

Plasma Quest RPCVD: Operating Procedure

(6/24/02)

Considerations:

- *There are four basic steps that **MUST** exist in a recipe: **Gas Stabilization, Plasma Tuning, Deposition/Process and End Step**. Additional steps may exist at the discretion of the user/programmer.
- *No temperature above **300 degrees Celsius** may be programmed without prior approval of CSSER staff.
- *If user discovers that the system is in “**Diagnostic**” or “**Configuration**” modes, **STOP** and immediately contact CSSER Staff. Normal interlocks are overridden and/or system functions could be altered, causing catastrophic results to the system
- *Refill recirculator reservoir with **Distilled Water ONLY** – found in specific containers within the clean room.
- *The action of each function key changes depending on the current mode
- *There are **different “PUCKS” for SiO₂ and Si₃N₄ processes**, Use the correct puck to transfer pieces. Place pieces towards the center of the puck to **avoid loss** as a result of vibrations during transfer cycles.
- *At the end of EACH processing session, user **MUST** run the “**LINPMPDN.PRC**” program to evacuate gas lines.

SIGN into the logbook: *(on tool in vicinity of the keyboard and monitor)*

Minimum information shall be **Name, Deposition Material, Temperature, Target Thickness, Time and Additional observations/comments.**

Set desired CHUCK TEMPERATURE: *(Omega Temperature Controller on front of tool)*

The display normally indicates the **CURRENT chuck temperature.**

Press “*” key to display current set point temperature,

Press “*” key and (∇ or ∆) to decrease or increase set point temperature.

NEVER press the “P” key.

Note: Return the set point to 100 degrees Celsius at the end of each process session.

Check the PCW lines for NORMAL configuration: *(lower left rear of tool)*

Normal: All three valve position are HORIZONTAL.

Bypass: All three valve position are VERTICAL.

Check WATER LEVEL in the recirculator: *(on the floor to the left of the main tool)*

Fill with DISTILLED water ONLY to within 1 inch from the top of reservoir.

TURN ON the desired gas valves defined in the program: *(at rear of the tool, inside the gas pod – lift hinged panel to access. Up is ON, Down is OFF.)*

Note: all gas line **MUST** be pump down at end of each session.

Position the Plasma TUNING RINGS at 40 and 104 along the tuning apparatus: *(proven to be a good starting location)*

Enter MAIN MENU mode: *(mode is noted on monitor in the lower left of the monitor screen)*

From Sleep Mode, press any key.

To CREATE a process: *(performed through Edit Mode)*

Press F1: *(Edit, will be prompted for the **password.**)*

Type: “pq”: *(password - lower case sensitive)*

Press RETURN: *(automatically, enters Select Mode with new function key definitions)*

Press F2: *(Create, screen prompted for a Filename, ≤ 8 characters)*

Type FILENAME: *(no extension should be entered)*

Press RETURN: *(begin parameter assignments)*

All parameter assignments are made using the following four steps.

- 1) Use the trackball to **MOVE THE CURSOR** on the screen to the desired parameter.
- 2) Press the **LEFT** button on the trackball unit. (other buttons are non-responsive)
- 3) **TYPE** in the desired **VALUE** for the parameter, as prompted.
- 4) Press **RETURN**

Set the GAS FLOW: *(attempts to enter values outside the acceptable range will be rejected and reverts to 0 SCCM)*

SiO₂: N₂O, He, SiH₄ **Si₃N₄:** NH₃, He, SiH₄

Note: These are typically repeated throughout the process, See STEP to STEP COPY

Set the PRESSURE: *(0-1000mT)*

Note: This is typically repeated throughout the process, See STEP to STEP COPY

Set the TIME for Step 1 (Gas Stabilization): *(1-9999 sec, typically, 30 to 60 sec.)*

Note: A time of ZERO seconds is interpreted as an END STEP and the process will start the unload cycle.

STEP to STEP COPY: *(copies all parameters to the next step)*

F4 (copy), F9 (next), F5 (paste)

Set the MICROWAVE power: *(250Watt Maximum)*

Set the TIME for Step 2 (Plasma Tuning): *(1-9999 sec)*

Hint: Enter a large time (i.e. 600 sec.) to perform the **manual tuning** effort in this step

STEP to STEP COPY: *(copies all parameters to the next step)*

F4 (copy), F9 (next), F5 (paste)

Set the TIME for Step 3 (Deposition): *(1-9999 sec)*

Press F9 (Next): *(if time is left at zero, by default this is the END STEP.)*

Press F2: *(Save, automatically enters MAIN MENU Mode. Process is not created unless file is saved.)*

To EDIT an existing process: (remember, changes made to **gas flows, pressure and power** need to be repeated to all following steps, typically.)

IMPORTANT: Never press **PRINT** in edit mode.

Press F1: (Edit, will be prompted for the **password**.)

Type: “pq”: (password - lower case sensitive)

Press RETURN: (automatically, enters Select Mode with new function key definitions)

Press F1: (Open, The filename/process in the upper-left of list will be highlighted with **GREEN TEXT**)

Locate the Existing File: (from the list with keyboard cursor control keys. The green highlight will traverse the list)

Note: If the green highlight is lost, repeatedly press the cursor left to bring it into view.

Press RETURN: (begin parameter edits)

All parameter assignments are made using the following four steps.

- 5) Use the trackball to **MOVE THE CURSOR** on the screen to the desired parameter.
- 6) Press the **LEFT** button on the trackball unit. (other buttons are non-responsive)
- 7) **TYPE** in the desired **VALUE** for the parameter, as prompted.
- 8) Press **RETURN**

Press F2: (Save, Automatically enters **MAIN MENU** Mode. Parameter edits are not retained unless file is saved.)

Note: If no changes to any parameter were made, **Press F10 to EXIT.**

To RUN an existing process:

IMPORTANT: *Never press ESC Key to abort, Always press F5 (Endstep), repeatedly, to abort.*

Verify Chuck Temperature: *(set point temperature is achieved.)*

Press F2: *(Run, will be prompted for the password.)*

Type: “pq”: *(lower case sensitive)*

Press RETURN: *(automatically, enters Select Mode with new function key definitions)*

Note: The action of each function key changes depending on the current mode

Press F1: *(Open, The filename/process in the upper-left of list will be highlighted in **GREEN TEXT**)*

Locate the Existing File: *(from the list with keyboard cursor control keys. The green highlight will traverse the list)*

Note: If the green highlight is lost, repeatedly press the cursor left to bring it into view.

Press RETURN: *(Enter RUN Mode, Begin processing session)*

Automatically advances through process steps at the expiration of time in each step.)

Press F1: *(Start, will be prompted, “ Do you wish to load wafer before running? [Yes] or [No] ”)*

Type: “Y”: *(or “N” as necessary.)*

OPEN Load Lock lid:

Place wafer onto the load arm: *(or samples on correct puck)*

Press RETURN: *(process program begins)*

Verify Stabilization - Step 1: *(gas flow and pressure levels, allow time to expire)*

Perform Manual Tuning - Step 2: *(move tuning rings to develop the lowest REFLECTED WATTS. The panel indicator on the Microwave source unit is most accurate. Typically, 3 to 6 watts reflected can be achieved.)*

Press F5: *(as soon as lowest reflected watt is achieved, significant deposition rate is occurring)*

Verify Deposition - Step 3: *(allow the step time to expire, retune reflected watts if indications drift)*

End Step – Step 4: *(auto-detected and begins the unload cycle)*

OPEN Load Lock lid and Retrieve Sample:

Hint: if another sample is to be processed, Place next sample onto load arm and press F1.

Press F10: *(Exit, to MAIN MENU mode)*

RUN “LINPMPDN.PRC”: (pumps down all gas line and MFCs)

Set CHUCK TEMPERATURE to 100 degrees C: (Omega Temperature Controller on front of tool)

TURN OFF all gas valves: (at rear of the tool, inside the gas pod – lift hinged panel to access. Up is ON, Down is OFF.)

Press F2: (Run, will be prompted for the password.)

Type: “pq”: (lower case sensitive)

Press RETURN: (automatically, enters Select Mode with new function key definitions)

Note: The action of each function key changes depending on the current mode

Press F1: (Open, The filename/process in the upper-left of list will be highlighted in **GREEN TEXT**)

Locate “LINPMPDN.PRC”: (from the list with keyboard cursor control keys. The green highlight will traverse the list)

Note: If the green highlight is lost, repeatedly press the cursor left to bring it into view.

Press RETURN: (Enter RUN mode, Begin processing session)

(Automatically advances through process steps at the expiration of time in each step.)

Press F1: (Start, will be prompted, “Do you wish to load wafer before running? [Yes] or [No]”)

Type: “N”: (No sample required)

Press RETURN: (process program begins)

Note: allow program to run to completion, each process gas flow indication will decrease until all gas sources have been cycled.

Automatic, unload cycle completes.

Press F10: (Exit, to MAIN MENU mode)

Press F9: (Enters Sleep mode, to protect monitor)