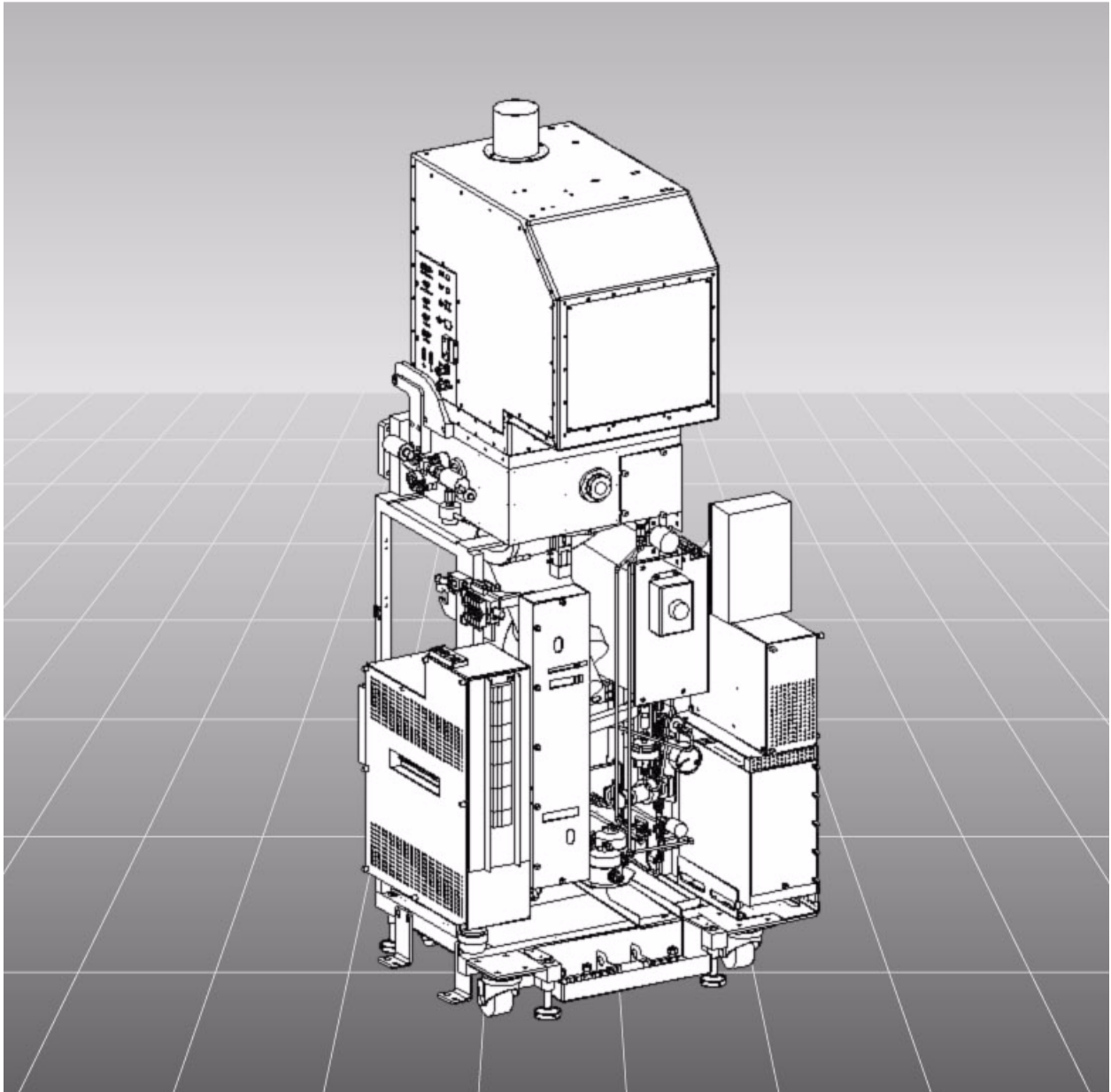


# **2300<sup>TM</sup> Microwave Strip Module**

---

## **Maintenance**





# ***2300<sup>TM</sup> Microwave Strip Module Maintenance***

PM BOM Version 571-801736-700

Ship With Integration BOM Version 573-802896-701

2300 Software Version 1.4.2

System Version 2300

Revision A  
September 2001

Revision A September 2001—First Printing (ECN Released)

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**Part Number: 406-240351-003**

## Safety Preface

The safety guidelines for the equipment in this manual do not purport to address all the safety issues of the equipment. It is the responsibility of the user to establish appropriate safety, ergonomic, and health practices and determine the applicability of regulatory limitations prior to use. Potential safety hazards are identified in this manual through the use of words Danger, Warning, and Caution, the specific hazard type, and pictorial alert icons.

### Hazard Levels

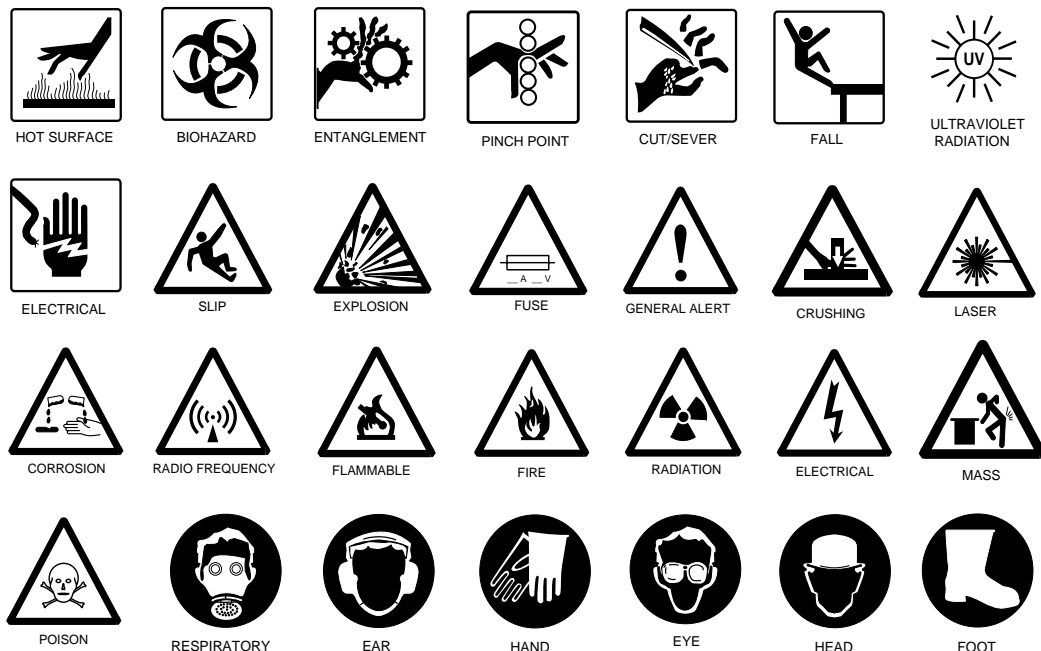
**Danger:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This is limited to the most extreme situations.

**Warning:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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# ***2300<sup>TM</sup> Microwave Strip Module Maintenance***

PM BOM Version 571-801736-700

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**Part Number: 409-240351-003**



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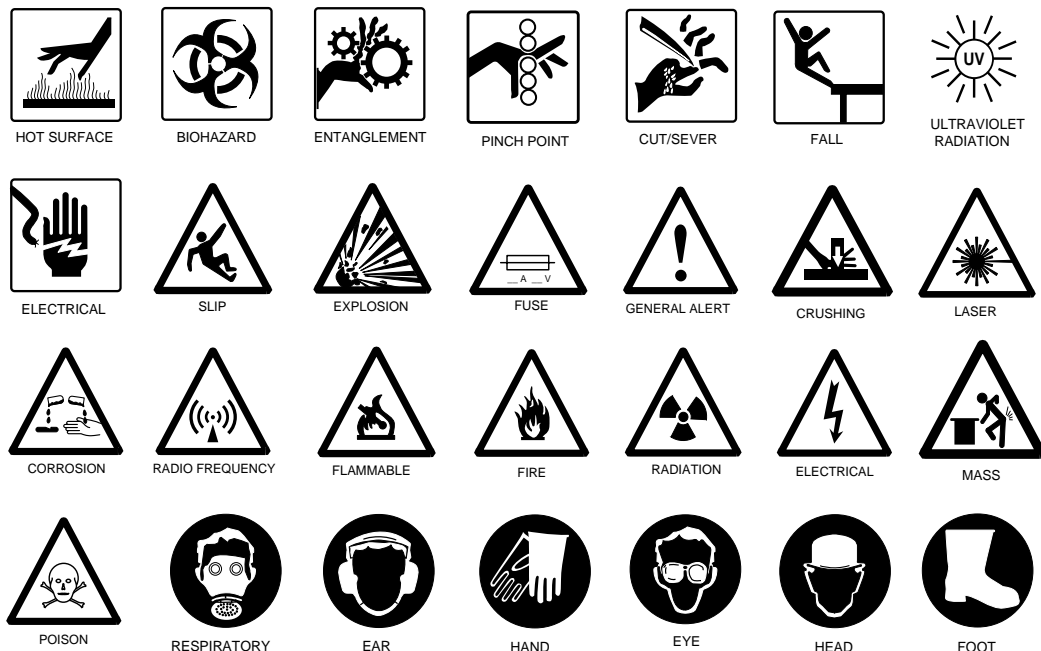
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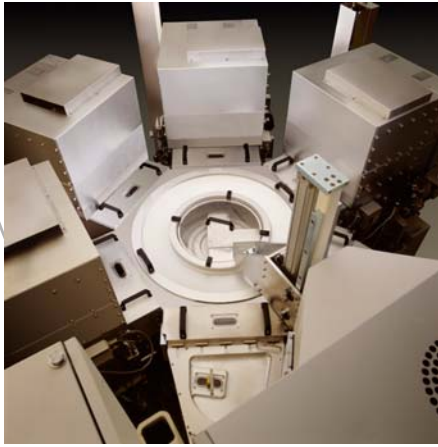
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## 2300™ Etch Series



Lam's new 2300 etch series is the low-risk solution for sub-100 nm volume production on 300 mm substrates. The 2300 suite of products brings Lam's tradition of excellence in etch processing to 300 mm wafers with the 2300 Exelan®, the 2300 Versys™ Silicon and the 2300 Versys™ Metal. The Versys conductor chambers have 200 and 300 mm capability, and all systems for conductor and dielectric films are available in a four chamber configuration. The compact 2300 series design reduces the floorspace for high-volume production while still providing full service access.

The 2300 etch systems also enable wafer fabs to have one platform independent of their technology roadmap. Lam's 2300 etch series of products lowers the risk of transitioning from 200 to 300 mm wafers, of changing from metal etch to dual damascene, and of moving 300 mm volume production from 150 nm to sub-100 nm technology nodes.

Extensive use of modeling during system design has ensured that the best technology has been incorporated into all of the systems, optimizing chamber conductance, thermal characteristics, and plasma uniformity. The 2300 etch series also builds on the production experience of Lam's 200-mm Alliance® etch systems, preserving the production benefits of repeatability, damage-free processing, and process flexibility.

The 2300 Exelan leverages Lam's successful Dual Frequency Confined™ (DFC™) plasma technology currently used on Exelan, Lam's fastest ramping product, to 300 mm processes and next-generation applications. Developed processes include both critical and noncritical etch. DFC technology has become the most successful production-proven technology for oxide copper-damascene applications, and customers are evaluating it for leading-edge, low k, dual damascene. 2300 Exelan provides leading edge solutions, with the industry's best damage performance and the lowest CoO.

Versys conductor etch systems rely on Lam's production-proven Transformer Coupled Plasma™ source to support in situ process solutions for leading edge device structures. Both systems deliver superior performance, have large process windows, and process complex film stacks in situ with a single chamber configuration. Versys Silicon processes metal gate and STI with top corner rounding in situ. Versys Metal provides excellent process results with serial etch and strip on a single platform to control corrosion. Both Versys etch systems drive CoO down, to compete with the lowest cost systems in the industry.

Lam's 2300 etch systems offer the lowest risk path to 300-mm production. The systems allow processes to be fully matured in 200 mm volume production before they are transferred in the same chamber to 300 mm substrates. With a production-proven technology, advanced process capability, low capital investment, and the flexibility that delivers high volume throughput, Lam's 2300 Etch Series is the low risk solution for all 200 and 300 mm production lines at sub-100 nm technology nodes.

# Contents

---

## **Chapter 1 Overview 1**

Changes Since Last Revision	1
Reference Documentation	1
How to Contact Us	3
Ordering Manuals	3
Standard Configuration	4
Optional Features	4
Showing the 2300 Microwave Strip Module	5
Safety	6
Training	6
Emergency Off	6
Environmental Regulations	7
Point-of-Use Abatement	7
Material Safety Data Sheets	8
Hazardous Waste	8
Recycling, Refurbishment and Reuse of Equipment	8
Ergonomics	9
Protective Gear	10
HAPs Regulations Management	10
Energized Electrical Work Types	11
Lockout/Tagout	11
Electrical Isolation	12
Process Gas Isolation	13
Liquid Lockout/Tagout	13
Pneumatic Air Lockout/Tagout	14
Chemicals Used During Maintenance	14
Potentially Hazardous Operations	16

Manual Mode	19
System Checks	19
General Interlocks	19
Transport Module Interlocks	20
Batch Transfer Arm Extension Interlock	21
Strip PM Interlocks	22
Process Gas Isolation	23
Gas Panel Safety	24
Gas Leak Detection Strategy	24
Ergonomics	25
Industrial Hygiene Report for the 2300 Microwave Strip Module	25
2300 Etch System Software	25
Using Custom I/O Windows	28
Maintenance Recipes	28
Neutralization Plasma	28
Checking the Pressure Control Linearity	28

## **Chapter 2 Preventive Maintenance Schedules 29**

2.1	2300 Microwave Strip Module Daily Preventive Maintenance	31
2.2	2300 Microwave Strip Module Weekly Preventive Maintenance	35
2.3	2300 Microwave Strip Module Monthly Preventive Maintenance	39
2.4	2300 Microwave Strip Module Quarterly Preventive Maintenance	43
2.5	2300 Microwave Strip Module Annual Preventive Maintenance	53

## **Chapter 3 Chamber Procedures 55**

3.1	Pumping Down the Chamber	57
3.2	Venting the Chamber	61
3.3	Performing Pump-and-Purge Cycles on the Chamber	65
3.4	Measuring the Chamber Leakback Rate	69
3.5	Performing a Chamber Wet Clean	73
3.6	Cleaning the Quartzware Offline	81
3.7	Opening and Closing the Chamber	85

**Chapter 4 Vacuum Hardware Procedures 89**

- 4.1 Maintaining the Butterfly Valve 91
- 4.2 Maintaining the Isolation Valve 95
- 4.3 Troubleshooting the Vacuum System 99

**Chapter 5 Heated Electrode Procedures 101**

- 5.1 Calibrating the Pinlift Assembly 103
- 5.2 Installing the Pinlift Sensor 109
- 5.3 Removing and Installing the Electrode 113

**Chapter 6 Pressure Control Procedures 119**

- 6.1 Calibrating the Manometers 121
- 6.2 Autozeroing the Process Manometer 129
- 6.3 Performing a Conductance Learn 131
- 6.4 Performing a Partial Pressure Test 137
- 6.5 Troubleshooting Pressure Control Problems 143

**Chapter 7 Gas Delivery Procedures 145**

- 7.1 Performing a Pump/Purge Cycle on the Gas Panel 147
- 7.2 Measuring the Gas Panel Leak Rate 153
- 7.3 Calibrating the Process Gases 159
- 7.4 Removing and Installing the Mass Flow Controllers 163
- 7.5 Setting the PRK Flow 169

**Chapter 8 Endpoint Procedures 171****Index 173**





# Figures

---

1-1	2300 Microwave Strip Module	5
3.1-1	Maintain\Chamber Window	60
3.2-1	Maintain\Chamber Window	64
3.3-1	Maintain\Chamber Window	67
3.3-2	Setup\Config IO\Vacuum Window	68
3.4-1	Maintain\Chamber Window	71
3.4-2	Setup\Config IO\Vacuum Window	72
5.1-1	Pin Depth Gauge	105
5.1-2	Lift Pin Arm	106
5.1-3	Lift Actuator	107
5-1	Installing the Guide Pins	116
5-2	Installing the Electrode	117
6.1-1	Diagnose\IO\VacuumIO Window	124
6.1-2	Maintain\Chamber Window	125
6.3-1	Maintain\Chamber Window	133
6.3-2	Setup\Config IO\Vacuum Window	134
6.3-3	Maintain\Gas/Vac\Conductance Window	135
6.4-1	Maintain\Chamber Window	139
6.4-2	Maintain\Gas/Vac\Partial Pressure	140
6.4-3	Maintain\Gas/Vac\Partial Pressure View All Window	141
7.1-1	Maintain\Chamber Window	149
7.1-2	Setup\Config IO\Gas Cal/Maintenance Window	150
7.1-3	Maintain\Gas/Vac\Gas Box Window	151
7.2-1	Maintain\Chamber Window	155
7.2-2	Setup\Config IO\Vacuum Window	156
7.3-1	Maintain\Chamber Window	161
7.3-2	Setup\Config IO\Gas Cal/Maintenance Window	162



# Tables

---

1-1	Reference Documentation	1
1-2	Hazardous Materials Used for Preventive Maintenance	8
1-3	Hazardous Operations	16
1-4	Slot Valve Open Delta Pressure Interlock	20
1-5	2300 Microwave Strip Module Interlocks	22
2.4-1	Gas Calibration Error Data	47
2.4-2	External System Checks Table	51
6.1-1	Manometer Linearity	127



# 1

## Overview

---

This manual provides maintenance information for the 2300™ Microwave Strip Module on the 2300 platform.

The manual covers the following schedules and procedures:

- Preventive maintenance schedules
- Wafer chamber
- TCP/Plasma chamber and match
- Vacuum hardware
- Electrode
- Pressure control
- Gas delivery

## Changes Since Last Revision

This is the initial release of this manual.

## Reference Documentation

Table 1–1 lists the manuals referenced in this manual.

**Table 1–1. Reference Documentation**

Part number	Manual
405-240351-001	2300 Microwave Strip Module Facility
406-240351-001	2300 Microwave Strip Module Installation
406-240351-002	2300 Microwave Strip Module Operation
406-240311-002	2300 Transport Module Operation
406-240311-003	2300 Transport Module Maintenance Vol. 1

**Table 1–1. Reference Documentation (continued)**

Part number	Manual
406-240390-002	<i>2300 Etch Systems Safety</i>

**Note** The part numbers for cleanroom versions of the listed manuals (except facility manuals) start with the prefix 409. Facility manuals are not available in cleanroom version.

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## ***Ordering Manuals***

Manuals can be ordered in standard paper, cleanroom paper and on CD-ROM. You can find a list of all orderable manuals and ordering instructions by going to the Technical Publications web site on the Lam internal web and selecting **Catalog of Manuals and CD-ROMs**.

## Standard Configuration

The standard configuration for the 2300 Microwave Strip Module includes:

- Fixed gap heated electrode
- Three-pin wafer lift mechanism
- Chamber gas feed with 10 roughness average (Ra) gas line surface finish
- Viton<sup>®</sup> chamber O-rings
- Heated gas manifold
- MKS<sup>®</sup> Vapor on Demand Module (VoDM)
- 200 millimeter (mm) or 300 mm courtesy kits
- Interconnect cables: PM peripheral kit, 25 foot (gas box, TCU, mechanical pump, emergency off (EMO), LonWorks<sup>®</sup>).
- 3 gas line gas box
- Courtesy kit

## Optional Features

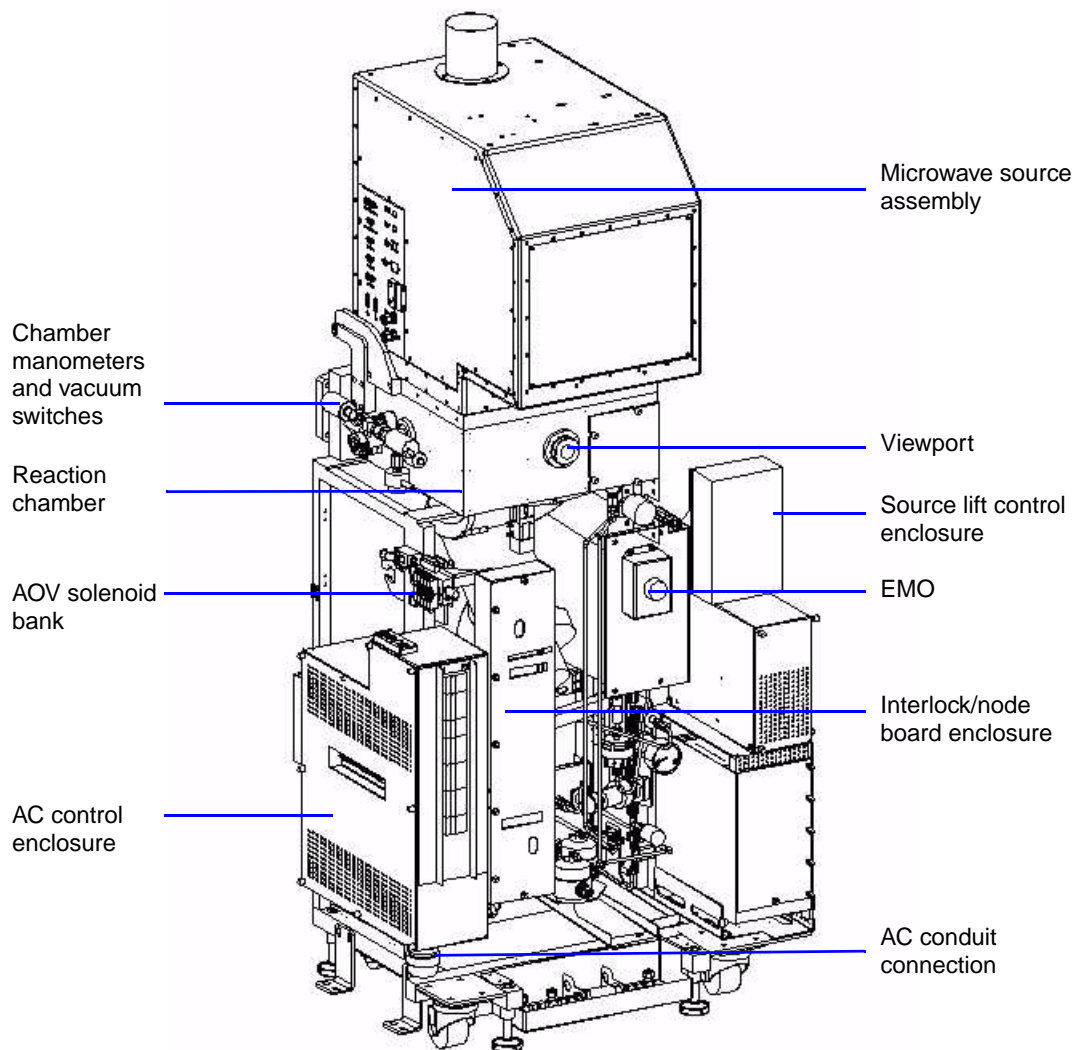
- Spares: quick clean kits, Viton chamber O-ring kits, Fluorosilicone chamber O-ring kits
- Interconnect cables: PM gas box kit, 25, or 50 foot (gas box, LonWorks)
- Interconnect cables: PM peripheral kit, 25,50, or 100 foot (mechanical pump, EMO, LonWorks).
- 6 gas line configuration with various MFC manufacturers (Unit 8161 Metal Digital, Area FC-D980C)
- Double containment, regulated inlet gas panel, nickel or stainless filters



## Showing the 2300 Microwave Strip Module

Figure 1-1 shows an overview picture of the 2300 Microwave Strip Module with major callouts.

Figure 1-1. 2300 Microwave Strip Module



## Safety

This section provides safety information for the 2300 Microwave Strip Module.

### *Training*

All operating personnel must have the appropriate safety training pertaining to the hazards of the system.

### *Emergency Off*

All Lam process modules include an emergency off (EMO) system that enables an operator or service technician to quickly disconnect power to the unit. Large, red buttons are located around the system, readily accessible in an emergency. Pushing any one of these buttons shuts off main alternating current (AC) and radio frequency (RF) power and closes all gas valves.

The limitations of the emergency off system when activated are,

- Power to the roughing pump is not disconnected.
- The operator interface is powered by its own uninterrupted power supply and will continue to operate.
- Power to the system control computer is disconnected, but the computer will continue to run for a few minutes on battery backup to gracefully shut itself down.
- Power to the EMO transformer and associated circuitry remains on after an EMO. Always open CB1 (main breaker) when working inside the AC/DC box.
- If the PM has the uninterruptable power supply (UPS) option, some power may still be present inside the AC/DC box. Always open CB1 (main breaker) when working inside AC/DC box.
- Power to the PM temperature control unit is not disconnected.

Lam recommends that you test the EMO function during quarterly periodic maintenance of the system.

## ***Environmental Regulations***

Environmental regulations and requirements vary by the geographic location or governmental jurisdiction in which the product is installed. Various local, regional, and national standards either exist, or are emerging, for the environmental performance of semiconductor process equipment.

Existing environmental requirements as they pertain to process equipment include the following categories: air emissions such as hazardous air pollutants (HAPs), perfluorocarbons (PFCs), volatile organic compounds (VOCs), water effluent, and solid or liquid hazardous wastes. In addition, performance requirements developed by the semiconductor industry are emerging in the areas of water and energy use efficiency. Lam participates in these discussions and tracks all important developments, some of which will be included in future facility manuals as industry or company standards are developed.

## ***Point-of-Use Abatement***

Point-of-Use (POU) emission abatement systems are designed for treating air emissions from the outlet of a specific semiconductor process to remove compounds of interest before they enter the facility's main exhaust ductwork. This distinction separates POU systems from facility-level abatement systems, which treat the collected exhausts of an entire facility, or large portion thereof. A typical POU system may serve from one to four similar process modules.

Several types of POU systems currently exist in the marketplace for specific classes of effluents such as HAPs (wet-scrub with chemical, wet-scrub without chemical, oxidation, and so forth), but specific equipment is typically neither provided by, nor recommended by, tool suppliers as standard peripheral equipment. As development of such equipment continues to evolve, this may change. Currently Lam is engaged in several research and development efforts for such equipment.

The SEMATECH Transfer Document *Point-of-Use Control Systems for Semiconductor Process Emissions* provides guidance in the identification and selection of POU systems for particular process applications. In all

cases where such equipment is used with Lam products, it is essential that you investigate and comply with any environmental regulations which may be particular to the jurisdiction where the equipment is employed.

## ***Material Safety Data Sheets***

Always be sure to keep on hand and review the material safety data sheets (MSDS) provided by the chemical supplier. These sheets contain pertinent information and a profile of hazardous substances or mixtures.

## ***Hazardous Waste***

Some of the maintenance procedures for the 2300 system expend waste products. Treat all waste as toxic. If disposal is required, please observe the proper occupational safety and health administration (OSHA)-approved or facility-approved disposal practices.

Table 1–2 shows the chemical by-products accumulated during regular maintenance of the process modules:

**Table 1–2. Hazardous Materials Used for Preventive Maintenance**

<b>Material</b>	<b>Quantity per wet clean</b>
Isopropyl alcohol on 20 each 9 x 9 lint-free polyester wipes	
Dry wipes (9 x 9 lint-free polyester)	20 each
Latex <sup>®</sup> gloves	12 pairs
Nitrogen and inline gas filters (796-091775-001)	1 each

## ***Recycling, Refurbishment and Reuse of Equipment***

In accordance with SEMI S2-0200 Paragraph 9.65, which references also SEMI S-12, in the event of tool reuse, recycling, or refurbishment, use the following guidelines:

- Treat any part of the etch system that comes in contact with hazardous gases the same way as you treat the hazardous gases and by-products generated by the customer process. Follow the same

regional environmental and worker protection laws regarding the contact and disposal of hazardous materials.

- The major structural components for the 2300 system, including the frames, are 1020 cold rolled steel. Most parts of process modules have areas contact with hazardous gases. Consider these parts as hazardous materials, unless determined or decontaminated otherwise. Exercise caution when you contact these parts.

The hazardous materials in a Lam etch system are primarily caused by the following two factors:

- Providing high pressure hazardous gas, typically from 5 to 50 per square inch (psi), to the gas box for the reaction chamber and delivering low pressure hazardous gas to the reaction chamber from the gas box: The predominant material used to contain the gas is 316L stainless steel tubing. The hazardous gases at worst case may corrode the steel after a period of years, depending on the consistency of gas purity supplied to the gas box. No residual personnel hazards should remain after the hazardous gases are removed. Residual contamination should be evaluated consistent with gas used and facility steel re-use and recycling plan.
- Removing low pressure hazardous gas from the reaction chamber, typically at pressure under 10 torr: Process by-products will adhere to the materials in the vacuum flow from the reaction chamber to the facility backing pump. The typical materials of construction in the vacuum flow path are high purity ceramics (alumina), anodized 6061 aluminium, and 304 stainless steel. Process by-products are discussed elsewhere in this manual in more detail. At worst case, these process by-products may result in an airborne toxicity in the event of system reuse, recycling, or refurbishment. Use suitable personnel protective equipment (PPE) consistent with the process by-products and regional environmental and worker protection laws.

## ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this manual may require excess reach by personnel of shorter height. Lam recommends the use of a suitable foot stool, step ladder, or appropriate means when performing these tasks.

### ***Protective Gear***

Wear protective, cleanroom-approved clothing and gloves, safety glasses and a full breathing apparatus whenever appropriate.

See the *2300 Etch Systems Safety* manual for additional safety information.

### ***HAPs Regulations Management***

Some HAPs emissions data for the 2300 Microwave Strip Module currently exists. Lam has committed to providing additional HAPs emissions characterization for all product lines.

## ***Energized Electrical Work Types***

The *Environmental, Health, and Safety Guidelines for Semiconductor Manufacturing Equipment* (SEMI S2-0200) defines four types of electrical work. The four types are as follows:

Type 1	Equipment is fully deenergized.
Type 2	Equipment is energized. Energized circuits are covered or insulated. Type 2 work includes tasks where the energized circuits are or can be measured by placing probes through suitable openings in the covers or insulators.
Type 3	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are no greater than 30 volts alternating current (VAC) root mean square (RMS), 42.4 VAC peak, 60 volts direct current (VDC), or 240 volt-amperes in dry locations.
Type 4	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are greater than 30 VAC RMS, 42.4 VAC peak, 60 VDC, 240 volt-amperes in dry locations. Potential exposures to radio-frequency currents, whether induced or via contact, exceed the limits in Table A5-1 of Appendix 5, SEMI S2-0200.

The applicable electrical work types are indicated in the Safety section at the beginning of each procedure.

## ***Lockout/Tagout***

A lockout is a method of keeping equipment from being energized and endangering workers. When using lockouts the following conditions may exist.

- A disconnect switch, circuit breaker, valve, or other energy-isolating mechanism is put into the safe or off position.
- A device is often placed over the energy-isolating mechanism to hold it in the safe position.
- A lock is attached so that the equipment cannot be energized.

In a tagout, place the energy-isolating device into the safe position and attach a written warning to the device.

Lam recommends that end-users carefully perform the following lockout and tagout procedures before servicing the unit. Only authorized technicians should perform these tasks.

## ***Electrical Isolation***

### **Shutdown**

► **To shut down the system for electrical isolation,**

- 1 Before servicing, inform all affected personnel that you will shut down the unit for servicing, and that you will lock out all electrical power sources.
- 2 Shut down the unit using normal shutdown procedures. See the *2300 Microwave Strip Process Module Operation* manual.
- 3 Lock all the electrical power sources in the disconnect position with a padlock that you can only open it with a key.

**Note** Power to the EMO transformer and associated circuitry remains on after an EMO. Always lockout/tagout the main circuit breaker CB1 when working inside the AC/DC box.

- 4 Attach written warnings to the locking devices.
- 5 Verify that all electrical power has been disconnected by attempting to restart unit at the front control panel, and by observing that the *power on* light is off.

### **Start-up After Servicing**

► **To start-up after servicing,**

- 1 Ensure that you remove all hand tools and other foreign objects from the unit.
- 2 Restore all guards and enclosure panels to their normal operating positions.
- 3 Check the area around the unit to ensure that all personnel are at a safe distance.
- 4 Verify that all controls are in the off or neutral positions.



- 5 Remove the locks and tags that were placed on the electrical power sources.
- 6 Notify all area personnel that you will energize the unit.
- 7 Energize the unit.

### ***Process Gas Isolation***

Isolate process gas when performing maintenance on a gas panel or when opening the gas delivery system.

Be sure to remove hazardous gases from gas panel (gas box) prior to servicing.

### **Shutdown**

- ▶ **To shutdown the process gas,**
  - 1 Close the manual gas supply valve(s) on the inlet side of the gas panel.
  - 2 Apply a locking device over each gas supply valve handle and lock with a padlock that you can only open with a key.
  - 3 Attach written warnings to the locking devices.

### **Start-up After Servicing**

- ▶ **To start-up after servicing,**
  - 1 Unlock and remove the locks and tags on each gas supply valve handle.
  - 2 Open the manual gas supply valve(s) on the inlet side of the gas panel.

### ***Liquid Lockout/Tagout***

The fab's facilities supply water directly to the system for each individual process. There are manual shutoff valves for both the inlet and outlet water lines. These are located between the process module (PM) and the

transport module (TM). Close the water valves completely and place a standard, readily available lockout device over the valve and lock it. Lam recommends you follow all other lockout/tagout procedures for the system.

### ***Pneumatic Air Lockout/Tagout***

Air is supplied to the process module from the TM by way of a quick disconnect connection. This connection is located between the PM and the TM. Completely uncouple the pneumatic air quick disconnect fitting, and lock a standard, readily available lockout device over the end of the fitting. Lam recommends you follow all other lockout/tagout procedures for the system.

### ***Chemicals Used During Maintenance***

The following chemicals are used during each wet clean of the 2300 Microwave Strip Module:

- Isopropyl alcohol (IPA) (3 to 6 ounces)
- DI water (H<sub>2</sub>O) (30 ounces)
- Fomblin<sup>®</sup> grease

### **Lam Recommendations**

- ▶ **Use the following guidelines when performing routine maintenance on the reaction chamber:**
  - 1 Wear appropriate protective gear, including arm guards, apron, goggles, and solvent-compatible gloves. This protective gear is essential to protect against human contact with toxic materials and vapors.
  - 2 Clear the surrounding area of all personnel not wearing appropriate protective gear.
  - 3 Prepare the chamber for pump-and-purge cycles by running the plasma clean recipes.

- 4 Perform a plasma clean, then a pump-purge operation just before opening the chamber. 60 nitrogen pump-purge cycles is sufficient before beginning work on the reaction chamber or any chemistry-carrying parts. Because fab operation procedures vary, Lam advises and/or requires that you perform industrial hygiene air sampling tests to ensure compliance with threshold limit value (TLV) and permissible exposure limit (PEL) specifications. Consult the maintenance procedures for details. The pump-and-purge process is vital to reducing toxic chemical concentrations.
- 5 Perform maintenance activities in a well ventilated area. Air circulation help prevent excessive build-up of vapors due to the residual chemistry that may remain after you perform the pump-and-purge cycles.

## Ultrapure Water

The preventive maintenance and cleaning activities on the 2300 Microwave Strip Module produce approximately 2 liters per year of ultra pure water (UPW).

## Potentially Hazardous Operations

Table 1–3 lists potentially hazardous operations and recommended procedures for minimizing dangers.

**Table 1–3. Hazardous Operations**

Operation	Danger	Recommended procedure(s)	Hazard alert
<i>Chemical</i>			
Opening the reaction chamber.	Residual gases may be present from recent processing of wafers and/or recent maintenance activities (such as gas calibrations). Reaction by-products could react with air to release hazardous gases.	Run chamber clean process, then perform the recommended number pump/purge cycles required. Ensure the plasma clean recipe is run. Turn off the 24 VDC actuators switch located on the main circuit breaker panel of the process module.	Failure to observe this precaution could result in exposure to toxic chemicals which could cause injury.
Inspecting or performing maintenance inside the chamber.	Residual gases may be present from recent processing of wafers and/or recent maintenance activities (such as gas calibrations). Reaction by-products could react with air to release hazardous gases.	Do not insert head into the reaction chamber.	Failure to observe this precaution could result in exposure to toxic chemicals which could cause injury.
Inspecting or performing maintenance inside the chamber.	Anodized surfaces could be scratched.	Take care to avoid scratching any anodized aluminum surfaces.	Failure to observe this precaution can result in premature wear of parts and/or shift in process results. It can also cause arching and burns, depending on the location of the scratches.
Handling of ceramic chamber parts.	All ceramic chamber parts are brittle and could break if dropped or bumped.	Take care when handling any ceramic parts not to drop or bump them.	Failure to observe this precaution could result in breakage of parts and the possible creation of sharp edges.

**Table 1–3. Hazardous Operations (continued)**

<b>Operation</b>	<b>Danger</b>	<b>Recommended procedure(s)</b>	<b>Hazard alert</b>
Cleaning ceramic chamber parts.	If the ceramic chamber parts are exposed to excessive moisture, a potential outgassing problem may exist.	Ensure the ceramic chamber parts have been thoroughly baked out.	Failure to observe this precaution could result in excessively high leakback rates.
<i>Electrical</i>			
Troubleshooting in AC/DC power distribution box.	Live terminals inside cover. Extreme hazard of electric shock if cover is removed with doors open and power on.	No regular maintenance is required. Troubleshoot only after lockout/tagout has been performed.	Failure to observe this precaution could result in serious injury or death.
Troubleshooting roughing pumps after performing an EMO.	Electrical shock from hazardous voltage.	Lockout and tagout of power to the roughing pumps before servicing.	Failure to observe this precaution could result in serious injury or death.
Troubleshooting ESC power supply with the cover off and the interlock bypassed.	Electrical shock from hazardous voltage.	Performed by only qualified technicians informed of this precaution to work on ESC power supply with the cover removed.	Failure to observe this precaution could result in serious injury.
Calibration of components in RF system.	Exposure to non-ionizing radiation. Risk of electric shock and/or burn.	Turn off all generators from both the control screen and the circuit breakers prior to disconnecting any RF cables. Always securely connect RF cables prior to turning on power to the module and/or generators.	Failure to observe this precaution could result in serious injury or death.
<i>Thermal</i>			
Cleaning a hot reaction chamber.	Burns to personnel, potential fire if wrong cleaning chemicals are used.	Turn down chamber wall temperature prior to starting a pump/purge cycle. Use cleaning chemicals recommended by Lam only.	Failure to observe this precaution could result in burns caused by contact with hot chamber elements. Potential flash fire if acetone or other similar high pressure solvent is used.

**Table 1–3. Hazardous Operations (continued)**

<b>Operation</b>	<b>Danger</b>	<b>Recommended procedure(s)</b>	<b>Hazard alert</b>
Removing gate valve when it is still hot.	Burns to personnel.	Turn down the reactor temperature. Allow to cool prior to removal.	Failure to observe this precaution could result in burns to hands and fingers unless unit is allowed to cool prior to removal.
Service/cleaning the gate valve while hot.	Burns to personnel.	Follow the pressure control procedures in this manual. Turn down temperature to ambient and allow to cool.	Failure to observe this precaution could result in burns to hands and fingers unless unit is allowed to cool prior to removal.
Servicing reactor cartridge heaters.	Burns to personnel.	Turn down all reactor temperature channels to ambient and allow to cool. Prior to removal, unplug heater(s) from power source.	Failure to comply could result in severe burns and a potential fire if the hot heater contacts a flammable surface.
<i>Mechanical</i>			
Manually opening the gate valve.	The turbo pump could be running and the chamber at atmosphere. The gate valve should never open if the 3 torr switch is not mated.	Ensure that both the pump and chamber are at vacuum or that they are both at atmosphere.	Failure to observe this precaution could result in catastrophic failure of the turbo pump and damage to the pumping system.
Manually opening the gate valve.	The valve may close. A potential pinch point may exist during certain maintenance situations.	Do not insert your hands in the valve while it is closing.	Failure to observe this precaution could result in a pinched hand by the valve while it closes.
Many maintenance operations require reaches which may be excessive for smaller operators.	The operator may sustain injury (such as a strained muscle), or lose their balance and fall.	Provide suitable step stools and ladders for the task at hand. Do not use the process module as a ladder or step stool.	Failure to observe this precaution could result in injury.

## ***Manual Mode***

Only factory-trained personnel should operate the system when it is in manual mode, because many of the software interlocks are bypassed when the system is placed in the manual mode. Operating personnel should use the system only when the system is in automatic mode.

## ***System Checks***

Use of potentially hazardous process chemistries requires a daily leak check of the 2300 Microwave Strip Module gas distribution and chamber assemblies in order to ensure the absence of potentially dangerous leaks. Give special attention to parts that are susceptible to leaks, such as:

- Ultra-torr fittings
- VCR connections
- Flex lines
- Conflat gaskets
- O-ring materials

When disassembling system assemblies, inspect the O-rings and air lines for cracks, nicks, or other deformations. Replace the O-rings and air lines as needed. Replace the VCR gaskets or nickel gaskets whenever the vacuum seal is broken.

## ***General Interlocks***

The 2300 multi-chamber system is interlocked to protect against single fault hazards. These interlocks protect against human error or equipment failures that could allow exposure of personnel, facilities, or community to hazards or directly result in injury, death, or equipment loss. They are implemented in circuits that are independent of the system controls. All of these interlocks, if activated, will report alarms to the user interface.

Human safety interlocks used to protect against injury of personnel rely only on dual compliant electro-mechanical devices. Microprocessors and integrated circuits are not used. Safety interlocks of the 2300 transport module and the 2300 Microwave Strip Module are described in the following sections.

## ***Transport Module Interlocks***

### **Slot Valve Close Signal to PM Interlocks**

You can connect a maximum of four PMs to the TM, each with an independent interlock signal. TM interlock circuitry provides the slot valve close signal to each associated PM to interlock the chamber gas delivery valves.

### **Slot Valve Open Delta Pressure Interlock**

To prevent opening a slot valve across a differential pressure, the *at atmosphere* and *at vacuum* pressure switches on both sides of the valve must match state with each pair at the opposite state (see [Table 1–4](#)).

**Table 1–4. Slot Valve Open Delta Pressure Interlock**

TM at ATM	PM at ATM	TM at VAC	PM at VAC	Valve state
0	0	0	0	No action
0	0	0	1	No action
0	0	1	0	No action
0	0	1	1	OPN
0	1	0	0	No action
0	1	0	1	No action
0	1	1	0	No action
0	1	1	1	No action
1	0	0	0	No action
1	0	0	1	No action
1	0	1	0	No action
1	0	1	1	No action



**Table 1–4. Slot Valve Open Delta Pressure Interlock (continued)**

TM at ATM	PM at ATM	TM at VAC	PM at VAC	Valve state
1	1	0	0	OPN
1	1	0	1	No action
1	1	1	0	No action
1	1	1	1	No action

### ***Batch Transfer Arm Extension Interlock***

Extension of the batch transfer arm is disabled unless both of the following conditions are met:

- The loadlock outer door safety sensor is not blocked.
- The loadlock outer door is open.

You can only bypass this interlock by a command from a password-protected maintenance window on the operator interface. Once the screen is exited, the interlock is automatically reactivated.

### **Loadlock Lasers**

The lasers located in the loadlock are interlocked with the loadlock door so that the laser cannot be activated unless the loadlock door is closed and clamped shut. You can only bypass this interlock by a command from a password-protected maintenance screen on the operator interface. Once the screen is exited, the interlock is automatically reactivated.

### **Loadlock Door Interlocks**

The automated door up motion is interlocked using a safety-certified sensor and relay. The sensor is located to protect the operator from all pinch points. The sensor output is sent to the loadlock node, where it activates a normally open relay. If the safety beam is interrupted, the relay goes to the default open position, disabling the door motion. This circuit is independent of the equipment safety interlock.

## Strip PM Interlocks

The hazardous functions of the microwave strip process module are interlocked as shown in [Table 1–5](#).

**Table 1–5. 2300 Microwave Strip Module Interlocks**

Table functions	Microwave generator on	Chamber gas delivery valve on	Chamber isolation valve open	Main water control valve	VoDM primary shutoff valve
Foreline pressure sw true			F		
Chamber vacuum sw true	H	H			H
Station x slot valve closed		H			
TCP coil down sw closed	H	H			
TCP RF connector sw closed	H				
TCP match scrubber sw closed	H	H			
TCP match cover sw closed	H	H			
Bias match cover sw closed					
Bias match connector sw closed					
Bias match interface box closed					

**Table 1–5. 2300 Microwave Strip Module Interlocks (continued)**

Table functions	Microwave generator on	Chamber gas delivery valve on	Chamber isolation valve open	Main water control valve	VoDM primary shutoff valve
Precharge manifold at vacuum		H			
No customer gas detect		H			
No customer interlock		H			

H = hardware human safety interlock

F = firmware equipment safety interlock

## ***Process Gas Isolation***

Generally you need to isolate process gases when you perform maintenance on a gas panel or when you open the gas delivery system.

Purge hazardous gases from the gas panel (gas box) prior to servicing.

## **Shutdown**

### **► To shutdown the process gas,**

- 1 Close the manual gas supply valve(s) on the inlet side of the gas panel.
- 2 Apply a locking device over each gas supply valve handle and lock with a padlock that you can only open with a key.
- 3 Attach written warnings to the locking devices.

## Start-up After Servicing

- ▶ **To start-up after servicing,**
  - 1 Unlock and remove the locks and tags on each gas supply valve handle.
  - 2 Open the manual gas supply valve(s) on the inlet side of the gas panel.

## Gas Panel Safety

The gas panel on the 2300 Microwave Strip Module is designed for fail-safe operation under all reasonably foreseeable failure conditions. During failures, the gas panel prohibits gas flow and contains gases in a scrubbed enclosure to prevent the contamination of the environment and exposure to operating personnel.



### Warning

**Chemical Hazard:** Hazardous gases may be used on the 2300 Microwave Strip Module. Consult the material safety data sheets (MSDS) or equivalent material safety information for chemical hazards.

## Gas Leak Detection Strategy

Containment of hazardous gases and detection of leaks are provided by a combination of on-board features and facilities infrastructure. The first priority is leak prevention, which is provided by physical containment, including back-up or double containment. The next priority is assuring proper evacuation of gases should containment systems fail or if internal subatmospheric pressures are not maintained.

On-board safety systems continuously monitor chamber vacuum. Should chamber vacuum fall out of specification, a red alarm is generated, the system returns to a safe, standby state, and the operator is notified by the user interface.

Additional gas containment features include:

- A differential-pressure switch interlock in the gas box that shuts off all gas being supplied by that gas box if the exhaust is lost.
- Vacuum interlocks on the reaction chamber that cut off the flow of process gases and any microwave power being supplied whenever vacuum integrity is lost.
- Provisions for a customer-supplied, double-contained gas line that runs between the gas panel and the reaction chamber.
- Gas panel flanged for scrubber protection.
- Upper match housing flanged for scrubber.

Lam recommends that you provide an additional level of protection by augmenting the containment features described previously with leak detectors located in the breathing zone in work areas adjacent to the main chamber and in the scrubbed exhaust from the on-board gas panel.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this manual may require excess reach by personnel of shorter height. Lam recommends the use of a suitable foot stool, step ladder, or appropriate means when performing these tasks.

## **Industrial Hygiene Report for the 2300 Microwave Strip Module**

[To be supplied]

### **2300 Etch System Software**

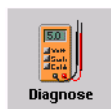
The 2300 etch system control software has a graphical user interface with menu buttons and icons that allow you to quickly access software signals and change data.

After system start-up, each screen that appears on the flat panel displays is called a window. Each window is identified by a window name, and the windows are organized into window groups. Icons for all the window groups appear along the bottom of every screen.

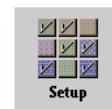
The primary window groups used during maintenance are **Maintain**, **Diagnose**, and **Setup**. These window group icons and their window names are as follows:



Chamber  
Calibration  
Command (Load Port, TM only)  
Gas/Vac (PM only)  
Front End (Load Port, TM only)  
Counters (PM only)



**I/O-TM**  
PGC  
TraceDataEnable  
SlotValve  
LightTower  
WaferSensor  
RobotServoIntlks  
AGV  
SlotValve-PM1  
Facility  
SlotValve-PM2  
SlotValve-PM3  
SlotValve-PM4  
**I/O - PM**  
Vacuum IO  
Pressure Control (VIOP stepper)  
Manometer Raw Reading  
Microwave Source  
Microwave Generator  
Microwave Interlock Signals  
Wafer Lifter  
PCC  
Anafaze  
HeaterChannels  
V gas  
Gas 1 to 4  
Gas 5 to 8  
Gas 9 to 12  
Gas Switches  
VoDM  
System Information  
**Custom IO**  
**I/O - Load Port**  
PortAll  
AGV  
PDO1  
PDO2  
TagReader



**Config IO - TM**  
PGC  
LeakBack  
TraceDataLog  
SlotValve  
WaferSensor  
VTMSimulation  
AGVConfig  
OCR  
Dynamic Alignment  
Facility  
**Config IO - PM**  
Vacuum  
Pressure Control  
Pressure Control Algorithm  
Microwave Source and Generator  
Temperature  
Gas Name  
MFC Types  
Gas MaxFlow  
Gas Cal/Maintenance  
Gas Tolerances (Gas1- Gas4)  
Gas Tolerances (Gas5 - Gas8)  
Gas Tolerances (Gas9 - Gas12)  
VoDM Config  
Miscellaneous Configuration  
**Custom IO**  
**Config IO - Load Port**  
PortConfig  
AGVConfig  
TagReaderConfig  
LoadPortConfig

## ***Using Custom I/O Windows***

As a convenience for accessing the most frequently-used software signals, the 2300 system software allows you to create multiple **Custom I/O** windows in the **Operate**, **Process** and **Diagnose** window groups. **Custom I/O** windows can save time when performing maintenance procedures and maintenance personnel should take advantage of them whenever possible.

For more details about **Custom I/O** windows and how to create them, see the *2300 Strip Process Module Operation* manual.

## **Maintenance Recipes**

### ***Neutralization Plasma***

[To be supplied]

### ***Checking the Pressure Control Linearity***

[To be supplied]



## Preventive Maintenance Schedules

---

This section provides preventive maintenance checklists for the 2300 Microwave Strip Module. Be sure to follow all safety precautions. If a situation occurs that has not been covered in this manual, contact Lam Field Service Support for assistance.

Preventive maintenance schedules include the quarterly and annual intervals.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 2.1

# ***2300 Microwave Strip Module Daily Preventive Maintenance***

---

Use this procedure to perform the daily preventive maintenance for the 2300 Microwave Strip Module.

You may need to modify this procedure for systems with special hardware or different processes or production volumes.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

- Vacuum gauge

### **Materials**

- Lint-free wipes
- 100 percent isopropyl alcohol (IPA)

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite™. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

None

## Procedure

► **To perform daily preventive maintenance,**

- 1 Measure the process gas pressure at the gas box inlet. Record the following values:

Gas 1	_____	psi	(20 psi $\pm$ 5)
Gas 2	_____	psi	(20 psi $\pm$ 5)
Gas 3	_____	psi	(20 psi $\pm$ 5)
Gas 4	_____	psi	(20 psi $\pm$ 5)
Gas 5	_____	psi	(20 psi $\pm$ 5)
Gas 6	_____	psi	(20 psi $\pm$ 5)
Gas 7	_____	psi	(20 psi $\pm$ 5)
Gas 8	_____	psi	(20 psi $\pm$ 5)

- 2 Measure the N<sub>2</sub> purge pressure at the gas box. Record the following value:

N <sub>2</sub>	_____	psi	(50 psi $\pm$ 5)
----------------	-------	-----	------------------

- 3 Measure the pneumatic CDA pressure at the gas box and process module. Record the following values:

CDA (gas box)	_____	psi	(90 psi $\pm$ 5)
CDA (process module)	_____	psi	(90 psi $\pm$ 5)

- 4 Measure the chamber base pressure and record the following value:

Chamber pressure	_____	mtorr	(less than 100 mtorr)
------------------	-------	-------	--------------------------

- 5 Measure the chamber leak rate and record the following value:

## Procedure

### *2300 Microwave Strip Module Daily Preventive Maintenance*

---

Leak rate \_\_\_\_\_ mtorr/  
minute (less than 3  
mtorr/  
minute)

- 6** Measure the actual temperature of the electrode. Record the measured value and the actual setpoint:

Setpoint temperature \_\_\_\_\_ degrees Celsius

Actual temperature \_\_\_\_\_ degrees Celsius

- 7** Record the total microwave minutes:

Total microwave minutes \_\_\_\_\_

- 8** Record the total wafer count:

Total wafer count \_\_\_\_\_

## 2.2

# ***2300 Microwave Strip Module Weekly Preventive Maintenance***

---

Use this procedure to perform the weekly preventive maintenance for the 2300 Microwave Strip Module.

You may need to modify this procedure for systems with special hardware or different processes or production volumes.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

- Vacuum gauge
- Pressure simulator
- RF watt meter

### **Materials**

- Lint-free wipes
- 100 percent isopropyl alcohol (IPA)

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.



## Preparation

None

## Procedure

► **To perform weekly preventive maintenance,**

- 1 Measure the process gas pressure at the gas box inlet. Record the following values:

Gas 1	_____	psi	(20 psi $\pm$ 5)
Gas 2	_____	psi	(20 psi $\pm$ 5)
Gas 3	_____	psi	(20 psi $\pm$ 5)
Gas 4	_____	psi	(20 psi $\pm$ 5)
Gas 5	_____	psi	(20 psi $\pm$ 5)
Gas 6	_____	psi	(20 psi $\pm$ 5)
Gas 7	_____	psi	(20 psi $\pm$ 5)
Gas 8	_____	psi	(20 psi $\pm$ 5)

- 2 Measure the N<sub>2</sub> purge pressure at the gas box. Record the following value:

N <sub>2</sub>	_____	psi	(50 psi $\pm$ 5)
----------------	-------	-----	------------------

- 3 Measure the pneumatic CDA pressure at the gas box and process module. Record the following values:

CDA (gas box)	_____	psi	(90 psi $\pm$ 5)
CDA (process module)	_____	psi	(90 psi $\pm$ 5)

- 4 Measure the chamber base pressure and record the following value:

Chamber pressure	_____	mtorr	(less than 100 mtorr)
------------------	-------	-------	--------------------------

- 5 Measure the chamber leak rate and record the following value:

## Procedure

### *2300 Microwave Strip Module Weekly Preventive Maintenance*

---

Leak rate \_\_\_\_\_ mtorr/  
minute (less than 3  
mtorr/  
minute)

- 6** Measure the actual temperature of the electrode. Record the measured value and the actual setpoint:

Setpoint temperature \_\_\_\_\_ degrees Celsius

Actual temperature \_\_\_\_\_ degrees Celsius

- 7** Record the total microwave minutes:

Total microwave minutes \_\_\_\_\_

- 8** Record the total wafer count below:

Total wafer count \_\_\_\_\_

- 9** Calibrate the mass flow controllers (MFC). Record the calibrated errors. Compare the data to previous calibrations for any indication that the MFC accuracy is failing, and take corrective action if necessary.

This step completes the procedure.

## 2.3

# ***2300 Microwave Strip Module Monthly Preventive Maintenance***

---

Use this procedure to perform the monthly preventive maintenance for the 2300 Microwave Strip Module.

You may need to modify this procedure for systems with special hardware or different processes or production volumes.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

- Vacuum gauge
- Pressure simulator

### **Materials**

- Lint-free wipes
- 100 percent isopropyl alcohol (IPA)

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

None

## Procedure

► **To perform monthly preventive maintenance,**

- 1 Measure the process gas pressure at the gas box inlet. Record the following values:

Gas 1	_____	psi	(20 psi $\pm$ 5)
Gas 2	_____	psi	(20 psi $\pm$ 5)
Gas 3	_____	psi	(20 psi $\pm$ 5)
Gas 4	_____	psi	(20 psi $\pm$ 5)
Gas 5	_____	psi	(20 psi $\pm$ 5)
Gas 6	_____	psi	(20 psi $\pm$ 5)
Gas 7	_____	psi	(20 psi $\pm$ 5)
Gas 8	_____	psi	(20 psi $\pm$ 5)

- 2 Measure the N<sub>2</sub> purge pressure at the gas box. Record the following value:

N <sub>2</sub>	_____	psi	(50 psi $\pm$ 5)
----------------	-------	-----	------------------

- 3 Measure the pneumatic CDA pressure at the gas box and process module. Record the following values:

CDA (gas box)	_____	psi	(90 psi $\pm$ 5)
CDA (process module)	_____	psi	(90 psi $\pm$ 5)

- 4 Measure the chamber base pressure and record the value below:

Chamber pressure	_____	mtorr	(less than 100 mtorr)
------------------	-------	-------	--------------------------

- 5 Measure the chamber leak rate and record the following value:

## Procedure

### *2300 Microwave Strip Module Monthly Preventive Maintenance*

---

Leak rate \_\_\_\_\_ mtorr/ (less than 3  
minute mtorr/  
minute)

- 6** Measure the actual temperature of the electrode. Record the measured value and the actual setpoint:

Setpoint temperature \_\_\_\_\_ degrees Celsius

Actual temperature \_\_\_\_\_ degrees Celsius

- 7** Record the total microwave minutes:

Total microwave minutes \_\_\_\_\_

- 8** Record the total wafer count below:

Total wafer count \_\_\_\_\_

- 9** Perform a partial pressure test for each MFC. Look for degradation of pumping speed and elevated pressures for the water vapor delivery system.
- 10** Calibrate the manometers. See [Section 7.1, "Performing a Pump/Purge Cycle on the Gas Panel."](#)

This step completes the procedure.

## 2.4

# ***2300 Microwave Strip Module Quarterly Preventive Maintenance***

---

Use this procedure to perform the quarterly preventive maintenance for the 2300 Microwave Strip Module.

You may need to modify this procedure for systems with special hardware or different processes or production volumes.

**Note** Inspect all parts and replace them if necessary.

This procedure contains the following sections:

- "Performing a System Precheck."
- "Removing the Chamber Parts."
- "Cleaning the Chamber."
- "Installing the Chamber Parts."
- "Removing the Gate Valve Door."
- "Cleaning the Gate Valve."
- "Installing the Gate Valve Door."
- "Removing the Quartzware."
- "Installing the Quartzware."
- "Cleaning the Slot Valve."
- "Post Checking and Restoring the System."
- "Returning the System to Production Mode."

## **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual

- 2300 Transport Module Maintenance manual
- 2300 Etch Systems Safety manual

## **Equipment Required**

- Vacuum gauge
- Pressure simulator
- 849-801736-200 Clean kit, 200 mm
- 849-801736-300 Clean kit, 300 mm

## **Materials**

- Lint-free wipes
- Nylon scrubbing pads
- 100 percent isopropyl alcohol (IPA)
- DI water

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.



## ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

## ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

## ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## ***Gas Panel Interlocks***

The process module gas panel is designed for fail-safe operation during pre-specified failure conditions. During failures, the gas panel prohibits gas flow and contains gases in a scrubbed enclosure to prevent contamination of the environment and the exposure of operating personnel.



### **Warning**

**Gas Hazard:** Ensure that you perform a pump-and-purge cycle on the reaction chamber prior to venting and opening the reaction chamber, to minimize the risk of exposure to toxic fumes.

## Preparation

► To prepare the system,

- 1 Perform a leakback rate test on the chamber. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#) Record the value on the schedules.
- 2 Run the neutralization plasma recipe. See "Neutralization Plasma," in [Section 1, "Overview."](#)



### Caution

**Mechanical Hazard:** Do not vent the chamber when the electrode is above 70 degrees Celsius. Damage to the ceramics and quartzware may occur.

- 3 Set the lower electrode setpoint to 25 degrees Celsius. Select the **Diagnose\Temperature** page, and set *Electrode1* and *Electrode2* to 25 degrees Celsius.
- 4 Vent the chamber. See [Section 3.2, "Venting the Chamber."](#)
- 5 Open the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)

## Procedure

### *Performing a System Precheck*

► To perform a system pre-check,

- 1 Record the pre-check data in the following table:

RF on time
Total wafer count
AC on time
Last etch rate
Uniformity
Software revision

Chamber process manometer offset
Chamber leak rate
Gas box leak rate
TM base pressure
TM leak rate

- 2 Log the MFC flow rates on the **Setup** page. Reset MFC full scales to manufacturer's specifications. If the calibration error is greater than 10 percent, replace the MFCs.
- 3 Run a 10-point gas calibration for each gas. Record the results in [Table 2.4–2](#).
- 4 Record the chamber volume, chamber temperature and electrode temperature in the following table.

Chamber volume
Chamber temperature
Electrode temperature

**Table 2.4–1. Gas Calibration Error Data**

Gas names	sccm	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Gas 1											
Gas 2											
Gas 3											
Gas 4											
Gas 5											
Gas 6											
Gas 7											
Gas 8											

### ***Removing the Chamber Parts***

- To remove the chamber parts,

- 1 Remove the top liner, upper ring, baffle, and lower ring.

- 2 Remove the focus ring and the adapter plate, if applicable.
- 3 Remove both the chamber O-ring and gasket.

### ***Cleaning the Chamber***

- ▶ **To clean the chamber,**
  - 1 Use a cleanroom-approved vacuum and vacuum the main chamber.
  - 2 Wipe the internal chamber surfaces with 100 percent DI water using a clean lint-free wipe.
  - 3 Wipe the chamber with a clean lint-free wipe using 100 percent IPA.
  - 4 Exchange the chamber O-rings and then clean the chamber O-rings. When cleaning the O-rings, use only water or IPA and be extremely careful that the lint-free wipes do not leave fibers on the O-rings. The fibers can cause excessive leaks and lead to extended down time.

### ***Installing the Chamber Parts***

- ▶ **To install the chamber parts,**
  - 1 Replace the chamber O-ring and gasket.
  - 2 Insert the new focus ring and adapter ring, if applicable.
  - 3 Insert the lower ring, baffle, upper ring, and top liner.
  - 4 Wipe down the chamber O-ring surface with 100 percent DI water on a clean lint-free wipe.
  - 5 Close the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)

## ***Removing the Gate Valve Door***

► **To remove the gate valve door,**

- 1 Verify that the screws that secure the slot valve top cover are loose, but do not remove them.

**Note** If the screws were tightened while the slot valve was at vacuum, the screws will be difficult to remove at atmosphere.

- 2 Loosen the two clamp screws that hold the gate assembly to the bellows shaft.
- 3 Select **TM\Diagnose\SlotValvePM\_**.
- 4 Set **SlotValvePM\_DualValveActuationMode** to **PMValveOnly**.
- 5 Set **SlotValvePM\_InterlockOverride\_DO** to **ON**.
- 6 Set **SlotValvePM\_SlotValvePositionSetPoint** to **Open**.
- 7 Remove the slot valve cover.

## ***Cleaning the Gate Valve***

► **To clean the gate valve,**

- 1 Wipe the inner surfaces with IPA on a clean lint-free wipe.
- 2 Lightly sweep the exterior surface of the bellows with a small brush.
- 3 Inspect the regions around the bellows at the base of the slot valve. Use a vacuum cleaner with a slim attachment to remove wafer shards or other debris.
- 4 Remove the O-ring by carefully prying it from the dovetail groove using a brass or plastic pick.

**Note** Do not scuff or scratch the sealing surface of the O-ring gland.

- 5 Clean the O-ring groove and the new O-ring with IPA and a clean lint-free wipe.
- 6 Install the O-ring.

**Note** Be careful not to twist or stretch the O-ring.

### ***Installing the Gate Valve Door***

- ▶ **To install the gate valve door,**
  - 1 Fit the gate valve assembly onto the bellows shaft.
  - 2 Close the slot valve.
  - 3 Tighten the gate clamp screw.
  - 4 Replace the slot valve cover and tighten the screws.

### ***Removing the Quartzware***

- ▶ **To remove the quartzware,**
  - 1 Vent the chamber. See [Section 3.2, "Venting the Chamber."](#)
  - 2 Open the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)
  - 3 Remove the top liner, upper ring, baffle, and lower ring from the chamber and set them aside.
  - 4 Remove the focus ring and adapter ring from the chamber, if applicable.

### ***Installing the Quartzware***

- ▶ **To install the quartzware,**
  - 1 Replace and install the chamber O-ring and gasket.
  - 2 Insert the new focus ring and adapter ring, if applicable.
  - 3 Insert the lower ring, baffle, upper ring, and top liner in the chamber.
  - 4 Wipe down the chamber O-ring surface.
  - 5 Close the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)

## Cleaning the Slot Valve

- Clean the slot valve.

## Post Checking and Restoring the System

- To perform a system post-check and restore the system,
  - 1 Pump down the reaction chamber.
  - 2 If you replaced a MFC, perform 120 pump/purge cycles on that line. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 3 Perform 20 pump/purge cycles on the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 4 Calibrate the manometers. See [Section 7.1, "Performing a Pump/Purge Cycle on the Gas Panel."](#)
  - 5 Perform leak rate tests and record the data. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#)
  - 6 Perform external system checks (TCU coolant level, resistivity, gas line pressures). Record the values in [Table 2.4–2](#).

**Table 2.4–2. External System Checks Table**

Item	Specification	Recorded value
Gas 1	20 ±5 psi	
Gas 2	20 ±5 psi	
Gas 3	20 ±5 psi	
Gas 4	20 ±5 psi	
Gas 5	20 ±5 psi	
Gas 6	20 ±5 psi	
Gas 7	20 ±5 psi	
Gas 8	20 ±5 psi	
N <sub>2</sub> vent	40 psi	
N <sub>2</sub> purge	0 to 3 psig	
Pneumatic	90 ±5psi	

- 7 Check the thermocouple accuracy.
- 8 Measure the gas box leak rate.

### ***Returning the System to Production Mode***

- ▶ **To return the system to production mode,**
  - 1 Perform 20 pump/purge cycles on the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 2 Perform a leakback test. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#)
  - 3 Condition the chamber by running at least 10 resist wafers using the customers recipe.
  - 4 Perform a strip rate and particle test.
  - 5 After conditioning, zero out the wafer and microwave minute counters on the **Diagnose\System Information** window.

This step completes the procedure.



## 2.5

### ***2300 Microwave Strip Module Annual Preventive Maintenance***

---

[To be supplied.]



## Chamber Procedures

---

This section contains wafer chamber procedures for the 2300 Microwave Strip Module.

Always follow your company's safety practices, in addition to the safety guidelines noted in the procedures. Make sure to use the proper equipment and observe all cautions and warnings.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 3.1

# ***Pumping Down the Chamber***

---

Use this procedure to pump down the chamber on the 2300 Microwave Strip Module to base pressure. Use this procedure after you perform chamber maintenance to prepare for normal operation.

This procedure contains the following sections:

- ["Pumping Down the Chamber."](#)

## **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

## **Equipment Required**

None

## **Materials**

None

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required,

observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

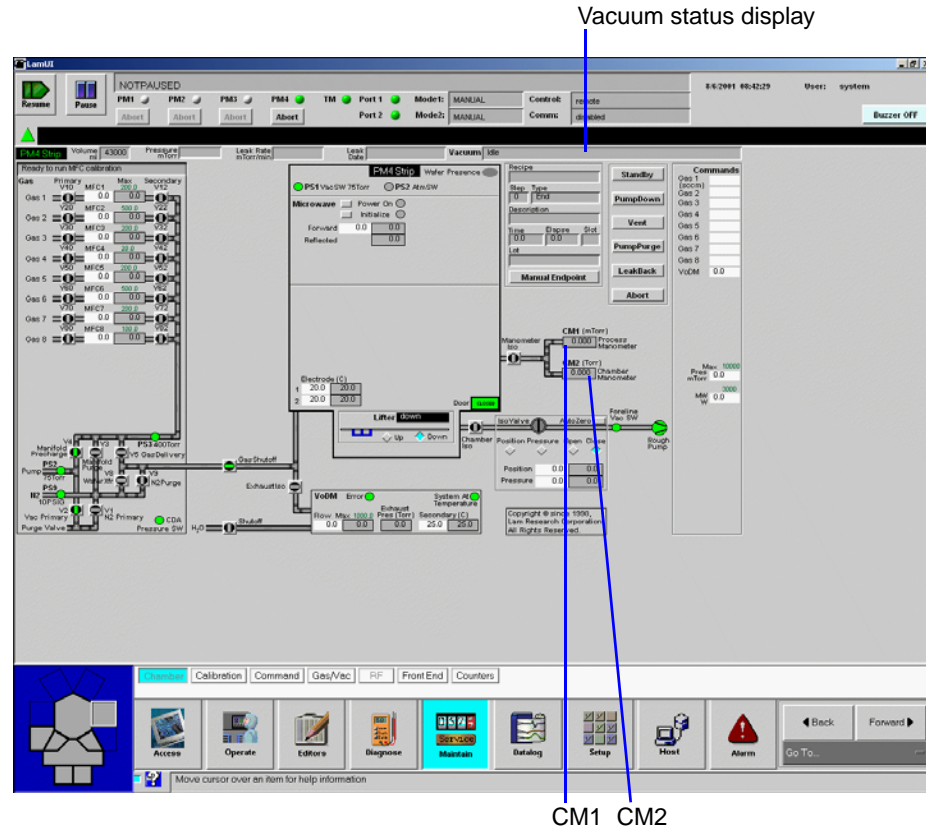
- ▶ **To prepare the process module.**
  - 1 Verify that the process module is powered up and running normally.
  - 2 Verify that the source lift actuator is in the fully retracted position.

## Procedure

### *Pumping Down the Chamber*

- ▶ **To pump down the chamber,**
  - 1 Set the user interface (UI) to display the windows for the strip process module. Select the strip PM on the station locator in the lower left screen. See [Figure 3.1–1](#).

Figure 3.1–1. Maintain\Chamber Window



- 2 Initiate the chamber pump-down sequence. In the **Maintain\Chamber** window, click **PumpDown**.
- 3 Observe the chamber manometer readout (CM2), and verify that the chamber pressure falls in the **Maintain\Chamber** window (Figure 3.1–1). After the chamber pressure falls below 100 mtorr, observe the process manometer readout (CM1).

You can monitor the status of the pump-down using the messages indicated by the Vacuum Status display (upper right corner, Figure 3.1–1). The Vacuum Status displays idle when the pump-down is completed.

This step completes the procedure.



## 3.2

# Venting the Chamber

---

Use this procedure to automatically vent the chamber of the 2300 Microwave Strip Module to atmosphere. The venting sequence includes performing a pump-and-purge cycle on the chamber to clear the system of potentially hazardous gases and contaminants. Perform this procedure prior to opening up the chamber.

Before venting and opening the chamber, run the plasma neutralization recipe to neutralize by-products in the chamber. See "[Neutralization Plasma](#)," in Section 1, "Overview."

This procedure contains the following sections:

- "[Venting the Chamber](#)."

## Reference Documentation

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

## Equipment Required

None

## Materials

None

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

► To prepare the system,

- 1 Run the neutralization plasma recipe on the chamber. See "Neutralization Plasma," in Section 1, "Overview."



**Caution**

**Mechanical Hazard:** Do not vent the chamber when the electrode is above 70 degrees Celsius. Damage to the ceramics and quartzware may occur.

- 2 Set the lower electrode temperature to 25 degrees Celsius.

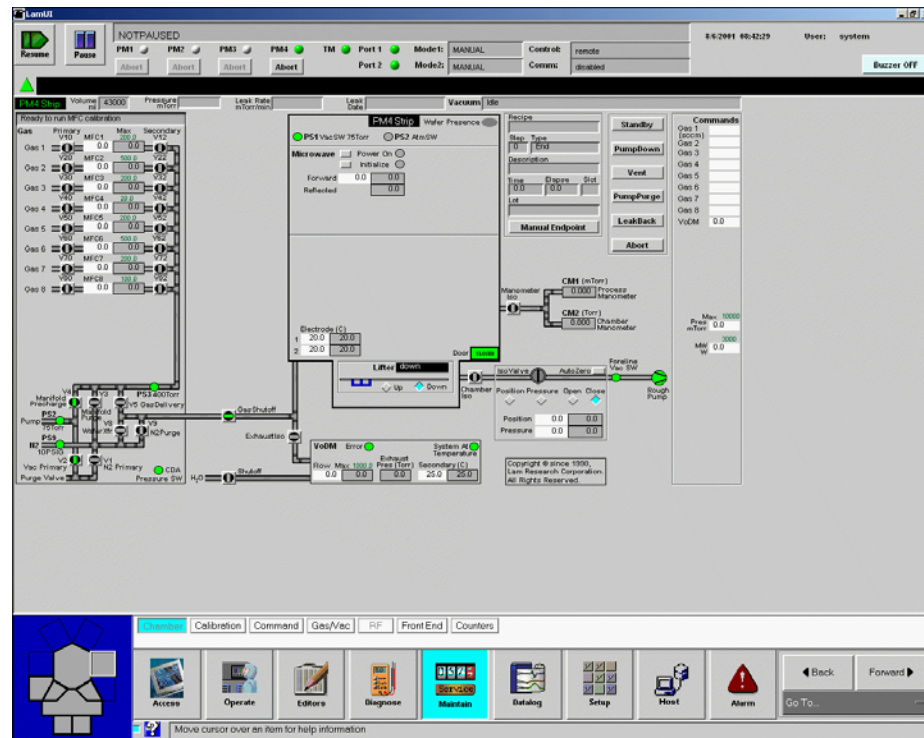
## Procedure

### *Venting the Chamber*

► To vent the chamber,

- 1 Select the **Maintain\Chamber** window. Select the strip PM on the station locator in the lower left window. See [Figure 3.2–1](#).

Figure 3.2–1. Maintain\Chamber Window



- 2 Initiate chamber venting. In the **Maintain\Chamber** window, click **Vent**. See Figure 3.2–1.
  - Click **Abort** to abort chamber venting. Aborting the chamber vent sequence returns the chamber to vacuum.

This step completes the procedure.

## 3.3

# ***Performing Pump-and-Purge Cycles on the Chamber***

---

Use this procedure to perform pump-and-purge cycles on the reaction chamber to remove particulate matter and gas contaminants while the chamber is under vacuum.

### **Reference Documentation**

- 202-803234-001, Pumping and Purging the Chamber
- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required,

observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

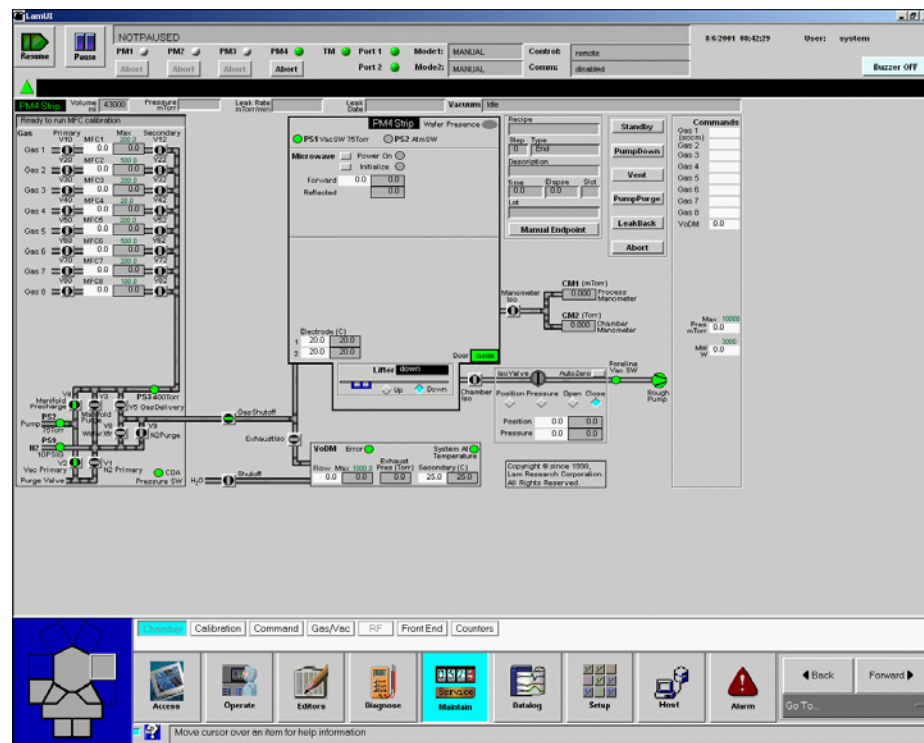
## **Preparation**

- Verify that the reaction chamber is under vacuum. In the **Maintain\Chamber** window, observe that the process manometer readout (CM2) is less than 50 mtorr.

## Procedure

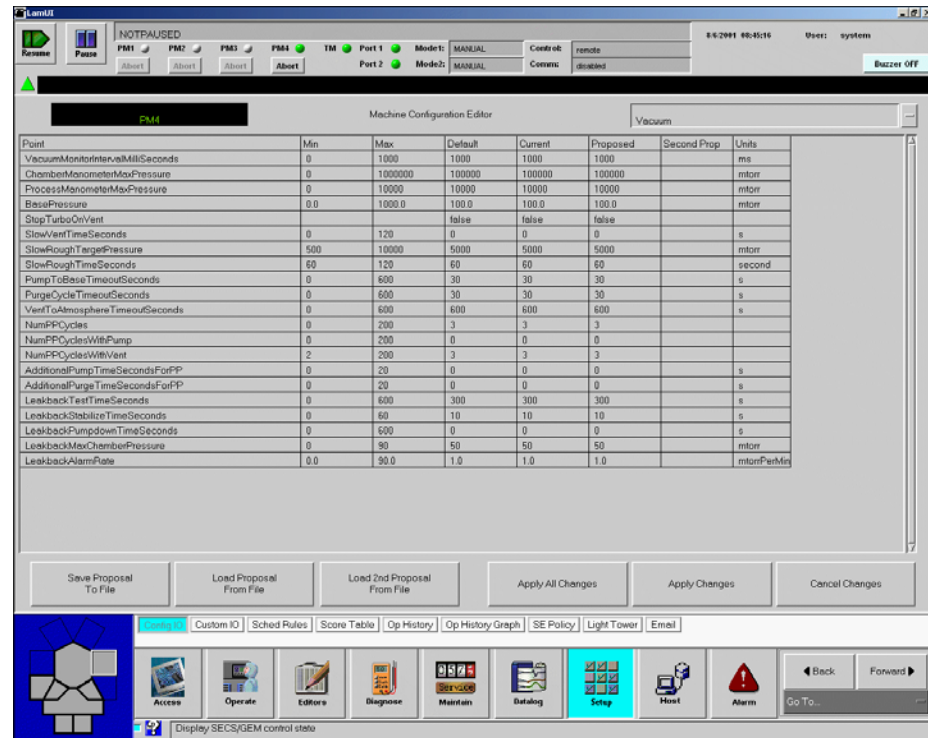
- To perform a pump-and-purge cycle on the chamber,
  - 1 Set the UI to display the windows for the 2300 Microwave Strip Module. Select the applicable PM on the station locator in the lower left window. See Figure 3.3–1.

Figure 3.3–1. Maintain\Chamber Window



- 2 In the Setup\Config IO\Vacuum window, verify that *NumPPCycles* is set at 20 cycles. The default is 10 cycles. (See Figure 3.3–2)

Figure 3.3–2. Setup\Config IO\Vacuum Window



- 3 Activate the pumping and purging cycle. In the **Maintain\Chamber** window, click **PumpPurge**. (See Figure 3.3–1)

- Click **Abort** to abort the pumping and purging cycle.

**Note** If you abort the pump/purge cycle, the system goes to idle. You must command the system to either pump-down the chamber as in Section 3.1, "Pumping Down the Chamber," or vent the chamber as in Section 3.2, "Venting the Chamber."

This step completes the procedure.



## 3.4

# ***Measuring the Chamber Leakback Rate***

---

Use this procedure to measure the strip chamber leakback rate on the 2300 Microwave Strip Module. You must perform this procedure after you open the chamber for servicing, close it, and then pump it down.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual
- [Section 3.2, "Venting the Chamber."](#)

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## Safety

### *Electrical Work Type*

Type 2 task involved.

### *Lockout/Tagout*

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### *Ergonomics*

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### *Personal Protective Equipment*

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

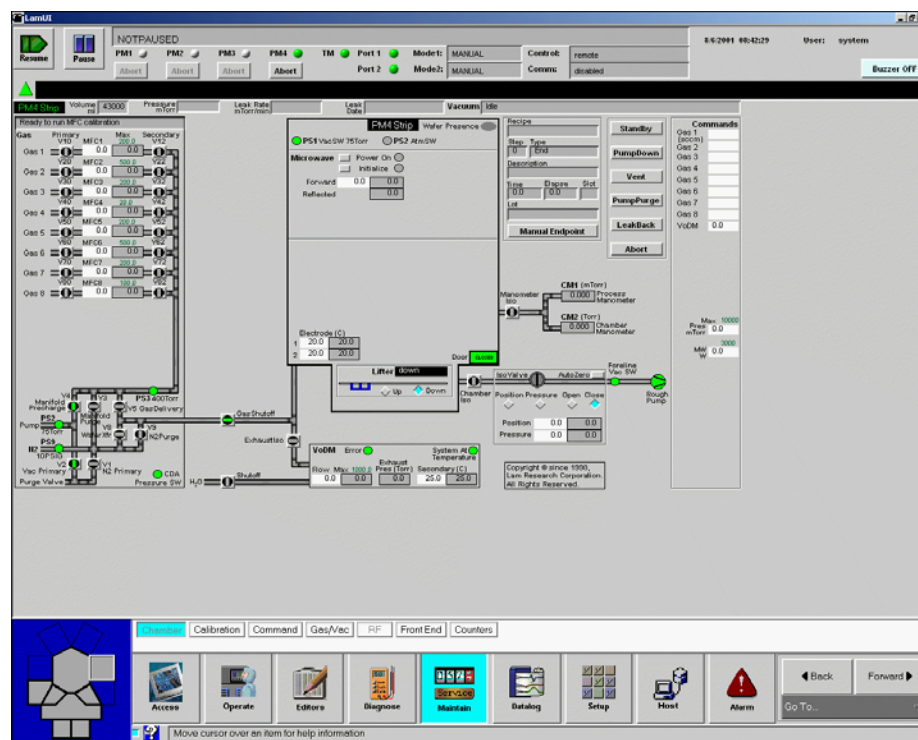
## Preparation

- If chamber has been opened, pump down the chamber. See [Section 3.2, "Venting the Chamber."](#) Pump down the chamber for at least one hour.

## Procedure

- To measure the chamber leakback rate,
  - 1 Select the **Maintain\Chamber** window. Select the strip PM on the station locator in the lower left window. See Figure 3.4–1.

Figure 3.4–1. Maintain\Chamber Window

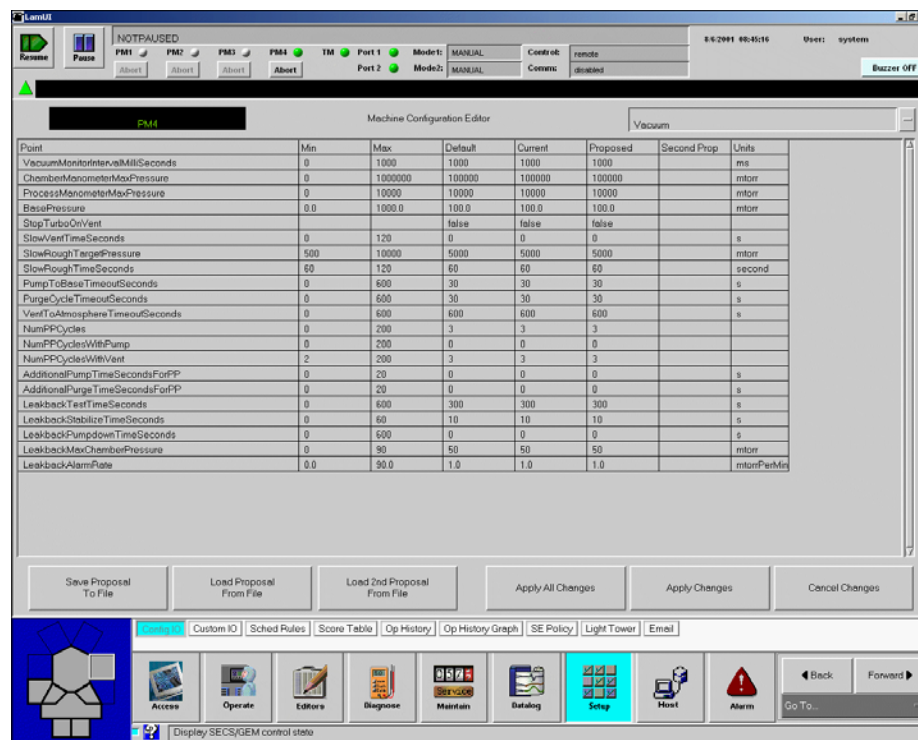


- 2 In the **Setup\Config IO\Vacuum** window, verify that the applicable variables are set to the proper values. See Figure 3.4–2.

The chamber leakback check is terminated after the time specified by *LeakbackTestTimeSeconds* (default value is 300 seconds) or when the chamber pressure rises above the value specified by *LeakbackMaxChamberPressure*.

An alarm posts if the leak rate is greater than the value specified by *LeakbackAlarmRate*.

Figure 3.4–2. Setup\Config IO\Vacuum Window



- Initiate the chamber leakback-rate test sequence. In the **Maintain\Chamber** window, click **LeakBack**. See Figure 3.4–1.
- Wait five minutes and observe the Leak Rate field in the upper middle area of the **Maintain\Chamber** window. The leakback rate appears when the leakback-rate test sequence ends.

During the chamber leakback check, the chamber is pumped down to base pressure and isolated, and the chamber pressure is then sampled at fixed intervals. The leak rate is calculated based on the initial and final pressure readings and the total elapsed time.

Before the leakback-rate test sequence has ended, full pumping of the reaction chamber is restored.

This step completes the procedure.

## 3.5

# ***Performing a Chamber Wet Clean***

---

Use this procedure to wet clean the reaction chamber.

This procedure contains the following sections:

- "Opening the Chamber."
- "Removing the Chamber Parts."
- "Cleaning the Chamber Walls and Sealing Surfaces."
- "Cleaning the Gate Slot Valve."
- "Installing the Chamber Parts and Closing the Chamber."
- "Returning the System to Production Mode."

## **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual
- 407-002480-001, SPI, Reaction Chamber 2300 Strpr

## **Equipment Required**

- 849-801736-200, Clean kit, 200 mm
- 849-801736-300, Clean kit, 300 mm

## **Materials**

- Lint-free wipes

- 100 percent isopropyl alcohol (IPA)

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.



#### **Warning**

**Toxic Hazard:** When performing this procedure, treat all waste, including used lint-free wipes, as toxic. Handle and dispose of all waste properly.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

## Personal Protective Equipment

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

► To prepare the system,

- 1 Run the neutralization plasma recipe on the chamber. See "Neutralization Plasma," in Section 1, "Overview."
- 2 Set the electrode temperature to 0 degrees Celsius to turn off the heater power to the electrode.



### Caution

**Mechanical Hazard:** Do not vent the chamber when the electrode is above 70 degrees Celsius. Damage to the ceramics and quartzware may occur.

- 3 Vent the chamber. See Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."

## Procedure

### Opening the Chamber

► To open the chamber:

- 1 Press the **Ext** and **Run** buttons to actuate the chamber lift hoist.

- 2 Release the **Ext** and **Run** buttons when the chamber lift hoist completes its movement.



**Caution**

**Mechanical Hazard:** When working in the chamber, be careful not to scratch the anodized chamber surfaces.



**Caution**

**Burn Hazard:** Allow the electrode to cool to 55 degrees Celsius before handling.

## ***Removing the Chamber Parts***

- ▶ To remove the chamber parts,
  - 1 Starting with the top piece and working down, remove the quartz liners and baffles and set them aside.
  - 2 Lift out the focus ring adapter (200 mm only) and the focus ring and set them aside.
  - 3 Remove the electrode heater and temperature control connections.
  - 4 Unscrew the electrode retaining bolts from beneath the chamber.
  - 5 Slide the electrode straight up and out of the open chamber top.

## ***Cleaning the Chamber Walls and Sealing Surfaces***

Wet cleaning the chamber surfaces covered with liners increases the chamber recovery time, and may not be necessary in all cases. In general, you probably should clean the chamber after the slot valve is done.



**Cleaning Notes** If you choose to clean and reinstall the liners, always use lint-free wipe and DI water. First use a wipe dipped in DI water solution to break up the etch residue buildup, then wipe everything again with another wipe dipped in 100 percent IPA.

When wiping O-rings, use only DI water or IPA, and be extremely careful that the wipes do not leave fibers behind. Fibers left on O-rings will cause excessive leak rates and lead to extended equipment downtime.

**Note** Clean the surface of the electrode with IPA. Do not use ScotchBrite on the electrode surface.

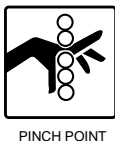
► **To clean the chamber walls and sealing surfaces,**

- 1 Wipe the internal chamber surfaces with DI water using a lint-free wipe.
- 2 Wipe everything with a lint-free wipe using 100 percent IPA.
- 3 Remove, clean, and reinstall the O-rings. When wiping the O-rings use only DI water or IPA. Be extremely careful that the wipes do not leave fibers on the O-rings. The fibers can cause excessive leakrates and lead to extended downtime. Before reinstalling the O-rings, wipe the O-ring groove with DI water and a lint-free wipe.

## ***Cleaning the Gate Slot Valve***

► **To clean the gate slot valve,**

- 1 Vent the transport module. See the *2300 Transport Module Maintenance* manual for the procedures.



**Caution**

**Pinchpoint:** When servicing the gate valve door, keep hands clear when testing functions. Possible bodily pinching from the door could occur.

- 2 Actuate the gate valve for this process module. See the *2300 Transport Module Maintenance* manual for further information.

- 3 Open the transport module access hatch that provides access to the gate valve.
- 4 Remove the three bolts from the back of the gate valve stem. Location of bolts is shown as follows:

**Note** Only remove the bolts when the valve is in the open position.

- 5 Lift the gate valve door and O-ring up and out. Inspect the door and O-ring. If the part is damaged, discard it and obtain a replacement.
- 6 Clean the door and O-ring.
- 7 After cleaning the door and O-ring, and with the gate valve still in the open position, replace the O-ring and place the door on the gate valve stem.
- 8 Install the three bolts that secure the door to the gate valve stem.
- 9 Close the access hatch.
- 10 From the TM user interface, actuate the gate valve to the closed position. See the *2300 Transport Module Maintenance* manual for further information.
- 11 Perform a leakback check on the transfer chamber. See the *2300 Transport Module Maintenance* manual for the procedure.

### ***Installing the Chamber Parts and Closing the Chamber***

- **To install the chamber parts and close the chamber,**
  - 1 The hardware installation procedure is the reverse of the removal procedure. See ["Removing the Chamber Parts."](#)
  - 2 Use new O-rings and gaskets supplied with the clean kits.
  - 3 Use the parts supplied with the clean kits to minimize down time. Clean the quartzware and ceramics off-line according to the procedure outlined in [Section 3.6, "Cleaning the Quartzware Offline."](#)

### ***Returning the System to Production Mode***

- ▶ **To return the system to production mode,**
  - 1 Pump down the chamber.
  - 2 Reset the electrode temperature to process temperature.
  - 3 Perform a leakback test until the chamber reaches a leakback rate of less than 5 mtorr/minute.
  - 4 Condition the chamber by running at least 10 resist wafers using the customers recipe.
  - 5 After you condition the chamber, zero out the wafer and the microwave minute counters on the **Diagnose\System Information** window.
  - 6 Once the system is back into the production mode, clean the chamber hardware that you removed during this wet clean according to the previous procedures. Replace any parts showing excessive wear or that have been damaged.

This step completes the procedure.



## 3.6

# *Cleaning the Quartzware Offline*

---

Use this procedure to clean the 2300 Microwave Strip Module quartzware. Do not use this procedure when you use  $\text{CF}_4$  as a component in the strip recipe.

This procedure contains the following sections:

- "Cleaning the Quartzware."
- "Cleaning Polymer Build-up."

## Reference Documentation

- 202-021066-001, Critical Vacuum Parts Packaging Specification

## Equipment Required

- Lint-free wipes
- Lint-free swabs
- Deionized (DI) water
- Isopropyl alcohol (IPA)
- Ultrasonic vat

## Materials

None

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.



#### **Warning**

**Toxic Hazard:** Opening the reaction chamber can expose you to corrosive or toxic gases. Death or severe injury may result from breathing gases. Wear self-contained breathing apparatus, goggles, gloves, apron, and solvent-protective clothing throughout this procedure. Work in a well-ventilated area. Dispose of used wipes according to safety regulations. Handle and dispose of all waste properly.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

## ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

- Remove the quartzware from the chamber. See ["Removing the Quartzware,"](#) in Section 2.4, "2300 Microwave Strip Module Quarterly Preventive Maintenance."

## **Procedure**

### ***Cleaning the Quartzware***

- ▶ **To clean the quartzware:**
  - 1 Wipe down the quartzware with DI water and lint-free wipes to loosen any minor polymer build-up. If the polymer build-up is excessive, proceed to ["Cleaning Polymer Build-up."](#)
  - 2 Use lint-free wipes and 100 percent IPA to clean the quartzware.
  - 3 Bake the quartzware for 15 minutes at 100 degrees Celsius.
  - 4 If you plan to use the quartzware at a later date, package it in accordance with the Critical Vacuum Parts Packaging specification.

### ***Cleaning Polymer Build-up***

- ▶ **To clean polymer build-up,**
  - 1 Swab out the baffle holes with DI water using a lint-free swab.
  - 2 Perform an ultrasonic clean with DI water for 10 minutes.
  - 3 Rinse or wipe down the quartzware with 100 percent IPA.

- 4** Bake the quartzware for 15 minutes at 100 degrees Celsius.
- 5** If you plan to use the quartzware at a later date, package the quartzware in accordance with the Critical Vacuum Parts Packaging specification.

This step completes the procedure.



## 3.7

# ***Opening and Closing the Chamber***

---

Use this procedure to open and close the chamber of the 2300 Microwave Strip Module.

This procedure contains the following sections:

- "Opening the Chamber."
- "Closing the Chamber."

### **Reference Documentation**

- *2300 Etch Systems Safety* manual

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

None

## Procedure

### *Opening the Chamber*

- ▶ **To open the chamber,**
  - 1 Remove the scrubbing duct, if applicable.
  - 2 If the chamber is at vacuum, then vent the chamber. See [Section 3.2, "Venting the Chamber."](#)
  - 3 Press the **Ext** and **Run** buttons to actuate the chamber lift hoist.
  - 4 Release the **Ext** and **Run** buttons when the chamber lift hoist completes its movement.

### *Closing the Chamber*

**Note** This procedure is based on the assumption that the chamber is fully open and cooled.

- ▶ **To close the chamber,**
  - 1 Clean the O-ring and O-ring groove of the chamber.
  - 2 Press the **Ret** and **Run** buttons to actuate the chamber lift hoist.
  - 3 Release the **Ret** and **Run** buttons when the chamber is fully closed.
  - 4 Install the scrubbing duct, if applicable.

This step completes the procedure.

## Procedure

### *Opening and Closing the Chamber*

---

## Vacuum Hardware Procedures

---

This section contains the vacuum hardware procedures for the 2300 Microwave Strip Module.

Always follow your company's safety practices, in addition to the safety guidelines noted in the procedures. Make sure to use the proper equipment and observe all cautions and warnings.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 4.1

# ***Maintaining the Butterfly Valve***

---

Use this procedure to maintain the butterfly valve on the 2300 Microwave Strip Module.

## **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

## **Equipment Required**

- Small and medium standard screwdrivers
- Set of hex wrenches
- 3/4-inch open-end wrench
- Small plastic pail

## **Materials**

- 100 percent isopropyl alcohol (IPA)
- Lint-free wipes

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required,

observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.



## Preparation

- ▶ **To prepare the system,**
  - 1 Perform a pump-and-purge cycle on the reaction chamber, as required. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 2 Vent the chamber. See [Section 3.2, "Venting the Chamber."](#)
  - 3 Turn off power to the process module. Press the **Stop** button on the process module AC box.

## Procedure

- ▶ **To perform maintenance on the butterfly valve,**
  - 1 Turn off the roughing pump.
  - 2 Remove the connector to the butterfly valve.
  - 3 Remove the four claw clamps holding the butterfly valve in place.
  - 4 Remove the O-ring from the gate. Replace the O-ring if necessary.
  - 5 Wipe the valve gate with IPA and a lint-free wipe.
  - 6 Install the O-ring.
  - 7 Replace the four claw clamps on the butterfly valve.
  - 8 Replace the connector to the butterfly valve.

This step completes the procedure.



## 4.2

# ***Maintaining the Isolation Valve***

---

Use this procedure to maintain the isolation valve on the 2300 Microwave Strip Module.

This procedure contains the following sections:

- "Servicing the Isolation Valve."
- "Servicing the Isolation Valve Internals."

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

- Small and medium standard screwdrivers
- Set of hex wrenches
- 3/4-inch open-end wrench
- Small plastic pail

### **Materials**

- 100 percent isopropyl alcohol (IPA)
- Lint-free wipes

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

- ▶ **To prepare the system,**
  - 1 Perform a pump-and-purge cycle on the reaction chamber, as required. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#)
  - 2 Vent the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 3 Turn off power to the process module. Press the **Stop** button on the process module AC box.

## Procedure

### *Servicing the Isolation Valve*

- ▶ **To service the isolation valve,**
  - 1 Vent the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 2 Power down the roughing pump.
  - 3 Remove the cables from the throttle valve.
  - 4 Loosen the two screws that attach the vacuum manifold bracket to the frame.

**Note** This allows vertical movement of the vacuum manifold.

- 5 Remove the eight clamps holding the throttle valve in place.
- 6 Remove the throttle valve and the centering rings.
- 7 Manually move the vacuum manifold down along the bracket slot, if it does not move down automatically.
- 8 Remove the eight screws holding the isolation valve to the chamber, and let the isolation valve rest on the isolation valve bracket.

- 9 Carefully remove the isolation valve by moving it toward the TM to clear the bracket, then move it away from the TM and lift the isolation valve from the chamber.

**Note** There is minimal space, so be careful not to damage the chamber O-ring surfaces and throttle valve mating surface.

- 10 Inspect all of the O-rings and centering rings, and replace them if necessary.
- 11 Inspect all of the vacuum sealing surfaces on the isolation valve and its mating surfaces.
- 12 Install the isolation valve in the chamber.
- 13 Connect the cables to the throttle valve.
- 14 Restore power to the roughing pump.

### ***Servicing the Isolation Valve Internals***

- **To service the isolation valve internals,**
  - 1 Vent the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 2 Power down the roughing pump.
  - 3 Remove the cables from the throttle valve.
  - 4 Remove the cap from the isolation valve.
  - 5 Remove the spring, O-ring, and other isolation valve components and set them aside. Make sure to use only a plastic tool to remove the O-ring.
  - 6 Clean the inside of the isolation valve, especially the sealing surface, with lint-free wipes and IPA.
  - 7 Inspect the O-ring and replace it if necessary.
  - 8 Clean the removed components.
  - 9 Assemble the isolation valve with the clean components.

This step completes the procedure.

## 4.3

### ***Troubleshooting the Vacuum System***

---

[To be supplied.]





## Heated Electrode Procedures

---

This section contains electrode procedures for the 2300 Microwave Strip Module.

Always follow your company's safety practices, in addition to the safety guidelines noted in the procedures. Make sure to use the proper equipment and observe all cautions and warnings.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 5.1

# ***Calibrating the Pinlift Assembly***

---

Use this procedure to calibrate the electrode pinlift assembly on the 2300 Microwave Strip Module.

### **Reference Documentation**

None

### **Equipment Required**

- Pin depth gauge assembly, 853-015790-001
- Adjustable wrench
- Allen wrench

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## Safety

### *Electrical Work Type*

Type 2 task involved.

### *Lockout/Tagout*

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### *Ergonomics*

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### *Personal Protective Equipment*

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

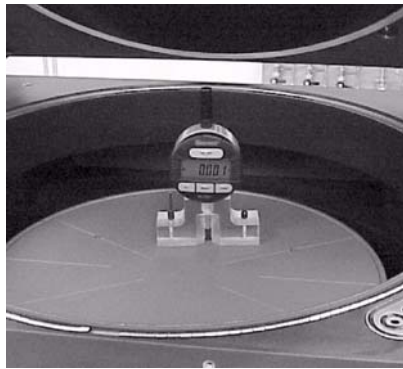
- ▶ **To prepare the system,**
  - 1 Vent the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 2 Open the chamber lid and allow the electrode to cool to room temperature.

## Procedure

### Setting the Pins Height

- ▶ To set the pins height,
  - 1 Manually actuate the lifter pin to the **Down** position, if you have not already done so.
  - 2 Zero the pin depth gauge to the top surface of the electrode. See [Figure 5.1–1](#).

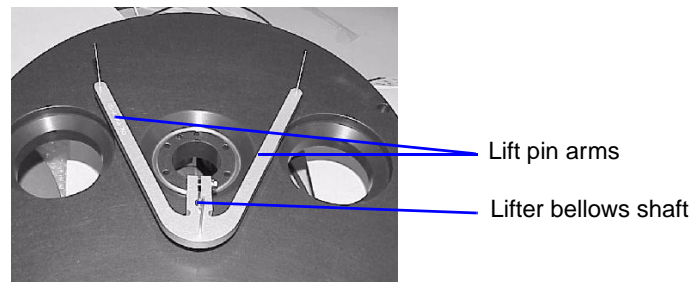
**Figure 5.1–1. Pin Depth Gauge**



- 3 With the pins in the **Down** position, measure the height of all three pins below the electrode surface. Verify that the pins are set within a .010-inch range of each other.
- Note** If the pins are set within .010 inch of each other, proceed to step 10. If the pins are not set within .010 inch of each other, proceed to step 4.
- 4 Verify the screw lengths and washer usage where applicable.
  - 5 Verify that the electrode, lifter bellows assembly, and the lift pin arm are securely fastened. Tighten any loose parts and repeat step 3. If the parts are all securely fastened, then proceed to step 6.
  - 6 Remove the electrode, the lifter pin arm, and its heat shield.

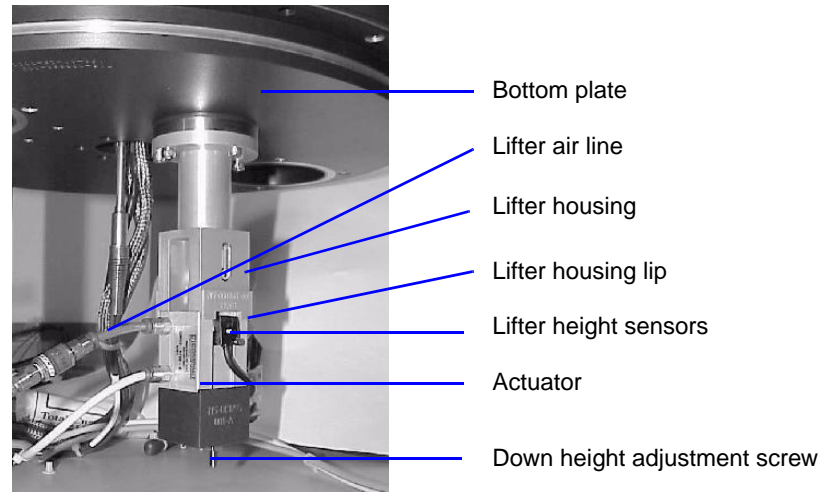
- 7 Measure the length of all three pins and verify that they confirm to specifications.
- 8 Reinstall the lift pin arm and ensure that it is properly seated on the lifter bellows shaft and is firmly clamped after tightening. There should be a minimal amount of play between the lift pin arm and the lifter bellows shaft. See [Figure 5.1–2](#).

**Figure 5.1–2. Lift Pin Arm**



- 9 Install the electrode, the lifter pin arm and its heat shield and repeat step 3. Consult a Lam engineer if the problem persists after proper installation.
  - 10 Loosen the down height adjustment screw. See [Figure 5.1–3](#).
- Note** The orientation between the actuator and the lifter housing is very critical. Make sure that the lifter air line is oriented as shown to allow free rotation. If the actuator is in the wrong orientation, the lifter housing lip will interfere with the air line causing rough lifter motion and wafer chatter.

Figure 5.1–3. Lift Actuator



- 11 Select the pin with the highest down height and set it to  $.007 \pm .001$  inch below the chuck surface by adjusting the down height adjustment screw.
- 12 Tighten the down height adjustment screw nut when the down height has been established.
- 13 Cycle the lifter more than three times and bring it back to the **Down** position.
- 14 Verify that all three pins are within .006-.015 inch below the electrode surface. If you have not properly set the down height, repeat step 10. Otherwise continue to the next step.
- 15 Bring the lifter to its **Up** position and verify that all three pins are within .455-.495 inch relative to the chuck surface and within .010 inch of each other. If the pins are not within .010 inch of each other, consult a Lam engineer.

This step completes the procedure.





## 5.2

# *Installing the Pinlift Sensor*

---

Use this procedure to remove and install the pinlift sensor on the 2300 Microwave Strip Module.

This procedure corresponds to the following 202 procedure.

- 202-004524-001, Installation Procedure for the Wafer Lift Mechanism, 2300 Microwave Stripper

### **Reference Documentation**

- [Section 5.1, "Calibrating the Pinlift Assembly."](#)

### **Equipment Required**

- Small standard screwdriver
- Allen wrench set

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required,

observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

None

## Procedure

► **To install the pinlift sensor,**

- 1 Manually actuate the lift piston to the **Down** position.
- 2 Slide the lifter up position sensor from the bottom of the cylinder up to the top.

**Note** Step 2 may require removing the down height adjustment block if this is an initial installation of the sensors.

- 3 Cycle the lifter up and down while positioning the lifter up sensor at 90-100 percent of its travel distance.

**Note** Note that the LED changes from green to red when sensed.

- 4 Tighten the sensor screws against the cylinder to hold it in place. Do not overtighten the sensor screws to avoid sensor errors.
- 5 Slide the lifter down position sensor from the bottom opposite side of the lifter up sensor.
- 6 Cycle the lifter up and down while positioning the lifter down sensor at 0-10 percent of its travel distance.

**Note** Note that the LED changes from green to red when sensed.

- 7 Tighten the sensor screws against the cylinder to hold it in place. Do not overtighten the sensor screws to avoid sensor errors.

This step completes the procedure.



## 5.3

# ***Removing and Installing the Electrode***

---

Use this procedure to remove and install the electrode on the 2300 Microwave Strip Module.

This procedure is divided into the following sections:

- ["Removing the Electrode."](#)
- ["Installing the Electrode."](#)

## **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual
- [Section 2.4, "2300 Microwave Strip Module Quarterly Preventive Maintenance."](#)

## **Equipment Required**

- Allen wrench set
- Guide pins (electrode installation), 713-016274-001

## **Materials**

- Lint-free wipes
- 100 percent isopropyl alcohol (IPA)

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

► To prepare the system,

- 1 Perform a leakback rate test on the chamber. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#) Record the value on the schedules.
- 2 Run the neutralization plasma recipe. See "Neutralization Plasma," in [Section 1, "Overview."](#)



### Caution

**Mechanical Hazard:** Do not vent the chamber when the electrode is above 70 degrees Celsius. Damage to the ceramics and quartzware may occur.

- 3 Set the lower electrode setpoint to 25 degrees Celsius. Select the **Diagnose\Temperature** page, and set *Electrode1* and *Electrode2* to 25 degrees Celsius.
- 4 Vent the chamber. See [Section 3.2, "Venting the Chamber."](#)
- 5 Open the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)
- 6 Allow the electrode to cool to room temperature.

## Procedure

### Removing the Electrode

► To remove the electrode,

- 1 Remove the quartzware from the chamber. See "Removing the Quartzware," in [Section 2.4, "2300 Microwave Strip Module Quarterly Preventive Maintenance."](#)
- 2 Turn off the power to the process module.
- 3 Disconnect the electrode 1 and electrode 2 thermocouples, RTD, and the electrode heater cable from their respective brackets.

- 4 From below the chamber, unbolt the electrode from the bottom plate.
- 5 Remove the electrode vertically, making sure that the lift pins are cleared.

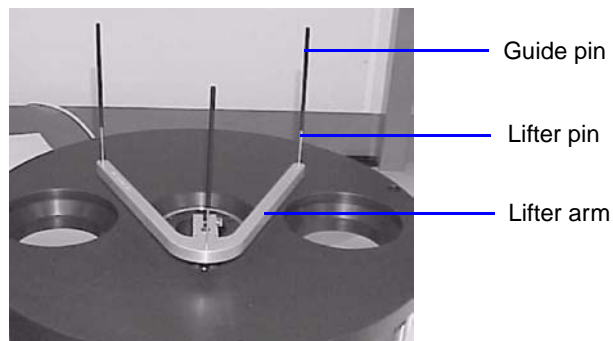
**Note** Make sure you do not bend the lift pins and you clear all cables when removing the electrode.

### ***Installing the Electrode***

► **To install the electrode,**

- 1 Install the guide pins on the lift pins. See [Figure 5–1](#).

**Figure 5–1. Installing the Guide Pins**

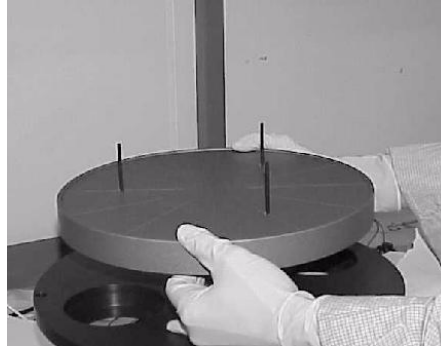


- 2 Verify the proper orientation of the electrode, and visually align all three guide pins to the electrode lifter holes from above. See [Figure 5–2](#).

**Note** Be very careful not to bend lifter pins during installation.



**Figure 5–2. Installing the Electrode**



- 3 Properly seat the electrode on the bottom plate and remove the guide pins from the lift pins.
- 4 Cycle the lifter up and down to verify that the pins are recessed below the electrode surface at its down position.
- 5 Install the mounting bolts from below. Use number 10-32 LG1 bolts with both lock and flat washers to slowly tighten in a star pattern.
- 6 Connect the electrode power, two thermocouples, and RTD cables to their respective brackets.
- 7 Restore power to the process module.
- 8 Verify that the lifter height is correct. See [Section 5.1, "Calibrating the Pinlift Assembly."](#)
- 9 Verify that the wafer placement is correct. See the *2300 Transport Module Maintenance Vol. 1*.
- 10 Install all necessary hardware and quartzware. See [Section 2.4, "2300 Microwave Strip Module Quarterly Preventive Maintenance."](#)
- 11 Close the chamber. See [Section 3.7, "Opening and Closing the Chamber."](#)
- 12 Pump down the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)

- 13** Set the electrode temperature as per normal process requirements.
- 14** Allow several hours for the chamber to reach normal operating temperature.
- 15** Perform a leakback check. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#)

This step completes the procedure.

## Pressure Control Procedures

---

This section contains pressure control procedures for the 2300 Microwave Strip Module.

Always follow your company's safety practices, in addition to the safety guidelines noted in the procedures. Make sure to use the proper equipment and observe all cautions and warnings.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 6.1

# ***Calibrating the Manometers***

---

Use this procedure to calibrate the following reaction chamber manometers on the 2300 Microwave Strip Module:

- Process manometer (CM1-10 Torr)
- Reaction chamber manometer (CM2-100 Torr)

The procedure contains the following sections:

- "Calibrating the Process CM1-10-Torr Manometer."
- "Calibrating the Chamber Manometer CM2-100-Torr Manometer."
- "Validating the Linearity."

## **Reference Documentation**

- 251-801736-700, 2300 Microwave Strip, Piping and Instrumentation Diagram
- *2300 Microwave Strip Module Facility* manual

## **Equipment Required**

- Digital voltmeter (DVM)
- Test leads
- Small standard screwdriver
- 9-pin extension board

## **Materials**

None

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

**Note** The relationship between the reaction chamber adjusted pressure that is displayed and the manometer output voltage does not change significantly unless the manometer drifts (uncommon) or you perform the auto zero function at a higher base pressure than the real base pressure.

► **To prepare the system,**

- 1 Ensure that the system is powered up and pumped down for a minimum of 8 hours with all gas flows off.
- 2 Verify that the reaction chamber is leak tight with a leakrate of less than or equal to 1 mtorr/minute.
- 3 Verify that the process module and foreline cavity are leak tight.

## Procedure

### *Calibrating the Process CM1-10-Torr Manometer*

► **To calibrate the CM1-10 Torr manometer,**

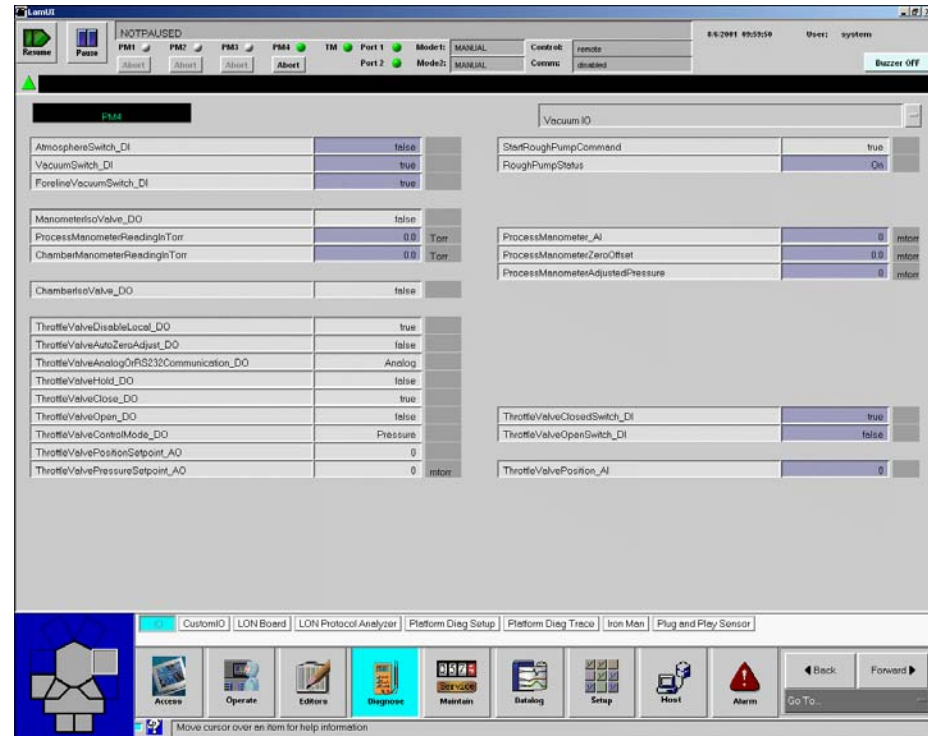
- 1 Go to **Diagnose\IO\Vacuum IO** window (see [Figure 6.1–1](#)) and observe the following variables.

*Process Manometer\_AI* \_\_\_\_\_mtorr

*Process ManometerZero offset* \_\_\_\_\_mtorr

*Process ManometerAdjusted Pressure* \_\_\_\_\_mtorr

Figure 6.1–1. Diagnose\IO\VacuumIO Window



- 2 Use a 9-pin extension board and a voltmeter (DVM) to adjust the zero potentiometer on the process manometer (CM1) so the DVM reads between 11 millivolts (mV) to 22 mV (0.011 VDC to 0.022 VDC).

Process Manometer\_AI \_\_\_\_\_mtorr.

Process ManometerZero offset \_\_\_\_\_mtorr.

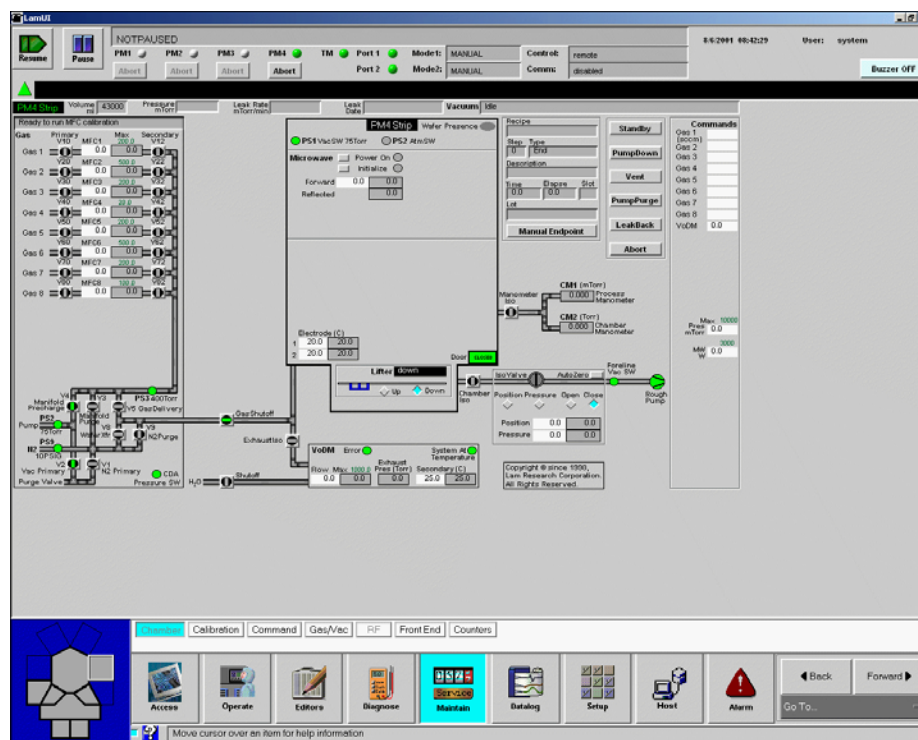
Process ManometerAdjusted Pressure \_\_\_\_\_mtorr.

DVM reading 0.016 VDC

- 3 Go to the **Maintain\Chamber** window (see Figure 6.1–2) and perform an autozero function. This will not zero the DVM voltage.



Figure 6.1–2. Maintain\Chamber Window



- 4 Go to the **Diagnose\IO\Vacuum IO** window and validate the following variables.

<i>Process Manometer_AI</i>	0 mtorr.
<i>Process ManometerZero offset</i>	0 mtorr.
<i>Process ManometerAdjusted Pressure</i>	0 mtorr.
<i>DVM</i>	0.016 V

- 5 Adjust the zero potentiometer on Process Manometer (CM1) so the *DVM* reads between 22 millivolts (mV) to 44 mV (0.022 VDC to 0.044 VDC). The *Process Manometer\_AI* will read 2 mtorr.

<i>Process Manometer_AI</i>	2 mtorr.
<i>Process ManometerZero offset</i>	0 mtorr.
<i>Process ManometerAdjusted Pressure</i>	2 mtorr.

- 6 On a completely out-gassed system with a leak back of less than 1 mtorr/minute, this should be the true base pressure. If you use a pressure standard (Lucas Lab or Certified Calibrated Standard) and the base pressure is less than 2 mtorr, use 2 mtorr for all setups. If the base pressure is above 2 mtorr measure the signal output and verify the voltage reading matches the pressure reading on the pressure monitoring device. Example: 4 mtorr = 0.004 VAC. If the base pressure is not above 2 mtorr, adjust the zero potentiometer on the manometer.

**Note** The relationship between the reaction chamber adjusted pressure that is displayed and the manometer output voltage does not change significantly unless the manometer drifts (uncommon) or you perform the auto zero function at a higher base pressure than the real base pressure.

### ***Calibrating the Chamber Manometer CM2-100-Torr Manometer***

► **To calibrate the chamber manometer,**

- 1 Go to the **Diagnose\IO\Vacuum IO** window and validate the following variables.

*Chamber Manometer\_AI*                      0 mtorr.

- 2 Adjust the zero potentiometer on the chamber manometer to read between 25 mtorr to 35 mtorr (.25 to .35 VDC).

*Chamber Manometer\_AI*                      30 mtorr.

*DVM*    0.003 V

- 3 On a completely out-gassed system, with a leak back of less than 1 mtorr/minute, this should be the true base pressure. If you use a pressure standard (Lucas Lab or Certified Calibrated Standard) and the base pressure is less than 2 mtorr, use 2 mtorr for all setups. If the base pressure is above 2 mtorr, measure the signal output and verify the voltage reading matches the pressure reading on the pressure monitoring device. Example: 40 mtorr = 0.004 VAC. If the base pressure is not above 2 mtorr, adjust the zero potentiometer on the manometer.

## Validating the Linearity

- To validate linearity,
  - 1 Go to the **Maintain\Chamber** window.
  - 2 Enter a 50 sccm setpoint for any inert process gas.
  - 3 Close the chamber isolation valve.
  - 4 Monitor the values in [Table 6.1–1](#) to see that all three pressure points scale equally and track each other within five percent. Record the values.

**Table 6.1–1. Manometer Linearity**

	1 torr	3 torr	5 torr	7 torr	9 torr
CM1					
CM2					

- 5 Go to the **Maintain\Chamber** window.
- 6 Perform a pump down command.

This step completes the procedure.



## 6.2

### ***Autozeroing the Process Manometer***

---

[To be supplied.]



## 6.3

# ***Performing a Conductance Learn***

---

Use this procedure to perform a chamber conductance learn as a baseline for pressure control on the 2300 Microwave Strip Module.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

- Verify that the chamber is under vacuum.

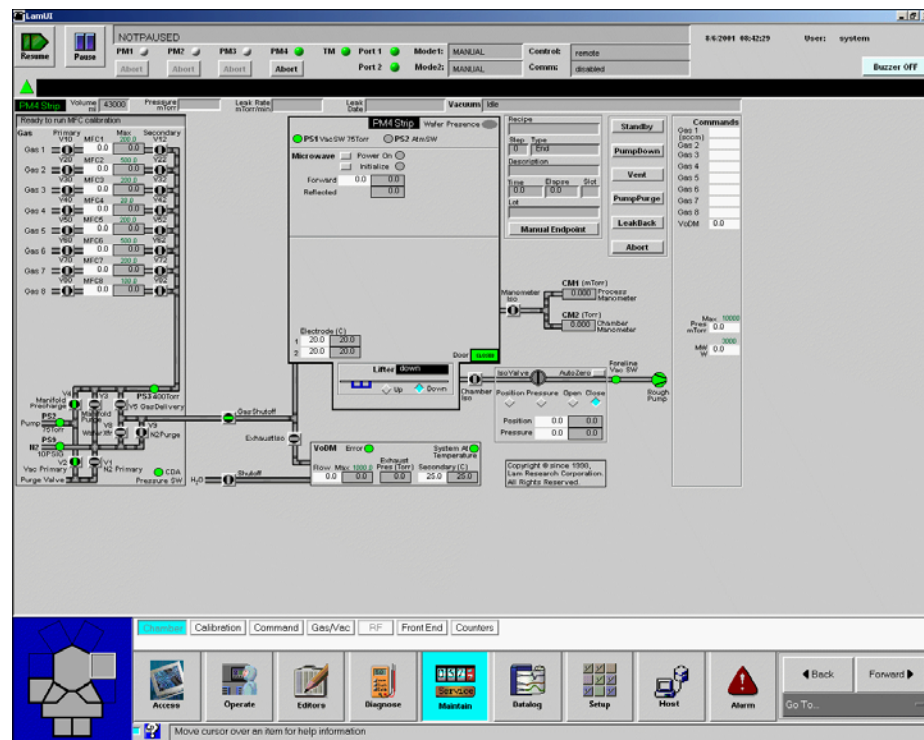


## Procedure

### Performing a Conductance Learn

- To perform a conductance learn,
  - 1 Select the **Maintain\Chamber** window in the UI. Select the applicable PM on the station locator in the lower left screen. See Figure 6.3–1.

Figure 6.3–1. Maintain\Chamber Window

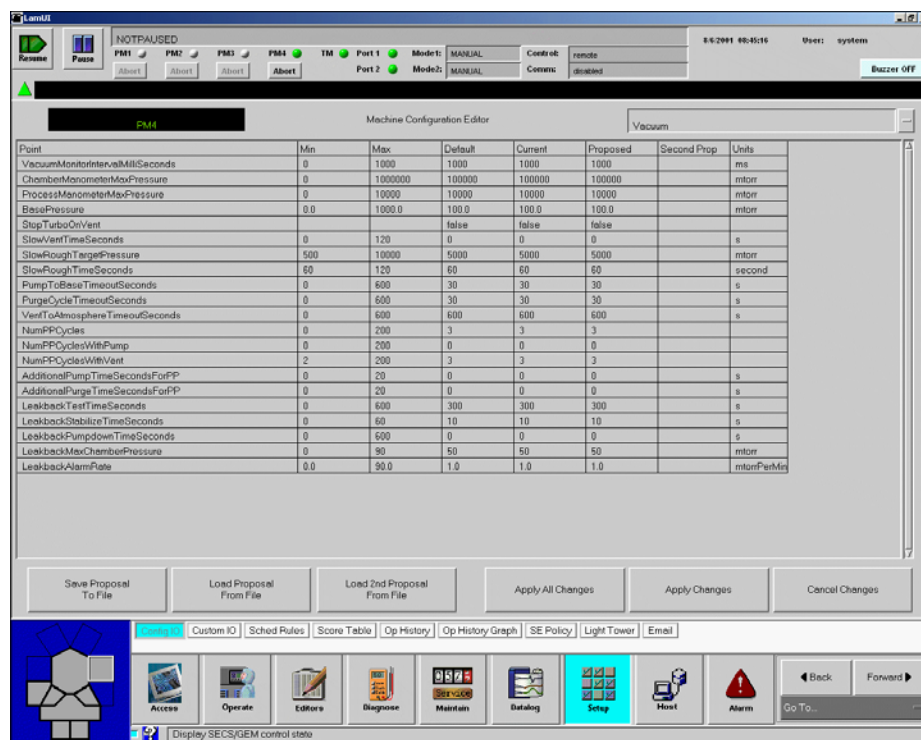


- 2 Verify that you have selected an appropriate gas and flow for the conductance learn. In the **Setup\Config IO\Vacuum** window, verify and, if necessary, set *ValveAutoLearnGas* to the desired gas and *ValveAutoLearnFlow* to the appropriate setpoint. See Figure 6.3–2.

Normally you should select a flow of approximately 100 sccm. You may use any of the 8 gases for the conductance learn, although you should not use very light (for example, He) and very heavy (for example, SF<sub>6</sub>).

In selecting the auto-learn gas, type a # sign before the name: for example, #Gas1.

Figure 6.3–2. Setup\Config IO\Vacuum Window

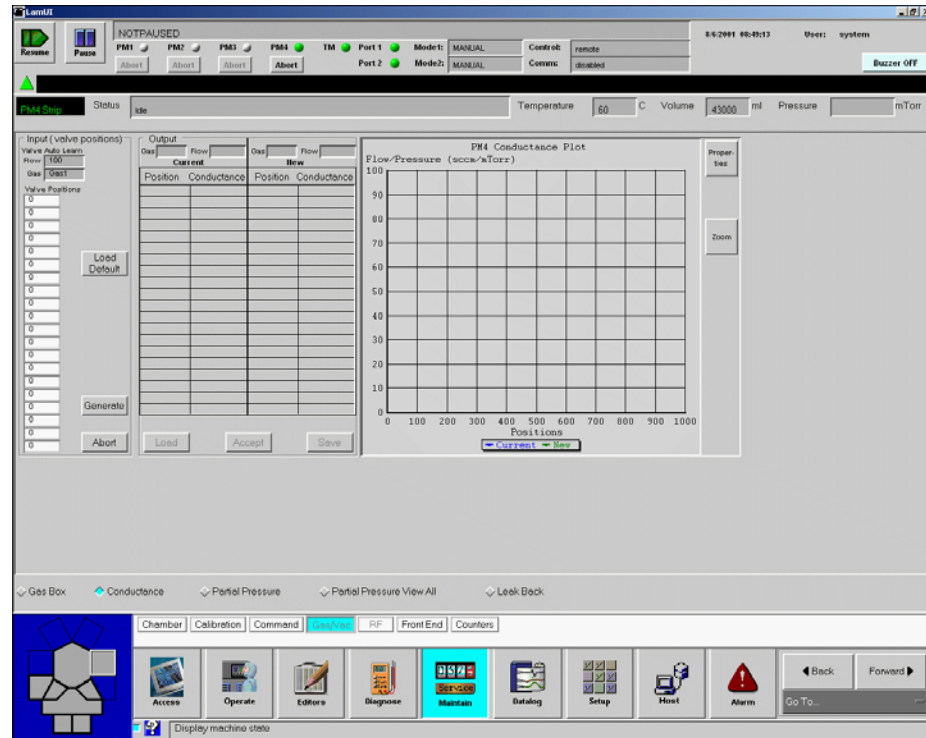


- 3 In the **Maintain\Gas/Vac\Conductance** window, enter the desired Valve Positions under Input. A default table is provided. See Figure 6.3–3.

The defaults shown are applicable for a nominal 1300 liter/second pump. Additional resolution at valve positions less than 100 counts are necessary for a 2000 liter/second pump.

The valve positions in the table must be strictly increasing with initial and final values of 0 and 1000, respectively.

Figure 6.3–3. Maintain\Gas/Vac\Conductance Window



- 4 Start the conductance learn procedure. Click **Generate**.

When the procedure completes, the **New** table under **Conductance** displays the measured conductance values versus valve positions.

The measured conductance curve should be a smoothly varying curve.

- 5 Repeat steps 1 and 2 as required.
- 6 Apply the learned values to the current execution session. Click **Accept**.
- 7 Save the result to a file for a future execution session. Click **Save**.

This step completes the procedure.



## 6.4

# ***Performing a Partial Pressure Test***

---

Use this procedure to perform a partial pressure test on the 2300 Microwave Strip Module.

### **Reference Documentation**

- 202-8032354-001, Performing Partial Pressures
- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

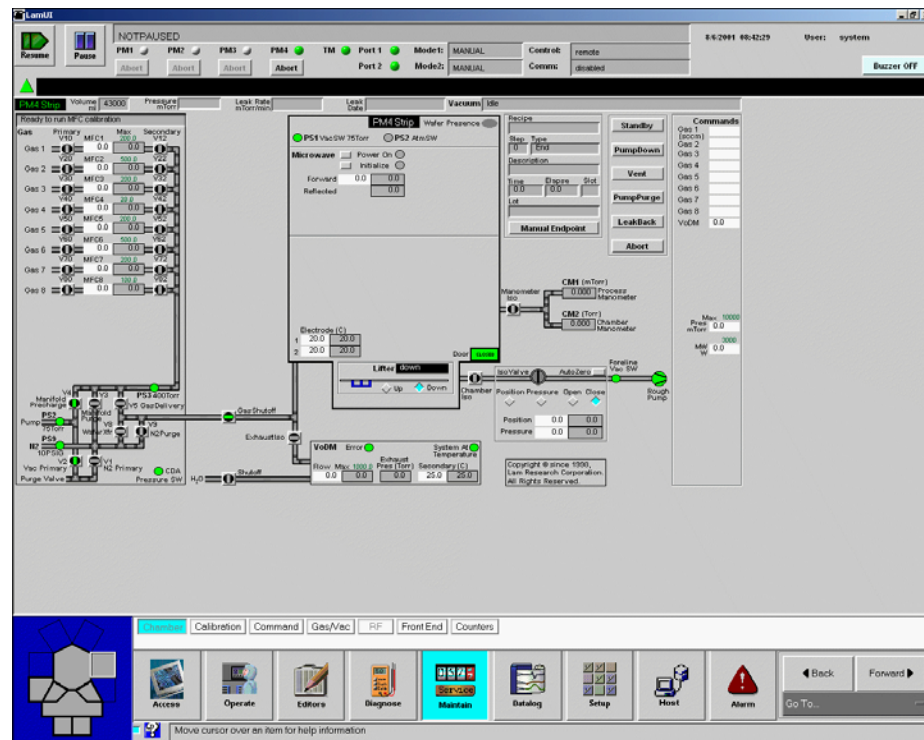
- If the reaction chamber is not at base pressure, pump down the chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)

## Procedure

### Performing a Partial Pressure Test

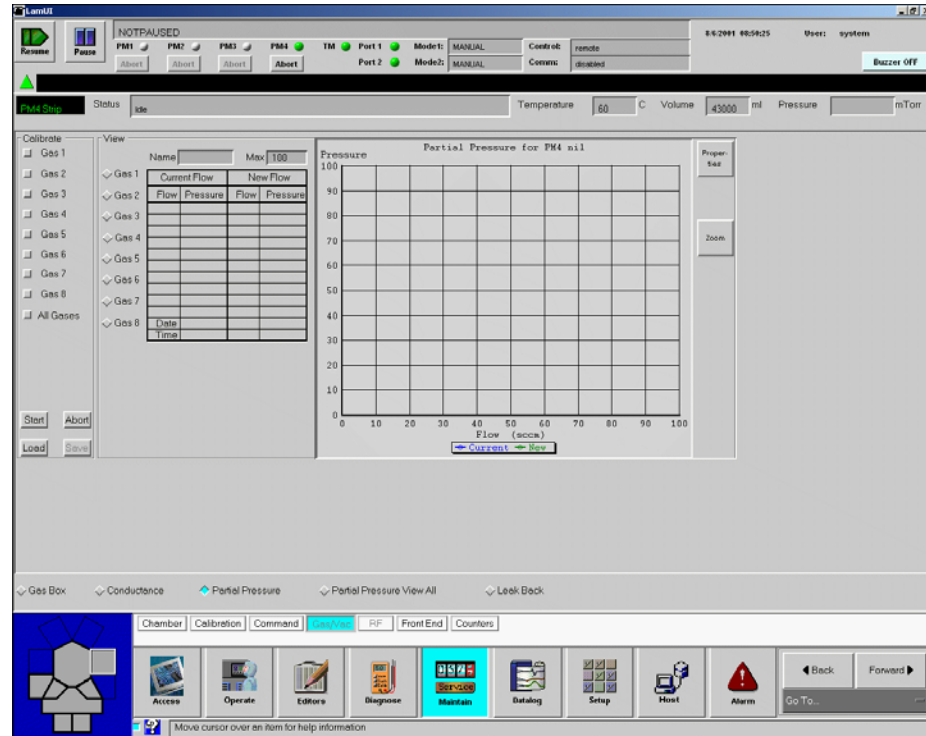
- To perform a partial pressure test,
  - 1 Select the **Maintain\Chamber** window in the UI. Select the strip PM on the station locator in the lower left screen. See Figure 6.4–1.

Figure 6.4–1. Maintain\Chamber Window



- 2 In the **Maintain\Gas/Vac\Partial Pressure** window, select a gas (or select all gases) that you want to test in the **Partial Pressure** box at the left side. See Figure 6.4–2.

Figure 6.4–2. Maintain\Gas\Vac\Partial Pressure



- 3 Initiate the partial pressure test sequence. In the **Maintain\Gas/Vac\Partial Pressure** window, click **Start**.

The **Status** window displays done when the sequence has completed.

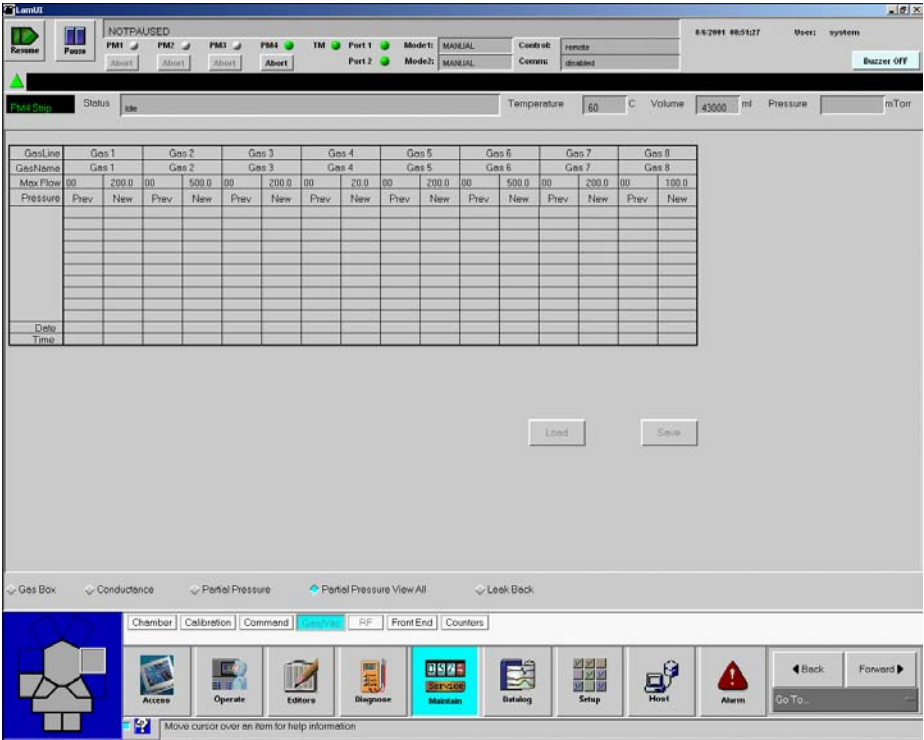
After the test, you can view the results (along with the previous reading) for one selected gas at a time in the View table to the right of the **Partial Pressure** box.

You can view the results for all the gases tested (with previous readings) in the **Maintain\Gas/Vac\Partial Pressure View All** window. See Figure 6.4–3.

- Click **Abort** to abort the sequence.



Figure 6.4–3. Maintain\Gas/Vac\Partial Pressure View All Window





## 6.5

# ***Troubleshooting Pressure Control Problems***

To be supplied



## Gas Delivery Procedures

---

This section contains gas delivery procedures for the 2300 Microwave Strip Module.

Always follow your company's safety practices, in addition to the safety guidelines noted in the procedures. Make sure to use the proper equipment and observe all cautions and warnings.

Before proceeding, read the safety information in [Chapter 1, "Overview."](#)



## 7.1

# ***Performing a Pump/Purge Cycle on the Gas Panel***

---

Use this procedure to perform a gas panel pump/purge cycle on the gas panel of the 2300 Microwave Strip Module. Perform this procedure before opening up the process gas system (such as when replacing MFCs) to clear the system of potentially hazardous gases.

### **Reference Documentation**

- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required,

observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

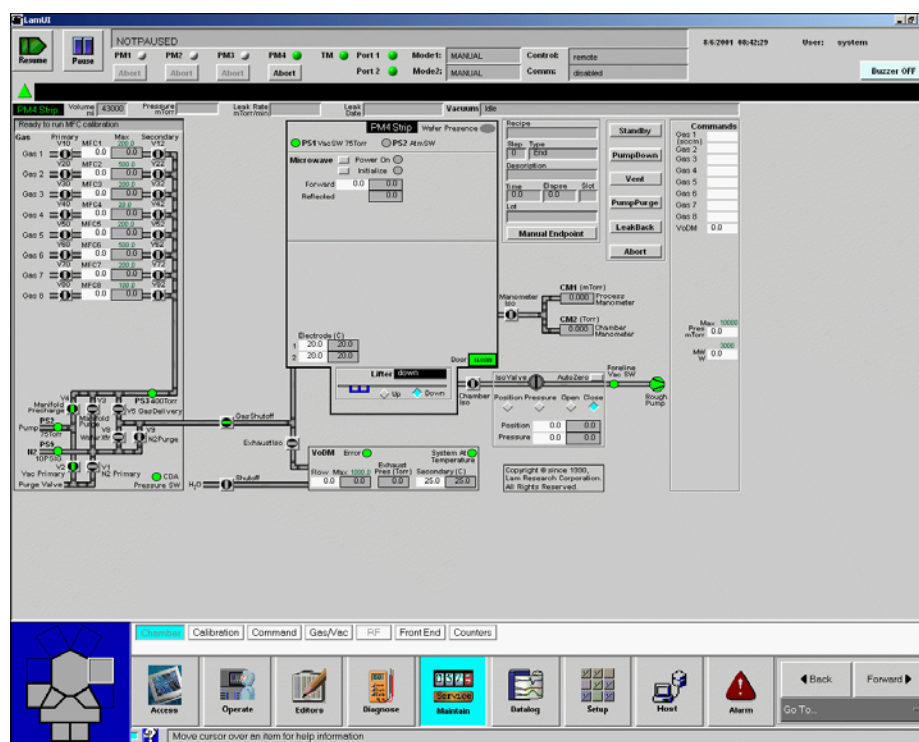
- Ensure that system status is idle.



## Procedure

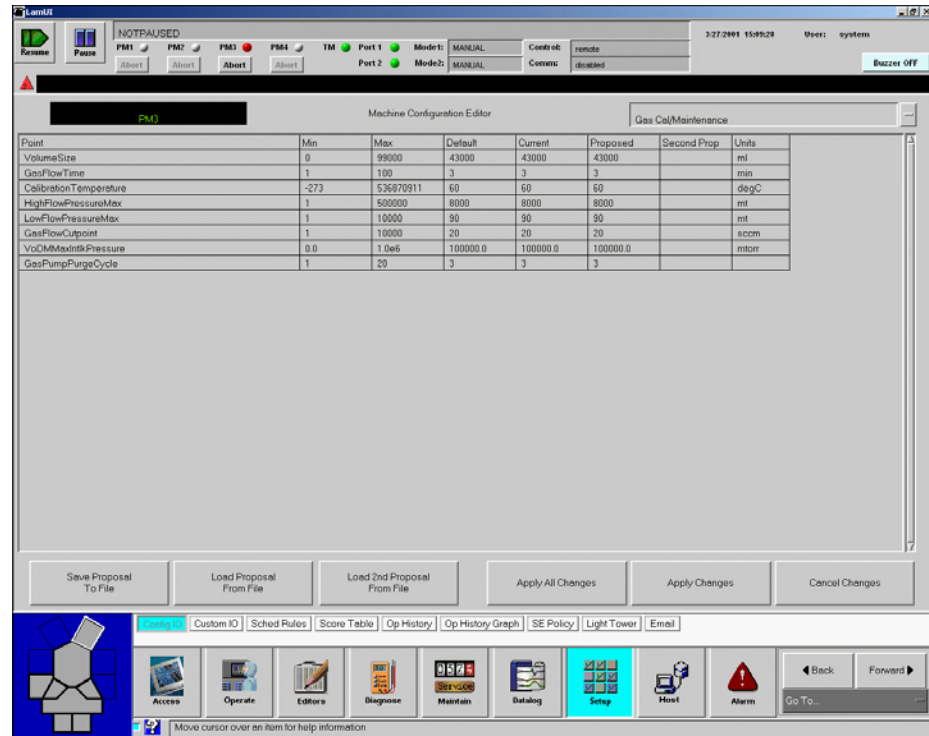
- To perform pump/purge cycle on the gas panel,
  - 1 Select the **Maintain\Chamber** window in the UI. Select the strip PM on the station locator in the lower left screen. See Figure 7.1–1.

Figure 7.1–1. Maintain\Chamber Window



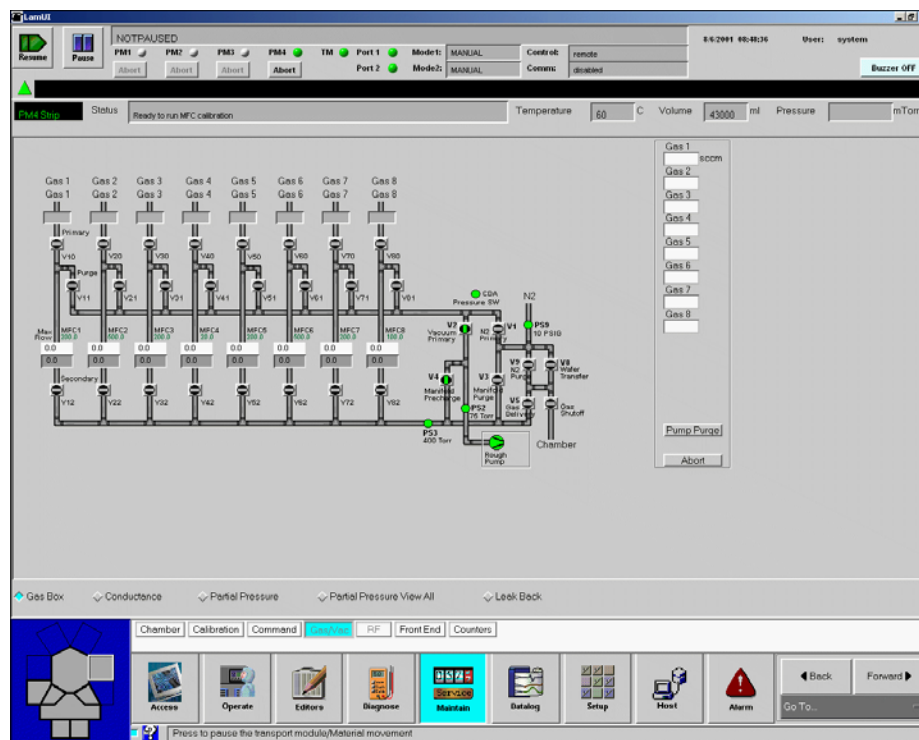
- 2 Set the desired number of pump/purge cycles. In the **Setup\Config IO\Gas Cal/Maintenance** window, set **GasPumpPurgeCycle** to a whole number between 1 and 20 under **Proposed**. The default value is 2. See Figure 7.1–2.

Figure 7.1–2. Setup\Config IO\Gas Cal/Maintenance Window



- Initiate the gas panel pump/purge cycle. In the **Maintain\Gas/Vac\Gas Box** window, click **Pump Purge**. See Figure 7.1–3.

Figure 7.1–3. Maintain\Gas\Vac\Gas Box Window



As the pump/purge cycle proceeds, the **Status** window (in the top left area of the window) displays *gasBoxPumpPurge* and then cycles through *forwardPurgeState* and *fullVentState*.

When the pump/purge cycle ends, the **Status** window displays *pumpPurgeDone* and then *idle*.

- Click **Abort** to abort the pump/purge cycle. This command pumps down the gas panel.

This step completes the procedure.

## Procedure

### *Performing a Pump/Purge Cycle on the Gas Panel*

---

## 7.2

# ***Measuring the Gas Panel Leak Rate***

---

Use this procedure to measure the gas panel leak rate on the 2300 Microwave Strip Module. The leak rate is the rate that the system pressure increases when the chamber is at vacuum and the pressure control gate valve is closed.

This procedure contains the following sections:

- "Testing the Gas Panel Leak Rate."
- "Completing the Procedure."

## **Reference Documentation**

- *2300 Microwave Strip Module Maintenance* manual
- *2300 Microwave Strip Module Operation* manual
- *2300 Transport Module Operation* manual
- *2300 Transport Module Maintenance* manual
- *2300 Etch Systems Safety* manual

## **Equipment Required**

None

## **Materials**

None

## ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## **Safety**

### ***Electrical Work Type***

Type 2 task involved.

### ***Lockout/Tagout***

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### ***Ergonomics***

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### ***Personal Protective Equipment***

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

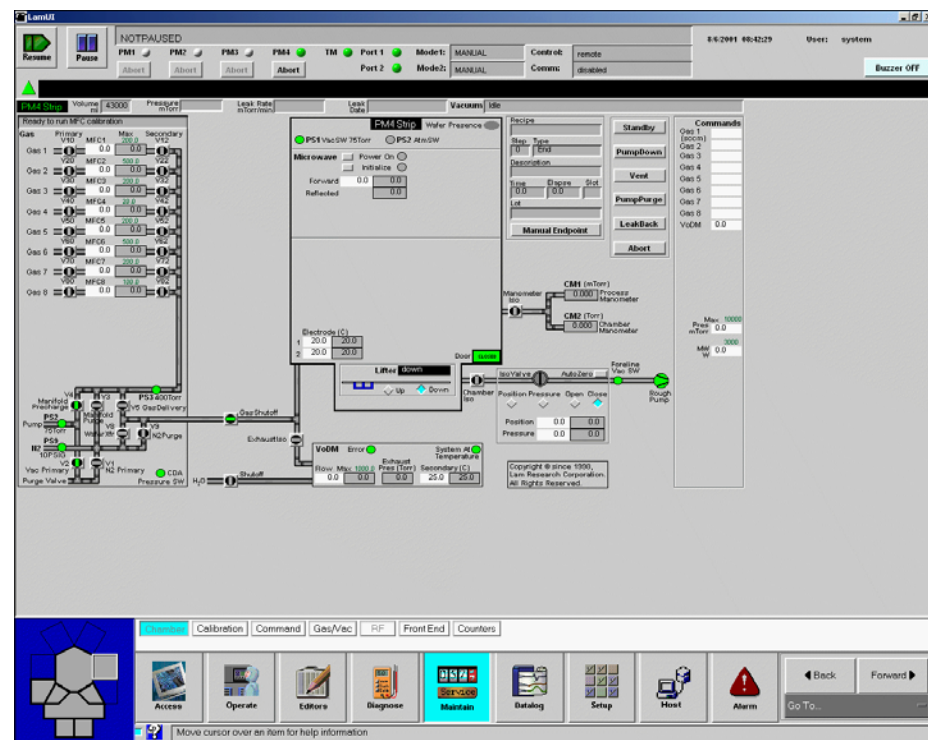
- Ensure that the system status is idle.

## Procedure

### Testing the Gas Panel Leak Rate

- To test the gas panel leak rate,
  - 1 Select the **Maintain\Chamber** window in the UI. Select the strip PM on the station locator in the lower left screen. See Figure 7.2–1.

Figure 7.2–1. Maintain\Chamber Window



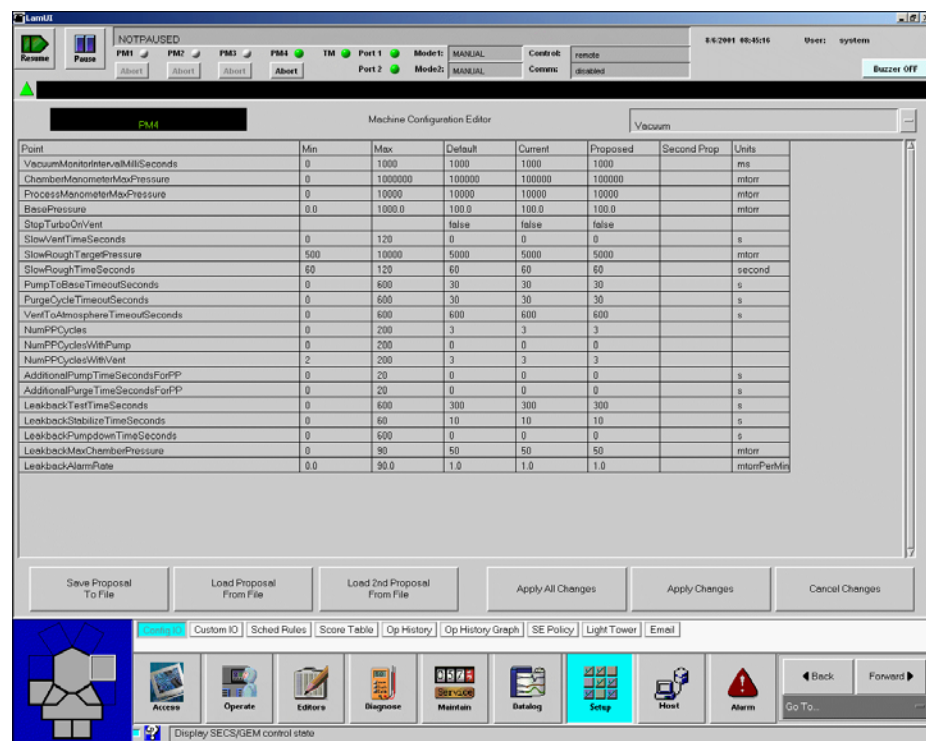
**Note** Use the chamber leak rate value to calculate the gas panel leak rate.

- 2 In the **Setup\Config IO\Vacuum** window, verify that the applicable configuration parameters are set to the proper values. See Figure 7.2–2.

The chamber leakback check is terminated after the time specified by the *LeakbackTestTimeSeconds* setting (default value is 300 seconds) or when the chamber pressure rises above the value specified by the *LeakbackMaxChamberPressure* setting.

An alarm posts if the leak rate is greater than the value specified by *LeakbackAlarmRate*.

**Figure 7.2–2. Setup\Config IO\Vacuum Window**



- 3 Isolate the gas flow from the gas box by closing the isolation valve located on the right side of the gas box.



- 4 On the **Maintain\Chamber** page, set the MFC flow rate to the maximum value. Allow the gas lines to pump for at least one hour.
- 5 Set the MFC flow rates to 0.
- 6 Initiate the chamber leakback rate test sequence. In the **Maintain\Chamber** window, click **LeakBack**. See [Figure 7.2–1](#).
- 7 When the leakback test is complete, set the MFC flow rate to the maximum value to test the gas line.
- 8 Record the chamber pressure that appears on the **Maintain\Chamber** page.
- 9 Isolate the chamber by closing the chamber isolation valve. Note the time when the chamber isolation valve is closed.
- 10 Record the chamber pressure that appears on the **Maintain\Chamber** page 300 seconds after closing the chamber isolation valve.
- 11 Open the chamber isolation valve.

### Completing the Procedure

► **To complete the procedure,**

- 1 Calculate the gas line leak rate (rate-of-rise) in mtorr. Use the following formula:

$$\frac{\text{ending pressure} - \text{starting pressure}}{5} - \text{chamber leakback rate} = \text{gas line leak rate (mtorr/minute)}$$

- 2 A new or completely clean chamber should have a leak rate less than or equal to 3.0 mtorr/minute. If the leak rate is greater than 3.0 mtorr/minute, repeating the previous test may improve the results.
- 3 If, when the reaction chamber is completely clean, a second test yields a leak rate greater than 3.0 mtorr/minute, a chamber leak exists.

**Note** Between cleaning cycles, outgassing will cause a leak rate greater than 1.0 mtorr/minute. Customer experience determines when unsatisfactory uniformity, etch rate, or particle counts require chamber cleaning. Cleaning cycles depend on type of process used and number of wafers run. Users must determine satisfactory leak rate test results between cleans.

This step completes the procedure.

## 7.3

# ***Calibrating the Process Gases***

---

Use this procedure to calibrate the process gases on the 2300 Microwave Strip Module.

### **Reference Documentation**

- 202-8032358-001, Calibrating the Process Gases
- *2300 Microwave Strip Module Operation* manual
- *2300 Etch Systems Safety* manual
- [Section 7.2, "Measuring the Gas Panel Leak Rate."](#)

### **Equipment Required**

None

### **Materials**

None

### ***Waste Material Disposal***

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## Safety

### *Electrical Work Type*

Type 2 task involved.

### *Lockout/Tagout*

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.

### *Ergonomics*

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

### *Personal Protective Equipment*

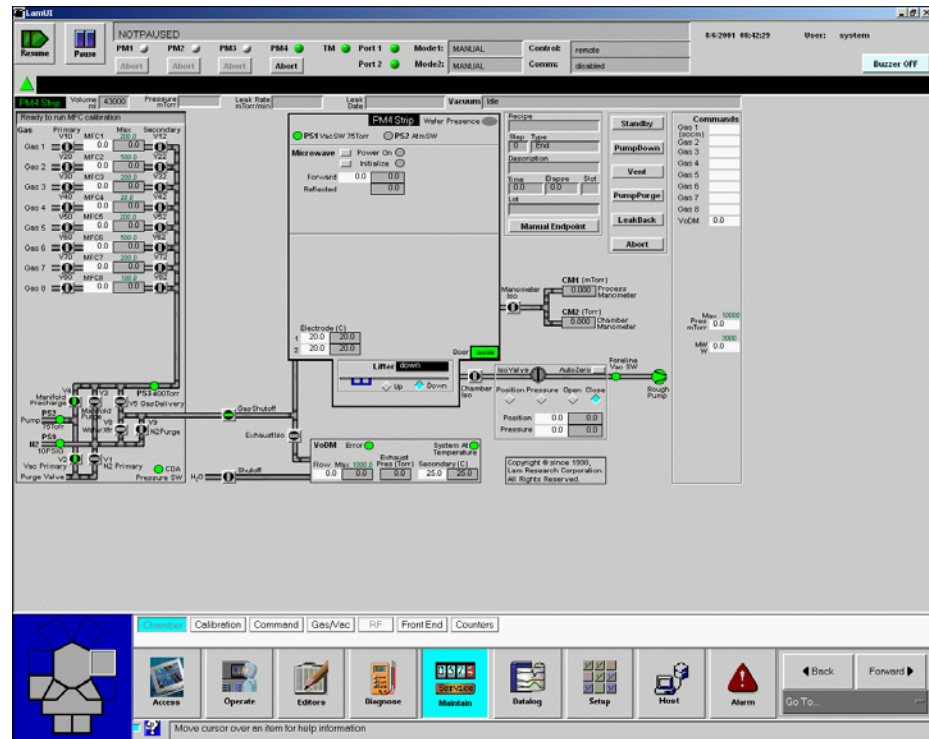
Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## Preparation

- ▶ **To prepare the system,**
  - 1 Ensure that the system is in working condition.
  - 2 Select the **Maintain\Chamber** window in the UI. Select the strip PM on the station locator in the lower left screen. See [Figure 7.3–1](#).

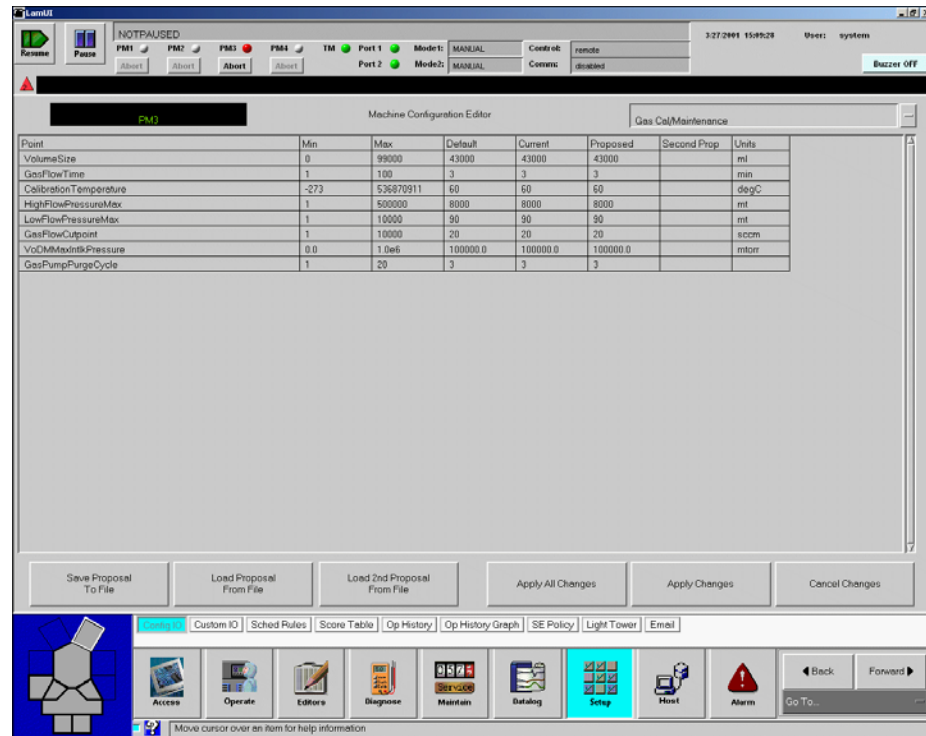
- 3 Verify that the chamber is pumped down to base pressure. Observe the process manometer (CM1) in the **Maintain\Chamber** window. See Figure 7.3–1.

Figure 7.3–1. Maintain\Chamber Window



- 4 Go to the **Maintain\Chamber** window and perform a chamber leak rate test. Verify the chamber leak rate is less than 1.0 mtorr/minute before continuing. See Section 3.4, "Measuring the Chamber Leakback Rate."
- 5 Perform a gas panel leak rate test. See Section 7.2, "Measuring the Gas Panel Leak Rate." Verify that the leak rate is less than 1.0 mtorr/minute.
- 6 Set the electrode and heated liner temperatures to 25 degrees Celsius. In the **Setup\Config IO\Gas Cal/Maintenance** window, set *Calibration Temperature* under Proposed to 25. Ensure that temperatures (under Current) have stabilized. See Figure 7.3–1.

Figure 7.3–2. Setup\Config IO\Gas Cal/Maintenance Window



## Procedure

### ► To calibrate the process gases,

- 1 Go to the **Maintain\Chamber** window and select the process gases and gas flow setpoints of the gases that you want to calibrate.

**Note** Do not calibrate H<sub>2</sub>O VoDM-A.

- 2 Select the **Start** button. The calibration error should be less than 5 percent for all gases.

## 7.4

# ***Removing and Installing the Mass Flow Controllers***

---

Use this procedure to remove and install the mass flow controllers (MFC) on the 2300 Microwave Strip Module gas panel.

This procedure contains the following sections:

- "Removing the MFCs."
- "Installing the MFCs."
- "Completing the Procedure."

### **Reference Documentation**

- 202-8032359-001, Removing and Installing the Mass Flow Controllers
- 2300 Microwave Strip Module Operation manual
- 2300 Transport Module Operation manual
- 2300 Transport Module Maintenance manual
- 2300 Etch Systems Safety manual
- Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."
- Section 3.4, "Measuring the Chamber Leakback Rate."
- Section 7.1, "Performing a Pump/Purge Cycle on the Gas Panel."
- Section 6.4, "Performing a Partial Pressure Test."
- Section 7.3, "Calibrating the Process Gases."

### **Equipment Required**

- Allen key set, standard

- Wrench, open end, 7/8-inch

## Materials

None

## Waste Material Disposal

Various maintenance procedures generate waste products such as lint-free wipes soaked in IPA, DI water, excess grease, nylon scrubbing pads such as Scotch-Brite. Treat all waste as hazardous. If special disposal is required, observe the proper local, state, and federal government laws and regulations. For additional process generated by-product and exposure information, see the Safety section of this manual.

## Safety

### Electrical Work Type

Type 1 task involved.



#### **Danger**

**Chemical Hazard:** When performing maintenance on the gas panel, or when opening the gas delivery system, make sure that the manual valve(s) on the inlet side of the gas panel are closed and locked and tagged to prevent accidental opening.

### Lockout/Tagout

Lam recommends that you carefully follow the lockout/tagout procedures described in the Safety section of this manual before servicing the unit. Only authorized technicians should perform these tasks.



## **Ergonomics**

Use proper lifting and handling when working on the system. Improper ergonomic handling may result in injury. Some tasks outlined in this procedure may require excess reach by personnel of shorter height. Lam recommends using a suitable footstool, stepladder, or appropriate means when performing these tasks.

## **Personal Protective Equipment**

Wear protective, cleanroom-approved clothing, solvent gear, gloves, safety glasses and approved respiratory protection whenever appropriate. See the Safety section of this manual for additional safety and exposure information.

## **Preparation**

- ▶ **To prepare the system,**
  - 1 Ensure that system is in process idle state.
  - 2 Close, lockout, and tagout the manual gas valves on the gas panel. This prevents backstreaming of N<sub>2</sub> into the process gas lines.
  - 3 Perform a pump-and-purge cycle on the reaction chamber. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber."](#)
  - 4 Perform a pump-and-purge cycle on the gas panel. See [Section 7.1, "Performing a Pump/Purge Cycle on the Gas Panel."](#)
  - 5 Verify the chamber leak rate is less than 3 mtorr/minute. See [Section 3.4, "Measuring the Chamber Leakback Rate."](#)
  - 6 Test the gas box leak rate of the MFC that you are replacing. See [Section 7.2, "Measuring the Gas Panel Leak Rate."](#) Insure the gas box leak rate is less than 1.0 mtorr/minute before continuing on with the procedure.

## Procedure

### *Removing the MFCs*

► **To remove the MFCs,**

- 1 Open the gas panel.
- 2 Locate the MFC that you want to remove.
- 3 Disconnect the ribbon cable from the MFC.
- 4 Use the 3/4-inch open-end wrench and crack the fittings loose.
- 5 Remove the screws that secure the MFC to the gas panel. Retain the screws for use when replacing the MFC.

**Note** You may need to loosen the adjoining MFC fittings.



**Caution**

**Mechanical Hazard:** When performing the next step, take care not to bump or scratch the MFC VCR glands.

- 6 Lift the MFC straight out from the gas panel to remove the MFC.
- 7 Remove the old seals from the MFC and discard them.
- 8 Remove the MFC adapter plate from the removed MFC to the new MFC.
- 9 Install new VCR gaskets onto the new MFC.

### *Installing the MFCs*

► **To install the MFCs,**

- 1 Mount—but do not secure—the new MFC in the gas panel.
- 2 Turn the MFC VCR nuts onto the fittings until they are finger tight.
- 3 Use the screws you retained when you removed the MFC and secure the MFC to the gas panel.

- 4 Tighten the VCR fittings not more than one half turn beyond hand tight.
- 5 Connect the MFC ribbon cable.

### ***Completing the Procedure***

- ▶ **To complete the procedure,**
  - 1 Perform 20 pump-and-purge cycles on the chamber and gas panel. See [Section 3.3, "Performing Pump-and-Purge Cycles on the Chamber,"](#) and [Section 7.1, "Performing a Pump/Purge Cycle on the Gas Panel."](#)
  - 2 Perform a leak rate test on the gas panel. See [Section 7.2, "Measuring the Gas Panel Leak Rate."](#)
  - 3 Slowly open the MFC manual valves. Allow the gases to flow for five minutes.

**Note** For best results, ensure that MFCs have been powered up for at least two hours before performing gas calibrations.

- 4 Perform gas calibrations on the gas channels that have been serviced. See [Section 7.3, "Calibrating the Process Gases."](#)
- 5 Perform the partial pressures test. See [Section 6.4, "Performing a Partial Pressure Test."](#)
- 6 Record observations and work performed in the system logbook.
- 7 Place caps on both fittings of the removed MFCs.

This step completes the procedure.

## Procedure

### *Removing and Installing the Mass Flow Controllers*

---

## 7.5

### *Setting the PRK Flow*

---

[To be supplied.]



## Endpoint Procedures

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[To be supplied.]





## Numerics

- 2300 etch system software 25
- 2300 Microwave Strip Module
  - Optional features 4
  - overview picture 5
  - standard configuration 4

## C

- chamber
  - leakback rate 69
  - pump/purge 65
  - pumping down 57
  - vent 61
  - wet clean 73, 81
- chamber manometer (CM1-100 mtorr)
  - calibrating 123
- chamber manometer (CM2-10 torr)
  - calibrating 126
- chamber walls and surfaces
  - clean 76
- chemicals,maintenance 14
- clean
  - wet clean the chamber 73, 81
- conductance learn 131
- custom I/O pages,using 28

## D

- double containment 24

## E

- electrical isolation 12
- electrical work types
  - Type 1 11
  - Type 2 11
  - Type 3 11

- Type 4 11
- emissions, air 7
- EMO system
  - limitations 6
- equipment
  - recycling, refurbishment, and reuse of 8
- ergonomics 9, 25

## G

- gas containment features 24
- gas panel
  - leakback rate 153
  - pump/purge 147
- gas panel interlocks
  - quarterly PM 45
- gas panel safety 24
- gate slot valve
  - clean 77

## H

- HAPs (hazardous air pollutants) 7
- hazardous air pollutants (HAPs) 7
- hazardous operations
  - chemicals 16
  - electrical 17
  - mechanical 18
  - thermal 17
- hazardous waste 8

## I

- interlocks
  - batch transfer arm extension 21
  - general information 19
  - loadlock door 21
  - loadlock laser 21
  - process module 22
  - slot valve close signal to PM 20
  - slot valve open 20

---

TM 20

## **L**

leakback rate  
    chamber 69  
    gas panel 153  
lockout/tagout 11

## **M**

maintenance safety guidelines 14  
manometer  
    validating the calibration 127  
manometers  
    calibrating 121  
manual changes 1  
manual mode 19  
material safety data sheets (MSDS) 8  
MFCs  
    remove & install 163  
MSDS (material safety data sheets) 8

## **P**

partial pressure test 137  
PEL (permissible exposure limit) 15  
perfluorocarbons (PFCs) 7  
PFC (perfluorocarbons) 7  
plasma  
    neutralize 28  
preventive maintenance  
    quarterly 31, 35, 39, 43  
process gas  
    calibrate 159  
process gas isolation 13, 23

## **R**

recipes, maintenance 28  
reference documentation  
    2300 Microwave Strip Module 1

return system to production mode 52

## **S**

### **Safety**

chemicals used during maintenance 14  
electrical isolation 12  
electrical work types 11  
EMO 6  
environmental regulations 7  
ergonomics 9, 25  
gas panel safety 24  
HAPS 10  
hazardous operations 16  
interlocks 19  
introduction 6  
lockout/tagout 11  
manual mode 19  
PM interlocks 22  
point-of-use abatement 7  
process gas isolation 13, 23  
protective gear 10  
startup after servicing 12  
system checks 19  
TM interlocks 20  
training 6  
system precheck, quarterly PM 46

## **T**

TLV (threshold limit value) 15

## **U**

ultrapure water  
    annual amount 15

## **V**

VOC (volatile organic compounds) 7  
volatile organic compounds (VOC) 7

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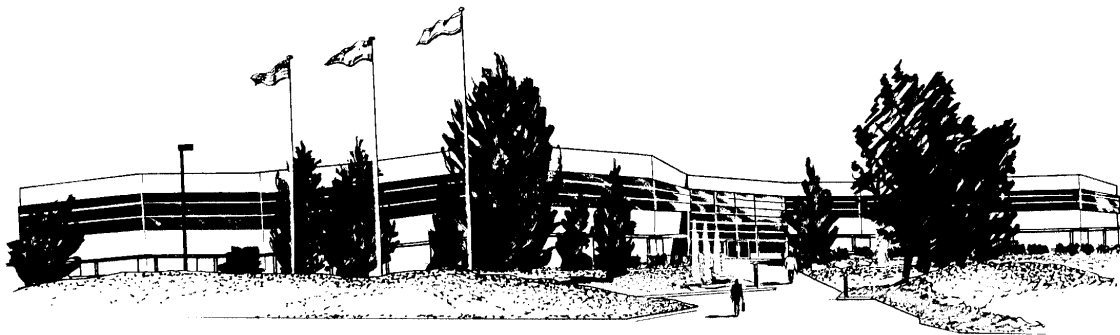
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tsic@lamrc.com  
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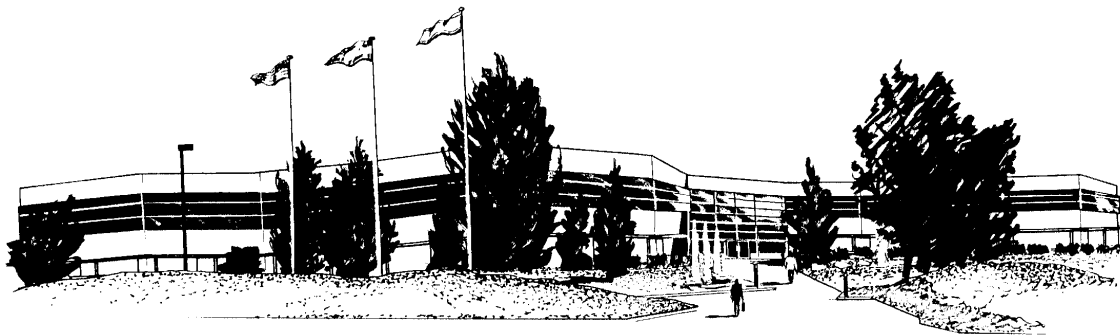
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