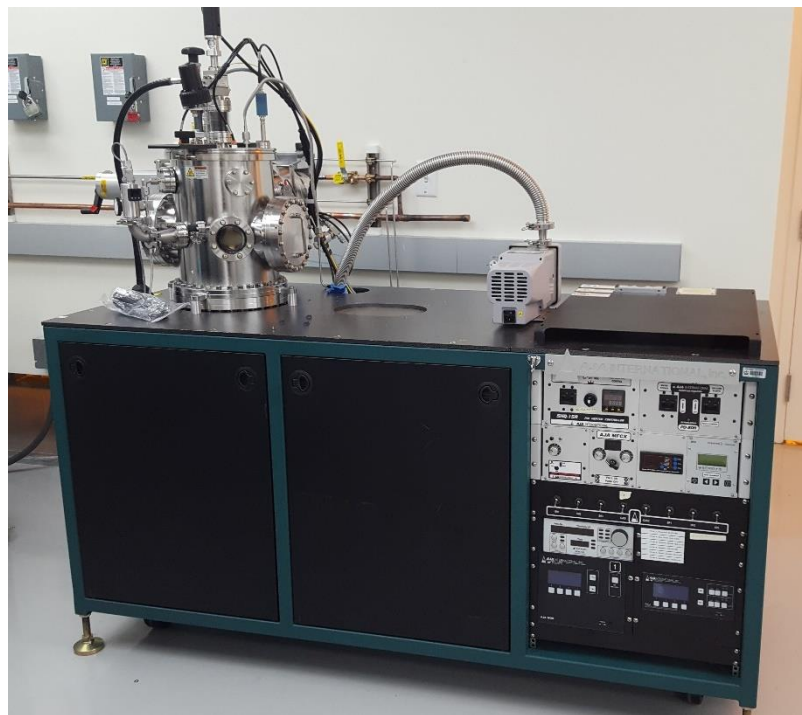


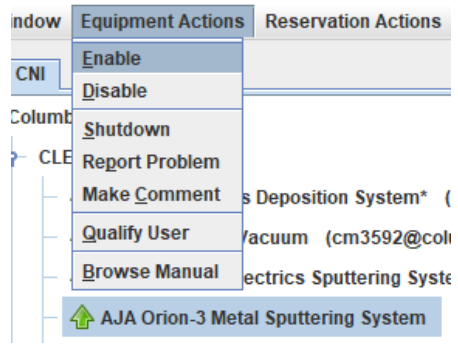


# AJA Metal Sputter Standard Operating Procedure



These instructions are intended for reference only, and will *not* replace the thorough training required for proper system operation. Contact a clean room staff member with questions or to report a system problem.

Written by Christine McGinn. Edited by Dr. Jaeun Yu and Dr. Nava Ariel-Sternberg

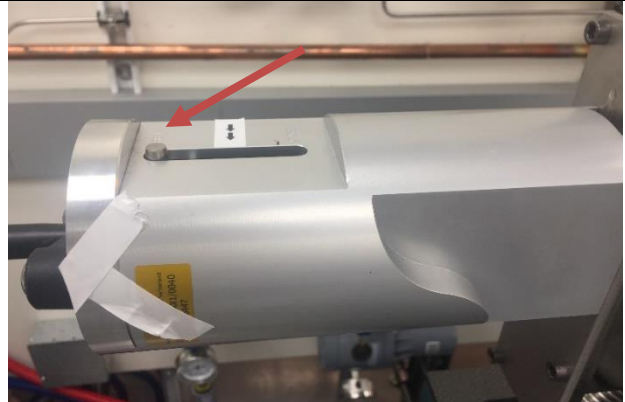


<p><b>1. BADGER:</b> Enable the tool in badger.</p>	
<p><b>2. INTRODUCTION:</b> The AJA Metal Sputter is FULLY MANUAL. It should be operated with EXTREME CAUTION as performing many of these steps out of order or improperly can cause substantial damage to the tool that can easily lead to weeks or months of downtime. PLEASE consult super users or staff with any questions.</p>	
<p><b>3. VERIFY SYSTEM STATUS:</b> Check that the chamber is pumped down and that the RF power supply is off.</p>	



**4. VENT CHAMBER:**  
Check the gate valve between turbo pump and the main chamber is fully opened.

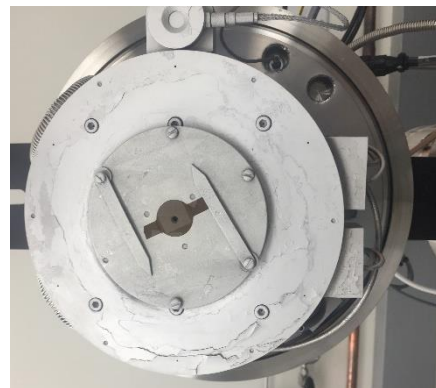
If not, open the gate valve to the fully open position, and then turn off the vacuum switch.



**5. LOAD SAMPLE:**  
 Once the chamber is vented, remove the sample holder from the stage by turning the holder slightly counterclockwise.

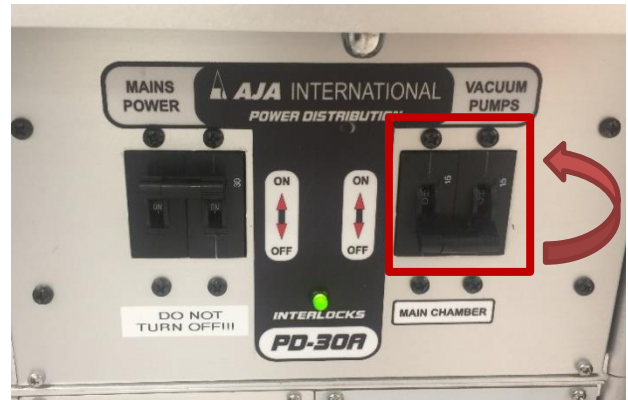
Mount your sample using the clips provided. Kapton tape is allowed but should be avoided if possible.

**Attach sample holder to the stage and slightly rotate clockwise. Ensure that it's stable.**



**6. PUMP DOWN:**

Carefully close the chamber and turn the vacuum switch on. Wait for the tool to pump down to below  $3E-5$  Torr (~20 minutes). For a higher quality film, pump down to lower base pressure.



**7. HEATER (OPTIONAL):**

Turn on the heater if the stage heating is needed. Adjust the temperature set point using the buttons on the temperature controller and turn on the heater with the knob.





**8. INTRODUCING GAS:**

Flip the ARGON switch in the middle of the switch panel to start flowing the gas into the chamber.



Pull out the Ar dial and if necessary, adjust the flow to ~15 sccm.



**9. ADJUST PRESSURE:**

Change the pressure by closing the turbo handle to an intermediate position (small black mark available).

Pressure for striking should be 40-60 mTorr. Check the pressure monitor on the equipment column.



**10. STRIKE THE PLASMA:**

Set the strike power on the RF power supply to a lower value than the deposition power, about 50-60W.

Click the ON/OFF button to turn on the gun. The LED light should be red when it's on and blue when it's off. The power will ramp up on its own to the power set point.

Plasma should appear. If plasma started, you should see a positive DCV and a lower reflected power. The feedback power should not be too high. If plasma did not strike, go to the troubleshooting section.

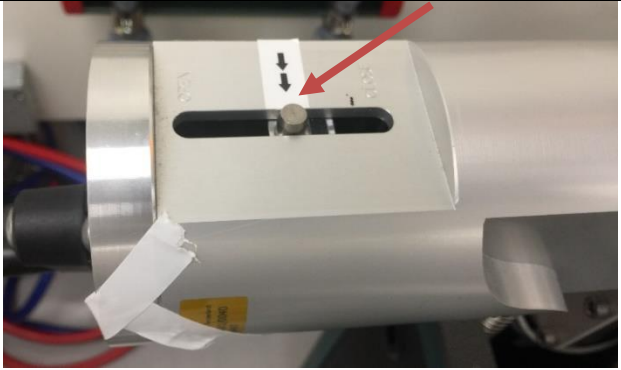

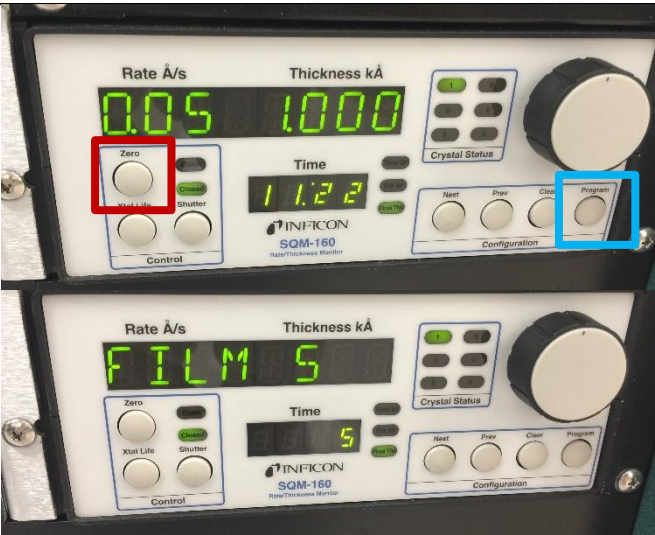



**11. ADJUST PRESSURE AND POWER TO DEPOSIT:**

Set the power for the deposition by slowly increasing the power (increasing at a rate of a few watts per second is recommended).

Re-adjust Ar flow to 15 sccm by turning the MFC knob if you have changed it to strike.



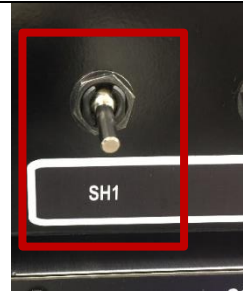
<p>Adjust the gate valve to reach the process pressure 2-15 mTorr (black arrows set point).</p>	
<p><b>12. STAGE ROTATION:</b> Turn on the rotation for the deposition uniformity.</p>	
<p><b>13. START DEPOSITION:</b> In order to monitor the rate and thickness, choose the film number on the crystal monitoring system to correspond to the correct film being deposited.</p> <p>To start the deposition on your substrate, open the shutter using the switch and zero the thickness monitor.</p>	 



**14. WHEN DEPOSITION IS COMPLETE:**

When you reached your desired thickness close the shutter. Turn off the rotation and the stage heating.

Turn off the power supply by pressing the ON/OFF button and wait for the light to turn blue indicating the power supply is off.



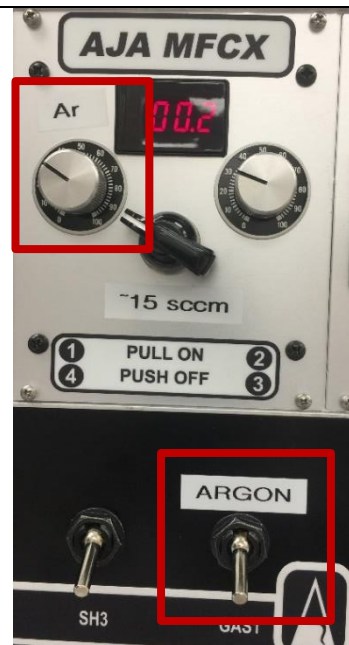
**15. TURN OFF GAS AND OPEN THE GATE VALVE:**

Stop the gas flow using the MFC knob and Ar switch.


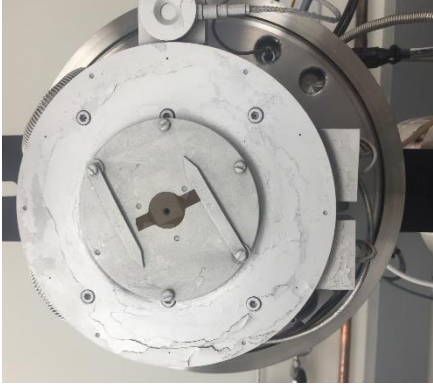

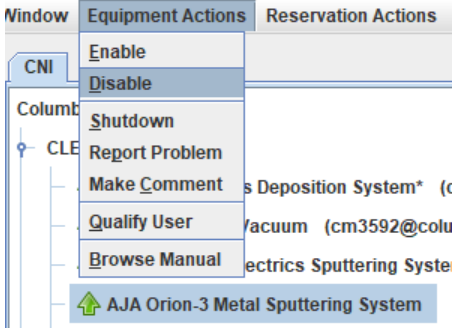
**Open the gate between turbo pump and the main chamber all the way.**

Wait for at least 5 minutes to cool down.

\*Turn off the heater if you have turned it on for the deposition. Wait for the stage is cooled down.





<p><b>16. VENT CHAMBER:</b> Turn off the vacuum switch to vent the chamber.</p>	
<p><b>17. UNLOAD SAMPLE:</b> Once the chamber is vented, take the sample holder out and unload your sample. Place the holder back on the stage.</p>	
<p><b>18. PUMP DOWN:</b> Turn on the vacuum pumps. The chamber should be left as pumped down with the RF power supply off.</p>	
<p><b>19. BADGER LOGOUT:</b> Don't forget to disable the tool in badger after you're done.</p>	



## **Troubleshooting:**

This section is designed to give users simple troubleshooting measures for common problems with sputterers working in normal operation. Reach out to the clean room staff or superuser if your problem is not listed here or if you are unsure about how to implement these measures.

1. Plasma not striking.
  - a. Make sure gas is flowing in the chamber.
  - b. Try increasing the pressure in the chamber while striking the plasma. Do not exceed 60mTorr.
  - c. Increase gas flow to between 15-18 sccm.
  - d. Open and close the shutter of the gun several times. This allows the gas to come into better contact with the gun/material.
  - e. Increase power. Do not exceed 65W.
  - f. Turn off RF power supply and gas flow and vent chamber to inspect for flakes or particles on the target surface before pumping down and trying again.
  - g. Check that the reflected power is not very high and that the feedback power is what is expected. If not, then maintenance by the superuser and clean room staff may need to be performed on the gun.
2. Rate is too low/does not seem right.
  - a. Use the crystal monitor to check the rate. Be sure to zero the crystal monitor before beginning to deposit.
  - b. Check the flow of gases into the chamber and pressure. Higher flow of gas and higher pressure can lower the rate.
3. Shutter not opening.
  - a. Make sure tool is enabled in badger. Badger interlocks with the compressed air, which will keep the shutter from opening.
4. Pressure issues.
  - a. Make sure gas is flowing in the chamber. Gas will not flow if the tool is not enabled.
  - b. Adjust the turbo gate. Tape may be necessary to hold the lever in the desired position.

