

ECO SENSORS, INC.

3-03.2

OEM OZONE CONTROLLER

Model OEM-2

INSTRUCTIONS FOR USE

GENERAL

The model OEM-2 is a system to control ozone generators and alarms based on an adjustable ozone concentration set point. It is designed to work with plug-in sensor modules for 0-0.1 ppm, 0-1 ppm, and 0-10 ppm. These are specified when ordering by putting the ppm range after the model number. For example, a 0.1 ppm OEM-2 board system would be OEM-2-.1 and the replacement sensor module for it would be SM-1-.1. These same sensor modules also work in our OEM-1 boards, which have features such as being powered by 110/220 VAC. The sensors modules can also be located at a distance from the OEM-2 boards by 2 or 8 meter cables. These are readily available DIN M/F 5 pin extension cables.

One component of the OEM-2 system is the base board which incorporates the power supply, final signal processing, set-point controls, and the output relay. The other component is the sensor mounted with its associated electronics in a cylindrical DIN plug. This is precalibrated in our lab so that the sensor module and main board module together work as a calibrated system. If the sensor module is damaged, it is simply replaced by another precalibrated module.

The design incorporates hysteresis and time delay (set at 8 seconds except for special orders) to eliminate chatter and other excessive interactions between the sensor and generator. The SPDT relay contacts will handle up to 5 amps at 250 volts. The OEM-2 should not be used outdoors or in the presence of NO_x, nitric acid, acid gases, or halogen compound fumes.

Allow warm-up according to the table below. At least 24 hours is recommended if the system hasn't been used for a week or so. This is because the sensor can absorb VOCs when it is not in use.

OPTIONS

In addition to the basic switching function, the OEM-2 may be ordered with the following:

1. An analog voltage output which is a buffered version of the sensor module signal. Again, one volt of output represents the calibration of the sensor module.
2. A 4-20 mA current output which is proportional to the sensor module's output.
3. A driver circuit for an audible alarm, including an acknowledge switch input to silence this alarm. The alarm will turn on again after the ozone level drops below the switch threshold and then rises again.
4. 2 and 8 meter extension cables are available for remote mounting of the sensor module. Note that the use of these cables unavoidably introduces a small offset voltage, which is added to the sensor output. This will raise the 'zero' point by an amount which is not usually significant.

INSTALLATION

CAUTION!

It is best to bench test the board with an AC adapter 12 VDC supply (see below). Do not let solder connections on the OEM-2 board short circuit to any metal surfaces.

The OEM-2 should be attached to your equipment (such as inside the ozone generator) by four mounting holes. Select four that align with your equipment and which stabilize the OEM board. The board surface on the solder side should be kept at least 6 mm (1/4") from any metal surface. The OEM-2 board should be wired to your power by the terminal block terminals 2 and 3 for 110 V 60 Hz or 220 V 50 Hz according to the power transformer wiring/jumper diagram found in these instructions. Alternately, you can power the unit by 12 V DC via jack J2. This low voltage power option was provided especially for bench testing the OEM-2 without exposing personnel to high line voltages. The Eco Sensors P-20 AC adapter (a purchase option) can be used to provide 12 VDC when 120 VAC 60 HZ is available. For 220 V 50 Hz power, you will have to purchase an adapter locally with specifications according to our Tech Note P-101.

CONNECTIONS

Along one edge of the OEM-2 board are three 3-position terminal blocks. These are labeled in silk-screen on the board as TB-1, TB-2 and TB-3.

TB-1, located at the front of the board (i.e. closest to the sensor module) is the relay output, which is capable of switching up to 5 amps at 250 V.

TB-2 provides the 4-20 mA and 0-2 Volt analog outputs, if these options have been installed.

TB-3, farthest from the sensor module, is the board's power input. Any supply from 12-24 Volts AC or DC is acceptable, with a current drain of approximately 75-100 mA. To operate the board from AC power, connect the supply leads to the two outside screws of TB-3. DC power may be applied between either of the outside screws and the center screw (the center screw is board ground and **MUST** be the negative side of the DC supply). Note that when powered from AC, the board's circuit ground is **NOT** connected directly to either supply lead.

For convenience, a DC power input connector is located between TB-2 and TB-3. An Eco Sensors model P-20 power adapter (or equivalent 12-18 VDC source) may be plugged into this connector to power the board. Do **NOT** use this option when power is being applied via TB-3.

WARM-UP

When the generator or other equipment is turned off, if possible, it is best to wire the units so that the OEM-2 board is always powered. The sensor will stay heated and burn off any chemicals it would otherwise absorb. When the ozone generator or other equipment is turned back on, the OEM board is ready to respond immediately and accurately.

Otherwise, warm-ups are required. Recommended warm-up times are:

Time Since Last Powered

1 minute - 3 days
3 - 7 days
More than 1 week

Warm-up Time

10 minutes
1 hour
24 hours

If the sensor is easily accessible, the warm-up time can be minimized by checking for full response by an ozone generator of known output. The Eco Sensors OG-2 Ozone Source Calibrator is a portable battery-operated source which is designed to check for response at 0.1 ppm.

OPERATION

The OEM-2 is calibrated at the factory by comparison with a NIST traceable UV analyzer. Lower detection points can be set by the calibrated dial pot R-14 on the main board. Its numbers represent percentage of ppm. For example, 50 on the dial pot is 50% of 0.1 or 0.05 ppm (50 ppb). The calibration as a percentage of 0.1 ppm should be within 20% over 0.03-0.10 ppm. We do not recommend operating with a set point for detection below 0.03 ppm because too many chemical, atmospheric, and electronic variables can collectively make lower set points inaccurate and unreliable. A rough check of the instrument's functionality and calibration in abusive environments should be done every three months. This can be easily done with our model OG-2 Ozone Source Calibrator if the check is at 0.1 ppm.

ADJUSTMENT

Before attempting to select a set point, the OEM board must be powered on for at least 10-15 minutes. This is the time required for sensor elements to fully warm up and equilibrate to the local ambient conditions. If the board has not been run for a very long time (weeks or months), additional time may be required for maximum stability and accuracy.

When power is applied to the OEM-2, a green LED (D3) located directly behind the sensor module connector is illuminated. This is simply an indication that power is available and that the on-board power supply is working.

A second green LED (D2) is located adjacent to the set point potentiometer (R14) and indicates whether the level of ozone currently being sensed is above or below the steeping. This LED is illuminated when the detected level is below the steeping and goes out when the level exceeds this threshold. Note that the hysteresis of the comparator circuit makes it impossible to turn off D2 by setting the threshold to zero when the ambient ozone level is extremely low. At higher levels (up to the sensor module's calibration point), turning the steeping pot up and down should make D2 turn on and off.

A yellow LED (D1) located behind the sensor module connector indicates the state of the board's relay. When this LED comes on, the relay is active. Note that there is a delay of 6-10 seconds between D2 and D1, so it is possible to have both LEDs on or off for short periods when the ozone level crosses above or below the set point.

ALARM CIRCUIT

If the optional alarm circuit is installed, there will be a header, J3, with four pins (0.025" square, on 0.100" (2.5 mm) centers) mounted directly in front of relay K1. When viewed from the front of the board, pin 1 of this header is located closest to terminal block TB-1 and pin 4 is closest to the center of the board. An audible or visual alarm may be connected between pins 1 and 2 of this header (pin 1 is the +12 Volt supply, 50 mA max, pin 2 is pulled low to turn on the alarm device).

An acknowledge button may be connected between pins 3 and 4 (pin 4 is circuit ground). When this button is pressed, it will silence the alarm. The alarm also goes silent when the ozone level falls below the set point value. If the ozone level again rises above the set point, the alarm will again come on.

CARE AND USE OF THE SENSOR

The sensor, which protrudes from the end of the sensor module, is a heated metal oxide (HMOS) sensor. It incorporates the latest IC and micromachining technology in its construction so it is very stable and rugged. It can easily lose its calibration - at least until it is burned-in again - if it is exposed to any VOC chemicals and fumes, especially if it is exposed to these when it is not powered. These harmful fumes and chemicals include grease and oils, finger oil, strong deodorants, solvent fumes, sulfur compounds and the like. The sensor cannot be user calibrated. It should be recalibrated by an authorized distributor or by the factory. If it is damaged, a new sensor module must be purchased.

The sensor module can be plugged into the main board directly. It can be extended up to about 8 meters using standard DIN M/F extension cables (not mini-DIN) available from most computer supply distributors.

CALIBRATION

The sensor is calibrated in the sensor module by comparison with an NIST traceable UV analyzer. The accuracy is within 20% at full sensor response.

AC ADAPTER

For using low voltage power input, such as for bench testing, an AC adapter that delivers 12 volts at 300 mA should be used. Its output plug to fit our jack should have the 5.5 mm/2.5 mm female specification, jack center pin +. These are widely available worldwide. For more complete specifications see our Tech Note P-101.

SPECIFICATIONS

Sensor: Heated metal oxide semiconductor.

Range: 0-0.1 ppm, 0-1 ppm and 0-10 ppm available. Accuracy: 20%.

Sensitivity: As low as 0.02 ppm for the 0.1 ppm module, 0.1 ppm for the 1 ppm module, and 0.3 ppm for the 10 ppm module. These sensitivities will decrease if sensor module extension cables are used.

Response time: Within 10's of seconds.

Turn-on, turn-off time delay: 8 seconds standard. Other times by request.

Temperature and humidity range: The calibration is only valid for normal room temperature and humidity. The circuit does not include temperature or humidity compensation devices.

Supply voltage required: 12-24 VDC or AC, 250 mA.

Relay ratings: SPDT non-latching. Contacts: 5 amps at 250 volts AC.

Size of main board: 83 X 83 mm (3.25" X 3.25"). Requires 23 mm (.875") clearance from top surface of board and 6 mm (.250") clearance from bottom surface of the board.

Main board mounting: By 4 3.5 mm screws (or 6-32 screws).

Sensor Module: 16 mm (dia) X 45 mm (length), (.62" X 1.75"), 10 g (0.3 oz)

Shipping weight: Both modules and 2 meter sensor extension cable, no adapter: 454 g (1 lb)

PRECAUTIONS

- Read all instructions in this manual.
- Review safety procedures in testing and operating this system.
- Call a qualified electrician if you have any doubts about voltages, wiring, electrical codes and practices, etc.
- Keep the boards and sensor dry. Never let water or other liquids into the system.
- Do not drop the boards. Damage may not be immediately obvious.

- Operate this system in areas of normal room temperature. Operation at lower temperatures, such as warehouses or refrigerated areas, should only be attempted after testing in the proposed environment for correct and reliable operation.
- Do not attempt to service the instrument yourself.
- Do not operate this system or rely on its operations where there are high concentrations of:
 - Chlorine or other halogen compounds
 - Sulfur compounds.
 - Nitrides of oxygen (NOx).
 - Urine residues and ammonia compounds.
 - Acid gases and vapors such as sulfuric or nitric acid fumes.

When in doubt, operate the system at least 24 hours in your worst case environment.

LIMITED WARRANTY

This product is warranted against defects in materials and workmanship for own year following the date of purchase by the OEM. This warranty does not include damage to the product as a result of misuse, damage, modifications or alterations, and it does not apply if the instructions in this manual are not followed.

If a defect develops during the warranty period, Eco Sensors at its election will repair the product or replace it with new or reconditioned product of equivalent quality. In the event of replacement with a new or reconditioned product, the replacement will continue the warranty of the original model.

To return this system or any module of it, call your distributor or OEM. OEMs and distributors call Eco Sensors at (800) 472-6626 or e-mail at: sales@ecosensors.com to receive return instructions and a Return Goods Authorization (RGA) number.

Except as provided herein, Eco Sensors makes no warranties, express or implied, including warranties of merchantability and fitness for a particular purpose. Eco Sensors shall not be liable for loss of use of this instrument or other incidental or consequential damages, expenses or economic loss, or claims for such damage or economic loss.

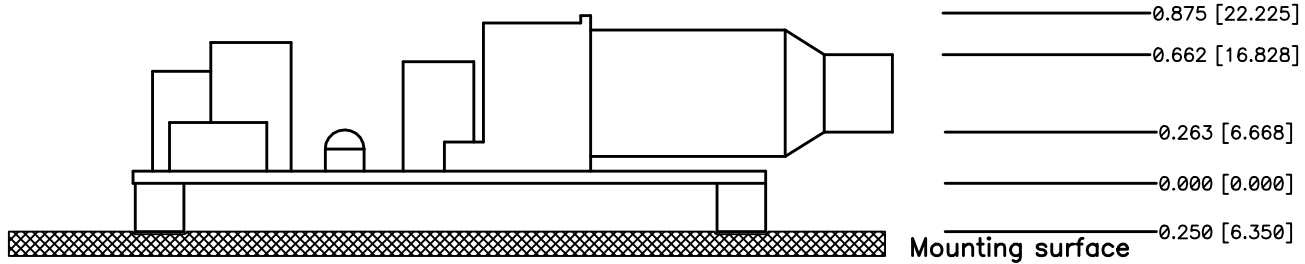
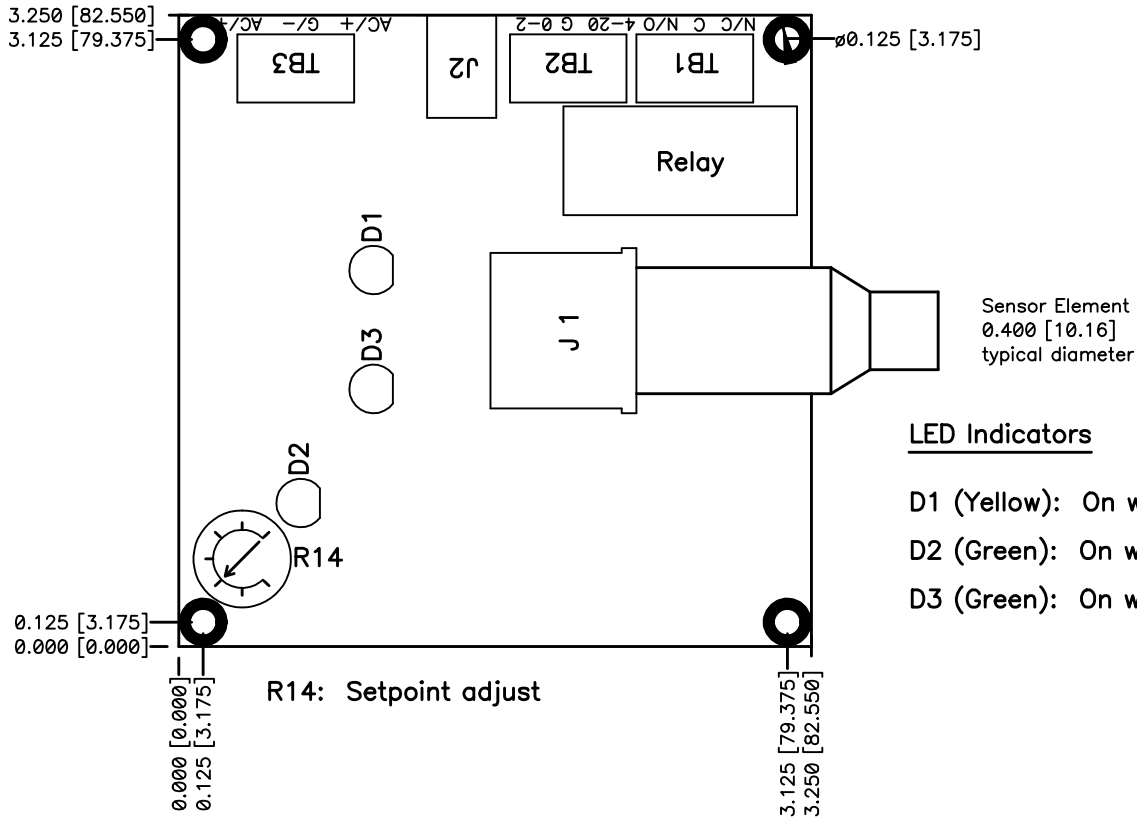
RECORD YOUR SERIAL NUMBER HERE _____

KEEP THIS MANUAL AND WARRANTY FOR YOUR RECORDS.

Eco Sensors is a registered trademark of Eco Sensors, Inc.

OEM-2 Ozone controller board application notes

Eco Sensors, Inc. Santa Fe, NM. USA



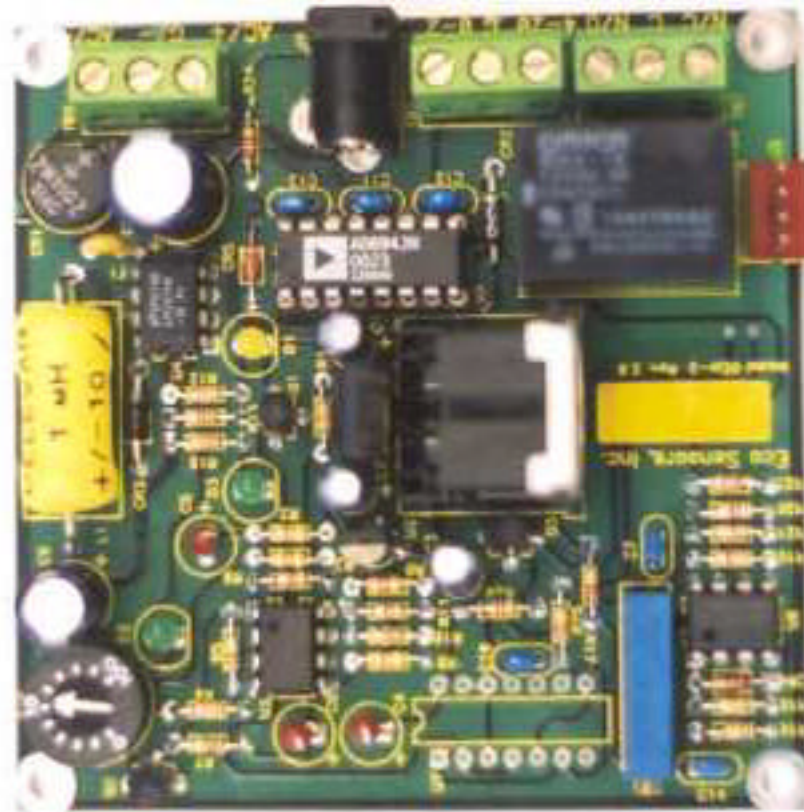
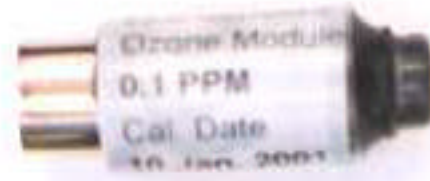
Installation Notes

- Line voltage is present on the board around terminal block TB1. Allow at least 0.250 inches (6.35 mm) clearance behind board.
- All mounting holes are connected to circuit ground and also to position 1 of terminal blocks TB2 and TB3.
- Maximum component height above board mounting surface is 0.875 inch (22.25 mm).
- Sensor plug is shown mounted directly to main circuit board, however extension cables may be used for remote mounting.
- Potentiometer R14 controls detector switching threshold. In standard configuration, 100% of scale equals 0.1 PPM.
- LED D1 (yellow) is illuminated when detected level is greater than threshold setting and relay is energized (after time delay).
- LED D2 (green) is illuminated when detected level is less than threshold setting. Responds quickly to changes.
- Connector J2 may be used to supply DC power (12 Volts nominal, center pin positive) to board for bench testing to reduce shock hazard.
- Mounting holes are 0.125" / 3.175 mm diameter. Maximum outer diameter for screws, standoffs, washers, etc. is 0.25 inch / 6.35 mm.

Terminal Block Connections:

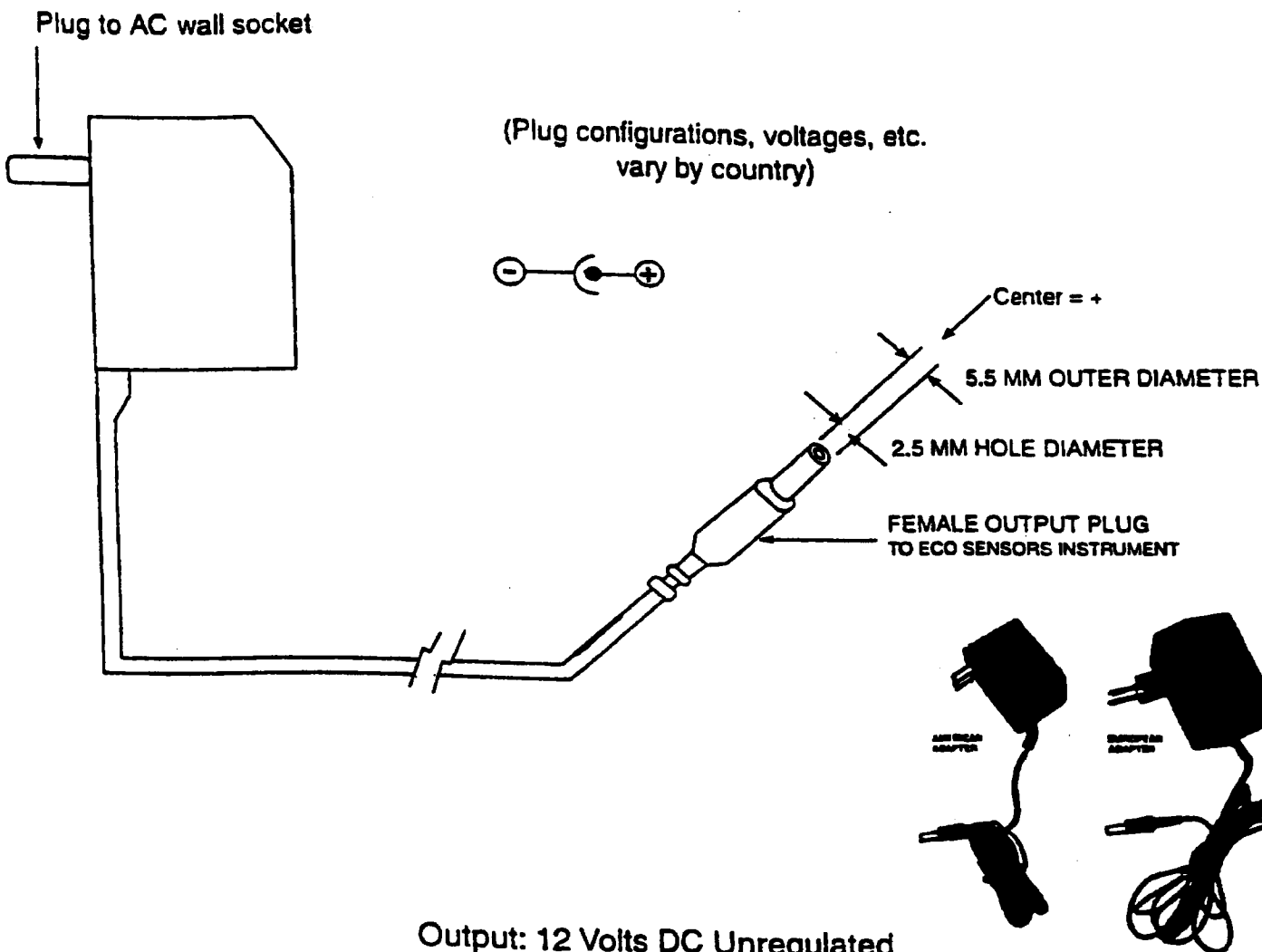
- TB1: Relay contacts (5 A @ 250 VAC MAX).
TB2: 0-2Volt and 4-20 mA analog outputs (optional).
TB3: Board power supply input. 14-24 V AC/DC.

Note: 0-2 Volt and 4-20 mA analog outputs must be configured for desired range during board assembly. Sensor modules are also set for desired measurement range during assembly and calibration.



Tech Note P-101

AC Adapter for Eco Sensors Equipment



Output: 12 Volts DC Unregulated
300-500 mA

Female output plug, 5.5 mm/2.5 mm, Center +

This size AC adapter is found in electronic stores and distributors worldwide. The adapters vary from country to country by plug geometries, voltage input, HZ rate, and conformity to local codes. The output plug which mates with our instruments is an international standard. While the Eco Sensors instruments will work with a 300 mA output adapter, the 500 mA size commonly available is preferred so that the adapter will run cooler and will have the additional capacity available to power the EE-2 Environmental Enclosure, RAP-7800 Alarm Panel, and other accessories. Eco Sensors only stocks the 120 volt 60 Hz North American size adapter.