

MANUAL

OZONE GENERATOR (100VA)

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100VA OZONE GENERATOR

Technical Specifications:

Construction	Modular system mounted on Bakelite sheet as integrated plug and play unit.
Capacity	100VAC maximum.
Supply Input	220VAC, 50Hz +/- 5% supply with earthing.
Supply output	High Voltage, High frequency about 5KHz to ozone cells.
Ozone Generation	Based on corona discharge principle
Electronic Control	Micro controller based intelligent system with inputs, status, Audio alarm and outputs to take care of system operation
Input	Dry air or Dry Oxygen, Dry air Approx.15 – 20 lpm, Dry oxygen Approx. 4 – 5 lpm.
Output Components	Ozone output is provided by 2 meters of Silicon tubing.
HT Transformer	Air-cooled HT Transformer.
Power Control	Set at 70VA for optimum performance. Connector is provided to measure voltage and current to calculate power. Voltage Tapping on power transformer is provided to adjust power fed to ozone cells.
Cell Power	100VA
Cell Output	Approximately 2 gms/hour with Dry Air as Input feed and approximately 8 - 10 gms/hour with Dry Oxygen as Input feed
Cell Diameter	40 mm (Quartz).
Cell Length	250 mm.
Cell Material	Ozone resistant quartz glass, SS 316 and silicon rubber.
Ambient Temp	Optimum performance at ambient temperature not exceeding 25°C.
Weight	Approx. 16.0 Kg (17 Kg. with box packing).
Dimensions	Mounted on 12 mm thick, 12 inch X 13 inch on Bakelite sheet. Height: 175 mm approximately.
Accessories	2 meters silicon tube for Ozone Output.

Introduction:

The Model OG100VAC is highly efficient Ozone Generator designed for stringent requirement and environmental conditions of Water Treatment Industry. The generator will give you trouble free service for years to come. The use of micro controller at the heart of circuit not only gives instantaneous fault protection but also controls all major functions like on /off, over current and over temp. Protection, safety interlock etc. and audio alarm (Beeper) are also provided for operator attention. The use of MOSFET/IGBT in power inverter stage gives fault tolerant power circuit, which can sustain short circuit even on HT side. The operating frequency is about 5 KHz, which gives uniform and highest ozone output for rated power.

Construction:

The Ozone Generator System is completely modular in construction. All necessary parts are mounted on a single base plate 300x400x12 mm Bakelite sheet. All the components are mounted and pre wired on the base plate. Sufficient care is taken for high voltage clearance to avoid sparking.

It comprises of various parts namely Electronic Module, HT Transformer, and Control cum Power Transformer, Ozone cell assembly, cooling fans, Wiring accessories and Tubing accessories. Refer to the block diagram of the Ozone Generator elsewhere in this manual.

The incoming voltage (230V) is fed to power cum control Transformer and cooling fans. The Electronic module is self contained Rectifier/Inverter which requires 19VAC (750mA) control supply for controlling internal circuitry & separate power supply for power inverter. Module output (Low Voltage high frequency) is connected to HT Transformer whose function is to step up the supply & drive the ozone cell. The module has few control inputs and outputs. The inputs are ON/OFF switch for starting and stopping of ozone, Temperature switch input to sense temperature of electronic module's heat sink and Safety input, which can be, used for interlocking safety aspects in panel design. Ex. Door Lock.

RED LED is provided for multifunction status output indication near connector 3, 4 and same output is available on pin 3, 4. 24VDC Lamp (max. - 5W) should be used for external status output indication. This output gives multifunction indications of different states of Ozone Generator. Variable power transformer output (60V-110V) is given to electronic module depending upon electrode construction, no. Of cells, Rated Current and in turn total power can be adjusted using these tapings. Tapings are also provided on HT Transformer for similar purpose as per voltage requirement for ozone cells. Pots (Frequency Pulse Width, Over Current) on electronic module should not be disturbed. They are factory set default value.

GREEN LED is provided for indication that short circuit has occurred in supply to lamp. (Between pin no. 3 and 4). Check and clear the fault. Normally Green LED should be off.

HT Transformer requires forced air-cooling. While mounting the unit ensures that there is a space of 1 foot on all sides of module for proper air circulation. Another important part of the system is ozone cell. It has typical construction as air-cooled ozone cell. The forced air-cooling for ozone cell is necessary. If fans are not working. Quartz tube of ozone cell will break. The power fed to ozone cell has to be restricted at 100VA per cell (total 200VA for 250VA Unit) to avoid overheating, which in turn would reduce the Ozone output. Connector is provided to connect voltmeter and ammeter for measuring VA and for indication. The input to ozone cell should be dry air or dry oxygen (O₂) only. The output of ozone cell which is having ozone content should be carried up to its application points using silicon tubing and any other accessory of SS only like "Y" joints. For the ozone path, use only ozone resistance material like silicon, Quartz, stainless steel 316 or better. The special care has to be taken in layout designing for placement of different components namely control cum power transformer, electronic module, HT Transformer, ozone cell, cooling fans, Acrylic partition etc. fitted on Bakelite sheet. Disturbing this layout may cause undesirable results in operation and performance of the system.

Operation and Maintenance:

The electronic unit does not require any maintenance. Some precautions must be taken while operating the system. It will ensure trouble free operation. Avoid humid environment and ozone leakage, as both will corrode the electronic parts and malfunction of ozone generator.

A. Operating Procedure:

The Ozone Generator is extremely easy to operate. Connect dry air / dry oxygen supply to input pipe (dry air flow 15-20 lpm or oxygen flow 4-5 lpm) and Connect the power cord of the Ozone Generator to 230V AC socket (50Hz, with earthing) and switch "ON" the supply. The status lamp keep flashing at regular interval indicating that Ozone Generator is ready for operation. Now put the on/off switch to ON position. The violet / blue corona will be visible at the end of cell and hissing sound will also be heard. The ozone will appear at the Ozone out end. You can smell the ozone, but never take the tube near your nose. Do not inhale Ozone.

The Status lamp provides multifunction status indication of Ozone Generator System as mentioned below:

- 1) REGULAR FLASH - Continuous regular flashing indicates ready for operation.
- 2) TWO FLASH - Two flashes with interval indicates that any of the safety interlock is open. Check for the door switches etc. Close the door properly. **(This facility is Bypassed (Not in use))**
- 3) THREE FLASH - Three flashes with interval indicates over current or short circuit fault tripping. To reset the fault indication, simply toggle ON/OFF switch to OFF position and status will show ready for operation. Then you can again switch ON the system. Also refer to trouble shooting if fault persists.
- 4) FOUR FLASH - Four flashes with interval indicates over temperature of Electronic Module Heat Sink. The fault will automatically clear when temperature returns to normal value. To reset the fault put ON/OFF switch to OFF position and status should show regular flashing indicating "ready for operation" if fault is clear.

Temperature switch is mounted on Heat sink to detect over temperature of Heat sink.

Temperature switch is wired to berg strip from bottom side of PCB

B. Precautions:

- 1) Do not exceed power beyond 100VA & current beyond 1.0A to 1.2A This will increase the cell temperature and ozone output will fall.
- 2) Ensure that all cooling fans are working. Fan airflow directions must be maintained towards ozone cell as mentioned in drawing.
A cool and dry place is essential for proper operation.
- 3) HT Transformer is air-cooled. Always ensure uniform forced air-cooling for HT Transformer and ozone cells.
- 4) Do not run ozone generator without air or oxygen feed at required flow.
- 5) Only dried and chilled air or oxygen should be fed to ozone cells. For air based system use of dryer is must and chiller is recommended. Ozone output increases with dry air feed. Filter must be used to avoid dust and tiny particles entering ozone cells.
- 6) Do not open the Ozone Generator door / Acrylic Cover, when generator is "ON", dangerous high voltage exists inside the panel.
- 7) Ozone leakage must be avoided. Use silicon rubber sealant for sealing.
- 8) Always ensure that tube do not get bend and restrict the flow.
- 9) Do not adjust the factory set pots.

10) High voltage wire must have sufficient clearance with ground potential

11) Proper separate earthing must be provided.

12) Connector is provided for measuring secondary current and voltage. If not used secondary current terminals must be shorted and voltage terminals should be kept open. This facility is provided so that voltmeter and Ammeter can be used on front panel using this connector. The product of this voltage and current represents power consumed in cells and it should not exceed approximately 200VA (Voltage in volts X Current in Amperes).

13) Never inhale the ozone coming from ozone out pipe. The concentration level is very high.

14) Ozone Cell is fragile, handle with great care.

C. Maintenance:

Loose connection: The most important point in electrical maintenance is to tighten all the electrical contacts to avoid loose connection

MOV of 275VAC/14mm is connected across input 230 VAC supply of control cum power transformer for over voltage protection. If over voltage condition occurs, fuse may sometimes blow off. Check and replace MOV (Spare MOV is provided). Some times MOV may also get damaged due to excess over voltage. Check it and replace fuse accordingly. All necessary precautions must be taken for correct operation and optimum performance of the ozone generator system. The system will require very little maintenance if proper care is taken. The electronic system does not require any maintenance as such. Keep the environment dust free and cool. Cell must be handled carefully to avoid damage or breakage.

Broken cell or dirty cell should be replaced with new cell. All parameters should be maintained in specified limits like flow, VA (power) etc.

For 19VAC control supply to Electronic Module 25V MOV for over voltage protection is provided on Electronic Module. In case of over voltage appearing here, fuse will blow due to MOV and circuit will be protected. Replace the fuse and circuit will be operational.

Note : Ozone leakage must be prevented. Ozone leakage will corrode and damage electronic component etc.

After few years there will be problem like rusting of connector, Lugs, etc. You have to observe carefully the complete wiring.

Tripping of the system occurs in many different situations.

- 1) Short Circuits.
- 2) Over Current.
- 3) High voltage discharge with ground due to insufficient isolation.
- 4) Breakage/puncture in electrode assembly.
- 5) Safety interlock is open. (**This facility is Bypassed (Not in use)**)
- 6) Over Temperature of electronic module heat sink.
- 7) Dust on both ends of ozone cell, HT Coil and HT Path (Clean it).
- 8) Dew formed and very cold ozone cell. Allow warm up of cell.

To restart the systems please refer to '**Operation**'.

If the system fails to work properly please refer to '**Precautions**' as mentioned above.

If Problem is not solved please refer to '**Trouble shooting**'.

Trouble Shooting: If you have problem with ozone generator operation, please refer below:

If the ozone fails to appear after starting the unit as given in operation, the fault finding can be done as per the instructions given below:

Please refer to the wiring schematic.

CAUTION! : Electrical Shock Hazard. To be opened and operated by authorized and trained person only. When you want to open the panel, switch off the supply, wait for few minutes to discharge, and then remove electrical supply plug. Then only work inside the panel for different checking.

Problem : Status Lamp is OFF

Sr No	Fault finding	Remark
1	a) Check fans are running b) Check Fuse on the right side of Panel c) Check Isolator ON / OFF Switch on the right side of the Panel (KAYCEE / 1S260) d) Check wiring (lugs rusting etc) and loose connections	a) If fans are running, then 230VAC supply is OK. If fans are off Check the incoming power supply and wiring inside Panel. b) If panel fuse is blown, replace it. c) Check On/off switch, fuse, and wiring. If switch is faulty replace it d) Clean and tighten all the connections.
2	Check MOV.	If MOV is damaged, replaced it
3	Check Status Lamp on the Panel is ok or not. Also check Status lamp wiring coming from module.	If LED on module is ON, then Lamp may be faulty. Then replace it. If wiring problem, correct it.
4	Check 230VAC Supply on control transformer primary.	If 230VAC is not coming, check wiring.
6	Check AC supply on control transformer secondary. It should be 19VAC. Check if it is reaching to Module.	Check for control fuse, connections and wiring going to module pin no. 1 and 2.
7	If all above is ok, then check if module is working.	Keep Ozone ON / OFF switch in OFF condition and see if Status LED on module is flashing. IF it is not flashing, module may be faulty.

Problem: Status Lamp is continuously ON but no ozone

1	Check Current on panel meter. If 0Amps, then check as follows. Check power LED in module, if it is OFF, check power fuse of Transformer.	If power fuse is blown, replace it. If wiring problem, correct it.
2	Check for cable connection: Module output to HT Transformer primary.	May be loose connections or Lugs Rusted or Dry solder.
3	Check for electrode connection to secondary of HT Transformer and ground.	
4	Check for probable fault in electronic module or HT Transformer.	

Problem : Power is insufficient (less voltage or less Current)

1	Check voltage (VA) (Secondary of HT Transformer) Check VA Chart for VA ratings. (Per Cell it is about 70VA to 80VA.)	If actual voltage is less than 70VAC, Increase the tapping position.
2	Check if current is OK or not.	Refer to our Voltage & current setting (VA) Chart as shown below.
3	Check if ferrite core is loose.	Tighten the HT Transformer assembly. (Do not over tight).
4	Check if ferrite core is broken.	Please send it for repair to us.
5	Check HT/LT coil	If damage Please send it for repair to us.

Maximum power should not exceed the rated power.

Problem : Insufficient Ozone output		
1	Check VA (power). Over or under power will give insufficient ozone. Check corona discharge visually (Blue / Violet and uniform). Corona Discharge ring may be visible at electrode end on cell. Sometime it may not be visible. This can be crosschecked by cell heating. It should be uniform heating through out the cell electrode.	For 100 VA unit optimum level is 70VA For 250 VA unit optimum level is 140VA For 350 VA unit optimum level is 210VA
2	Check feed gas flow at input & output side. Both should be same.	Please check this in Ozone OFF condition
3	Check the required feed gas flow as per the chart.	For Ozone output requirement, corresponding feed gas input flow must be as mentioned.
4	Check input feed gas tubing assembly for any leakage & blockage	If tube has leakage or blockage rectify it
5	Check ambient temperature (Not exceeding 25 ⁰ C).	Place ozone generator in dry and cool place.
Problem : Ozone Output looks ok, but Insufficient ozonation		
1	Check ozone leakage / escape (not mixing)	
2	Check ozone mixing and contact time.	Mixing of Ozone and more contact time is very important.
3	Check water quality, load to be treated and ozone dosing (grams/hour) required	According to load, calculate your ozone requirement.
Problem : Status Lamp with two flashes (This facility is Bypassed (Not in use))		
1	Safety interlock is open. This is potentially free NC type contact (Normally Closed).	Check the interlock circuit and rectify the problem.
Problem : Status Lamp with three flashes (Over Current or Short circuit fault)		
1	Check if ozone cell is puncture or broken. If the ozone cell is puncture or broken, the fault will immediately appear after ozone ON.	If Cell is damaged, send it for repair.
2	Check if ozone cell sides are dirty. This will cause High Voltage Discharge to ground and will trip on over current.	Clean ozone cell extremely carefully. Both sides of cell must be clean and free of oil and dust.
3	Check if HT wire to cell is not touching the ground. If HT wire touches or near to ground OR the area surrounding the HT wire is dirty, unit may trip.	The clearance of minimum 25 mm between HT Wire and ground. Surrounding to HT wire must be clean.
4	Check if ferrite core is loose.	Tighten the HT Transformer assembly. (Do not over tight).
5	Check if ferrite core is Broken.	Please send HT Transformer it for repair to us.
6	Check if power Tapping is on higher side like 90VAC or more reduce it and try again.	Check secondary Current. It should not exceed the limit. Excess heating of cell due to more current will drop ozone output.
Remove wires going from module to HT Transformer and switch "ON" the ozone, if tripping on three flashes still continue, this indicate fault is in Electronic Module and you can send the electronic module for repairs immediately. (Reduce the tapping position on Power transformer.)		
Problem: Status Lamp with four flashes. (Over temperature fault.)		
1	Check if cooling fans for Electronic Module is off.	Ensure Fan is running.
2	Check if the fan near HT Transformer is running and direction of airflow is correct.	Ensure Fan is running and direction of Fan airflow is correct.
The temperature switch is mounted on Module Heat sink		
1) Heat sink may be over heated due to fan failure		
2) If Heat sink is not over heated then some problem in module or temperature switch or Lugs or wiring.		
Reduce the tapping position.		

Due to noise in fault condition some time the fault indication by LED may be misleading (incorrect). So consider this while finding the fault.

Ozone Generator : Feed Gas Input and Ozone Output Chart

OZONE Unit	Feed Gas : Dry Air		Feed Gas : Dry Oxygen	
	Dry Air Input	Ozone Output	Dry Oxygen Input	Ozone Output
100 VA 1 cell of 100 VA	15-20 lpm	Upto 2 gm/hour	4-5 lpm	Upto 8-10 gm/hour
250 VA 2 cell of 100 VA	30-40 lpm	Upto 4 gm/hour	8-10 lpm	Upto 16 -20 gm/hour
350 VA 3 cell of 100 VA	45-60 lpm	Upto 6 gm/hour	12 -15 lpm	Upto 24-30 gm/hour

Voltage & current setting (VA) Chart Secondary current is shown on current meter on the panel.

Voltage and current depending upon the actual AC Input, you will need to change secondary tapping.

If (VA) power is very low, Ozone output will be low.

If (VA) power is excessively High, Cells will overheat & again Ozone output will drop due to over temperature.

So, optimum setting for maximum possible Ozone output is important as mention below:

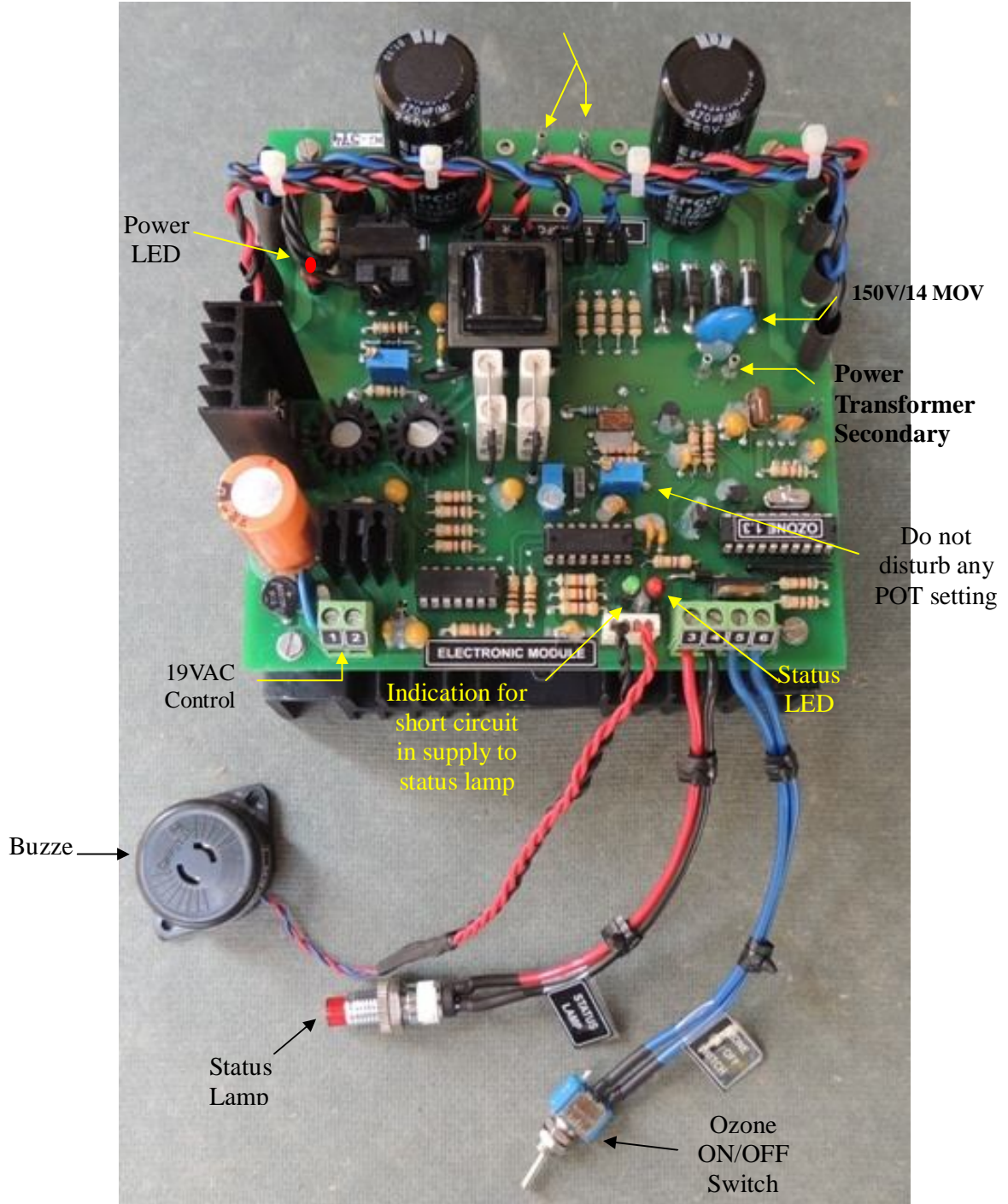
	Secondary Voltage (VA)	Secondary Current
100VA 1Cell	70VA-80VA	0.8Amp -1Amp
250VA 2Cell	140VA-160VA	1.7Amp - 2A
350VA 3Cell	210VA-240VA	2.6Amp -3Amp

For further information please contact,

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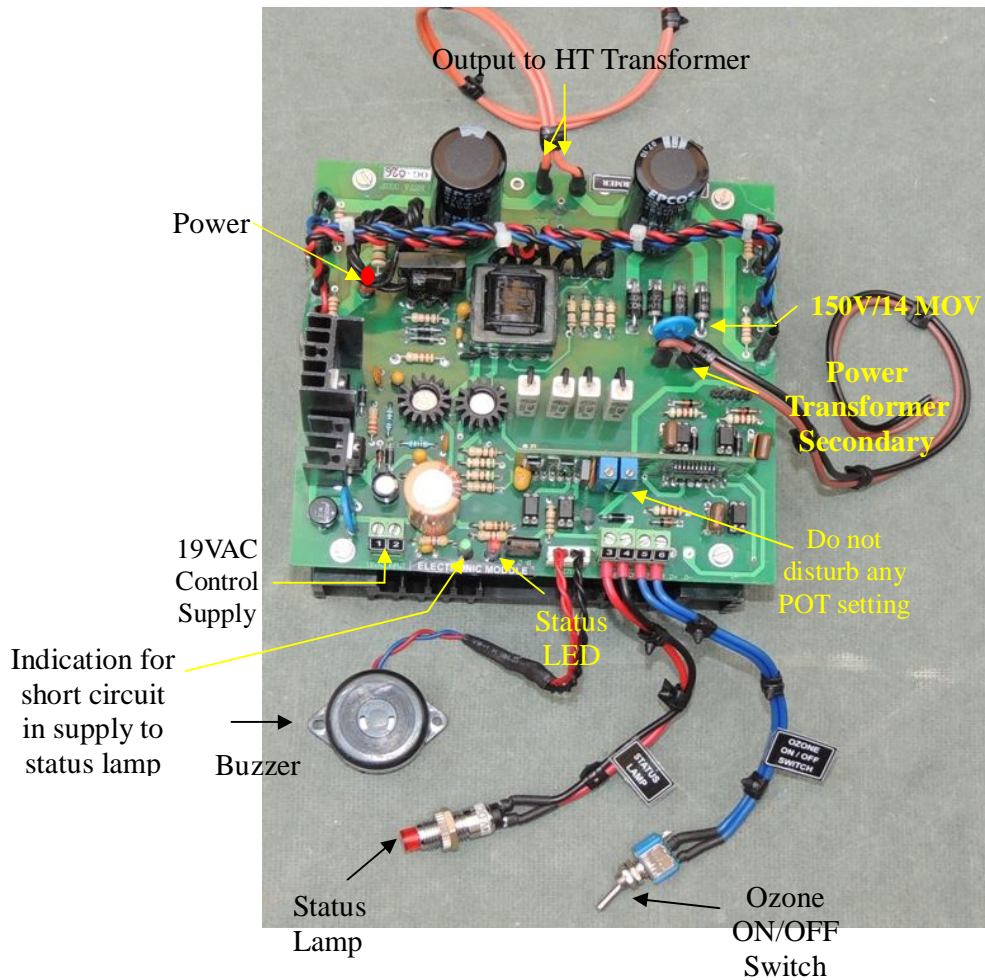
For emergency services please call on
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OLD MODULE DISCRPTION



IMPORTANT NOTE: NEW AND OLD BOTH MODULES ARE INTERCHANGABLE

NEW MODULE WITH ADAPTOR PCB DISCRPTION



100VA UNIT LIST OF SPARES

SR. NO.	ITEM	QTY.	Tested By	Checked By
1)	Output Silicon Tube	2 mtr.		
2)	Spares :-			
a)	Fuse 2A (FH – 1)	3No's.		
b)	Fuse 3A (FH – 1)	3No's.		
c)	Fuse 4A (FH – 1)	3No's.		
d)	Lugs 4/6 sq.mm Round	2No's.		
e)	Lugs 4/6 sq.mm 'U' Type	5No's.		
f)	Cable Ties CV-100 & support	4No's.		
g)	MOV 275 Volt	1No.		