

## LAM590-TRL

### STANDARD OPERATING PROCEDURE

CORAL

Name: *LAM590-icl*

Model

Number: Autoetch

Location: TRL ballroom

What it does: Plasma Etches Silicon Nitride and Oxide

Introduction: The LAM590-TRL is a plasma etcher donated by Analog Devices Inc. It is a 6" tool but smaller substrates may be placed on a "handler" wafer. The LAM590-TRL etches Silicon Nitride and Oxide

There are 5 gases, but only 4 are available for processing: Oxygen (O<sub>2</sub>), Helium (He), Trifluoromethane (CHF<sub>3</sub>), and Tetrafluoromethane (CF<sub>4</sub>). The other CF<sub>4</sub> (gas 1), is not used.

Safety: **CAUTION:** Do **NOT** remove any machine covers under any circumstances!!!

**NOTE:** There is an **On/Off** switch on the keyboard to be used in case of emergency. This switch disables the power to the entire system (but not the vacuum pumps). Use this button in emergency situations!!! This switch should also be used if a wafer is going to be broken!!! In either case, notify the Staff immediately so the system can be checked!!!

Due to the toxic nature of the processing gases, only qualified technical staff is allowed to perform the tasks of turning gases on and off and changing of gas cylinders. Keep your hands away from all moving parts. Do not try to defeat any of the system interlocks.

If, while operating this machine you encounter an issue, report it immediately Using Coral as either a problem or a shutdown depending on its severity. The staff in charge will address it in a timely fashion.

Procedure: Check reservations in CORAL to insure that you reserved the correct machine in the correct facility for the correct date. Another user may have reservations; it is your responsibility to honor them, if this is the case.

'Engage' the machine in CORAL for the equipment that you are about to use; use this command BEFORE you start the operation. Insure that the correct facility is set (ICL, TRL, etc.) and that your lot name is entered correctly."

The CORAL switchbox light must be "ON" in order to enable the Start button!!!

**NOTE:** Use the arrows (v, ^, >, <) to navigate the screen, and then push FIELD SELECT to toggle through the various choices

If you have any etch/process problems  
please send e-mail to [LAM590-TRL@mtl.mit.edu](mailto:LAM590-TRL@mtl.mit.edu)

1. Select the proper recipe module. These modules are kept at the etcher. There is a Fast Recipe (850W) and a Slow Recipe (450W) for Oxide. Approximate Fast etch rates are: 380nm/min. Approximate Slow etch rates are: 290nm/min. There is a Fast Recipe (850W) and a Slow Recipe (450W) for Nitride as well. Approximate Fast etch rates are: 400nm/min. Approximate Slow etch rates are: 180nm/min.

2. Plug the selected module into the module receptacle located on the lower left side of the control panel.
3. Press the **LOAD** button located to the right of the module receptacle. **CAUTION: Use Extreme Care! Do Not Press The Save Button!**
4. Load 2 blank wafers into the SEND cassette. Blank wafers are kept in a box labeled LAM Dummies. If wafers are not available then contact the Staff.
5. Place the SEND cassette with the wafers on the flat-finder. Orient all wafer flats in the upward position.
6. Place the SEND cassette on the send elevator located on the left side of the etcher.
7. Place the RECEIVE cassette on the receive elevator located on the right side of the etcher.
8. Press the **START** button located on the right side of the process control panel. This procedure seasons the chamber and ensures the system is in proper working order before etching your wafers.
9. After the dummy wafers have been etched, remove them from the RECEIVE cassette and return them to the wafer box labeled 490B Dummies.
10. Replace the RECEIVE cassette on the receive elevator
11. Load your process monitor into the SEND cassette and orient the flat in the upward position.
12. Place the SEND cassette on the send elevator. Press the **START** button. After this wafer is etched you should measure the underlying material to ensure that the process is working properly. A visual inspection should also be done.
13. If everything is okay, then load the remainder of your wafers into the SEND cassette. Orient the wafer flats in an upward position and press **START**.
14. Remove your wafers from the RECEIVE cassette when the process is complete. Replace the RECEIVE cassette on the receive elevator.

**ALARMS:** The etcher will alarm for the following malfunctions.

- Low water flow
- RF mismatch (high reflected RF power)
- Gap spacing unstable
- Wafer arm malfunction
- Endpoint detection fail
- Pump down fail

**Please report any problems/shutdowns with the tool via CORAL**

### **SYSTEM FUNCTIONS:**

**Status Page:** This page is completely controlled by the computer.

- Monitors gas flow in sccm
- Gap spacing in cm
- RF forward power in Watts
- RF reflected power in Watts (must be stabilized within 20 seconds)
- Movement of wafers (simulated)
- Etch chamber pressure in Torr
- Etcher temperature in degrees C (monitored in cooling water return)
- Verification of set points
- Manually stop step in recipe (if desired)
- Viewing set points during processing

**Recipe Page:** The following variables are programmable.

- Step #
- Pressure
- RF power

Gap  
CF4 (Not Plumbed)  
O2 Oxygen  
He Helium  
CHF3 Trifluoromethane  
CF4 Tetrafluoromethane  
Stability  
Time + Endpoint  
Recipe  
Overetch  
Time—Max 00:00 Min:Sec  
Copy—Step #00 to #00

**Parameter Page:** This page is used in conjunction with the Recipe page. There are 3 choices at the Parameter prompt: Machine, Endpoint, and LamLink.

Machine:

Resetting of alarms is from this page  
Silencing Alarms  
RF alarm reset

Endpoint:

Selection of the endpoint (etch finished)  
Triggering of the endpoint  
Time for delaying the endpoint start time  
Time for normalizing the sampling of the endpoint reference  
Setting of the channel for the endpoint detector

LamLink:

Primarily a page for a production environment.

**Options Page:** This page is primarily used by the staff to diagnose problems with the system and to reset it if a malfunction occurs.

This page also monitors the read out of all the digital and analog inputs and outputs of the system. There is also a manual operation subset to this page that enables manual control of the system. This subset is restricted to staff use only.

However, the operator can monitor the actual endpoint of the etch by looking at channel 18 (Filter D)

Author:R. Bicchieri, 8/12