

University of Minnesota Nano Fabrication Center

Standard Operating Procedure

Equipment Name: AJA Sputter System
Coral Name: aja-sputterer
Model: ATC 2000
Location: Bay 3

Revision Number: 6
Revisionist: L. Matzke
Date: 09/17/09

1 Description

The AJA sputter system utilizes ionized gas (Ar, O₂, N₂) to sputter material from source targets to substrates, depositing a thin film in the process. There are 4 shuttered guns on the system: 2 DC, and 2 RF.

2 Safety

a. Be careful not to pinch your fingers while lowering the hoist (chamber lid).

3 Restrictions/Requirements

- a. Must be a qualified user on the AJA sputter system.
- b. There is a follow-up session required for this piece of equipment.

4 Required Facilities

- a. Compressed air
- b. Chilled water
- c. Cryo at 10 K
- d. Vacuum
- e. Ar
- f. O₂
- g. N₂

5 Notes

a. All AJA targets are located in the silver, nitrogen purged cabinet in chase 3.

6 Operating Instructions

a. LOGGING ON

- 1 Log in on the NFC Coral system.
- 2 FILL OUT user info in LOG BOOK.
- 3 On AJA login screen, the username is 'apex', and there is no password.
- 4 Type in your assigned 4 digit PIN number and click 'accept' -- do not hit 'enter' on this screen or later you will receive error messages saying you are not logged in.

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b. CHANGING TARGETS

(If you don't need to change targets, see section 'c' for sample loading)

TIPS: SCREWS ONLY NEED TO BE SNUG, DO NOT OVERTIGHTEN

- 1 Look at the box labeled **Automated Control**, click on the button labeled **VENT**. Then when the vent window appears on the screen, press **START**
- 2 Venting the system will shut off the DC and RF power supplies, but check that the front of the power supplies have no displays lit up to ensure that they have been powered off. If they have not shut off, **DO NOT CONTINUE**; contact an NFC staff member for assistance.
- 3 Locate the gun angle adjuster and note the position, so you can return to it after the target change. Also make sure the chamber view port shield is covering the view port, this ensures it is in a position that will give clearance for the guns when you lower the hoist later.
- 4 Use the hoist button to raise the chamber lid. Raise it so the top of the threaded bolt on the hoist matches the height of the black bracket which is attached to the hoist (going further will stretch the cables too much!).
- 5 You may now swing the chamber lid over to access the target guns for target changes. Swing it slowly at first to make sure you have clearance, and then fasten the lid to the system control box using the metal clip and chain.
- 6 Adjust the gun angle adjuster and turn it until the target gun is straight down.

Note: Place several clean room wipes on a table top to set all fixtures onto during dis-assembly, to capture debris from the fixtures, and to keep the fixtures clean from the table top. You do not need to use wipes if you are placing fixtures on the corner of the sputterer station.

- ** If there is debris/flakes seen on the shutter prior to removal, try to contain the mess on the shutter to prevent debris/flakes from falling on the floor **
- 7 Loosen the shutter clamp one turn (without removing)--which will be a knurled twist-on type clamp (knob)--slide off the end of the shutter shaft to remove the shutter.
 - 8 Remove the gun chimney by removing the two vertically mounted screws. Leave the horizontally mounted screws in place. Slide the chimney assembly off of the shutter shaft.

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** If there is a noticeable amount of flaking on the chimney or shutter, go to the “Resolving Shield Flaking” section at the end of this SOP **

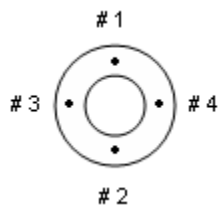
- 9 Locate the two extension screws (knurled) in the clear plastic case sitting on the system. Remove two of the small target retainer screws (opposite from one another) and replace them with the extension screws (knurled); tighten them until slightly snug, and then loosen them a half-turn.

Note: If target retainer screws are stuck and the torque allen-wrench can not remove them, temporarily use the regular allen wrench to loosen them (located in blue toolbox), then, once loosened, put that tool back in the toolbox.

- 10 Remove the other two target retainer screws. While holding up the target retainer and target, remove the extension screws. There are three parts to this target assembly: the target, the target retainer, and the copper mesh.
- 11 Place your target material sputter-side-down into the target retainer so it rests on the lip (or place the 0.125" adaptor ring on the lip first, IF a 0.125" target is used instead of a 0.250" target. Then place the target on the adaptor ring. Center the copper mesh over the back of the target. The copper mesh goes between the target and the gun. Do not bend or fold the copper mesh. If the mesh is frayed or damaged, replace it with a new piece (located in blue toolbox).

Note: If you are using a target which is bonded into a copper power cup, a separate target retainer is not used, but you MUST USE the copper mesh as usual.

- 12 Hold the target assembly, with copper mesh centered, up to the gun. Use the two extension screws and tighten them until slightly snug, then loosen them a half-turn. Now install two of the small target retainer screws but leave them a little loose. Remove the two extension screws and install the two remaining retainer screws. Tighten all four screws in a cross pattern (ex: #1, 2, 3, then 4 as shown below) until you hear the torque allen-wrench “click”. The screws should be snug, so you will not be able to wiggle the target at all.



- 13 Carefully slide the chimney assembly over the shutter shaft. Be sure the largest hole on the chimney slides over the shutter shaft. Secure this in place with the two larger screws, tighten until snug.

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- 14 Slide the shutter back onto the shaft; leave ~3 to 5 mm space between the shutter and the chimney (like the other targets). Center the shutter over the target and then tighten the knurled knob of the twist-on clamp (it **MUST** be tight enough so the shutter doesn't swing freely, the shutter should only be able to open when the shaft rotates during the run).
- 15 Re-adjust your gun angle setting (if you haven't already); typically 10mm is used.
- 16 **Test the shutter by clicking on your target's # displayed in the target circle on the computer screen. Click it again to close the shutter. This is especially important so the twist-on shutter clamp doesn't slip off the shutter shaft during operation.** Readjust the shutter, and tighten if necessary.

Make sure that all targets are angled inward and the view port shield is blocking the window, or these will crash into each other when you lower the hoist.

- 17 Use the hoist button and lower the hoist.

Make sure the load lock cover is in place and the chamber is fully closed.

- 18 On the computer screen go to the box labeled, **Automated Control** click on the **PUMPDOWN** button. Then when the pumpdown window appears on the screen, press **START**. The automatic pump down sequence will begin in a couple minutes. It will take 12.5 minutes to rough-pump down the system. A pop up window will appear when the pump down sequence has finished. Then you will need to wait until the base pressure is reached; ~ 2.0 E-6 Torr.

c. SAMPLE LOADING

- 1 If load lock is not vented, do the following:
 - a) Close **Load Lock Gate Valve**.
 - b) Turn off **Load Lock Pump ("L.L." on computer screen)**.
 - c) Wait until vented (Load lock pressure gauge will read "OR" or ~760).
- 2 Load samples into vented load lock.
- 3 When finished loading samples, return lid.
- 4 Turn on **Load Lock Pump ("L.L." on computer screen)**.

Once the L.L. is in the 10⁻⁵'s range, it is okay to proceed:

- 5 Open **Load Lock Gate Valve**.
- 6 Make sure the toggle switch on the stage control panel is switched to the **Load/Unload** position. Table should be in the Down position with **Down**

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LED lit. Push the **Transfer Fork** all the way into the chamber so that the **Substrate Holder** is situated directly over the **Stage**.

- 7 Bring the **Stage** up using the yellow **Up** button on the **Rotation/Z-Height Control Panel**. Continue to press the yellow button until the **Up** LED is lit. Stage will stop moving when in Up position.
- 8 Pull the **Transfer Fork** out; note it must be pulled out as far as possible to contact the micro-switch.
- 9 Close the **Load Lock Gate Valve**.

d. PROGRAMMING OF LAYERS AND PROCESSES

- 1 Select **Program Layers** in the upper left hand of the screen.
(See examples below for explanation on how to program)
- 2 Enter parameters. Always be sure to hit 'Enter' after each entry, or it won't be recognized by the software program.

Some examples of typical programs follow below. These have proven to be quite reliable. Users are encouraged to use them as templates for their own programming.

The three examples outlined below include:

- 1) **Program Template for DC Powered Metal Target** *no strike layer required for DC gun*
- 2a) **Program Template for RF Powered Metal Target** *strike layer*
- 2b) **Program Template for RF Powered Metal Target** *deposition layer*
- 3a) **Program Template for RF Powered Semi. or Dielectric Target** *strike layer*
- 3b) **Program Template for RF Powered Semi. or Dielectric Target** *deposition layer*

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1) Program Template for DC Powered Metal Target

(No strike layer required with DC Guns. Plasma will light at 5mtorr.)

RSView32 Runtime 1500

RESTORE
SAVE

LAYER

DESCRIPTION

EXIT

	CH #1	CH #1 BIAS	POS #1 RF-5S#1 SiO2	POS #3 RF-5S#2 In3n	POS #2 MDX 1K#1 Ta	POS #4 MDX 1K#2 Cu
PRESSURE						
CHAMBER EHABLE	<input type="text" value="1"/>					
CONTROL <small>0=POS 1=PRES</small>	<input type="text" value="1"/>					
PRES STPT (mT)	<input type="text" value="5"/>					
POS STPT (0-1000)	<input type="text" value="0"/>					
BASE PRES* (mT) <small>* first layer only</small>	<input type="text" value="0"/>					
GAS	AR					
GAS #1 STPT (sccm)	<input type="text" value="20"/>					
	<input type="text" value="O2"/>					
GAS #2 STPT (sccm)	<input type="text" value="0"/>					
	<input type="text" value="N2"/>					
GAS #3 STPT (sccm)	<input type="text" value="0"/>					
SUBSTRATE						
HEAT (0=OFF,1=ON)	<input type="text" value="0"/>					
SP (°C)	<input type="text" value="0"/>					
SOAK TIME (sec)	<input type="text" value="0"/>					
RF POWER SUPPLIES						
OIL-OFF (0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
DELAY TIME (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
CTRL MODE (0=W,1=V)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
RAMP UP / DH (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
WATTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
VOLTS STPT (mA)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
SHUTTER DELAY (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
SHUTTER(0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
COAT TIME (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
IDLE WATTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
IDLE VOLTS STPT(mA)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
SWITCH OUTPUT (0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>		
DC POWER SUPPLIES						
OIL-OFF (0=OFF,1=ON)			<input type="text" value="1"/>	<input type="text" value="0"/>		
CTRL MODE (0=W,1=A,2=V)			<input type="text" value="0"/>	<input type="text" value="0"/>		
DELAY TIME (sec)			<input type="text" value="10"/>	<input type="text" value="0"/>		
RAMP UP / DH (sec)			<input type="text" value="15"/>	<input type="text" value="0"/>		
WATTS STPT			<input type="text" value="250"/>	<input type="text" value="0"/>		
VOLTS STPT			<input type="text" value="0"/>	<input type="text" value="0"/>		
AMPS STPT (mA)			<input type="text" value="0"/>	<input type="text" value="0"/>		
SHUTTER DELAY (sec)			<input type="text" value="120"/>	<input type="text" value="0"/>		
SHUTTER (0=OFF,1=ON)			<input type="text" value="1"/>	<input type="text" value="0"/>		
COAT TIME (sec)			<input type="text" value="300"/>	<input type="text" value="0"/>		
IDLE WATTS STPT			<input type="text" value="0"/>	<input type="text" value="0"/>		
IDLE VOLTS STPT			<input type="text" value="0"/>	<input type="text" value="0"/>		
IDLE AMPS STPT (mA)			<input type="text" value="0"/>	<input type="text" value="0"/>		
SWITCH OUTPUT (0=OFF,1=ON)			<input type="text" value="0"/>	<input type="text" value="0"/>		

PRINT SCREEN
Clear
Clear All

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2a) Program Template for RF Powered Metal Target

(Strike layer required with RF Guns. Light plasma at 20 mtorr, deposit film at 5 mtorr.)

This is the strike layer...

RSView32 Runtime 1500
EXIT

	LAYER	DESCRIPTION			
PRESSURE	CH #1		CH #1	POS #1	POS #3
CHAMBER ENABLE	<input type="text" value="1"/>		BIAS	RF-5S#1	RF-5S#2
CONTROL 0=POS 1=PRES	<input type="text" value="1"/>			SiO2	InSn
PRES STPT (mT)	<input type="text" value="20"/>		RF POWER SUPPLIES		
POS STPT (0-1000)	<input type="text" value="0"/>		OIL-OFF (0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="1"/>
BASE PRES* (mT)	<input type="text" value="0"/>		DELAY TIME (sec)	<input type="text" value="0"/>	<input type="text" value="10"/>
			CTRL MODE (0=W,1=V)	<input type="text" value="0"/>	<input type="text" value="0"/>
GAS	AR		RAMP UP / DIH (sec)	<input type="text" value="0"/>	<input type="text" value="15"/>
GAS #1 STPT (sccm)	<input type="text" value="20"/>		WATTS STPT	<input type="text" value="0"/>	<input type="text" value="50"/>
	O2		VOLTS STPT (mA)	<input type="text" value="0"/>	<input type="text" value="0"/>
GAS #2 STPT (sccm)	<input type="text" value="0"/>		SHUTTER DELAY (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>
	N2		SHUTTER(0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>
GAS #3 STPT (sccm)	<input type="text" value="0"/>		COAT TIME (sec)	<input type="text" value="0"/>	<input type="text" value="10"/>
			idle WATTS STPT	<input type="text" value="0"/>	<input type="text" value="50"/>
SUBSTRATE			idle VOLTS STPT(mA)	<input type="text" value="0"/>	<input type="text" value="0"/>
HEAT (0=OFF,1=ON)	<input type="text" value="0"/>				
SP (°C)	<input type="text" value="0"/>		DC POWER SUPPLIES	POS #2	POS #4
SOAK TIME (sec)	<input type="text" value="0"/>		OIL-OFF (0=OFF,1=ON)	MDX 1K#1	MDX 1K#2
			CTRL MODE (0=W,1=A,2=V)	Ta	Cu
			DELAY TIME (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>
			RAMP UP / DIH (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>
			WATTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>
			VOLTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>
			AMPS STPT (mA)	<input type="text" value="0"/>	<input type="text" value="0"/>
			SHUTTER DELAY (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>
			SHUTTER (0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>
			COAT TIME (sec)	<input type="text" value="0"/>	<input type="text" value="0"/>
			idle WATTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>
			idle VOLTS STPT	<input type="text" value="0"/>	<input type="text" value="0"/>
			idle AMPS STPT (mA)	<input type="text" value="0"/>	<input type="text" value="0"/>
			SWITCH OUTPUT (0=OFF,1=ON)	<input type="text" value="0"/>	<input type="text" value="0"/>

PRINT SCREEN
Clear Clear All

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3a) Program Template for RF Powered Semi. or Dielectric Target

(Strike layer required with RF Guns. Light plasma at 20 mtorr, deposit film at 5 mtorr.)

This is the strike layer...

The screenshot shows the RSView32 Runtime 1500 software interface. The window title is "RSView32 Runtime 1500". The interface is divided into several sections:

- Buttons:** RESTORE, SAVE, LAYER, DESCRIPTION, EXIT, PRINT SCREEN, Clear, Clear All.
- Pressure Section:** CH #1 (1), CHAMBER ENABLE (1), CONTROL (0=POS, 1=PRES), PRES STPT (mT) (20), POS STPT (0-1000) (0), BASE PRES* (mT) (0).
- Gas Section:** GAS (AR), GAS #1 STPT (scm) (20), GAS #2 STPT (scm) (0), GAS #3 STPT (scm) (0).
- Substrate Section:** HEAT (0=OFF, 1=ON) (0), SP (°C) (0), SOAK TIME (sec) (0).
- RF Power Supplies Section:**
 - CH #1 BIAS:** OIL-OFF (0=OFF, 1=ON) (0), DELAY TIME (sec) (0), CTRL MODE (0=W, 1=V) (0).
 - POS #1 (RF-5S#1 SiO2):** OIL-OFF (0=OFF, 1=ON) (1), DELAY TIME (sec) (10), CTRL MODE (0=W, 1=V) (0), RAMP UP / DIH (sec) (60), WATTS STPT (0), VOLTS STPT (mA) (0), SHUTTER DELAY (sec) (0), SHUTTER (0=OFF, 1=ON) (0), COAT TIME (sec) (10), IDLE WATTS STPT (0), IDLE VOLTS STPT (mA) (0).
 - POS #3 (RF-5S#2 InSn):** OIL-OFF (0=OFF, 1=ON) (0), DELAY TIME (sec) (0), CTRL MODE (0=W, 1=V) (0), RAMP UP / DIH (sec) (0), WATTS STPT (0), VOLTS STPT (mA) (0), SHUTTER DELAY (sec) (0), SHUTTER (0=OFF, 1=ON) (0), COAT TIME (sec) (0), IDLE WATTS STPT (0), IDLE VOLTS STPT (mA) (0).
- DC Power Supplies Section:**
 - POS #2 (MDX 1K#1 Ta):** OIL-OFF (0=OFF, 1=ON) (0), CTRL MODE (0=W, 1=A, 2=V) (0), DELAY TIME (sec) (0), RAMP UP / DIH (sec) (0), WATTS STPT (0), VOLTS STPT (0), AMPS STPT (mA) (0), SHUTTER DELAY (sec) (0), SHUTTER (0=OFF, 1=ON) (0), COAT TIME (sec) (0), IDLE WATTS STPT (0), IDLE AMPS STPT (mA) (0).
 - POS #4 (MDX 1K#2 Cu):** OIL-OFF (0=OFF, 1=ON) (0), CTRL MODE (0=W, 1=A, 2=V) (0), DELAY TIME (sec) (0), RAMP UP / DIH (sec) (0), WATTS STPT (0), VOLTS STPT (0), AMPS STPT (mA) (0), SHUTTER DELAY (sec) (0), SHUTTER (0=OFF, 1=ON) (0), COAT TIME (sec) (0), IDLE WATTS STPT (0), IDLE AMPS STPT (mA) (0).

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3b) Program Template for RF Powered Semi. or Dielectric Target

(Strike layer required with RF Guns. Light plasma at 20 mtorr, deposit film at 5 mtorr.)

This is the deposition layer...

RSView32 Runtime 1500
_ □ ×

RESTORE
SAVE

LAYER

DESCRIPTION

EXIT

	CH #1	CH #1 BIAS	POS #1 RF-5S#1 SiO2	POS #3 RF-5S#2 InSn		POS #2 MDX 1K#1 Ta	POS #4 MDX 1K#2 Cu
PRESSURE							
CHAMBER EHABLE	<input type="text" value="1"/>						
CONTROL 0=POS 1=PRES	<input type="text" value="1"/>						
PRES STPT (mT)	<input type="text" value="5"/>						
POS STPT (0-1000)	<input type="text" value="0"/>						
BASE PRES* (mT) * first layer only	<input type="text" value="0"/>						
GAS	AR						
GAS #1 STPT (sccm)	<input type="text" value="20"/>						
	O2						
GAS #2 STPT (sccm)	<input type="text" value="0"/>						
	N2						
GAS #3 STPT (sccm)	<input type="text" value="0"/>						
SUBSTRATE							
HEAT (0=OFF,1=ON)	<input type="text" value="0"/>						
SP (°C)	<input type="text" value="0"/>						
SOAK TIME (sec)	<input type="text" value="0"/>						
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p style="color: red; margin: 0;">RF POWER SUPPLIES</p> <p>OIL-OFF (0=OFF,1=ON) <input type="text" value="0"/></p> <p>DELAY TIME (sec) <input type="text" value="10"/></p> <p>CTRL MODE (0=W,1=V) <input type="text" value="0"/></p> <p style="background-color: yellow;">RAMP UP / DIH (sec) <input type="text" value="120"/></p> <p>WATTS STPT <input type="text" value="250"/></p> <p>VOLTS STPT (mA) <input type="text" value="0"/></p> <p style="background-color: yellow;">SHUTTER DELAY (sec) <input type="text" value="120"/></p> <p>SHUTTER(0=OFF,1=ON) <input type="text" value="1"/></p> <p>COAT TIME (sec) <input type="text" value="300"/></p> <p style="background-color: yellow;">IDLE WATTS STPT <input type="text" value="0"/></p> <p>IDLE VOLTS STPT(mA) <input type="text" value="0"/></p> <p>SWITCH OUTPUT (0=OFF,1=ON)</p> </div> <div style="width: 20%; border: 1px solid red; padding: 2px;"> <p style="color: red; margin: 0;">DC POWER SUPPLIES</p> <p>OIL-OFF (0=OFF,1=ON) <input type="text" value="0"/></p> <p>CTRL MODE (0=W,1=A,2=V) <input type="text" value="0"/></p> <p style="background-color: yellow;">DELAY TIME (sec) <input type="text" value="0"/></p> <p>RAMP UP / DIH (sec) <input type="text" value="0"/></p> <p>WATTS STPT <input type="text" value="0"/></p> <p style="background-color: yellow;">VOLTS STPT <input type="text" value="0"/></p> <p>AMPS STPT (mA) <input type="text" value="0"/></p> <p>SHUTTER DELAY (sec) <input type="text" value="0"/></p> <p style="background-color: yellow;">SHUTTER (0=OFF,1=ON) <input type="text" value="0"/></p> <p>COAT TIME (sec) <input type="text" value="0"/></p> <p>IDLE WATTS STPT <input type="text" value="0"/></p> <p style="background-color: yellow;">IDLE VOLTS STPT <input type="text" value="0"/></p> <p>IDLE AMPS STPT (mA) <input type="text" value="0"/></p> <p>SWITCH OUTPUT (0=OFF,1=ON)</p> </div> <div style="width: 20%; border: 1px solid blue; padding: 2px;"> <p style="color: blue; margin: 0;">POS #2</p> <p style="color: blue; margin: 0;">MDX 1K#1</p> <p style="color: blue; margin: 0;">Ta</p> <p style="color: blue; margin: 0;">OIL-OFF (0=OFF,1=ON) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">CTRL MODE (0=W,1=A,2=V) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">DELAY TIME (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">RAMP UP / DIH (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">WATTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">VOLTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">AMPS STPT (mA) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SHUTTER DELAY (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SHUTTER (0=OFF,1=ON) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">COAT TIME (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE WATTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE VOLTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE AMPS STPT (mA) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SWITCH OUTPUT (0=OFF,1=ON)</p> </div> <div style="width: 20%; border: 1px solid blue; padding: 2px;"> <p style="color: blue; margin: 0;">POS #4</p> <p style="color: blue; margin: 0;">MDX 1K#2</p> <p style="color: blue; margin: 0;">Cu</p> <p style="color: blue; margin: 0;">OIL-OFF (0=OFF,1=ON) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">CTRL MODE (0=W,1=A,2=V) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">DELAY TIME (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">RAMP UP / DIH (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">WATTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">VOLTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">AMPS STPT (mA) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SHUTTER DELAY (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SHUTTER (0=OFF,1=ON) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">COAT TIME (sec) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE WATTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE VOLTS STPT <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">IDLE AMPS STPT (mA) <input type="text" value="0"/></p> <p style="color: blue; margin: 0;">SWITCH OUTPUT (0=OFF,1=ON)</p> </div> </div>							

PRINT SCREEN
Clear
Clear All

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Standard Operating Procedure

- d. PROGRAMMING OF LAYERS AND PROCESSES [cont.]
- 3 Select **Save** to save layer. Avoid using '.' '/' ';' (periods, commas, slashes) in the file name. These seem to cause software problems. You can use '_' and '-' (under-scores, hyphens) in the file name as they seem to work okay. All recipe file names will be saved in the recipe folder (on the Window's desktop) with the extension '.rcp' and filed with the logged-in user's 4 digit PIN number in front of the name.
 - 4 To create a process, select **Program Processes**. From the list of layers, choose a sequence of layers to create your desired process. All processes must begin with the 'base' layer (base.rcp) and terminate with the 'end' layer (end.rcp). See Appendix on last page for details.
 - 5 Select **Save** to save process. Avoid using '.' '/' ';' (periods, commas, slashes) in the file name. These seem to cause software problems. '_' and '-' seem to work okay. All process file names will be saved in the recipe folder (on the Window's desktop) with the extension '.ajp' and filed with the logged-in user's 4 digit PIN number in front of the name.
- e. DEPOSITING FILM
- 1 Select **Run Process** in upper left corner of screen.
 - 2 Select **Browse** and choose the intended process. Make any notes you wish to save with the data log file of the run.
 - 3 Select **Next**.
 - 4 Turn on table rotation. Switch must be in 'Run' mode, turn up dial to 20% (~16 RPMs).
 - 5 Select **Start**.
 - 6 Be sure to record necessary data in the log book such as:
 - Number of Amps reached during process (If using DC gun)
 - Number of Watts Reflected Power during process (If using RF gun)
 - Setpoint and Actual Gas flow rates
 - Setpoint and Actual Process Pressure (look at Gauge B while the process is running – this is the capacitance manometer gauge “CM”)
 - 7 When finished, a window pops up saying **Process Complete**. Click OK to acknowledge the message.
 - 8 Turn off table rotation by returning dial to 0%, and then switch back to 'Jog' mode.

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f. SAMPLE UNLOADING

- 1 If **Load Lock** is not already under vacuum, turn on **Load Lock Vacuum Pump** (“**L.L.**” on computer screen).

Once the L.L. is in the 10^{-5} 's range, it is okay to proceed:

- 2 Open **Load Lock Gate Valve**.
- 3 Make certain the **Stage** is in the Up position with the **Up** LED lit. Push the **Transfer Fork** all the way into the chamber which should slip the **Fork** around the base of the **Substrate Holder**.
- 4 Bring the **Stage** down using the yellow **Down** button on the **Rotation/Z-Height Control Panel**. Continue to press the yellow button until the **Down** LED is lit. Stage will stop moving when in the Down position.
- 5 Pull the **Transfer Fork** out (with the **Substrate Holder**); note it must be pulled out as far as possible to contact the micro-switch.
- 6 Close the **Load Lock Gate Valve**.
- 7 Turn off **Load Lock Pump** (“**L.L.**” on computer screen).
- 8 Wait until vented.

g. LOGGING OFF

- 1 Pump down the Load Lock by returning the cover lid to this chamber, and then turn on the **Load Lock Vacuum Pump** (“**L.L.**” on computer screen).
- 2 Make certain the **Load Lock Gate Valve** is closed.
- 3 Log out on the AJA screen, leaving the computer on the log in screen.
- 4 Fill out any remaining info in the log book.
- 5 Log out of the NFC Coral system.

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Standard Operating Procedure

7 Problems / Troubleshooting

<u>Problem</u>	<u>Solution</u>
Program goes into infinite loop in one of the program layers...	Need to make certain a finite time is entered into the "Coat Time" entry box. Zero causes an infinite loop in programming.
RF Power Source is not lighting...	Try using a strike layer in your process, i.e. increase pressure set point to 20 mtorr.
Files aren't listed in browser...	File names are saved with 4 digit PIN in front; make certain to log in using 4 digits.

8 Resolving Shield Flaking

1. Place several clean room wipes on a table top.
2. Remove shielding just like doing a target change. If shutter has loose flakes, try to contain them as the shutter is removed, and throw these into the trash.
3. Gently tap the chimney assembly and shutter on the stack of wipes.
4. If the flaking is bad, use the wire brush and scrub the shielding, collect the flakes in a wipe, dispose of the flakes in the trash (Gold flakes should be turned into NFC staff if possible – for recycling)
5. Lightly dampen a clean room wipe with Isopropyl and wipe off the fixture(s).
6. Blow the shielding off with N₂, direct the N₂ over the shield and into the trash
7. Get a new clean room wipe, gently re-tap the shielding over the wipe, if it is still flaking, contact NFC staff, turn the red status indicator lamp on, and put the system into SHUTDOWN status in coral.
8. If you feel that flaking metal has fallen into the chamber and would cause contamination to processing, contact NFC staff, turn the red status indicator lamp on, and put the system into SHUTDOWN status in coral.
9. Please do not further disassemble the chimney assembly, or the shutter assembly (only remove them from the gun, as with any target change)
10. Repeat this cleaning procedure with any of the other guns' fixtures if needed (especially the other guns' shutters, because debris can fall on your samples due to vibrations even when those other guns are not in use during your run)

9 Appendix

Base Layer:

Chamber Enable = 1
Control = Position Mode = 0
Position Set point = 1000
Base Pressure = .001
All else is zero.

End Layer:

Chamber Enable = 1
Control = Position Mode = 0
Position Set point = 1000
All else is zero.