

PRINTING HISTORY

This manual covers the Portable N_2O Source, which is used with the Model 211 Ozone Monitor and the Model 408 NO Calibration Source. New editions of this manual are complete revisions that reflect updates to the instrument itself, as well as clarifications, additions and other modifications of the text.

Revision A	
Revision B	September 2016
Revision B-2	December 2017
(Clarifications regarding the use of different sizes of N_2O cartridges; other minor edits.)	
Revision B-3	December 2023
(Updated hyperlinks.)	

1. WARNINGS

Nitrous oxide (N₂O) is supplied by a cartridge containing liquid N₂O having a vapor pressure inside the cartridge of 58.5 bar at 20°C. These cartridges are the same or similar to ones sold as a consumer product for producing whipped cream. Nitrous oxide or "laughing gas" is also used as a general anesthetic at concentrations up to 50% and is thus well tolerated by humans. There are no known toxicological effects of N₂O other than asphyxiation at extremely high concentrations due to exclusion of oxygen. N₂O is not itself combustible, but it strongly supports combustion of organic materials and reducing agents. Contact with liquid N₂O cartridge is punctured outside the piercing device/regulator, the cartridge will act as a "rocket." However, the N₂O cartridges are commonly used consumer products available commercially and are safe to handle if the procedures below are followed.

2. INSTALLATION

The Portable N₂O Source is a standard feature of the Model 408 NO Calibration Source and the Model 211 Scrubberless Ozone Monitor. A piercing device is used to open disposable liquid N₂O cartridges that are loaded in the cartridge cup, and an integrated pressure regulator drops the pressure before delivering N₂O (nitrous oxide) to the instrument. A pressure gauge shows the pressure inside the cartridge, where a drop in pressure (<~600 psi) indicates that the cartridge is almost empty. Either 8-gram or 16-gram N₂O cartridges may be used.

Portable N₂O Source Manual Rev. B-3



Figure 1. Diagram of the Portable N₂O Source and mounting hardware.

To install the Portable N₂O Source follow the following steps:

1) If there is no regulator mount on the instrument, first install the mount.

<u>Model 211</u>: If you have a newer instrument that has a regulator mount on the back panel, proceed to Step 2. Otherwise, a new back panel will need to be requested from 2B Tech and installed. Remove the top and bottom cover first and disconnect all connections to the back panel. Taking a photo of the connections to the back panel is a good idea to help ensure that the connections are remade correctly after installation of a new back panel. Transfer all the components on the old back panel to the new one. Mount the regulator mount to the back panel using the two #10 pan head screws and split locking washers supplied with the Portable N_2O Source. Install the back panel on the instrument and install the top and bottom panels.



Figure 2. Diagram of the Portable N₂O Source mounted on a Model 211.

<u>Model 408</u>: If you have a newer instrument that has a regulator mount on the left side panel, proceed to Step 2. Otherwise, a new left side panel with the correct mounting holes will need to be requested from 2B Tech and installed. Remove all of the screws around the enclosure front and back panels, including the screws on the front bezel. Remove the left panel while keeping the top and bottom panels of the instrument from sliding. Install the regulator mount on the left panel using the two #10 pan head screws and split locking washer supplied with the Portable N₂O Source. Install the left panel on the instrument and install all of the screws at the front and back panels of the enclosure.



Figure 3. Diagram of the Portable N₂O Source mounted on a Model 408.

- 2) Loosen the single #10 socket cap screw (see Figure 1) to allow the regulator assembly to slide into the mount.
- 3) Slide the regulator assembly into the mount from the top. Position the regulator assembly so that the mount is centered on the top part of the piercing device, not the black cartridge cup (see Figure 4). Tighten the #10 socket cap screw to secure the assembly in the mount.

4) Connect the outlet of the regulator to the N₂O inlet of the instrument.



Figure 4. Diagram of the N_2O source properly installed in the mount.

3. OPERATION

Please read all the following information before attempting to use the Portable N₂O Source. For assistance, please call 2B Technologies at (303)273-0559 or email us at techsupport@2btech.io.

Shipping Box Contents

Open the shipping box and verify that it contains the following:

- 1. Piercing device with integrated pressure regulator and removable insert
- 2. Regulator mount
- 3. Two #10-32x1/2" Phillips head screws with split washers
- 4. One #10-32x1" socket cap screw with flat washer
- 5. Connecting tubing to instrument.

If anything is missing or obviously damaged, contact 2B Technologies immediately.

Description

Nitrous oxide is supplied to the instrument by means of N₂O cartridges. Each cartridge contains ~16 g or~ 8 g of liquid N₂O. When using the Portable N₂O Source with the Model 211 Scrubberless Ozone Monitor, the cartridges will supply a gas flow of N₂O of 13 mL/min for ~8 hours (16-g cartridge) or 4 hours (8-g cartridge). For the Model 408 NO Calibration Source, the cartridges will supply a gas flow of N₂O of 40-60 mL/min and provide an operating time of ~2 hours (16-g cartridge) or ~1 hour (8-g cartridge). The pressure inside the cartridge remains nearly constant as N₂O evaporates and flows out of the cartridge. The evaporation of N₂O causes the N₂O cartridge to cool, which, in turn, slightly reduces the internal pressure of ~600 psi.

Warning: If an N_2O cartridge is punctured outside the piercing device/regulator, liquid N_2O can escape, and if it evaporates on skin it will cause frost bite. The cartridge will also act as a "rocket" if the seal is punctured outside the piercing device/regulator. However, the N_2O cartridges are commonly used consumer products available commercially and are safe to handle if the procedure below is followed.

Installation of N₂O Cartridges

- Make sure that any cartridge already installed in the assembly is empty by checking that the reading on the pressure gauge is below 50 psi with the on/off valve open. To make sure the valve is open, check that the knob cannot be turned clockwise any further. Do not tighten the knob more than hand-tight.
- 2) Close the on/off valve by rotating the knob clockwise until you feel the knob stop turning.
- 3) Unscrew the cartridge cup from the assembly. Do not completely remove the cartridge cup until you are certain that any residual N₂O gas has escaped. If you hear a hissing sound, N₂O is escaping. Once all the N₂O has been vented, completely remove the cartridge cup and remove the empty cartridge. The cartridges are made of steel and may be recycled.
- 4) Insert a new cartridge into the cartridge cup with the narrow neck of the cartridge pointed upward.

If using an 8-g N_2O cartridge, the removable insert should be left in place in the bottom of the black cartridge holder. If using a 16-g cartridge, slide the insert out of the black cartridge holder.

5) Reattach the cartridge cup to the piercing device. As you screw the cup onto the piercing device, the cartridge seal will be punctured, and as you continue to

Portable N₂O Source Manual Rev. B-3

rotate the cup a seal will be made. You should rotate the cup quickly after puncturing the cartridge to minimize loss of N_2O gas. Do not tighten the cartridge cup more than hand-tight so that it is not difficult to remove the cup later.

Operation

- 1) When not using the Portable N₂O Source, keep the on/off valve closed (knob turned completely clockwise).
- To use the Portable N₂O Source, check that there is tubing connecting the source to the instrument and then open the on/off valve by turning the knob completely counterclockwise. Use only moderate hand force to loosen the knob (do not force with tools).
- 3) The pressure gauge will read ~600 psi, until the liquid N₂O in the cartridge is exhausted. Then the pressure will rapidly fall off.
- 4) To stop using the N₂O source, close the on/off valve by turning the knob completely clockwise. Do not tighten the knob more than hand-tight.