



Model 108-L Ozone Monitor

QUICK START GUIDE



These instructions describe how to install and establish the plumbing and electrical connections of your Model 108-L, and how to initiate measurements. Please see the full user manual for more detail on operating, maintaining, and calibrating the instrument.

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PRINTING HISTORY

This Quick Start manual covers the Model 108-L Ozone Monitor used for measurement of Low (0-100 ppm) ozone concentrations. Please refer to the full user manual for more complete instructions on using this instrument. New editions of this Quick Start manual are complete revisions that reflect updates to the instrument itself, as well as clarifications, additions and other modifications of the text.

Revision A-1.....	April 2019
Revision A-2.....	September 2019
Revision A-3.....	October 2019
Revision A-4.....	April 2020
<i>Inlet and outlet fittings changed from nylon to stainless steel.</i>	
Revision A-5.....	December 2023
<i>Updated hyperlinks.</i>	

TRADEMARKS & PATENTS

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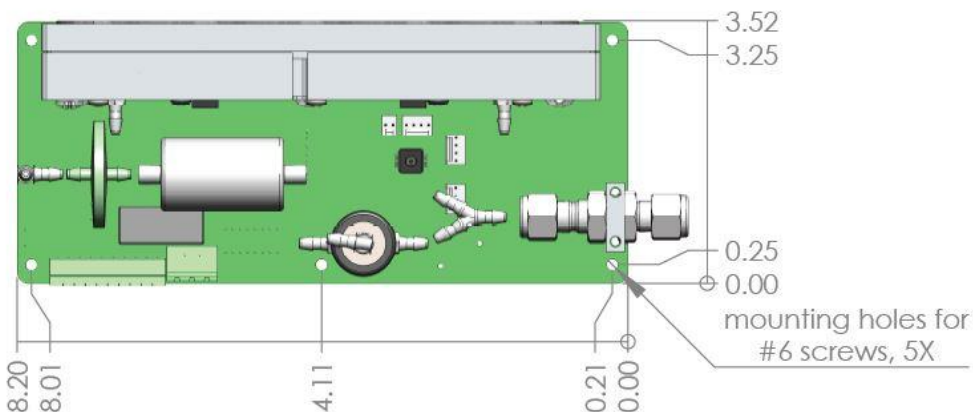
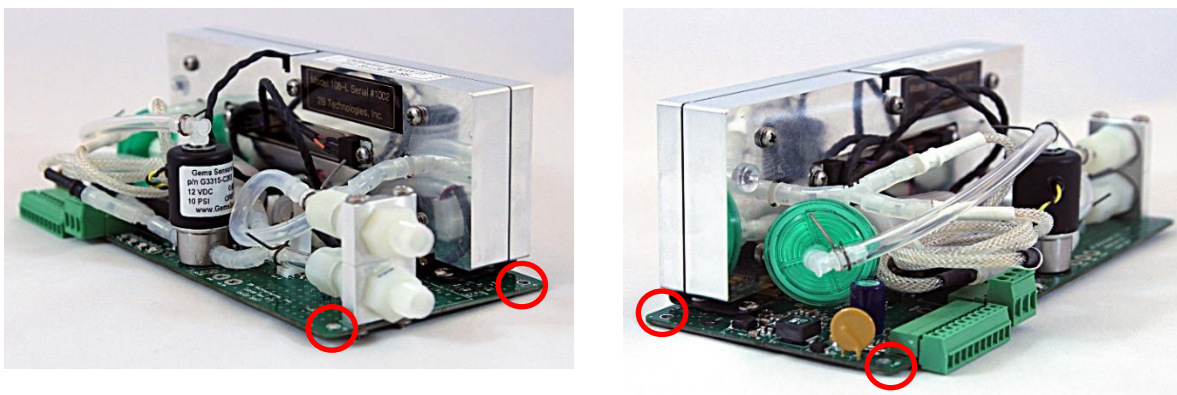
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QUICK START

Note that the inlet/outlet fittings shown in the pictures in this Guide are made of nylon. Most recent builds of the Model 108-L (after ~March 2020) use stainless steel fittings.

1. Attach the Model 108 to your gas system.

- Use the four mounting holes to secure the Model 108 in your system.



2. Gather the materials and components you will need.

Provided when you purchase your instrument:

- Model 108-L
- 10-pin connector
- Relay connector
- Power cable connector
- Serial cable connector
- Power cable
- Serial cable
- External ozone zeroing scrubber

User-supplied materials and components:

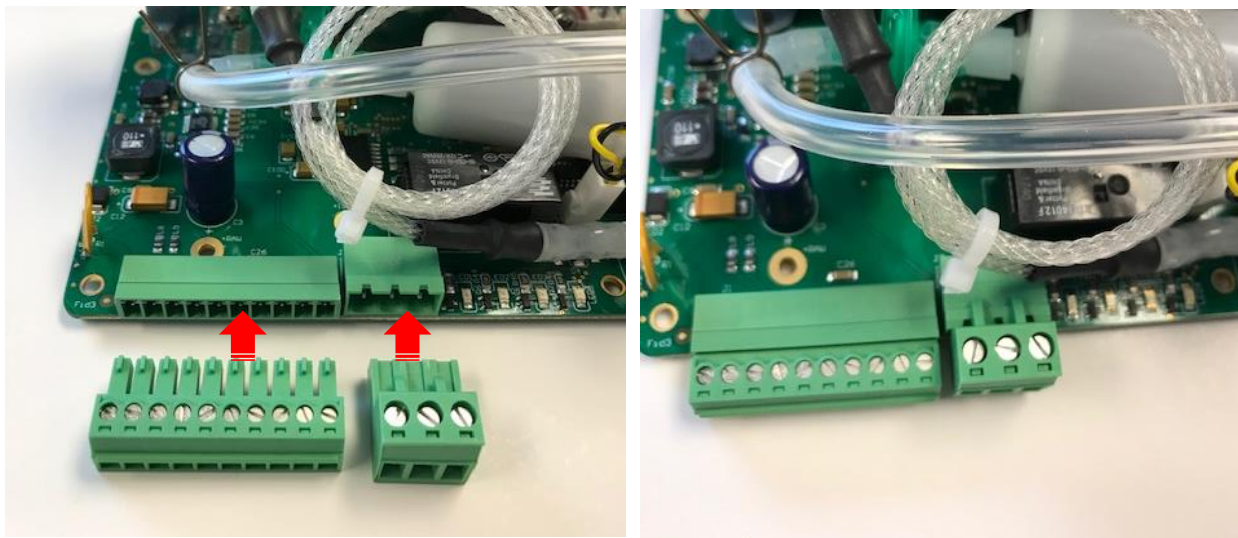
- Pump
- Flow meter
- Inlet filter
- Outlet ozone scrubber/particle filter
- 1/4" tubing, nuts, ferrules (on the inlet side, the tubing must be inert toward ozone)
- Nuts/bolts as needed to attach instrument to your system

Tools

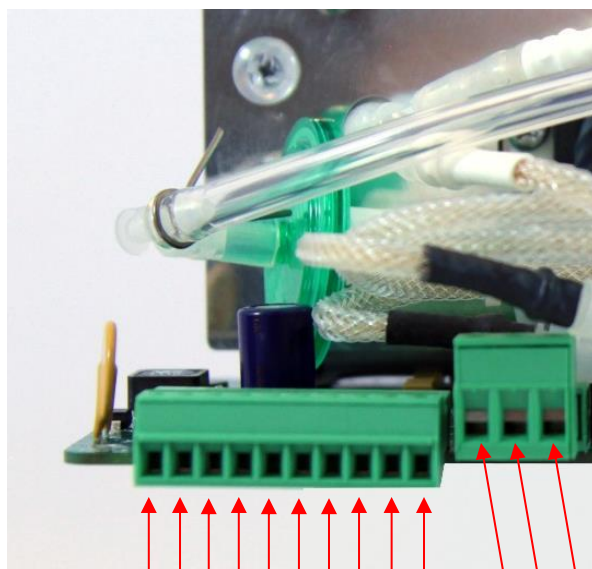
- Small flathead screwdriver
- Wrenches (5/8" and 9/16")
- Wire strippers

ELECTRICAL CONNECTIONS

3. Snap the 10-pin connector and relay connector into place on the Model 108-L.



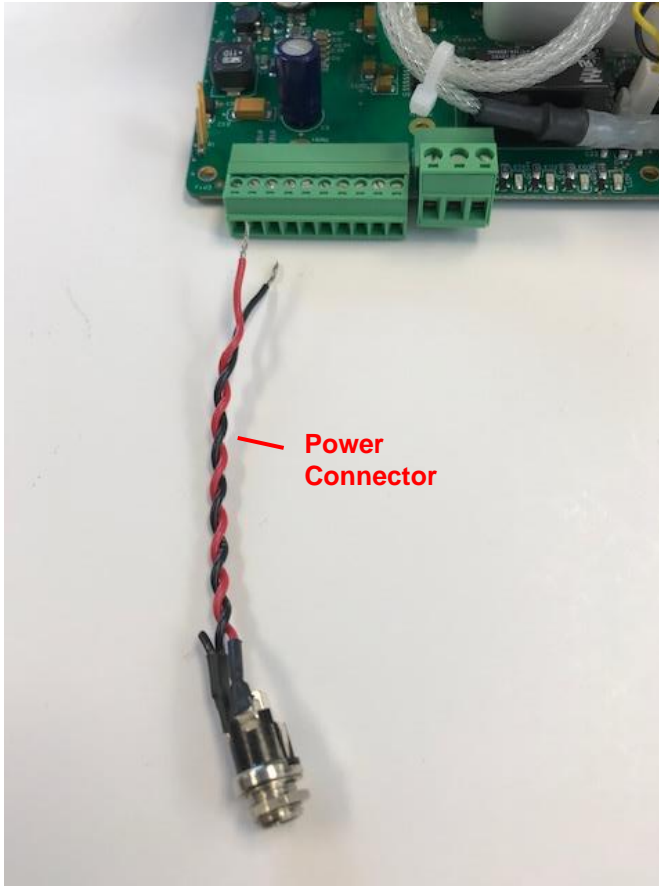
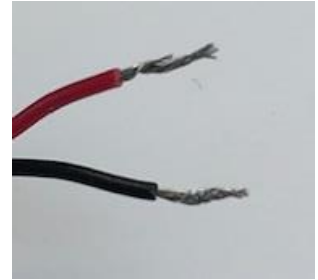
Note the pin assignments in the figure below. These will be used in the next few steps.



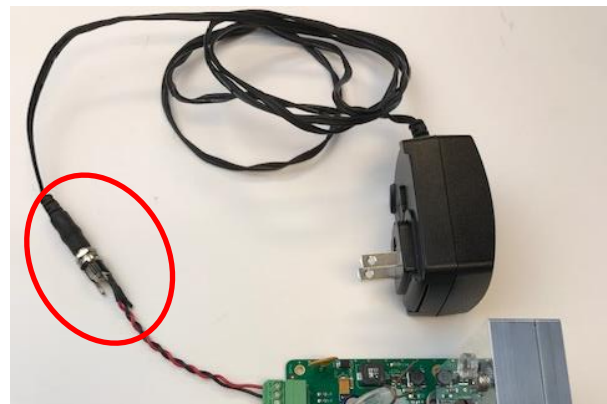
- | | |
|-----------------------|---------------------|
| Pin 1: + 11 to 28V | Relay Pin 1: NC |
| Pin 2: Ground input | Relay Pin 2: Common |
| Pin 3: RS232 Transmit | Relay Pin 3: NO |
| Pin 4: RS232 Receive | |
| Pin 5: Ground | |
| Pin 6: +Voltage Out | |
| Pin 7: +Current Out | |
| Pin 8: Ground | |
| Pin 9: (N/A) | |
| Pin 10: (N/A) | |

4. Connect the external 12V DC power source supplied with your instrument, using **pins #1 and #2** of the 10-pin connector.

- Obtain the power connector sent with your instrument. Strip about $\frac{1}{2}$ inch of the ends of the wires.
- Twist the thin bare wires of the **red lead** together and insert them into **pin #1**. Tighten with a small flathead screwdriver.
- Twist the thin bare wires of the **black lead** together and insert them into **pin #2**. Tighten. Be sure both leads are securely fastened in the pin connector.



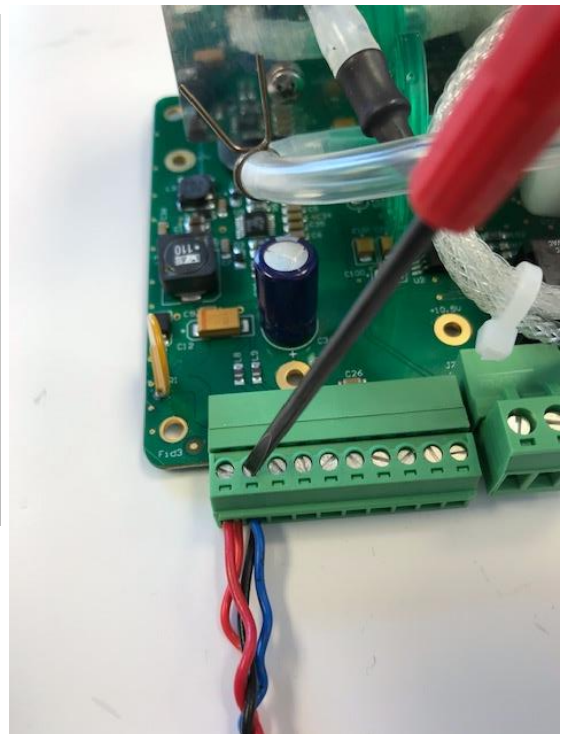
- The power plug provided with your instrument fits into the connector as shown.



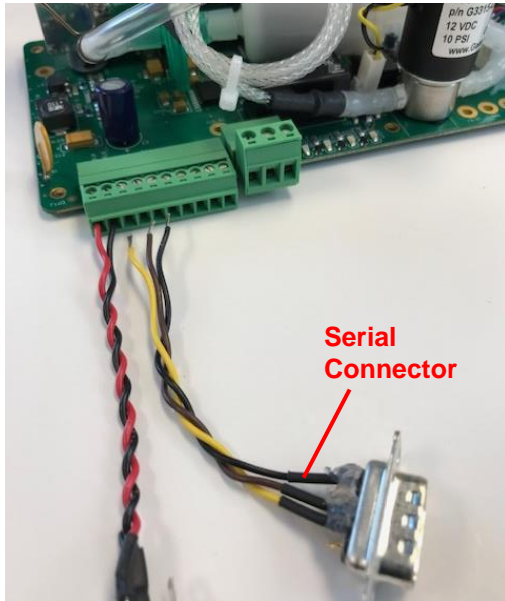
- If you are not using the power source supplied with your instrument, note that your power source can be in the range 11-28 V DC without any detrimental effects on the measurement.
- A circuit breaker and diode are installed on the circuit board in case of an electrical short or incorrect battery attachment. If activated, the breaker will reset itself after a few minutes.

OPTIONAL: The two bullets below are applicable only for some users.

- If you are using this power source to also power a pump for your system, twist the pump leads together with the power source leads in pin #1 (Vin) and pin #2 (ground).
CAUTION: Verify the pump is rated for the power you are supplying to the Model 108.
- For the pump shown below as an example, twist the ground leads together (blue pump lead and black power connector lead in this example). Then twist the 12V power leads together (red pump lead and red connector lead in this example). Insert the ground leads into pin #2 and the power leads into pin #1 and tighten. [The pump shown below is available for purchase from 2B Technologies.]



5. Connect the serial port connector, using **pins #3, #4, and #5** of the 10-pin connector.



- Strip and separately twist the 3 leads of the serial connector as done for the power connector in Step 4.
- The digital pinout for the RS232 is standard and as follows (see photo of proper wiring):
Pin 3 = transmit (Yellow) Pin 4 = receive (Brown) Pin 5 = ground (Black)
- Insert the 3 leads into the proper pins and tighten securely.

6. If using the Analog Output to send data to a plotter or other device, connect the device using pin **#8 or #5** (ground) and either pin **#6** (voltage) or pin **#7** (current).

- Voltage is 0 to 2.5 V full scale. Current is 4 to 20 mA full scale.

7. If using the Relay, make the connections as shown below.

- Physical connection to the instrument's 12-amp relay is made by means of a supplied screw connector (installed on the Model 108-L in step 3 above) for attaching wires to your device. The center terminal is common.
- Please see our Technical Note #45 for detailed information about using relays.

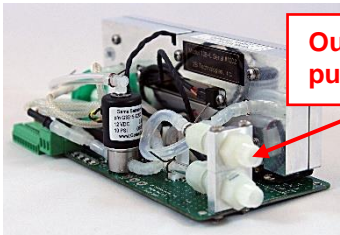
https://2btech.io/wp-content/uploads/docs/tech_notes/TN045.pdf



PLUMBING CONNECTIONS

8. Connect an inline ozone scrubber/filter assembly, a flow meter, and a pump to the Model 108's ¼" Nylon outlet (top bulkhead).

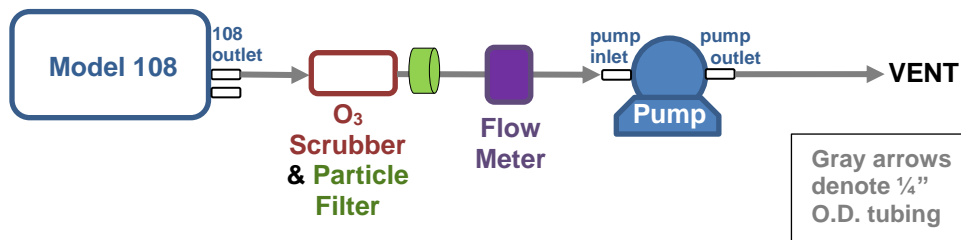
- The Model 108-L ozone monitor has no internal pump. The user's system must include a pump, **arranged so that the pump will pull** (not push) **the sample through the Model 108-L**. Suitable pumps are available for purchase from 2B Technologies.
- Use ¼" O.D. tubing with nylon ¼" nuts/ferrules to make the connections described below. For the outlet, the type of tubing used is not critical.
- The pump should be located downstream of the Model 108, pulling air through the Model 108 via the **outlet** of the instrument (top bulkhead). Connect to the bulkhead using a 5/8" wrench to brace the bulkhead and a 9/16" wrench to tighten the nut ¼ turn past finger tightness.



- To protect the pump, it is recommended to install an exhaust ozone scrubber/particle filter (supplied by the user; example shown in photo) between the Model 108 outlet and the pump inlet. (Replace this scrubber every ~6 months.)
- Also install a flow meter on the inlet line (user-supplied). This is needed because the instrument must operate within a specified flow rate range (nominal flow rate recommended is 1 L/min; flow rates in the range of 0.6-1.5 L/min are acceptable).
- In case of scrubber degradation/failure, the pump outlet should be vented so that personnel are not exposed to potentially unsafe levels of ozone.

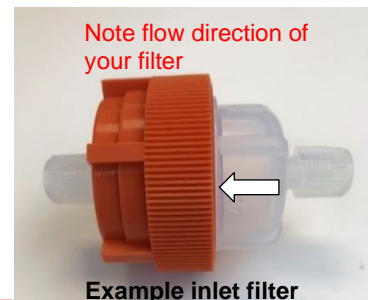
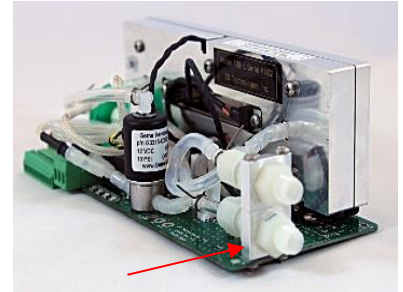


Please refer to the diagram of the outlet plumbing on the next page:

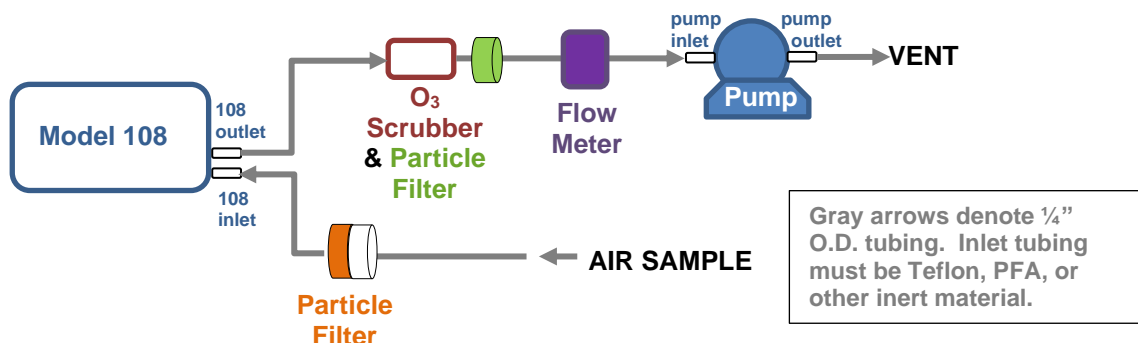


9. Connect your sample line to a particle filter, and then to the 1/4" Nylon inlet (bottom bulkhead) of the instrument.

- Use 1/4" O.D. tubing with nylon 1/4" nuts/ferrules to make the connections described below. Use wrenches to brace the inlet bulkhead and tighten the nut 1/4 turn (as shown for the outlet in the previous step).
- The inlet tubing should be made of PTFE (Teflon®), PFA, FEP, PVDF or some other inert material that does not destroy ozone and that does not desorb plasticizers and other organics that can contaminate the flow path. Tygon®, polypropylene (which may look like Teflon) and metal tubing should not be used. FEP-lined Tygon tubing, which is used inside the instrument, provides the flexibility of Tygon with the inertness of FEP.
- The length of tubing should be kept as short as possible (preferably not more than a few feet) to minimize ozone destruction within the inlet tubing.
- **A Teflon or PVDF inlet filter (user-supplied) is highly recommended** to prevent internal contamination of the Model 108's tubing and absorption cell by particulate matter. The filter should be tested for ozone loss by measuring ambient ozone with and without the filter attached. (Filters with 5 micron pore size are available through 2B Technologies; example shown in the photo.)



Note: The sample must be PULLED through the Model 108-L. "Push" configurations will not work.



STARTUP AND BEGIN MEASUREMENTS

10. Supply power to the instrument.

- *The Model 108-L Ozone Monitor should be operated within flow limits (0.6 to 1.5 L/min) of the instrument. A nominal flow rate of 1 L/min is recommended. The user's setup should incorporate some means of measuring flow rate, either before or after the Model 108. See Step 8 for suggested arrangement.*
- *Once the instrument has been powered on, the first dozen readings (requiring about two minutes) will be spurious, with large positive and negative swings due to the rapid warmup of the lamp and electronics.*
- *Also, ozone readings may be inaccurate during the 10-20 minutes required for the lamp, photodiode, and internal temperature of the absorption cell to stabilize.*

Operating Recommendation <i>(see full user manual for more detail)</i>	Frequency	Section in Full User Manual
Allow ~20 minutes for instrument warmup before taking data	Each startup	2.2
Install a pump to <u>pull</u> (not push) the sample through the instrument	Each use	2.2
Inlet tubing should be made of inert materials, such as PTFE, PFA, FED, PVDF (do not use Tygon®, polypropylene, or metal tubing)	Each use	2.2
Maintain flow rate within operating limits (0.6 to 1.5 L/min)	Each use	2.2.1
Use a Teflon or PVDF inlet filter; test it for ozone loss	Each use	2.2
Use an ozone scrubber on the outlet to protect the pump from ozone damage	Each use	2.2
Check the zero offset	Occasionally	4.6
Perform multipoint calibration	<ul style="list-style-type: none"> • Annually • Any time major disassembly of components is performed • Any time the zero or span checks give results outside of the acceptable limits 	4
If strong temperature fluctuations are expected, place the instrument in a thermally insulated box	User-defined	2.2
Use adaptive filter* if rapidly changing ozone concentrations are occurring or are anticipated <i>* see user manual</i>	User-defined	1.2

11. Collect data over the Serial Port.

- The serial cable used to connect the instrument to your computer must be a 9-pin Female to 9-pin Female straight-through cable (provided with your instrument). Cross-over cables will not work!
- Start up your data acquisition program (such as Tera Term). Tera Term is available on our website at <https://2btech.io/downloads/> (under the Software archive). In the software setup, be sure to identify the proper COM port and baud rate for your connection.
- The RS232 protocol of the Model 106-L is 2400 baud; 8 bits; no parity; 1 stop bit.
- The data output line will give the ozone mixing ratio, internal cell temperature, cell pressure, and photodiode voltage. These are sent as comma-delimited ASCII text to the serial port every 2 seconds, 10 seconds, 1 minute, 5 minutes, or 1 hour, depending on the averaging time selected using the serial menu.
- In-process menu commands are: **h** Output serial data line header
 m Access serial menu

Menu Commands: Serial Port

Please see the full user manual for more information on these functions.

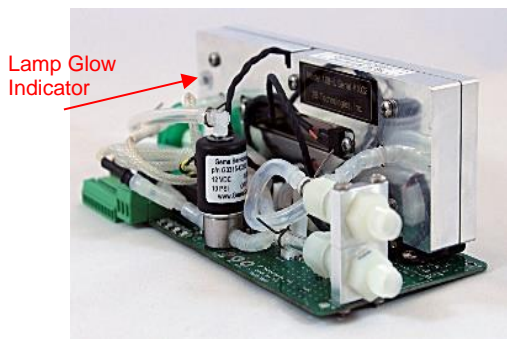
- a** Averaging time: enter a number followed by carriage return (0 = 2 second (no averaging), 1 = 10 second, 2 = 1 minute, 3 = 5 minute, 4 = 1 hour)
- z** Zero (offset) calibration setting: displays current setting and waits for a setting followed by a carriage return (enter a setting [integers only] and carriage return)
- s** Slope calibration setting: displays current setting and waits for a setting followed by a carriage return (enter a setting and carriage return)
- h** Output serial data line header (also available during measurements).
- Y** Set all configuration to default.
- b** Adaptive filter difference (integers only; see Section 1.2).
- l** Adaptive filter percent (integers only; see Section 1.2).
- k** Adaptive filter long average length (integers only; see Section 1.2).
- m** Adaptive filter short average length (integers only; see Section 1.2).
- n** Output instrument serial number.
- p** Perform lamp test.
- g** Set the relay OFF ozone level (when ozone is greater than this, relay turns off).
- j** Set the relay ON ozone level (when ozone is less than this, relay turns on).
- f** Set the analog output full scale in ppb.
- u** Set the ozone units (0 = ppb, 1 = pphm, 2 = ppm, 3 = $\mu\text{g}/\text{m}^3$, 4 = mg/m^3).
- c** Set the temperature units (0 = K, 1 = $^{\circ}\text{C}$, 2 = $^{\circ}\text{F}$).
- o** Set the pressure units (0 = torr, 1 = mbar, 2 = psi)
- ?** Output this help menu.
- x** Exit menu and return to measuring.

12. Using the Analog Output and the Relay.

- The 0-2.5 V voltage output is measured across pins #6 (+) and #5 or #8 (ground).
- The 4-20 mA current output is measured across pins #7 (+) and #5 or #8 (ground).
- To change the analog output voltage scaling factor, send the character 'f' in the serial menu and enter a number between 1 and 99999. For example, if you entered the number 2000, then 2.5 volt (full scale) = 2000 ppb; i.e., 1 volt = 800 ppb. Also, the current output will be scaled such that the full scale of 20 mA corresponds to 2000 ppb. A reading of zero ozone concentration will be output as 0 V and as 4 mA.
- To set the On and Off limits of a relay, enter the serial menu and press 'g' and "j" to access the high and low limits for the relay settings. Enter a number between 1 and 99999 for each of the desired settings.
- Please see our Technical Note #45 for detailed information about using relays. https://2btech.io/wp-content/uploads/docs/tech_notes/TN045.pdf

13. Indicators

- In addition to the status LEDs on the printed circuit board, a lamp glow indicator is located on the side of the optical bench.



MAINTENANCE RECOMMENDATIONS

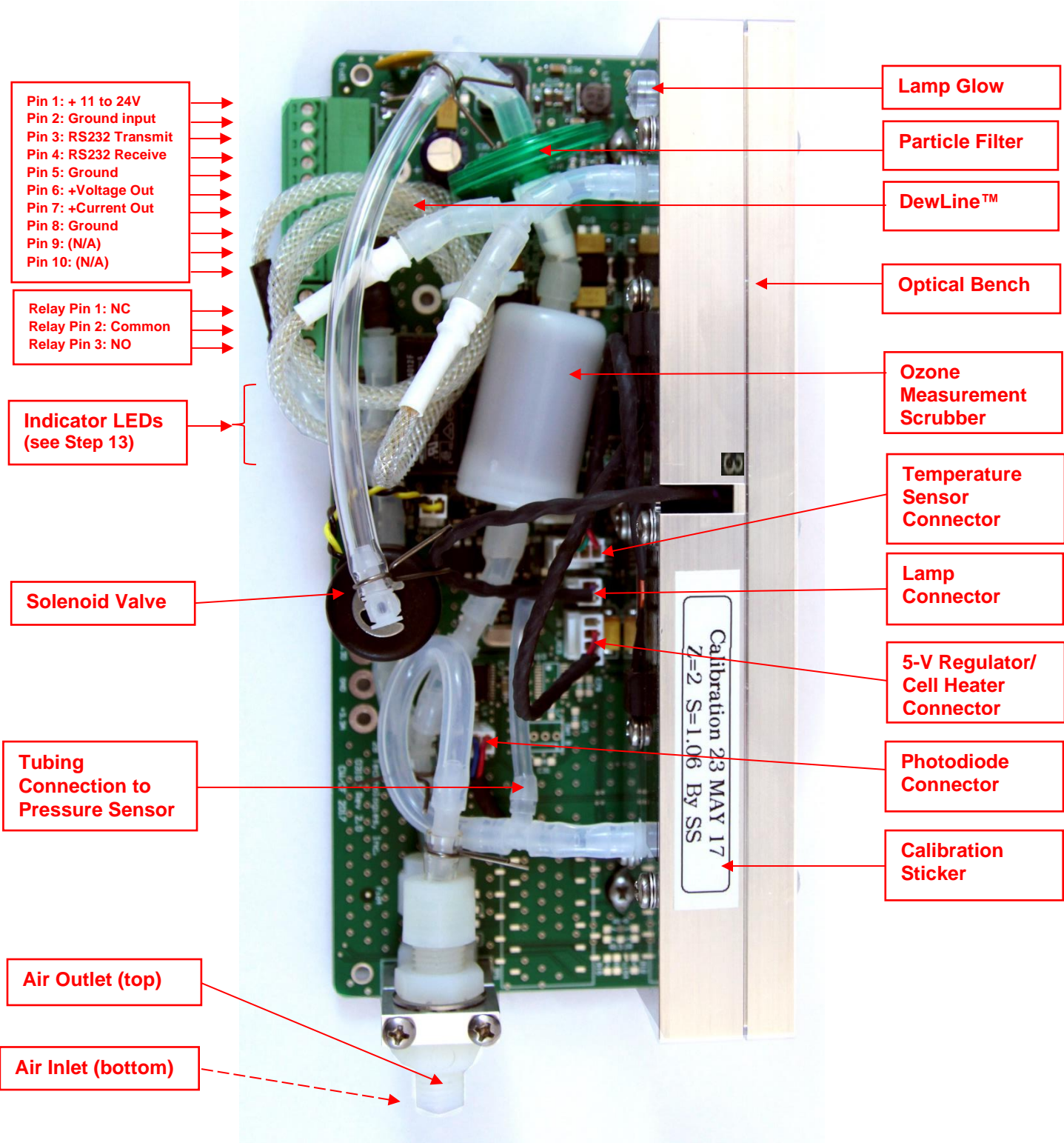
See full user manual for more detail.

Maintenance Recommendation	Frequency	Reference in Full User Manual
Recalibrate instrument and clean flow path	At least once per year	2.2.2, 4.1-4.6
Replace ozone measurement scrubber and external ozone scrubber	every 6 months of continuous operation (~4,000 hrs); otherwise annually	3.1
Clean flow path (methanol)	As needed if instrument has large offset and ozone readings are low, or if readings are noisy	3.1; send instrument to 2B Tech, or call 2B Tech for cleaning procedures

SPECIFICATIONS: MODEL 108-L OZONE MONITOR

Measurement Principle	UV Absorption at 254 nm, single beam
Linear Dynamic Range	0-100 ppm (100,000 ppb); 0-0.5 ppm for FEM
Resolution	0.1 ppb
Measurement Frequency	2 s, 0.5 Hz
Data Averaging Options	10 s, 1 min, 5 min, 1 hr
Response Time, 100% of Step Change	For 2-s output: 4 s, 2 data points For 10-s output: 20 s, 2 data points
Precision (1σ) for 10-s output (rms noise)	Greater of 1.5 ppb or 2% of measurement
Limit of Detection (2σ)	3 ppb for 10-s averaging
Accuracy	Greater of 1.5 ppb or 2% of measurement
Calibration	NIST traceable, annual calibration recommended
Flow Rate Limits	Minimum required: 0.6 Liter/min (volumetric); Nominal: 1 Liter/min; Maximum: 1.5 Liter/min
Ozone Units	ppb, pphm, ppm, $\mu\text{g m}^{-3}$, mg m^{-3}
Pressure Units	torr, mbar, psi
Temperature Units	$^{\circ}\text{C}$, $^{\circ}\text{F}$, K
Temperature and Pressure Corrected	Yes
Temperature Range	0 – 50 $^{\circ}\text{C}$ (20 – 30 $^{\circ}\text{C}$ for FEM)
Data Outputs	RS232, 0-2.5 V, 4-20 mA
Output Ranges	User-defined scaling factor in serial menu
Adaptive Filter	Available; user-defined parameters
Data Transfer Baud Rate	2400
Relay with Two Set Points	Relay responds based on ozone set points (user-defined in serial menu)
Power Requirements	11-28 VDC, nominally 165 mA at 12 V; 2.0 watt
Size	8.7 x 4.0 x 3.0 in (22 x 10 x 7.6 cm) (l x w x h)
Weight	2.0 lb (0.89 kg)

LABELED INSTRUMENT PHOTO



Top View of the Model 108-L.


WARNINGS

ENGLISH

**WARNING:**

Any operation requiring access to the inside of the equipment, could result in injury. To avoid potentially dangerous shock, disconnect from power supply before opening the equipment.

**WARNING:**

This symbol,  on the instrument indicates that the user should refer to the manual for operating instructions.

WARNING:


If this instrument is used in a manner not specified by 2B Technologies, USA, the protection provided by the instrument may be impaired.

ESPAÑOL

**ATENCIÓN:**

Cualquier operación que requiera acceso al interior del equipo, puede causar una lesión. Para evitar peligros potenciales, desconectarlo de la alimentación a red antes de abrir el equipo.

**ATENCIÓN:**

Este símbolo,  en el instrumento indica que el usuario debería referirse al manual para instrucciones de funcionamiento.

ATENCIÓN:


Si este instrumento se usa de una forma no especificada por 2B Technologies, USA, puede desactivarse la protección suministrada por el instrumento.

FRANÇAIS

**ATTENTION:**

Chaque opération à l'intérieur de l'appareil, peut causer du préjudice. Afin d'éviter un shock qui pourrait être dangereux, déconnectez l'appareil du réseau avant de l'ouvrir.

**ATTENTION:**

Le symbol,  indique que l'utilisateur doit consulter le manuel d'instructions.

ATTENTION:


Si l'instrument n'est pas utilisé suivant les instructions de 2B Technologies, USA, les dispositions de sécurité de l'appareil ne sont plus valables.

DEUTSCH

**WARNHINWEIS:**

Vor dem Öffnen des Gerätes Netzstecker ziehen!

**WARNHINWEIS:**

Dieses,  auf dem Gerät weist darauf hin, daß der Anwender zuerst das entsprechende Kapitel in der Bedienungsanleitung lesen sollte.

WARNHINWEIS:


Wenn das Gerät nicht wie durch die Firma 2B Technologies, USA, vorgeschrieben und im Handbuch beschrieben betrieben wird, können die im Gerät eingebauten Schutzvorrichtungen beeinträchtigt werden.

ITALIANO

**ATTENZIONE:**

Qualsiasi intervento debba essere effettuato sullo strumento può essere potenzialmente pericoloso a causa della corrente elettrica. Il cavo di alimentazione deve essere staccato dallo strumento prima della sua apertura.

**ATTENZIONE:**

Il simbolo,  sullo strumento avverte l'utilizzatore di consultare il Manuale di Istruzioni alla sezione specifica.

ATTENZIONE:


Se questo strumento viene utilizzato in maniera non conforme alle specifiche di 2B Technologies, USA, le protezioni di cui esso è dotato potrebbero essere alterate.

DUTCH

**OPGELET:**

Iedere handling binnenin het toestel kan beschadiging veroorzaken. Om iedere mogelijk gevaarlijke shock te vermijden moet de aansluiting met het net verbroken worden, vóór het openen van het toestel.

**OPGELET:**

Het symbol,  geeft aan dat de gebruiker de instructies in de handleiding moet raadplegen.

OPGELET:

Indien het toestel niet gebruikt wordt volgens de richtlijnen van 2B Technologies, USA gelden de veiligheidsvoorzieningen niet meer.

CHINESE

**警告：**

任何需要接触设备内部的操作均可能造成人身伤害。为避免可能的触电危险，请在打开设备前切断电源。

**警告：**

这个符号  在仪器上表示用户应参考说明书上的操作指南。

警告：


如果仪器没有按照美国 2B 科技公司指定方式操作，仪器的保护性能会减弱。

JAPANESE

**警告：**

機器の内部で操作する時、怪我できます。危険な衝撃を回避するために、機器を開ける前に、電源を切断してください。

**警告：**

機器でこの記号  を見れば、マニュアルを読んでください。

警告：

この機器は 2B テクノロジー会社、USA の指定でなければ、機器の保護が損なえます。