



Respond O₂

Ultrasonic Oxygen Indicator Operation Manual

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WARRANTY

Responsive Respiratory will extend the following warranty to the original purchaser of the *Respond O₂*™ Ultrasonic Oxygen Indicator:

If the unit becomes inoperable prior to two years from date of purchase for any reason other than:

1. Unusual, abusive use or handling
2. Dead, defective battery
3. Water or water vapor has been introduced into unit.

Responsive Respiratory will, at its option, have the unit repaired or replaced. If repair is authorized, Responsive Respiratory will not charge for parts or labor. Purchaser will be responsible for all shipping charges to return the unit to Responsive Respiratory. Responsive Respiratory will be responsible for normal shipping charges for the return of the unit to purchaser.

All warranties are voided if the *Respond O₂*™ unit has been opened or tampered with in any way.

If claim is made after two years from the date of purchase and unit is inoperable, all costs involved in such repair are to be paid by the purchaser.

In the event that the unit becomes inoperable, the purchaser should promptly notify Responsive Respiratory for instructions in handling repair/return of the unit. *Any return without prior authorization from Responsive Respiratory is at purchaser's expense and risk.* Responsive Respiratory does not assume any other liability except as stated above.

OPERATION MANUAL

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WARNING NOTES

USAGE: The *Respond O₂*™ Ultrasonic Oxygen Indicator is designed for intermittent usage to determine the **oxygen concentration** produced by an oxygen concentrator. It may also be utilized to do spot checks of gaseous or liquid oxygen.

WARNING: The unit is not designed nor intended for use in anesthesia applications, or for monitoring oxygen concentration from any source other than a conventional oxygen concentrator using molecular sieve beds. This unit will not withstand fluid spillage. The unit will not withstand mechanical shock or vibration.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- ▲ *Reorient or relocate the receiving antenna*
- ▲ *Increase the distance between the equipment and receiver.*
- ▲ *Connect the equipment into an electrical outlet on a different circuit from which the receiver is connected.*
- ▲ *Consult the dealer or an experienced radio/TV technician for help.*

TROUBLE SHOOTING CHECKLIST (CONTINUED)

| <i>Complaint</i> | <i>Probable Cause</i> | <i>Suggested Corrective Action</i> |
|--|--|--|
| Display shows "err" during calibration | Calibration was performed incorrectly or wrong calibration gas was used. | Ensure U.S.P. oxygen (> 99.0%) is being used and re-perform procedure according to directions in the Operation Manual. |
| Display shows "err" during use | Unit has made a reading outside normal ranges. | Check calibration. Make sure gas being measured is from oxygen concentrator. |
| "LO BATT" appears in display screen when unit is turned on | Battery is low. | Change battery. |
| Display shows "err" or a reading other than 100% ± 2% after full calibration | Unit may have been used to check a concentrator with a humidifier bottle in line or water has gotten inside of unit. | Call Responsive Respiratory Customer Service Department at (866) 333-4030 for authorization to return unit for repair. |

TROUBLE SHOOTING CHECKLIST

| <i>Complaint</i> | <i>Probable Cause</i> | <i>Suggested Corrective Action</i> |
|--|---|---|
| Display is blank when unit is turned on. | Bad batteries. Corroded battery terminals. | Replace batteries. Clean battery terminals. |
| When unit is turned on display flashes " PRO O2 @ CAL " and then turns off. | Unit requires calibration. | Perform "Full Calibration Procedure" outlined in Operation Manual. |
| Display reads 91.8% on a source of U.S.P. oxygen (≥ 99.0%). | Unit is operating in mode to check concentrators and is adjusting for concentrator's output of argon. | With unit still connected to source of U.S.P. oxygen (≥ 99.0%) push and hold down U <u>continue to hold down</u> "pure OB_{2B}/calibrate" button to temporarily remove argon correction from unit's software. |
| Display reads between 98% to 102% (but not 99.9%) on a source of U.S.P. oxygen (≥ 99.0%) with button held down. | Unit requires quick calibration. | With unit still connected to source of U.S.P. oxygen (≥ 99.0%) push and hold down "pure OB_{2B}/calibrate" button until display reads 99.9% - 101 (approximately 20 seconds). The unit is then recalibrated. |
| Unit is out of 98% to 102% range after quick calibration. | Unit requires full calibration. | Perform "Full Calibration Procedure" outlined in User Manual. |
| "---" appears on display while unit is being calibrated. | Incomplete calibration. | Release the "pure O₂/calibrate" button and restart calibration process. |
| Display shows "-U-" . | Indicates an out of range reading. | Perform "Full Calibration Procedure" outlined in User Manual. |

INTRODUCTION

Thank you for purchasing a **Respond O₂TM Ultrasonic Oxygen Indicator**. The designers of this product have years of experience in the field of oxygen concentrator repairs. The unreliability and high cost of operation of fuel cell analyzers led to the invention of the **Respond O₂TM Ultrasonic Oxygen Indicator**.

By relying on a method already used in many oxygen concentrators to trigger "Low O₂" alarms – **ultrasound – Respond O₂TM Oxygen indicator** offers more cost effective product to check the output of oxygen concentrators. The **Respond O₂TM Ultrasonic Oxygen Indicator** responds faster, has no fuel cell to replace and is simpler to use than a fuel cell analyzer.

Directions for Use:

There are two (2) controls for the **Respond O₂TM** unit:

1. Pressing and releasing the “**on/off**” button will turn the unit on or off.
2. The “**pure O₂ calibrate**” button when pressed and held down while connected to a compressed gas or liquid U.S.P. oxygen ($\geq 99.0\%$) source verifies that the unit is properly calibrated, thus eliminating the need to have an outside source calibrate the unit.

Since the **Respond O₂TM** device uses ultrasound technology to check the concentrator operation, there has to be two modes of operation:

1. When the unit is turned on, the software enables the unit to measure the output of an oxygen concentrator adjusting for the argon that passes through the sieve beds.
2. When using the unit with the “**pure O₂ calibrate**” button depressed the software measures oxygen not adjusting for the argon. When the “**O₂ calibrate**” button is released, the unit automatically returns to the concentrator mode and will then again adjust for the argon and read incorrectly for pure oxygen.

INITIAL SETUP

1. Remove the **Respond O₂TM Ultrasonic Oxygen Indicator** from the package. Make sure you have the following items:
 - **Respond O₂TM** indicator unit
 - 9-volt battery (factory installed) – Spare battery also included
 - 2 foot connecting tubing
 - Carrying case and strap
 - Operation Manual
2. The **Respond O₂TM Ultrasonic Oxygen Indicator** was calibrated at the factory. However, the proper calibration of the unit's oxygen concentration measurement mode can be quickly and easily verified by following the "Pure Oxygen Verification" procedure on **page 6** of this manual.
3. If accreditation organizations or internal policies and procedures require routine calibration, instructions on performing a "Quick One Step Calibration Procedure" to U.S.P. oxygen ($\geq 99.0\%$) can be found on **page 6** of this manual. A "Full Two Step Calibration Procedure" to both U.S.P. oxygen ($\geq 99.0\%$) and room air can be found on **page 7** of this manual.

Low Battery Indicator:

When the unit displays “**LO**” and “**BAT**” in the lower left corner, battery is low and should be replaced. See **page 8**.

FREQUENTLY ASKED QUESTIONS (continued)

When I am in the Concentrator Mode and hook the unit up to a U.S.P. oxygen ($\geq 99.0\%$) source the LCD does not read 99% (± 2), why?

When the unit is in its default (concentrator) mode the device's software enables the unit to measure the output of an oxygen concentrator by compensating for the argon that passes through the sieve beds. In this mode, it will display a false reading (usually $\pm 90\%$) if connected to an oxygen source other than a concentrator. Pressing and holding the "pure O₂/calibrate" button removes the argon compensation and allows the device to measure the oxygen purity with $\pm 2\%$ of compressed gaseous or liquid oxygen.

When I am in the Concentrator Mode and hook the unit up to a U.S.P. oxygen ($\geq 99.0\%$) source the LCD the display reads - "Concentrator O₂ 91.8" (approx). What's wrong?

Nothing. When in the Concentrator Mode, the electronic components of the indicator automatically compensates for the argon found in the gas produced by an oxygen concentrator. As a result the display will read approximately 90% unless this function is overridden by pushing the "pure O₂/calibrate" button.

Whenever I check concentrators with the Respond O₂TM, I consistent get an O₂ concentration reading of 96.0 on every concentrator. Why?

Concentrators work at their maximum efficiency (96.0%) at lower flow rates. When the flow rate is increased the output of the concentrator typically will decrease slightly. If you question whether the device is functioning properly, stabilize it to room air and then retest with the concentrator set on the maximum flow rate or beyond. Be sure to allow the concentrator to stabilize at the higher flow rate before testing. This may take as long as 10 minutes.

Will the unit lose calibration when I change batteries?

No. The unit holds calibration even when the battery is removed.

FREQUENTLY ASKED QUESTIONS

The following are some of the frequently asked questions about the operation of this device.

Do I have to calibrate my Respond O₂TM unit daily?

No. The Respond O₂TM indicator was calibrated at the factory.

How do I know that my Respond O₂TM device is accurately measuring concentrations?

To verify, simply connect the unit to a source of either compressed gas or liquid U.S.P. oxygen ($\geq 99.0\%$) at 2 LPM. Then turn on the device and hold down the "pure OB_{2B}/calibrate" button. As long as the display reads between 99% and 101%, the unit is properly calibrated.

How often should I calibrate my Respond O₂TM unit?

As long as you can verify (via the Pure Oxygen Verification Procedure) that the unit is holding calibration against a U.S.P. oxygen ($\geq 99.0\%$) source, the unit does not require calibration.

My accreditation organization as well as our internal policies require periodic calibration of this type of equipment. Can I calibrate the Respond O₂TM device to comply with these requirements?

Yes, if accreditation organizations or internal policies and procedures require routine calibration, instructions on calibrating the device are found on pages 6 - 7 of this manual.

Does the unit have to be turned off before verifying or calibrating?

Yes. The unit must be turned off and evacuated to room air before you begin the oxygen verification or calibration procedures.

Why doesn't the unit drop immediately to room air?

Oxygen is heavier than room air, so it will linger inside the unit.

When there is a flow (either from room air or another concentrator), the reading will change immediately.

Can I exhale (blow) into the unit to reach room air?

No. You may apply a small suction or flow of room air, but do not exhale into the unit.

INSTRUCTIONS FOR CHECKING O₂ CONCENTRATORS

To turn unit on and off: To turn the unit on or off press and release the “on/off” button on the lower left-hand side of the unit. (EXAMPLE: Concentrator O₂ 20.9) When the unit is turned on the device defaults to the mode in which the software enables the unit to measure the output of an oxygen concentrator compensating for the argon that passes through the sieve beds. The display will read “PRO”, then “O₂” and finally “Concentrator O₂” and a number. If the unit is hooked up to an operating concentrator, the device will automatically measure the concentration of the oxygen being produced and show the value on the LCD display. The unit's default operating mode automatically compensates for the argon that passes through the sieve beds, it will display a false reading (*approximately 90%*) if connected to an oxygen source other than a concentrator unless the specific actions discussed on **pages 6 - 7** of this manual are taken. If the device is not hooked up to an oxygen source it will measure and display the concentration of oxygen in the ambient air (*usually 20.9%*). **Reading may vary if sample gas remains in unit.**

To turn the *Respond O₂*™ off, press and release the “on/off” button. The unit will display “OFF” and shut down. To conserve battery life, it automatically shuts down if any one of the unit's functions is not utilized for approximately 5 minutes.

Measuring Oxygen Concentrations:

Follow the steps below to measure the concentration of oxygen being supplied by an oxygen concentrator:

1. Make sure the concentrator has been running long enough (follow concentrator manufacturer's guidelines) to reach full operational output.
2. Make sure flow rate is above 2 LPM - preferably at the concentrator's highest output.
3. **Remove any humidifier from concentrator.**
4. Connect supply tubing to the concentrator oxygen outlet and the inlet port
5. Turn on the device (See above).
6. The indicator will stabilize in about 10 seconds and provide an accurate reading on the LCD display.
7. If there is any question to the accuracy of the reading, perform the "Pure Oxygen Verification Procedure" and if necessary the "Quick One Step Pure Oxygen Calibration Procedure on **page 6**.



CAUTION: Do not check concentrator with humidifier in place. Humidity can affect unit's readings and damage the unit.

NOTES: Never check a concentrator while holding down the “pure O₂/calibrate” button. You will get a false reading. You must hold down the “pure O₂/calibrate” button to check unit against a source of U.S.P. oxygen ($\geq 99.0\%$) cylinder or liquid oxygen.

INSTRUCTIONS FOR SPOT CHECKING LIQUID OXYGEN VESSELS or OXYGEN CYLINDERS

The *Respond O₂*™ Ultrasonic Oxygen Indicator can also be used to perform spot checks ($\pm 2\%$) of gaseous or liquid oxygen as follows:

1. Connect the inlet port on the unit to a gaseous or liquid oxygen source (cylinder or liquid oxygen) via a supply tube.
2. Turn the oxygen flow on to 2 LPM.
3. Press the “on/off” button to turn the unit on.
4. When unit stabilizes the unit display will read “Concentrator O₂ 91.8” (*approx concentration.*)
5. Press and continue to hold down the “pure O₂/calibrate” button.
6. Unit will display “Pure O₂” and a numeric reading.
7. If the source gas is oxygen, the display should read between **99% and 101%**.
8. If the unit display reads “err”, “---”, “-U-” or any other reading other than 99.9 ($\pm 2\%$), the source gas may not be pure oxygen and should be quarantined for retesting using a more sophisticated method such as a Servomex* oxygen analyzer.

NOTE: *Respond O₂*™ Ultrasonic Oxygen Indicator can be used to spot check the identity and purity of gaseous or liquid oxygen only, it cannot be used to perform or verify U.S.P. oxygen ($\geq 99.0\%$) testing since it cannot provide the required U.S.P. oxygen ($\geq 99.0\%$) accuracy of $\pm 0.1\%$.

* Servomex Inc. - Sugarland, TX

UNIT SPECIFICATIONS

General Specifications

Physical Data

Dimensions: 3.60" W x 5.75" H x 1.29" D
(9.14 cm W x 14.6 cm H x 3.28 cm D)

Weight: 9 ounces (255.15 Grams)

Connector: 1/4" anodized aluminum hose barb

Case: Solid color ABS plastic with threaded metal bolt channels

Battery: The battery capacity is a standard 9-volt "transistor" alkaline type battery with polarized terminals.

A rechargeable type battery is not recommended.

Operating Temperature: 32° F to 105° F (0° C to 41° C)

Storage Temperature: -29° F to 160° F (-34° C to 71° C)

Specifications - Concentration Mode

Measured Oxygen Concentration Range: 20.9% to 100%

Response Time: 10 seconds

Accuracy: ± 2%, assuming proper calibration with a sample gas at a temperature of 32° F to 105° F (0° C to 41° C), and a flow rate of 2 to 5 LPM to the unit during calibration.

Input Gas Flow Rate: Use a flow rate of .5 to 10 LPM for concentrator sampling.

Sampling Frequency: Continuous

Vents: The unit vents through the side vent port.

Linearity: ± 2% of Full Scale

Sensor: Ultrasonic

ENVIRONMENTAL EFFECTS

Temperature

Under normal operating conditions 32° F to 105° F (0° C to 41° C), the unit's microprocessor and temperature circuit will compensate for variations in temperature. The temperature during storage and shipping should not reach below -29° F (-34° C) or above 160° F (71° C). *If the unit has been stored at other than normal room temperatures, allow unit to stabilize at room temperature for 15 to 30 minutes. Unit will stabilize quicker if turned on.*

Barometric Pressure

The *Respond O₂*™ multifunctional unit's microprocessor makes it unnecessary to recalibrate during minor altitude changes. Please verify calibration if used over 5,000 feet.

Note: If readings do not seem accurate, recalibrate the unit.

Vibration

It is recommended that the unit be used in a stable position to prevent the display reading from fluctuating.

Note: Unit will not withstand excessive shock or vibration.

Relative Humidity/Water Vapor

The relative humidity (RH) of the gas being sampled will affect the reading being displayed. As the RH increases, the sample gas becomes diluted with water vapor. This decreases the percentage of all gases measured including oxygen. Gases from high-pressure cylinders and oxygen concentrators are basically dry (< 0.5% RH). Gas measured after a humidifier or that has a high RH can cause a reading up to 10% lower than the actual reading.

Note: For accurate results, never measure oxygen percentage downstream from a humidifier. This can damage the unit.

VERIFICATION & CALIBRATION INSTRUCTIONS

PURE OXYGEN VERIFICATION PROCEDURE

To verify that the indicator unit is accurately measuring the concentration of oxygen being produced by a concentrator, perform the following steps:

1. Connect the inlet port on the unit to a USP oxygen source (cylinder or liquid oxygen) via a supply tube.
2. Turn the O₂ delivery flow to 2 LPM.
3. Press the “on/off” button to turn unit on.
4. When unit stabilizes the display will read - "**Concentrator O₂ 91.8**" (approx.concentration.).

NOTE: When in the Concentrator Mode, the electronic components of the indicator automatically compensate for the argon found in the gas produced by an oxygen concentrator. As a result the display will read 90% (± 2%) unless this function is over-ridden by pushing the "pure O₂/calibrate" button).

5. Press and continue to hold down the “pure O₂/calibrate” button.
6. Unit will display “Pure O₂” and a numeric reading.
7. If the unit is properly calibrated, the display should read between **99% and 101%**. The Respond O₂™ is ready to use.
8. If the unit display reads "err", "---", "-U-" or any other reading other than 99.9 (± 2%), the unit should be recalibrated (See below).

QUICK “ONE STEP” PURE OXYGEN CALIBRATION

The following procedure can be used to calibrate the *Ultrasonic Oxygen Concentrator Indicator* to pure oxygen:

1. Follow steps 1 through 6 of "Pure Oxygen Verification Procedure" above.
2. When the unit displays "**Pure O₂**" and a numeric reading, continue holding down the “pure O₂/calibrate” button.
3. After a few seconds, the LCD display (while continuing to read "**Pure O₂**") will start to alternately display "**CAL**" and number.
4. Continue to hold the “pure O₂/calibrate” button down until the display stops alternating and simply displays “**Pure O₂ 100**”.
5. At that point, the unit is calibrated to pure oxygen and ready for use.

NOTE: If unit displays an O₂ concentration reading outside of the ± 2% tolerance range (eg. < 98% or >102%) unit will not “Quick Cal” and the Full Two Step procedure on the following page must be followed.

FULL "TWO STEP" CALIBRATION PROCEDURE

The following procedure may be used to calibrate the indicator to both room air and U.S.P. oxygen (≥ 99.0%):

1. **Do not** connect unit to oxygen source or introduce oxygen to the unit at this time.
2. Turn unit on by pushing “on/off” button.
3. Wait for the unit to stabilize at room air - and the LCD displays “**Concentrator O₂ 20.9%**”. *If necessary, airflow will purge the oxygen. Do not continue to flow air during the rest of this calibration process.*

NOTE: Do not exhale breath into unit. Moisture will affect calibration; a slight suction can be used to evacuate the sampling chamber.

4. When unit is stabilized at room air and displays “**Concentrator O₂ 20.9%**” (± 2%) - turn unit OFF by pushing “on/off” button.
5. Next, hold the “pure O₂/calibrate” button down while pressing and releasing the “on/off” button.
6. Continue to hold down the “pure O₂/calibrate” button until the display reads “---”.
7. Release the “pure O₂/calibrate” button and the display will read “**CAL AIR**”.
8. Press and release the “pure O₂/calibrate” button again
9. The unit's display will roll for approximately one minute while it calibrates to room air.
10. When the unit display reads “**CAL O₂**” - connect the inlet port to an oxygen source (cylinder or liquid) using the supplied tube.
11. Introduce U.S.P. oxygen (≥ 99.0%) at 2 LPM to the unit. (**Do not use a humidifier**).
12. Press and release the “pure O₂/calibrate” button again.
13. The unit's display will roll for approximately one minute while it calibrates to oxygen.
14. When the calibration sequence is complete the unit will display “**CAL END**”.
15. The unit is then calibrated and ready for use.
16. To verify that the unit is properly calibrated, repeat the "Pure Oxygen Verification Procedure" on **page 6**.

NOTE: If unit displays "CAL ERR" during verification or calibration procedures, check to ensure that you are using U.S.P. oxygen (≥ 99.0%) and that the flow is turned on to at least 2 LPM, then repeat procedure.

NOTE: If unit displays "---" during verification or calibration procedures, release the "pure O₂/calibrate" button or the unit will shut off automatically.

If any problems are encountered during the calibration sequences, contact Responsive Respiratory at 1-866-333-4030.

MAINTENANCE

Battery Replacement

When the LCD displays "**LO BATT**" in the lower left corner, the battery is low and should be replaced. A spare battery is supplied with your unit.

NOTE: The Respond O₂™ must be removed from the carrying case to replace battery.

Install a new 9-volt battery by sliding the battery door (located on the rear of the unit) away from the case. Connect the 9-volt battery to the standard 9-volt battery connection and lay the battery sideways in the battery compartment. Insert battery door by sliding door back onto unit in the reverse direction of opening.

Cleaning

The unit may be cleaned by wiping the case with a mild detergent or standard topical disinfectant and a soft cloth.



CAUTION: Do not let cleaning solution spill on or inside unit. Unit is not intended for any type of sterilization.