

Panasonic ICP #2



Manufacturer:

Panasonic Factory Solutions, Japan

Model:

E620-R&D

General Information and Usage:

This is a single-chamber tool for etching of a variety of materials. The chamber is configured as an ICP etching tool with 1250 W ICP power, 600 W RF substrate power, and RT-80°C operation with back-side He cooling and an electrostatic chuck to maintain controlled surface temperatures during etching. This chamber has Cl₂, BCl₃, CF₄, CHF₃, SF₆, Ar, N₂, He, and O₂ for gas sources and can be used to etch a variety of materials from SiO₂ to metals to compound semiconductors. The chamber evacuated with a 2000 lpm Osaka Vacuum magnetically levitated turbo pump, allowing for fast pump down. The system accepts 6" wafers (JEIDA Std) or pieces mounted to the wafers.

Detailed Specifications:

- 1250 W ICP source, 600 W RF Sample Bias Source in etching chamber
- RT - 80°C sample temperature for etching
- Etch pressure from 0.1 Pa to 5 Pa (0.75 mT - 37.5 mT)
- Cl₂, BCl₃, CF₄, CHF₃, SF₆, Ar, N₂, He, and O₂ in etch chamber
- Pieces possible by mounting to 6" wafer
- Load-Locked
- Up to 20 steps per recipe

Password: 101

Don't open chamber door if green start button is lit up.

Use the mouse as much as possible because the keyboard is weird. You can click on the function buttons on the screen. If you press the keyboard key next to the spacebar, you won't be able to type what you want to type. Try pressing the yen ¥ key until everything goes back to normal.

Don't press the stop button. Don't press the off button. You press the emergency stop button if someone is getting hurt or the machine is getting damaged.

Click F12 = return (to main screen).

Click F2 then F1 = Monitor recipe

If the machine won't start: Press the Prep button. The two boxes should both be ready to start, but they probably aren't because there was a problem. Click the two boxes to put a checkmark in them. Click Start Up. Click Register. Now you can press the Start button.

Click F4 then F4 for recipes. A yellow recipe is registered – that's the one that will run. A purple recipe is selected /highlighted. The yellow may hide behind the purple!

Don't change the first ten recipes (except step time). They are the staff recipes. Everything else is up for grabs, so check your recipe before you run it!

Wafers: Get fresh wafers from the Vidmar as needed. The robot won't run if the wafer isn't shiny and reflective. The size of the wafer and the length of the flat side are important, so don't bring in outside wafers.

1. Gas change instructions are available.
2. Clean the front and back of the wafer and mount the sample with oil. You don't want the oil to show.
3. If the start button is dark, you can open the door and load a wafer by putting it in there.
4. Click: F1 recipe, F4 Processing.
5. Highlight the recipe you want to run. Click Select. Press the Start button to start the machine.
6. Click OK. Click 12 to return. Click F2 then F1 to monitor.
7. Wait. Don't open the door until the start button is dark.
8. If you use Chlorine or CHF₃, SF₆, or CF₄, then be sure to run a cleaning process after your etch.
 - 1 minute of CF₄/O₂ cleaning for each 2 minutes of Cl₂ etching. At least five minutes. Look for the CF₄ Clean recipe and edit the step time.
 - 1 minute of cleaning for each 1 minute of CHF₃, SF₆, or CF₄ etching, according to the posted sign.

To advance to the next step immediately

Maybe you suddenly realized that you set the etch step time too long. Find the Panasonic sub control panel with two green buttons on the side. Push in the both green buttons at the same time.

Recovering after you open the door while the machine is running

If you open the door while the robot arm is extended, only Mike Silva can reset the machine. Let's hope you only opened the door while the machine was running but not while the robot arm was extended.

Suppose you open the cover while the wafer is being processed. You can either retrieve the wafer now or you can keep processing it without taking it out.

To retrieve the wafer now:

1. Press “Error reset” to remove the error.
2. Press “Test” to put the machine in the mode where you can retrieve the wafer.
3. See the manual transfer wafer sheet for the rest of the steps. (You will need to click F3 Transportation from the F4 Trans Test menu.)

To keep processing without taking out the wafer:

1. Press “Error reset” to remove the error.
2. You probably want to edit the process to shorten the step time because it’s already run through some of the step time. Click F12 to return and F1 for recipe and edit the recipe. Don’t forget to save it!
3. Click F4 Trans Test
4. Click F4 Process Step.
5. Select recipe and click Register.
6. Press Test. Press Start.

Editing a recipe:

Click: F1 recipe, F4 Processing.

- Don’t try to get to the recipe via F11, because it has a bug. It will only allow you to edit the recipe 50% of the time.

Copy and paste an entire recipe:

1. Highlight the recipe to copy. Click Copy. Click Execution. OK.
2. Highlight the recipe to overwrite. Do not overwrite one of the first ten recipes!
3. Click return to get out of copy/paste mode.

Double click a recipe to open it for editing.

- ICP #2 has up to 20 steps for a single recipe -- instead of multirecipes like ICP #1.
1. Change the recipe name.
 2. Edit the recipe, keeping in mind:
 - Mike Silva and Brian Thibeault can help!
 - Step 1 is plasma ignition. You need a pressure of at least 2 Pascal.
 - The last two steps must be Neutralization (to discharge the electrostatic chuck (ESC)), then Pushing (to push the wafer off the electrostatic chuck). There’s no need

to edit these steps. You can copy them over if you need to insert etching steps. Note that the settings for “Use of ESC” and “Pushing for neutralization” are crucial for these last two steps.

- Step 2 might be a step for lowering the pressure, if you need an etching pressure below 2 Pa.
- The middle steps are etching steps. That’s when the bias fwd is on.
- Example: adding two etch steps to change a recipe from 1 etching step (5 steps total) to 3 etching steps (7 steps total).
 - i. Change “End step” from 5 to 7.
 - ii. Change “Start step for neutralization” from 4 to 6.
 - iii. Copy the last two steps: Triple left click Step 4 to copy the column. It will highlight purple. Single left click step 6 to paste. Copy the step 5 column to the step 7 column the same way.
 - iv. Copy the etch step (Step 3) to columns 4 and 5 so that the parameters are correct for etching.
 - v. Edit the etch steps as desired.
 - vi. Click Register to save! (or Cancel to not save)
 - vii. If you have any questions or want to double-check your recipe, talk to Brian Thibeault or Mike Silva.
- “RF (source) ref limit” – ref means reflection. This actually subtracts from the RF (source) FWD.
- ESC volt 1 and volt2 must have opposite voltages, like +1200V and -1200V.
- Set limits to 20%. If the limit is only 0% then the machine will error for *any* deviation.
- “Chamber dead time” sets the waiting time until error detection after rf discharge is started.
- “RF wait time” is the time to stabilize the vacuum before starting rf power supply.
- “Vacuuming time” needs to be zero until the last etch step (i.e. the third-to-last step). It turns off everything, including the plasma.
- Long etches: Mike Silva has increased the maximum rf power time from 1 hour to 2 hours, but you do risk overheating. If the quartz hits 120°C, it will stop the process. To prevent overheating, you could turn off the plasma and add a nitrogen flow step with the electrostatic chuck (ESC) on but no FWD power.