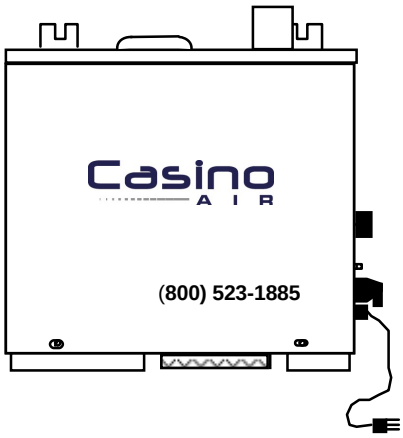
MOLECULAR OXIDIZERS

(800) 523 1885



INSTALLATION, APPLICATION AND SERVICE INSTRUCTIONS

CASINO AIR MOLECULAR OXIDIZERS

Service Instruction Section

ROUTINE MAINTENANCE

The molecular oxidizer requires routine maintenance for years of service at maximum ozone output. This occasional maintenance requires only minor cleaning and will take only a few minutes. Failing to routinely clean the unit will reduce the ozone output and require longer times for treatment. A complete failure to perform maintenance can cause a total failure of ozone output and a possible failure of molecular oxidizer components, which voids the warranty.

The amount of time between cleaning will depend upon a few variables. Below is a list of important operating factors that increase the frequency for cleaning:

- Unit operated 24 hours a day.
- Unit operated 365 days a year.
- Unit mounted outdoors.
- Unit operated in a high moisture or humidity environment.
- Unit operated in an area of excessive dust or dirt.

The harder the service, the more often the maintenance is required. Molecular oxidizers mounted outdoors, should be cleaned every 3 months. Notice that if the unit is elevated above floor level, cleaning frequency should be less. This is because at floor level more moisture is drawn into the molecular oxidizer. Air purification applications should require cleaning approximately every 3 months unless located in dirty or moist environment. Please note the above cleaning suggestions are averages. Check your equipment more often initially to determine if your use will allow you to go longer or shorter periods between cleanings.

An easy way to determine if your machine is really dirty is to listen to it. With a clean molecular oxidizer, turn the ozone level knob to zero, and then turn on the machine. The blower will come on, and it has a low volume fan sound. Next, turn up the ozone knob briefly to hear the sound of corona being formed. This corona formation is the result of a high voltage causing an air gap to ionize. The sound is a low tone hissing or buzzing. A really dirty unit will have no corona sound. If a unit has too much moisture in it or is dirty, a snapping or arcing sound occurs. Please shutdown the unit and perform the necessary cleaning.

Routine maintenance consists of cleaning the air filter, cleaning the cabinet interior, cleaning of electrodes and glass, and oiling the blower motor. All of these tasks can be performed by almost anyone with a few simple instructions. The molecular oxidizer can be cleaned in the shop or on the job site. Cleaning supplies consist of clean water, glass cleaner, abrasive cleaner, abrasive brush, cleaning cloths or pads, and twenty-weight oil.

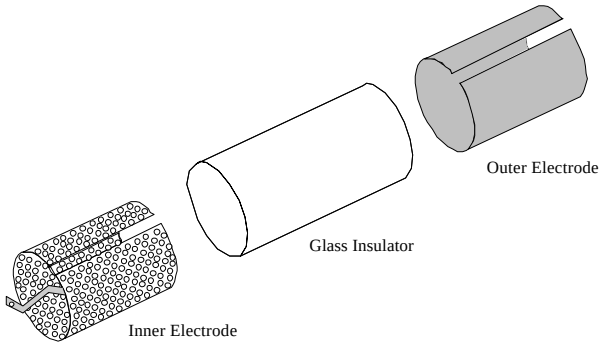
Œ **Unplug the molecular oxidizer**, remove and clean or replace the air filter from beneath the unit.

- Remove the service cover by taking out two or three screws at the bottom and pulling down on the cover. Look at the inside of the cabinet and compare it to the internal drawings of the proper model in this manual. Identify the following components: the high voltage transformer(s), the electrode assembly(s), and the blower motor. The electrode assembly(s) consists of an outer electrode(s), a glass cylinder(s), and a perforated inner electrode(s). See if the glass appears to be broken, dirty, smudged, or has a chalky appearance.

Ž Clean the electrode assembly(s). If possible, the cabinet should be laid on its back with the opening upward. Begin by removing the high voltage wire connected to the inner electrode(s) directly or via the bus bar(s). This requires removing the wing nut from this connection point. Be careful not to break the glass insulator tube(s). Next, loosen the generator holder retaining straps around the electrodes. The screw mechanism on the generator holder will swivel and allow the straps to pull all the way out. On the model CA300, only a single electrode is in the cabinet. On the models CA600 and CA1000, the electrodes are in sets of three. Disconnect the bus bar from the three inner electrodes and remove each individual electrode. They can also be carefully removed, as an assembly. Secure the electrode assembly(s) on a table or counter for cleaning.

- Disassemble the electrodes. Remove the bus bar on the triple electrode assembly to individualize each electrode if not done in step 3. From each assembly remove the outer electrode by slightly springing it open and carefully sliding it off the glass insulator tube. If the outer electrode is stuck to the glass, soak the entire assembly in hot water (soapy if necessary), or in some other solution such as Lime-A-Way. Next, remove the inner electrode by slightly squeezing it together and sliding it out of the glass tube.

CONT'D - (ROUTINE MAINTENANCE)



SINGLE ELECTRODE ASSEMBLY

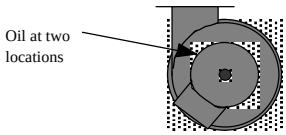
- Clean each of the electrode components. Thoroughly clean the glass by normal methods used with glassware such as window cleaner, ammonia cleaners, or detergent and water. If the glass tube is extremely dirty, or appears to have oxidized, then clean thoroughly using a stiff bottlebrush. The inner and outer electrodes should then be cleaned. To remove any oxidization that might have built up on the electrodes, use an abrasive means, such as wire brush, SOS pad, stiff plastic brush with abrasive powders (Ajax or Comet), etc. The chalky substance on the aluminum electrodes is aluminum oxide that is a result of moisture. Clean the electrodes until they are back to the basic metal surfaces. Make sure to wash off any residue. Dry each of the electrode(s) and the glass tube(s) thoroughly.

‘ Reassemble the electrode assembly(s). Spring the inner electrode(s) open slightly to insure a tight fit, and install into the glass tube(s) until it is in the center of the glass (approximately 1-1/2 inches of clear glass on each end). Next, slide the outer electrode(s) over the glass and align it with the inner electrode(s) in the center of the glass. The bus bar can be installed for the model CA600 and CA1000 here, but may be easier to install in next step.

’ Reinstall the electrode assembly(s) into the cabinet. Look at the gaskets on the blower (CA300), or on the plenum (CA600 & CA1000), and verify they are in good shape. If they have any deterioration, order new ones and change out at next cleaning. Next, insert the electrode assembly(s) back into the generator holder and push the end of the glass firmly against the gasket on the blower, or plenum. Align the electrodes with the inner electrode tab down for the CA300 and directed toward the back of the cabinet so that the bus bar (CA600& CA1000) dimples will slip into the holes on the inner electrode strap. Reattach the generator holder retaining straps around the electrode assembly and tighten securely all straps. Duplicate this for remaining electrode assemblies on the CA600 and CA1000 models. Connect the bus bar if not done previously. Connect the high voltage lead wire from the transformer back to the inner electrode tab, or the bus bar. To prevent arcing, do not get the high voltage wire lead, bus bar, or inner electrode tab too close to the side or rear of the cabinet. Please refer to the internal drawing of the cabinet in this manual to verify that all components look as shown.

“ Use a damp cloth to wipe out the interior of the cabinet to remove dust, dirt, etc. If a cleanser is required, use one that does not have an alcohol or hydrocarbon base that might be flammable. Over scrubbing the cabinet's exterior or interior might destroy the paint. Wipe the interior out with a clean, dry, cloth.

” Oil the blower motor with 10-20 drops of 20W oil or Teflon lubricant at each end of the blower motor. Do not over oil. Once every three months should be adequate. Wipe off the motor and verify that no oil has leaked onto the bottom of the cabinet.



OILING OF BLOWERS

Note: Motors Mfg after January 2015 don't require oiling.

- Replace the cover and test the unit. Test by plugging in the unit and turning it up slowly to raise the ozone level. Determine if the corona sound occurs and the smell of ozone is present. The unit should be ready to put back into operation.

After cleaning, if no ozone is detected, or corona sound is heard, unplug the unit. Remove the door and verify that the glass electrode(s) is up against the gasket(s), and that transformers are connected to the inner electrode, or bus bar. If all appears correct, refer to the troubleshooting section of this manual for directions.

TROUBLE-SHOOTING

Troubleshooting the Casino Air models require a familiarity with the machines, as well as general electrical troubleshooting and electrical safety skills. Testing can be done with a volt-ohmmeter, and some troubleshooting can even be done without electrical meters. However, do not attempt to do any troubleshooting until you are familiar with the function and components of the equipment. Do not attempt testing if any test or procedure is not fully understood.

Refer to the appropriate model's internal layout to follow operation and troubleshooting steps. Item numbers in bold will follow the descriptors below.

The Casino Air units use a blower (**18**) to draw air in through the air filter (**20**) at the bottom of the cabinet (**1**). Air is drawn into the open end of the glass tube(s) (**6**), into the plenum (**35**) on the CA600/1000 models, into the blower (**18**), and out the top of the cabinet (**1**). The glass tube(s) (**6**) with inner and outer electrode(s) (**4**&**7**) is the location where the ozone is created. A high voltage field between the inner and outer electrode(s) (**4**&**7**) generates ozone. The voltage level to the generator is adjusted by the level control on the side of the Molecular oxidizer. On model CA300, a rheostat (**19**), and on models CA600/1000, a variable transformer (**19**) is used to adjust the voltage to the high voltage transformer (**16**). Additional controls are the on-off selector switch (**22**) or the optional timer (**22B**), which controls the blower as well as power to the level control. There is also an optional control configuration that is referred to as the ventilation timer on some models. In this configuration, the ventilation timer controls only the time period that ozone is generated, and has no control over the blower.

Begin by removing the front cover (**2**) and looking inside the molecular oxidizer. Check for things that seem abnormal such as excessive dirt or film on cabinet, or any components. If a machine is stored for an extended period of time, moisture or humidity can cause a film to develop on some of the electrical components, such as where the brush (wiper) touches the windings on the variable transformer (**19**). Examine items that appear to need cleaning, such as the generator section (glass and electrodes). Look especially for components that appear to have heated or arced. These items can often determine the cause of the problem, and allow future prevention.

On a following page is a list of symptoms, probable causes, and solutions to the problems. Please refer to this page for a starting point in troubleshooting the Casino Air models. After extended service of the machine, any component can fail. However, the most common failures come from a lack of cleaning and maintenance.

MOST COMMON ELECTRICAL TROUBLESHOOTING PROCEDURE

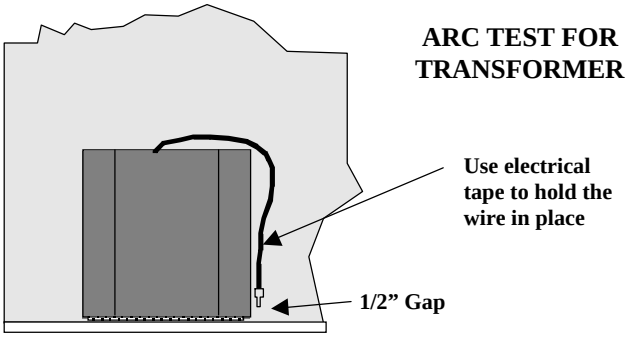
If the Casino Air blower will operate, but no ozone is detected, the first step is to check to see if the unit needs cleaning. Unplug the unit before removing the front cover (**2**) to inspect the electrode(s) (**4**&**7**), and glass tube(s) (**6**). If they appear dirty or chalky, remove and clean as instructed under Routine Maintenance section of this manual. If the glass tube(s) is not up against the gasket(s) (**39**) on the blower (**18**), or the plenum (**35**), push it up against the gasket(s) firmly. Check the transformer fuse(s) (**34**) on the side of the newer cabinet, or located next to the transformer in the older style cabinets (**16**). Use an ohmmeter to verify the fuse is good. Fuses can look good, but be open in the end region that is not visible. If the fuse is good, place it back in the fuse holder (**25** in new cabinets or **33** in older cabinets). If the fuse is bad, replace it with the correct size and type.

If everything above appears to be correct, test the unit while the door is removed. This can be accomplished by being careful to keep hands out of the inside of the cabinet. Turn down the ozone level control (**19**) to zero, plug in the unit, press in the door safety switch (**21**), and turn on the selector switch or timer (**22** or **22B**). When the blower (**18**) comes on, turn up the ozone level control slowly. Listen for the distinctive "ionization" sound. It should intensify as the level increases. Verify that no arcing or sparking occurs. If an arc occurs, verify its location, turn off and unplug the machine. Determine the reason for the arc and correct it. Typical problems are dirty glass and electrodes, moisture in the glass, misalignment of electrodes, cracked glass, etc. If problem is not located, it is recommended that the high voltage transformer circuit be tested.

Proper testing of high voltage transformer (**16**) requires an AC voltmeter that will measure approximately 15KV. Actual voltage should be between 10KV and 14KV. If a HV test meter is unavailable, then an "arc" or "spark" test can be performed to determine if high voltage is available. Note that on a model CA1000 the transformer fuse on the transformer not being tested is to be removed, to prevent it from being energizing while the other HV transformer is tested. With the unit unplugged, disconnect the transformer (**16**) high voltage wire from the inner electrode(s) (**4**). Loop the high voltage wire down in front of the transformer and form it or tape it to the side of the transformer so that the wire is approximately ½ inch from the bottom of the cabinet. Do not hold the wire or use a screwdriver to hold it in place. With the door off, turn the ozone level knob (**19**) to zero, plug the unit in, hold down the door safety switch (**21**) and turn the selector switch or timer (**22** or **22B**) on. The blower should turn on. To "arc" test: raise the ozone level knob (**19**) gradually toward the maximum setting.

CONT'D - (TROUBLE-SHOOTING)

When the knob approaches the maximum output, an arc should occur from the high voltage wire to the bottom of the cabinet. The arc should be a strong arc, but should not damage the cabinet, other than minor etching to the paint. If a strong arc occurs, then the high voltage and control circuits are good. The problem is in the electrode-glass assembly and can be fixed by cleaning or replacing electrodes or glass.



If the arc does not occur or is very weak, the transformer could be bad. Also, the voltage coming into the transformer might not be present or high enough. Repeat test for second transformer on model CA1000. If voltage coming into the HV transformer is suspected not to be correct then a 150VAC voltmeter is required to test the primary voltage coming into the high voltage transformer.

Testing Voltage into HV Transformer on Model CA300

On the model CA300, begin by verifying that the unit is unplugged. Check that the transformer fuse is good as instructed above. Connect a 150VAC voltmeter from the left side (transformer side) of the brown resistor (**30**) located in the center of the cabinet and attached to the rear, near the bottom. Connect the other voltmeter probe to the cabinet ground. If possible, connect the voltmeter to the resistor with a jumper or alligator clip to hold it in place. If the probe must be held onto the resistor by hand, be very careful not to come near, or in contact with the high voltage transformer lead, or the inner electrode (**4**) to the left. This may have extremely high voltage present. Plug in the model CA300, set the ozone level control (**19**) to zero, turn on the selector switch (**22**), and press in the door safety switch (**21**). The voltmeter should read approximately 50 volts. Adjust the ozone level knob to mid-scale, and the voltmeter should read approximately 60-65 volts. Adjust the ozone level knob to maximum, and the voltmeter should read approximately 95-100 volts. If these readings are observed, then the rheostat (**19**) is good. If the rheostat appears to be bad, unplug the model CA300, then place a temporary jumper between the two terminals on the rheostat (**19**) that have wires. This will bypass the rheostat, and the unit will be at full output. Plug in the unit, turn on the selector switch, press in the door safety switch, and the unit should come on at full output. If the "arc" test is being checked, it should produce a hot arc. If a hot arc occurs then the transformer (**16**) is good and the rheostat (**19**) is bad. If a hot arc is not seen, then the transformer is bad and should be replaced.

Testing Voltage into HV Transformer(s) on Models CA600 and CA1000

On models CA600/1000 begin by verifying that the unit is unplugged and then remove the fuse(s) to the transformer(s). Check that the transformer fuse(s) is good as instructed above. With the transformer fuse(s) removed, there will be no voltage above 120VAC in the cabinet. Next, the voltage at the line side of the transformer fuse holder should be measured. To do this, connect the 150VAC voltmeter from the line-side of the fuse holder(s) (**33**) and the cabinet ground, or test between terminals 3 and 4 on the level control variable transformer (**19**). Plug in the unit's cord, turn the selector switch on, press in the door interlock switch, and turn up the level control knob to mid-scale (50%). The voltmeter should read approximately 60 volts. Turn up the level control knob to maximum (100%), and the voltmeter should read approximately 120 volts. If readings are correct, then the variable transformer (**19**) is good. If readings are much lower or erratic, then the variable transformer wiper, or variable transformer, is dirty or bad. Clean the area that the wiper (brush) contacts the variable transformer windings with a rubber eraser or electrical contact cleaner. Also, clean the wiper to remove film buildup. If this does not correct, replace the bad component. If the variable transformer (**19**) tests good, and the HV transformer (**16**) does not produce a strong arc, then the transformer is bad. Replace the transformer and verify that the unit performs correctly.

Replace all components with factory-approved components only. Failure to replace with factory-approved components could result in damage to equipment or injury to personnel. Do not attempt to repair the machines unless you have a complete understanding of the procedure, and the proper test equipment is used. Call Casino Air for parts and assistance.

TROUBLE-SHOOTING LIST

Note: Before beginning troubleshooting problems, always refer to all diagrams and manual instructions. These units have high voltages in excess of 12KV.

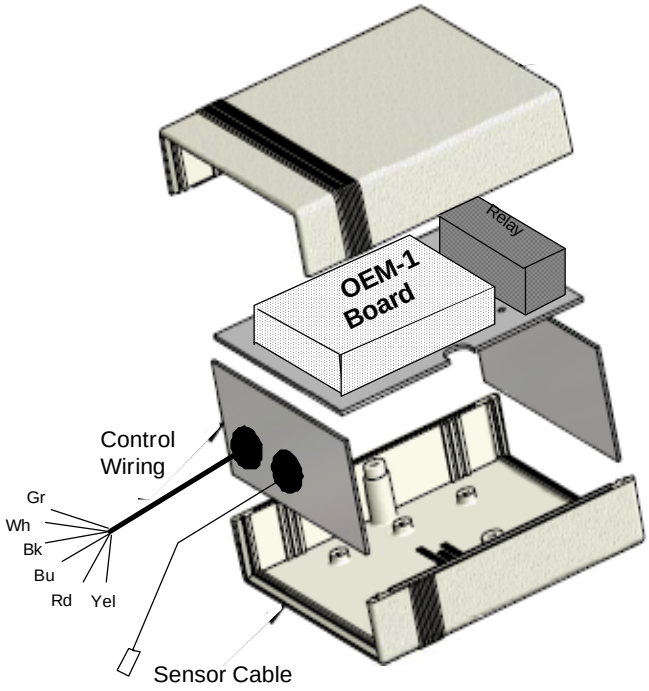
Symptom	Probable Cause	Solution
Machine not working.	Power to the receptacle off.	Check receptacle for power or tripped GFI.
	Cover not on good enough to close the door limit switch.	Tighten or adjust the cover.
	Main fuse blown.	Replace the main fuse with spare fuse.
	Failure of on-off switch or timer.	Replace on-off switch, contacts, or timer.
	Failure of door limit switch.	Replace the limit switch.
	Failure of blower motor.	Verify that blower motor will rotate and has not failed. Lubricate or replace if necessary.
No Ozone or Low Ozone Output	Glass tube(s) not up against the gasket(s) on the blower or the plenum.	Push the glass tube(s) up against the gasket(s) to prevent air from bypassing the generator.
	Ozone level setting too low.	Increase the setting.
	Dirty or oxidized glass tube(s) and electrodes.	Clean the glass and electrodes, or replace them.
	Cracked glass insulator(s).	Replace the glass insulator tube(s).
	Blown HV transformer fuse.	Verify fuse is blown and replace. Check glass.
	HV transformer failed.	Test transformer and replace if required.
.	Dirty, worn, or broken variable transformer wiper (brush).	Clean or replace the variable transformer wiper.
	Variac, rheostat or resistor failed.	Test and replace components if required.
	No air movement (blower not operating).	Clean filter. Free the blower from obstructions and oil motor with 20W oil. Replace motor, if necessary.
Main Fuses Blown	Shorted variac or rheostat.	Replace the component.
	Shorted blower motor.	Replace the blower motor.
Transformer Fuses Blown	Transformer shorted.	Replace the transformer.
	Glass insulator tube is very dirty, has excessive moisture in it, or is cracked.	Clean the glass and electrodes, or replace the glass tube and electrodes.
	Wire insulation breakdown.	Locate the wire failure and replace.

Ozone Sensor Testing

INSTALLATION

The OEM-1 sensor board can be mounted in ozone equipment by two methods. First method is mounted exposed where the card is installed inside the ozone generator attached by two mounting feet to the cabinet bottom. The sensor is then either installed in the card so that it measures ozone coming in from the air filter opening, or an extender cord can plug into the card and allow the sensor to be placed outside the cabinet. With this installation normally an additional relay is installed adjacent to the card to provide control functions for turning on and off the ozone output and provide a contact should external indication be needed.

The second method of installation is for the sensor board/card to be installed in a plastic enclosure. The sensor relay will also be mounted inside the enclosure and wiring will be routed out of the box. The box will be mounted to the bottom of the ozone cabinet with feet. Purpose of the housing is to provide environmental protection to the sensor board. To monitor the LEDs on the board during trouble shooting, the cover of the plastic housing will need to be removed. When using the housing, the sensor always requires the use of a sensor extender cord.



The OEM-1 board should be powered up continuously for it to properly and quickly respond to measured levels of ozone. When the board is powered initially, the Green and Yellow LEDs will turn on, and after a few seconds if the ozone level is below the setpoint, the Yellow will turn off. When the ozone level rises above the setpoint, the Green turns off, and a few seconds later the Yellow turns on. When the Yellow turns on, the relay is also activated, turning off ozone production in the ozone generator. When the ozone level drops, the Green turns on and then the Yellow turns off, and relay turns the ozone generator back on.

The OEM-1 board is typically factory calibrated for a 0-0.1 ppmv value of ozone. The sensor head measures the amount of ozone, and sends an electrical signal back to the OEM-1 board where the value is compared to the setpoint. The setpoint adjustment potentiometer R14 corresponds to levels of ozone in percentage. Example is that at 100% on R14, the setpoint is equal to 0.1 ppmv (100 ppbv). This is maximum OSHA level allowed. Normally the unit is normally set about 45% which equals to 0.045 ppmv (45 ppbv). This is below the EPA level of 0.05 ppmv for continuous exposure to ozone. R14 should not be adjusted below 30 or it will not operate properly. The sensitivity will keep the unit off, including Green Led. If the unit operates improperly, such as on/off operation, then the card and sensor should be tested.

Refer to the data sheet on the sensor system for more detail information on the specifications of the board and sensor. All repairs to the sensor board must be done by the manufacturer, especially in warranty applications. The sensor heads are generally not repairable, and will need replacement if found to be defective.

Ozone Sensor Testing (continued)

TESTING

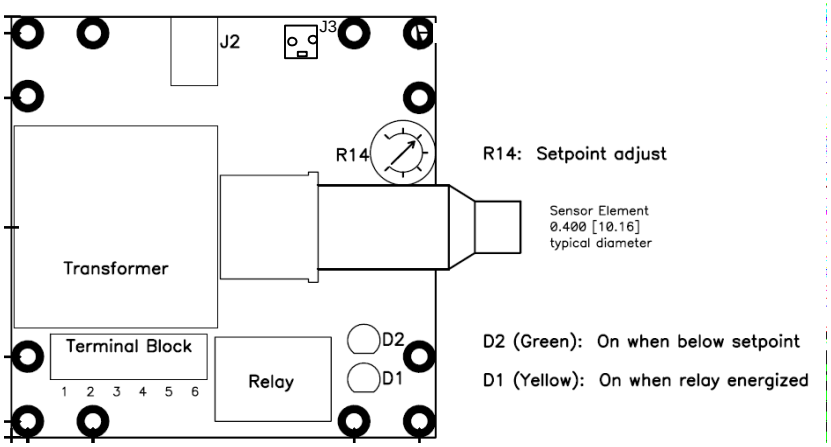
1. Verify that the card is powered up, indicated by Green LED illuminated. If not, then measure the voltage on terminal blocks 2 & 3 for 120VAC input. If no voltage, check ozone generator for blown fuses, open door, faulty safety switch, etc. The unit will not operate until power is restored. Check also that transformer fuses are good. Ohm the fuses as they may burn open in the top part of the fuse, invisible to the eye.

2. Next verify that the sensor is operating properly. The sensor is a replaceable item that typically needs replacement every 1-2 years. It is inexpensive, and simply plugs into the card, or the sensor cable. To test the sensor, remove it from the point of installation in the duct or room. Place the sensor head in a clean air environment so that it is not exposed to ozone. Give it a moment or two for exposure to air without ozone. Take a voltmeter set for DC volts and measure the voltage between the two pins on J3 on the figure below. The voltage level being measured is the voltage level coming in from the sensor head. For example if the sensor head is measuring a level of 0.05 ppmv (50 ppbv) then the voltage measured would be approximately 0.5VDC. Or if the level was 0.1 ppmv (100 ppbv), then the voltage would be 1.0VDC. If the value is above the setpoint then this might be the reason the unit will not turn on. To try to reset the board, try raising the value of R14 and see if the Yellow turns off. If not then set R14 back to its original setting. If the level is below 1VDC, try to stimulate the sensor to drop lower by taking a felt tip marker and placing the tip near the end of the sensor. The vapors coming off the felt tip will cause opposite effect from ozone. If the voltage does not drop then the sensor is bad. If the voltage drops, but drifts back above the setpoint, then most likely the sensor is still bad. It may need further testing where it can be powered up in a no ozone environment. Note the voltage jumps to 5VDC if the sensor is removed.

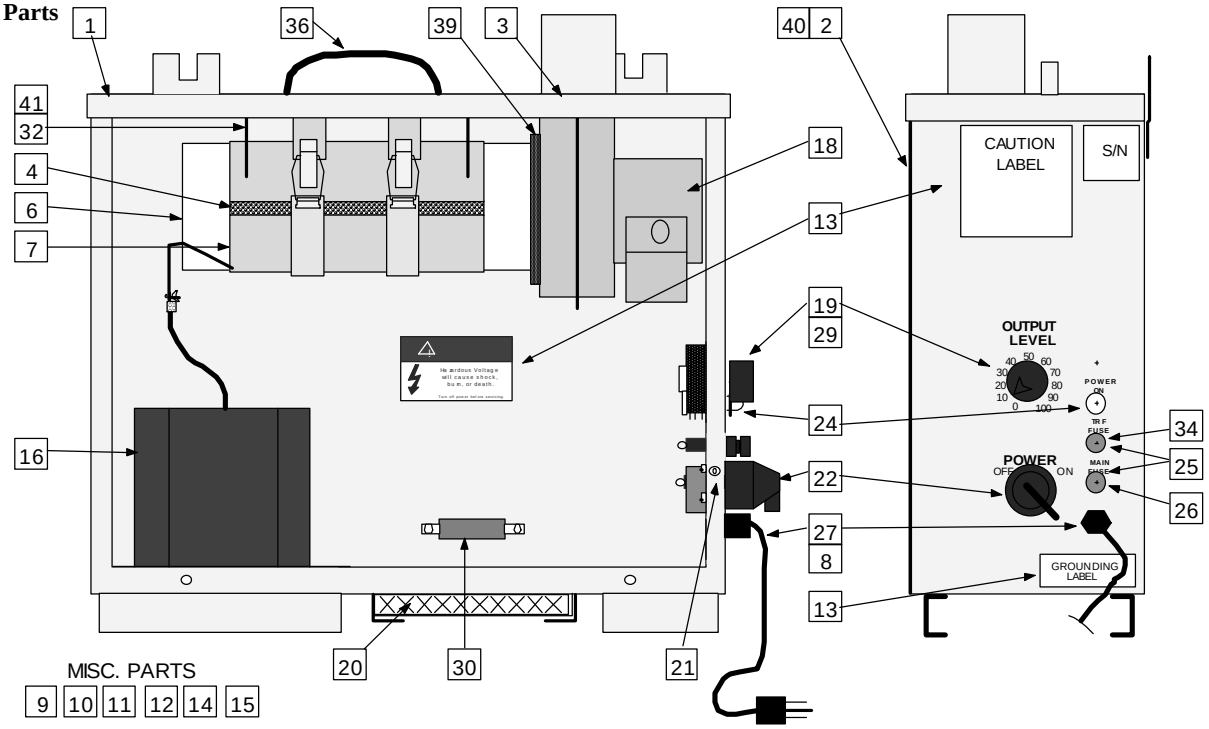
3. If the sensor appears to be bad, replace it with a sensor that is known to be good. Repeat the tests to verify the unit is working properly. Remember that the sensor head will not operate accurately until it is given time to warm up and calibrate. When a sensor is first plugged in it normally reads a value of about 0.046 - 0.200VDC. It may slowly creep up, but should stabilize. You may need a small portable ozone generator to verify operation of sensor. Once operation is acceptable, install the sensor head back into operating location.

4. Another point of testing is operation of the relay on the OEM board. The relay has 5A contacts and should these stick, or burn open then system operation would be incorrect. The relay on the OEM board operates the larger sensor relay which controls in most case the primary voltage to the HV transformers which produce the ozone. When the sensor indicates ozone level above setpoint, the relay de-energizes the HV transformer(s). The ozone production should turn on when the Yellow turns off, and vice versa. If it may be necessary to test the OEM relay contacts then making voltage measurements or removing the wiring and testing with an ohmmeter maybe required. The card will need replacement if the relay is bad or if operation can not be restored by these tests.

Terminal Block Pinout
1. Ground (chassis)
2. AC Line Neutral
3. AC Line Hot
4. Relay Normal Closed Contact
5. Relay Common Contact
6. Relay Normal Open Contact.

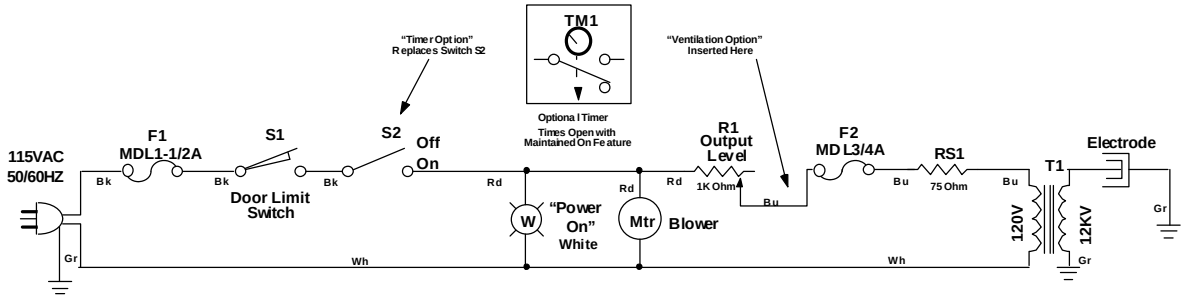


Model CA300
Drawing and Parts

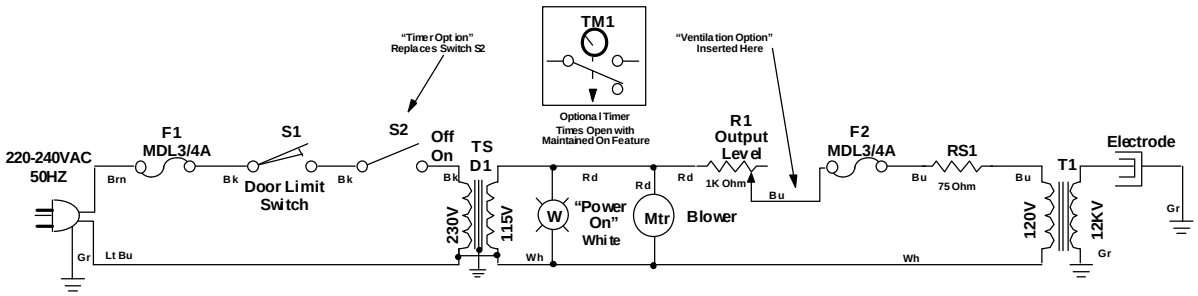


Casino Air Model CA300

Model CA300
Schematic

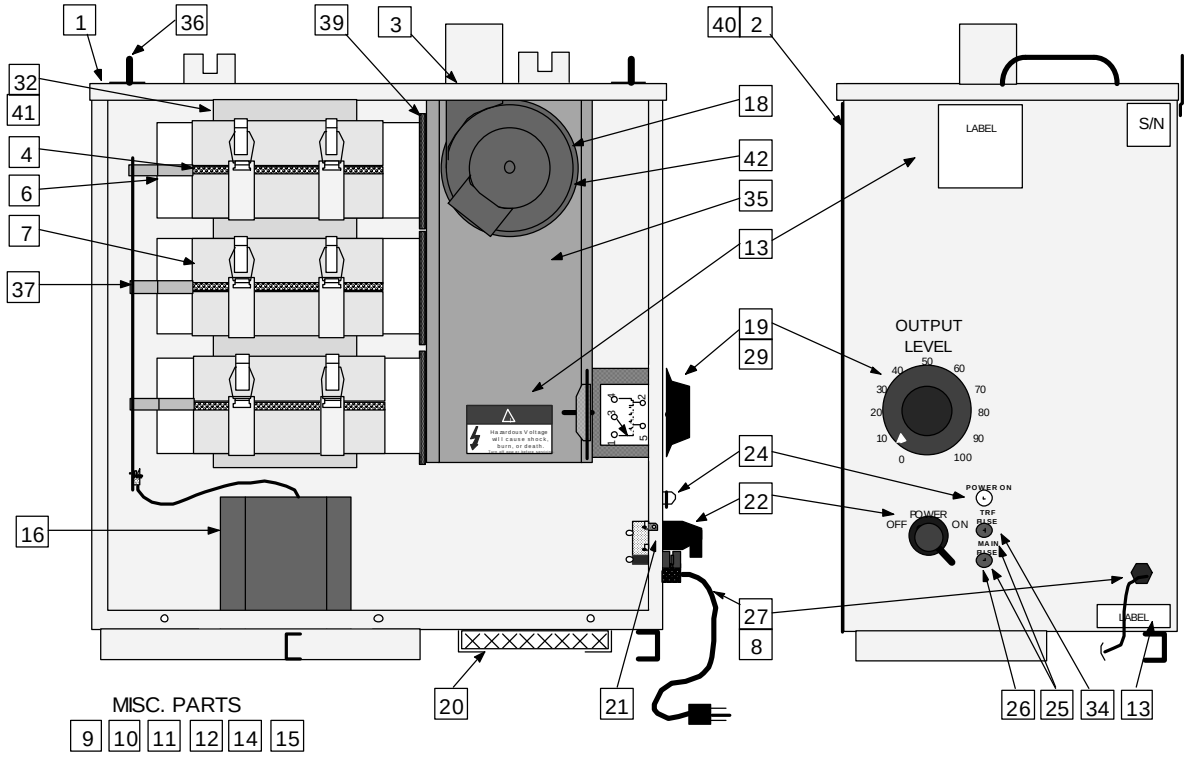


Schematic for Casino Air Model CA300 (115vac, 50/60hz)



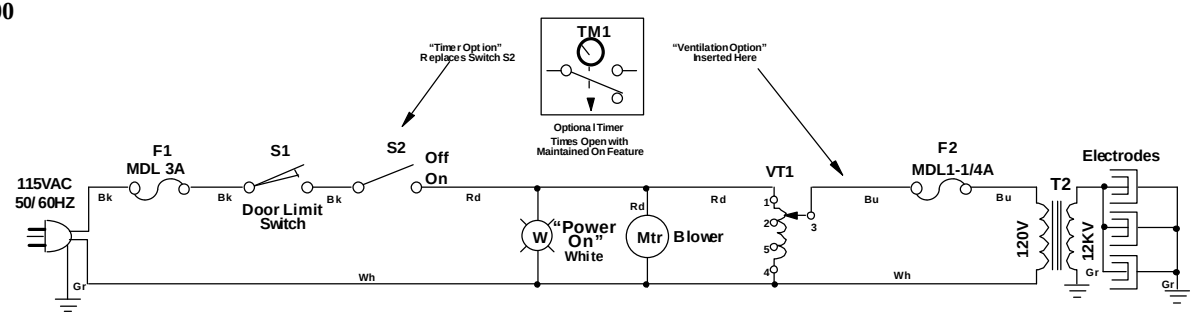
Schematic for Casino Air Model CA300 (230vac, 50hz)

Model CA600
Drawings and Parts

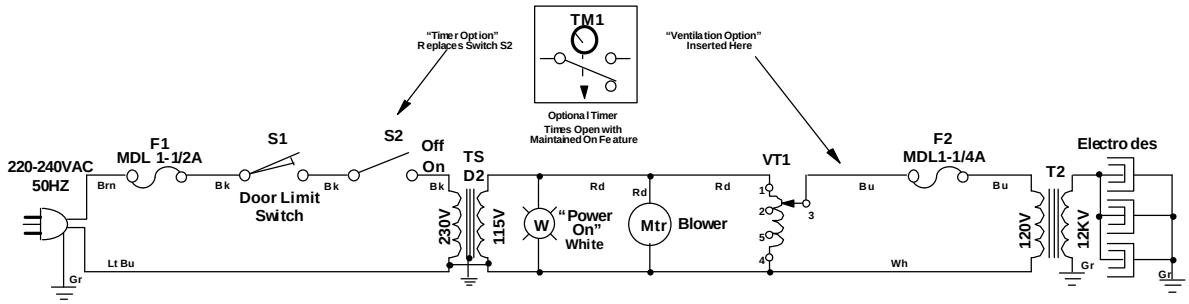


Casino Air Model CA600

Model CA600
Schematic

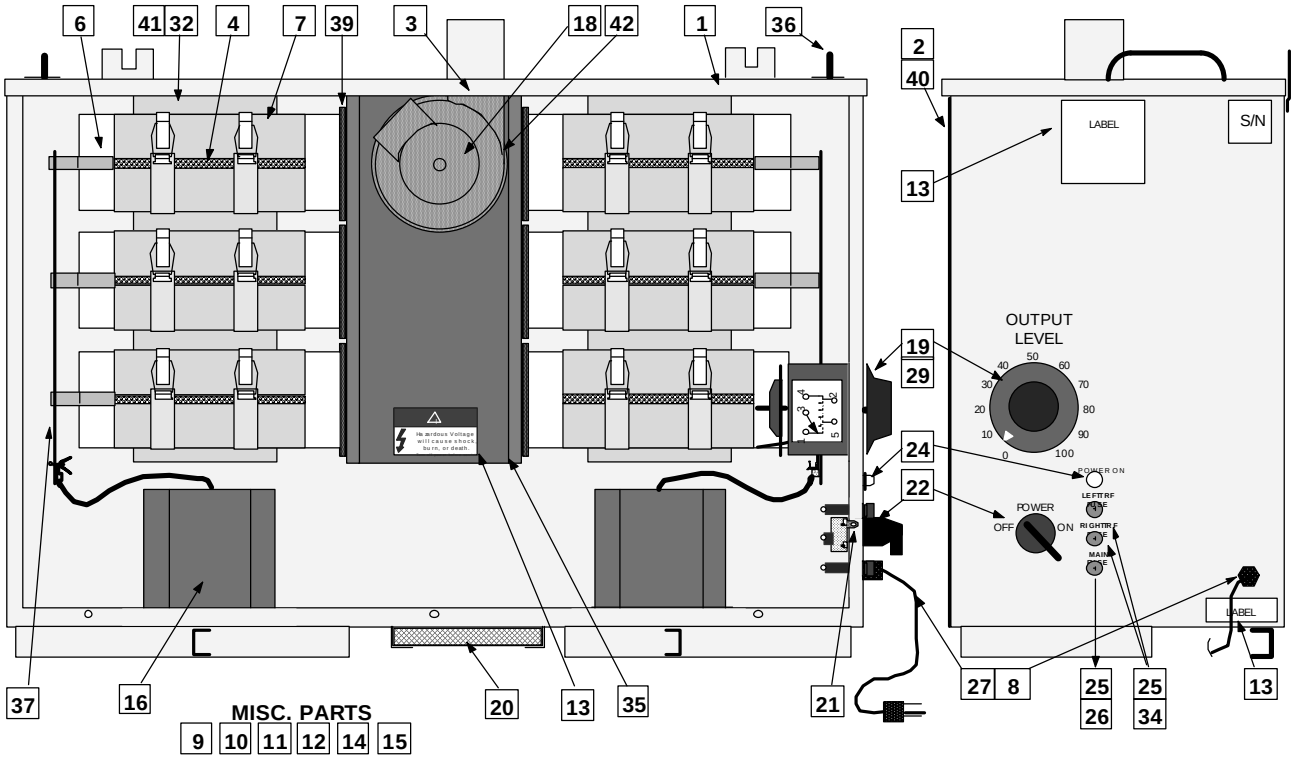


Schematic for Casino Air Model CA600 (115vac, 50/60hz)



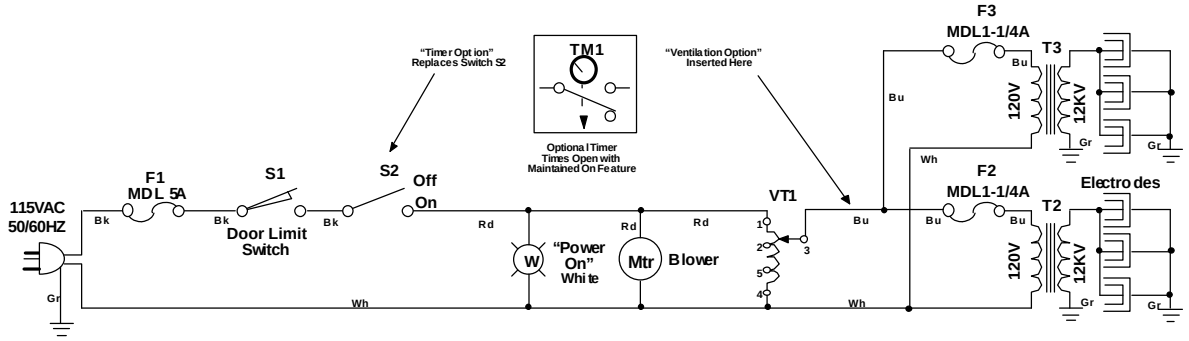
Schematic for Casino Air Model CA600 (230vac, 50hz)

Model CA1000
Drawings and Parts

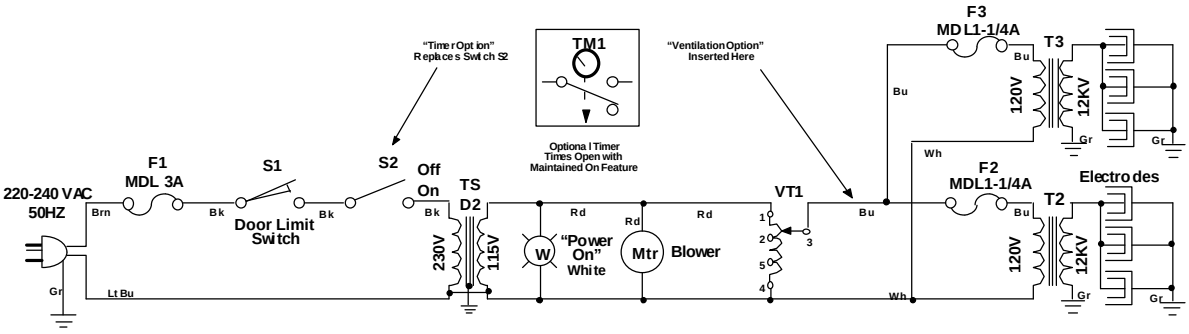


Casino Air Model CA1000

Model CA1000
Schematic

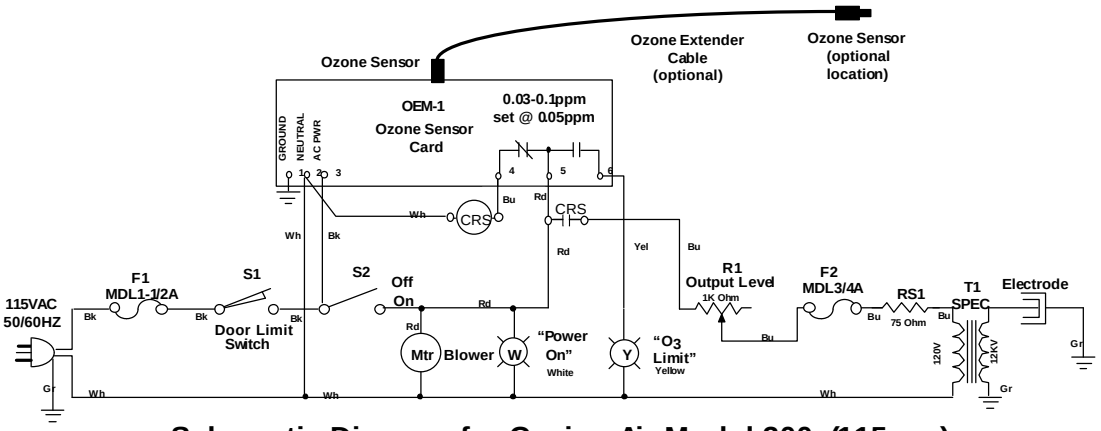


Schematic for Casino Air Model CA1000 (115vac, 50/60hz)

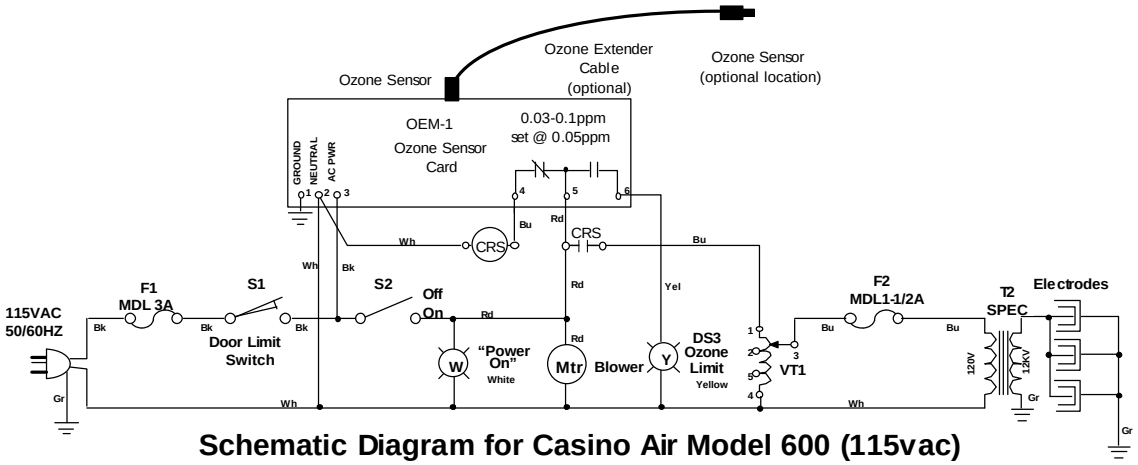


Schematic for Casino Air Model CA1000 (230vac, 50hz)

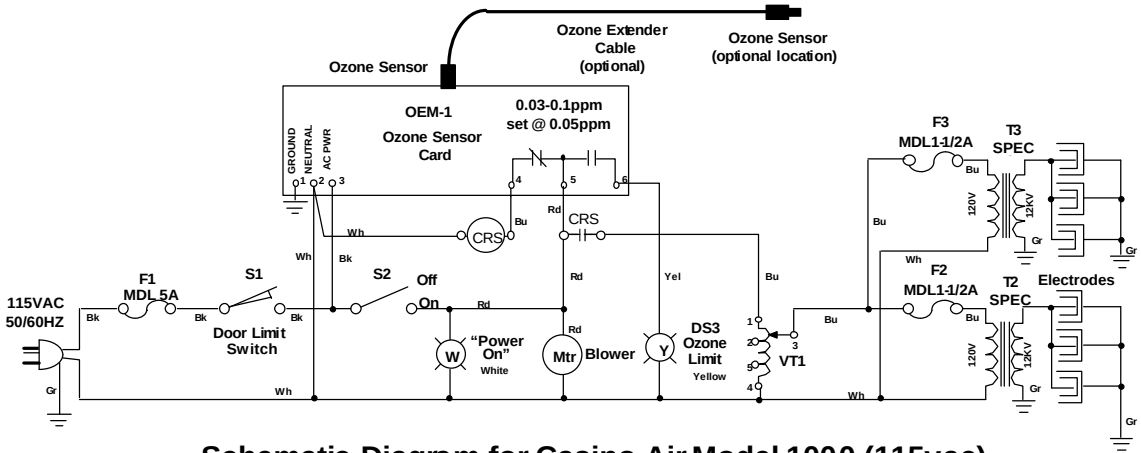
Schematics with Ozone Sensors



Schematic Diagram for Casino Air Model 300 (115vac)
W/ OEM-1 Ozone Sensor & Indicator Light & Ozone Relay



Schematic Diagram for Casino Air Model 600 (115vac)
w/ OEM-1 Ozone Sensor & Indicator Light & Ozone Relay



Schematic Diagram for Casino Air Model 1000 (115vac)
w/ OEM-1 Ozone Switch & Indicator Light & Ozone Relay