURCE MATERIAL

Refer to BNC Wiki for available source materials provided by Birck

- 3.1 Titanium
- 3.2 Chromium
- 3.3 Nickel
- 3.4 Gold
- 3.5 Palladium
- 3.6 Molybdenum
- 3.7 Aluminum
- 3.8 Platinum
- 3.9 Indium Tin Oxide
- 3.10 Silicon Dioxide
- 3.11 Alumina

4. VACUUM CYCLE OF OPERATION

- 4.1 Prior to beginning, please enable the Lesker through iLabs to ensure proper billing.
- 4.2 Record the pressure in the Log Book
- 4.3 Turn off the ion gauge controller by pushing the ION button

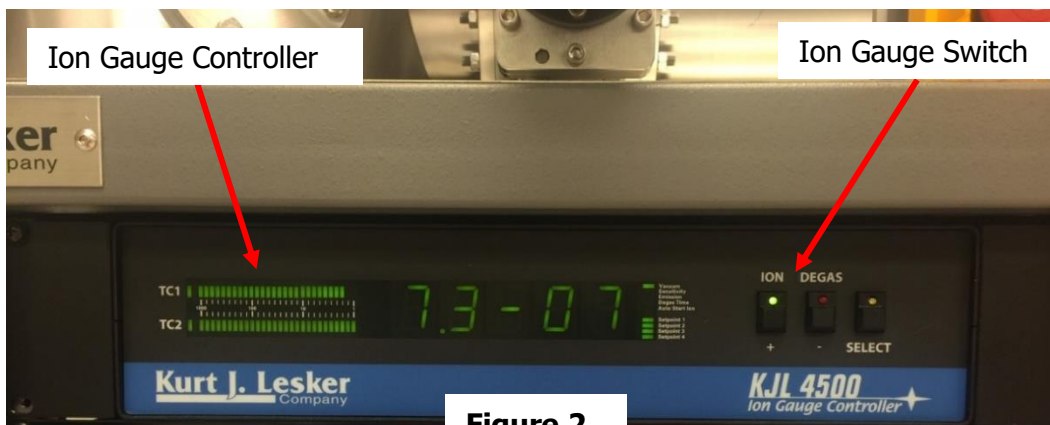


Figure 2

- 4.4 Close the Gate valve. Rotate the valve clockwise until the handle feels tight and locks in place

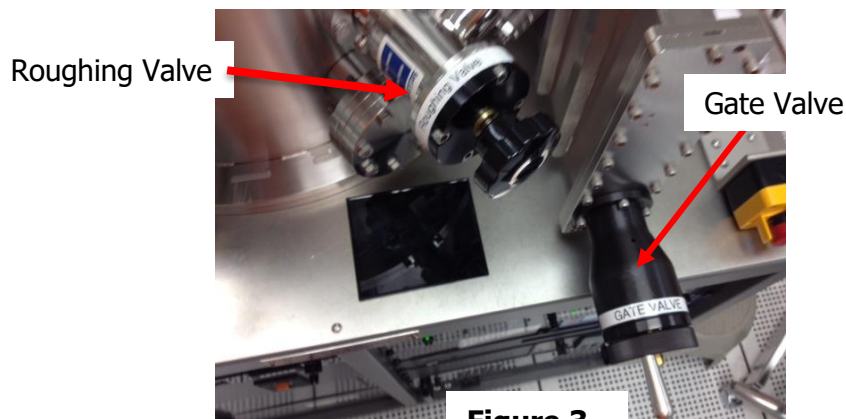


Figure 3

- 4.5 Slowly open the vent valve.
- The system will vent in approximately 4-5 minutes. Wait for a small gap between the bell jar and base.

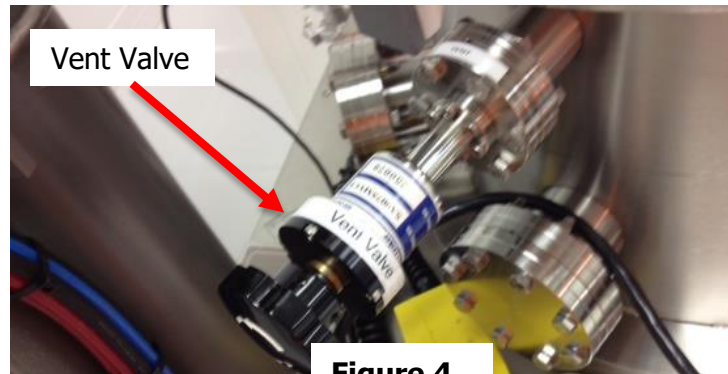


Figure 4

4.6 SAMPLE LOADING:

- 4.6.1 Fill out **PRECLEAN PVD RUN SHEET** in detail
- 4.6.2 Raise bell jar about 18 inches, making sure the safety bar clears the safety bracket, using the bell jar lift controller to allow access to the sample loading station (Figure 1).
NOTE: Only raise bell jar enough for the safety bar to clear the safety bracket.
- 4.6.3 Move the safety bar toward the bell jar so it is positioned under the safety bracket.
- 4.6.4 Lower the bell jar until the safety bar limit switch is engaged.
- 4.6.5 **DOUBLE GLOVE** before entering chamber. Make sure power breakers on the "TT-6" Power Supply are off before going into the chamber.
- 4.6.6 If the sample block is attached to the machine, it can be removed by loosening the 3 thumb screws approximately 1.5 turns, and then rotate the block clockwise about 10° until the block is free and able to lower straight down. (Figure 5)

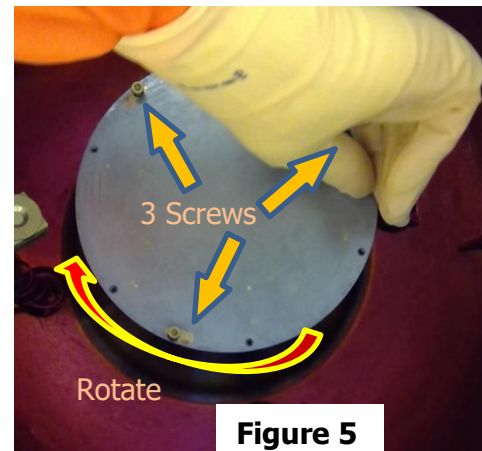


Figure 5

- 4.6.7 Load sample onto block sample holder using clips. NOTE: Only use the block located inside the chamber. (Figure 6)

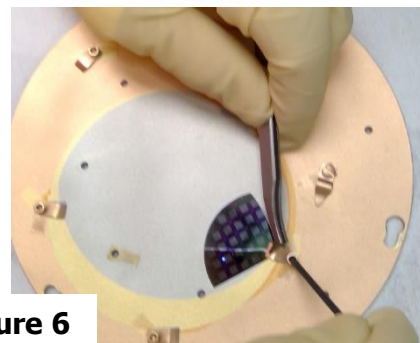


Figure 6

- 4.6.8 Blow the sample block with nitrogen gun located next to the tool.
- 4.6.9 Vacuum any loose metal flakes taking care to not contact the vacuum tube or with any of the sample, clips or block after wrapping new, clean UHV foil around the tip of the vacuum hose.

- 4.6.10 Fill out the log sheet detailing how your samples/glass slide has been cleaned.
BEFORE LOADING ANY SAMPLES INTO THE CHAMBER, MAKE SURE THEY ARE CLEANED PROPERLY! FAILURE TO CLEAN SAMPLES PROPERLY WILL RESULT IN LOSS OF PRIVILIGES ON THIS TOOL.
- 4.6.11 Mount the sample holder block onto the stage by aligning the three openings on the sample block with the thumb screws on the stage. Rotate the sample block counter-clockwise before snugging the screws against the sample block.
- 4.6.12 Wipe the base plate flange with new, clean wiper with Isopropyl Alcohol (use as many as needed). Do Not wipe the O-ring on the bell jar.
- 4.6.12 Lower the bell jar making sure the alignment tabs on the bell Jar are in the proper place.

4.7 ROUGHING THE SYSTEM

- 4.7.1 Close the Vent valve.
- 4.7.2 Slowly open the Rough valve
➤ Wait until the pressure drops below 5.0×10^{-2} torr or 50milli-torr. (Takes about 15 minutes)
- 4.7.3 Close the Rough valve.
- 4.7.4 Open the Gate Valve.
- 4.7.5 Wait 5 minutes and then turn on the Ion Gauge
➤ Record the initial pressure in the log book
- 4.7.6 Wait until the pressure in the falls below **3.0×10^{-6}** before proceeding.

5. DATA ENTRY OPERATION

- 5.1 Turn on the Main Power switch on the "TT-6" Power Supply

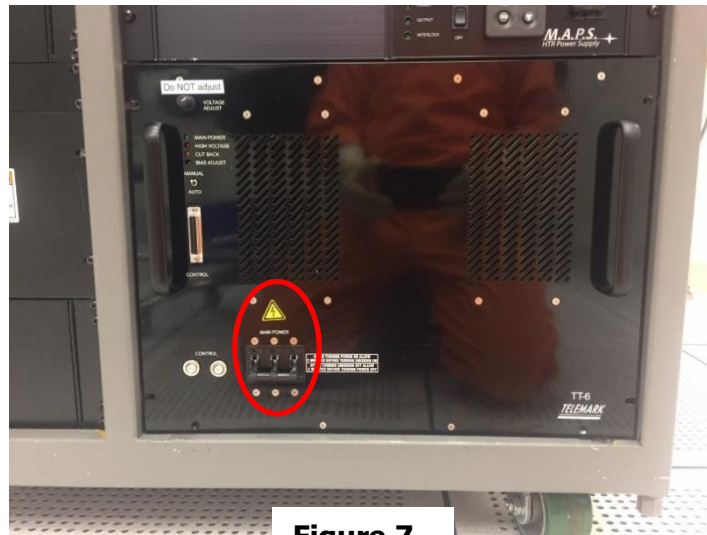


Figure 7

5.2 **INFICON CONTROLLER ENTRIES**

- 5.2.3 From the main screen, push the “menu” button
- 5.2.4 Arrow down to “film parameter” and press “menu”
- 5.2.6 From the source screen, enter the density and z-ratio for desired material and then press enter
- 5.2.7 Go to sensor menu and enter the tooling factor for desired material and press “menu”,
- 5.2.9 Scroll back to the left, press “menu”, scroll up to operate, and press “menu” to return to the main screen.

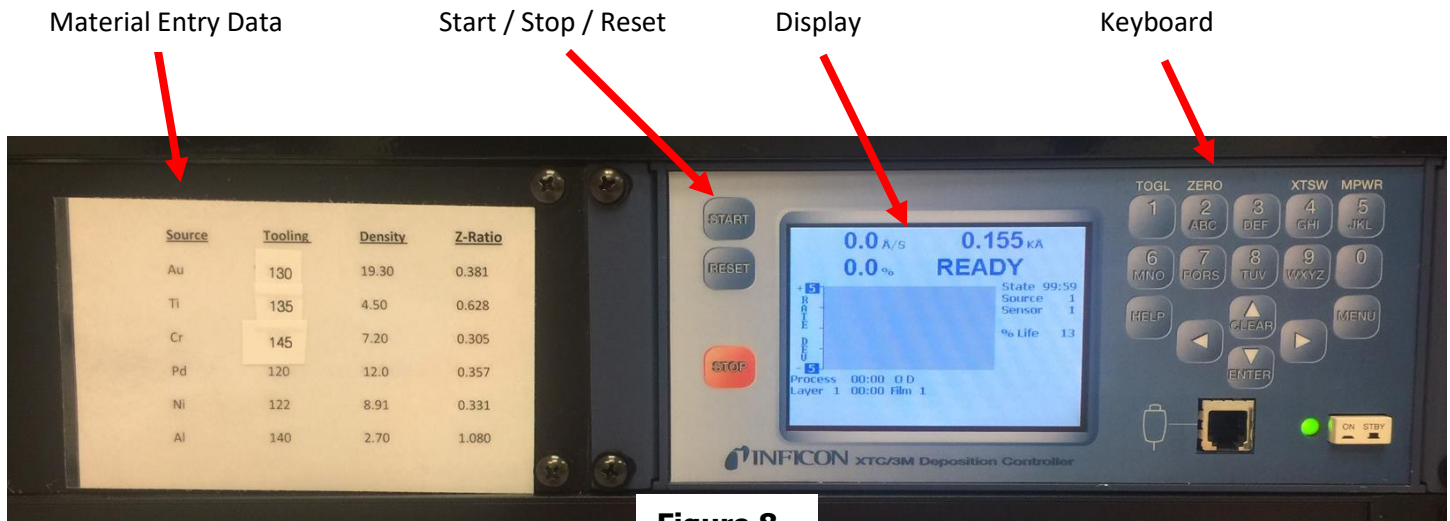


Figure 8

6. **DEPOSITION OPERATION**

- 6.1 Move the dial to the desired source on the TELEMARCrucible Indexer.



Figure 9

- 6.1.1 After approximately 30 seconds, the corresponding metal position chosen will light on Crucible Indexer.

6.1.2 Turn on the sweep Controller

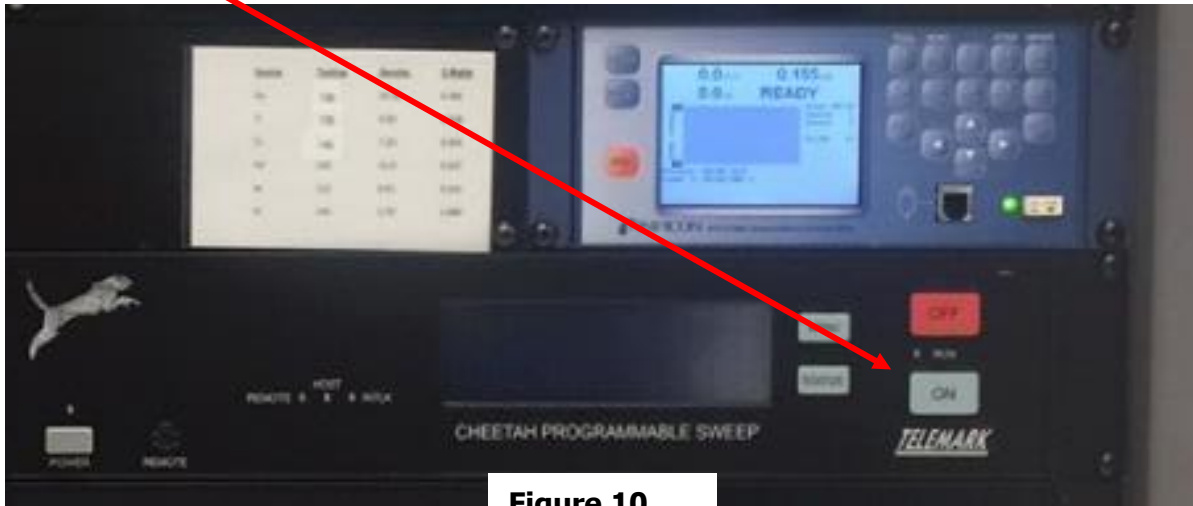


Figure 10

6.2 Turn on the substrate rotation

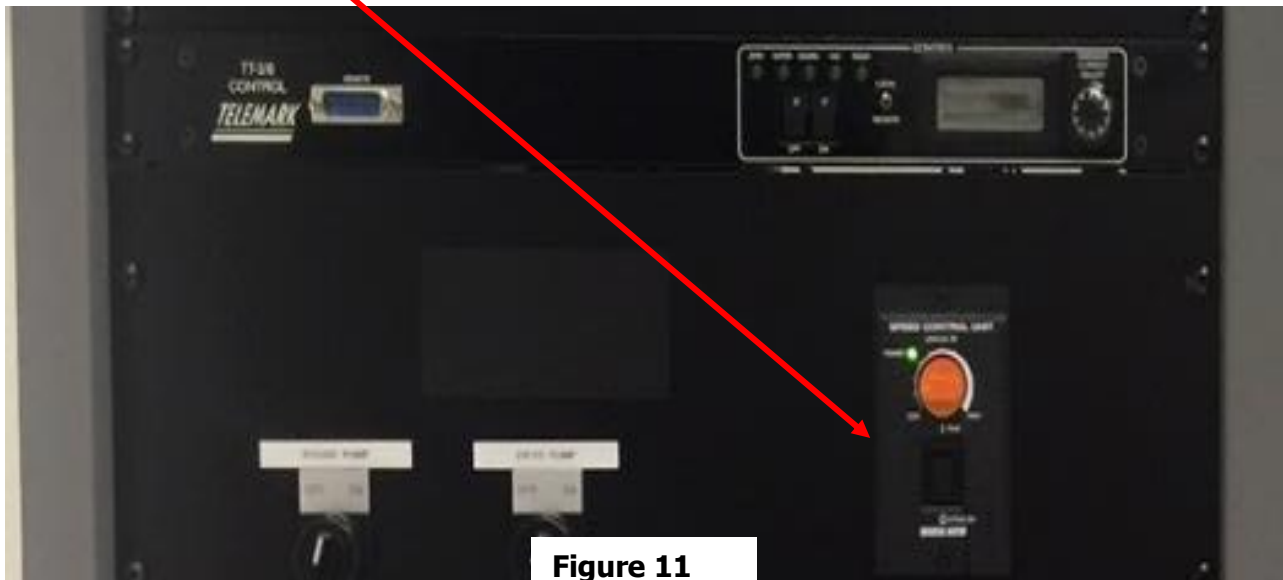


Figure 11

6.2.1 On the Inficon controller, press “stop” then “reset”, then “zero” to clear the controller. This will reset the clock and put the controller in the proper mode to start the deposition.

6.2.2 Refer to the previous log sheet to determine the current required for the material that is going to be deposited.

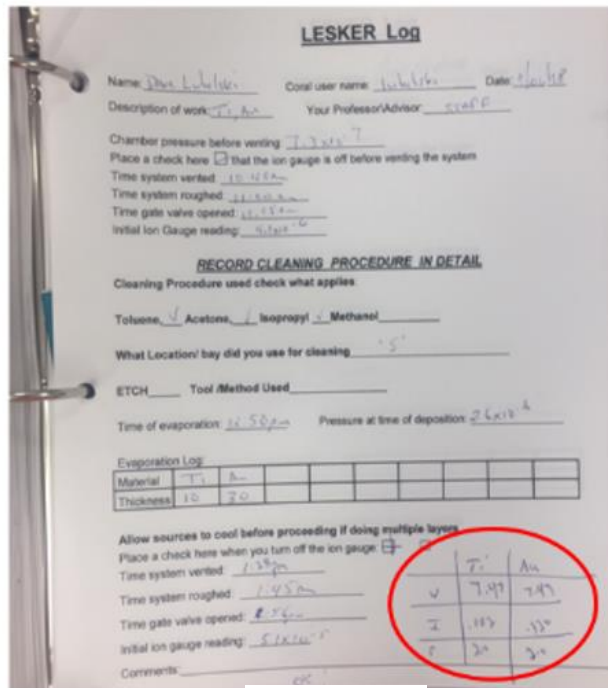


Figure 12

- 6.2.3 On the main controller, press "start"
- 6.2.4 Wait until the % power reading is at 0.3% or higher
- 6.2.5 Press the "MPWR" button (#5).

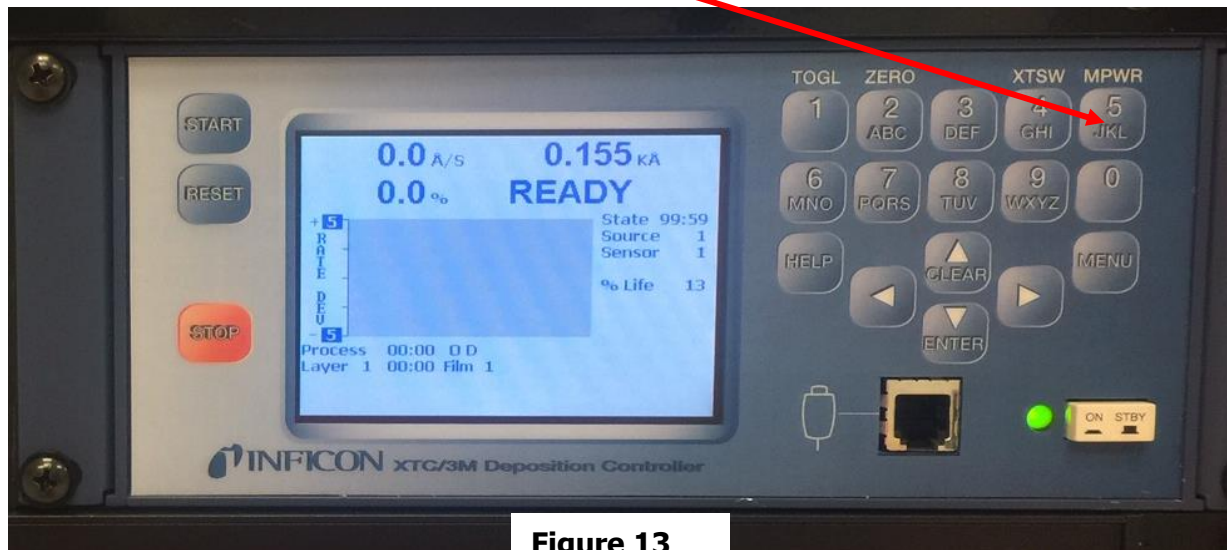


Figure 13

- 6.3 On the TT controller on the left side of the machine, push the "ON" button, and wait until the voltage stabilizes above 7.5v



Figure 14

- 6.4 Turn the "Emission Control Adjust" (current adjust) to 40 and wait 30 seconds.
- 6.5 If the current is stable, move the dial up to 60.
- 6.6 Continue increasing the current by increments of 20 (wait 15 seconds after the current has stabilized before turning the current up higher) until your desired current has been reached. Let the current stabilize and wait 1 minute for the system to stabilize.
- The desired current information will be found on previous users log sheets use there current as a starting point.
- 6.7 Turn the shutter to the left until it stops (around 100 degrees), and this will start the deposit. You will need to loosen the small screw on the end of the shutter in order to turn it. Tighten the small screw when the shutter is open.

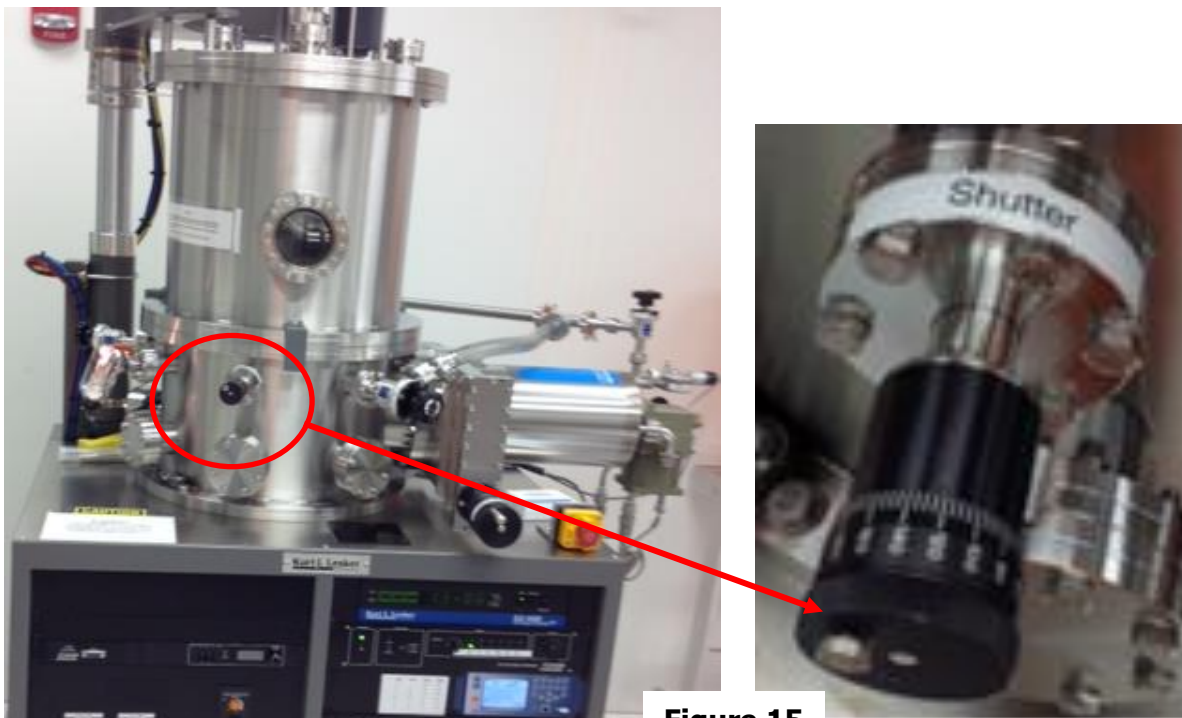


Figure 15

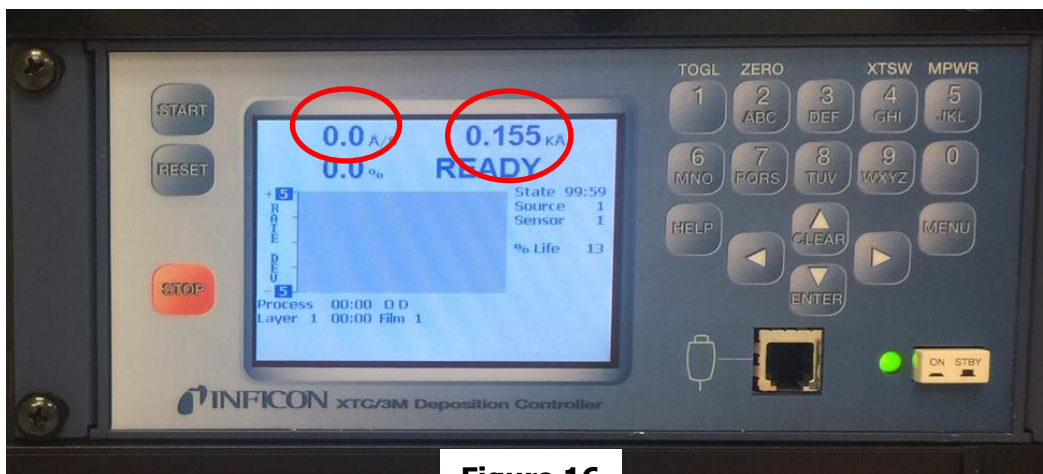


Figure 16

- 6.8 Observe the rate of deposition and the thickness on the main controller, and adjust the current knob as needed to maintain your desired deposit rate. Once you've reached your desired thickness, close the shutter.
- 6.8.1 Make note of the voltage, current & rate in the log book.
- 6.8.2 Turn the current knob back to zero. **When using Ni or Al, turn the current down slowly in 5 steps in order to prevent the crucible from cooling too fast and cracking.**
- 6.9 If you're depositing another layer, go back to step 5.2 and repeat the process.
- 6.10 If you're finished, turn the voltage off (the button next to the current control), and then push the "stop" & "reset" buttons on the main controller.

7. COMPLETING EVAPORATION OPERATION

- 7.1 Wait 2 minutes and turn off the Main Power switch on the Power Supply. **Failure to wait the 2 minutes can result in damage to the power supply.**
- 7.2 Turn off the substrate rotation
- 7.3 Turn off the sweep controller.
- 7.4 Wait a minimum of 10 minutes before proceeding to the next steps for venting the system.
- 7.5 Turn off the ion gauge controller by pushing the ION button **and wait 1 min.** Check box in log book
- 7.6 Close the Gate valve. Rotate the valve clockwise slowly until the handle feels tight and then go about ½ turn until the handle clicks
- 7.7 Slowly open the vent valve. The system will vent in approximately 4-5 minutes. Wait for a gap between the bell jar and base.
- 7.8 Raise bell Jar about 18 inches, making sure the safety bar clears the safety bracket, using the bell jar lift controller to allow access to the sample loading station (Figure 1).
NOTE: Only raise bell jar enough for the safety bar to clear the safety bracket.
- 7.9 DOUBLE GLOVE before entering chamber. Make sure the power breakers are off before going into the chamber.
- 7.10 Remove the sample block by loosening the 3 thumb screws approximately 1.5 turns, and then rotate the block about 10° until the block is loose, and then pull straight down.
- 7.11 Vacuum any loose metal flakes
- 7.12 Wipe the base plate with new clean wipes (use as many as needed).
Lower the bell jar. Please make sure the alignment tabs on the bell Jar are in the proper place.
- 7.13 Close the Vent valve on the left side of the machine.
- 7.14 Slowly open the Rough valve and wait until the pressure drops below 5.0×10^{-2} torr or 50milli- torr. This will take about 15 minutes.
- 7.15 Close the Rough valve
- 7.17 Open the Gate Valve.
- 7.17 Wait 5 minutes and then turn on the Ion Gauge
- Record the initial pressure in the log book
- 7.18 The pressure should be less than 3.0×10^{-6} Torr
- Contact the BNC Staff if the pressure is not in this acceptable range.

Location: Cleanroom / K-Bay

8. REVISION RECORD

Reason for Revision	Date of Revision	Person Responsible
Initial Release	April 1, 2013	Kenny Schwartz
Update	March 3, 2020	Kenny Schwartz
Added instructions for safety bar and general updates	June 25, 2021	R. Harlan & D. Lubelski

Location: Cleanroom / K-Bay