



**Plasma Prep Plasma Cleaner
Maintenance &
Instruction Manual**

SPI Supplies Division of STRUCTURE PROBE, INC.

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SPI Supplies is a registered trademark of Structure Probe, Inc.



WARRANTY

The SPI Supplies unit you have purchased is guaranteed to be free of defects in workmanship on the day of shipment . This warranty covers parts and labor for a period of one year, excluding shipping charges or consumables. breakage of glassware is specifically excluded from this warranty.

Proper use of your unit, according to this instruction manual, should result in trouble-free operation. Any improper use of the SPI Supplies unit through modifications or unreasonable operating procedures will void this warranty.

DISCLAIMER

SPI Supplies instruments are designed for simplicity of installation and operation. This manual provides full and complete information in both these areas. SPI Supplies therefore assumes no liability or responsibility of any kind for damage or injury resulting from incorrest installation or operation of the machine. If questions arise , call SPI Supplies TOLL FREE at 800-2424 SPI (USA only). FAX at 1-610-436-5755 or EMAIL at SPI2SPI@2SPI.COM FOR ASSISTANCE.

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SPI PLASMA PREP PLASAMA CLEANER
UNPACKING INSTRUCTIONS

This instrument is shipped complete in one packing carton. Examine the shipping carton for evidence of damage. The unit was thoroughly inspected and carefully packed before leaving our premises. Responsibility for its safe delivery was assumed by the carrier at the time of shipment. Claims for loss or damage to the contents should therefore be made upon the carrier and should be reported to the carrier's agent immediately.

SEE INSTRUCTION SHEET THAT FOLLOWS FOR FILING DAMAGE CLAIM

Open the carton and remove the instruction manual. Immediately beneath it you will find the hose resting on top of the unit as well as an envelope containing two hose clamps. Remove hose from carton and attach a hose clamp to each end. Remove and retain the packing slip.

List Plasma Prep Plasma Cleaner out of the carton and place the unit on a sturdy bench or table.

Remove large box from the sidewall partition and place on dry, stable surface. Inside you will find the outer chamber, TEM Specimen Adapter as well as a power tube.

Carefully inspect machine for any damage to the enclosure, chamber sections, switches, knobs and other components. If components are missing, notify SPI Supplies immediately. For damage caused in shipping, see following page.

NEXT STEP: MOVE ON TO THE INSTRUCTION MANUAL

TABLE OF CONTENTS

SECTION	TITLE	
1	GENERAL DESCRIPTION	
1-1	General Comments.....	6
1-2	Functional Description.....	6
1-2.1	RF Generator.....	6
1-2.2	Vacuum System.....	6
1-2.3	Gas Supply System.....	7
1-2.4	Reaction Chamber.....	7
1-3	Safety Information.....	7
1-4	Description of Plasma Process.....	7
1-5	Access to Process Monitoring.....	8
2	INSTALLATION AND PREPARATION FOR USE	
2-1	Facility Requirements.....	9
2-2	Site Requirements.....	9
2-3	Assembly.....	9
2-3.1	Connecting Vacuum Hose.....	10
2-3.2	Installation of Optional Vacuum Gauge.....	11
3	OPERATION	
3-1	General.....	13
3-2	Controls and Indicators.....	13
3-3	Operation.....	13
3-4	Other Useful Information.....	14
4	USER MAINTENANCE	
4-1	General.....	19
4-2	Cleaning.....	19
4-3	Replacing RF Tubes.....	19
4-4	Tuning the RF Oscillator.....	19
4-5	Spare Parts.....	20
4-6	Customer Return Information.....	20
4-7	Substrates to be Etched.....	21

LIST OF ILLUSTRATIONS

FIGURE NO.	TITLE	
2-1	Connection to Vacuum Manifold.....	12
3-1	Front View of Plasma Prep Plasma Cleaner Controls and Indicators.....	16
3-2	Rear View of Plasma Prep Plasma Cleaner Controls and Indicators.....	17
4-1	Bottom View of Plasma Prep Plasma Cleaner Showing Oscillator Tuning Capacitor Location.....	22

LIST OF TABLES

TABLE NO.	TITLE	
1-1	Table of Specifications.....	8

SECTION 1
GENERAL DESCRIPTION - SPI PLASMA PREP PLASMA CLEANER
(11007-AB, 11007-AX)

PLEASE - TAKE A MOMENT TO READ SECTION ONE [1] BEFORE PROCEEDING TO INSTALLATION

1-1 GENERAL COMMENTS

The SPI Supplies Plasma Prep Plasma Cleaner is a table top plasma chemistry reactor designed to provide plasma technology at a moderate cost. This simple-to-operate instrument can perform both cleaning of TEM specimen holders as well as repeatable plasma chemical reactions with a minimum of automation. All controls are manual; however, where necessary, automatic monitors and controls take over to protect the equipment and the samples in the reactor.

The Plasma Prep Plasma Cleaner comes equipped with an internally housed RF generator. RF power is transferred from a power amplifier directly coupled to the reaction chamber. A variable capacitor provides a tuning control for resonating the power amplifier.

Instrumentation for the Plasma Prep Plasma Cleaner consists of a power tuning indicator.

1-2 FUNCTIONAL DESCRIPTION

The Plasma Prep Plasma Cleaner is a small reactor which weighs under 31 pounds fully assembled, less vacuum pump. With the exception of the external vacuum pump, it is a fully self-contained machine. It consists of an RF generator and associated tuning circuits, a vacuum system with solenoid control valves, a constant feed gas supply system and a reaction chamber system which includes two semitubular electrodes and one Pyrex glass chamber and a plastic chamber seal.

1-2.1 RF Generator - The RF power source includes a solid state oscillator operating at 13.56 MHz, the FCC-authorized industrial frequency. A solid state driver and one 4-65A vacuum tube power amplifier supplying continuous wave power at a maximum of 10 watts. Power transfer to the reaction chamber is accomplished via the electric field between the semitubular electrodes. Maximum power transfer is realized by a suitable tap on the final amplifier tuned circuit. The tuning control allows the tuning of the final amplifier tuned circuit to resonance providing the maximum output power.

1-2.2 Vacuum System - The vacuum system includes the vacuum pump (not supplied as part of the Plasma Prep Plasma Cleaner), the vacuum hose, the vacuum valves and the control circuitry. The vacuum valve switch is interlocked with the RF generator switch to prevent the RF power from coming on unless the vacuum valve is energized. (CAUTION: There is no vacuum sensing, so the vacuum pump must be attached and operating).

1-2.3 Gas Supply System - The gas supply system for the Plasma Prep Plasma Cleaner consists of the gas delivery system inside the reaction chamber. This delivery system is a glass tube sealed on the inner end and perforated along its bottom surface. Connections to the delivery tube are made by sliding the silicone tubing over the barbed fittings on the glass chamber.

1-2.4 Reaction Chamber - The reaction chamber sub-system consists of an upper and lower electrode and a Pyrex glass reaction chamber with a plastic adaptor seal (See Fig. 2-1). The chamber is sealed with a flat silicone gasket which seats against a raised lip on the Plastic adaptor portion. The gas delivery tube feeds through the back of the outer chamber section. This chamber section also provides connection to the vacuum hose by a glass tube joined at the front of the chamber.

1-3 SAFETY INFORMATION

Interlocks - There are four microswitch interlocks engineered into the machine to prevent injury to operating personnel. These are:

- a. Front panel interlock-cuts off AC to the RF power supply
- b. Right side, front and rear-shuts off all primary power
- c. Shield can on outside of front Panel in series with (a. above)

WARNING

SINCE THE GAS USED IN MANY CASES IN THE
PLASMA PREP PLASMA CLEANER IS OXYGEN, NO SMOKING SIGNS
SHOULD BE POSTED NEAR THE MACHINE AND
THE NO SMOKING BAN OBSERVED

Even if a different gas is going to be used, we still recommend the enforcement of the NO SMOKING ban because, quite frequently, the user has an unanticipated need for oxygen and the NO SMOKING ban would be appropriate.

1-4 TYPICAL PLASMA PROCESS

The "Plasma Process" is accomplished through the use of a low pressure, RF induced gaseous discharge. The material or specimen is loaded into the reaction chamber. The chamber is evacuated to a mild vacuum (approximately 200 microns) by a mechanical vacuum pump. A carrier gas is drawn through the chamber over the specimen. Radio frequency power is applied around the chamber (at 13.56MHz). This excites the carrier gas molecules and changes some of them into chemically active atoms and molecules.

The mechanism employed in this process is one of oxidation. Electrons produced by ionization of gas, gain energy in the electric field. Subsequent collisions between these energetic electrons and neutral gas molecules result in an energy transfer to the molecules producing chemically active atoms, free radicals, ions and free electrons. The combustion products, which are completely dissociated and harmless, are carried away in the gas stream. The unique property of this process is that it occurs near ambient temperatures without employing toxic chemicals.

1-5 ACCESS TO PROCESS MONITORING

Another connection is provided for the addition of a pressure transducer to monitor chamber pressure. Recommended Model #11019 (see page 10). This connection is marked PRESS (Pressure) PORT. Spare parts are available (see page 25).

TABLE OF SPECIFICATIONS

PHYSICAL DIMENSIONS

Height	10.5 inches (26.7cm)
Width	11.8 inches (30.0cm)
Length	14.8 inches (37.6cm)

WEIGHT

Assembled	31 pounds
Ship w/container	44 pounds

EFFECTIVE CHAMBER SIZE

Inside length	5.9 inches (15.0cm)
Inside diameter	4.15 inches (10.54cm)

RF POWER 0 to 10 Watts

RF FREQUENCY 13.56MHz crystal controlled

RF TUNING Variable capacitor to maintain resonance

AC POWER 120 VAC, 50/60Hz 15 amp line service
(not including vacuum pump)

NOTE: The Plasma Prep Plasma Cleaner meets Article 18 of the FCC and NIOSH radiation standards.

SECTION 2 INSTALLATION AND PREPARATION FOR USE

2.1 FACILITY REQUIREMENTS

The Plasma Prep Plasma Cleaner is designed for table top use. The facility requirements to operate the Plasma Prep Plasma Cleaner are:

- a. Vacuum pump capable of 50-100 liters per minute. We recommend the SPI# 10405L-AB (equipped with Fomblin oil).
- b. Gas supply - oxygen (O₂), industrial grade with regulator capable of supplying 5 PSIG, and shut off valve.
- c. 120 VAC 50/60 Hz, 15 amp service.

2-2 SITE REQUIREMENTS

There are very few constraints on the location of the Plasma Prep Plasma Cleaner in use. The machine should be operated in a well-ventilated area away from any corrosive fumes. The supply from the cooling fan should not be obstructed. The machine's exhaust (the vacuum pump exhaust) should be vented away from operating personnel. Finally, the machine should be far enough away from high voltage equipment to prevent possible high voltage interference.

2-3 ASSEMBLY

The Plasma Prep Plasma Cleaner comes in nine pieces as listed on the packing list.

- a. Begin by unpacking the main chassis remove the top cover and remove the front panel with the plastic chamber seal adapter attached.
- b. Loosen the right two nylon screws of the chamber electrodes. Remove the two left nylon screws watching for the two nylon spacers on them.
- c. Loosen the brass nut on the fitting that accepts the chamber vacuum port at the front bottom of the chamber.
- d. Engage the two neoprene tubing on the rear of the chamber with two brass fittings on the rear of the chassis then gently slide the vacuum port of the chamber into the brass fitting on the chassis. Snug the brass nut on the chamber port till the "O" ring is engage.
- e. Reinstall the front Panel there is a two pole connector on the right side of the panel that engages with a mating connector on the chassis making sure that the microswitch, mounted on the lower right of the chassis front opening, is engaged.
- f. Remove the two wires that are restraining the plastic chamber seal and let the seal come up to the front of the chamber to seal against the rubber "O" ring on the seal this must be securely seated to create the proper vacuum seal.
- g. Install the vacuum Tube in the socket in the rear of the chassis in front of the fan on the rear of the chassis. Find the plate cap for the tube, which is taped to the top support member of the chassis. Place on the top metal connection of the vacuum tube and secure the screw to hold it.

- h. Connect the metal hose to the rear of the chassis and to the vacuum pump.
- i. Replace the top cover being mindful that the microswitches are not damaged.
- j. Install the specimen stage adapter place a rubber stopper in the front port of the adapter to check for proper vacuum. When appropriate vacuum is achieved turn off vacuum pump and install the specimen stage. Turn on the vacuum pump and when the right vacuum is achieved.
- k. Install the RF shield to engage the microswitch on the front panel set the Power Level knob to mid point and turn on the RF power rotate the tuning knob until a plasma is achieved.

WARNING

Never use metallic screws in place of the nylon screws. Metal, even this small amount, will short circuit the chamber's electrodes.

2-3.1 CONNECTING VACUUM HOSE

- a. On Fig. 3-2 the vacuum connection show is a NW16 flange connector. Supplied are a metal hose, O-ring, centering ring and a flange clamp. If a pump was purchased with the system then these items are supplied for the pump end also. If not then it will depend on your pump arrangement as to what will be needed.
- b. Connect the regulated gas supply hose to the quarter-inch fitting GAS IN, Item 12 of Figure 3-2, located at rear of the machine.

WARNING

Make sure that the VACUUM switch, the RF switch and the METER switch are all off (down position). Turn the LEVEL control fully counterclockwise.

2-3.2 INSTALLING THE RF POWER TUBE

- a. Remove the RF power tube from its shipping container. As a matter of good practice, handle the tube by its end rather than in the middle. Use clean hands to avoid depositing finger oils on the glass barrel of the tube. Install the tube into its socket. The tube base and socket are keyed by one tube prong being larger this allows the proper orientation of the tube in the socket.
- b. Put the power tube connector (this is taped to the top of the chassis for shipping) on the tube plate cap on the top of the tube and secure it with the hardware supplied with the connector.

2-3.3 INSTALLATION OF OPTIONAL VACUUM GAUGE

SPI#11019 VACUUM GAUGE INSTALLATION INSTRUCTIONS

Remove 1/4" pipe plug located on rear of instrument, labeled pressure port.

Tape the thermocouple tube, which has 1/4" NPT, using Teflon tape. Three wraps should be sufficient.

Screw gauge into the vacuum gauge port on the back of the unit.

Insert and tighten with wrench.

CAUTION: DO NOT OVERTIGHTEN

Plug in octal socket into thermocouple gauge tube.

Insert 110AC plug into 110 grounded AC outlet.

Green indicator light will come on.

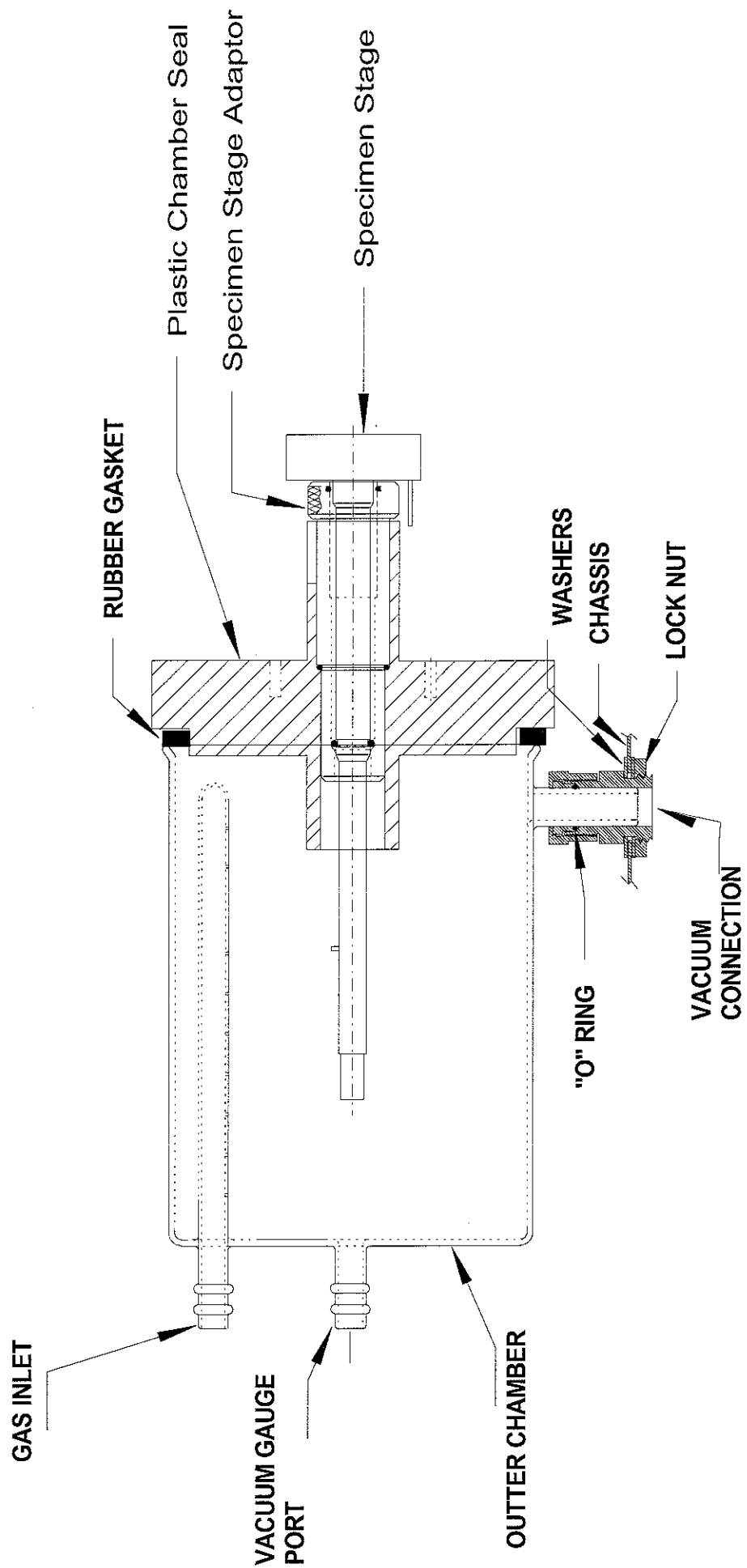


FIG. 2-1 SECTION THRU CHAMBERS

SECTION 3 OPERATION

3-1 GENERAL

Operation of the Plasma Prep Plasma Cleaner consists of loading the TEM specimen stage, evacuating the reaction chamber, applying the process gas and applying the energizing RF power. The RF amplifier must be resonated and power level adjusted to the appropriate level. Upon completion of the process, the RF power switch is turned off, the vacuum valve switch is turned off. The primary power must remain on for the chamber to bleed back to atmospheric pressure.

3-2 CONTROLS AND INDICATORS

Table 3-1 and Figures 3-1, 3-2 are a table of controls and indicators and illustrations of their location on the machine respectively.

3-3 OPERATION

To operate the Plasma Prep Plasma Cleaner, proceed as follows:

- a. Power, vacuum and RF switches should be off.
- b. Start vacuum pump. Turn on AC power by depressing the AC switch (No. 1, Fig. 3-1). The pilot lamp will light and the filament of the tube will glow yellow. Allow the tube and the vacuum pump to warm up for at least 2 minutes.
- c. Load the TEM specimen stage into the Plasma Prep Plasma Cleaner adapter. Be sure that the specimen stage is fully engaged so that the o-rings make a good seal.
- d. Load the specimen stage/adapter into the Plasma Prep Plasma Cleaner making sure that the stage is fully inserted into the unit. The adapter should sit firmly in the chamber. The stage is now automatically positioned at its proper location in the Plasma Prep Plasma Cleaner.
- e. Turn the RF power switch (No. 3, Fig. 3-1) on (upward position). Advance (clockwise) the power level control (No. 4, Fig. 3-1) until there is an indication on the plate current meter (No. 6, Fig. 3-6) of approximately 30mA. Turn the tuning control (No. 5, Fig. 3-11) 90° counterclockwise and clockwise until a dip in the plate current meter is seen. Rock the tuning control back and forth until a minimum is achieved. Advance the power level control until the meter is indicating 10mA and again rock the tuning control until a minimum is achieved. Full power out will be when the meter indicates 10mA(+/- 20%) at the minimum setting of the tuning control. Operating at lower levels of power is achieved by reducing the power level but maintaining a minimum with the tuning control.

NOTE: After the initial use of the Plasma Prep Plasma Cleaner, allow the unit to run for approximately one hour before using it. This will eliminate any contamination, which might be present in the chamber. Either air or process gas (O₂) can be used for this purpose.

Turn off Plasma Prep Plasma Cleaner as follows:

- a. Turn LEVEL control fully counterclockwise.
- b. Turn RF switch off (down).
- c. Turn VACUUM switch off (down).*
- d. The machine can now be loaded and a process performed.
- e. If this is the last cycle of the day, precautions must be taken to avoid contaminating the exhaust line with pump oil. [See NOTE 1].

* If the main power switch is turned off before the chamber returns to atmosphere, it may take a long time to vent. The main power should remain on and the vacuum switch off to vent the chamber.

1. With AC on (lighted) and VACUUM toggle switch DOWN, shut off the vacuum pump.

NOTE 1: Make sure tank pressure is shut off or else gas will continue to bleed and empty the bank.

2. Leave the pump off for about a minute.
3. Throw the VACUUM toggle UP, then turn the pump back on again for another minute, then shut it off.

3-4 OTHER USEFUL INFORMATION

Each gas produces a slightly different color for the resulting plasma:

- | | |
|-------------------------|------------|
| a. oxygen | blue/white |
| b. argon | fuchsia |
| c. carbon tetrafluoride | blue/white |

If the color of the plasma is red to violet, and the etch rate seems low, then air is leaking into the chamber (the color is due to the presence of nitrogen).

The most likely sources of air leaks would be:

- a. vacuum line to back of Plasma-Prep to mechanical pump.
- b. "O" ring seal between the chambers (check to make sure no extraneous particles are present that would interfere with the vacuum).
- c. vacuum line from back of Plasma-Prep to the glass etching chamber.

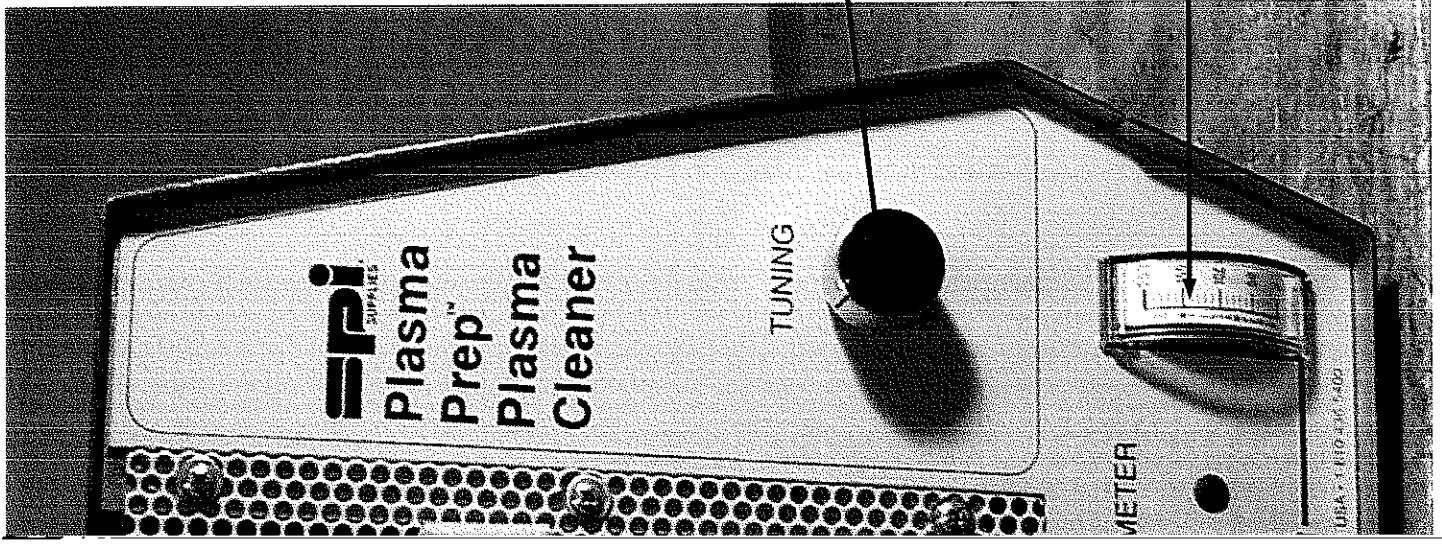
Sometimes mixtures of gases are required in order to accomplish specific ends. One very important case is the removal of epoxy or silicone thermosetting materials (such as the plastic package of an electronic device). Although basically "organic", they are oftentimes filled with various inorganic (most common SiO₂) fillers. The gas composition usually used is 10% CF₄, 90% O₂, with the CF₄ removing the filler and the O₂ taking away the polymer.

Typical etch times are as follows:

- a. Removal of 1 μ m SiO₂: 25-30 minutes.
- b. Removal of 1 μ m Si₃N₄: 30-35 minutes.
- c. Cleaning of hybrid device: several minutes.
- d. Gentle etching to reveal inorganics in an organic polymer matrix, such as magnetic storage media, pigment plastics, etc.: several minutes.
- e. Cleaning of metallographically prepared samples prior to TEM examination: several minutes.

TABLE 3-1 AND CONTROLS AND INDICATORS

ITEM	CONTROL OR INDICATOR	POSITION	TYPE	FUNCTION
1	AC	PUSHBUTTON/LAMP	PUSHBUTTON/LAMP	CONTROLS PRIMARY POWER WITH INDICATOR LAMP
2	VACUUM	UP	TOGGLE SWITCH	VACUUM SOLENOID VALVE OPEN AND BLEED SOLENOID VALVE CLOSED
		DOWN		VACUUM SOLENOID VALVE IS CLOSED AND BLEED SOLENOID VALVE IS OPEN. CHAMBER IS OPEN TO ATMOSPHERE
3	RF	UP	TOGGLE SWITCH	RF POWER IS ON
		DOWN		RF POWER IS OFF
4	LEVEL		POTENTIOMETER	CONTROLS RF POWER LEVEL
5	TUNING		VARIABLE CAPACITOR	TUNES RF POWER AMPLIFIER
6	METER	0 - 200mA	PLATE CURRENT	POWER AMPLIFIER PLATE CURRENT
7			FLOW METERING VALVE (INSIDE TOP COVER) FACTORY SET	SET AT FACTORY FOR GAS FLOW RATE TO PROVIDE 200 MICRONS AT 5 PSIG OF OXYGEN
8	TO VACUUM PUMP		VACUUM FITTING	PROVIDES CONNECTION TO VACUUM PUMP
9	GAS IN		1/4" HOSE BARB	PROVIDES CONNECTION FOR INPUT GAS
10	PRESS		FITTING FOR OPTIONAL PRESSURE TRANSDUCER	PROVIDES ACCESS FOR PRESSURE TRANSDUCER
11	ASB		FUSE	7AMP SLOW BLOW FUSE, A/C POWER
12/13	OSC GND		TEST POINTS	PROVIDES ACCESS TO POWER AMPLIFIER GRID CURRENT FOR RETURNING GRID DRIVE



5. Tuning Dial

6. Plate Current Meter

9. Gas Inlet

7. Flow
Metering
Valve

10. Pressure
Transducer
Port

11. Fuse

SECTION 4 USER MAINTENANCE

4-1 GENERAL

Maintenance on the Plasma Prep Plasma Cleaner consists of cleaning, changing RF tube, replacing such spare parts as "O" rings, lamps and fuses. In addition, a procedure is given for tuning the RF oscillator circuit board (see Section 4-9, 4-10). Any other repairs should be performed by SPI Supplies. The maintenance flow chart (Figure 4-2a, 2b, 2c) is a convenience to help both the user and maintenance personnel understand the relationship between symptom and cause.

4-2 CLEANING

Cleaning consists of a routine procedure, which should be performed periodically. This schedule will depend on frequency of use, type of materials processed and the environment in which the machine has to operate.

4-3 REPLACING RF TUBE

*****WARNING***** - Disconnect the Plasma Prep Plasma Cleaner from AC power before replacing the RF tube.

If the RF tube have to be replaced, proceed as follows: [refer to the operation and maintenance flow chart (Fig. 4-1) for RF tube failure symptoms].

- a. Remove the 4 screws that fasten on the sheet metal cover and remove the top cover.
- b. Unscrew the attaching hardware and remove the lead to the tube plate cap. The old tube can then be lifted out of its socket. CAUTION: Tubes can be hot.
- c. Replace with the new tube and reattach the lead to the plate cap with the same hardware.

NOTE: It is good practice to avoid handling the tube by the glass barrel. Always hold the tube by its base with clean hands. This will increase tube life.

4-4 TUNING THE RF OSCILLATOR

To retune the RF oscillator, proceed as follows: (this procedure should be performed by a qualified electronic technician).

*****WARNING***** - Make sure that RF is OFF and the RF tubes are seated in their sockets.

- a. Unplug the AC connector from the power source.
- b. Remove the top and bottom cover and turn the Plasma Prep Plasma Cleaner on its side.
- c. The AC interlock switches have to be overridden; that is, mechanically held in "closed" position.

- d. Connect VOM test leads between OSC and GND test points at rear of the machine. Set the VOM to the 50mA DC scale (or as close to that scale as your test instrument supplies).
- e. Plug in the AC cord of the Plasma Prep Plasma Cleaner . Push AC pushbutton switch. Allow at least 1 minute for the tubes to warm up.
- f. On the oscillator circuit board (see Figure 4-1) adjust trim capacitor C7 for maximum reading on the VOM.
- g. Tune trim capacitor C11 for a maximum reading on the VOM. The reading should be at least 12-15mA and can be higher. Repeat (f) and (g) until no more can be achieved.
- h. The machine can be closed up again. Make sure that the interlock overriding devices are removed before the top and bottom covers are replaced.

4-5 VACUUM SYSTEM ADJUSTMENTS

The process gas flow is adjusted by the internal needle valve located at the rear top of the instrument just after the connector for the gas line. This should be adjusted for the appropriate chamber pressure by attaching a vacuum gauge to the pressure monitor port.

The chamber bleed to atmosphere is controlled by a bleed valve solenoid located on the left side of the chassis beside the chassis connector for the power transformer. The adjustment is a set screw. Turning it clockwise closes the valve and increases the time to bleed to ATM.

4-6 SUCCESSFUL FUNCTIONING OF YOUR EQUIPMENT

Successful functioning of your equipment depends upon a proper vacuum. Your vacuum pump should be serviced on a frequent and regular schedule. Pump fluid changes should be done on a regular schedule per the pump manufacturers recommendation.

4-7 SPARE PARTS LIST

SPI#	PART NUMBER DESCRIPTION
11009-AB	4" ID Outer Pyrex Chamber
11010-AB	4" ID "O" Ring
11011-AB	Fuse, Bus 7AMP
11013-AB	Solenoid Valve, Straight thru
11014-AB	Solenoid Valve, Metering
11015-AB	Lamp, 12V
11024-AB	"O" Ring for Outer Chamber
11022-AB	RF Power Tube (1)
11027-AB	Quartz Outer Chamber
11005RF-AB	Power Board
11005M-AB	Meter
11005T1-AB	H.V. Supply Transformer
11005T2-AB	Bias/Filament Supply Transformer

4-8 CUSTOMER RETURN INFORMATION

If a Plasma Prep II is to be returned to SPI Supplies for whatever reason, the following procedure should be followed:

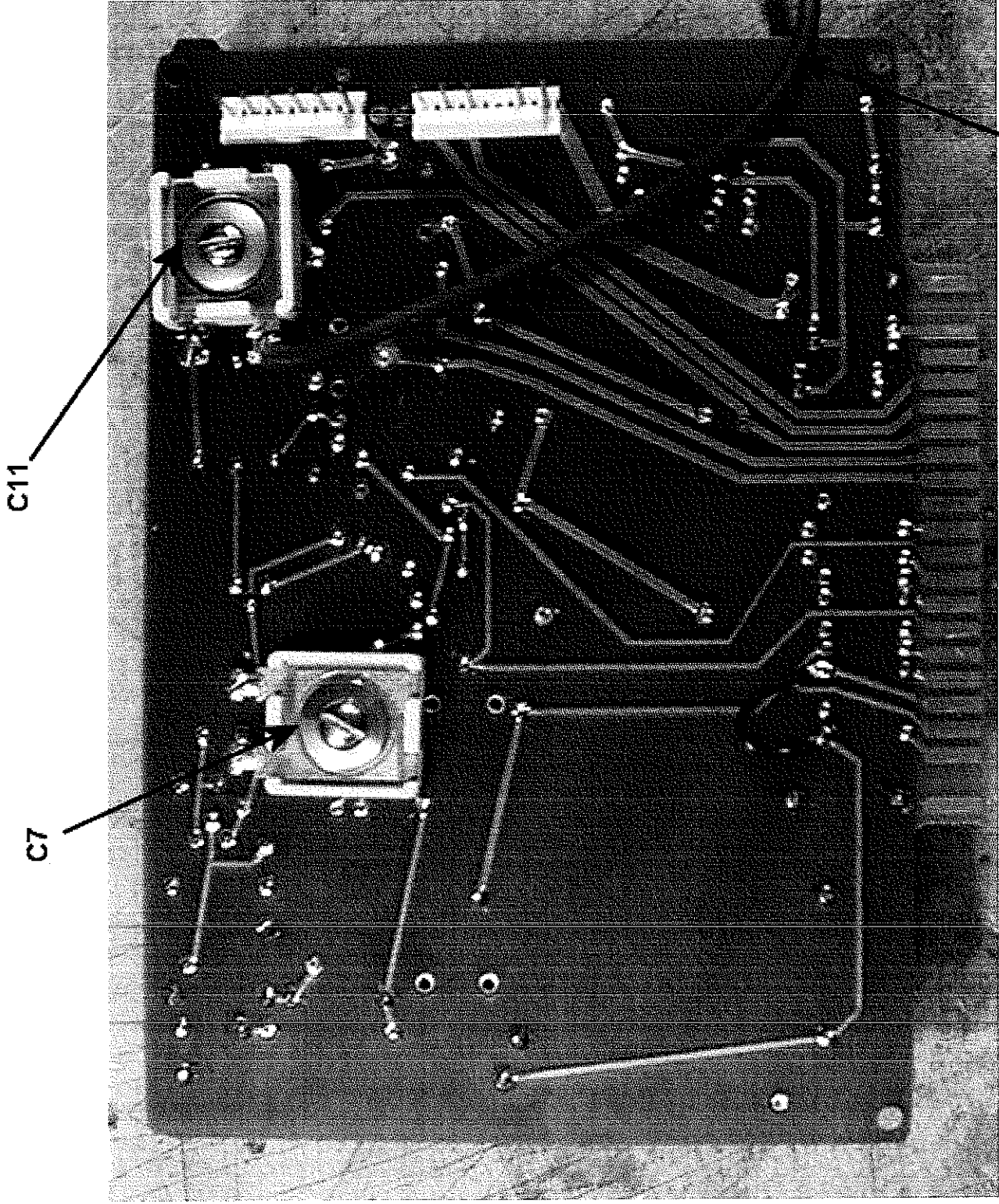
1. From the USA, call SPI Supplies' Customer Service Department, 800-2424-SPI for a Return Authorization Number (RA#). If unit is not received with this RA number on the outside of the box, it will be rejected by the Receiving Department. From Canada, call (610) 436-5400 following the same instructions. For other countries, contact either your closest SPI Supplies agent or SPI Supplies in the USA by phone (610) 436-5400, FAX: (610) 436-5755 or e-mail SpiSupp@aol.com following the same instructions.

2. Repack the machine in its original shipping container. If this is no longer available, take special precautions to avoid damage to the glass chamber sections and other fragile components. DO NOT SHIP ANY GLASSWARE ASSEMBLED WITH THE UNIT.

3. If the machine is still under warranty, the only charges are shipping costs. If the machine is out of warranty, a purchase order will be required for approved accounts and customer can expect to be billed for all parts and service. All others will require some form of guaranteed prepayment such as a letter of credit.

4-9

SUBSTRATE TO BE ETCHED	REACTIVE GAS OR GAS MIXTURE
Stainless Steel	CF4 CF4/O2 mixture (experiment for correct proportions) CCl4-necessary if chromium present
Hydrocarbons, all organics, polymers, etc.	O2
Metal oxides	Ar
SiO2; Si3N4 (passivation layers)	CF4 or other reactive fluorine gases
Plastic packages	Combination of O2 and CF4, O2 to etch plastic, CF4 to etch glass filler. Typical formula: % 10 O2/% 90 CF4
Aluminum and aluminum alloys	Cl2; CCl4; or mixtures of Cl2 + CCl4 NOTE: Initially use small amount of Br2 in mixture to remove surface skin of Al2O3. Also useful are CF4 and CHF3 for this purpose Al2O3; all forms of anodized aluminum; oxide layers on electronic circuits

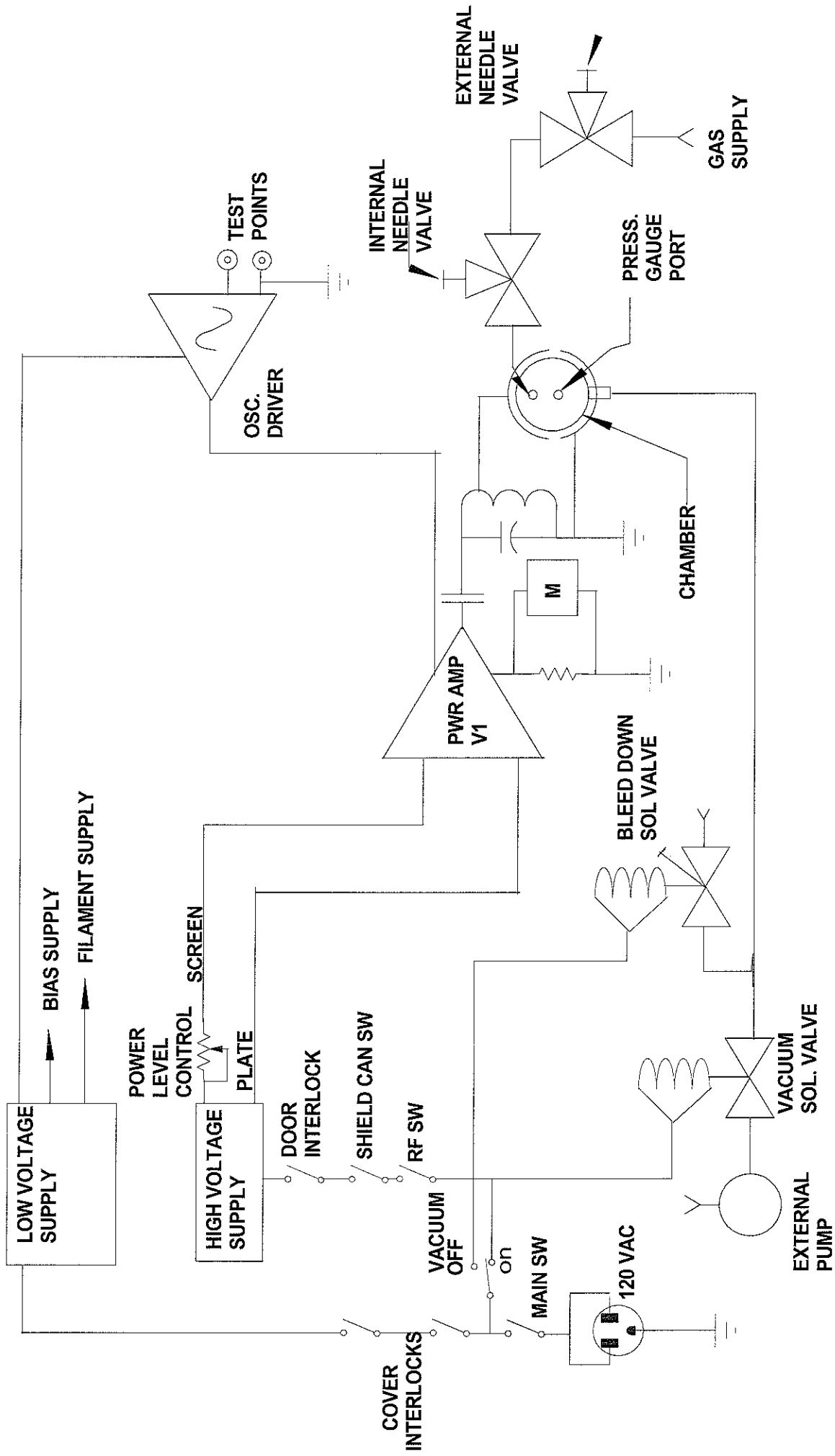


C11

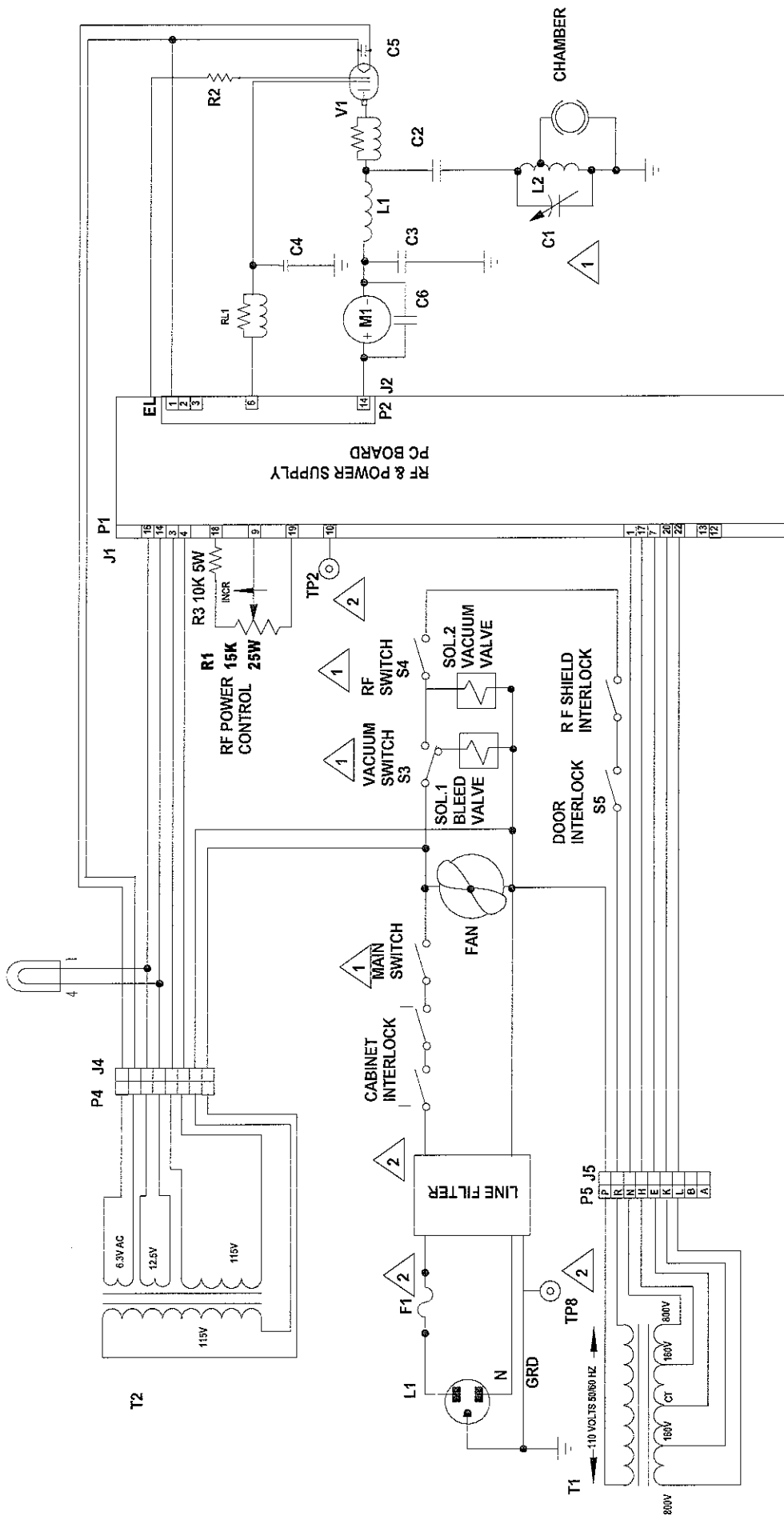
C7

External Lead (EL)

Fig 4-1

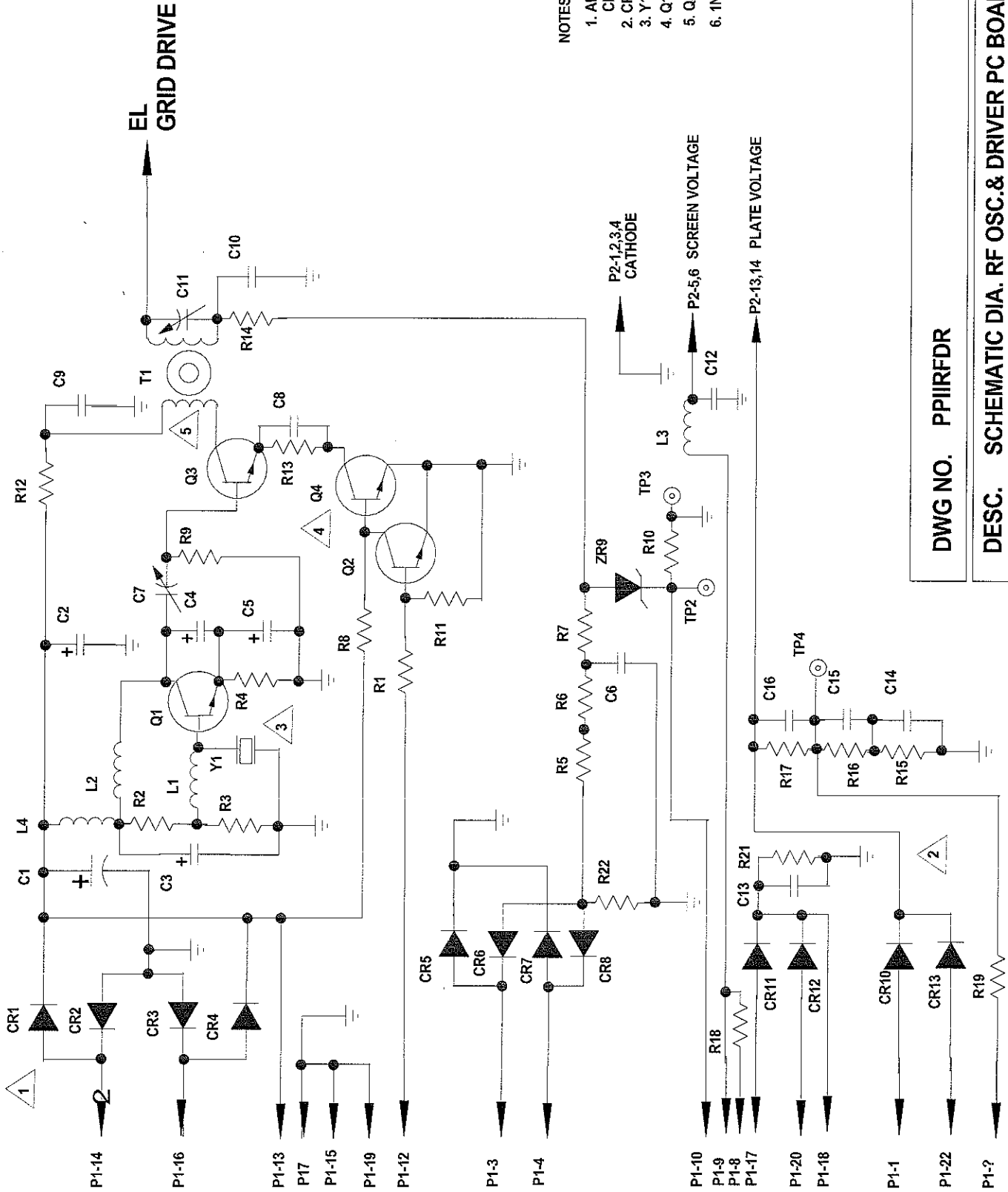


**PLASMA CLEANER SYSTEM
BLOCK DIAGRAM**



1 INDICATES COMPONENT IS MOUNTED ON FRONT PANEL
 2 INDICATES COMPONENT IS MOUNTED ON REAR PANEL

DWG NO. Plsclnr1
 DESC. Plasma Cleaner Chassis wiring
 DATE 3/16/00 BY ALM



NOTES

1. ALL DIODES CR1-CR12 EXCEPT CR10, CR13 1N4005
2. CR10, CR13 HT1651-4 4KV PIV
3. Y1 13.56 MHZ
4. Q1, Q2, Q3 2N3553 Q2 2N697
5. Q3 EQUIPPED WITH HEAT SINK
6. 1N4005 1A 600V PIV

DWG NO. PPIIRFDR

DESC. SCHEMATIC DIA. RF OSC.& DRIVER PC BOARD

DATE 2/29/96 BY ALM