Description:

The Alcatel 601E utilizes the Bosch process to provide deep etches into silicon substrates. With proper substrate preparation and handling the system can completely etch through the silicon. Current configuration is for 100 mm silicon wafers with a single flat. After a substrate has been manually loaded into the Loadlock all transfer and processing is completed under automatic computer control.
Safety:

1. Before operating this tool, users must be trained and certified by Lab staff.
2. Make sure that a substrate is loaded and the Vacuum Loadlock lid is down before starting any process.
3. A Red Alarm status light indicates the system has/had a condition that may not allow processing. The user should use caution until the cause of the alarm is determined.
4. If the Alarm will not remain off after acknowledging contact the staff at the phone number listed below.
5. If Green On status indicator is off and Red stop status indicator is on do not attempt to start. Discontinue using the system and contact the NCNC staff.

Emergency Machine Off (EMO)

Use the EMO Button only if there is a safety hazard or serious system failure. If there is water on the floor between you and the system leave and contact the lab staff.

1. Push Red EMO (Emergency Machine Off) button
2. Call NCNC staff
   a. Lab Phone 2-9831

![EMO Button Diagram](image)
**System Operation**

**Initial System Checks:**

1. Check the logbook to verify system condition. If system is down and was not noted in the NCNC mail please send an E-Mail updating the staff and user group.
2. Note the alarm status.
3. Verify that system chamber vacuum is in the x.x-6 mBar range.
4. Loadlock should be vented.
5. Open Loadlock and check for substrate.

**GUI (Graphical User Interface)**

1. Provides Video display of Control Computer Sensor and Status information, function windows and data input fields.
Prepare for Etching

1. Select User Button using Trackball and left click key. (see Appendix)

2. Using Trackball and left click key Select Login to open Login Window.
3. Using Trackball and Keyboard Enter your user name and password then click OK.

4. Use Trackball to open Alarm screen if active.
5. Record any alarm other the Heater standby message in the Logbook.
6. Please notify Dan Haskell 4-6587 of all alarms other than Heater standby.
7. Acknowledge the Alarm(s).
8. Wait one minute if Alarm remains off, system can be used for process.
9. If Alarm returns, Logoff and place a machine down notification on the system.
   Record the alarm message text in the logbook and E-mail NCNC that the system is down.
10. If no active alarms are present open the Loadlock and place substrate with one flat oriented to the locator screws.
11. Close Loadlock Lid and proceed.

Select Recipe

2. Using Trackball Select the drop down list.
3. Scroll through the list and click on desired Process.

4. Enable Data logging “recommended”.

**Etch Substrate**

1. Select GO! Run button to start the Process.
2. The screen will change to the Process Control display.
3. System will pump down the Loadlock then transport the wafer into the Process Chamber.

4. Monitor Helium flow and temperature for at least 2 minutes before leaving. Helium may rise to 10 sccm at the beginning of the step but should settle to below 3 sccm in the first minute of flow. Helium Flows over 3 sccm can cause process shifts. The system should generate a Warning and an Alarm that should halt process if the Helium flows exceed 10 sccm.

5. Observe the Process Control screen for at least 2 minutes before leaving the system.

6. Verify that sensor displays are reaching recipe Setpoints and no Alarms have occurred.
After Etch is Complete

1. When all process steps are complete the system will place the substrate in the Loadlock. The Loadlock is vented to Atmosphere then an End of process window will be displayed.

2. Open Loadlock and remove substrate.
3. Inspect the substrate for damage. If any breakage or pieces are missing discontinue using the system. Logoff and place a system down notification on the system. Send E-mail notification to NCNC giving the system status.
5. If last wafer Logoff.
6. Close Loadlock lid before leaving system.
7. Update Logbook.
APPENDIX:

Trackball:

1. M1 is equivalent to Left Mouse Button.
2. M3 is equivalent to Right Mouse Button.
3. Rolling Trackball should move indicator arrow on screen.

Front Control Panel:

1. Stop Button (Red Indicator) lamp should be off. Do not press button, unused during normal operation.
2. Start Button (green indicator) should be on during normal operation. If Green indicator is off do not attempt to restart system.
3. Emergency Stop Pushbutton. Only used in Emergencies removes Electrical power from the system.
4. Alarm Indicator (Red) active when system is not ready to run a process.
**User Interface System Screen:**

1. Red indicates Inactive or Closed. Green indicates Active or Open.
2. Time and Date fields are active on all pages.
3. Loadlock Pressure display. Only attempt to open when display reads Atm.
4. Source RF Status field displays power delivered vs. power reflected.
5. Process Chamber High Vacuum Sensor displays system base pressure. During process the associated Isolation Valve will close and the sensor display goes to off.
6. Loadlock has no Lid closed or wafer present sensors.
7. Manometer Sensor Field displays Chamber pressure during Process steps.
8. VAT Valve can isolate the chamber or move to computer controlled position to vary chamber pressure.
9. Loadlock Turbo Pump Status Display Green indicates on and at operating speed. This typically will go Red briefly during Loadlock pump down.
10. Loadlock Roughing Pump Green indicates on and proper pressure level to support the Turbo Pump.
11. Substrate Holder RF Status field displays power delivered vs. power reflected and Bias voltage developed.
12. Wafer Icon displays last expected placement position. When system is in idle mode Wafer Icon is shown in Loadlock.

13. Process Turbo Pump status Display should remain Green. During normal operation Red is an Alarm condition.

14. Turbo Nitrogen Valve is only opened used during maintenance.

15. Process Turbo Pump Isolation valve should remain open (Green) during normal operation.

16. Process chamber roughing pump provides rough vacuum pumping during system start up. Typically the chamber rough pump provides exhaust vacuum for the Process Turbo pump.
17. Lower Substrate Holder Vacuum Valve controls Vacuum supply to Lower Substrate Holder Assembly
18. He Vacuum Valve activates to pump Helium from backside of the Substrate before clamp is released.
19. Process Chamber Turbo Bypass Valve only used during maintenance.
20. Substrate Holder Temperature Sensor Display
21. He Supply Valve delivers the Mass Flow Controller output to the Backside of the substrate
22. Load lock N2 valve. Supplies N2 during Loadlock vent to Atmosphere.
23. Loadlock Vacuum Valve used to pump Loadlock for substrate Vacuum transport. Valve is closed (red) when Loading or Unloading Loadlock at atmospheric pressure.
24. He MFC (Mass Flow Controller) displays He flow. If He flow readings exceed 3 sccm expect process shifts. Flows above 10 sccm should generate a warning or alarm.
25. He Pressure sensor. Normal pressure should match recipe Setpoint of 1.0E-1 mBar.
26. Machine Operating Mode, should always be in Local.
27. Process Library is assigned to user listed here.
28. User Log Display lists the User that is presently logged in.
29. Communication status displays status of the link between the User interface and the (PLC) System Control Computer
Process Status Screen:

1. Pumping Status Field. Triangles should remain Green indicating pumps are on during process steps.
2. Elementary moves. Red indicates the Robot has completed the substrate movement indicated by the text.
3. Process Status Field. Yellow Triangle indicates active system control to match Recipe step values.
4. Thermalization Status Field. Yellow Triangle indicates active system control to match Recipe Setpoints. Thermalization Setpoints remain active after step is complete until finish of process recipe.
5. Temporization Status Field. Red Triangle indicates the step Duration (timer has completed).
6. Process Pressure. Turquoise Field indicates sensor value. This pressure is a result of the VAT valve position and the amount of gas flowing into the process chamber. Expect to see varying values during the Bosch Etch Process.
7. Recipe Gas Flow Setpoints are displayed in Yellow fields.
9. RF reflected power display. Bosch process changes variables faster than system can respond. Varying levels are normal.
10. Substrate Voltage. This voltage varies with Substrate, RF power, Chamber pressure and Gas
11. Stop Process button. Aborts all process steps then removes wafer immediately from the chamber.


13. Step (resume). Resumes a stop due to an Alarm. Resumes a step that was being held.

14. Step (hold). The recipe process time or Duration Setpoint is ignored. The system will continue run the active step with no regard to time elapsed. Be careful if this button is pushed during a process step don’t leave system unattended, it will continue to etch.