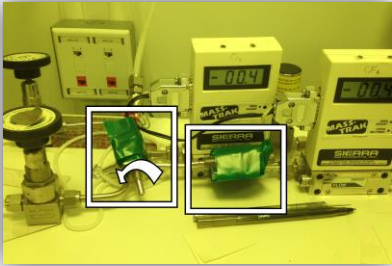


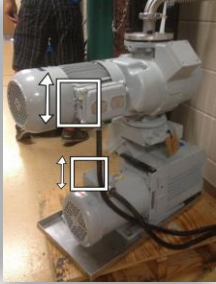

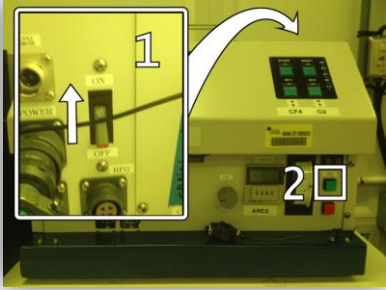

SAMCO COMPACT RIE
STANDARD OPERATING PROCEDURE





LAST REVISED: 31 MARCH 2014

INSPECTION





<p>1) The SAMCO should be left under vacuum when not in use. Try opening the lid; it should not open.</p>	
<p>2) Make sure the mass flow controllers are not open. Try turning the potentiometers counterclockwise; they should not spin.</p>	
<p>3) Check the pressure of the N2 gas (P ~ 5 psi).</p>	
<p>4) Check the pressure on the regulator's outlet gauge of the processing gas(es) (O2, CF4, Ar) you wish to use. Open the cylinder valve and regulator outlet valve and check the pressure (P ~ 20 psi). DO NOT ADJUST THE GAS PRESSURE! For instruction on operating the gas regulator, see the instructions posted on the door.</p> <p>If you notice any irregularities upon inspection, please inform the superuser.</p>	

SYSTEM START-UP

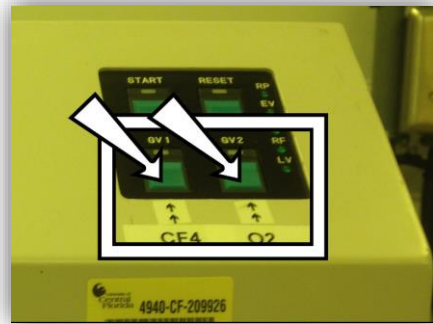
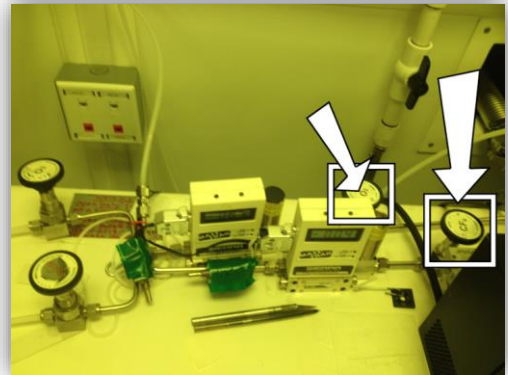
<p>1) Switch on both the roughing pump and the blower unit located in the corridor.</p>	 A photograph of a white industrial blower unit mounted on a metal base. Two white boxes with arrows point to specific components on the unit.
<p>2) Make sure the valve on the MKS pressure controller is 100% open (press OPEN if it is not already 100% open).</p>	 A photograph of an MKS 600 Series Pressure Controller. The digital display shows '100.00'. A white box highlights the 'OPEN' button, and an arrow points to it.
<p>3) Power on the SAMCO. Switch on the breaker located on the back of the SAMCO, and then press the green "ON" button on the front.</p>	 A photograph of a SAMCO unit. An inset shows a breaker switch labeled '1' being turned on. The main image shows a green 'ON' button labeled '2' on the front panel.
<p>4) Power on the RF generator. Switch on the breaker on the back of the RF power supply, then press POWER on the front of the power supply.</p>	 A photograph of an RF power supply. An inset shows a breaker switch labeled '1' being turned on. The main image shows a 'POWER' button labeled '2' on the front panel.

<p>5) Press START on the SAMCO.</p>	 <p>A photograph of a control panel with several buttons. A white box highlights the 'START' button, and a white arrow points to it from the left. Other buttons include 'RESET', 'HV', 'LV', 'CF4', and 'O2'. The panel is labeled '4940-CF-209926'.</p>
<p>6) Press RESET and the interlock bypass button in order to vent the chamber with N2.</p>	 <p>A photograph of the same control panel. A white box highlights the 'RESET' button, and a white arrow points to it from the left.</p>  <p>A photograph of a chamber interior. A white box highlights a button labeled 'INTER LOCK BYPASS'. A white arrow points to it from the right.</p>
<p>7) Once the alarm sounds, the chamber is vented. Press RESET again to turn off the alarm</p>	 <p>A photograph of the same control panel. A white box highlights the 'RESET' button, and a white arrow points to it from the left.</p>

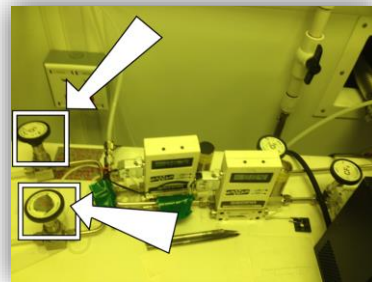
DRY RUN (BEFORE INSERTING SAMPLE)

<p>1) Open the lid and ensure the chamber is empty</p>	
<p>2) Press OPEN on the MKS controller to open the RIE vacuum valve.</p>	 <p>The image shows the MKS 600 Series Pressure Controller. A white box highlights the 'OPEN' button on the right side of the control panel. A white arrow points to this button. The display shows '1.0E-05 Torr'.</p>
<p>3) Close the lid and press START to</p>	 <p>The image shows a control panel with several buttons. A white box highlights the 'START' button. A white arrow points to this button. Other buttons include 'RESET', 'GV', 'GV2', 'RF', and 'LV'. Below the buttons are labels for 'CF4' and 'O2'.</p>
<p>4) Make sure the timer on the RIE is set to 1 hour or more.</p>	 <p>The image shows the SAMCO RIE unit. A white box highlights the digital timer display. A white arrow points to this display. The display shows '00:00'. The SAMCO logo is visible on the left side.</p>
<p>5) Wait until pressure is BELOW 20 mTorr, then press the interlock bypass button in front of the SAMCO. The GV LED will illuminate. DO NOT bypass the interlock unless pressure is below 20 mTorr!</p>	 <p>The image shows the interlock bypass button. A white box highlights the button. A white arrow points to this button. The text 'INTER LOCK BYPASS' is overlaid on the image. The SAMCO logo is visible on the left side.</p>

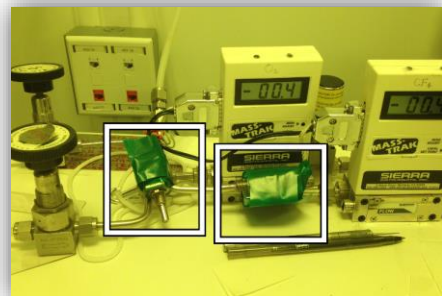
6) Open the RIE gas valves for desired gas(es) and press GV1 or GV2 (or both) depending on the desired gases.



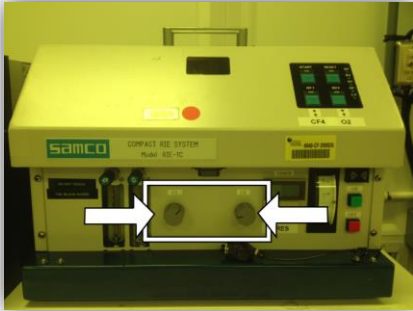



7) Open the Nupro gas valves for the gas(es) you wish to use.



8) Set the mass flow controller(s) (MFC) to the desired flow rate(s) (in SCCMs) by turning the potentiometer(s) clockwise.



<p>9) When the indicated pressure is below the set point pressures, select the set point (A through E, or press OPEN) on the MKS controller to achieve the desired pressure.</p>	 <p>The image shows the MKS 600 Series Pressure Controller. A white box highlights a row of five buttons labeled A, B, C, D, and E. Two white arrows point to the A and B buttons.</p>
<p>10) When the pressure stabilizes, press RF ON on the RF generator and simultaneously start your stopwatch (look in the view port and make sure plasma is being generated).</p>	 <p>The image shows the RF generator control panel. A white box highlights the 'RF ON' button. A hand is holding a stopwatch in the foreground, indicating the start of a timing period.</p>
<p>11) Adjust the tuning capacitors on the SAMCO labeled C1 and C2 to achieve the lowest reflected power (< 6 W)</p>	 <p>The image shows the SAMCO Compact RF System. A white box highlights two tuning capacitors labeled C1 and C2. Two white arrows point towards these capacitors, indicating they should be adjusted.</p>
<p>12) When 3 minutes have passed, press RF OFF to turn off the RF generator.</p>	 <p>The image shows the RF generator control panel. A white box highlights the 'RF OFF' button. A white arrow points to this button.</p>

13) Turn off GV1, GV2, or both.



14) If not already open, press OPEN on MKS controller.



15) When pressure is below 20 mTorr, press CLOSE on the MKS controller.



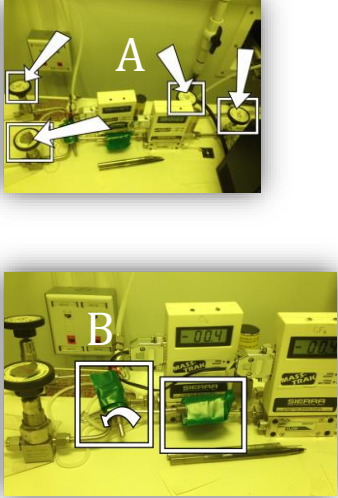
16) Vent the chamber by pressing RESET on the RIE and then pressing the interlock bypass button. Make sure the LEDs turn off.

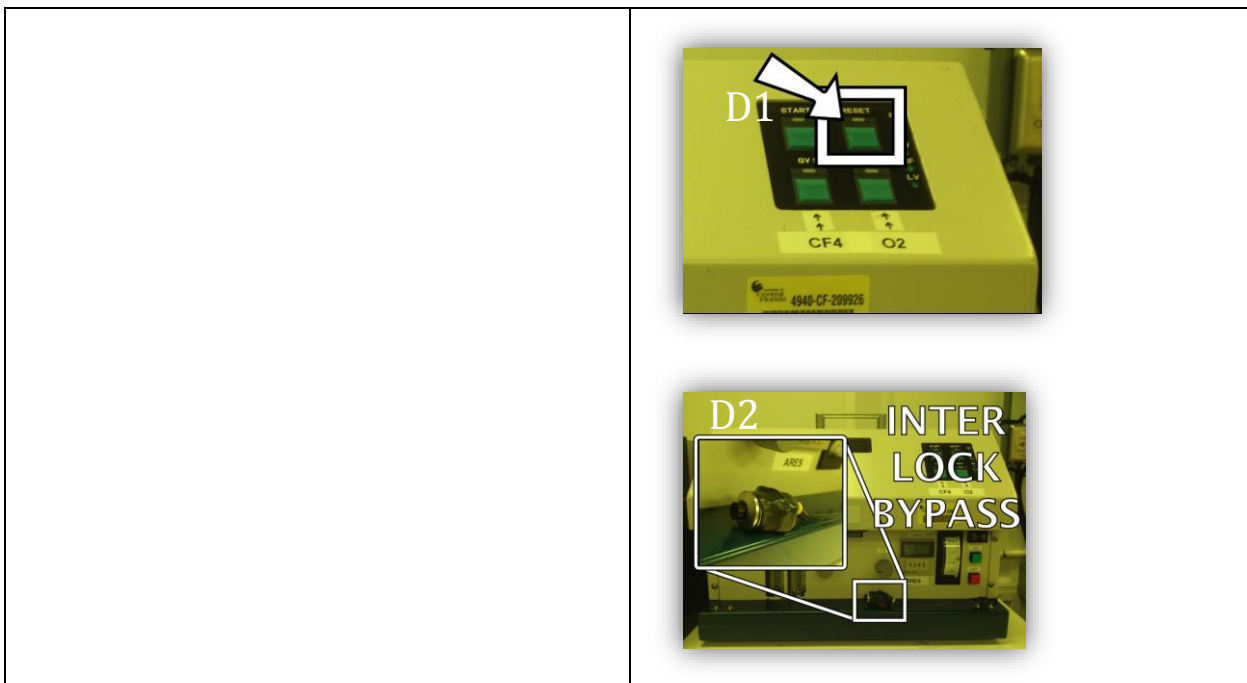


17) When the alarm sounds, press RESET again.



INSERTING AND PROCESSING YOUR SAMPLE

<p>1) Open the reactor lid and place your sample onto the sample stage.</p>	
<p>2) Close the reactor lid and repeat the DRY RUN procedure with the following modifications:</p> <ul style="list-style-type: none">a. The capacitors C1 and C2, as well as the flow rate(s) for the MFC(s), may need tuning depending on your specific OP.b. Processing time will depend on your OP.c. BEFORE VENTING AND REMOVING YOUR SAMPLE, see 3.	
<p>3) After your timed run(s) is(are) complete, do the following:</p> <ul style="list-style-type: none">a. Close the Nupro gas valvesb. Set the flow rates on the MFC(s) to 0 sccm.c. Press OPEN on the MKS controller.d. Press RESET and the interlock bypass button to vent the chamber (press RESET again once the chamber is vented in order to silence the alarm)e. Open the chamber lid, remove your sample, and close the lid.	 <p>Image A: A photograph of the laboratory setup with several white arrows pointing to specific components, likely gas valves, that need to be closed. A large white letter 'A' is overlaid on the image.</p> <p>Image B: A photograph of the laboratory setup showing the chamber lid being opened. A large white letter 'B' is overlaid on the image.</p>


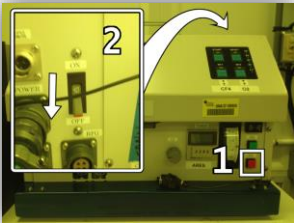

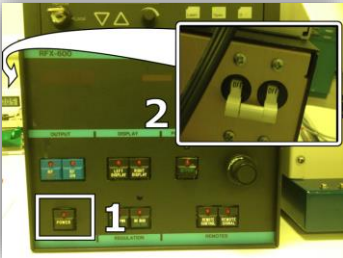


When you finish with your processing, **you must perform a 3 minute dry run** with the same gas(es) you used to process your sample.

SHUT DOWN PROCEDURE

- 1) Press **START** to begin pumping down the chamber.



<p>2) When pressure $P < 50$ mTorr, press CLOSE on the MKS controller.</p>	 <p>The image shows the front panel of an MKS 600 Series Pressure Controller. A white arrow points to a button labeled 'CLOSE' on the right side of the panel. The display shows 'PRESS 753.0' and '0.400'. Other buttons like 'OPEN', 'STOP', and 'POWER' are also visible.</p>
<p>3) Turn off the RIE by pressing the red OFF button on the front of the SAMCO and then the breaker on the rear.</p>	 <p>The image shows the front panel of a SAMCO RIE control unit. A red 'OFF' button is highlighted with a white box and labeled '1'. A white arrow points to a breaker switch on the rear panel, labeled '2'.</p>
<p>4) Turn off the RF generator by pressing the POWER button.</p>	 <p>The image shows the front panel of an RF generator. A white arrow points to a blue 'POWER' button on the left side of the panel. Other buttons like 'STOP', 'RESET', and 'POWER LEVEL' are also visible.</p>
<p>5) Wait 10 minutes (meanwhile proceeding to steps 6 and 7), then switch off the breaker on the back of the RF generator.</p>	 <p>The image shows the front panel of an RF generator. A white box highlights the 'POWER' button, labeled '1'. A white arrow points to a breaker switch on the rear panel, labeled '2'.</p>
<p>6) While you're waiting, close the gas valves on the cylinder(s) of your processing gas(es) (ensure that no one else in the lab is using those gases before you shut them off).</p>	

7) Shut off the roughing pump and blower unit in the corridor.

