

## Standard Operating Procedure: Plasma Asher

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## Hardware Description and Principle of Operation

### *PVA Tepla Plasma Asher*

The IoN 40 is a plasma processing system configured for etch, strip, clean and surface treatment of wafers. It is a programmable automatic instrument with a built in computer and a touch screen graphic display that enables on screen access to recipes, process follow-up and on screen editing and activation. High purity O<sub>2</sub> and Ar are available as process gases and are supplied to the rectangular three-shelf aluminum chamber via MFC controllers. The chamber is served by a Dry Vacuum Pump Edwards XDS 35i Dry Pump. Plasma is generated by an integral auto-matched, air-cooled, 600 watts, 13.56 MHz RF generator.



## Material Requirements

Equipment: substrate and tweezers

Personal Protective Equipment: nitrile gloves

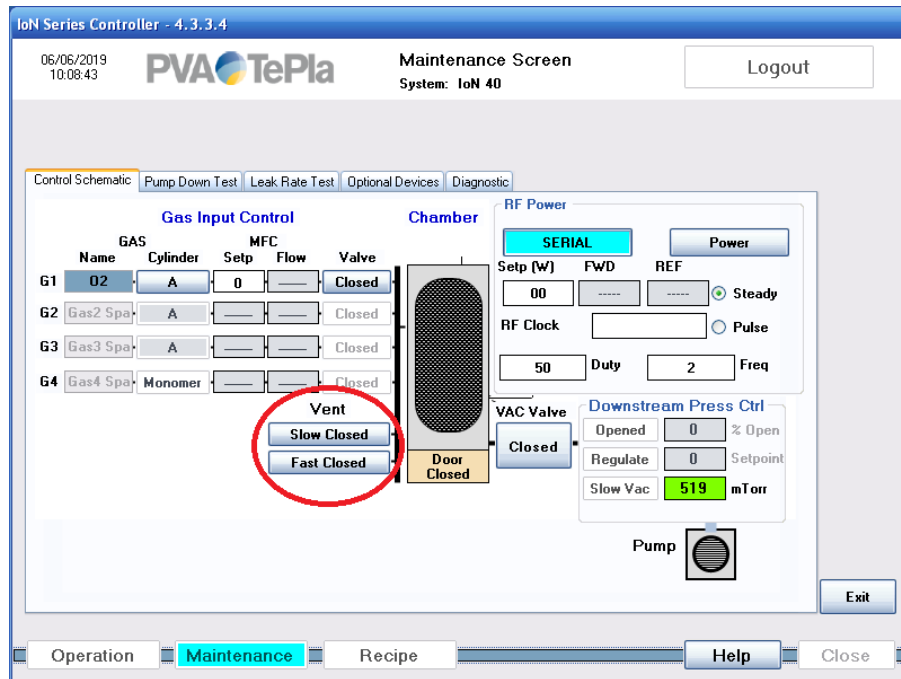
## Procedure

Estimated Time: 10-15 minutes

### Load Sample

1. Vent chamber if the tool is under vacuum (Main Menu → Maintenance → **Fast Closed**).

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2. Open the chamber door and place samples on the rack. Shelves may be removed or adjusted in order to load samples; however, they will need to be secured before running a process.

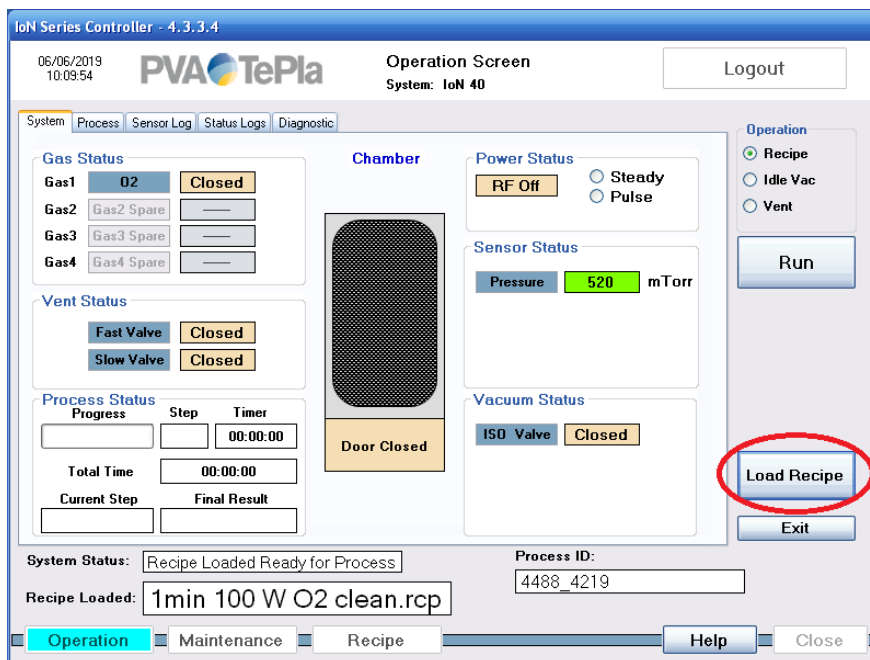


3. Shut the chamber door.
4. Close the **Maintenance** screen.

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## Running Process

1. Click **Operation** in the Main Menu.
2. Click **Load Recipe** and select desired recipe.



3. Click **Run** to run recipe.

## Unload Sample

1. When the process is complete, the chamber should be vented per the recipe.
2. Open the chamber door and unload samples.
3. Clean any dirty residue on the shelf and inner chamber.
4. Shut the chamber door.
5. Select **Idle Vac** under **Operation** and the click **Run**. Allow the chamber to pump to base pressure.
6. Return to the home screen. *Note: You must return to the home screen before disabling the tool in badger, otherwise the software will crash.*

## Emergency Stop

- To abort a recipe mid-process, select **Abort** while the recipe is running.
- In the case of an emergency where a tool malfunction puts users in imminent danger, press the red EMO button on the front of the tool. This is only to be used as a last resort.

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## Allowed Activities

### Recipe

Recipes can be tailored to your needs; however, you will mainly only ever need to change the gas flow rate, generator power and the duration of the Ignite Plasma step. If you wish to create your own recipe, it may be beneficial to open a previous user's, change the necessary parameters and save it as a new and separate file.

The screenshot shows the 'Recipe Editor Screen' for the 'IoN Series Controller - 4.3.3.4'. The interface includes a date and time display (06/06/2019 10:07:42), the PVA TePla logo, and a 'Logout' button. The 'File Loaded' path is 'C:\Recipes\1min 100 W O2 clean.rcp'. Below this is a table with columns for Step, Start, Pump, Gas Flow, PWR Generator, Tol Alarms, and Step End. The table contains six steps: Pump Down, Flow Gas, Ignite Plasma, Pump Down, Vent, and End Step. Below the table are 'Recipe Edit Options' including buttons for 'Clear Editor', 'Save File', 'Load File', 'Print File', and 'Exit Editor', along with a 'Disable Version Check' checkbox. At the bottom, there is a navigation bar with 'Operation', 'Maintenance', 'Recipe' (highlighted), 'Help', and 'Close' buttons.

Step	Start	Pump	Gas Flow	PWR Generator	Tol Alarms	Step End		
NAME	VAC	VENT	GAS Control	PWR(cyc)	PWR (w)	ALARMS	END Conditions	
1	Pump Down	Fast	Off	All Gas Flows Off	Off	0	Alarms Off	Pres:100
2	Flow Gas	Fast	Off	G1A:300	Off	0	G1	0:1:30
3	Ignite Plasma	Fast	Off	G1A:300	Steady	100	G1 Fwd Ref	0:1:0
4	Pump Down	Fast	Off	All Gas Flows Off	Off	0	Alarms Off	Pres:100
5	Vent	Off	Fast	All Gas Flows Off	Off	0	Alarms Off	0:2:0 Door
6	End Step	Off	Off	All Gas Flows Off	Off	0	Alarms Off	None
*								

Users may also use the Maintenance Screen to check the chamber pressure they can achieve with a specific flow rate. To do so, they must open the VAC Valve, change the Setpoint of the O2 gas and then open the O2 valve. Let it flow for about a minute and a half to see where the chamber pressure settles.

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## Disallowed Activities

- Shelves may be removed to make room for larger samples, but if doing so, two shelves must be removed and they must be two sequential shelves due to how the tool generates a plasma.
- Do not use tape or polymers to adhere samples to the shelves. Samples should simply sit on the shelves.

## What to watch out for during operation

- If removing shelves after a process, be careful handling them as they can become very hot depending on the power and duration of the process.
- If removing the shelves, be sure that all the shelves are plugged in within the chamber and that they are in the correct positions before running a process.

## Common Troubleshooting Tips

- If the fast vent valve is not opening when the chamber is trying to vent, most likely due to a malfunctioning valve, go to the Maintenance screen and open the slow vent valve instead. It will take significantly longer for the chamber to vent, but it will vent.

## When to call staff?

- When the pump is failing.
- When the pump or vent valves are not opening.

## Badger Criteria

### Report Problem:

- When the plasma is pinkish in hue, which means there is probably a chamber leak.

### Shutdown:

- When the pump is failing.
- When the pump or vent valves are not opening.

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## Revision History: