



TS-10 & 20

**Select either a 10 or 20 g/hr.
Both are Turnkey Ozone Generation Systems**

Installation and Operation Manual



Contents

Cautions, Warnings and Hazards.....	3
Unpacking Instructions.....	4
Introduction	6
Theory of Operation.....	6
System Flow Diagram and Theory of Operation.....	6
Required Operating Conditions	7
Pre-Installation Check Instructions.....	8
Installation	9
Start up Procedures.....	10
Shutdown Procedures.....	10
Ozone Generator Performance	10
Troubleshooting Guide.....	12
External Components Drawing.....	13
External Components Description.....	14
Internal Components Drawing	15
Environment.....	16
Maintenance	16
Ozone Generation Cell	17
Status LED's	21
Mechanical Specifications	23
How to Contact Ozone Solutions	24

Cautions, Warnings and Hazards

Ozone is a powerful oxidizing agent. Observe strict operating procedures when using ozone equipment. Ensure that either the TS-10 or TS-20 are in a well-ventilated area.

Note: If the operator has asthma, he/she must not enter an ozonated airspace. Ozone can induce an asthma attack.

- WARNING** Ozone is an extremely aggressive and powerful oxidizer. The Occupational Safety and Health Administration (OSHA) 8-hour exposure limit is 0.10-PPM. The OSHA 15-minute exposure limit for ozone is 0.3 PPM. Above 0.3 PPM, there is the risk of damage to respiratory tissues.
- WARNING** People who have no sense of smell should not operate this equipment.
- WARNING** **Never attempt to verify ozone production by directly breathing or smelling the ozone outlet or an ozone-tubing outlet.**
- WARNING** The system uses ozone compatible Stainless and Teflon tubing. The Ozone Generators under high pressure poses the possibility of ozone leaks to occur. In the event of an ozone leak, immediately shut down the system.
- WARNING** Use only Teflon or other approved methods for ozone tubing. Ensure tubing connections between the Ozone System and the point of use are secure and in good condition. Failure to do so could result in the discharge of dangerous amounts of ozone into an occupied space.

The TS- 10, 20 contains OXYGEN SIEVE'S for the production of high concentration oxygen to supply the Ozone Generator.

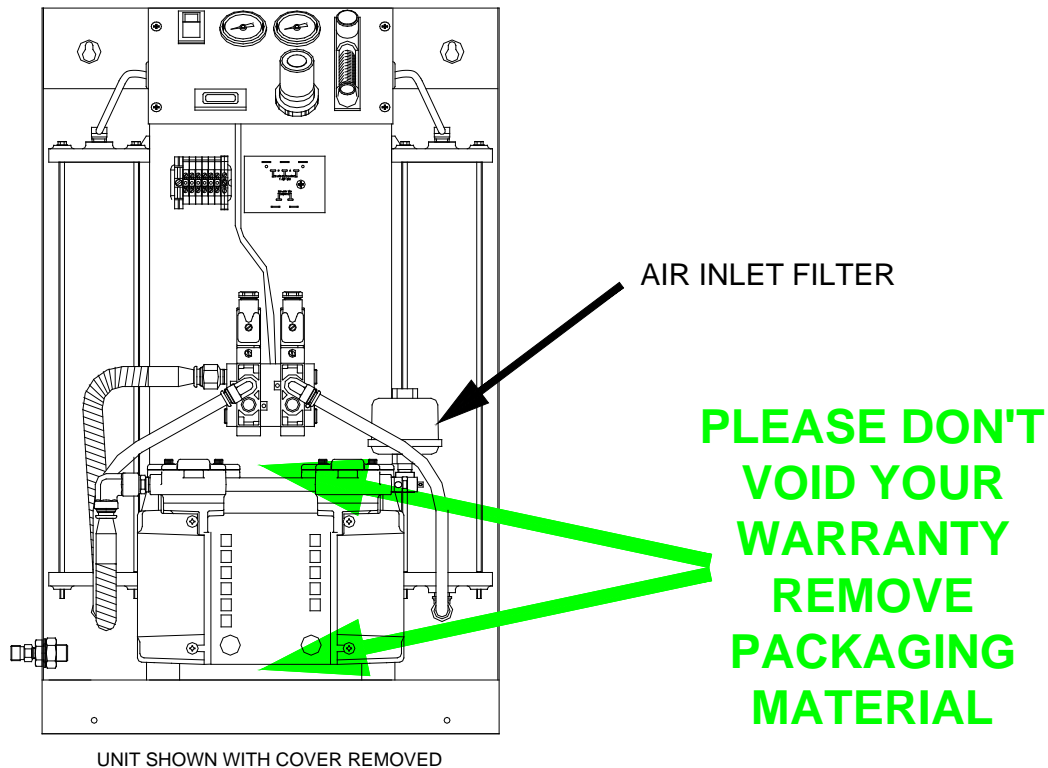
Although oxygen itself is not combustible, it can be very dangerous. It greatly accelerates the burning of combustible materials.

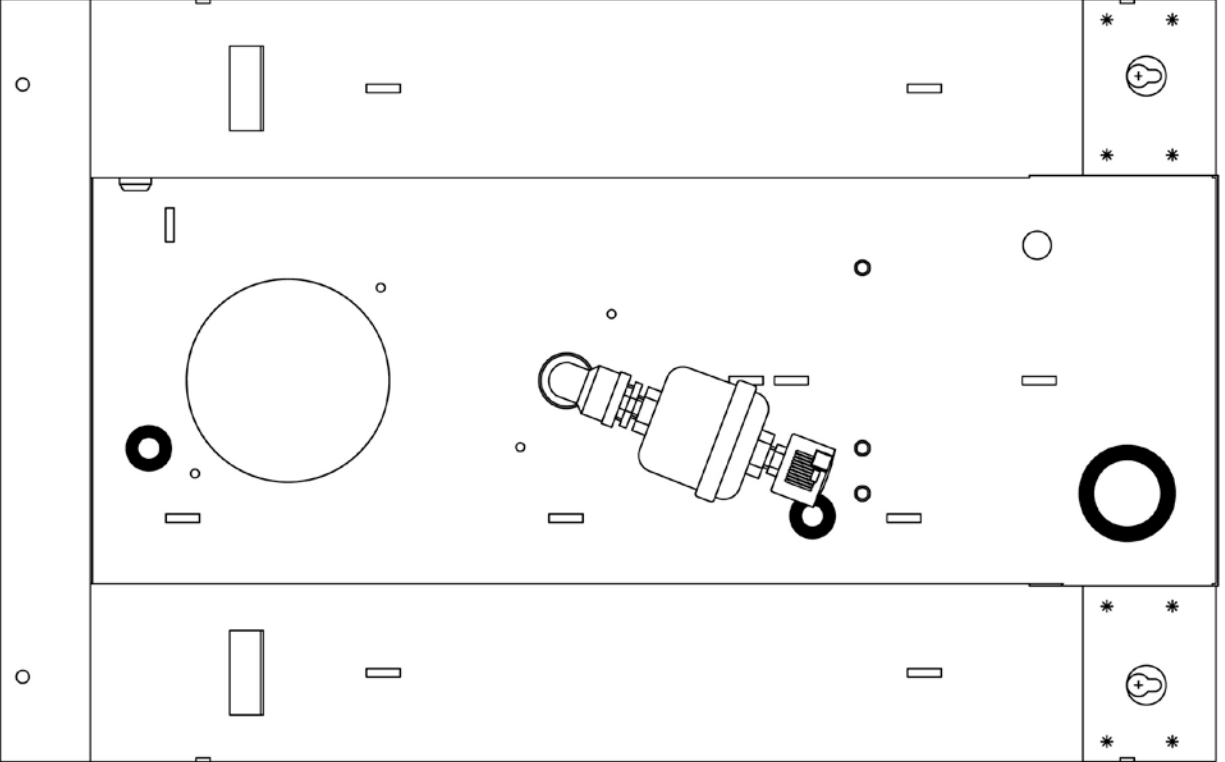
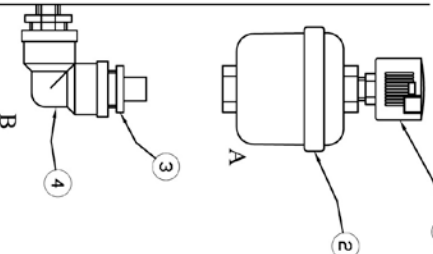
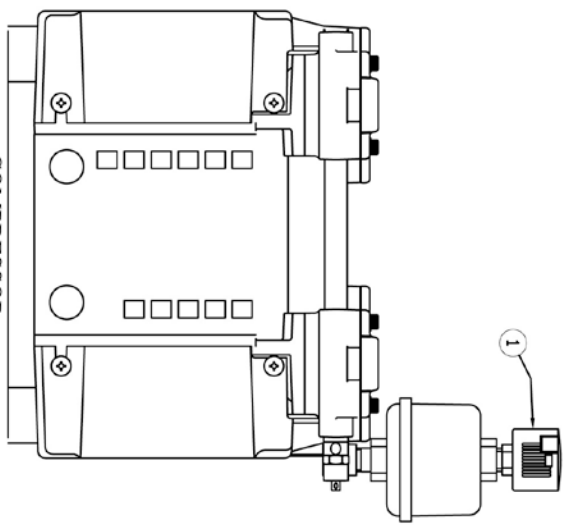
- Precautions should be taken to avoid a fire in the area of the generator.
- Smoking should not be permitted in the area where the generator is located.
- All oxygen connections and hoses should be kept clean and free of grease, oil and other combustible materials.
- Valves controlling oxygen flow should be opened and closed slowly to avoid the possibility of fires or explosions that can result from adiabatic compression.
- When bleeding a tank or line, stand clear and do not allow oxygen to embed itself within clothing. A spark could ignite the clothing violently.
- High-pressure gases may be present within the system. Valves should be opened and closed slowly. Safety glasses and hearing protection should be worn at all times while gases are being vented.
- Do not attempt to modify or enhance the performance of the Generator in any way.

Unpacking Instructions

ADDITIONAL PACKAGING MATERIAL INSIDE THE UNIT MUST BE REMOVED AND THE AIR INLET FILTER MUST BE INSTALLED PRIOR TO OPERATING THE GENERATOR.

- 1) Make sure the unit is NOT plugged into an electrical outlet.
- 2) Remove the (6) screws with nylon washers located on the front and both sides of the unit.
- 3) Lift the front cover up and away from chassis.
- 4) Remove packaging material from top, behind, and under the air compressor (per drawing).
- 5) Install air inlet filter (on top of the air compressor as shown below).
- 6) Install the front cover and secure the (6) screws with nylon washers.



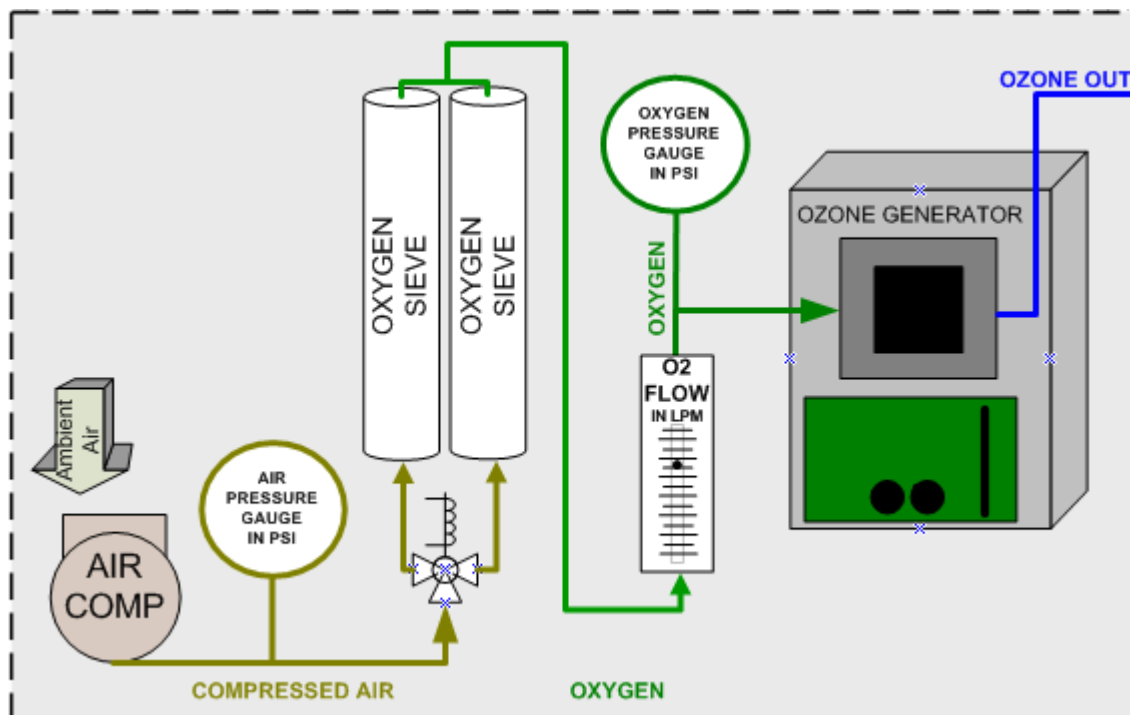
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">REV</th> <th style="text-align: left;">DESCRIPTION</th> <th style="text-align: left;">DATE</th> <th style="text-align: left;">CHK</th> <th style="text-align: left;">ECN #</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	REV	DESCRIPTION	DATE	CHK	ECN #						<div style="text-align: center;">  </div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">ITEM</th> <th style="text-align: left;">QTY</th> <th style="text-align: left;">DESCRIPTION</th> <th style="text-align: left;">OGSI P/N</th> </tr> <tr> <td>1</td> <td>2</td> <td>1/4" INTAKE FILTER</td> <td>2160001 C02</td> </tr> <tr> <td>2</td> <td>1</td> <td>1/4" EXHAUST MUFFLER</td> <td>1700001 C02</td> </tr> <tr> <td>3</td> <td>1</td> <td>1/2" x 1/4" NYLON REDUCING NIPPLE</td> <td>1220102 E0C</td> </tr> <tr> <td>4</td> <td>1</td> <td>1/2" NYLON FEMALE ELBOW</td> <td>1210102 E0E</td> </tr> </table>	ITEM	QTY	DESCRIPTION	OGSI P/N	1	2	1/4" INTAKE FILTER	2160001 C02	2	1	1/4" EXHAUST MUFFLER	1700001 C02	3	1	1/2" x 1/4" NYLON REDUCING NIPPLE	1220102 E0C	4	1	1/2" NYLON FEMALE ELBOW	1210102 E0E
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Introduction

The TS Series 10/20 Ozone Generators are a complete air preparation and ozone generation systems. These units include an integrated Air Compressor, Oxygen Sieve's, and Ozone Generator. No external oxygen supply is required. Contained within the TS series chassis is an Ozone Generator, capable of producing either the 10 or 20gm/hr of ozone at 3.6% concentration by weight. Using pressurized oxygen from the Oxygen Sieve's, the Ozone Generator (TS-20) will achieve from 2 to 20 gm/hr of ozone production at flows of 1-7 LPM and at pressures of up to 15 PSI.

Theory of Operation

System Flow Diagram and Theory of Operation



1. Air Compressor takes in ambient air & delivers it to the Oxygen Sieve's.
2. Compressed air enters the Oxygen Sieve's in an alternating sequence. Please read below.
3. The Oxygen Sieve's remove nitrogen from the air using pressure swing absorption, leaving 90-95% oxygen. Effluent nitrogen is then vented to the atmosphere.
4. 90-95% Oxygen leaves the Oxygen Sieve's at up to 15 PSI pressure. Pressure & flow are regulated by an internal needle valve downstream of the Ozone Generator, see #6 below.
5. Oxygen enters the Ozone Generator where it is utilized to produce high concentration ozone under pressure.
6. Panel mounted Needle Valve will allow adjustment of oxygen flow from the TS Series Ozone Generator.
7. Ozone exits the TS series via the OZONE OUT port.

Oxygen Sieve's

It separates the Oxygen (21% of air) from the air it is provided and returns the Nitrogen (78% of air) to the atmosphere through a waste gas muffler. The separation process employs a technology called Pressure Swing Adsorption (PSA). At the heart of this technology is a material called Molecular Sieve.

This Molecular Sieve is an inert, ceramic-like material that is designed to adsorb Nitrogen more readily than Oxygen. Each of the two beds that make up the generator contain this sieve. As air is fed into one of the beds, the sieve in that bed holds the Nitrogen to it and allows the Oxygen to flow through it and out to the surge tank as product gas. Eventually the sieve becomes saturated with Nitrogen. When this occurs, the feed air is directed to the other bed where the oxygen production/separation process continues. While the second bed is being fed air, the first is depressurized and safely releases the Nitrogen it has trapped through the waste gas muffler. This regenerates the sieve in the first bed and prepares it to accept feed air again continuing the process. The two beds continue to work in this alternating fashion to provide a continuous supply of Oxygen.

This air separation process is reliable and virtually maintenance free. The Molecular Sieve will last indefinitely, as long as it does not become contaminated with water and oil vapors. This is why regular filter element replacement is critical to trouble free operation. The filter elements are very inexpensive, semi-annual maintenance.

Required Operating Conditions

Location of Machine: The standard Oxygen Generator is intended for use indoors in a commercial or light industrial setting. The enclosure meets **NEMA 12** protection guidelines, which provides a degree of protection against dust, falling dirt and non-corrosive liquids.

Feed Air/Ambient Air Quality: The useful life expectancy of any PSA Oxygen Generator is directly related to the air quality that is fed into it. Hot, humid, dirty, oily air deteriorates and degrades the performance of molecular sieve. In order to preserve the effectiveness and extend the useful life of the generator, all precautions should be taken to insure that Cool, Dry, Clean, Oil-Free air is provided to it.

Changing the inlet air filter is a simple and easy way to provide the unit with some protection. Where possible, it would be advantageous to locate the unit in an air-conditioned space, or at least a well-ventilated area. The room should also be free of toxic gases and high concentrations of hydrocarbons, especially carbon monoxide. Additionally, to the degree possible, humid, oily areas should be avoided as installation sites.

Ambient Air Temperature: The machine is designed for use over a temperature range of 40°F to 100°F (5°C to 38°C). Since hot air has the ability to hold much more water, in the form of humidity, than cool air, operating the units in hot areas will reduce the effective life of the molecular sieve.

Note: Operation outside of this temperature range will not be warranted.

Electrical Power: On U.S. models, the power for the control circuitry of the Oxygen Generator is a single-phase electrical supply of 115 Volts AC and about 6 Amps at a frequency of 60 Hz. This equates to approximately 600 Watts of power. It is required that a 15 Amp circuit be **dedicated** to each OG-15. Additionally, the unit must be plugged into this circuit using only the supplied power cord, and without additional extension cords.

Feed Air Requirements: 4 SCFM at 30-50 psig incoming pressure is required for proper functioning of this machine. The air should be cool and clean, filtered to remove any contaminants, such as dust particles and moisture. It is recommended that it meet the requirements of ISO8573.1 Class 4.

Positioning: The unit must be operated in an upright position only, with no obstruction blocking airflow around the unit.

Pre-Installation Check Instructions

The following checks are necessary to insure that none of the internal components have been damaged in shipment.

- 1.) Make a visual inspection of the machine and make sure all parts are properly attached.
- 2.) Plug the unit into an electrical outlet. A receptacle plug of local configuration will need to be attached first if the machine has been shipped outside North America.
 - a. Turn the On/Off, green lighted switch to the on position and make sure the green light comes on,
 - b. Listen for the sound of the compressor to start running, if you do not hear it within a few seconds shut the machine down immediately and call the factory for assistance.
- 3.) Once the machine is running, turn the knob on the upper part of the oxygen flow meter to adjust the oxygen flow to 6 LPM. The ball in the flow meter should be in the middle of the flow meter indicating 6 LPM flow and the oxygen pressure gauge should read 9 PSIG. If it does not, turn the oxygen regulator either clockwise to decrease the pressure or counter-clockwise to increase it until it reaches 9 PSIG.
- 4.) You should be able to feel oxygen being discharged from the lower left oxygen outlet port. If these things do not occur, check to make sure that none of the hose connections have come loose. Call us here at Ozone Solutions if no loose connections are found and trouble persists.

Installation

Before installing the **TS10/20**, it is necessary to consider the location, space available and power supply for the generator.

1.) Locating the **TS10/20**:

- a. The unit should be located in an area that is indoors and remains between 40°F (5°C) and 100°F (38°C). **Location of the machine outdoors or in an area that is not normally within this temperature range will void the Warranty.**
- b. There should also be at least 8 inches (20 cm) between the unit and any side wall in the room that it will be located. This is to ensure that airflow into the machine through the cooling fans is not restricted.

2.) Space Available for the **TS10/20**:

- a. If the **TS10/20** is going to be located in a room that is small, (less than 1000 cubic feet or 25 cubic meters), that room should be well ventilated (at least 5 air changes in the room per hour). There are two reasons for this. The first is that the generator will be discharging nitrogen into the atmosphere of the room, and a nitrogen build up could be dangerous to people entering the room. The second is that if, for instance, the generator was located in a small closet the air in that closet would become enriched with nitrogen. As the generator continues to run it would become more and more difficult for it to separate the oxygen from the air because oxygen will make up a smaller and smaller fraction of the air that is fed into the generator.

3.) Power Supply for the **TS10/20**:

- a. The unit should be positioned within 8 feet (2.2 meters) of the electrical outlet that will power it. The reason for this is that the motor has a large current draw especially during the first few seconds of startup. **It is also very important for this reason NOT to use any extension cords with the unit.** They could overheat and melt, possibly causing a fire.

Start up Procedures

Once the system has been installed in accordance with the setup and installation instructions, it may be run. The following steps should provide some direction. Please keep in mind that this system is not designed for use as a medical oxygen concentrator.

- 1.) Connect the oxygen outlet to the application.
- 2.) Plug the power cord into a grounded outlet.
- 3.) Press the On/Off switch, check to see that the green light on the switch goes on and listen for the air compressor.
- 4.) Wait 2 minutes for the unit to come up to maximum purity.
- 5.) The oxygen delivery pressure should be set to 9 PSIG.
- 6.) Open the flow meter to the desired level of flow as indicated by the ball float inside the flow meter.
- 7.) Begin using the oxygen.

Shutdown Procedures

- 1.) To stop the flow of oxygen out of the unit temporarily, simply close the valve on the flow meter by turning the knob at the base of it fully clockwise. Within a few seconds 0 LPM flow will be indicated on it.
- 2.) To shut the machine off, press the On/Off button to off. The light should go out on the switch and the compressor noise should quickly die out.

Ozone Generator Performance

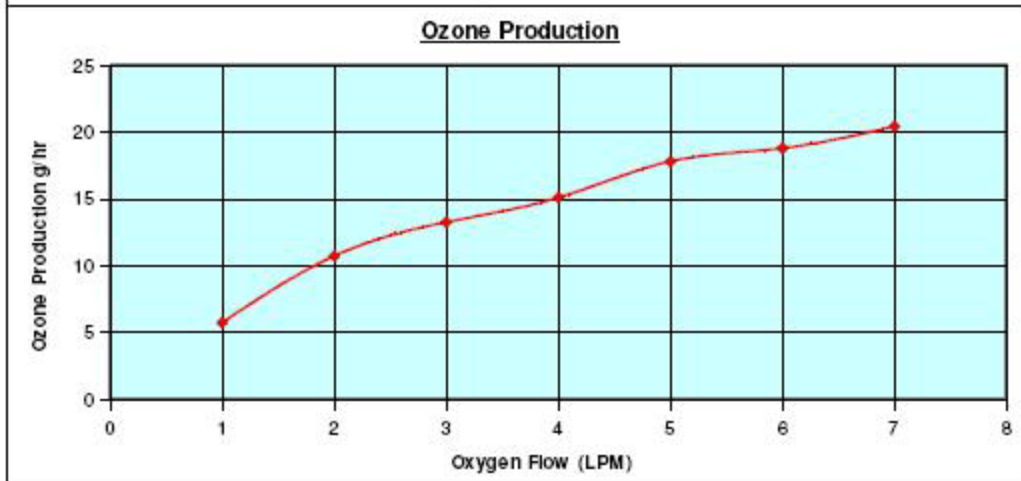
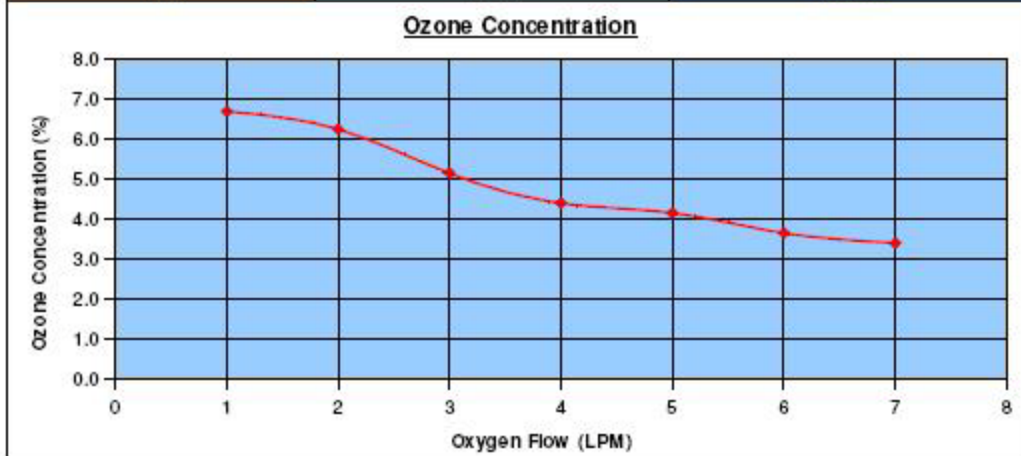
The Ozone Generator is designed to produce ozone from oxygen under pressure. While maximum ozone production (by volume) will be achieved at higher pressures and flows.

“Optimum” ozone production is dependent on the application. Some applications require higher concentration ozone at a lower flow rate (lower overall production by volume), while others may require maximum overall production by volume (lower concentration). Desired ozone flow can be determined by the user according to the chart on the following page.

TS-20 Ozone Generator Performance

TS-20 Ozone System

Oxygen Flow in LPM	Ozone Concentration, % by weight	Ozone Production in g/hr
1.00	6.70	5.75
2.00	6.25	10.73
3.00	5.15	13.26
4.00	4.40	15.10
5.00	4.15	17.80
6.00	3.65	18.79
7.00	3.40	20.42



All tests were performed at 70-deg F
 Ozone Generator was run at each flow rate for 1 hour prior to recording reading

Troubleshooting Guide

DUSTING OF SIEVE BEDS

Signs of Problem:	White powder visible in machine or pressure levels too high
Causes of Problem:	High pressuring of machine
Solution to Problem:	Replace Sieve Beds

VALVES STICKING

Signs of Problem:	Pressure levels too high
Causes of Problem:	Dusting of Sieve or Filters not replaced let dirt & dust into machine
Solution to Problem:	Remove valve block from machine and clean valves and spools completely

PRESSURE SWITCH NOT WORKING

Signs of Problem:	Machine not shutting on/off at target pressures
Causes of Problem:	Faulty switch
Solution to Problem:	Remove switch and return for replacement

Detailed Warning Description

Low Oxygen Pressure: This may be a result of a leak in the system. Use a leak testing solution to locate and repair any air leaks.

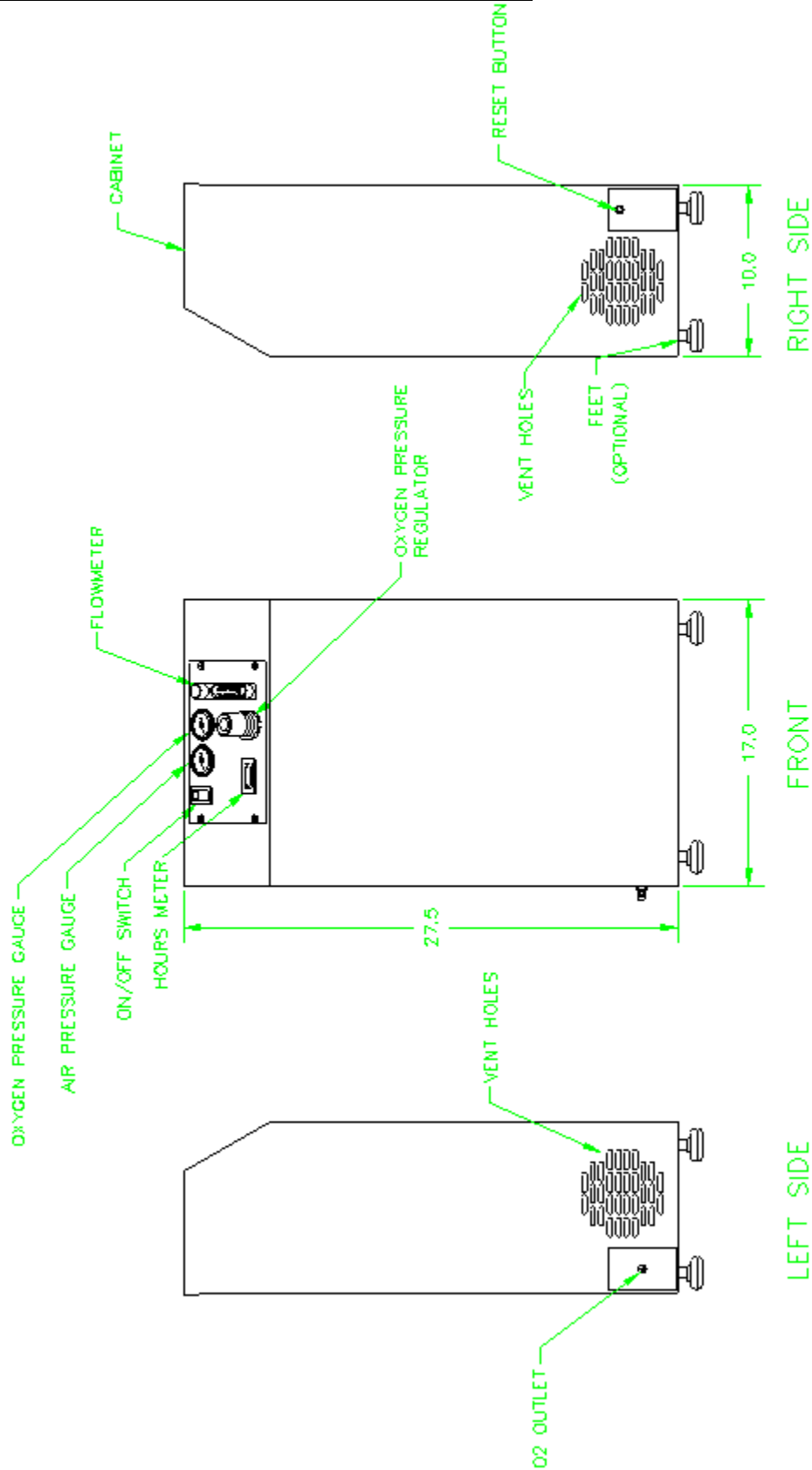
The machine has run for 30 minutes and purity has not yet been reached:

This may be a result of a leak in the system. Use a leak testing solution to locate and repair any air leaks.

Oxygen purity has fallen below acceptable limits:

This may be an indication of a leak within the system. Use a leak testing solution to locate and repair any leaks.

External Components Drawing



External Components Description

Vent Holes- These vent holes allow cooling air to enter the enclosure

Oxygen (O₂) Outlet- This fitting is a 'B' size oxygen adapter. It can be removed to expose a 1/8" female NPT pipe fitting.

On/Off Switch- Controls power to machine. Is lit up when the machine is on.

Air Pressure Gauge- This gauge indicates the air pressure being delivered by the internal air compressor to the sieve beds. It should vary between 19-29 PSIG while the unit is running.

Oxygen Pressure Gauge- This gauge indicates the pressure at which the oxygen is being delivered. Nine (9) PSIG is the rated delivery pressure for a 15 SCF per hour flow rate. The regulator can adjust the pressure.

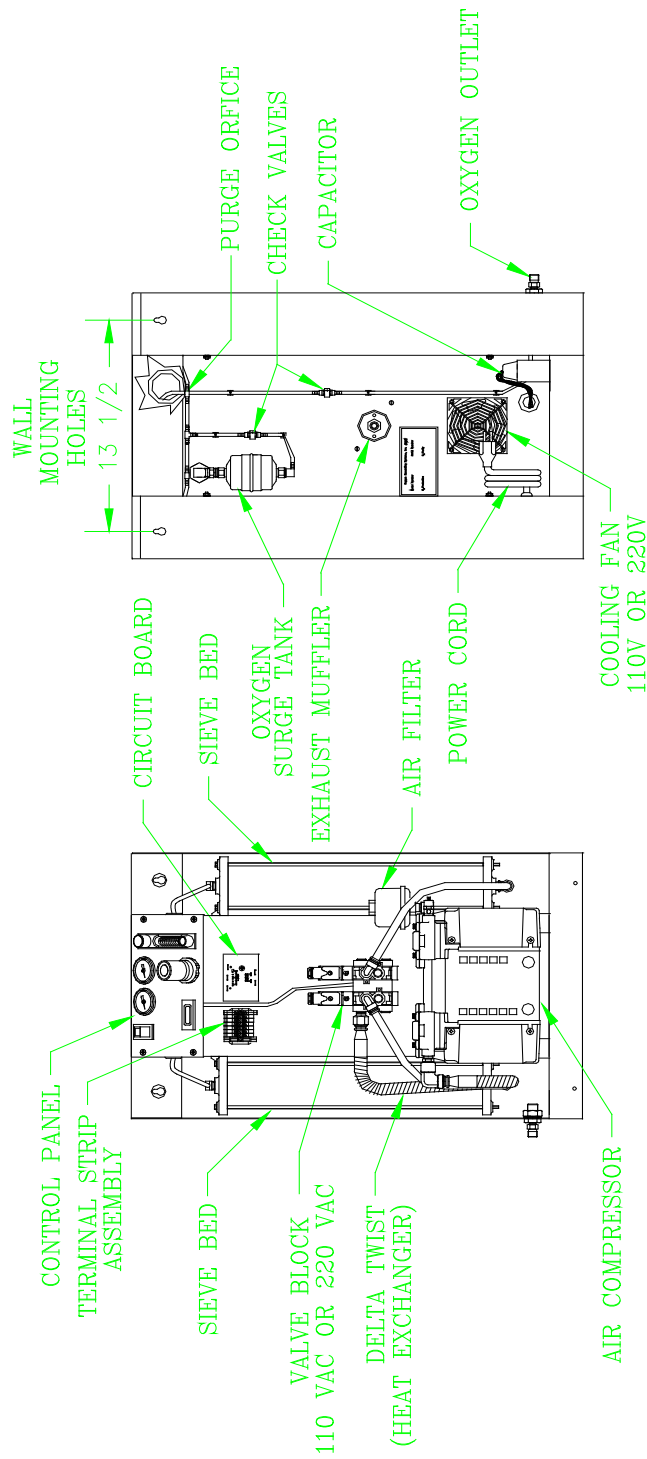
Oxygen Pressure Regulator- The regulator controls the oxygen delivery pressure level. Turning it clockwise increases the delivery pressure while turning it counter-clockwise decreases the delivery pressure. The oxygen pressure gauge will indicate the level set. To lock it into place, push down the adjustment knob.

Hours Meter- The hours meter increments time while the unit is running. It provides an indication as to when service intervals are due.

Reset Button- The reset button is actually a circuit breaker that opens if there is an electrical overload in the system.

Power Cord- The power cord is designed for use on 110 VAC/60 Hz electrical systems and comes with a 3-pronged ground fault protected plug. For foreign shipments the plug will be removed and a plug of local configuration will need to be installed. The green wire is the Earth Ground and the black and white wires are for the AC Supply.

Internal Components Drawing



Environment

The Oxygen Generator is not weather proof; it must be operated indoors or in an enclosure in a non-condensing environment. If the space is occupied, sufficient ventilation must be provided to prevent the accumulation of low oxygen concentration waste gas in the space.

Temperature (Operating): 40°F to 95°F

Temperature (Storage): -10°F to 150°F

Humidity: 0 to 85% RH

Barometric Pressure Range: 28 to 31-inches of Hg

Ambient Oxygen Concentration: 20.0% minimum

Maintenance

Routine Maintenance Instructions

Filter Element Replacement

The filter element provided with the TS10/20 must be replaced every six (6) months. The element helps to maintain the quality of the feed air supply and preserve the molecular sieve inside of the oxygen generators.

Cabinet & Power Cord

The cabinet and power cord should be occasionally washed down with a sponge or clean rag and some soapy water. Avoid the use of ammonia or other strong chemical based cleaning solvents. The intention is to avoid dust and dirt from building up on the machine.

Long Term Maintenance

Air Compressor

You should consider your air compressor an important part of your Oxygen Generating System. In addition to changing its filter elements, maintenance is relatively simple. The fans on either end should remain free of debris/dust.

The air compressor should last five or six years under normal operating conditions, and in many cases longer. Eventually, however, it will need to be re-built or replaced. Oxygen purity and flow rate along with feed air pressure delivered to the sieve beds will all be indicators that the air compressor has expended its useful life. Replacement in the field is possible, but return of the unit to the factory or an authorized service center is recommended.

Valve Replacements

As with compressor repairs the best practice will be to return the unit to the factory or to an authorized service center for repair.

Ozone Generation Cell



O3 Generation Cell

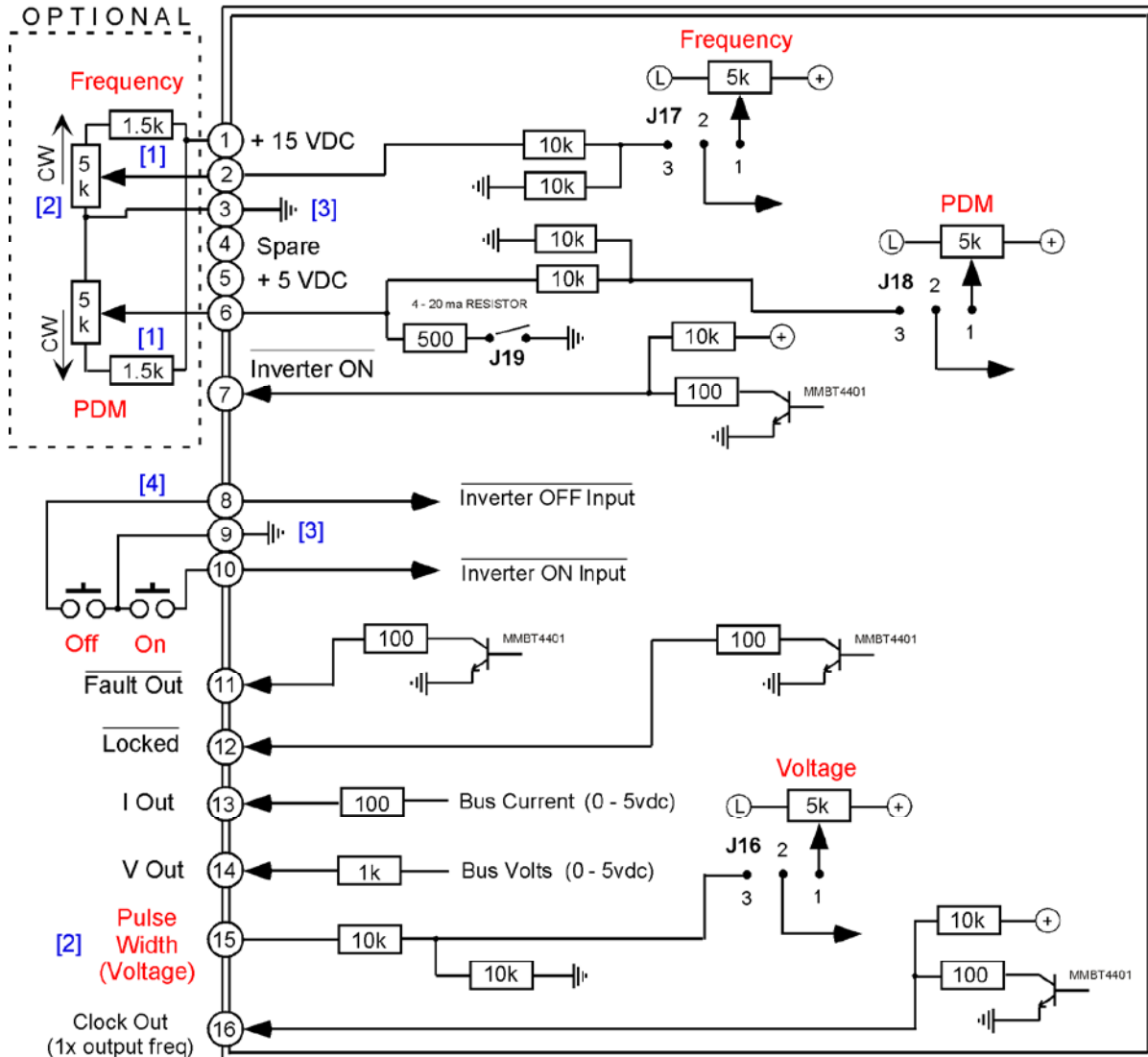
O3 Generation Cell:

- Does not require service or maintenance
- Does not need modification
- Controllable with adjustable dial on the external panel
- Is inside of the TS-10/20 chassis

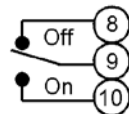
O3 Generation Cell

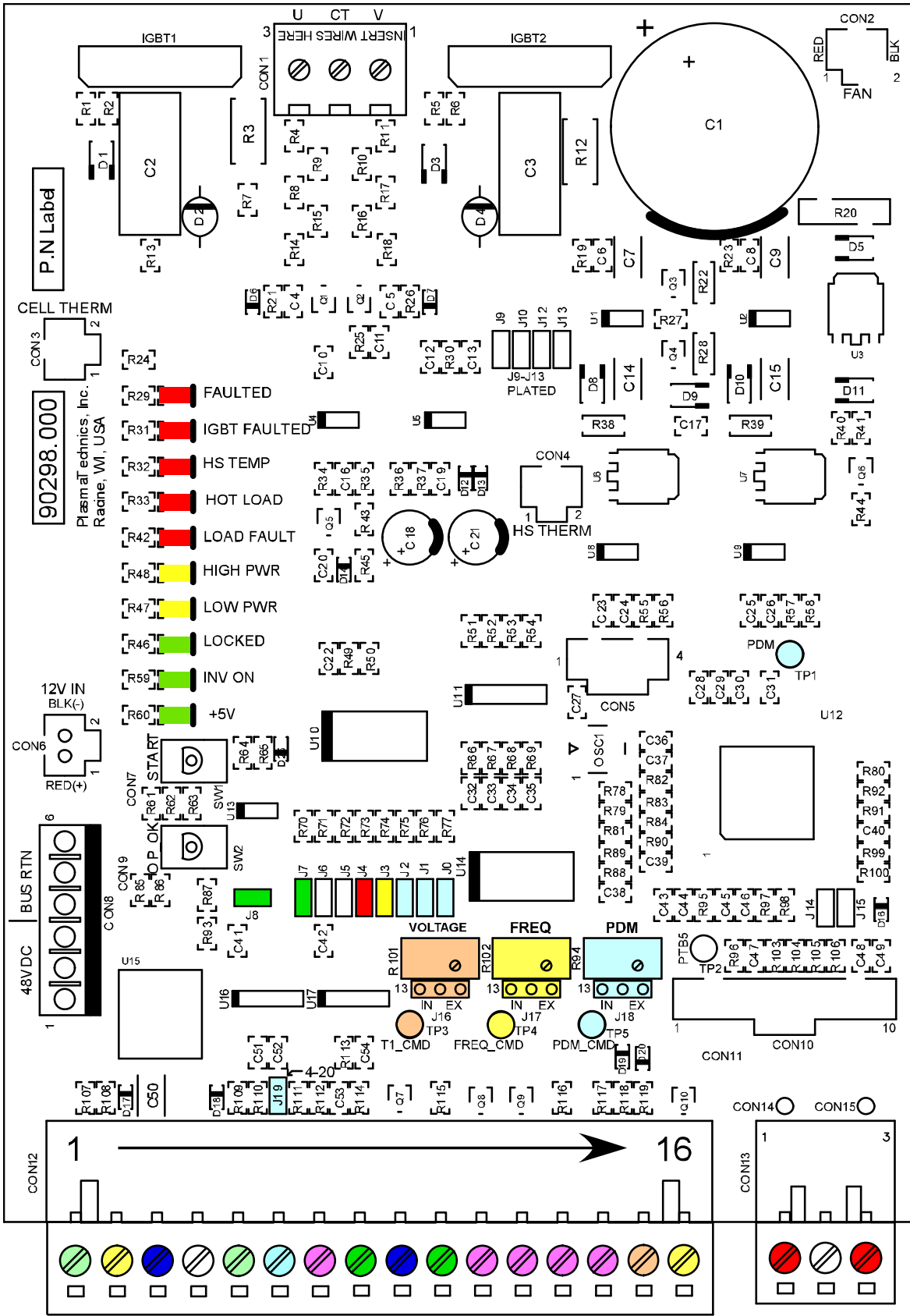
1. The Generation Cell is built with aluminum and ceramic. While aluminum provides maximum safety for applications like water purification, it does react with nitric acid that would be produced if atmospheric air were to be used rather than a concentrate for gas feed. For this reason **ONLY a concentrator or O₂ can be used to provide the feed gas.** To maintain the warranty the feed gas must be at least -60°F dew point and 93% O₂ or more.
2. **BEFORE** the system is energized for the first time the Generation Cell should be pre-dried by flowing the above feed gas for 3 to 5 minutes. If the installed system will be dormant for long intervals then the control system should do a pre-purge to insure the system is dry before power is applied to the cell.
3. The best cell seasoning is accomplished with a concentrator. All cells have been factory seasoned but it is always a good idea to operate the finished system for a few hours prior to installation to allow all components to settle in.
4. When a system is off for an extended period, it is very important to prevent backflow of liquids and gasses through the cell. Backflows void the cell warranty. For example, systems which use a venturi and concentrator must contain a solenoid valve to block gas flow if it is possible that the venturi will be active while the concentrator is off.
5. When the Cell requires servicing, return it to the factory - DO NOT disassemble. The Generation Cell is fitted with a tamper label. If the label is broken, the warranty is void.
6. **While it is possible to configure the system to accommodate negative pressures, negative pressures are problematic and tend to cause large power and ozone fluctuations. The most stable and predictable systems occur at positive pressures.**
7. The ozone outlet fitting mounted into the Generation Cell mates with other fittings inside of the unit and **must not be removed or changed** to another fitting type. Contact the factory if other sizes or styles are required.

DAT300 Connections



- Grounding either #3 or #9 is not necessary and usually controlled by PLC.
- External pots for frequency and voltage should be multi-turn, cermet substrate types for stability and precision. Rating of 1/4 watt.
- Shielded cable recommended for connection runs of 2' or more.
- [1]** Optional but recommended (1/4w) to obtain full use of potentiometer range.
- [2]** External pot 5k, 1500 ohm resistor recommended as per note 1.
- [3]** Ground symbol represents circuit board floating common, not earth grounded. Best to leave floating or allow PLC to establish the ground relationship.
- [4]** Optional SPDT toggle switch or relay.





Plasma Technics, Inc. DAT300 (rev0)

Control I/O (low voltage) AC Power Input

Status LED's

- +5vdc** **Low voltage** DC supplies are operational (line voltage applied to unit).
- INV ON** **On solid** – Inverter output enabled. Ozone output per PDM command, if enabled.
Flash - Output enabled via ON command but disabled by PDM < 2ma (4/20). Output is re-enabled if PDM > 3ma, 'INV ON' LED on solid.
- LOCKED** **Flash** – Semi-Automatic tuning is enabled when jumper J15 is removed. Frequency tuning occurs during flash interval. Search rate varies automatically: See Jumper J7. The Voltage pot is active and should be used to set the desired full power operating level. See: 'Start' button adjustment procedure.
ON solid – Occurs only in 'Auto-Tune mode when Jumper J15 is installed and signals that the proper operating point has been established and 'locked'. The indicator is ON continuous, and only winks off momentarily while a new scan of the operating parameters is conducted.
- LOW POWER** **Flash** – Output current is slightly below the programmed tolerance window. A service request enunciation is placed via the soft fault if jumper J4 is in place. No disabling action is taken in this state. If the current continues to drop, the flash will transition to an on steady (solid) mode – see ON solid, below.
 Note: It is normal for the LOW POWER LED to flash for a few seconds when a large incremental increase in PDM is commanded. This can be helpful in that it will provide a visual indication that the PDM control input is being stimulated. No enunciation action is taken.
ON solid – Output current to the ozone cell is lower than the allowable programmed window. If sustained, a hard fault will be generated in 32 seconds, which disables ozone production when FAULTED LED is ON solid. This LED will be latched on indefinitely to provide service diagnostics. The latched fault is cleared by either an OFF / ON transition (includes 4/20 off as well) or power cycle.
- HIGH POWER** **Flash** – Output current is slightly above the programmed tolerance window. A service request enunciation is placed via the soft fault if jumper J4 is in place. No disabling action is taken in this state. If the current continues to increase, the flash will transition to an on steady (solid) mode – see ON solid, below.
Note: It is normal for the LOW POWER LED to flash for a few seconds when a large incremental decrease in PDM is commanded. This can be helpful in that it will provide a visual indication that the PDM control input is being stimulated. No enunciation action is taken.
ON solid – Output current to the ozone cell is higher than the allowable programmed window. If sustained, a hard fault will be generated in 32 seconds, which disables ozone production when FAULTED LED is ON solid. This LED will be latched on

indefinitely to provide service diagnostics. The latched fault is cleared by either an OFF / ON transition (includes 4/20 off as well) or power cycle.

LOAD FAULT

ON solid – Possible flooded cell, shorted cell or open transformer connection.

HOT LOAD

Wink – Cell temperature is slightly above programmed limit. No disabling action is taken in this state. If the temperature continues to increase, the wink will transition to a flash (longer duty cycle than wink) – see below. During this mode the processor is reducing the PDM level automatically in an effort to lower the cell temperature. This of course also reduces ozone output.

Flash – Cell temperature continues to rise. PDM is controlling power to hold cell temperature constant in an effort to produce some ozone and remain online. This elevated temperature will not damage the cell. A service request enunciation is placed via the soft fault if jumper J4 is in place. No disabling action is taken in this state. If the temperature continues to rise, the flash will transition to an on steady (solid) mode – see ON solid, below.

ON solid – The ozone cell temperature is higher than the allowable programmed window. If sustained, a hard fault will be generated in 32 seconds, which disables ozone production when FAULTED LED is ON solid. This LED will be latched on indefinitely to provide service diagnostics. The latched fault is cleared by either an OFF / ON transition (includes 4/20 off as well) or a power cycle.

HS TEMP

Wink – Heat sink temperature (electronics) is slightly above programmed limit. No disabling action is taken in this state. If the temperature continues to increase, the wink will transition to a flash (longer duty cycle than wink) – see below. During this mode the processor is reducing the PDM level automatically in an effort to lower the heat sink temperature. This, of course, also reduces ozone output.

Flash – Heat sink temperature continues to rise. PDM is controlling power to hold cell temperature constant in an effort to produce some ozone and remain on line. This elevated temperature will not damage the cell. A service request enunciation is placed via the soft fault if jumper J4 is in place. No disabling action is taken in this state. If the temperature continues to rise, the flash will transition to an on, steady (solid) mode – see ON solid, below.

ON solid – The heat sink temperature is higher than the allowable programmed window. If sustained, a hard fault will be generated in 32 seconds, which disables ozone production when FAULTED LED is ON solid. This LED will be latched on indefinitely to provide service diagnostics. The latched fault is cleared by either an OFF / ON transition (includes 4/20 off as well) or power cycle.

IGBT FAULTED

If a short-circuit is present on the inverter output, sophisticated electronic circuits instantly disable the effected power section. If this occurs over too many cycles, the output is disabled and a fault is enunciated.

■ FAULTED

Rapid Flash – signals a **SOFT FAULT** via open collector to terminal #11. **Jumper J4 must be installed for this mode to be active.** A soft fault up to 32 seconds in length can be produced by any one of the following: cell operational current signature, high or low current, high instantaneous current in the output power section, over temp in the electronics or cell. A hard fault will **not** be latched or reported as a hard fault if the fault self-corrects within 32 seconds.

Both cell and electronics over temp conditions invoke an automatic closed loop turndown control of the PDM function that results in a constant, but elevated, cell temp. This condition can be sustained indefinitely. If the system can manage the event, no hard fault is delivered. The soft fault is continuous. **This is a summons for service.** Ozone production is curtailed, but not disabled.

On solid - signals a **HARD FAULT** via terminal #11 (pulls low). Ozone production is OFF; the nature of the fault is latched and enunciated.

Mechanical Specifications

Model	Max Ozone Production	Max Ozone Pressure Flow	Operating Temp.	*Operating Humidity	Storage Temp.	*Storage Humidity
TS-10	10 g/h from 5 LPM of Oxygen	15 PSI at the 5 LPM Oxygen	40°F to 95°F	85% RH max	-10°F to 150°F	non-condensing
TS-20	20 g/h from 7 LPM Oxygen	15 PSI at the 7 LPM Oxygen	40°F to 95°F	85% RH max	-10°F to 150°F	non-condensing
Electrical Requirements Below						
Model	Operating Voltage	Full Load Run Amps	Max. Starting Amps	Power Consumption		
TS-10	120 Volts	9 Amps	17 Amps	730 Watts		
TS-20	120 Volts	10 Amps	17 Amps	760 Watts		
Dimensions and Weight Below						
Model	Dimensions			Weight		
TS-10	17" wide x 27.5" tall x 10" deep			85 lbs.		
TS-20	17" wide x 27.5" tall x 10" deep			85 lbs.		

*Humidity levels are to be non-condensing

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