****NOTE****

If the new heater temperature setting is significantly above the existing setpoint, it may take 10-20 min for the temperature to stabilize at the new temperature. If the new setpoint is significantly below (100-250°C) the existing one, it may more than an hour for the heater to cool down to the new setpoint. Faster cool down can be obtained by opening the reactor lid.

****NOTE****

For more information on the REX-C100 temperature controller, refer to the operation manual for the controller in Appendix E.

3.3.2. Ozone Scrubber Temperature

a. Normally, the temperature set point on the ozone scrubber heater should be set to 100°C. If the setpoint is not set to 100°C, adjust it to this value using the steps given in Sec. 3.3.1.

b. If the "OZONE SCRUBBER HEATER" switch on the operation panel is not already lit red, press the switch to supply current to the ozone scrubber heater. The heater temperature will be either raised or lowered in response to the new set point. The temperature of the heater is read out in the upper segment (PV) of the display. The maximum temperature that can be set for the ozone scrubber heater is 150°C.

****NOTE****

During the process, the temperature of the ozone scrubber may rise above the setpoint of the heater due to the exothermic ozone decomposition reaction. For example, if the heater temperature is set for 100°C, it is not unusual for the canister temperature to rise to 110°C. The actual temperature value reached during the process will depend on the ozone concentration and gas flow rate.

3.3.3. Process Time

a. Fig. 3.3 shows the front panel of the process timer.

b. To set the process time, adjust the thumb wheel switches on the lower part of the timer. As the system is shipped from the factory, the timer is set to operate in minutes:seconds [m-s] mode. The two left most thumb-wheels are for setting the minutes and the two right most thumb-wheels are for setting the seconds.

c. The time mode can be changed from minutes:seconds to hours:minutes [h-m] or to seconds [s] by moving the ratchet switch in the middle of the timer up or down using a small jeweler's-type screw driver. The time that has elapsed after the "START" switch was pressed is shown on an LED display at the top of the timer.

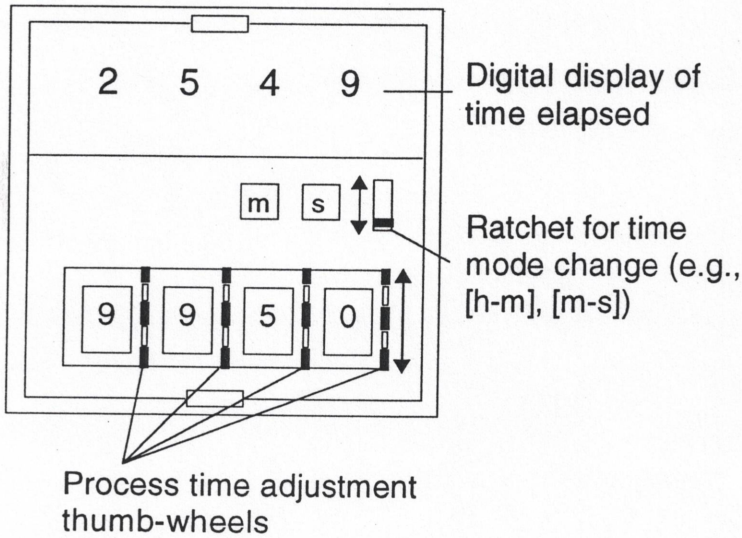


Figure 3.3. Process timer front panel.

****NOTE****

More information about the timer can be found in the QM-48 timer manual in Appendix E.

3.3.4. Oxygen and Nitrogen Flow Rate

a. Figure 1.2 (Appendix B) shows the flow path of the process gases through the system and shows the key flow components. The flow rate of oxygen though the ozone generators and the flow rate of purge nitrogen through the system must be set before the process is started. This section describes how to set the oxygen and nitrogen flow rates under the same conditions used during the planned process.

b. This section assumes that oxygen and nitrogen are being supplied to the system at the appropriate process pressure range (see Section 3.1 and Appendix A). Carry out the following steps to set up the nitrogen and oxygen flow rates:

1. The temperature of the reactor and ozone scrubber can affect the back-pressure through the system and affect the gas flow rates. Therefore, set the temperatures of the substrate heater and ozone scrubber and allow them to reach the desired setpoint and stabilize before setting the gas flowrate values.

2. Make sure that the reactor lid is closed and latched.

Purge

The "PURGE" switch is used to manually purge the system when a UV-ozone process is interrupted by a power failure, the EMO switch being pressed, or a cooling water failure. The manual purge function is also useful if a nitrogen atmosphere is desired inside the chamber for special processing requirements. When the switch is depressed, the switch lights up blue and nitrogen flows into the reactor at the rate set on the nitrogen mechanical flow meter. The purge will continue until the switch is pressed again. During an automatic process, the light on the "PURGE" switch will come on after the process time has elapsed during the time the automatic nitrogen purge is on.

UV Lamp

When this switch is in the "down" position, the UV-lamps will be turned on during the cleaning/stripping process. If the switch is depressed, the switch will light up white after "START" has been pressed. If the switch is in the "up" position, the lamps will be off during the process. The switch has a plastic cover which must be lifted up to activate the switch.

2.2.4. Temperature Controllers

The two temperature controllers to the right of the bank of switches are used to control the temperatures of the substrate and the ozone scrubber heater, respectively. These controllers come on when the power to the system is turned on using the main "ON" switch. Set points for the heaters can be set using the membrane pad at the bottom of the controllers. The heater setpoint and current temperature is digitally displayed. The controller will control the temperature of the heater to within ±2°C of the setpoint. Heater current is not supplied unless the appropriate operation panel switch is pressed to set it in the "ON" position.

2.2.5. Process Timer

To the right of the temperature controllers is the process timer. Processing time is set using the thumb wheel adjustment switches. The elapsed process time is digitally displayed during the process. Process times in the range of seconds to 99 hours can be set.

2.2.6. UV Lamp Failure Indicator Lights

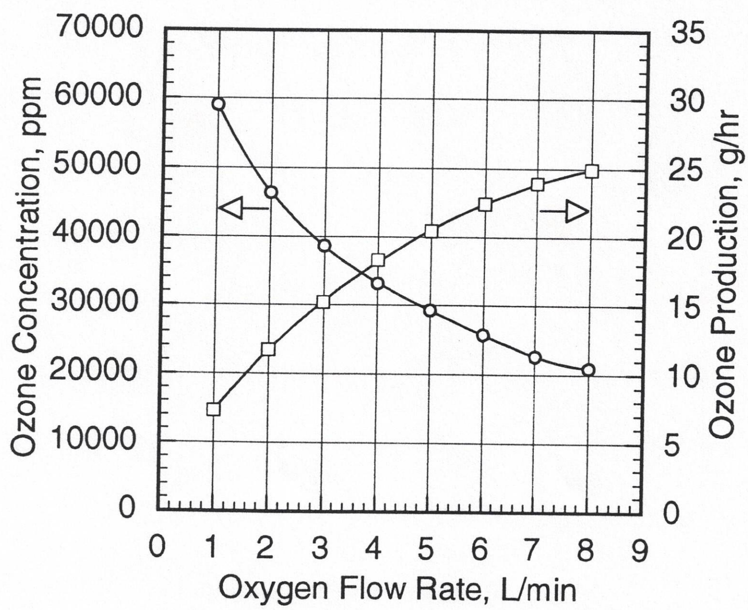
The bank of lights next to the process timer indicate the status of the six UV-lamps in the reactor. If a UV-lamp fails, the current to lamp will decrease below a critical level and the indicator lamp on the operation panel will light up. When the UV-lamps are first switched on during a process, the indicator lamps will flicker for up to 60 sec until the lamp current has stabilized. This is normal.

2.3. Flow Meters

The flow of oxygen through the ozone generators is controlled by mechanical flowmeters. There is one 10 l/min flowmeter for each of the two ozone generators. The flowmeters are located on the left front panel of the system (see Fig. 1.1, No. 7). The flowmeter for the nitrogen purge is located next to the oxygen flowmeter (No. 8).

2.4. Ozone Generators

The ozone generators (ozonizers) are mounted to the floor inside the chassis of the system and can be accessed by removing the front and/or side panels (see Fig. 1.1, No. 5). Oxygen is fed into the inlet side of the ozone generators and oxygen enriched with ozone is evolved from the outlet side. The water-cooled ozonizers generate ozone through a high voltage, moderate frequency, atmospheric pressure electric discharge (i.e., silent discharge). The ozone concentration and production rate are dependent on the oxygen flow rate (see Fig. 2.2).



silicone-rubber blanket heater. The mixed metal honeycomb ozone catalyst scrubs ozone from the process gas exhaust stream by converting it into molecular oxygen. During operation the catalyst bed reaches temperatures above 100°C and reduces the ozone concentration to below 0.1 ppm. The catalyst bed can be accessed by removing the rear panel of the system.

2.6. UV lamps

There are six U-shaped ultraviolet lamps mounted in the reactor lid of the system. The lamps are visible when the lid is opened. The lamps are made from UV-transparent quartz and employ a low pressure mercury vapor/inert gas discharge to generate ultraviolet bands at 185 and 254 nm.

2.7. Cooling Water Flow Interlock

The cooling water flow interlock is mounted near the lower left-hand corner of the system back panel (see Fig. 1.1, No. 4). The interlock consists of a magnetically coupled float/switch which senses when the cooling water flowrate is below the set point. The float can be see from the cutout in the back panel.

2.8. Cooling Fans for UV Lamps.

The UV lamps in the reactor lid are cooled by the passage of air through the lid drawn in the top by cooling fans (see Fig. 1.1, No. 14). The inlets to the fans on the top of the reactor lid should be kept open so that the lamps received adequate cooling.

g. Install the panel or wafer platen that will be utilized onto the substrate heater and tighten the 10 screws so that the platen makes good thermal contact with the heater.

h. Remove the side panels of the UV-660 using a large size slotted screw-driver or a coin (dime). Check that the power switches on the two ozone generators are in the "ON" up position. The switches are on the panel of the ozone generator facing towards the rear of the UV-660. Normally, these switches are left in the "ON" position, and the power to the ozonizers is controlled by the switches on the operation panel. After checking that the ozone generator power switches are in the "ON" position, re-install the side panels on the system.

i. Make sure the main circuit breaker on the lower right front panel of the UV-660 is off. Then supply 115 VAC single phase power to the system from the facilities power grid.

3.2. Start-Up the System

a. Switch the main circuit breaker to the "ON" position. The breaker switch is located on the lower right front panel of the system.

b. Press the main power "ON" switch on the operation panel. The switch will light up green. The yellow "ABORT" switch light will also be on. The temperature controllers for the substrate heater and the ozone scrubber will come on, but heat will not be supplied to the heaters unless the switches for the heaters on the operation panel are depressed and the switch lights are lit red.

WARNING!!! CAUTION!

Depending on the setpoint of the substrate heater and the state of the substrate heater switch, the substrate heater may come on when the system is switched on. Make sure that only heat resistance materials are in contact with the substrate platen. Non-heat resistant plastics or combustible materials may result in serious damage to the system components and/or cause a fire.

3.3. Set-Up Process Parameters

Before running a process, it is necessary to set-up or check the settings of the system components.

3.3.1. Substrate Heater Temperature

a. If the substrate heater will be used during the process, check the lower display of the substrate heater temperature controller to see if the proper heater temperature is set. If the setpoint is correct, press the "SUBSTRATE HEATER" switch on the operation panel to supply current to the heater (if it is not already on). Otherwise change the setpoint to the desired setting.

b. Referring to Fig. 3.2 which shows the front panel of the temperature controller, set the desired substrate temperature as follows.

1. Press "SET" on the temperature controller membrane pad. The right most digit of the lower, orange LED setpoint range will be highlighted brighter than the other digits.

2. Press the setting digit shift key (left facing arrow key) to select the desired digit of the set point (SV) to adjust. The highlighted (bright) digit will move from right to left each time the key is pressed.

3. Once the appropriate digit has been selected, press the set point increment key to increase the value of the selected digit of the set point value. Press the set point decrement key to decrease the value of the selected digit of the set point value.

4. Repeat steps 2 and 3 until the desired set point value is shown in the digital display (SV).

5. Press "SET" to enter the set point value. If "SET" is not pressed within 60 seconds of changing the set value, the controller will revert to the previous setpoint setting.

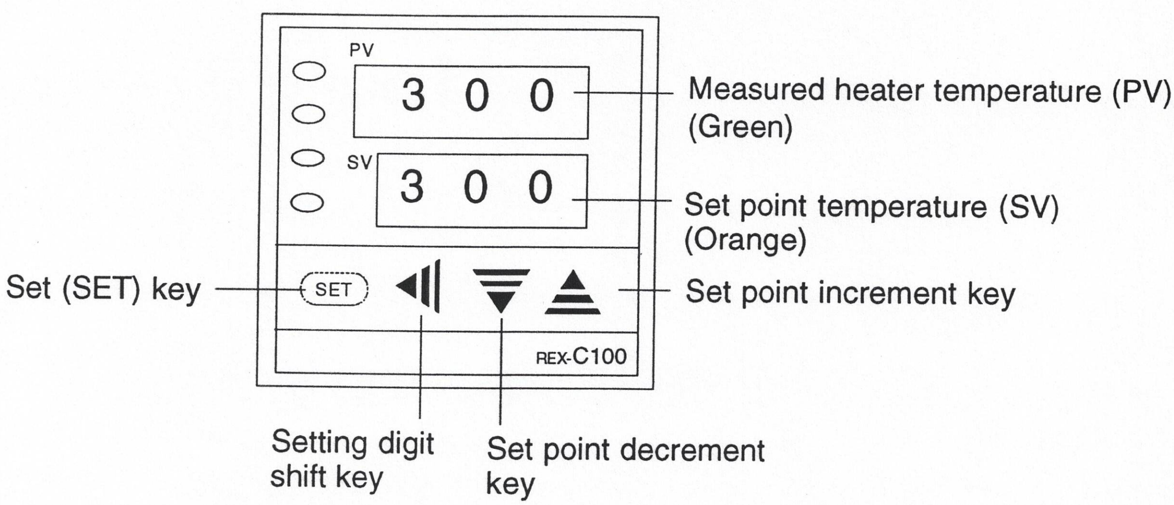


Figure 3.2. Substrate heater temperature controller front panel.

c. Once the substrate temperature setpoint is correct, press the "SUBSTRATE HEATER" switch on the operation panel to supply current to the heater. The heater temperature will be either raised or lowered in response to the new set point. The temperature of the heater is read out in the upper green LED segment (PV) of the display. The maximum temperature that can be set for the substrate heater is 300°C.

1.2.2. Current System Configuration/Process Overview

The system described in this manual has been configured to process either one to four 6" wafers or one 320 mm x 340 mm glass panel depending on the platen mounted to the substrate heater platform.

Figure 1.1 is a schematic drawing of the system from various viewpoints which shows the location of key components using a numbered legend. In the text that follows, the numbers in parentheses refer to the numbered components on Fig. 1.1. The reactor door (1) housing the UV lamps is unlatched and lifted to expose the heated substrate platen inside the reactor (2). A wafer or glass panel is manually loaded onto the platen by the operator and the reactor door is closed and latched. The process parameters are set using the operating switches (9), oxygen, and purge nitrogen flow meters (7,8), catalyst heater and substrate heater temperature controllers (10, 11), and process timer (12).

Once the process parameters have been set up, pressing the start switch (9) turns on the oxygen flow to the ozone generators (5), and switches on the UV lamps and ozone generators (if they have been selected using the operating switches, 9). The ozone/oxygen gas mixture flows from the ozone generators through tubing into the manifold above the UV lamps in the reactor lid and is distributed through nozzles over the substrate surfaces. The reactant and product gases flow out the bottom of the reactor to the ozone scrubber (6) where the residual ozone in the reactant gas stream is removed. The product gases mixed with oxygen flow out the exhaust port (22) at the back of the unit. See Fig. 1.2 for a flow schematic of the system.

Once the selected process time has elapsed, the oxygen flow, UV lamps, and ozone generators are switched off and a nitrogen purge flow is automatically switched on to sweep residual ozone out of the generators and reactor. After the nitrogen purge, the substrate(s) can be removed from the platen.

1.2.3. System Dimensions, Layout, and Weights

The UV-660 is a single self-contained unit. Figure 1.1 also shows footprint and elevation dimensions for the system.

The absolute minimum maintenance clearance at the sides and rear of the system is 400 mm (16"), but SAMCO ***strongly recommends*** a clearance of at least 600 (23.6") mm on all sides of the system for ease of maintenance..

Table 1.1 Summarizes the dimensions, approximate weight and averaged floor loading for UV-660. The reactor door requires an overhead clearance of at least 1530 mm (60.2") to fully open. Please see Fig. 1.3 for a drawing of the dimensions of the system with the reactor door open. The heated platen which holds the panels or wafers being processed is 1010 mm (39.8") above the floor.

TABLE 1.1 Dimensions (reactor closed), weight and floor loading for the UV-660

Dimensions, mm (in), W x D x H	*Weight, kg (lbs)*	*Floor loading, kg/m²(lbs/ft²)*
1043.5 (41.1) x 759 (29.9) x 1084 (42.7)	265 (584)	335 (68.4)

2. Facility Requirements

2.1. Required Utilities

Table 2.1 lists the utilities that are required for the operation of the UV-660 system. Please read Section 3.3 section carefully before installing the utilities. Section 3.3 contains important details on setting up the utility connections.

TABLE 2.1. Utilities required for operation of the UV-660 system

Utility	*Description of Requirements*
Power:	115 VAC (± 5%), single phase, 50 amp. Flex cord provided.
Grounding:	Independent type 3.
Cooling Water:	*Supply Pressure:* • pressure differential between supply and drain ports (in and out) should be 3-4 kg/cm² (29.4-44.1 psi), **not to exceed 5 kg/cm² (73.5 psi) gauge.** *Supply Temperature:* 10-25°C (50-77°F) recommended, not to exceed 25°C (77°F) *Supply Flow Rates:* 2.0-3.0 liters/min (0.53-0.79 gal/min) *Connection requirements:* • 1/4" female NPT for supply and drain. • Recommend 1/4" *ID* tubing minimum. • Recommend <20 µm rated depth filter on supply line. • Water should be free of corrosion products

TABLE 2.1. (Continued) Utilities required for operation of UV-660 system	
Utility	*Description of Requirements*
Process Gases:	*Source pressure:* 1 kg/cm^2 (14.7) gauge recommended, **not to exceed 1.5 kg/cm^2** (22 psig). 0.5 kg/cm^2 (7.8 psig) minimum (rated flow may not be possible at pressures less than minimum) *Flow Rate:* • Oxygen: 0-20 SLM *Connection requirements:* • 1/4" Swagelok® fittings • A point of use filter rated at <2 micron or compatible with the process requirements should be installed upstream of the back plane (Nupro® SS-4FW-2 or equivalent). Filter must pass 20 SLM oxygen at 1-1.5 kg/cm^2 upstream pressure • Type 316 stainless steel tubing recommended
Nitrogen Purge Gas:	*Source pressure:* 1 kg/cm^2 (14.7 psig) gauge recommended, **not to exceed 1.5 kg/cm^2** (22 psig). 0.5 kg/cm^2 (7.8 psig) minimum (rated flow may not be possible at pressures less than minimum) *Flow Rates:* • for system purge: 10-20 SLM *Connection requirements:* • 1/4" Swagelok® fittings • A point of use filter rated at <2 micron or compatible with the process requirements should be installed upstream of the back plane (Nupro® SS-4FW-2 or equivalent). Filter must pass 20 SLM nitrogen at 1-1.5 kg/cm^2 upstream pressure • Type 316 stainless steel tubing recommended

TABLE 2.1. (Continued) Utilities required for operation of UV-660 system

Utility	*Description of Requirements*
Process Gas Venting:	*Purpose:* Conduct process and product gases from system reactor to safety vent *Connection requirements:* • 1/2" Swagelok®. Tubing between exhaust port on back-plane of system and customer provided duct work should be of Teflon, stainless steel, or aluminum. **WARNING!!!** *The effluent stream contains oxidation products of organic contaminants being removed (e.g., carbon dioxide, water vapor, etc.). Also, the lifetime of the ozone decomposition unit is nominally 1400 hours and the ozone concentration could exceed 0.1 ppm after the rated lifetime of the catalyst material has expired. Therefore, always connect the exhaust port to an appropriate and safe vent connection.*
Chassis Heat Exhaust:	*Purpose:* Exhaust waste heat from ozone catalyst unit. Maximum temperature is 50°C (122°F). *Connection requirements:* • Chassis heat exhaust: 50 mm (2") OD, 50 mm (2") length tube stub provided on back plane of system for connection of metal or flexible ductwork to negative pressure exhaust system. 230 liters/min (8.2 CFM) required.
Environment:	*Temperature*: 25 ± 5°C (77 ± 9°F) *Relative Humidity:* 60% ± 10%

3.3. Connecting The System Utilities

3.3.1. Overview/Background

Table 2.1 (Section 2) lists the utilities that are required for the operation of the UV-660 system. Figure 3.1 shows the customer-supplied utility requirements schematically. Figure 1.1 shows individual utility connection points at the back-plane of the UV-660 with elevation and lateral position dimensions.

Please review these drawings carefully before continuing to read this section.

3.3.2. Connecting the Power Supply and Ground

The UV-660 requires 115 VAC, single phase power at a rating of 50 A. The voltage tolerance required for all system components to function properly is 115 VAC ±5%, (109.3 to 120.8 VAC). Please make sure that the voltage is maintained within this range.

CAUTION!

Supply voltage variations outside the recommended range may degrade the performance of the system, decrease the life expectancy of system components, and/or cause serious damage to components.

The customer is responsible connecting the flexible power cable provided with the system to their power grid. The power to the system should be routed from the customer supplied wall-mounted main power disconnect box using the flexible cable provided. The connector end of the power cable should be installed on the mating connector at the back panel (see No. 23 on Fig 1.1).

The ground rating should be type 3. If the ground from the power grid is not of this rating, an independent ground wire connection should be provided to the customer-supplied main disconnect box.

CAUTION! WARNING!!!

During installation, the system will be checked by the SAMCO installation engineer. Do not supply power to the system until given authorization by the SAMCO installation engineer or else damage to the system components or harm to personnel may result.

3.3.3. Connecting the Cooling Water

There is one cooling water channel for cooling the ozone generators. The inlet and outlet connection ports (female 1/4" NPT) can be found at the lower back-plane of the system main unit (see No. 18 and 19, Fig. 1.1). The cooling water supply should be free of corrosion products and passed through a filter with a rating of at least 20 µm. The required cooling water flow rate is 2-3 liters/min (0.53-0.79 gal/min). The water temperature should be in the range of 10-25°C (50-77°F) and should not exceed 25°C (77°F). Cooling water lines should have an inside diameter of not less than 1/4". A differential pressure between the inlet and outlet ports of at least 3 kg/cm^2 (44.1 psig) is required to achieve the required flow rates. If the minimum recommended coolant flow rate is not met, the cooling water failure light on the control panel will be lit and a process cannot be run. The recommended pressure is 3-4 kg/cm^2 (44.1-58.8 psig). The maximum pressure supplied to the inlet side should not exceed 5 kg/cm^2 (73.5 psig).

CAUTION! WARNING!!!

The maximum pressure limit of 5 kg/cm^2 (73.5 psig) should not be exceeded at any time. Operation of the system at higher coolant pressures may damage the system and endanger the operator.

3.3.4. Connecting the Process Gas

Carefully follow all local safety standards concerning the use of compressed gases. The connection port for the oxygen process gas at the back-plane of the main unit is shown in Fig. 1.1 (No. 25). The port is a 1/4" Swagelok® tube fitting. Clean stainless steel tubing of 1/4" outside diameter is recommended for connections between the gas source and the system. Tubing materials which corrode, generate particles, or have a pressure rating below the maximum outlet pressure of the source gas regulator should not be used. Although the process gas lines inside the main unit are designed to handle pressures up to 1.5 kg/cm^2 (22 psig), the *recommended* pressure upstream of the system is 1 kg/cm^2 (14.7 psig). At pressures less than 0.5 kg/cm^2, the maximum rated flow of process gas may not be reached. A two-stage high purity (metal diaphragm, diffusion resistant) regulator or equivalent is recommended to control the pressure upstream of the system process gas connections.

CAUTION! WARNING!!!

The maximum pressure limit of 1.5 kg/cm^2 (22 psig) should not be exceeded at any time. Operation of the system at higher gas pressures may damage the system and endanger the operator.

A point of use particulate filter as required by the cleaning process specifications should be installed upstream from the back-plane connection port to protect substrates from particulate contamination arising from the tubing, valves or pressure regulator. Internal 7 µm rated filters are provided inside the system to protect the flow meters and other flow system components from gross particulate contamination.

3.3.5. Connecting the Purge Nitrogen

Carefully follow all local safety standards concerning the use of compressed gases. The connection port for the nitrogen purge gas at the back-plane of the system is shown in Figure 1.1 (No. 24). The port is a 1/4" Swagelok® tube fitting. Clean stainless steel tubing of 1/4" outside diameter is recommended for connections between the gas source and the system although Teflon® tubing may be used if it does not violate local safety codes and has a wall thickness able to safely contain pressures up to 1.5 kg/cm^2 (22 psig).

A point of use particulate filter as required by the cleaning process specifications should be installed upstream from the back-plane connection port to protect substrates from particulate contamination arising from the tubing, valves or pressure regulator. Internal 7 µm rated filters are provided inside the system to protect the flow meters and other flow system components from gross particulate contamination..

Although the nitrogen purge gas lines inside the main unit are designed to handle pressures up to 1.5 kg/cm^2 (22 psig), the recommended pressure upstream of the system is 1 kg/cm^2 (14.7 psig). At pressures less than 0.5 kg/cm^2 (7.8 psig), the maximum rated flow of purge gas may not be reached.

CAUTION! WARNING!!!

The maximum pressure limit of 1.5 kg/cm^2 (22 psig) should not be exceeded at any time. Operation of the system at higher gas pressures may damage the system and endanger the operator.

3.3.6. Connecting the Process Gas Exhaust Port

Process gases and process gas by-products are exhausted from the ozone scrubber canister. The gases exhausted by the system should be handled in accordance with local safety ordinances. The customer supplied connections downstream from the system exhaust port should be capable of handling peak gas flows of at least 20 liters/min.

The principle gases exhausted by system are oxygen and nitrogen (during the purge). Process gas effluents will also contain carbon dioxide, water vapor and other trace gases depending on what organic materials are cleaned/stripped from the substrates being processed.

WARNING!!!

The effluent stream contains oxidation products of organic contaminants being removed (e.g., carbon dioxide, water vapor, etc.). Also, the lifetime of the ozone decomposition unit is nominally 1400 hours and the ozone concentration could exceed 0.1 ppm after the rated lifetime of the catalyst material has expired. Therefore, always connect the exhaust port to an appropriate and safe vent connection.

3.3.7. Connecting the Cabinet Ventilation Exhaust Port

A 50 mm (1.97") diameter by 50 (1.97") mm long exhaust port at the back plane of the system (No. 29 in Fig. 1.1) is provided to exhaust waste heat from the chassis of the system. The maximum estimated temperature for the air flowing out of the chassis is 50°C (122°F). This port should be connected to an appropriate exhaust duct such that the airflow through the port is 230 liters/min (8.2 CFM) or greater. The connecting duct can be of a flexible metal or plastic type, depending on the local code requirements.

2. System Layout/Key Component Overview

The purpose of this section is to familiarize the operator with the location and function of key system components with which the operator must interact during start-up, operation, and shut down of the system and/or which require operator awareness. In the component descriptions that follow, make sure that you understand where each of the mentioned system components are located for future reference.

****NOTE****

A set of individual manuals for key instrumentation components of the system can be found in Appendix E. A listing of the system specifications can be found in Appendix D.

Figure 1.1 is a detailed mechanical drawing of the system from various viewpoints which shows the location of key system components. Fig. 1.1 can be found in Appendix B.

2.1. Main Circuit Breaker

The main circuit breaker for the system is located on the lower right front panel of the system. (see No. 26 on Fig. 1.1). Before operation of the system is possible, this breaker must be in the "ON" position. The breaker should be switched off before performing any service to the system.

2.2. Operation Panel

Fig. 2.1 is a schematic drawing of the main operation panel used to control and monitor the functions of the system.

2.2.1. EMO Switch

The red emergency off (EMO) switch is for shutting down the power to the system immediately, if required, for safety reasons. The switch is located at the extreme left side of the operation panel. Once the switch has been pressed and the power cut to the system, the switch must be rotated to the right and allowed to pop out the non-tripped position in order before it is possible to restore power to the system.

2.2.2. UV-Lamp Hour Meter

The UV-lamp hour meter is located above the EMO switch and tracks the number of hours that the UV-lamps have been on during processing. The number displayed on the meter is useful in determining when the UV-lamps should be replaced.

2.2.3. Process Switches

The bank of switches/status lights to the right of the EMO are used to control the main processing components of the system.

Power On

Pressing the "ON" switch turns on the main power to the system. The switch lights up green.

Start

Pressing the "START" switch initiates the UV-ozone cleaning/stripping process. The oxygen flow, UV lamps (if pre-selected), and the ozonizers (if pre-selected) are turned on and remain on for the time pre-set on the process timer. When pressed the switch lights up white.

Abort

Pressing the "ABORT" switch after a process has been initiated using the "START" switch, stops the oxygen flow, turns off the UV-lamps (if pre-selected) and ozone generators (if pre-selected), and initiates a automatic nitrogen purge of the reactor. When the system is first powered "ON" and after a cleaning process is complete, the abort switch lights up yellow. The switch light is off during the UV-ozone process.

Cooling Water Failure Light

Next to the "ABORT" switch is the red "COOLING WATER FAILURE LIGHT", which comes on if the cooling water to the system is stopped or the cooling water flow rate is below the recommended level. When the cooling water is below the recommended setpoint, the substrate and ozone scrubber heaters will be turned off, and any process components (UV lamps, ozone generators, gas valves) will be shut off.

Ozonizer 1, 2

When these switches are in the "down" position, ozone generator No. 1 and 2 will be turned on during the cleaning/stripping process. If the switches are depressed, the switches will light up blue after "START" has been pressed. If the switches are in the "up" position, the ozone generators will be off during the process and the switches will not light up when "START" is pressed.

Ozone Scrubber Heater

Pressing this switch turns on the power to the pre-heater on the ozone scrubber canister. The switch will light up red and current will flow to the ozone scrubber heater. Pressing the switch again turns off the power to the heater.

Substrate Heater

Pressing this switch turns on the power to the substrate heater. The switch will light up red and current will flow to the substrate heater. Pressing the switch again turns off the power to the heater.

