

Approved by:

_____/_____/_____/

Process Engineer

_____/_____/_____/

Equipment Engineer

1 SCOPE

The purpose of this document is to detail the use of the Applied Materials P5000. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

2 REFERENCE DOCUMENTS

- Material Safety Data Sheets
- Appropriate Tool Manuals

3 DEFINITIONS

n/a

4 TOOLS AND MATERIALS

- 4.1 **General Description** - The P5000 is a load locked system with 4 process chambers. Chamber A is for TEOS depositions, Chamber B is for Plasma Nitride depositions, Chamber C is for Oxide etching and Chamber D is not active.

5 SAFETY PRECAUTIONS

5.1 Hazards to the Operator

- 5.1.1 **Gases** - The system uses a number of different gases including silane and ammonia which are hazardous. Read and understand the material safety data sheets (MSDS) for all gases used in the system and be familiar with the hazards and safety controls to prevent an accident before using the system.
- 5.1.2 **Chemicals** - The system uses a liquid source chemical for the TEOS depositions.
- 5.1.3 **Mechanical** – Pinch hazards exist near wafer handling. Keep clear of outer door, wafer slit door and cassette mechanics.

5.1.4 **Burn** – Wafers are processed at 390°C. Interior surfaces of tool may be hot.

5.1.5 **Electrical** – A variety of electrical and RF hazards exist inside the tool. Please operate with all covers in place.

5.2 Hazards to the Tool

5.2.2 **Contamination** - Process only clean wafers in the system. No photoresist, gold or copper. *If you are not sure about a wafer please ask a staff member.*

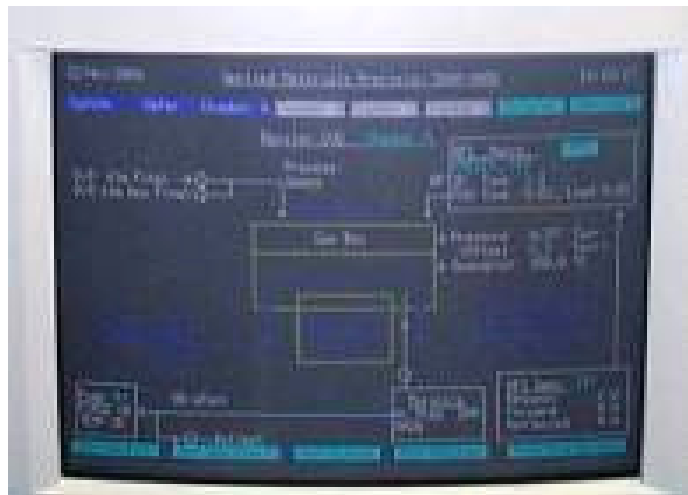
5.2.3 **Damaged Substrates** – Avoid processing warped or damaged substrates.

5.2.4 **Unapproved Recipes** - Unapproved recipes could cause damage to the system. Users are only allowed to change deposition time. **Other recipe changes need staff approval.**

5.1.5 **Chamber Pump Down** - Make sure that chamber is pumped down before turning on the lamps.

5.1.6 **Chamber Clean** – The chamber clean must be run after every 1um of deposition to prevent flaking from the top of the chamber.

5.1.7 **Excessive Deposition** – The maximum deposition in a single run is 1um. For depositions greater than 1um, the wafer must be removed for a chamber clean after every 1um of deposition.



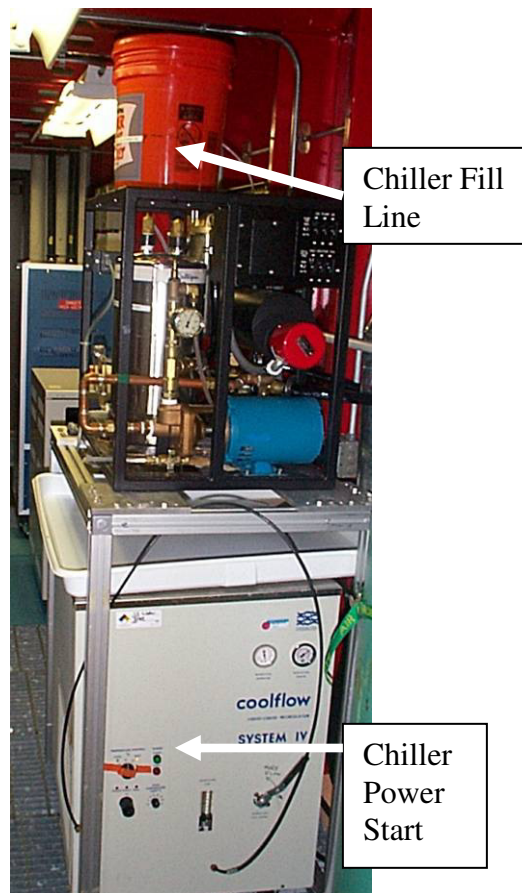
6 INSTRUCTIONS

6.1 Swipe in on the card swipe system.

6.2 Verify that the *chamber* that you need to use is up.

6.3 Service Chase 2755 setup

6.3.1 Verify that the nitrogen valve for the P-5000 is on. (Usually on)

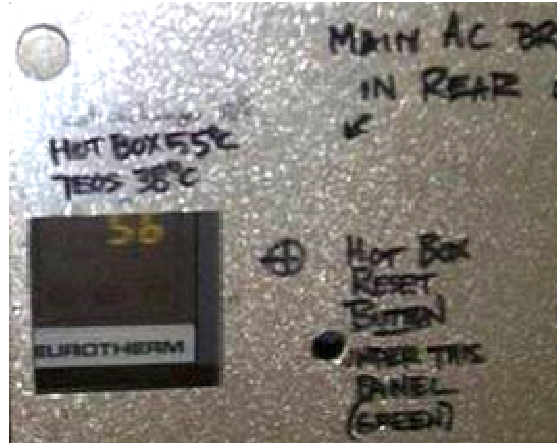


6.3.2 Make sure that the water level in the bucket on top of the chiller is close to the line, if not add water with the orange fill knob.

6.3.3 Make sure that the chiller is on. If not, press **Power Start**.

6.4 Behind the tool setup

6.4.1 Make sure that the hot box temperature is 55°C.



6.4.2 Press the blue button on the hot box with a pen if the light is blinking. After pressing the blue button, blinking light should go off. This will ensure the hot box does not overheat.

6.4.3 Make sure the breakers for the **Load lock** and **Chamber A Pump** are on.



6.5 Computer setup

- 6.5.1 Make sure that the computer is operating. If the computer is off, check with a staff member.
- 6.5.2 Clear any alarm lines. Go to **System, Fault Screen** and select **Clear Alarm Lines** on the top right.
- 6.5.3 Make sure that the heat exchanger is on. Go to **System, Monitor Facilities, Heat Exchanger Frame, HX1** and select **On**. (Level will be Low)
- 6.5.4 Make sure that the TEOS temperature is 38°C. Go to **System, Monitor Remote Panel** and **Chamber A**. The TEOS level should be close to 100%.
- 6.5.5 Make sure that the system is in Manual Mode. Next to **System State**, it should say **Manual**. If not, go to **System, Control System**, and select **Manual**.

6.6 Home the robot

- 6.6.1 Go to **Wafer** and **Control Handler**
- 6.6.2 Select **Abort Load Chamber operation** and confirm.
- 6.6.3 Select **Abort current loader operation** and confirm.
- 6.6.4 Select **Abort automatic sequencing** and confirm.
- 6.6.5 Select **Home all Robot Axes** and confirm. Keep clear of wafer handler as it moves.
- 6.6.6 You can check if this step is working by going to **Wafer** and **Monitor Handler**. If this step is working, numbers on each axis should be changing. When done, **Completed Manual Home all Loader Axes** will be displayed. Click on top banner to confirm.

6.7 Load lock pump down

- 6.7.1 The load lock chamber pump is normally left on.
- 6.7.2 Go to **Service, Vacuum Service, Loadlock Chamber** and check if **Pump On**.
- 6.7.3 If **Off**, select **Off** and change to **On**. Then go back to **Service, Vacuum Service, Load Chamber Idle** and select **Start Load Chamber Pump Down**.

6.8 Chamber A pump down

6.8.1 The Chamber A pump is normally left off when not in use to conserve nitrogen.

6.8.2 Go to **Service, Vacuum Service**

6.8.3 For **Chamber A**, select **Offline for Maintenance**

6.8.4 Select **Start Chamber pump down**. Chamber will pump down. When complete it will indicate **Ch A has completed pumpdown service program**. Click on border at top to confirm.

6.9 Start the Lamps

6.9.1 The standard chamber temperature is 390°C. **Warning! Do not energize lamps before chamber is pumped down!**

6.9.2 Go to **Chamber A** (on top of the screen), **Chamber Service** and view the **lamps** temperature. The left number is the set point and the right number is readout.

6.9.3 Change the lamp temperature to **390°C**, select **=** and start the chamber heating.

6.9.4 Wait about an hour for the chamber lamps to heat up and stabilize. The deposition rate and film stress will be most stable after 3 hours.

6.10 Put Chamber A Online for Process

6.10.1 Go to **Service, Vacuum Service**

6.10.2 For **Chamber A** select **Offline for Maintenance**

6.10.3 Select **Put Online for Process**.

6.11 Deposit TEOS on a wafer

6.11.1 Edit time in desired recipe, if needed. Select **Program, Process Programs**, choose recipe from list and change the time in **Step 2**.

6.11.2 Select **System, Control System**. Under **Chamber Process Program Selection and Wafer Process**, click on the line next to **A: ____** and choose recipe to be run from the list.

- 6.11.3 Load a single wafer with the **flats up** in the cassette, near the H-bar. Make sure not to cross-slot the wafers and make sure that the cassette is well seated. Place cassette in tool on **A** side.
- 6.11.4 At the bottom of the screen select **Close Door**. Select **Release** next to **Cassette**, choose **Clamp** and then confirm on the darker blue box above.
- 6.11.5 Select **Wafer, Monitor Wafers**. On the lower left of the screen select your wafer, (#1 is at the bottom of the cassette near the H-Bar) and then **Source for Move**. (wafer will blink) In the top slot of the **Elevator** area in the center of the screen, select **Destination for Move** to load the wafer into the loadlock.
- 6.11.6 Select **System, Control System**. Under **Cleaning Process** in the bottom center of screen, select **RUN** next to **A6-1M TEOS CLEAN** to start chamber clean. Wait for clean to finish.
- 6.11.7 Select **Wafer, Monitor Wafers**. Select the wafer at the top of the elevator and choose **Source for Move**. Select the blue line under **Chamber A** and choose **Destination for Move** to load the wafer into the process chamber. Wait for the wafer to load.
- 6.11.8 Select **System** and **Control System**. Under **Wafer Process** select **Run** next to your recipe to run the process. Wait for the process to complete.
- 6.11.9 Select **Wafer** and **Monitor Wafers**. Under **Chamber A** select your wafer and choose **Source for Move**. On the lower left of the screen select the empty slot where the wafer started and choose **Destination for Move**. Wait for the wafer to move out to the cassette.
- 6.11.10 On the bottom right of the screen select **Clamp A**, choose **Release** and confirm on the darker blue box.
- 6.11.11 On the bottom left of the screen select **Open Door**.
- 6.11.12 Remove wafer and repeat for other wafers. Remember to run the chamber clean between wafers or after every 1 micron of deposition. Finish with a clean before shutting down.

6.12 Shutdown

6.12.1 Go to **Service, Vacuum Service** and click on **Online for Process** for **Chamber A**. Select **Put Offline for Maintenance**.

6.12.2 If no one else will be using the chamber that day, turn off the chamber lamps. At the top, go to **Chamber A** and **Chamber Service**, click on the temperature next to **Lamps** and select **Set to Standby**.

6.12.3 Go to **System, Monitor Facilities** and turn off **Lamp/ Mag Contactor** for **Chamber A**.

6.12.4 Go to **Service, Vacuum Service** and **Chamber A**. Close the valve above the throttle and then turn off the pump. (will see **PRG Fail Overtemp**)

6.13 Errors during Run

6.13.1 For wafer handling errors try to **Home the Robot** again.

6.13.2 For stuck or broken wafers, please contact a staff member.

7 APPROPRIATE USES OF THE TOOL

7.1 The maximum deposition in a single run is 1um. For depositions greater than 1um, the wafer must be removed for a chamber clean after every 1um of deposition.

REVISION RECORD

Summary of Changes	Originator	Rev/Date
Re-Issue for Chamber A only	Sean O'Brien	A-11/07/2018