Matrix 10X—especially the industry-proven Matrix 105—is one of the most trusted plasma asher and descum platforms worldwide. Its excellent process repeatability, uniformity, and long-term stability make it a perfect fit for compound semiconductor fabs, supporting low-temperature applications up to 250°C for 2- to 6-inch wafers. Many fabs run dozens, even hundreds, of these systems every day.

For more than 10 years, SemiStar Corp has specialized in refurbishing, upgrading, servicing, and supplying spare parts for Matrix 10X and Matrix 105 systems. Our deep engineering experience and large inventory have earned strong recognition from customers around the world.

If you need equipment, maintenance service, or OEM-quality spare parts, contact SemiStar at sales@semistarcorp.com—we're ready to support your fab with reliable, cost-effective solutions.

SECTION 1

SYSTEM OVERVIEW

1.1 System Description

The System One Model 105 is a photoresist removal system that reduces carbon-chain polymer resists in a non-damaging environment. Its design incorporates closed-loop control of vital process parameters, which, in turn, eliminate device damage that can be both thermal and electrical.

The Model 105 uses a production-proven "pick and place" cassette-to-cassette wafer transport system. This allows individual wafer selection and automatic group processing of substrates.

The operating system was designed to facilitate ease of operation thereby minimizing training requirements. Through a series of menus utilizing a cursor select function programming method, the operator is able to select and execute process recipe changes and process wafers.

The system's modular architecture allows for significant reductions in repair time. Components have been chosen for their quality, reliability and serviceability thereby increasing uptime.

1.1.1 Main Console Assemblies

Process Module
Operator Interface Module
Wafer Transport Module
Card Reader Module
Elevator Module
Microprocessor Controller Module
MFC Module

1.1.2 Power Supply Console Assemblies

RF Generator
DC Supply
AC Distribution
Temperature/Pressure Control Assembly
Nitrogen Distribution Panel

1.1.3 Vacuum Pump

Vacuum Hose
Ballast Assembly

1.2 Features

* SINGLE WAFER PROCESSING
* WAFER CAPABILITY: 100 mm, 125 mm and 150 mm
* CASSETTE HANDLING
* ROBOTIC WAFER HANDLING
* MICROPROCESSOR CONTROLLED
* TIMED OR ABSOLUTE ENDPOINT DETECTION

* ISOLATED REACTOR DESIGN (PATENTED)
* CLOSED LOOP TEMPERATURE CONTROL OF THE WAFER CHUCK 150 TO 250° C.
* PINS UP AND DOWN
* DOT MATRIX PLASMA DISPLAY
* MODULAR DESIGN
* DIAGNOSTICS
* PHASE MAGNITUDE TUNER
* BUTTERFLY-TYPE PRESSURE CONTROLLER
* MULTI-STEP PROCESS CONTROL
* QUARTZ CHAMBER WITH DISPERSIVE GAS PLENUM AND QUARTZ ION SHIELD BAFFLE
* REDUCTION IN OVER HEAD TIME
* FULL MESH ELECTRODE CONFIGURATION

1.2.1 Throughput and Uniformity Specification

Process Performance Typical Positive Resist on 150mm Substrate

Rates:	1.2-2.5 u/min*
Uniformity:	(Max-Min)/(2Avg)
Strip:	± 10%
Descum:	± 5%
Particulate:	Less than 0.10 particles of 0.3 microns or greater in size will be added per sq. cm.
Throughput:	40-60 WPH*

* Depending on pattern density, substrate size, and prior process treatment

1.2.2 Damage Specification

Measured by customer on-site following process optimization

C.V. Shift: Less than 0.1 volts from control (on 1000 A Oxide)

Vt Shift: Less than 10% shift on 98% of the measurements with no point shifted greater than 20%.

Consult Matrix Process Engineers for Test details.

1.2.3 Reliability Specification

MTBF:	≥ 450 Hours
MTTR:	~ 4 Hours

Where: MTBF = mean time between failures or average time between equipment failures.

MTTR = mean time to repair or average time to return equipment to operational status after a failure, not including requalification time.

The above failure incidents do not include scheduled maintenance or operator activities associated with normal equipment functioning such as

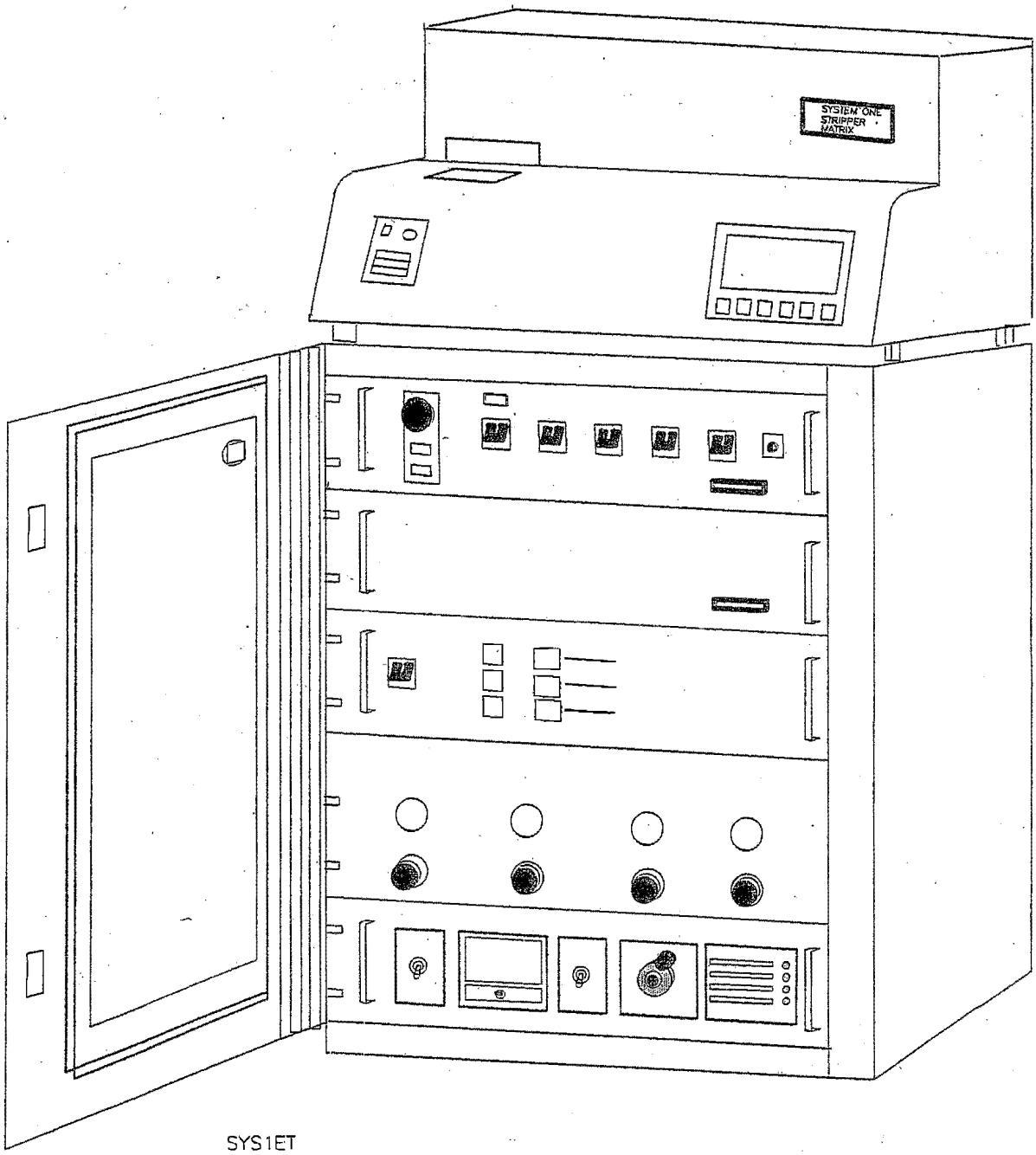
loading and unloading cassettes, initiating runs and initializing process parameters. Any required monitoring or adjustment of equipment settings and parameters after loading wafers and initiating the process will be considered a failure and counted in the calculation of MTBF and MTTR.

The word "time" used in the above definitions is defined as operating time; i.e, time the machine is idle for lack of material, operator, etc. is not included in the accumulation of MTBF.

A failure is defined as any malfunction or interruption of operation that prevents the system from performing its intended function, including but not limited to:

* Electronic or mechanical failure
* Process degradation, with any specific parameter failing to meet the stated requirements
* Contamination exceeding the stated maximum levels
* Any malfunction resulting in material damage

FIGURE 1-1: STRIPPER SYSTEM



SYS1ET

1.3 Principles of Operation

The system is process driven by menu commands or by the insertion of a programmed magnetic card. It functions in the following sequence:

1.3.1 Loading Transport

One wafer at a time is robotically picked from a cassette, transported to and deposited in the reaction chamber. The chamber door closes and the chamber is automatically sealed from the atmosphere.

1.3.2 Process

Through a series of microprocessor controlled operating steps, the wafer is processed, i.e., the photoresist is removed. The processing steps include the following:

a) The chamber is evacuated to a preset, process selected pressure. The wafer can be lowered to the chuck for preheating.

b) Oxygen flow to the chamber is initiated. Both gas flow and pressure are controlled at their setpoint values.

c) After the wafer has been preheated, a gas plasma is produced by exposing oxygen to radio frequency energy from a generator through a patented electrode design operating at a frequency of 13.56 MHz.

d) A maximum of three steps, in addition to overetch, can be preprogrammed for multiple processes. Each step allows independent control of the RF power, oxygen flow, pressure and up/down movement of the wafer.

e) The gas plasma contains monatomic oxygen that reacts with the photoresist to form gaseous byproducts. These byproducts are then removed from the chamber by the vacuum pump.

f) A light spectrum detector is used to monitor the illuminated plasma and determine the process endpoint. Either absolute or timed endpoint can be used.

1.3.3 Process Deactivation

When the processing of the wafer is completed (photoresist removed), the power and gas flow are stopped. Nitrogen is then used to restore the chamber to atmospheric pressure.

1.3.4 Unloading Transport

The wafer is robotically returned to its original position and orientation in the cassette. Subsequent wafers are similarly selected, transported, processed and returned to the cassette.

1.4 Equipment Specifications

TABLE 1-1: EQUIPMENT SPECIFICATIONS

EQUIPMENT SPECIFICATIONS	
ENVIRONMENTAL REQUIREMENTS	
AIR CONDITIONS	
Temperature	20-30°C
Humidity	Non-condensing
GAS AND LIQUID RESOURCES	
VACUUM (FROM SYSTEM VACUUM PUMP)	
Connection/Dimensions	KF40
Equipment Pipe Material	Plastic (supplied) 316 SS (optional)
COOLING WATER (100% distilled water should be used with the Matrix recommended self-contained water temperature controller.)	
Inlet Pressure	2.75 to 4.13 bar (40 to 60 psig)
Inlet Temperature	23 to 25°C
Connection/Dimensions	3/8" Swagelok
Equipment Pipe Material	3/8" Polypropylene tubing
Consumption per Unit	8.0 LPM
Recommended POU Filter	5.0 Micron (nominal)
NITROGEN	
Inlet Pressure	5.51 bars (80 psig)
Connection/Dimensions	Compression -- 1/4"
Equipment Pipe Material	316 Stainless Steel
Consumption per Unit	17.5 LPM (maximum) or 35.5 CFH
Gas Purity	99.9%
Recommended Particle Purity	0.2 um ABS
Gaseous Impurities	< 0.1% Total
POU Filter	Internal 0.2 Micron

OXYGEN	
Inlet Pressure	0.62 bars (9 psig)
Connection/Dimensions	VCR -- 1/4"
Equipment Pipe Material	316 Stainless Steel
Consumption per Unit	5 LPM
Gas Purity	99.8%
Recommended Particle Purity	0.2 um ABS
Gaseous Impurities	< 0.2% Total
POU Filter	Internal 0.2 Micron

DIMENSIONS

Transport Into Facility

	Crate #1 (Power Supply)	Crate #2 (Main Console)	Crate #3 (Cabling, etc.)
Length (m)	1.00	1.00	0.46
Width (m)	0.90	1.02	0.46
Height (m)	1.27	0.90	0.38

Total Weight	295 kg

Equipment Only

	(Power Supply)	(Main Console)
Length (m)	0.71	0.71
Width (m)	0.64	0.64
Height	0.92	0.56

Total Weight	201 kg

ELECTRICAL VALUES

Voltage	200 to 240 vac
Frequency	50 or 60 Hz
Phase	Single
Maximum Power per Unit	6.3 kW
Normal Power per Unit	2.1 kW
Isolated Grounding	#10 AWG with THHN Insulation
Grounding Resistance	<1 Ohm at 50 or 60 Hz

THERMAL LOAD	
Exhaust Environment Cooling Water	1 kW 750 W 1 kW

1.4.1 Physical Specifications

Component	Width	Depth	Height	Weight
Main Console	25" (64 cm)	28" (71 cm)	22" (56 cm)	100 lbs 45 kg
Power Supply	25" (64 cm)	28" (71 cm)	36" (89 cm)	310 lbs 141 kg
Overall	25" (64 cm)	28" (71 cm)	58" (147 cm)	410 lbs 186 kg
Vacuum Pumps				
Edwards E2M30	24" 61 cm	8" 21 cm	11" 28 cm	75 lbs 40 kg
Edwards E2M40	10" 25 cm	26" 66.5 cm	15.5" 39.5 cm	159 lbs 72 kg
Leybold D30A	28" 71 cm	12" 30.5 cm	14" 36 cm	163 lbs 73 kg
Oil Filtration Sys				
Edwards E0F2500	15" 38.5 cm	12.6" 32 cm	17" 43.5 cm	55 lbs 25 kg
Edwards E0F4000	15" 38.5 cm	12.6" 32 cm	17" 43.5 cm	58 lbs
Leybold OF1000	14" 35.5 cm	16" 40 cm	11" 28 cm	
Temperature Controller				
Tempryte HS-0550-AC-SX	17" 43 cm	27" 69 cm	25.5" 65 cm	250 lbs 114 kg

1.4.1.1 Vacuum Pump (Optional)

The Edwards E2M30 vacuum pump is the usual vacuum system used with your Model 105. Customers can select from two other optional pumps -- Leybold-D30A or Edwards E2M40 depending on process requirements and other considerations. Your fab may use a different pump depending on location and application. Please refer to the manual which accompanied your system's vacuum pump for the proper physical specifications.

NOTE:

The Edwards EOF2500 Oil Filtration System is used with the Edwards E2M30 vacuum pump while the EOF4000 Oil Filtration System works with the E2M40 pump. The Leybold-Heraeus OF1000 Oil Filtration System is used with the L-H D30 vacuum pump. Space should be left around the oil filtration system to allow for service and maintenance.

NOTE:

The Water Temperature Controller must be located within 15 feet of the Model 105 to ensure proper operation. The preceding vacuum pumps and water temperature controllers are optional with your system. Your fab may use a different pump or water temperature controller depending on location and application. Please refer to the manual which accompanied your system's vacuum pump or temperature controller for the proper physical specifications.

1.4.1.2 Equipment BTU Dissipation (Maximum Normal Operation)

TABLE 1-3: EQUIPMENT BTU DISSIPATION

Equipment	Heat Dissipation (per hour)
Main Console	4,500 BTU
Power Supply Console (without pump or water temperature controller)	2,800 BTU
L-H D30A 1 1/2 HP Pump	3,800 BTU
L-H D30A 2 HP Pump	8,000 BTU
L-H D60A 2 HP Pump	5,000 BTU
L-H D60A 3 HP Pump	6,500 BTU
L-H D90A 3 HP Pump	6,500 BTU
Edwards E2M30 Pump	5,088 BTU
Edwards E2M40 Pump	6,500 BTU
Water Temp. Controller (dissipated in room air)	
-- Tempryte HS-0550-AC-SX	6,000 BTU

1.4.2 Electrical Specifications

1.4.2.1 Main Console

RF, DC and 24 VAC and 185 VDC are supplied by the Power Supply Console.

1.4.2.2 Power Supply Console

Powered by input voltage of 190-240 VAC tappable selection, 50/60 Hz, single phase, main circuit breaker rating 30 amps. Actual voltage must be specified at the time of installation. Unit supplied with a L6-30P plug with 10 feet of line cord.

1.4.2.3 Vacuum Pump

208 VAC, single phase, 60 Hz, is standard. A 20 amp service is provided by the Power Supply Console at the same voltage supplied to the console. Other voltages and 50 Hz are available

as options.

The Edwards EOF2500, EOF4000 and Leybold-Heraeus OF1000 Oil Filtration Systems are wired for 115 Volt, single phase, 50/60 Hz operation. The Oil Filtration Systems use a standard 115 V, 20 Amp wall outlet.

The distance from the vacuum pump to the Edwards EOF2500 and EOF4000 filtration system should not exceed 8 feet. The distance from the vacuum pump to the Leybold-Heraeus OF1000 should not exceed 4 feet. For 230 Volt operation, see the manual that accompanied your oil filtration system.

NOTE:
The Edwards E2M30, Edwards E2M40 and Leybold-Heraeus D30A vacuum pumps are optional with your system. Your fab may use a different pump depending on location and application. Please refer to the manual which accompanied your system's vacuum pump for the proper electrical specifications.

1.4.2.4 Water Temperature Controller

A water temperature controller is provided by Matrix as optional equipment. The electrical requirement for the controller is:

Tempryte HS-0550-AC-SX
208 VAC, 50/60 Hz, Single Phase, 20 Amp circuit

1.4.3 RF Generator Specifications

Frequency:
13.56 MHz

Frequency Stability:
+.005%/-.005% Max.

RF Output Impedance:
50 Ohms

Power Line:
Power supply taps provided 190/208/220/240 VAC±5%, single phase, 50-60 Hz, at 10 Amps or less at full power output. There are two separate power relay coils -- one for 190 AC operation and one for 208-240 VAC operation.

RF Power Control:
Automatically forward power leveled.

Maximum Power Output:
More than 650 Watts.

Harmonic Distortion:
All harmonics are more than 55dB below the fundamental. Noise, hum and ripple; more than 30dB down at maximum power output.

AC Line to Power Regulation:
0.25% maximum change in output power for 7.5% change in the AC line voltage.

Power Output Meter:
0 to 750 Watts with accuracy of 4% of full scale. Forward and reverse power by switch selection.

Auto. Forward Power Leveling:
1 to 650 Watts internally or externally controlled.

Power Foldback Protection:
Automatic. Occurs when reverse power reaches 150 Watts, or power amplifier current exceeds preset limit.

Auto. Forward Power Regulation:
+3%/-3% typical, +5%/-5% maximum of set power for load variation from 1.1 VSWR to :1 VSWR (within foldback Limits).

Cooling:
Water flow at 1.5 gal./min. minimum. Connections provided to accept 3/8" Swagelok.

Maximum Water Inlet Temperature:
+27°C

1.4.4 Water Temperature Controller Specifications

Tempryte HS-0550-AC-SX

Operating Temperature Range:
20°C to 100°C

Chamber Capacity:
1.5 gals. (6.0 liters)

Heater Capacity:
2000 Watts

Cooling Capacity:
* At 20°C -- 5000 BTU/hour (1466 Watts)
* Compressor is air cooled

Circulating Pump:
* Micro Pump - gear; magnetically-coupled positive displacement carbon vane type.

Pressure:
* 0 to 80 psig (internally adjustable)

1.4.5 Elevator Unit Specifications

Power Requirements:
+24 VDC, 3 Amps
+5 VDC, 2 Amps

Maximum Load:
12 lbs. (5.44 kg)

User Selected Functions (Switch Selected):
* Calibrate -- On/off for carrier plate adjustment
* Carrier Pitch -- 1/16 inch to 1/2 inch increments
* Address -- 1 to 31 addressable units on daisy chain
* Carrier Capability -- 1 to 31

Remote Selectable Functions:
Carrier pitch, carrier capacity and index direction

Data Input/Output:
TTL level, parallel bus with total of 17 active lines:
* 5 lines, address 1 to 31 modules
* 8 lines, bi-directional data
* 3 lines, control
* 1 line, reset

Mating Connectors:
Logic
* 34-pin Scotchflex 3414-6000
Power
* Molex 03-06-1044. Requires 4 female crimp terminal pins, Molex 02-06-1103.

1.4.6 Mass Flow Controller Specifications

Gas Type:
Nitrogen

Gas Flow Rate:
Gas Position 1 is 0 to 5 LPM
Gas Position 2 is 0 to 300 SCCM

NOTE:
When an optional third MFC is used, Gas Position 3 is 0 to 5 LPM.

Accuracy:
±1.0 of Full Scale

Linearity:
±0.5 of Full Scale

Repeatability:
±.2 of Full Scale

Regulation:
±.25 of Full Scale

Temperature Coefficient:
±.1% of Full Scale/^{o}C

Pressure Coefficient:
±.007% of Full Scale/psi (N2)

Temperature (Ambient and gas):
5 to 45^{o}C

Pressure:
* Proof 1500 psig
* Maximum Operating 150 psig
* Pressure Drop 10 to 40 psia

Output Indication:
0 to 5.0 VDC (into 2000 minimum load impedance, short-circuit protected.)

Command Signal:
0 to 5.0 VDC (from voltage source with maximum impedance 2500)

Input power:
+15 VDC (±4%), 25 mA Max
-15 VDC (±4%), 125 mA Max 2.25 Watts Max.

Leak Integrity:
1 x 10^{-9} sccs He

Fittings:
1/4" VCR

Filtration:
20 um Inlet

NOTE:

The mass flow controllers used in the Model 105 are calibrated for 300 sccm and 5 LPM of Nitrogen. Other process gases may be used, however, it is necessary to determine the proper flow rate for the substituted gas using a formula with the appropriate conversion factor. Conversion factors for other gases typically used in the Model 105 are:

Oxygen (O_2)	.99
Helium (He)	1.42
Nitrogen (N_2)	1.00
Nitrous Oxide (N_2O)	.71

The following formula should be used to determine the proper flow rate:

$$\frac{Desired\ rate\ of\ flow}{substitute\ gas\ conversion\ factor} = adjusted\ flow\ rate$$

For example: Required calibration for 150 sccm of Helium.

$$\frac{150}{1.42} = 105.6\ sccm\ flow\ of\ Helium$$

CAUTION:

Conversion of a controller to or from helium may seriously alter dynamic response or stability.

1.4.7 Butterfly Pressure Controller

Input Power:
30 Watts at 90, 115, 230 VAC as required

Input Frequency:
50/60 Hz

Fuse Size:
.5 Amp Slow Blow

Ambient Temperature Range:
0° to 50°C

Input Pressure Signal:
0 to 10 VDC proportional to pressure

Input Impedance:
10K Ohms

Control Accuracy:
.25% of setpoint

Repeatability:
.1% of full scale

Input Command:
RS232C -- Format fixed and

available. All setpoints continuously adjustable plus report command.

Output Command:
RS232C -- Reporting format fixed and available. Reports pressure, stored setpoints, valve position and lock status.

1.4.8 Butterfly Valve

Maximum Pressure Differential:
1 Atmosphere

Full Closed Leak Rate:
<1/10,000 of full scale conductance

Motor Type:
4-Pole stepping motor

Drive Assembly Output Torque:
* Start/Stop -- 240 ounce/inches
* Running -- 430 ounce/inches

Opening and Closing Rate:
300 steps/second maximum;
1 step = 1/2 degree (approx.)

Materials Exposed to Process:
Stainless Steel and Teflon*

* Teflon is a registered trademark of E.I. DuPont Co.

1.4.9 Capacitance Manometer

Manufacturer:
Vacuum General (Tylan General)

Pressure Ranges:
0 to 10 Torr

Recommended Minimum Pressure:
50 mTorr

Accuracy:
1.0% of Reading

Overpressure Limit: 17 PSIA or 125% of F.S.

Response Time: 10 msec

Volume of Sensing Cavity: 17 cc

Materials Exposed to Process:
Inconel & 304 Stainless Steel

Input Power: ±15 VDC (±5%) @ 30 mA

Output Power: 0 - 10 VDC into 5 k Ohm load

Temperature Range: 0 - 45°c

Temperature Effect on Zero:
.01% of F.S./°c

Temperature Effect on Span:
.04% of F.S./°c

Weight: 1.125 lbs. (567 g)

NOTE:
Accuracy includes linearity, hysteresis, long-term stability and reference standards.

Overpressure Without Damage:
1140 Torr (1.5 atmospheres)

Response Time:
5 milliseconds

Volume of Sensing Cavity:
20 cubic centimeters

Materials Exposed to Process:
Inconel, 304 Stainless Steel

Operating Voltage and Current Requirements:
±15 Volts DC at 10 milliamps

Output Voltage:
0 to +10 Volts DC

Minimum Load Impedance:
5 kilohms

Temperature Range
+5°C to +45°C

Temperature Effect on Zero:
.01 percent of full scale/°C

Temperature Effect on Span:
.04 percent of reading/°C

Vacuum General Pressure Display:
80-6

Mounting Position:
Tubulation facing sideways or down, but NOT up

Weight:
1.125 lbs. (510 grams)

1.4.10 Matching Network

Size:
Matching Network -- 12" (30.5 cm) x 8" (20.5 cm) x 5.7" 14.5 cm) -- overall
Control Module -- 4.5" (11 cm) x 7.5" (19 cm) x 3.3" (8 cm) -- overall
3.9" (10 cm) x 6.9" (17.5 cm) -- mounting centers

RF Power:
10 Watts to 700 Watts CW
(<=1% modulation)

Freqency:
13.56 MHz

RF Input Impedance:
50 ohms

RF Output Impedance:
Impedances ranging from 3 ohms to 200 ohms.
Resistive part -- 1.5 ohms to 100 ohms.
Reactive part -- 200 ohms capacitive to 100 ohms inductive.

RF Input Connector:
N receptacle

RF Output Connector:
1/4 x 20 bolt

Matching Response Time:
Settle to P_{rev} < 10W + 4%·P_{fwd} in <4s (from preset, worst case).
Results are usually much better than this.

Matching Accuracy:

Cal. Cond.:
≤2W reflected power (worst case)
<=1W reflected power (typical)
When measured with the same meter and cable as used to calibrate the network, and at the same temperature.

Other Temp.:
<=5W reflected power (worst case)
When measured with the same meter and cable as used to calibrate the network, but at a different temperature.

Other Cond.:
P_{rev} = <5W = 3%·P_{fwd}

Power Requirements:
±15 Volts at 1.5 Amps supplied by user

Electrical Interfaces:
Computer Control/Status
Manual/Control Status
±15V Power

Operator Interfaces:
LEDs, Pots and a switch

Temperature:
10°C to 50°C internal ambient (during operation)
20°C to 40°C internal ambient (during calibration)

1.4.11 Heater Chuck

Resistant Heaters:
Ambient to 250°C Maximum

1.5 Safety

This section provides information intended to prevent damage to the Matrix Model 105 or injury to operation and maintenance personnel.

All hazards are not covered, only those most prevalent and serious. Your full understanding of the capabilities and limitations of this equipment is necessary for safe and efficient operation.

When operating and maintaining the Model 105, the following safety procedures and precautions must be followed to avoid certain hazards.

Observe all warnings and cautions. Their purpose is to protect personnel from injury and long term health hazards and to protect the machine from damage.

NOTE:
A WARNING provides information concerning a hazard to personnel. A CAUTION provides information concerning a hazard to equipment. A NOTE provides general supplementary information.

The Model 105 presents certain hazards if operated or maintained improperly. These fall into the following categories:

* Electrical hazards.
* RF radiation hazards.
* Process gas hazards.
* Process byproduct hazards.
* Oxygen hazards.
* Thermal hazards.

1.5.1 Electrical Shock Hazards

The 105 requires electrical power which is distributed through the machine. While no high AC Main (208 volts) exists in the Main console, it must be remembered that 185 VDC are present. This voltage is fed from the Power Supply Console to the Main Console to power the display. This voltage is present at all times the system is powered up and must be treated with the utmost caution.

There is also 120 VAC present for the chuck heaters which requires caution when working beneath the chamber assembly.

Safety interlocks are installed to shut off electrical power to the system when any external cover or module is opened or removed. However, even with the power off, there are some hazards from capacitors which can store energy for long periods of time. These should be discharged to ground before attempting any maintenance.

When certain maintenance functions are performed these interlocks may need to be defeated. Operation of a system with an interlock defeated must only be done when absolutely necessary and only by a qualified trained, competent individual.

Handling the system in this state is not recommended and Matrix Integrated Systems assumes no liability for injuries or deaths caused by operation with interlocking devices defeated. Caution and safety measures characteristically taken with all high energy RF generators and AC and DC circuitry is imperative.

1.5.2 RF Radiation Hazards

The RF energy used to operate a glow discharge is provided by a solid state RF generator which can operate at up to 650 Watts in Continuous Wave (CW) mode. Its frequency is 13.56 MHz. At these powers and frequency, unless shielded, the RF radiation is sufficient to cause surface radiation burns.

Depending on proximity, these burns can be serious enough to cause significant injury to personnel. Under normal operating conditions the Model 105 is properly shielded. RF power supplies and their associated circuitry are extremely dangerous and should be handled only by trained, competent maintenance technicians.

WARNING:

Do not operate the RF generator with any of its covers removed, or any covers on the 105 removed. Lethal radiation hazards exist.

1.5.3 Process Gas Hazards

The standard 105 process uses two complex process gases: O_2 or forming gas (5% to 15% H_2 in N_2), depending on user application. O_2 is an oxidant and supports combustion. It must be handled with care. Forming gas is non-toxic and odorless. It is flammable and never should be stored at 125° F or greater. Inhalation of forming gas should be avoided.

1.5.4 Process Byproduct Hazards

The stripper byproducts found in the vacuum fluid and on the reactor surfaces of the Model 105 should be treated as potentially hazardous. Depending upon specific process parameters and choice of photoresists, organic and inorganic acids may be present in used pump fluid.

WARNING:

Skin, eye and respiratory contact with these products (i.e., with the used fluid) should be avoided.

Due to the variations in chemistry employed to meet application requirements, the exact constituents of effluents from this process family cannot be defined. However, the following general precautions should be observed:

* Solvent proof neoprene or viton gloves should be worn while maintaining the reactor surfaces and while servicing the vacuum pump and its accessories.

* Eye protection should be used while handling pump fluid, internal components or accessories. Full face protection is recommended.

* Fully enclosed vacuum pump fluid changing equipment should be employed wherever possible to eliminate chance contact with contaminated fluid. If pump changing is not conducted under controlled conditions such as with closed systems, maintenance should be per formed in a well ventilated area. If any doubt of the effectiveness of the ventilation in an area exists, a respirator type breathing apparatus should be worn.

* In the event of skin contact with contaminated pump fluid or deposits from the reactor chamber, observe the following procedure:

  -- Promptly flush the contact area well with cold running water.
  -- Wash contact area well with common soap and warm water for 15 minutes.
  -- Contact first aid or plant safety personnel.

Consult plant safety personnel and the vacuum pump manual for further safety directions and considerations. Handling and disposal of vacuum pump fluid and vacuum exhaust must be governed and monitored by your assigned safety personnel in accordance with the standards and practices of the semiconductor manufacturing industry and local and federal laws.

Matrix Integrated Systems claims no responsibility for the safety of the byproducts of the Model 105 photoresist stripper.

1.5.5 Oxygen Hazards

In plasma processing systems it is quite common to utilize oxygen as a process gas, either alone or in conjunction with other gases. A possible EXPLOSIVE condition exists at the vacuum pump if the vacuum pump is not especially prepared by the manufacturer for oxygen service.

Any time there is heat, oxygen under pressure, and the concentration of oxygen is greater the 21% of the volume, the condition for an explosion exists. It should be noted this potential condition exists anytime a bottle of oxygen is connected to the system.

Matrix Integrated Systems recommends that only vacuum pumps prepared for oxygen use be attached to the Model 105 System. These pumps are degreased and must be charged with a synthetic perfluoropolyether fluid such as Fomblin^{R} or Krytox^{R} which contains no hydrocarbons.

1.5.6 Thermal Hazards

The wafer chuck must be allowed to cool down before it is serviced. Allow 60 to 90 minutes for the chuck to cool before touching. Burns may result if the wafer chuck is touched before the cooling time elapses.

In addition, use of solvents, such as IPA (isopropyl alcohol) or acetone to clean the chamber, may pose a hazard if used while the chuck is still hot.

NOTE:

The software contains two safety shutoffs. The first is an interrupt that turns OFF the heaters if the main software has been interrupted for more than approximately 3 seconds.

The second shutoff shuts down the heaters, RF Generator and the MFCs if any temperature above 260^{o}C is read. These high readings indicate that the thermocouple is broken or disconnected from the Temperature/Pressure Controller, in which case the interface reads 99999.99 degrees.

1.5.7 Vacuum Hazards

The part of the reactor chamber made of quartz is very fragile. When the unshielded reactor chamber is under vacuum, this poses a hazard.

It is strongly recommended that the reactor chamber only be serviced with the shield in place whenever the chamber is evacuated. Otherwise, one should shield one's self, others and the surrounding area to avoid injury and damage from the potential implosion of the chamber.

SECTION 2

FACILITY PLANNING

2.1 Introduction

NOTE: For the Model 105 Strippers with the SMIF adaptation, please refer to the 105 SMIF Facilities and Supplemental Manual, Part Number 995-99849.

2.2 Facility Preparation

NOTE:
All facilities required for the operation of the Matrix system and its support equipment should be completed before any connections are made to any of the equipment.

2.2.1 Floor Placement

(See Figures in the Drawing Section).

Surface area required by the system is nominally 25 inches (64 cm) wide and 28 inches (71 cm) deep. Clearance at the rear must be at least 17 inches (43 cm) to accommodate plumbing attachments. A clearance of fifteen inches beyond the hardware dimensions is needed for service access on both sides of the machine. It is required that no facilities hardware be within this service access, especially that which may limit machine accessibility. The side service access need not be replicated for machines that are placed side by side (i.e. two machines placed side by side need 15 inches service access, not 30). A top clearance of 12 inches (30.5 cm) is necessary as well.

Since there are various pump packages available, additional floor space must be planned for the pump system on your particular system. Please refer to the pump manual shipped with your machine. The basic system without the pump package weighs approximately 410 pounds (186 kg).

2.2.1.1 Additional Floor Space

Depending on the vacuum pump package, water temperature controller and other accessory equipment, additional space should be allowed for proper installation.

Component	Width	Depth	Height	Weight
Main Console	25" (64 cm)	28" (71 cm)	22" (56 cm)	100 lbs 45 kg
Power Supply	25" (64 cm)	28" (71 cm)	36" (89 cm)	310 lbs 141 kg
Overall	25" (64 cm)	28" (71 cm)	58" (147 cm)	410 lbs 186 kg
Vacuum Pumps				
Edwards E2M30	24" 61 cm	8" 21 cm	11" 28 cm	75 lbs 40 kg
Edwards E2M40	10" 25 cm	26" 66.5 cm	15.5" 39.5 cm	159 lbs 72 kg
Leybold D30A	28" 71 cm	12" 30.5 cm	14" 36 cm	163 lbs 73 kg
Oil Filtration Sys				
Edwards E0F2500	15" 38.5 cm	12.6" 32 cm	17" 43.5 cm	55 lbs 25 kg
Edwards E0F4000	15" 38.5 cm	12.6" 32 cm	17" 43.5 cm	58 lbs
Leybold OF1000	14" 35.5 cm	16" 40 cm	11" 28 cm	
Temperature Controller				
Tempryte HS-0550-AC-SX	17" 43 cm	27" 69 cm	25.5" 65 cm	250 lbs 114 kg

Nominal Displacement on the Vacuum Pumps is:

E2M30 = 22.9 CFM 650 l/m
E2M40 = 30 CFM 845 l/m
D30A = 26.8 CFM 760 l/m

Water Temperature Controller Dimensions

Tempryte HS-0550-AC-SX

Width: 17" (43 cm)
Depth: 27" (69 cm)
Height: 25.5 (65 cm)
Weight: 250 lbs. (114 kg)

NOTE:
The Water Temperature Controller must be located within 15 feet of the Etcher to ensure proper operation.

2.2.2 Electrical

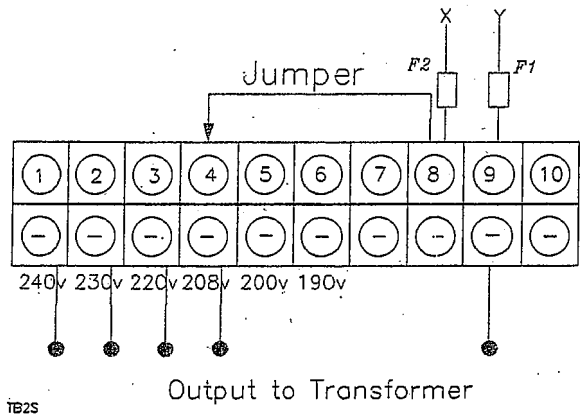
2.2.2.1 Main Console

None Required

2.2.2.2 Power Supply Console

Transformer taps inside the AC Distribution module provide for selecting input voltages of 190, 200, 208, 220, 230, and 240 VAC; single phase, 50/60 Hz, 30 amps, with a NEMA receptacle #L6-30R (P/N 990-97004) (See Figure 2-1).

FIGURE 2-1: SYSTEM VOLTAGE SELECTION TAPS



The power cord has a range of 8 feet (2.4 m) from the lower area of the system. An isolated computer grade building ground must be provided. This ground must be a continuous wire from the service entrance to the building and must be isolated from making contact with other conduits or with the safety ground connections of other equipment. A minimum requirement is #10 AWG copper wire with THHN or equivalent insulation. The impedance of the conductor should be <1 Ohm at 60 Hz from end to end.

If such a building ground cannot be provided, an Isolation Filter that attenuates both common and normal mode noise and spikes on the power line can be used.

The device is a single phase, 208 Volt, 5 KVA combination super-shielded isolation transformer and normal mode filter. It is supplied with a standard nine-foot power cable with a NEMA L6-30 twist-lock plug for input and a single L6-30R receptacle into which the Model 105 is plugged.

Even if the Isolation Filter is used, a basic safety ground must be provided. The filter serves to make the Model 105 safer from voltage spikes and noise from an existing ground line, but will not compensate for a very poor or nonexistent ground.

Another possible method for providing an adequate ground is by utilizing a grounding rod. Contact the Matrix Service Department for further details.

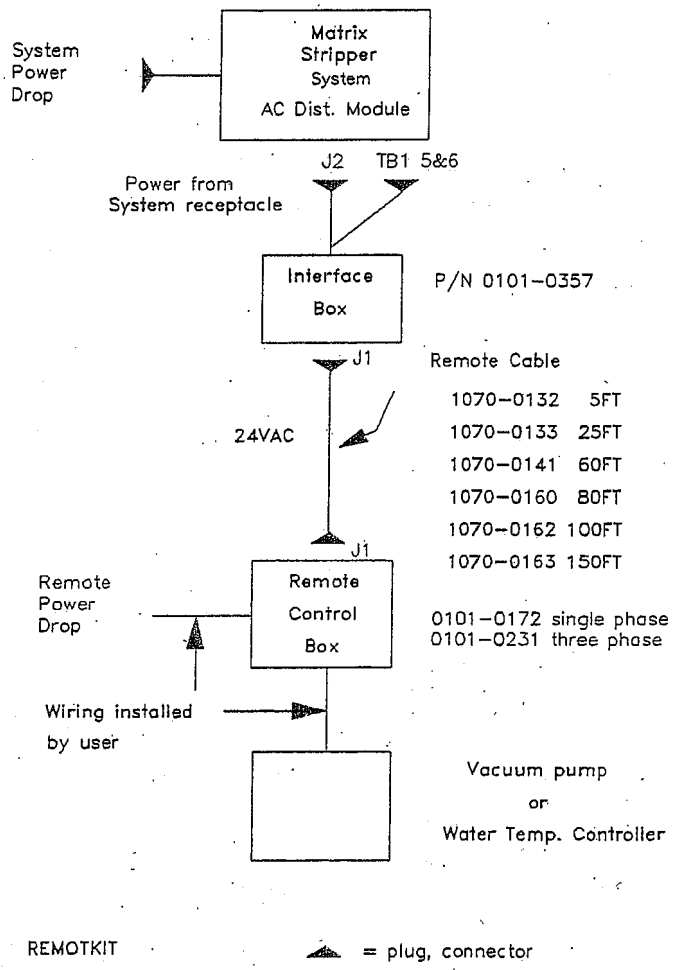
NOTE:
Conduit IS NOT an adequate ground.

2.2.2.3 Remote AC Kit Option

For facilities where the vacuum pump and/or water temperature controller must be placed in a remote location and the EMO circuit connection is desired, an optional Remote AC Kit is available. The following figure illustrates the components of this kit.

NOTE:
The length of the water temperature controller's lines should not exceed 15 feet for optimum performance.

FIGURE 2-2: REMOTE AC KIT OPTION WITH EMO INTERLOCK



2.2.2.4 Vacuum Pump

No electrical connection is required if the vacuum pump is installed within power cord range of the Power Supply Console and the pump motor is of the same voltage specification as the Power Supply Console. A 20 AMP, NEMA L6-20R, receptacle is available at power supply cabinet.

If electrical specifications are different than those found on the Power Supply Console, a receptacle of the correct specification should be provided at the pump location. If not within power cord range, please refer

to your vacuum pump manual for specific individual requirements.

If the vacuum pump is located more than eight feet from the system and the EMO circuit connection is desired, a Remote AC Kit is available through Matrix. (See Figure 2-2). If the kit is used, the customer must supply an L6-30R receptacle (Matrix Part # 990-97004).

The following are current requirements for the Matrix provided pump packages if in a remote location:		
*** Leybold-Hereaus**	208 Single Phase	208 3-Phase
D30	11.5 Amps	4.9 Amps
D60	n/a	7.4 Amps
WA150	n/a	4.7 Amps
WA150/D30	n/a	10.2 Amps
*** Edwards**	208 Single Phase	208 3-Phase
E2M30	11.5 Amps	4.9 Amps
E2M40	n/a	7.4 Amps

2.2.2.4.1 Oil Filtration System

The Edwards EOF2500 and EOF4000 Oil Filtration Systems and the Leybold-Heraeus OF1000 are wired for 115 Volt, single phase, 50/60 Hz operation. The Oil Filtration System uses a standard 115 V, 20 Amp wall outlet. The distance from the vacuum pump to the EOF2500 and EOF4000 filtration systems should not exceed 40 inches.

The distance from the vacuum pump to the Leybold-Heraeus OF1000 should not exceed 4 feet. For 230 Volt operation, see the manual that accompanied your oil filtration system.

2.2.2.5 Water Temperature Controller Option

A Water Temperature Controller is provided by Matrix as optional equipment. The electrical requirements for the controller are:

Tempryte
208 Volts (180-220 VAC), 50/60 Hz, 20 Amps.

2.2.2.6 Accessories

User is required to supply a 115 Volt 20 Amp duplex wall outlet for chart recorder, spectrometer and printer accessories. In addition to the accessories, one additional duplex plug should be available for equipment service.

2.2.2.7 Coolant

It is recommended that a closed loop water temperature controller be used. For controllers that have a magnetically coupled pump, 100% distilled water (18 Mohm - cm) is preferred. For controllers that have rubber seals in the controller pump, the coolant should be 40% ethylene glycol with the balance being distilled water. The customer must supply a water filter for sediment, dirt and sand at the water source. A 5 micron (nominal) filter is recommended.

The temperature should be set to 23°C or lower. One unit capable of handling up to 60 psi with a flow rate of a minimum of 1.5 gallons (5.7 liters) per minute at 20°C will provide all of the cooling needs of the Matrix 105 system.

It is recommended that a coolant flow meter be placed in series with the return to monitor flow through the Matrix 105 Stripper.

The use of municipal water or any other type of water/coolant source is not recommended. These sources can lead to chemical deposits, scaling, occlusions or electrolytically-induced loss of the conducting metal.

2.2.2.8 Main Console

Baseplate: Coolant for the baseplate is attached by 1/4 inch Swagelok^{tm} connectors at the lower rear of the main console. Minimum flow of 1.5 gallons per minute (5.7 liters) at 23°C ±4 °C at a pressure not greater than 60 psi is required. The temperature should be set at 23°C ± 4°C.

RF Generator: Coolant for the RF generator is attached by 3/8 inch Swagelok^{tm} connectors at the lower left (looking from the rear) of the Power Supply Module.

Minimum flow of 1.5 gallons (5.7 liters) per minute at a pressure not greater than 60 psi is required. The temperature should be set at 23°C ± 4°C.

2.2.2.9 Coolant Hook-up

Coolant should be routed from the supply with 3/8" polyethylene tubing. At the rear of the system using "T" fittings reduce the line to 1/4" lines to connect to the baseplate. See the Coolant Connection Diagram (Figure 2-8). A connection kit with a 15-foot (4.6-meter) capability is available from Matrix (P/N 101-0105).

NOTE:
The length of the water temperature controller's lines should not exceed 15 feet for optimum performance.

2.2.3 Vacuum

As process requirements vary from one plant to another, many different pumps and pumping configurations are used. Review the operation and maintenance manual

of the vacuum pump delivered with your system for proper installation and operation.

Many customers want the ability to do in situ capacitance manometer calibrations. This does not come standard with the system. The customer can elect to obtain from Matrix the right angle vacuum isolation valve with VCR fitting, P/N 0995-16528, or provide a KF40 tee fitting with appropriate mates for access with the calibration standard. This KF40 fitting tee would be placed between the process module weldment piece and the butterfly valve. The service access area in the back of this configuration would be extended by the length of the KF40 fitting.

The operating temperature of the average vacuum pump in this application is 100°C. A six-foot (1.8-meter) vacuum hose with KF40 flanges is provided with the system. For distances greater than six feet (1.8 meters), please contact your local Matrix representative.

The standard system configuration may not include a charge of perfluorpolyether fluid in the pump. If one was not ordered with the pump as a option then it is the user's responsibility to have it available for installation.

2.2.3.1 Vacuum Pump Fluid Requirements

If your Model 105 was shipped with either an Edwards E2M30, Edwards E2M40 or Leybold-Hereaus D30 vacuum pump, the following amounts of perfluoropolyether fluid are required:

Edwards E2M30
2 to 3 kg, 1 to 1.5 liters **OR** 4.4 to 6.6 lbs. of Fomblin Y06/6 or Krytox 1506 pump fluid

Edwards E2M40
9 kg, 4.5 liters **OR** 20 lbs. of Fomblin Y06/6 or Krytox 1506 pump fluid

Leybold-Hereaus D30
6.6 kg, 3.3 liters, **OR** 16 lbs. of PFPE HE1400.

WARNING:

Operating the pump without any perfluoropolyether fluid OR with the improper fluid will void the pump warranty.

2.2.4 House Exhaust

House exhaust is required for evacuating the exhaust in both the vacuum pump and machine cabinets. The pump exhaust and cabinet exhaust must be separated to prevent cross contamination. All exhaust hoses are user supplied.

2.2.4.1 Cabinet Exhaust

The exhaust port(s) must not allow a flow greater than 100 CFM. The exhaust port located in the power cabinet is 4 inches (10 cm) in diameter. Review the diagram in the Drawing Section for physical placement.

2.2.4.2 Chamber Exhaust

This exhaust port is powered by an internal fan and maintains chamber temperature to a predetermined ambient temperature (approx. 90° C). If exhaust is attached to the house exhaust system, the port must be dampened to less than 200 CFM for proper operation.

2.2.4.3 Upper Assembly Exhaust

This exhaust port is an option that can be used to keep the process module assembly area free of particulates. The port must not allow a flow greater than 100 CFM.

2.2.4.4 Vacuum Pump Exhaust

Leybold-Heraeus vacuum pumps use a KF-40 flange for the exhaust port. Edwards pumps supplied by Matrix have a NW25 flange for the exhaust port. Standard exhaust for the Edwards pumps is a 15 mm OD nipple.

Fluid mist will be contained in the exhaust media. It is strongly recommended that an oil mist recovery system be installed on any pumping system.

2.2.5 Process Gases

No internal gas dryers are provided with the system. The mass flow controllers have internal 20 micron filters.

All house process gases must be supplied to the Main Console through facility filters and dryers. Fittings are 1/4 inch VCR connectors at the lower left of the Main Console.

Process gas pressure must be regulated at 8 to 10 psig, the actual setting will be determined at the time of process development. We suggest a regulator with a maximum pressure not to exceed 30 psig.

NOTE:
The gas pressure regulators should NOT be located more than 10 feet from the Model 105. A location as close as possible to the system's mass flow controllers and purge valve will ensure proper operation.

The standard Model 105 has two MFCs: In position one is a 5 LPM (full scale) MFC and in position two is a 300 SCCM (full scale) MFC. Typically, both MFCs are facilitized with oxygen. The larger flow MFC is used in strip processes while the smaller flow MFC is used for descum.

With the use of an optional third MFC, the MFCs in positions one and two remain standard and position three is rated 5 LPM (N_2). In this arrangement, MFC 1 and MFC 2 are facilitized with oxygen. Mass Flow Controller 3 uses an optional gas, usually a forming gas.

Check with your process engineer for the exact requirements of your facility.

2.2.6 Nitrogen

The nitrogen must be regulated at 80 psi and is connected by 1/4 inch Swagelok^{tm} connectors on the Nitrogen Distribution Panel. Regulators used to apply various pressures are provided with the system.

2.3 Preparation for Installation

Please read the entire Preparation for Installation instructions first before starting any work.

2.3.1 Uncrating

To uncrate the Matrix System One Stripper, the following instructions should be followed. Note that the crate is of high quality, and can be used to ship or store the equipment, and hence may be saved for future use.

Uncrating Stripper System:

I. Uncrating the Power Console:

1. Unscrew the lag-screws (10) around the bottom perimeter of the crate using a 1/2" wrench.

2. Remove the wire clips (6) around the face of the crate, or the "door" using a claw hammer or "crow bar".

3. Remove the door, note the unloading "ramps" attached to the inside.

4. Remove the loading/unloading ramps by removing the bolts (2) securing them to the inside of the door using a 9/16" wrench.

5. Insert the securing lips of the loading ramp at the doorway, over the rim of the pallet; they must be lined up with the casters of the power cabinet.

6. Slide the crate off of the pallet.

7. Remove the tie-down straps (2) holding the power console to the pallet.

8. Remove the retaining bar from the doorway by removing the bolts (2) using a 9/16" wrench.

9. Carefully roll the power console down the ramp (2 persons required), lifting it at the bottom to avoid scraping the underside of the power console as the unit becomes level on the floor.

10. Remove the plastic cover.

11. Close up the crate for storage by putting all packaging material (bolts, cover, etc.) inside the crate and securing the door with the wire clips (6) with a claw hammer.

II. Uncrating the Main Console:

1. Unscrew the lag-screws (10) around the bottom perimeter of the crate using a 1/2" wrench.

2. Remove the wire clips (6) around the face of the crate, or the "door" using a claw hammer or "crow bar".

3. Remove the door.

4. Slide the crate off of the pallet.

5. Remove the tie-down strap (1) holding the main console to the pallet.

6. Leave the protective plastic cover on the main console unless it is to be installed immediately to avoid contamination.

7. Remove the retaining brackets (4) from the leveling feet at the corners of the main console.

8. Lift the main console onto the power console (2 persons required), note that the leveling feet must "nest" on top of the four socket screws on the power console.

9. Close up the crate for storage by putting all packaging material (bolts, cover, etc.) inside the crate and securing the door with the wire clips (6) with a claw hammer.

The Model 105 should be removed from its sealed plastic shroud only in an appropriate particulate-free environment to avoid contamination prior to its installation.

2.3.2 Mechanical Inspection

If damage to a shipping container is evident, do not proceed with unpacking until a carrier's agent is present. After unpacking, the equipment should be checked for damage of any kind. If damage is evident after unpacking, notify the carrier immediately. Retain all shipping containers for possible further carrier inspection and possible return of the damaged unit.

Place Main Console and Power Console in position in the clean room. Depending upon the handling of the Main Console during transport to your facility, the wafer transport system may require readjustment.

NOTE:
It is required under the warranty provisions that this system be checked for proper operation and alignment by a Matrix Integrated Systems Field Representative prior to operation by the user. The purpose is to prevent damage to the system, and to ensure the unit is functioning properly.

2.3.3 Shortage Inspection

Immediately after unpacking each container a receiving inventory should be done. If shortages are noted, first insure all containers were unpacked.

If there was a shortage of a container, notify the carrier immediately. If all containers were unpacked and there is still a shortage, notify Matrix Customer Service at 510-222-2727.

CAUTION:
Call Matrix Integrated Systems for installation and system set-up after Sections 1 and 2 have been completed. DO NOT ATTEMPT TO OPERATE THE MACHINE, THIS WILL VOID THE WARRANTY.

2.4 Drawings

FIGURE 2-3: SYSTEM DIMENSIONAL DRAWING, REAR

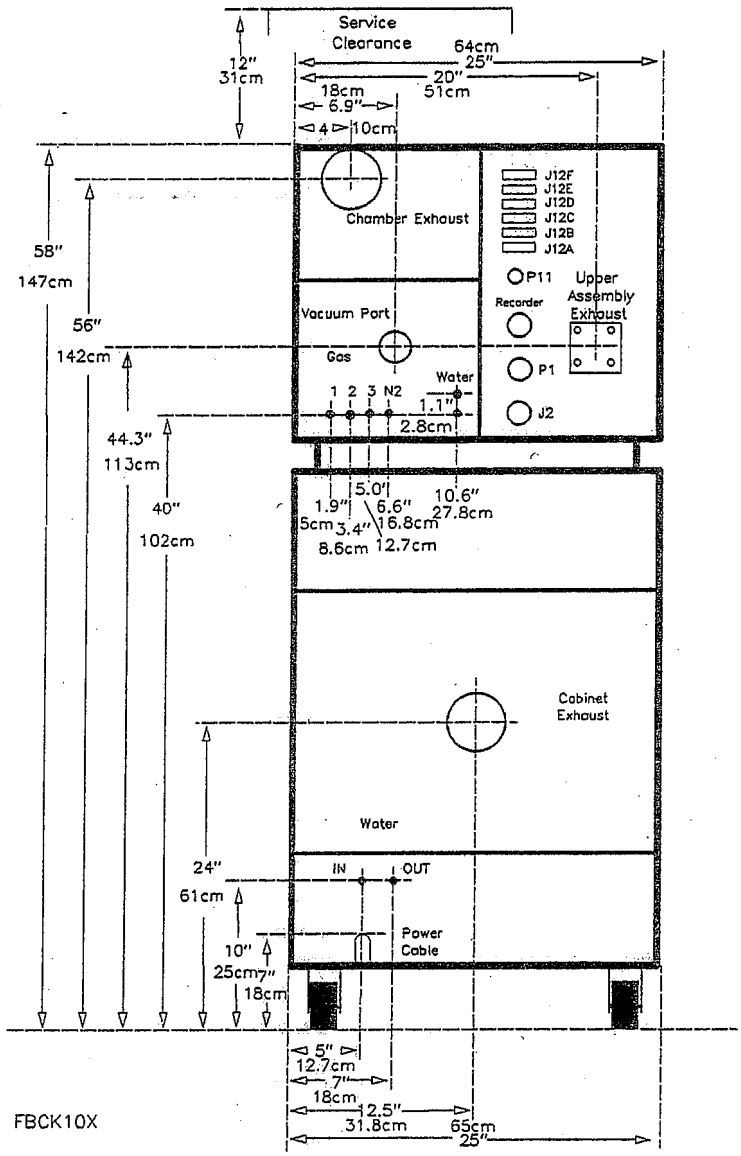


FIGURE 2-4: MAIN CONSOLE DIMENSIONAL DRAWING

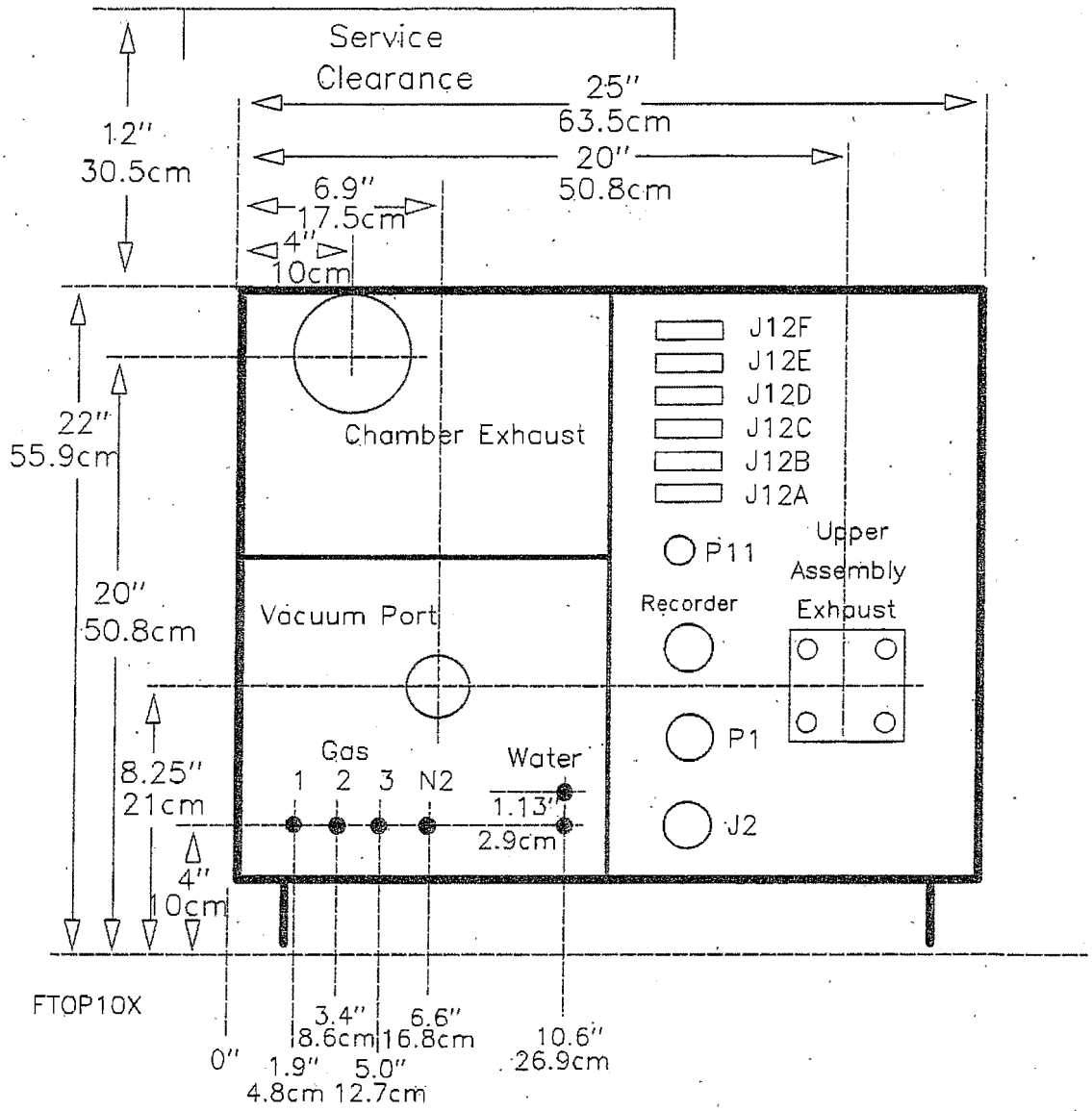


FIGURE 2-5: SYSTEM SIDE VIEW

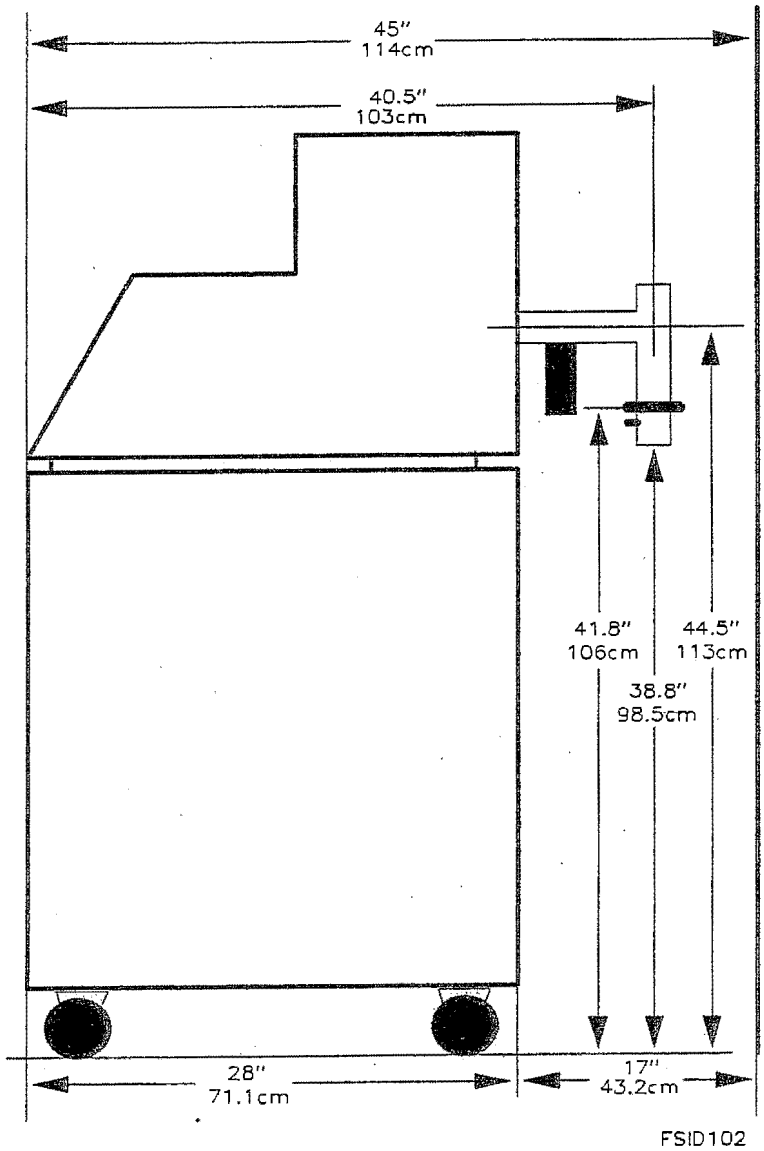


FIGURE 2-6: POWER SUPPLY DIMENSIONAL DRAWING

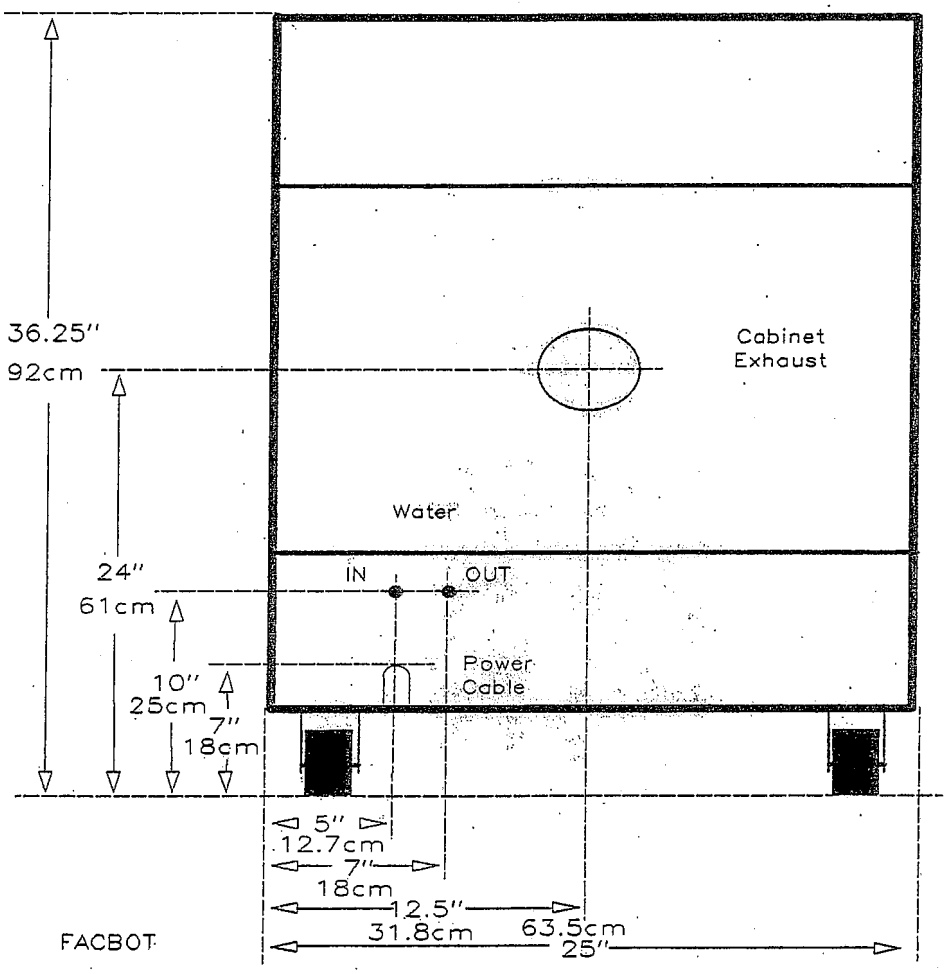


FIGURE 2-7: FLOOR DIMENSIONS

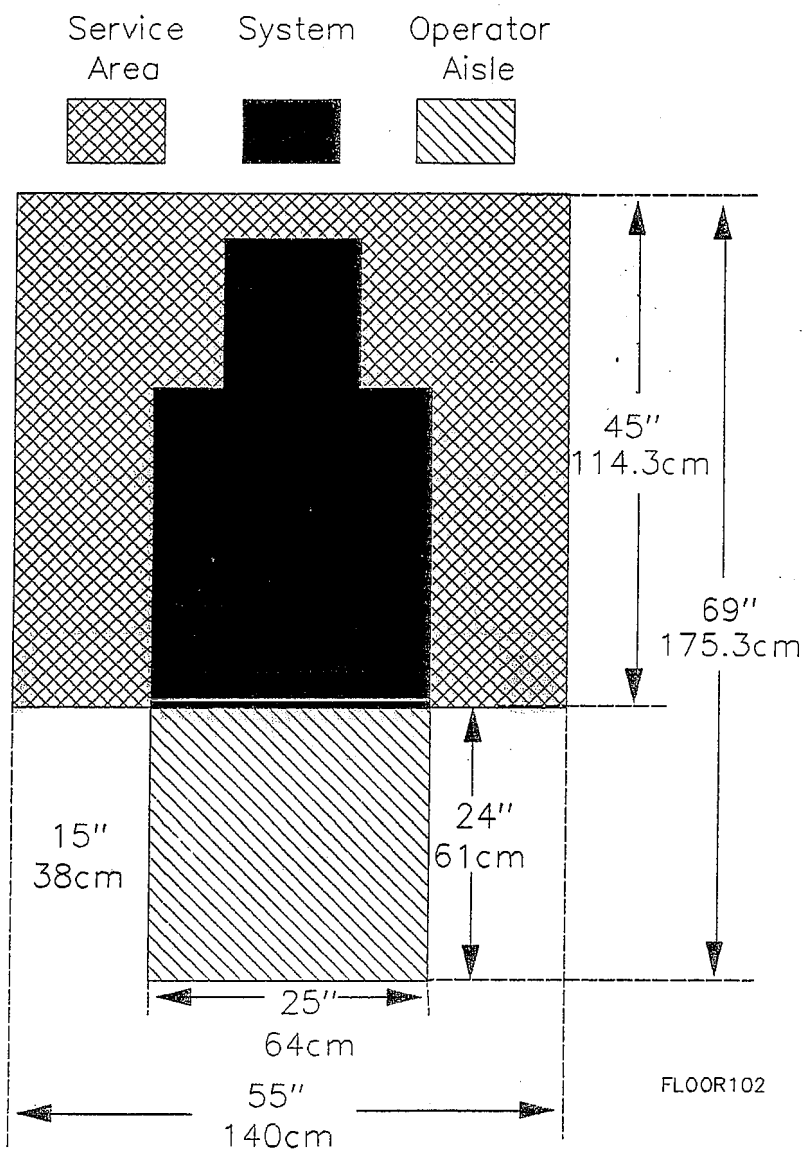


FIGURE 2-8: COOLANT CONNECTION DIAGRAM

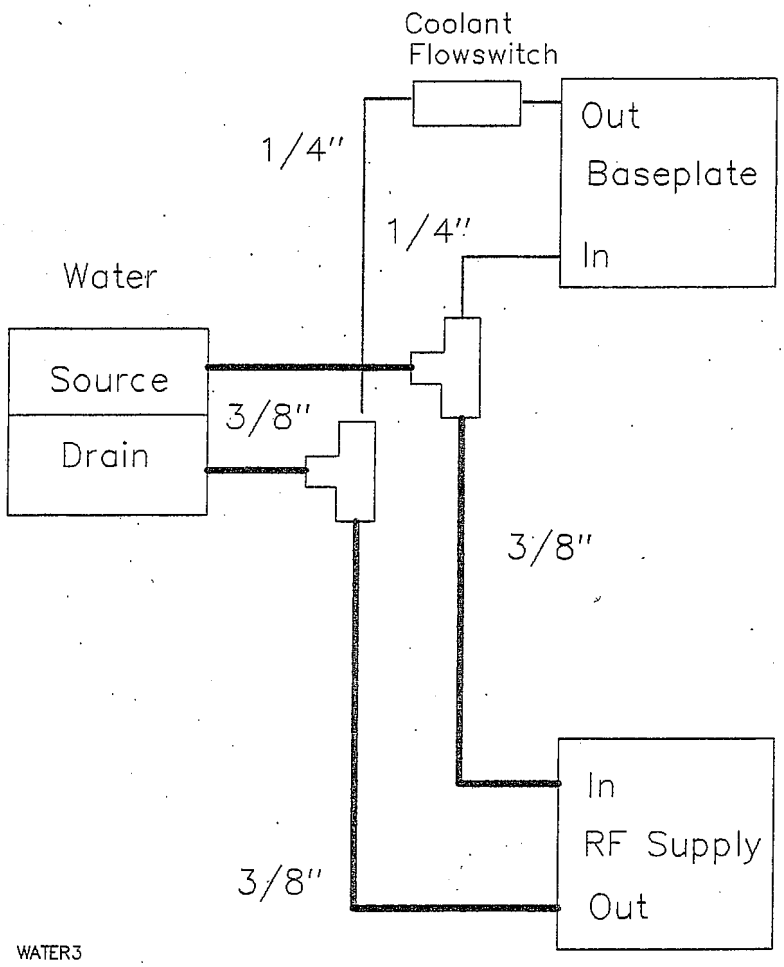
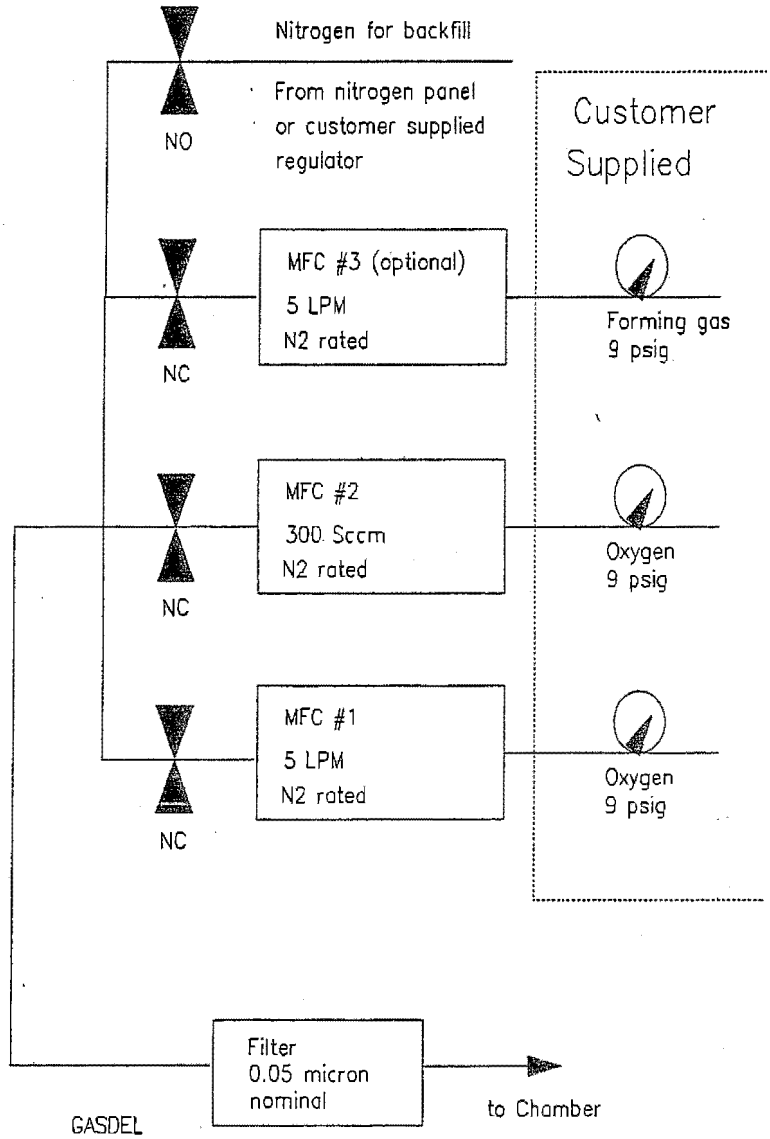


FIGURE 2-9: GAS DELIVERY SCHEMATIC



2.5 Facilities Checklist

MATRIX INTEGRATED SYSTEMS -- PHOTORESIST STRIPPER MODEL 105
FACILITIES CHECKLIST

2.5.1 Introduction

The following document has been adapted from the SEMI Facilities Interface Specification Format (EC-85). This checklist will establish a communication link between Matrix and its customers.

2.5.2 Administrative Interface

2.5.2.1 Administrative Interface

Company Name Matrix Integrated Systems, Inc.
Address 4131 Lakeside Drive
Richmond, CA 94846
Phone 510-222-2727

Sales Representative (if different than manufacturer)
Company Name _____
Address _____
_____
Contact _____ Phone (___)_____

2.5.2.2 Purchaser (User) Information

Company Name _____
Address _____
_____
Contact _____ Phone (___)_____
Title _____

Installation Location (if different from above):
Organization Name _____
Installation Address _____
_____
Contact _____ Phone (___)_____
Title _____

Special Instructions for Finding Installation Location:
_____
_____
_____

2.5.2.3 Equipment Identification

Equipment Vendor and Type: System One Stripper
Model: 105
Serial Number: _____
Quotation No.: _____
Purchase Order No.: _____
Sales Order No.: _____
Project Serial No.: _____
Equipment Description: Single Wafer Photoresist Stripper

2.5.3 Facilities Interface

It is expected the following facilities will be installed and operational before the start-up of the Model 105.

2.5.3.1 Environmental

	During Operation	During Idle Operation	During Storage
Room Temperature Minimum Maximum	 60°F (16°C) 80°F (27°C)	 60°F (16°C) 80°F (27°C)	 50°F (10°C) 80°F (27°C)
Relative Humidity at 68°F (20°C)	Maximum: 60% Minimum: 20%	Maximum: 60% Minimum: 20%	Maximum: 60% Minimum: 20%
Air Exchange Rate	2 Exchanges per hour	2 Exchanges per hour	2 Exchanges per hour
NOTES: _____			

2.5.3.2 Electrical, Main System

Supply:
Volts: 208 Standard
(Taps for inputs of 190, 200, 220, 230 and 240 VAC)
Phases: 1 (Adjustable to Delta or Y configuration)
Number of Wires: 3
Frequency: 50/60 Hertz
Current: Peak -- 21 Amps;
Steady State -- 14 Amps;
Idle -- 7 Amps
Power Factor: P.F. = 87
(for standard Edwards E2M30 pump)

Specific Requirements:

An isolated computer grade building ground is required. This ground must be a continuous wire from the service entrance to the building and must be isolated from making contact with conduits or with the safety ground connections of other equipment.

A minimum requirement is a #10 AWG copper wire with THHN or equivalent insulation. The impedance of the conductor should be less than 1 Ohm at 60 Hertz from end to end.

Conduit IS NOT an adequate ground.

Emergency Power Requirements: None required.

2.5.3.3 Computer Interface

This equipment contains a computer interface. System diagnostics for the Model 105 are available via a terminal and the system's RS-232 interface. See Section 6 of the 105 Maintenance and Operation Manual for details.

2.5.3.4 Coolant

Distilled water is required to cool the system. Deionized (DI) water and tap water are not suitable since they will react in the RF field to form deposits or loss of metal in the coolant line.

When a closed-loop water temperature controller is used, a mixture of distilled water and 40% ethylene glycol (antifreeze) is recommended to prolong the working life of the controller pump. For water temperature controllers such as the Bay Voltex Tempryte which uses a magnetically coupled pump, 100% distilled water (18 Mohm - cm) is preferred. Furthermore, the length of the supply and return lines should not exceed 15 feet.

Maximum inlet temperature: 81°F (27°C)
Minimum inlet temperature: 66°F (19°C)
Maximum inlet pressure: 60 psig (4.2 kg/cm^2)
at a flow of 1.5 gpm (5.7 liters/minute) at 20°C
Water to be filtered to 5 Microns (nominal)

The standard system comes with a Ship Cooler Kit that contains the tubing and fittings necessary for distribution of the coolant to the system. The 3/8" polyethylene tubing (15' in length) must be connected to the water temperature controller by fittings supplied by the user. The 3/8" Swagelok fittings are commonly used and acceptable.

Instrumentation to be supplied and installed by the user:
Pressure Gauge Inlet -- With a range of 0-100 psi (11 kg/cm^2) is suggested.
Flowmeter -- With a range of 0-4 gpm (15 liters/min.) is suggested (installed on the return line).

2.5.3.5 Process and Support Liquids

Not applicable.

2.5.3.6 Compressed Air

Not applicable.

2.5.3.7 Process Vacuum

Maximum Flow Rate: Nominal Pump Displacement:

23 SCFM (Edwards E2M30), 27 SCFM Leybold D30A
Average Flow Rate: 0.2 to 4 SCFM (based on one hour's operation)

The Model 105 system requires process vacuum that is usually obtained by means of a rotary vane pump with perfluoropolyether (e.g., Fomblin) fluid. The size and type of pump used with the Model 105 will depend on the process requirements and the pump system configuration (e.g., length of foreline).

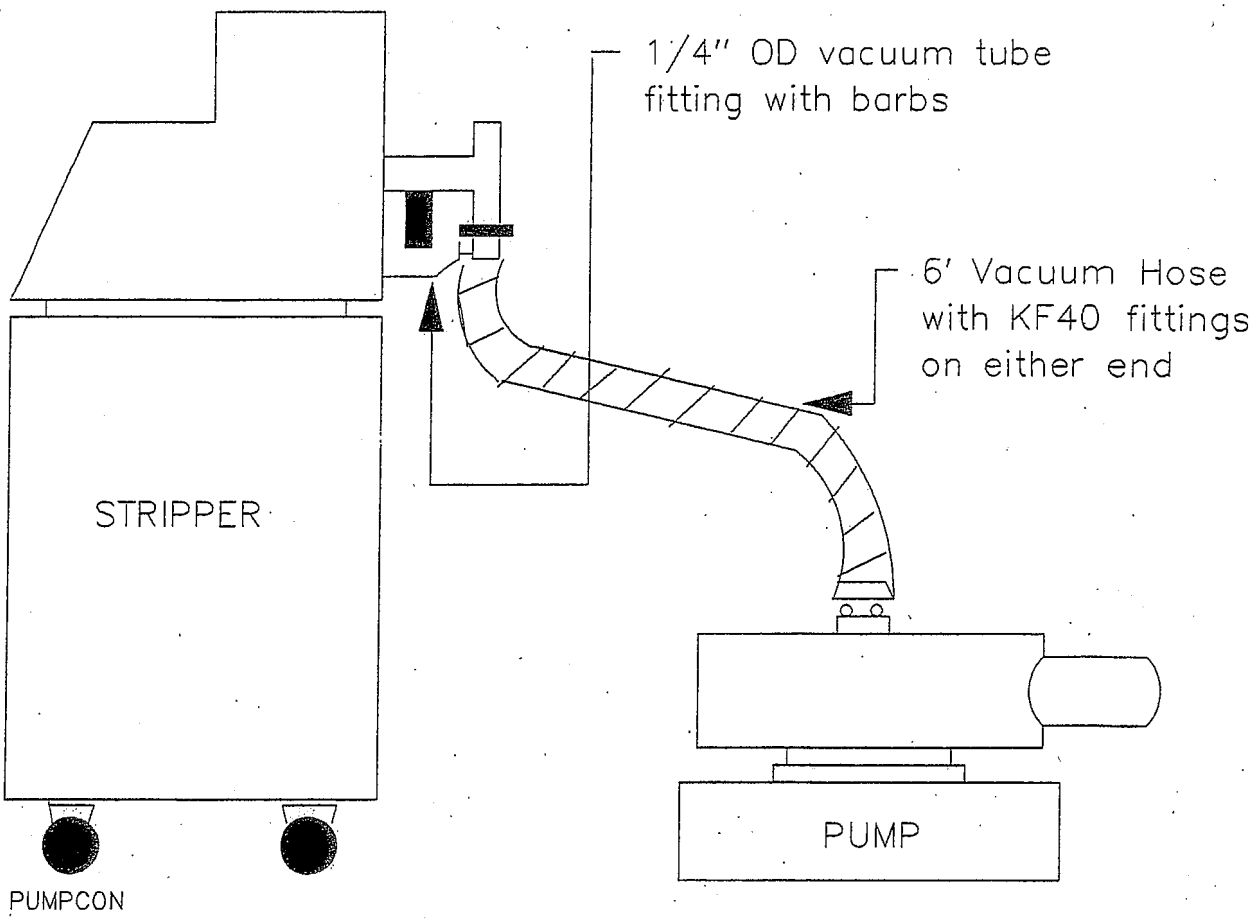
A standard pump configuration consists of either an Edwards E2M30 or Leybold-Hereaus D30A pump. The pump is connected to the system by means of a 6-foot hose (2" O.D., 1.5" I.D.) with KF40 flanges on either end. One end has a fitting with a barb that attaches to 1/4" OD flexible tubing on the back of the machine. This tube supplies vacuum for the spatula used for wafer transfer. It is also used to supply N_2 as ballast to the vacuum line when the gate value is closed for long periods of time. This is to prevent backstreaming of the pump fluid.

For facilities where pumps are placed in a remote location and/or metal (316 stainless steel) forelines are used, the flange piece with the "T" fitting may be removed from the flexible tubing and welded to the foreline.

Appropriate vacuum pump configuration will again depend on the system and process utilized. As a rule, the pump exhaust and fluid will be handled as toxic, non-corrosive material. Use of PVC or metal duct for the flue is appropriate for most process applications. Check with your process engineer for non-standard processes.

Vacuum Pump supplied by Matrix:
_____ Yes _____ No
Type: _____
Line size/length:
_____ / _____
Fluid type: _____
Amount: _____
Exhaust system installed:
_____

FIGURE 2-10: STRIPPER PUMP CONFIGURATION



2.5.3.8 Process Exhaust

<u>**Process Exhaust #1**</u> is the Chamber Exhaust. Provisions for this exhaust are required. Proper operation and safety of this equipment requires the attachment to an exhaust system designed to handle a non-corrosive, non-toxic class of materials.

The inlet fitting should have a maximum flow rate of 200 SCFM. Isolation of the exhaust is required. This equipment will, under normal operating conditions, exhaust gases at a maximum temperature of 30°C (85°F).

At any time during the operating cycle, the following gases are expected to be vented: Air is drawn from the clean room

over the chamber and matching network for cooling.

This equipment is supplied with an exhaust port which contains a 4" PVC fitting with a muffin fan supplying forced convection flow over the chamber assembly. The exhaust port is designed to connect with flexible 4" vinyl (or nylon polyamid) wire-reinforced tubing. It is recommended that the flues be made of either PVC or metal.

Process Exhaust #2 is the Lower Cabinet Exhaust. Provisions for this exhaust are required. Proper operation and safety of this equipment requires the attachment to an exhaust system designed to handle a non-corrosive, non-toxic class of materials.

The inlet fitting should have a maximum flow rate of 100 SCFM. Isolation of the exhaust is required. This equipment will, under normal operating conditions, exhaust gases at a maximum temperature of 30°C (85°F).

At any time during the operating cycle the following gases are expected to be vented: Air is drawn through the power supply cabinet for equipment (electronics) cooling.

This equipment is supplied with an exhaust port consisting of a panel cutout suitable for mounting a 4" PVC fitting. No forced convection (fan) is provided. A flexible hose fitting made of PVC (Matrix Part # 992-50006) is provided in the Spare Parts Kit.

The exhaust port is designed to connect with flexible 4" vinyl (or nylon polyamid) wire-reinforced tubing. It is recommended that flues be made of either PVC or metal.

Process Exhaust #3 is the Upper Assembly Exhaust. This exhaust is suggested. Proper operation and safety of this equipment requires the attachment to an exhaust system designed to handle a non-corrosive class of materials.

The inlet fitting should have a maximum flow rate of 100 SCFM. Isolation of the exhaust is suggested, however, this exhaust must be isolated from the Chamber Exhaust (See Process Exhaust #1, above). The exhaust will, under normal operating conditions, exhaust gases at a maximum temperature of 30°C (85°F).

At any time during the operating cycle, the following gases are expected to be vented: Air is drawn through the Main Console for increased particulate reduction.

This equipment is supplied with an exhaust port containing a panel cutout suitable for mounting a 4" PVC fitting for the attachment of flexible tubing. No forced convection (fan) is provided. Additional

house exhaust fittings made of PVC can be ordered from Matrix (Matrix Part # 992-50006).

This exhaust port is designed to connect with flexible vinyl (or nylon polyamid) wire-reinforced tubing. It is recommended that flues be made of PVC or metal.

2.5.3.9 Process and Support Gases

2.5.3.9.1 Process Gas #A -- Oxygen

Supply Pressure:
9 psig (0.6 kg/cm^2)
Allowable variation after set-point has been established:
1 psi (0.07 kg/cm^2)
Maximum Flow Rate:
0.17 CFM (STP) or 5.3 LPM
Purity Classification:
99.95%; Exposed to wafer during process

Instrumentation to be supplied by the user:
Regulator and Pressure Gauge -- 0 to 30 psi
(0 to 2.1 kg/cm^2) [REQUIRED]
Flow Meter - 0 to 0.25 cfm (0 to 7.0 LPM) [SUGGESTED]

NOTE:
The regulator and gauge should be installed within 10 feet (tube length) of the system. For standard processes, Gas Ports #1 and #2 are plumbed for Oxygen.

2.5.3.9.2 Process Gas #B -- Forming Gas (N_2/H_2)

(Optional Package)

Supply Pressure:
9 psig (0.6 kg/cm^2)
Allowable variation after set-point has been established:
1 psi (0.07 kg/cm^2)
Maximum Flow Rate:
0.17 CFM (STP) or 5.0 LPM
Purity Classification:
99.95%; exposed to wafer during process

Instrumentation to be supplied by the user:
Regulator and Pressure Gauge -- 0 to 30 psig
(0 to 2.1 kg/cm^2) [REQUIRED]
Flow Meter -- 0 to 0.25 CFM
(0 to 7.0 LPM) [SUGGESTED]

NOTE:
The regulator and gauge should be installed within 10 feet (tube length) of the system. For standard processes, Gas Port #3 is plumbed with forming gas.

2.5.3.9.3 Support Gas #A -- Nitrogen

Supply Pressure:
60 psig (4.2 kg/cm^2)
Allowable variation after set-point is established:
-5 to +10 psi (-0.35 to 0.70 kg/cm^2)
Maximum Flow Rate:
0.3 CFM (STP) or 10 LPM
Purity Factor:
Exposed to wafer during back-fill

The user is expected to supply a pressure regulator equal to:
Manufacturer -- Norgren
Description -- Pressure regulator, 100 psig gauge, 1/8 NPTF fittings
Part Number -- R07-100-RGKA

The Matrix 105 Stripper has a Nitrogen Distribution Panel in the Power Supply Cabinet. There is a 1/4" 316 SS Swagelok fitting for the nitrogen source to the panel.

The following instrumentation must be supplied by the user:
Pressure Gauge -- 100 psig (7.0 kg/cm^2) [REQUIRED]
Flow Meter -- 0 to 0.5 cfm (0 to 15 LPM) [SUGGESTED]

2.5.3.10 Drains

Not applicable.

2.5.4 Shipping

Piece No.	Dimensions (W" x L" x H")	Weight	Container Description
1	39 x 40 x 35	250 lbs.	Crate
2	34.5 x 39 x 50.5	350 lbs.	Crate
3	18.5 x 18.5 x 15.5	50 lbs.	Cardboard container

The water temperature controller, pump and pump accessories will be shipped in additional containers if ordered with the 105 System.

During storage, care should be taken to keep all pieces dry and within a temperature range of 50°F (10°C) to 80°F (27°C) with humidity not to exceed 60% R.H.

2.5.5 Installation

During the actual assembly and installation of this equipment, the following provisions will be required of the customer:

Tools -- An oscilloscope may be needed.

Personnel -- During installation, the customer's facilities staff should be on call to answer questions and integrate the equipment with the facilities. In addition, it is expected that the following personnel be provided:
Facilities Engineer -- 1 hour or less
Line Maintenance Engineer -- 1 hour or less
Process Engineer -- 1 hour or less.

Time -- It is expected that installation will take approximately eight hours. This estimate covers only the time from the arrival of the

factory-trained installation personnel to the beginning of the start-up.

2.5.6 Start-Up

Once the equipment has been installed, a period of start-up, check-out and calibration will be required. In support of this activity, it is requested that the customer provide or make available the following supplies or equipment:

25 Silicon wafers with 1.2 microns of photoresist, unpatterned, hard-baked at 130°C for 30 minutes. (More wafers may be required.)

During this phase it is asked that the customer have present personnel trained or able to assist in the following functions:

Process Engineer capable of describing process needs, verifying test wafers and certifying process criteria.
Lead Operator to learn the operation of the 105 Stripper.

2.5.7 Operator's Certification

Training courses are not applicable, however, careful reading of the Model 105 Operation and Maintenance Manual is suggested. Matrix will supply the manual with the equipment. It is expected that the operator will have read and become familiar with this manual before attempting to operate this equipment. The 105 Operation and Maintenance Manual will be shipped with the system.

On-site training will also be made available. Once start-up is complete, it is anticipated that some period of time will be set aside for on-site familiarization and orientation of operators by the Matrix representative. One hour should be allotted for this task. The lead operator(s) will be shown the fundamentals of operation.

2.5.8 Maintenance Certification

Before attempting to maintain this equipment it is required that maintenance personnel participate in an operator's training class. In addition, a course for maintenance personnel is strongly recommended. The one-week class is entitled "Matrix System One Stripper Training Class." Please contact Matrix for course locations, times and dates offered, and costs.

The manufacturer will supply an Operation and Maintenance Manual with the equipment. It is expected that the maintenance personnel will have read and become familiar with this manual before attempting to maintain this equipment.

On-site training is available. Contact Matrix for on-site course availability, times and dates offered, and costs.

SECTION 8

PROCESS

8.1 Introduction*

The Model 105 is a versatile and powerful system that offers flexibility via more options and improved control while maintaining ease of use.

The 105 software allows the Process Engineer to control three independent steps, as well as an overetch step. The following parameters can be controlled in each of the three steps:

* RF power
* Gas flow
* Pressure
* Pins UP/DOWN
* Endpoint

During overetch, RF power, pin position and process time can be set.

It is recommended that process personnel read Sections 4 and 6 of this manual in addition to Section 8 to fully understand 105 operation and software. Section 4 covers editing a process, saving and loading a process from magnetic cards, running a process and the report screen. Software commands, non-volatile constants and the method used to set these constants are among the topics discussed in Section 6.

8.2 Process Set-up Guidelines

8.2.1 105 Process Guide

Standard Process

This process will strip resist with good rate and uniformity.

Step 1:

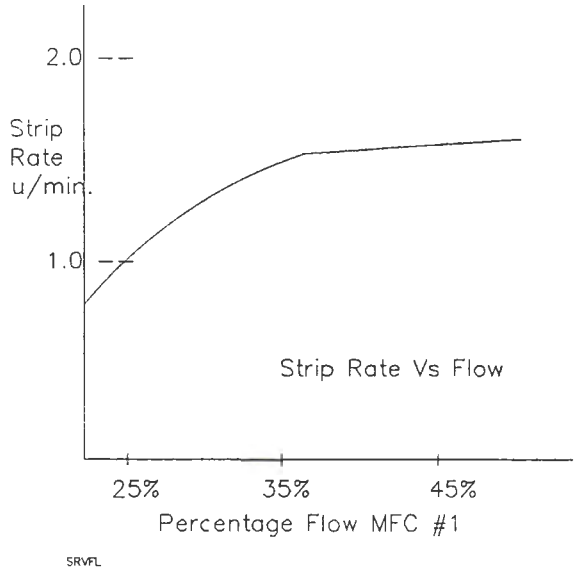
Pressure:3.75 Torr
Flow: 35% MFC1
0% MFC2
R.F. Power:450 Watts
Chuck Temp.:220°C
Wafer Position:DOWN
Endpoint:ABSOLUTE #2
Holdoff: 15 secs.
Cutoff: 2:00
Sensitivity: 150
Normalization: 30%
E.P. Threshold 90%
Filter Factor: 10%

Step 2: Same recipe as Step 1 but it used as an overetch and is run in timed mode for 15 seconds. This time would be varied to suit customer needs.

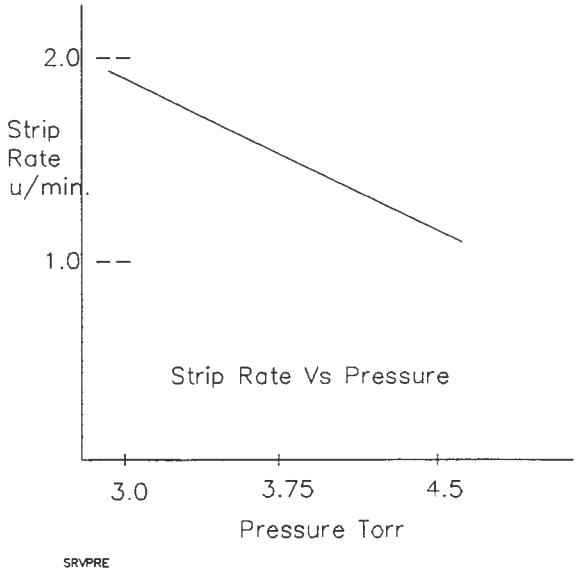
Overetch - Step 4: Same recipe as Step 1 except that the wafer is in the UP position to remove any remaining resist bead. This step can only be run in timed mode and is usually set at 15 seconds.

The standard process can be modified to suit particular customer needs. The graphs

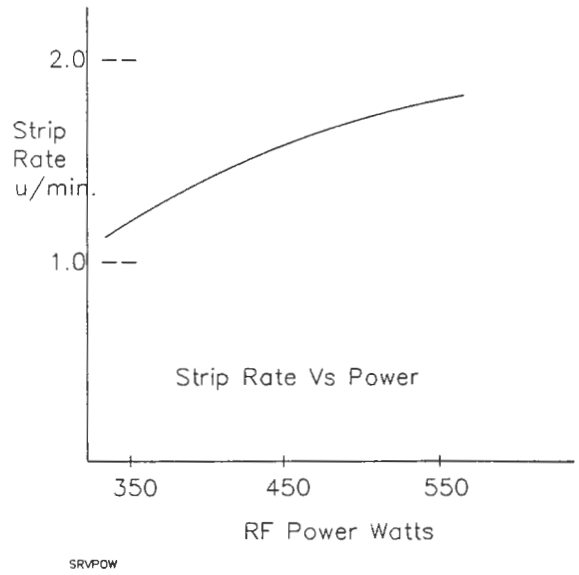
below indicate trends that occur when individual recipe values are changed.



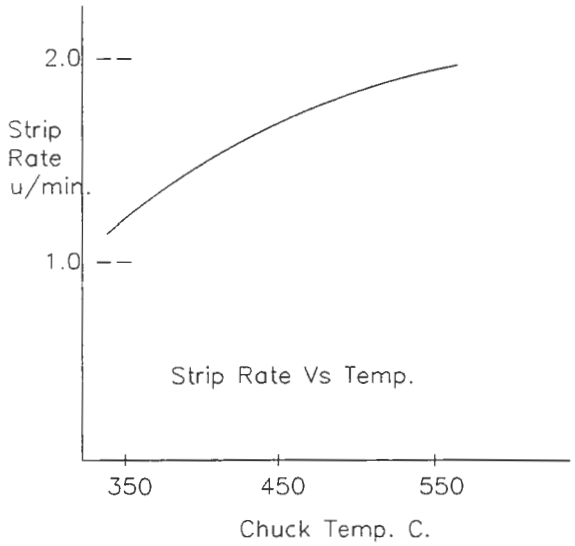
Increasing O_2 flow does not increase rate but will improve uniformity. Rate will increase if R.F. power is increasedd with flow. Reducing flow will decrease rate.



Strip rate can be increased by reducing pressure. If the pressure is too low, plasma hot spots will ocur over the wafer and cause damage. Increasing pressure will reduce rate and worsen uniformity.



Increasing R.F. power will increase rate and then plateau unless flow is increased. If the power is too high, hot spots will occur and damage the wafer.



wrong numbers, should be maximum 200C

The chemical reaction of stripping resist increases with the addition or heat. Increasing flow will also stop this reaction from plateauing.

Descum Processes

Standard Processes

Step 1:

Pressure:3.00 Torr
Flow: 0% MFC1
55% MFC2
R.F. Power:250 Watts
Chuck Temp.:200°C
Wafer Position:UP
Endpoint:TIMED

To ensure consistency in results, a minimum of twenty seconds should be set in the timed endpoint.

Alternate Process

This process can be used when MFC2 is being used for gases other than 0_2, and for resist thinning.

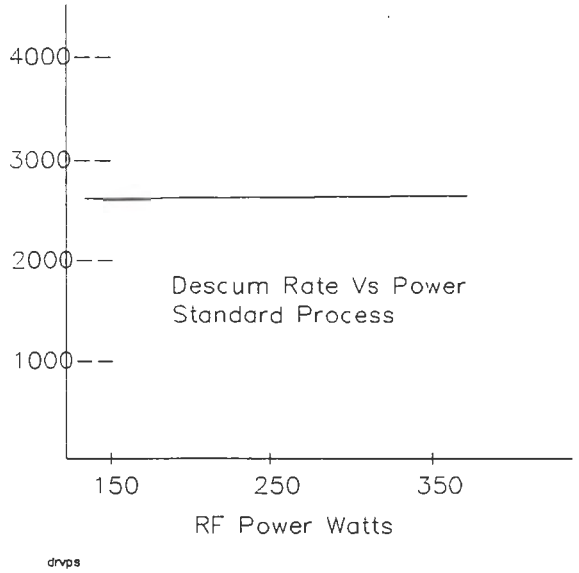
Step 1:

Pressure:2.00 Torr
Flow: 20% MFC1
0% MFC2
R.F. Power:150 Watts
Chuck Temp.:200°C
Wafer Position:
Endpoint:TIMED (20 seconds minimum)

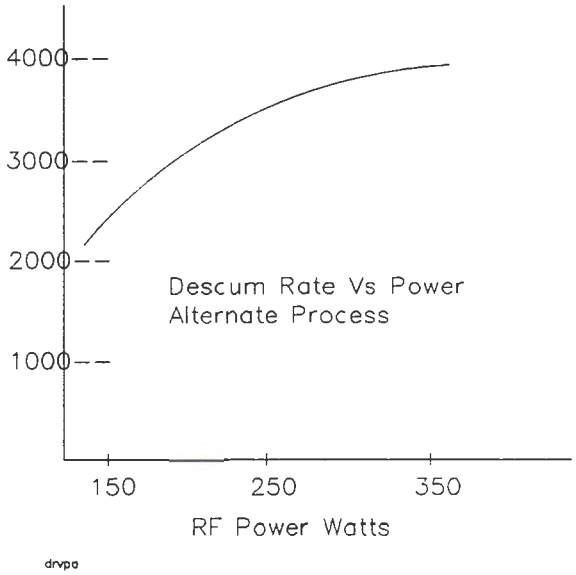
The chuck temperature is maintained near strip temperature so that a 105 that is used for both strip and descum can be changed from one mode to the other with a minimum of delay. A dedicated descum 105 can be

run at a lower temperature to reduce rate which is especially useful.

The graphs below indicate trends in the descum processes when the R.F. power is changed.



The process is species limited due to the low O_2 flow (165 sccm) and increasing power does not increase rate.



Rate increases with power as the large O_2 flow (1SLM) allows more species to be generated with increase in power.

8.2.2 Endpoint Detection**

There are three methods of end-point detection: ABSOLUTE #1 and ABSOLUTE #2 and TIMED modes.

ABSOLUTE #1 and ABSOLUTE #2 use light intensity from a photo-cell to determine endpoint. The light intensity decreases as the final photoresist is removed.

Although Absolute endpoint detection can be programmed in any or all of three steps, it will only function in a step where photoresist is removed. Therefore, it should only be programmed in such a step.

System 1, Model 105
150mm Performance

Specification

■	**SPECIFIATION** Rate:	0.8 - 1.5 u/min. (@200 to 250 deg C.) bulk strip 1000 A/min descum@150C
■	Removal Uniformity:	<15% (Max-Min) Strip <15% (Max-Mn) Descum
■	Temperature Control:	80 - 250°C (±2°C)
■	Process Range (for bulk strip application)	
	Pressure:	3.0 to 5.0 torr
	Power:	250-475 W
	Flow:	1.0-2.5 liters O2
	Endpoint:	Diode array
■	Particulates:	<0.05/cm² (0.03um or greater)
■	Damage	
	CV:	<0.1V from control
	Mobile Ion:	<1-2 E^{10}
	Vt:	0% total shift on 98% of points tested, no shift >5%

Actual

-	ACTUAL Rate:	1.5 um/min (@30 sec partial strip)*
■	Removal Uniformity:	10% (max-min) (5mm edge exclusion)
■	Temperature Control:	250°C (±5°C)
■	Process conditions	
	Pressure:	4.0 torr
	Power:	425 W
	Flow:	O_2 1.75 liters

*Resist Type: AZ1350J
Thickness: 1.5 um
Bake Temp: 120 deg C

Matrix 10X—especially the industry-proven Matrix 105—is one of the most trusted plasma asher and descum platforms worldwide. Its excellent process repeatability, uniformity, and long-term stability make it a perfect fit for compound semiconductor fabs, supporting low-temperature applications up to 250°C for 2- to 6-inch wafers. Many fabs run dozens, even hundreds, of these systems every day.

For more than 10 years, SemiStar Corp has specialized in refurbishing, upgrading, servicing, and supplying spare parts for Matrix 10X and Matrix 105 systems. Our deep engineering experience and large inventory have earned strong recognition from customers around the world.

If you need equipment, maintenance service, or OEM-quality spare parts, contact SemiStar at sales@semistarcorp.com—we're ready to support your fab with reliable, cost-effective solutions.