

Date	ECO#	Rev	Description	Originator
DEC-98		1.0	FIRST RELEASE	VJD
Mar-99		1.1	Hi-Lo Alarm Capability	VJD
Sep-99		1.2	Flow rate for gas phase measurement	VJD
Oct-00	172	A	Release to Revision A	CRH
Nov-00	189	B	Updated Figure 4, Figure 7	LZ
OCT-26	311	C	Add. Addendum #1069 (pages 29,30)	LZ



***MODEL IN2000- L2-LC
LOW CONCENTRATION
OZONE ANALYZER***

Operating and Maintenance Instructions

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CONFIGURATION

MODEL	IN2000-L2-LC
SERIAL NUMBER	
MEASURING RANGE	
CPU REV	
HVPS REV	
PRE-AMP REV	
KEYBOARD REV	
SOFTWARE VERSION	
CALIBRATION DATE/INITIALS	
OPERATING MANUAL VERSION	

TUBING TYPE: TEFLON
 STAINLESS STEEL

AC VOLTAGE SERVICE: SPECIFIED VOLTAGE : _____

CONFIGURATION: BENCH
 RACK
 NEMA 4X
 Other _____

INLET/OUTLET FITTINGS: 1/8" SWAGelok™
 1/4" SWAGelok™
 1/4" MALE VCR™
 OTHER: _____

FACTORY INSTALLED OPTIONS: SAMPLE PRESSURE COMPENSATION
 SAMPLE TEMPERATURE COMPENSATION
 Other _____

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GENERAL SPECIFICATIONS

Measuring Principle	Absolute determination by UV absorption. Automatic zeroing.
Measuring Range (Factory Set)	Gas Phase: 0 - 9,999 PPMV, in multiple ranges Dissolved O ₃ : 0 - 3 mg/L, in multiple ranges
Display/Resolution (a function of Measuring Range)	Gas Phase: 0.001 PPMV or 0.1 PPMV Dissolved O ₃ : 0.001 mg/L
Sample Pressure and Temperature	Optional
Linearity	Better than 99% throughout range.
Calibration Standard	Traceable to the US NIST, +/- 1%
Ozone Concentration Units (Factory Set)	Gas Phase: PPMV (others upon special request). Dissolved O ₃ : mg/L (operated as part of a W-1 System)
Readout	2x20 character, alpha-numeric, LCD.
Gas Sample Flow Rate	Gas Phase: 1.0 l/min Dissolved O ₃ : 1.0 l/min
Analog Outputs	4-20 mA and 0-10 V DC standard.
Digital Output	RS-232 compatible interface, bi-directional.
Relay Contacts	3 Form C (Single Pole, Double Throw, Make before Break) rated at 5 Amp resistive load at 250 VAC.
Diagnostic Features	Continuous internal diagnostics with error messaging and instrument error relay.
Configurations	19" rack 3U height. NEMA 4X Wall Mounted
Sample Ports	1/4" Swagelok.
Supply Voltage	100/115 - 220/240 VAC, 50/60 Hz, Selectable
Environmental Operating Conditions	5-45°C; 0-95% RH noncondensing

Specifications subject to change without notice.

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CAUTIONS AND GENERAL NOTES

CAUTION: HIGH CONCENTRATIONS OF OZONE ARE DANGEROUS AND HARMFUL TO HUMANS. TAKE REASONABLE STEPS TO AVOID EXPOSURE. THE CURRENT MAXIMUM 8-HOUR EXPOSURE LIMIT FOR OZONE IS 0.1 PPM.

NEVER LOOK DIRECTLY AT THE UV LAMP WHICH IS INSIDE THIS ANALYZER WITHOUT PROPER EYE PROTECTION. UV RADIATION CAN CAUSE PERMANENT EYE DAMAGE.

COMPONENTS WITHIN THIS ANALYZER ARE POWERED BY AC. TAKE ALL NECESSARY PRECAUTIONS TO ELIMINATE THE RISK OF ELECTRICAL SHOCKS.

CERTAIN COMPONENTS MAY BE HOT TO THE TOUCH. PLEASE ALLOW PROPER COOLING TIME BEFORE WORKING WITH THESE COMPONENTS.

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GENERAL DESCRIPTION

The L2-LC Ozone Analyzer is an ultraviolet (UV) absorption analyzer designed for the monitoring of low concentrations of ozone in the gaseous phase. If so equipped, the analyzer also allows the user to monitor the pressure and temperature of the ozone in the measurement cell.

MECHANICAL INSTALLATION

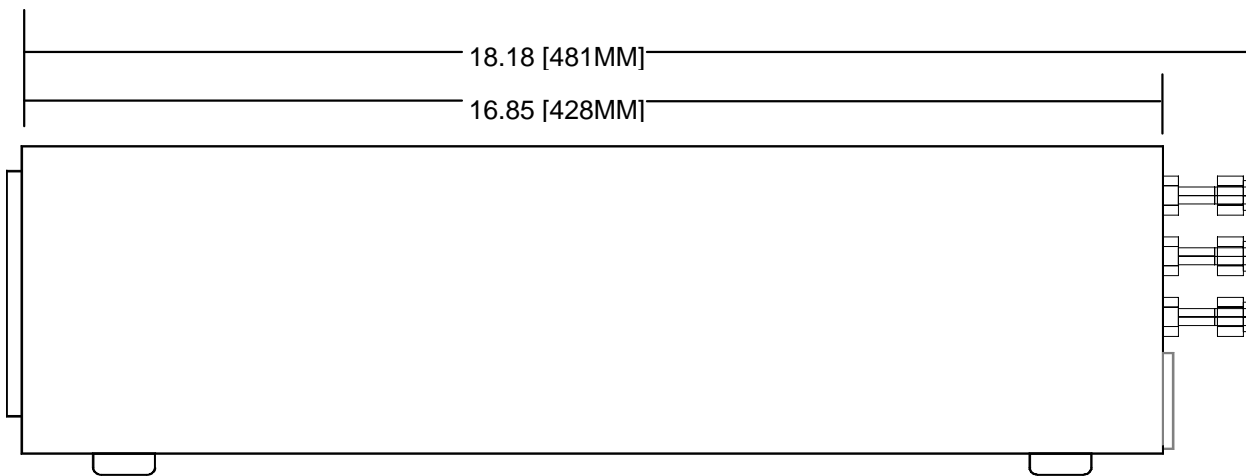
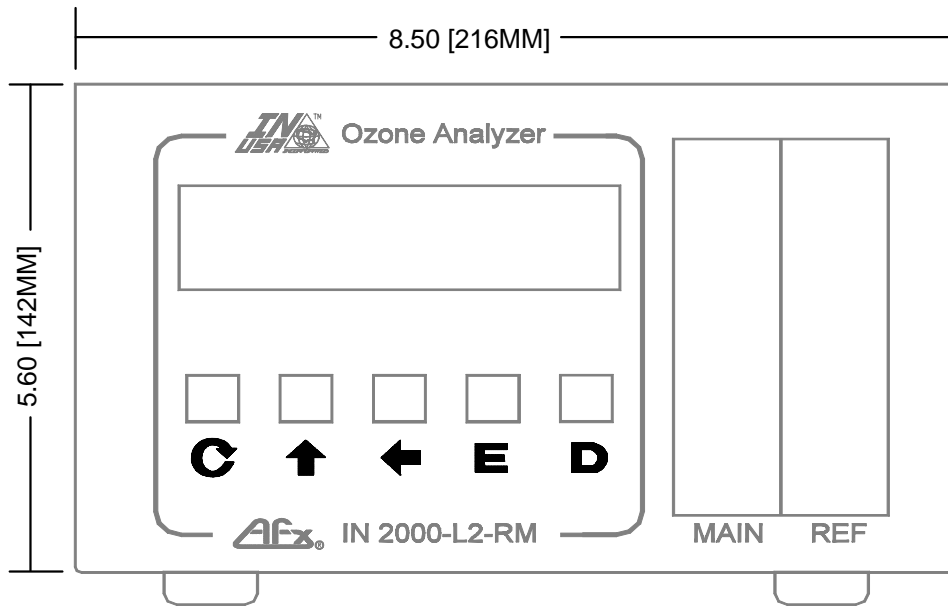
The L2-LC can be housed for bench top, 19" rack and wall mounting. Figure 1 and Figure 2 provide mechanical dimensions for bench top and for 19" rack mounting.. The instrument should be used in areas where the operating conditions are within the envelope defined under General Specifications, and where free air circulation is provided for convection cooling.

Note: If the analyzer is rack mounted, it should either have side rails or be supported in the back to reduce stress on the front panel. The front panel mounting "ears" are not robust enough to support the weight of the unit.

Figure 3 provides mechanical dimensions for the NEMA 4X enclosure.

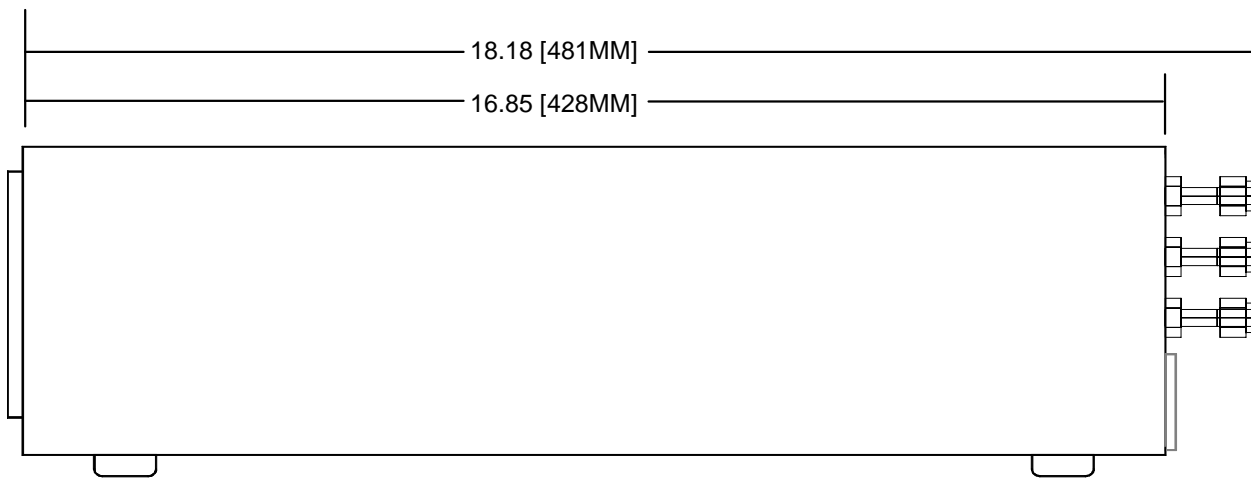
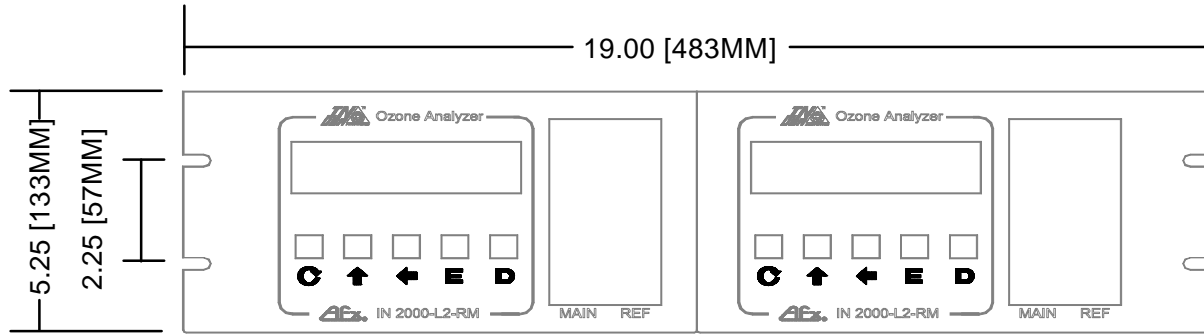
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Figure 1: Bench Top Dimensions



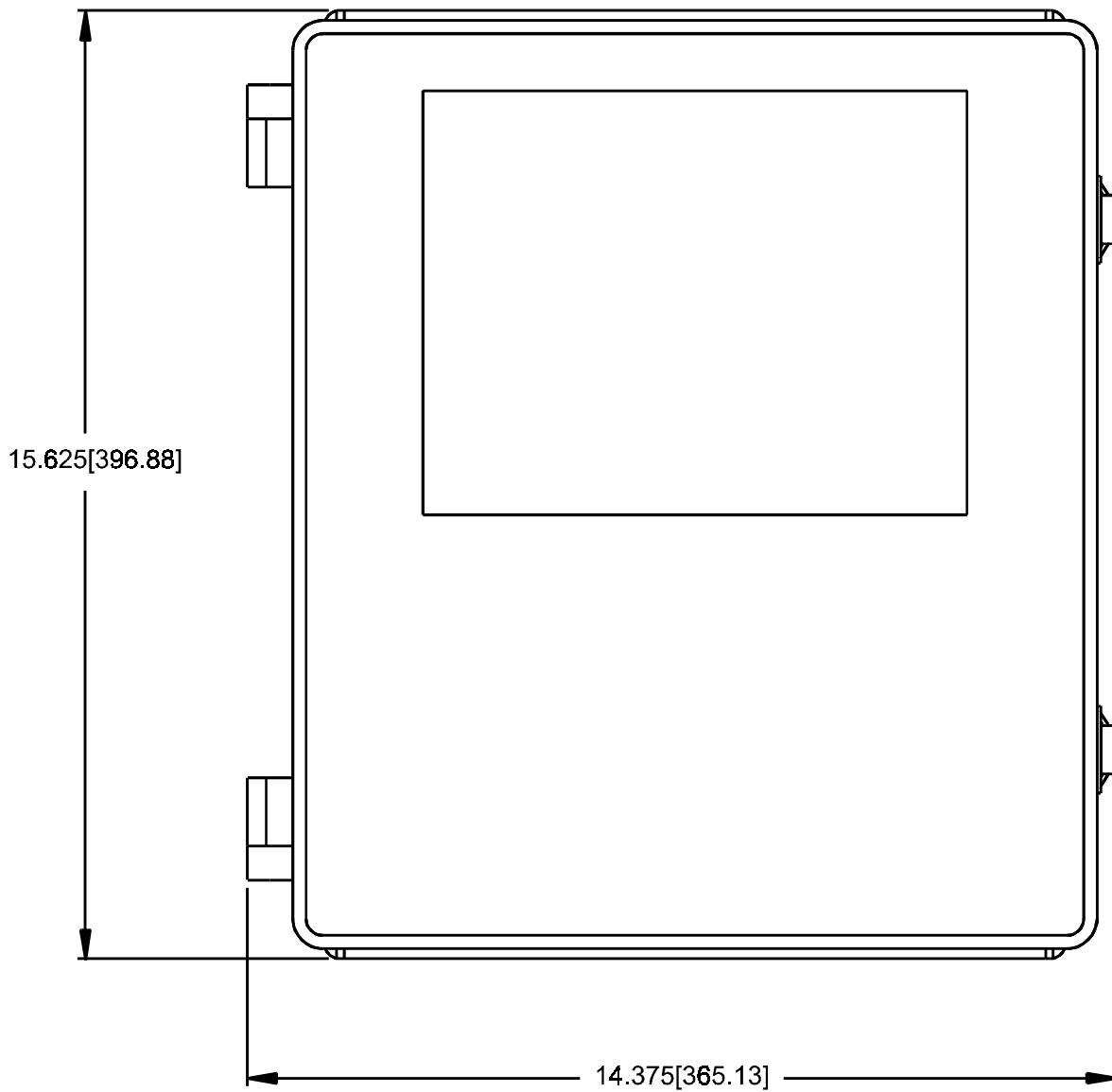
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Figure 2: 19" Rack Dimensions



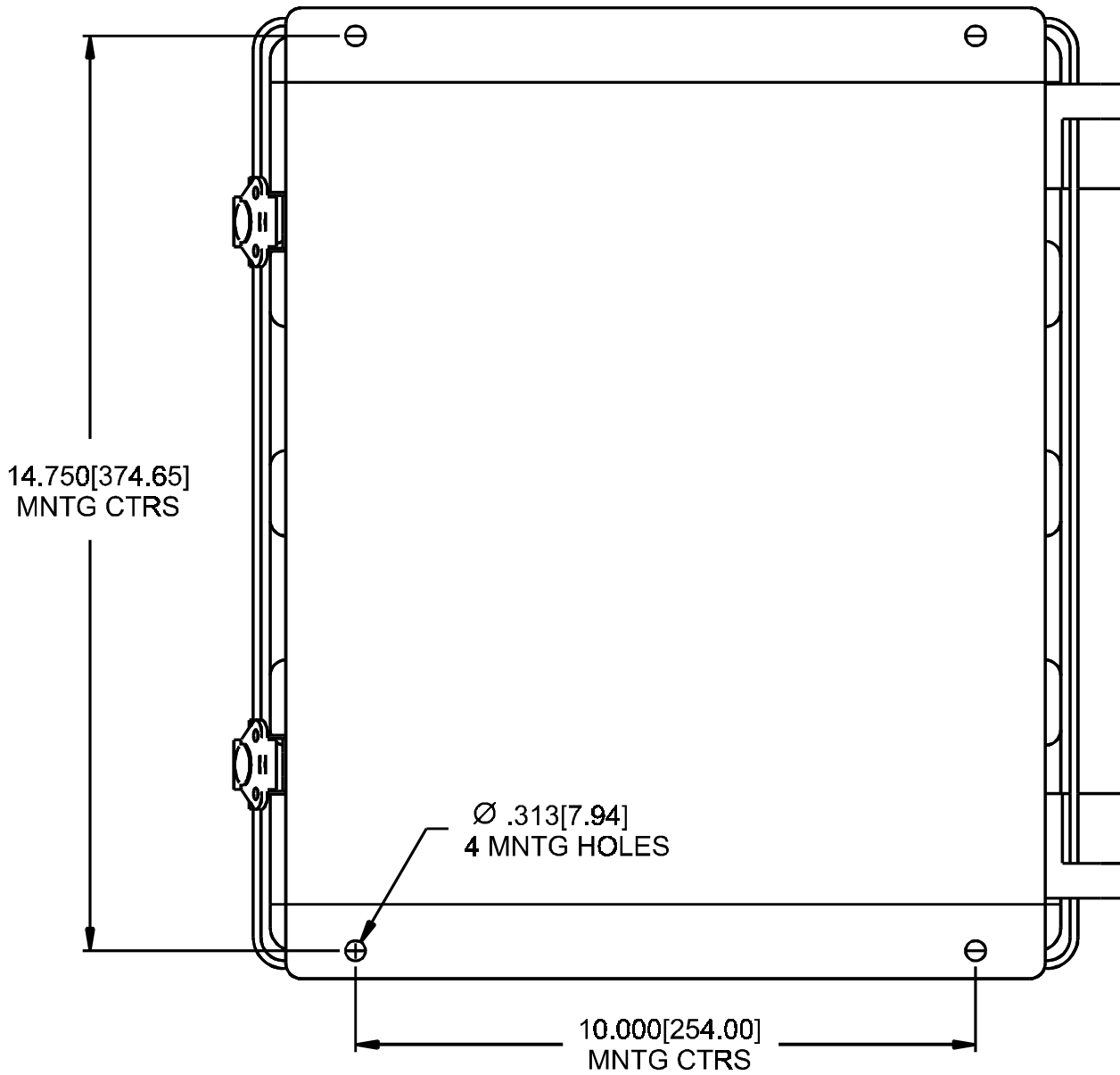
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**Figure 3 Wall Mounted, NEMA 4X, Mechanical Dimensions
Front View**



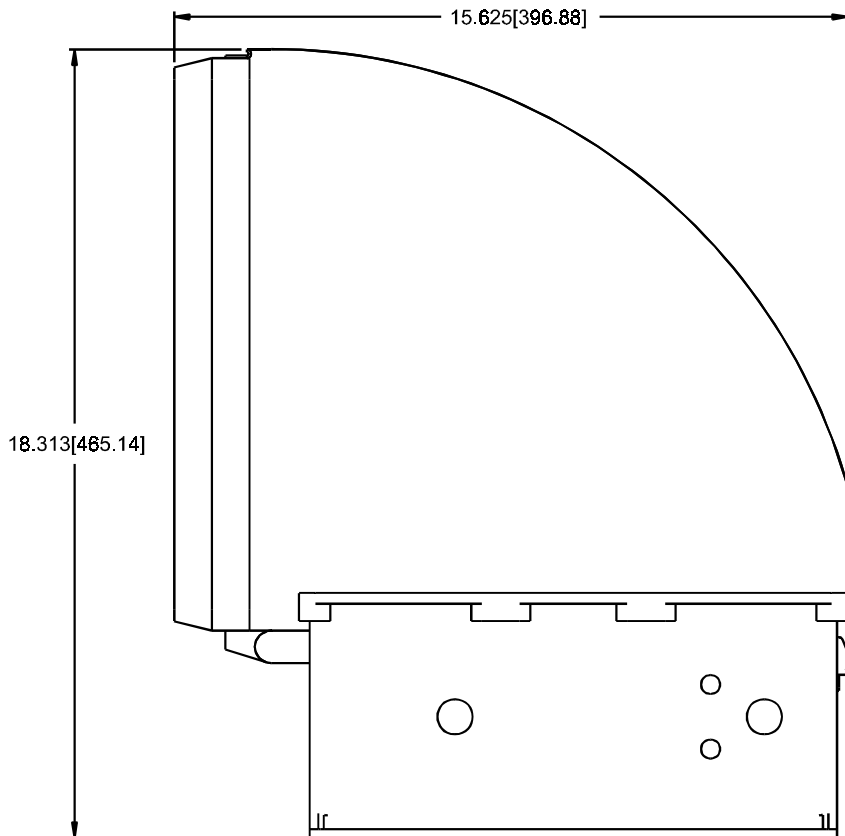
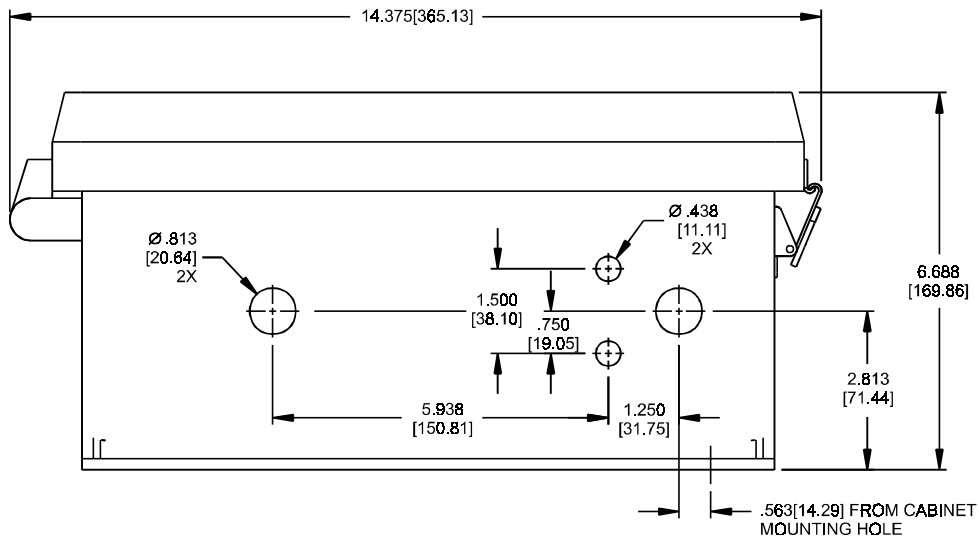
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**Figure 3 Wall Mounted, NEMA 4X,
Mechanical Dimensions (Continued)
Rear View**



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**Figure 3 Wall Mounted, NEMA 4X,
Mechanical Dimensions (Continued)
Side Views**



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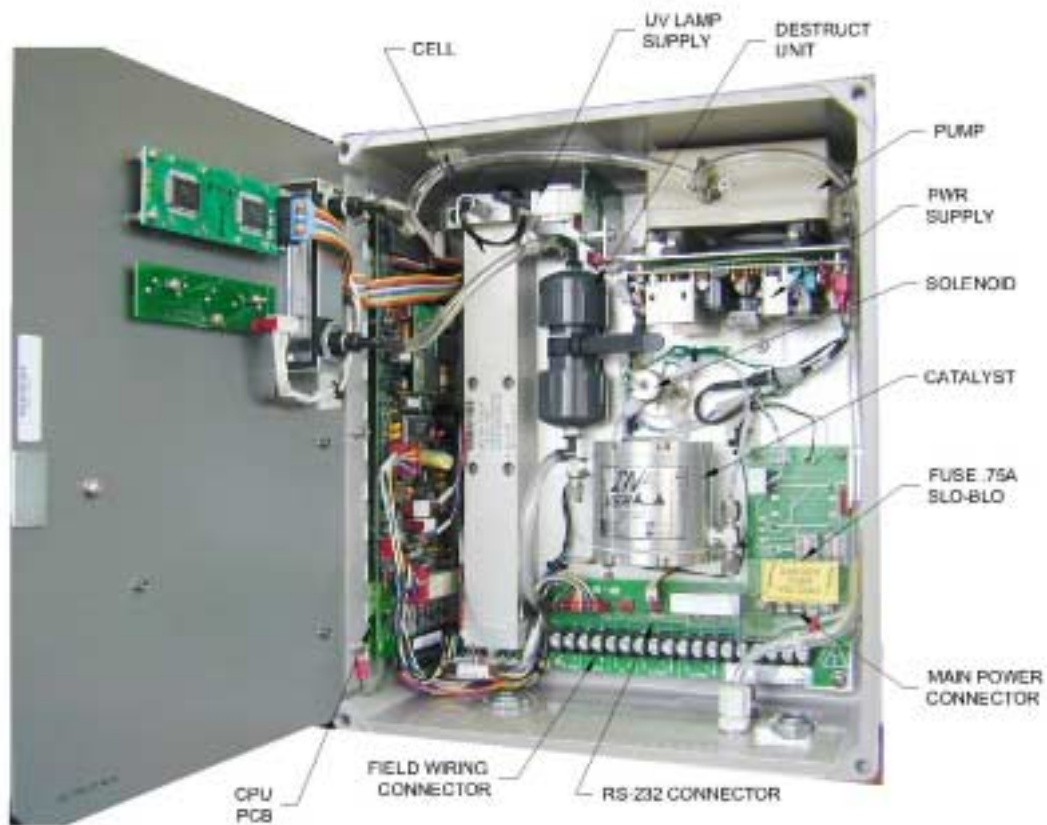
ELECTRICAL INSTALLATION

Power Connections

When housed in the bench top or 19" rack configurations, the L2-LC is provided with a standard AC power receptacle and with a standard 3-wire power line cord for use with a grounded 120 VAC, 50/60 Hz power outlet. The instrument requires up to a maximum of 70 Watts and is fused with two .75 Amp, Slo-Blo fuses found in the power receptacle located in the rear panel.

The NEMA 4X version, refer to Figure 4, is fitted with a 3 pole barrier strip terminal block with #6 size screw connector, for Mains Power interconnection. The unit requires a maximum of 70 Watts and is protected via a Slo Blo type 3AG Fuse, rated at 0.75 Amp.

**Figure 4 Key Component Location
NEMA 4 Enclosure**



Signal Connections - Field Wiring

The L2-LC produces analog and digital serial data outputs. It also provides contacts for field wiring of alarms and instrument relays.

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Refer to Figure 3 and Figure 4 for location and identification of connectors. The Bench Top and 19" configurations feature a 13- position terminal block (TB) and a D-size male connector, labeled RS-232. The NEMA 4X version features a 19 position terminal block and a D-size male connector, labeled RS-232.

**Table 1.a: 13-Position Terminal Block Pin-out
Bench Top and 19" Rack Units**

PIN #	DESCRIPTION OF OUTPUT	NOTES
1	Common Ground, Analog Output, 0-+1 VDC or +10 VDC	1
2	0-+1 VDC or +10 VDC, Analog Output Voltage, O ₃ Concentration	1
3	4-20 mADC Return, Ozone Concentration	2
4	4-20 mADC, Ozone Concentration	2
5	Instrument Error Relay Contact, Open on Error Condition	3
6	Instrument Error Relay Contact, COMMON	3
7	Instrument Error Relay Contact, Closed on Error Condition	3
8	Alarm #2 Relay Contact, Open on Alarm Condition	4
9	Alarm #2 Relay Contact, COMMON	4
10	Alarm #2 Relay Contact, Closed on Alarm Condition	4
11	Alarm #1 Relay Contact, Open on Alarm Condition	4
12	Alarm #1 Relay Contact, COMMON	4
13	Alarm #1 Relay Contact, Closed on Alarm Condition	4

Notes:

- 0-1 VDC or 0-10 VDC factory selected. This is a Low impedance, short-circuit protected analog output, intended primarily for data acquisition (recording) and monitoring.
- 4-20 mADC is a non-isolated current loop. Compliance is 750 Ohm, and the loop is open-circuit protected.
- Instrument Error (IE) relay is normally energized. If there is a "malfunction" of the power supply, or any key component in the optical sensing scheme, the relay will de-energize and become active. It is a Form-C, Single Pole, Double Throw (SPDT), Break before Make relay, with contact ratings of 5 Amp at 250 VAC, resistive load..
- The alarm relays are Form-C, Single Pole, Double Throw (SPDT), Break before Make relay, with contact ratings of 5 Amp at 250 VAC, resistive load. They are normally de-energized; that is, only under alarm conditions will they energize.

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**Table 2.b: 19-Position Terminal Block Pin-out
NEMA 4, Wall Mounted Units**

PIN #	DESCRIPTION OF OUTPUT	NOTES
1	Common Ground, Analog Output, 0-+1 VDC or +10 VDC	1
2	0-+1 VDC or +10 VDC, Analog Output Voltage, O_3 Concentration	1
3	4-20 mADC Return, Ozone Concentration	2
4	4-20 mADC, Ozone Concentration	2
5	Instrument Error Relay Contact ,Close on Error Condition	3
6	Instrument Error Relay Contact, Close on Error Condition	3
7	Alarm #2 Relay Contact, Open on Alarm Condition	4
8	Alarm #2 Relay Contact, COMMON	4
9	Alarm #2 Relay Contact, Closed on Alarm Condition	4
10	Alarm #1 Relay Contact, Open on Alarm Condition	4
11	Alarm #1 Relay Contact, COMMON	4
12	Alarm #1 Relay Contact, Closed on Alarm Condition	4
13-19	No Connection	5

Notes:

- 0-1 VDC or 0-10 VDC factory selected. This is a Low impedance, short-circuit protected analog output, intended primarily for data acquisition (recording) and monitoring.
- 4-20 mADC is a non-isolated current loop. Compliance is 750 Ohm, and the loop is open-circuit protected.
- Instrument Error (IE) relay is normally energized. If there is a "malfunction" of the power supply, or any key component in the optical sensing scheme, the relay will de-energize and become active. It is a Form-C, Single Pole, Double Throw (SPDT), Break before Make relay, with contact ratings of 5 Amp at 250 VAC, resistive load.. In the NEMA version of the unit, two contacts of the relay are available to the user. There is an open circuit between pin #5 and #6 only if there is power applied to the unit, and no problems are detected by the embedded diagnostic software.
- The alarm relays are Form-C, Single Pole, Double Throw (SPDT), Break before Make relay, with contact ratings of 5 Amp at 250 VAC, resistive load. They are normally de-energized; that is, only under alarm conditions will they energize.
- Positions 13 through 19 are not used in the Model L2-LC

Table 3: RS-232 Connector Pin-out

PIN #	DESCRIPTION
2	Transmitted Data (TXD)
3	Received Data (RXD)
7	Signal Ground (GND)

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SAMPLE GAS CONNECTIONS

For the units house in Bench Top and in 19" Rack configuration, there are 3 pneumatic ports located on the rear panel. Only the ports labeled MAIN and EXH are used. . The MAIN is used as the ozone sample input to the analyzer and the EXH is the exhaust port which discharges safe levels of ozone may be left alone or routed to a main facility exhaust line.

Connect the MAIN pneumatic port to the sampling point using 1/4" OD Teflon tubing. Be sure that the sampling point is in a location that only the gas sample is taken into the tubing and not any liquid or particulate matter. It is highly recommended the sample line be filtered using one of the filters provided by IN USA.

In the NEMA 4X version, there are 2 ports identified as INPUT and OUTLET. Their function is identical to MAIN and EXH above.

CAUTION: USE ONLY MATERIALS SUITABLE FOR OZONE SERVICE. CONSULT WITH *IN USA, INC.* FOR ADVICE ON MATERIALS.

CAUTION: EXPOSURE TO OZONE IS HAZARDOUS. ENSURE THAT ALL GAS CONNECTIONS ARE TIGHT AND THAT NO LEAKS EXIST.

SETTING THE SAMPLE FLOW RATE

The sample flow rate is adjustable via the valved flow meter on the front panel.. The Flow rate should be checked periodically.

The standard version of the L2-LC is equipped with a pump. The pump must be on for the unit to operate correctly and detect ozone.

The recommended gas flow rate is

Gas Phase Measurement : 1.0 liters/min

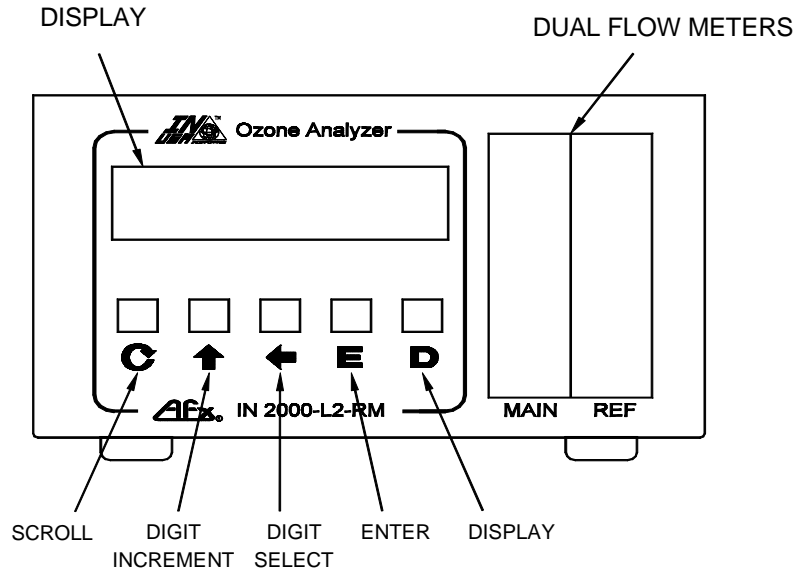
Dissolved Ozone in Water Measurement: 1.0 liters/min

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FRONT PANEL DESCRIPTION

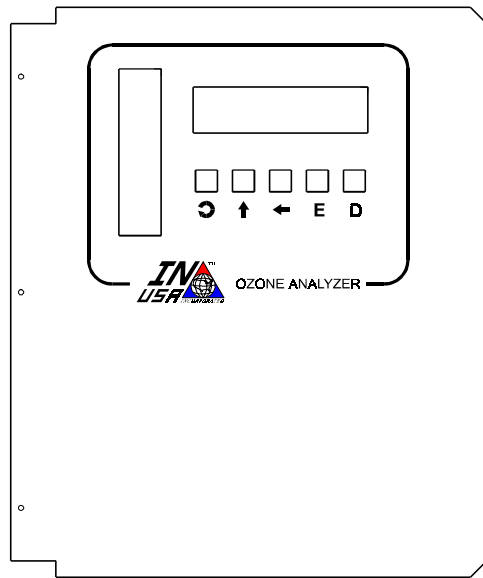
The front panel of the Bench Top and 19" units is illustrated in Figure 5. The front panel contains the digital readout, keyboard, and dual flow meters.

Figure 5: Front Panel, Bench Top Unit



The front panel of the NEMA version of the unit is illustrated in Figure 6.

Figure 6: Front Panel, NEMA Unit



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Digital Readout Description

The digital readout consists of 2 rows of 20 alpha-numeric characters each. The readout is a Liquid Crystal Display, LCD, that is back illuminated. Under normal operation the displayed information is updated every 2 seconds.

Keyboard Description

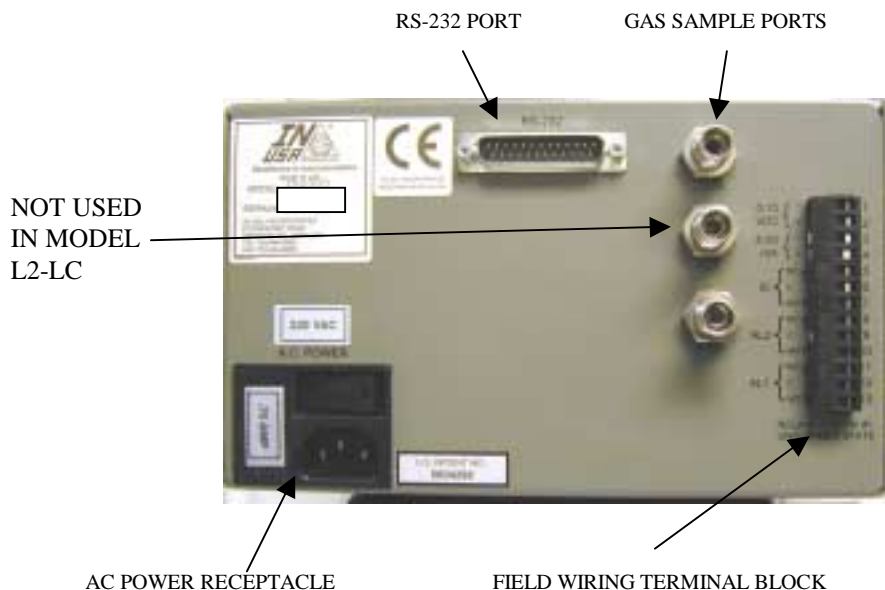
There are 5 active keys, located in the front panel of the L2-LC analyzer:

1. SCROLL, identified as a circular arrow '↻'
2. DIGIT INCREMENT, identified as an up arrow '↑'
3. DIGIT SHIFT, identified as left arrow '←'
4. ENTER, identified as **E**
5. DISPLAY, identified as **D**

REAR PANEL DESCRIPTION

Refer to Figure 7. The rear panel of the L2-LC contains the pneumatic ports, the digital serial port, the field wiring port, main power receptacle, and power switch.

Figure 7: Rear Panel

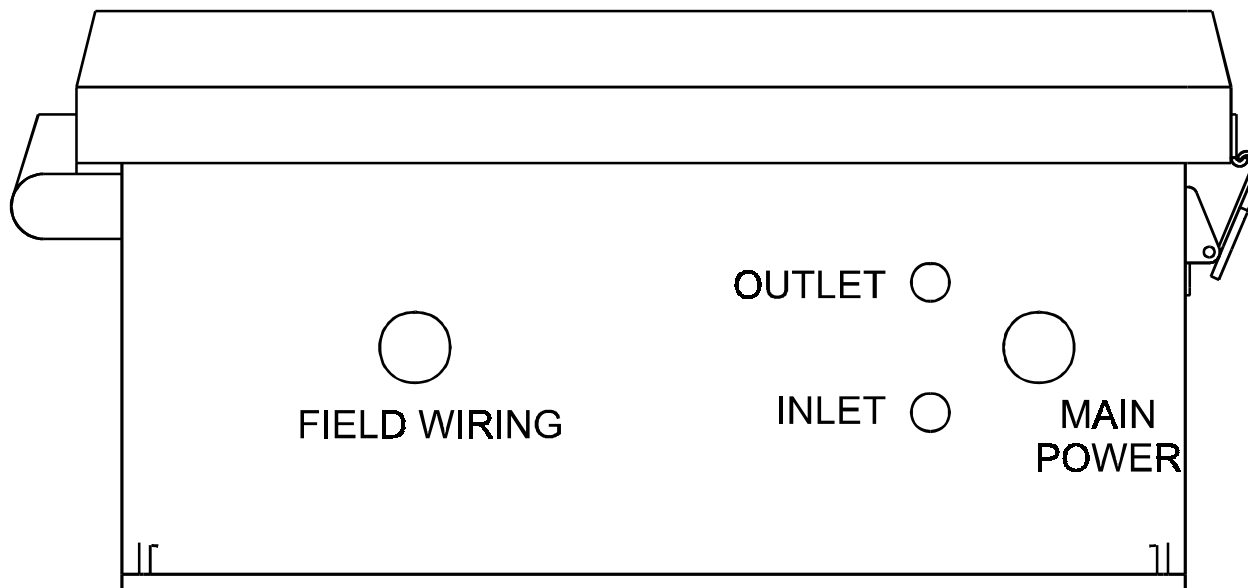


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Figure 8 illustrates the location of the ports in the NEMA version of the unit. Note that there are 2 (two) electrical entry ports, identified as "FIELD WIRING " and "MAIN POWER" intended for allowing electrical conductors to penetrate the enclosure, typically through a conduit, and effectuate the connections. There are also 2 (two) pneumatic ports, identified as "INLET" and "OUTLET" which are use to bring the sample gas in and the exhaust of the analyzer out respectively.

Figure 8. Port Location, NEMA Enclosure

*



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PREPARATION FOR OPERATION

The L2-LC Ozone Analyzer, as shipped, is configured for 100/115 VAC operation or, if requested, 220/240 VAC, and has been tested as such. However, before using the equipment, certain precautionary checks should be made to ensure that the instrument is set up properly for the particular application in question.

AC Input Voltage Selection

Select the input voltage planned for your installation, either 100/115 VAC or 220/240 VAC. The voltage selector is located in the power receptacle in the rear panel. See the Power Connections section. For NEMA 4X enclosed units, the Operating voltage is 110/115 VAC unless ordered in a different configuration.

Initial Set Up

If possible, locate the L2-LC in a clean area where free convection of air is possible. Make any connections to external recording or monitoring equipment as necessary at the field wiring terminal block or at the RS-232 output connector. Connect the desired sample point to the MAIN gas port using clean Teflon tubing, keeping the sample line as short as possible. It is highly recommended to use the Teflon element filter (supplied by IN USA) to remove particulate matter from the gas sample.

Turning the Unit On and Warming Up

Turn the instrument on by actuating the Power switch located in the rear panel. There is no Power Switch in the NEMA 4X housed units. After a few seconds, the readout displays "Warming Up." Press the D key in the keyboard; the ozone concentration value is then displayed. The warm-up period is necessary to allow the UV lamp to reach stable temperature and output. Once the UV lamp has reached stability, the "Warming Up" message is extinguished and the readout stabilized. This warming up period lasts about 5 minutes. However, if the monitor has been shut off for longer than 1 hour, allow a minimum of 3 hours for the monitor to warm up.

The L2-LC contains a very sensitive photometer. It should be warmed up a minimum of 3 hours from a cold start. For first time startup, an overnight warm-up period is recommended to allow complete purging of the system and associated tubing.

While the "Warming Up" message is on, the 3 relays associated with the two programmable alarms and the instrument error are disabled (to prevent misinterpretation by any peripherals connected to the relay contacts). In addition, the front panel display and analog output will be read 0.00 PPM during the warm up period. The system should be operational and displaying correct ozone readings after the warm up period.

Note: For maximum performance, it is recommended that the L2-LC monitor stays on at all times.

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Performing Lamp Calibration

A Lamp Calibration should be performed upon startup after the warm-up period to ensure a proper starting lamp intensity. It must also be done if a new UV lamp is installed in the system.

Note: *Be sure that the unit has warmed up before calibrating the lamp. Lamp calibration is disabled during the Warming Up period.*

To perform the Lamp Calibration, move to the LAMP CALIBRATION menu item (refer to Figure 9) and press ENTER. The process should take about 10 seconds once the monitor has entered its reference phase of the measurement cycle. Press D once the process is complete to return to the main menu.

PROGRAMMABLE PARAMETERS

Description of Programmable Parameters

The L2-LC allows the operator to Review (browse without altering) and Program (change) several parameters. The instrument is normally in Review mode and may be put into Program mode if a parameter needs to be changed. See the next section on programming programmable parameters for directions on how to enter Program mode.

NOTE: *All programmable parameters are stored in nonvolatile memory. Powering the unit off or removing power from the unit will not affect these parameters.*

Refer to Figure 5 for a layout of all programmable parameters.

Numerous operating parameters can be accessed and modified by the operator. These parameters are:

Alarm 1 and Alarm 2

For each of the Alarms 1 and 2, the following parameters may be set:

1. STATUS

The Alarm Status condition defines the alarms as either **Enabled** or **Disabled**. The default status is Disabled.

2. THRESHOLD

This is the alarm threshold value at which the given alarm will be triggered. The threshold is expressed in the currently active units of measurement of ozone concentration. The default values are 0.

3. HYSTERESIS

This parameter is only relevant for alarms that are Unlatched. After a High alarm is triggered, the ozone concentration level must drop below the threshold value less the

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hysteresis value before the alarm is cleared. After a Low alarm is triggered, the ozone concentration level must climb above the threshold value plus the alarm hysteresis value before the alarm is cleared. The default values are 0.

4. NATURE

This parameter defines the threshold as either HIGH or LOW. The default values are Low. A high alarm is one in which an alarm condition is triggered when the ozone concentration rises above the alarm threshold. A low alarm is one in which an alarm condition is triggered when the ozone concentration falls below the alarm threshold.

5. TYPE

Defines whether an alarm that is triggered should be **Latched** or **Unlatched**. The default is Latched.

An Unlatched alarm will remain active only while the given alarm condition that triggered it is present. A Latched alarm will remain active until it is reset. Resetting a Latched alarm is accomplished by pressing the E key, located on the front panel. Of course, pressing the E key will clear a Latched alarm only if the original alarm condition is no longer present.

Input/Output

The L2-LC features 2 analog output signals, which correspond to the ozone concentration:

- 4-20 (std.) or 0-20 mADC current loop, non-isolated
- 0-10 (std.) or 0-1 VDC

The unit also features a digital serial communications interface, that is RS-232 compatible.

The analog outputs can be tested by means of the simulation described below.

For each of the analog output signals, the following parameters may be set:

1. ANALOG OUTPUT HIGH SETTING

This is a number, expressed as a percent of full scale that defines the upper end of the analog outputs; i.e., the concentration value that corresponds to the 20 mADC or to the 1.0/10.0 VDC. The default is 100%.

2. ANALOG OUTPUT LOW SETTING

This is a number, expressed as a percentage of full scale, that defines the lower end of the analog outputs; i.e., the concentration value that corresponds to the 4 mADC or to the 0.0 VDC. The default is 0%.

The L2-LC features a Simulation mode which allows for testing of the analog outputs. The Simulation mode can be accessed only in Program mode. (See the Programming Programmable Parameters section.)

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For the RS-232 the following parameters may be set.

1. RS-232 BAUD RATE

The baud rate can selected to any one of the following values:

300
600
1200
2400
4800
9600 (Default)
19200
38400

3. SIMULATION

Simulation allows the user to check the operation of the analog outputs and associated data acquisition equipment. Analog output values corresponding to a percent value (% value) of Full Scale may be simulated on the analog output. The L2-LC must be in Program mode to access simulation

Operating Parameters

Time and Date (This is a factory installed option)

Refer to the Manual Addendum of this Option for details on Time and Date.

Programming Parameters

The arrow keys are used to change editable values when in Program mode. Items which are editable are *highlighted* in the following menu tree. To enter Program mode, use the following procedure:

1. Press the D key until the screen preceding the ozone concentration screen is displayed.
2. Press and hold the D key down.
3. Press the SCROLL key three times while the D key is held down.
4. Release the D key.

Refer to Figure 9, which illustrates how to move within the available parameter items. The SCROLL key allows movement horizontally along menu items. The ENTER key moves you vertically within a menu item.

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Table 4: Programmable System Parameters

PROGRAMMABLE PARAMETER

- a)
- b)
- c) Alarms
- d) Hi and Lo Analog Output
- e) RS232 Baud Rate
- f) RS232 Update/Output Rate
- g) Simulation Value
- h) Time and Date (when available)

Parameters that can be changed fall into two categories:

1. TOGGLE

Toggle parameters can take only preprogrammed values. For instance:

Alarm Nature (High/Low)
Speaker (Enabled/Disabled)

2. NUMERICAL

The value of each digit in a numerical parameter can be changed. For instance:

Alarm 1 Threshold (xxx.x digits)
Time (xx:xx:xx)

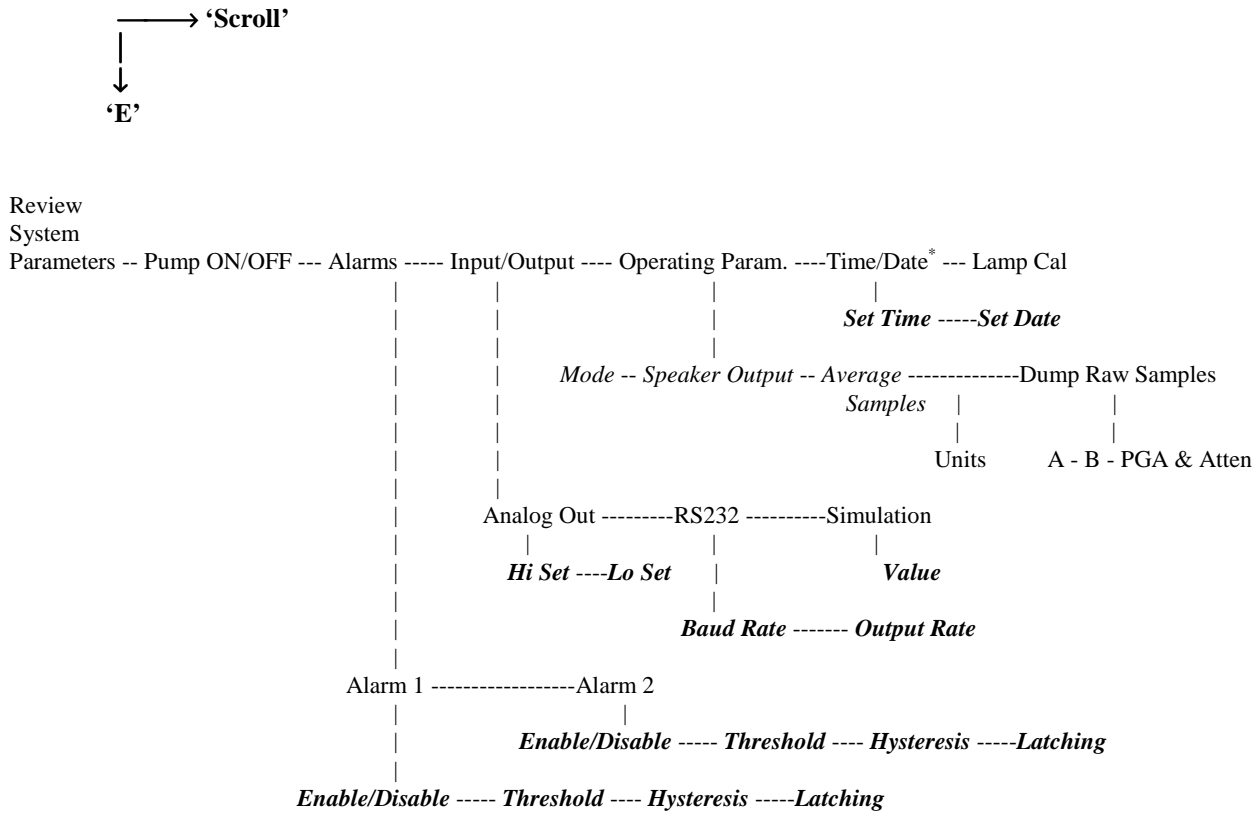
To change the value of a Toggle parameter, use either the DIGIT SHIFT key (left arrow " ← ") or the DIGIT INCREMENT key (up arrow " ↑ "). With each press of the key, the preprogrammed values are scrolled on the screen. When the value you want is displayed, press the **E** key to accept the value and remain in Program mode, or press the **D** key to accept the value and leave Program mode.

To change the value of a Numerical parameter, use the DIGIT SHIFT key (left arrow " ← ") to position the cursor (flashing square) over the digit to be changed, then use DIGIT INCREMENT key (up arrow " ↑ ") to change the value of the digit between 0 and 9.

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The menu system utilizes the five keys on the front panel. The E key will move you down (in the following pictorial menu tree), and the SCROLL key will move you to the right (with wrap at the end). The main display consists of the ozone, temperature, pressure, and Review System Parameters screens. These can be viewed separately by using the D key.

Figure 9: Menu Structure



(*) Note: Time and Date are available, as a factory installed option.

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WARNING/ERROR MESSAGES

The L2-LC continuously goes through sophisticated self-diagnostic routines which are designed to detect malfunctions or abnormal situations that can lead to potential problems. The instrument communicates these conditions by displaying a message on the display, by transmitting this message via the RS-232 interface, and in some cases by triggering (de-energizing) the Instrument Error (IE) relay. The conditions detected are sorted as: Non Fatal Conditions, Warnings and Fatal Conditions.

Non Fatal Conditions: Do not trigger the Instrument Error Relay, and automatically extinguish once the event that cause them is not longer present.

Warning Conditions: Do not trigger the Instrument Error Relay. Require user intervention to extinguish (Via a front panel keyboard "E" Key., or through the RS-232 interface "E" character.

Fatal Condition: Trigger the Instrument Error Relay. Once the causing event is not longer present this conditions require user intervention to extinguish (Via a front panel keyboard "E" Key., or through the RS-232 interface.

Table 5 summarizes the above conditions,

Table 5. Diagnostics Conditions

<u>Condition</u>	<u>State</u>	<u>Message</u>	<u>Type</u>	<u>IE Relay</u>
Negative Ozone Concentration	No Latch	"NEGATIVE,DO LAMP CAL"	Non Fatal	NO
Overange	No Latch	"OVERRANGE OZONE"	Non Fatal	NO
Warm-up	No Latch	"WARMING UP"	Warning	NO
Low UV Output	Latch	"LO UV, DO LAMP CAL"	Fatal Error	YES
High UV Output	Latch	"HI UV, DO LAMP CAL"	Fatal Error	YES
Alarm #1 (1)	Optional	"ALARM 1 TRIGGERED"	N/A	NO
Alarm #2 (1)	Optional	"ALARM 2 TRIGGERED"	N/A	NO
Calibration Failure:High UV Output (2,3)	Modal	"LAMP CAL ERROR" "HI UV, ADJUST LAMP"	Fatal Error	YES
Calibration Failure:Low UV Output (3)	Modal	"LAMP CAL ERROR" "LO UV, REPLACE LAMP"	Fatal Error	YES
Calibration Failure:Warm Up (3)	Modal	"UNABLE TO CAL LAMP" "WARMING UP, PRESS D"	Warning	NO

Note: (1) Alarm #1 and Alarm #2 are programmable alarms. (Refer to Programmable Parameter Section).

(2) Contact IN USA Technical Support for instruction on how to proceed to adjust the UV Lamp

(3) Pressing the "E" key will remove diplayed message eventhough condition persists. IE relay (if involved), will remain in "ERROR"(de-energized) status .

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PERIODIC MAINTENANCE

It is recommended that the UV lamp be changed under the following conditions:

- After 12 months of continuous operation.
- If the analyzer displays the message "LOW UV/REPLACE LAMP" (after a lamp calibration)

Replacing the UV Lamp

CAUTION: ALWAYS DISCONNECT POWER TO THE ANALYZER BEFORE WORKING ON THE UV LAMP.

UV LIGHT IS DAMAGING TO THE EYES. NEVER LOOK AT A POWERED UV LAMP DIRECTLY WITHOUT APPROPRIATE EYE PROTECTION.

WHILE WORKING WITH THE SENSOR ASSEMBLY, TAKE EXTRA CARE NOT TO WARP OR BEND THE APERTURE DISK.

USE POWDER-FREE LATEX GLOVES TO HANDLE THE UV LAMP.

To replace the UV lamp, perform the following steps:

1. Remove the cover from the unit.
2. Disconnect the UV lamp from its power supply printed circuit board.
3. Loosen the set screw that holds the lamp in its holder.
4. Gently pull the lamp out off its holder.
5. Insert the new lamp in the holder. The lamp holder has a built-in step. Make sure that the base of the lamp sits against that step.
6. Tighten the set screw to secure the lamp in the holder.
7. Connect the lamp to the power supply printed circuit board. Note that the connectors are polarized and that there is only one way to interconnect the two pieces.
8. Install the cover.
9. Apply power and allow the unit to warm up. ***NOTE: A new UV lamp may require a longer warm-up period before stabilizing.***

Perform a Bulb Calibration procedure after warm up.

Use only UV lamps purchased from or approved by IN USA. The L2-LC will not operate properly and could be severely damaged if the improper lamp is used.

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ACCURACY AND CALIBRATION

The L2-LC has been carefully calibrated against a factory standard unit. This factory standard unit was calibrated by NIST and, consequently, the units themselves are NIST traceable. A certificate of calibration is issued with each unit. Further details on this procedure are available from IN USA, Inc.

Many end users opt to send instruments to our facility on a yearly scheduled basis for recertification. Please consult with IN USA, Inc. to determine the most appropriate calibration schedule for your application.

CONTACTING *IN USA, INC.*

IN USA's technical support staff is available by calling 781-444-2929, or by fax at 781-444-9229.

IN USA is also reachable through electronic mail (e-mail), at AFXOZONE@AOL.COM

Please visit our website at <http://www.inusaozone.com>

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PRODUCT MANUAL ADDENDUM



DESCRIPTION: Model IN-2000-L2-LC RS-232 Interface	ADDENDUM #: 1069	REV#: A	PAGE: OF: 29 30
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INTRODUCTION

This is an addendum to the manual for the standard model IN-2000-L2-LC Low Concentration Ozone Analyzer, Document Number 610-0023-01.

THE ADDENDUM

This addendum contains information that pertains to the Serial Digital Output. The Model IN-2000-L2-LC features a bi-directional Serial Interface Communication Capability, via the RS-232 port. Refer to the Operation Manual for (Document 610-0023-01) for:

- RS-232 Port location and Pin-out
- Analog Output High Setting
- Analog Output Low Setting
- Programming of Baud Rate

The data structure is as follows:

- **Baud Rate:** 300,600, 1200, 2400, 4800, **9600** (default), 19200, and 38400
- **Parity:** None (not even, not odd, not “space”, not mark)
- **Data bits:** 8
- **Number of Stop bits:** 1

Once a terminal is configured and connected to the unit, the communication can start.

The command to use is ASCII “F” (Upper Case F).

Once an ASCII “F” is sent, the instrument will produce the following message, once every 2 seconds:

ANALOG RANGE= X PPM TO Y PPM: OUTPUT = Z.ZZZ V

Where:

- **X** is an integer figure equal to the Analog Output Low Setting expressed in ppm_v, and (Typically equal to zero)
- **Y** is an integer figure equal to the Analog Output High Setting, expressed in ppm_v, and (Typically equal to the full Range of the unit)

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- **Z.ZZZ** is fix point decimal figure, equal to the 0 to 1 VDC value of Analog Voltage produced by the unit.

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DESCRIPTION: Model IN-2000-L2-LC RS-232 Interface	ADDENDUM #: 1069	REV#: A	PAGE: OF: 2 30
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The “F” Command is a toggle, i.e.; sending another “F” Command will result in stopping the dump of the message illustrated above.

To calculate the concentration “c” in ppm_v from the RS232 dump, simply compute:

$c[\text{ppm}_v] = (Y - X) * Z.ZZZ$

For instance,

Range [ppm _v]	Analog Output High Setting [%]	Analog Output High Setting [ppm _v]	Y	Analog Output Low Setting [%]	Analog Output Low Setting [ppm _v]	X	Analog Volatge Output [V]	z.zzz	Ozone Concent c [ppm _v]
0 -1	100	1.000	1	0	0.000	0	0.500	0.500	0.5
0 -1	50	0.500	0	0	0.000	0	1.000	1.000	0.5
0-10	100	10	10	0	0.000	0	0.050	0.050	0.5
0-10	50	5	5	0	0.000	0	0.100	0.100	0.5
0-10	100	10	10	0	0.000	0	0.500	0.500	5.0
0-10	50	5	5	0	0.000	0	1.000	1.000	5.0
0-400	100	400	400	0	0.000	0	0.250	0.250	100