



EDS Model O₂D1

INSTRUCTION MANUAL

Single Person
Electronic Digital Pulse-Demand
Aviation Oxygen Delivery System

Patent # 6,220,244
Other Patents Pending



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LIMITED LIFETIME WARRANTY

Mountain High Equipment & Supply Company warrants your MH EDS-O2D1 unit or system against defects in materials and workmanship for as long as you own it. Should any part of the MH EDS-O2D1 become defective, follow the return instructions found later in this manual and we will repair or replace it free of charge (you pay only shipping). This warranty is only valid if Mountain High Equipment & Supply Company determines that the system and its components have not been damaged due to improper use, been submerged in fluids, dismantled or abused. Mountain High Equipment & Supply Company reserves the right to determine if repairs are to be done under warranty or at a nominal charge. To activate warranty coverage, you must complete and return the owner's guarantee & registration form that came with your MH EDS-O2D1 unit.

NOTICE OF NON-LIABILITY

This device is classified as, and is only suitable for use as, a supplementary breathing apparatus (SBA) for aviation use. It is intended to help supply the needed amount of oxygen for persons during excursions at flight altitudes where supplemental oxygen is needed. This device is not suitable for any type of life support operations. This device is not suitable for SCBA (Self Contained Breathing Apparatus), SCUBA (Self Contained Underwater Breathing Apparatus) or any medical operations.

Before it is put to use, it is the responsibility of any user who will use this device to become familiar with the operation and safety aspects of this device. Using the system improperly could cause failure and lead to possible property damage and/or personal injury.

Mountain High Equipment & Supply Company assumes no responsibility for property damage, accidents, injury or death that may result from the misuse of this device/equipment. This includes any use of this device/equipment outside the scope of common sense, the Instruction Manual, inserts and other related documentation.

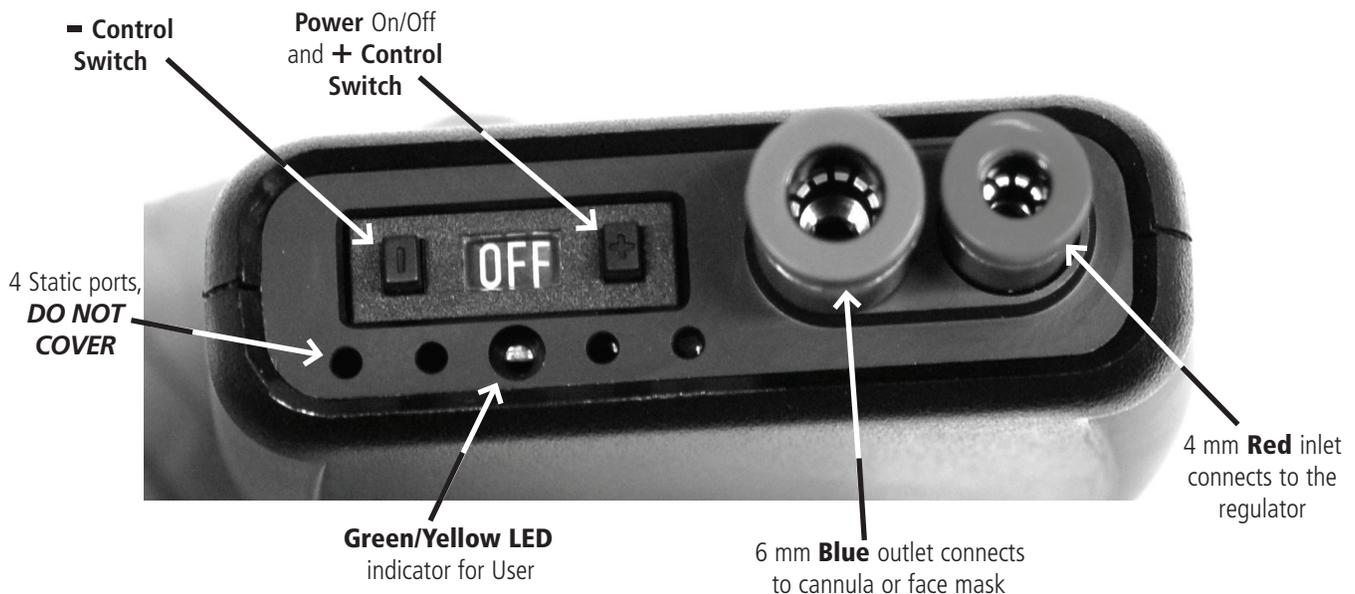
INTRODUCTION

The patented MH EDS-O2D1 is an aviation oxygen delivery device for one person. It is designed to deliver aviation oxygen in the most efficient, comfortable and convenient way possible. With its user-selectable settings, apnea alarm and small size, the MH EDS-O2D1 is the most portable and flexible electronic digital oxygen delivery system in the world.

By providing a measured pulse of oxygen every time you breathe in, the MH EDS-O2D1 automatically supplies the oxygen you need to stay alert and comfortable while flying. In contrast to constant flow systems that waste oxygen by supplying more than your body can use, the MH EDS-O2D1 provides a short pulse of oxygen as you inhale, ensuring that your oxygen is used most efficiently. Efficient oxygen delivery means you can fly further on a single oxygen refill or save space and weight with a smaller tank. It also makes it more feasible to enjoy the advantages of oxygen while flying below the altitudes where oxygen is mandated--that can mean fewer headaches, increased alertness, and feeling less exhausted when you reach your destination. Your actual oxygen usage will be determined by your breathing rate and physiological needs at altitude.

The programmability of the MH EDS-O2D1 means that, unlike constant-flow oxygen systems, you can “set it and forget it”. By automatically detecting your pressure altitude, the MH EDS-O2D1 can be set to start providing oxygen immediately or at a specified altitude and will automatically adjust the oxygen flow as your altitude changes. When you’re flying, don’t you have more important things to do than adjust your oxygen flow during altitude changes?

FEATURES



- Easy-to-use two-button control, small size and light weight
- Automatically adjusts oxygen flow with altitude
- Provides reduced oxygen consumption through more efficient oxygen delivery than standard constant-flow systems
- Push button control switch allows automatic altitude enable, Night and Day operations and high flow settings
- Green/Yellow LEDs indicate oxygen flow, alarm, and status
- Audible and visible apnea alarm informs user of kinked, pinched, or disconnected oxygen lines, obstructed cannula or mask
- Reduced dry mouth discomfort compared to constant-flow oxygen systems

BASIC SAFETY

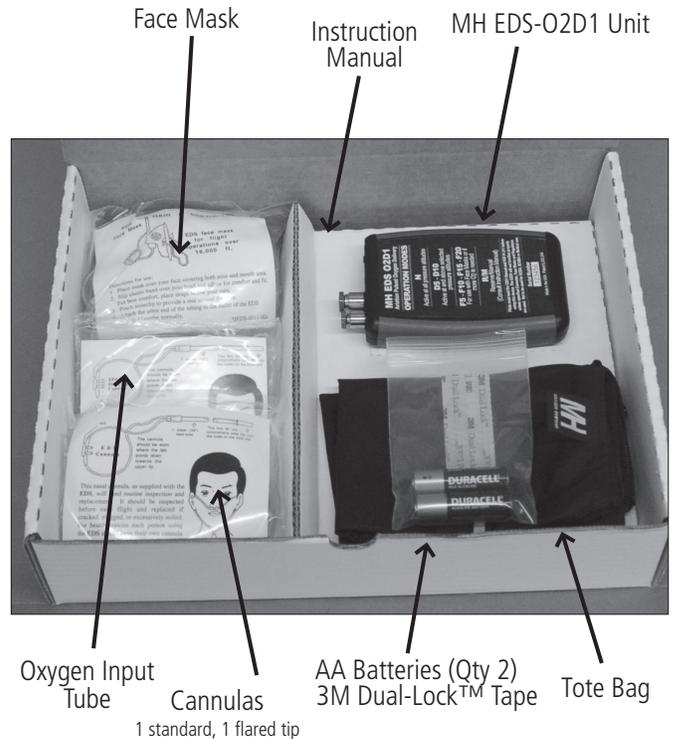
Pure oxygen is a highly oxidizing gas and can vigorously accelerate combustion. It can provide a catalyst for spontaneous combustion resulting in personal injury or death if not used properly and with caution.

DO NOT use any type of oil or grease on any of the fittings, valves or cylinders. DO NOT smoke while in use. DO NOT operate near an open flame.

GETTING STARTED

The MH EDS O2D1 is intended to be used with regulators provided by Mountain High. Some third-party oxygen regulators may be used. See "Using a Third-Party Regulator" page 7 for details. Pilots who intend to fly with the MH EDS O2D1 are advised to familiarize themselves and their passengers with the system prior to using it. Two cannulas and a face mask are included with the MH EDS O2D1 unit. The cannula may be used for flight operations up to 18,000 ft. Above 18,000 ft., a face mask should be worn. A compatible face mask with a built-in microphone is available from Mountain High.

1. **If** you have not already done so, fill your cylinder with Aviation oxygen. (Many FBOs offer this service.)
2. **Inventory** your system (see photo) and read the front label on the unit.
3. **Per** the instructions provided with your cylinder and regulator, attach the regulator to the cylinder and **hand tighten only (DO NOT use a wrench or pliers—the "O" ring seals the regulator to the cylinder, over tightening will damage the regulator).**
4. **Open** the battery cover on the back of the MH EDS-O2D1 unit, install the 2 AA batteries (supplied) and replace the battery cover. (NOTE: Batteries fit tightly, handle with care.) See next page for detailed instructions.
5. **If** you are using the MH EDS-O2D1 with a Mountain High Four-Port regulator (FPR), locate the oxygen input tube (clear tube with a short red tube on one end) and insert the Red tube into the red "Oxygen In" connector on the MH EDS-O2D1 unit until it stops (approx. 1/8 inch). Then connect the other end of the tube to your regulator. If you are using a MH single port regulator (XCR), use the tube that came with the regulator in place of the tube that came with your MH EDS-O2D1.
6. **Insert** the Blue end of the cannula or face mask tubing into the **blue "Out" connector** on the unit.
(CAUTION: DO NOT pinch the Cannula or Facemask tubing when inserting them into the blue "Out" connectors). Use only the supplied MH EDS cannula as other cannulas may not work properly with the MH EDS-O2D1. DO NOT lengthen or shorten the cannula tube.
7. **Turn** the cylinder valve on.
8. **Push** the "+" power/control button on the MH EDS-O2D1 unit once. This will turn the unit on and set it to "N" mode. A start-up pulse of oxygen, LED light and beeper test will verify battery power.
9. **Don** the cannula or face mask (make sure the face mask seals against the skin) and take a breath. The bright green LED should illuminate, and a pulse of oxygen should be delivered. Refer to the card that comes with the cannula or facemask for details on donning.
10. **You are ready to fly.**



Comfortable cannula position, looped over ears

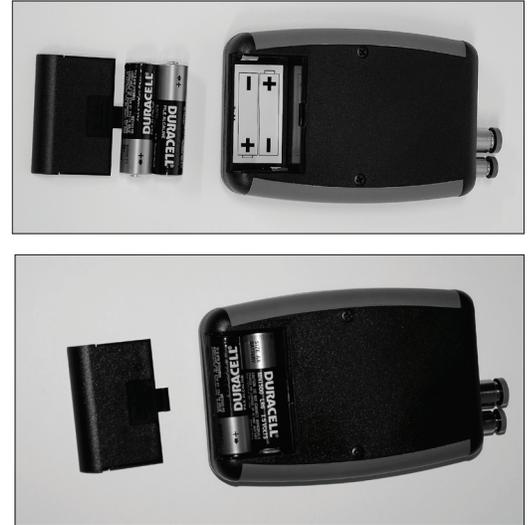


O2D1 with cannulas, regulator connection, regulator and cylinder



INSERTING AND REMOVING THE BATTERIES

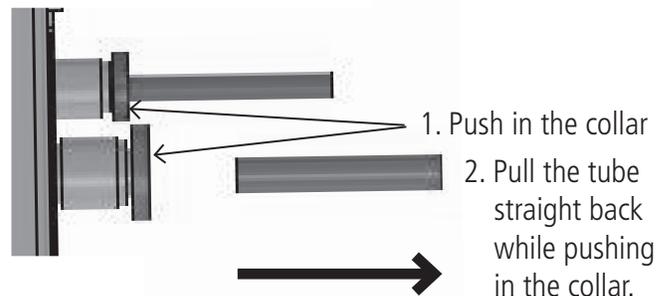
Remove the battery door by pressing down gently on the battery cover flange then slide the door out and away from the unit. The O2D1 unit uses two (2) standard AA alkaline (or NiMH or NiCAD) batteries. Insert the batteries as shown on the label inside the battery compartment (they will be a tight fit), then replace the door by sliding the door into place until it snaps in place. Take care when removing and replacing the batteries as to not damage the batteries and/or connectors.



REMOVING THE TUBING

To Remove the tubing, push in slightly on the tubing, then push in the connector collar while you pull gently on the tubing to remove it.

DO NOT pull on the tubing without pushing in the collar; it will damage the connector.



STORING THE MH EDS-O2D1

When not being used, the MH EDS-O2D1 unit, oxygen tubes, cannulas, etc., should be disconnected from the oxygen supply and stored in a secure manner to ensure that dirt and debris do not enter the inlet and outlet tubes. The supplied tote bag or a zip-top plastic bag is a good storage container. ***If the unit is not going to be used for 30 days or more, remove the batteries. When using the unit for the first time after storage, check the batteries to ensure proper operation. A set of fresh spare batteries should be part of your pre-flight inventory.***

DO NOT store the EDS unit while the inlet is under pressure. Remove all sources of oxygen pressure and secure the unit to ensure it will not become damaged. If the lines are disconnected they must be covered so that debris, dust or dirt can't get in. If the supply line is left hooked to the system, make sure that it is first purged with clean dry air or oxygen before the EDS unit is connected. ***If the lines are disconnected they must be covered so that debris, dust or dirt can't get in.***

MOUNTING THE MH EDS-O2D1

You may mount the MH EDS-O2D1 unit to a suitable place using the supplied piece of 3M DUAL LOCK tape. Peel the protective backing off one of the rectangles to expose the adhesive and apply it to the back of the unit above the thumb indent for the battery door. **DO NOT COVER ANY PART OF THE BATTERY DOOR.** When a suitable place to mount the unit has been found, peel off the protective adhesive backing on the other rectangle and press the adhesive side to the chosen mounting area. ***Let the adhesive cure for 12 hours before attempting to remove the two halves of the Dual-Lock from each other, or the adhesive may pull away from the unit or mounting area.***

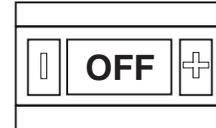
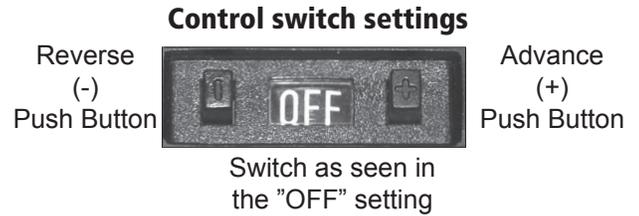
CONTROL SWITCH SETTINGS AND MODES OF OPERATION

The MH EDS-O2D1 unit is controlled by two push button control switches. A stop inside the selector switch prevents inadvertently turning the unit off in flight.

The MH EDS-O2D1 has three main modes of user controlled operation:

1. Fully-Automatic (D5, D10)
2. Semi-Automatic (N and F modes)
3. Manual (R/M)

NOTE: The N and D modes are designed to provide the amount of oxygen needed by an average size healthy person using a cannula at the given altitudes; your needs may be different. To determine whether you are receiving enough oxygen in a particular mode you will need to use a pulse oximeter (available from Mountain High) to determine your blood oxygen saturation (goal is 90-100%) at any given altitude. In all modes (except R/M), the O2D1 provides a pulse of oxygen which increases with altitude, i.e., it is altitude compensating.

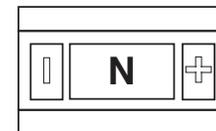


N MODE: "Night" or "Now"

At this setting the MH EDS-O2D1 will immediately start the standard oxygen flow providing pulses of oxygen appropriate for an average healthy person using a cannula.

Flow start: All altitudes
Flow amount: Standard

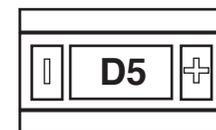
Use with: Cannula
Altitude Compensating?: Yes



D MODES: "Day" or "Delayed"

The *D5* setting will cause the MH EDS-O2D2 unit to delay oxygen flow until it senses a pressure altitude of 5,000 ft. and above. The *D10* setting delays oxygen flow until 10,000 ft. and above. NOTE: When the barometric pressure is low, it will start operation at a slightly lower altitude than when the barometric pressure is high.

Flow start: D5--5,000 ft., D10--10,000 ft. **Use with:** Cannula
Flow amount: Standard **Altitude Compensating?:** Yes



F MODES: "Face Mask"

The *F* mode settings (*F5*, *F10*, *F15*, and *F20*) are called the "Face mask" settings. They supplement the standard oxygen flow with a richer flow by adding approximately the selected number of feet (in thousands) to the MH EDS-O2D1's perceived altitude.

Flow start: All altitudes
Flow amount:
Enriched: F5 =Standard+5,000 ft
 F10=Standard+10,000 ft
 F15=Standard+15,000 ft.
 F20=Standard+20,000 ft.

Use with: Cannula or face mask
Altitude Compensating?: Yes

Example: If you are at a pressure altitude of 5,000 ft. and select the F10 setting you will receive the effective flow rate of 5,000 + 10,000 = 15,000 ft. The "F" modes are useful for people for whom the standard oxygen supply does not achieve the desired blood oxygen saturation or for those who prefer to use a face mask rather than a cannula.

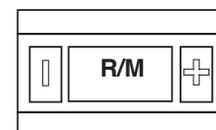


R/M: "Reserve/Manual"

This last switch setting, *R/M*, for "Reserve" or "Manual" provides the maximum oxygen flow regardless of altitude. The pulse duration does not vary with altitude.

Flow start: All altitudes
Flow amount: Maximum

Use with: Cannula or face mask
Altitude Compensating?: No



DISPLAY AND ALARM INFORMATION

There is a LED display on the MH EDS-O2D1. A **Green LED** indicates oxygen flow for every breath. A rapidly flashing **Yellow LED** indicates a flow fault or apnea condition and a slowly flashing **Yellow LED** indicates low battery.

FLOW FAULT ALARM

The MH EDS-O2D1 will produce a two second **Yellow LED** and a two-second series of beeps sound to indicate that the oxygen flow from the tank has stopped. This typically means that the oxygen supply is depleted; the supply line has been pinched closed, is plugged up or has come off; or the valve has failed to open.

APNEA ALARM

The MH EDS-O2D1 will produce a visible **YELLOW LED** (4 flashes) and audible (4 beeps) Apnea alarm every four seconds to indicate that the breathing has not been detected within the past 30 seconds. This typically occurs for the following reasons: (1) The user has quit breathing for 30 seconds or the cannula/face mask is improperly worn. (2) The outlet tube from the MH EDS-O2D1 to the mask or cannula has become disconnected. (3) The outlet tubing has become pinched closed or is plugged off.

POWER-UP SELF TEST

The MH EDS O2D1 provides a battery check when the unit is first turned on. The LED's flash and the alarm sounds for about 2 seconds.

LOW BATTERY

While the EDS-O2D1 will operate approximately 100 hours with a fresh set of alkaline batteries under normal operations, eventually they will run low on reserve power. The MH EDS-O2D1 provides two levels of low battery warning before it stops functioning. The first warning will occur when the battery has approximately 5 hours left and will appear as a single flash of the **YELLOW LED** every 2 seconds. (*Note: there will be no audible alarm*). The second level warning occurs with approximately 2 hours remaining. The **YELLOW LED** will double flash once every 2 seconds, with no audible alarm. When the batteries have reached the end of their useful life, an audible alarm will accompany the double-flash LED every 2 seconds. **When this alarm occurs, the air flow will stop and batteries should be replaced IMMEDIATELY.**

USER ADJUSTABLE SETTINGS

The MH O2D1 has two programmable toggle settings that can be changed by the user. The apnea alarm below the D5/D10 threshold altitude can be enabled and disabled, and the unit's audio output can be turned on and off. The settings are adjusted by pressing the +UP and -DOWN buttons during the power ON self test as described below.

Apnea alarm below D5/D10 threshold altitude ON/OFF setting. (UP 2 DOWN 1)

By default, when the O2D1 unit detects no breaths for approximately 30 seconds, the apnea alarm occurs. This happens at all altitudes, even when the unit is set to D5/D10 mode and the pilot is below the turn-on threshold altitude (i.e. below 5,000/10,000 feet). By adjusting this setting, the apnea alarm can be disabled when in D5/D10 mode and below the threshold altitude. To toggle this setting ON or OFF, perform the following: Starting with the unit OFF, quickly press the +UP button two times, then the -DOWN button one time: (i.e. OFF ... N...D5...N). The unit ends up in 'N' mode. This button press sequence must be completed before the unit's start up self test is finished (within 2 seconds), otherwise the setting is not changed. Note: that the apnea alarm will always occur above the D5/D10 threshold altitude, regardless of this setting.

Audio output ON/OFF setting. (UP 3 DOWN 2)

By default, the O2D1 unit provides audio output for the various alarms. By turning this setting off, the audio output is disabled resulting in silent operation while in flight. To toggle this setting ON or OFF, perform the following: Starting with the unit OFF, quickly press the +UP button three times, then the -DOWN button two times: (i.e. OFF ... N...DS...DIO...D5...N). The unit ends up in 'N' mode. This button press sequence must be completed before the unit's start up self test is finished (within 2 seconds), otherwise the setting is not changed. Note: The audio always sounds during power up while it performs its start up self test, regardless of this setting.

USING THE MH EDS-O2D1 WITH A THIRD-PARTY REGULATOR

If the EDS-O2D1 will not be used with a MH Regulator, the alternate regulator must be able to deliver a pressure of between 15 and 33 psi (static). If the above listed pressure specifications are not met, the EDS-O2D1 may not operate correctly. Lower pressures will result in an inadequate volume of oxygen. Higher pressures will result in a too high volume of oxygen. Excessively high pressures will cause the valve to open spontaneously and leak oxygen.

To use the MH EDS-O2D1 with a third-party regulator or built-in oxygen system with a pressure higher than 33 psi, it is recommended that you use the MH EDS Regulator Stabilizer (EDS-STR) to ensure correct flow pressure. The EDS-STR goes between the third-party regulator or built in system and the MH EDS-O2D1 to reduce the flow pressure to an appropriate level. Up to six MH EDS-O2D1 users may be connected to the EDS-STR. Call MH for specific EDS-STR information.

Maximum respiration rate: In all modes: Up to 30 BPM (*Breaths per minute*).

Apnea time-out: Approximately 30 seconds. Apnea alarm sounds in the "D" modes if your actual pressure altitude is below the D5 or D10 altitude setting.

Operating inlet pressures: 15 -25 psi. At higher inlet pressures the valve may open to relieve the pressure and the unit will not operate correctly.

Operating Voltage: Low-Voltage warning: (Initial low battery alarm) 4-8 hours remaining - 1 flash of the Green/Yellow LED.
Low-Voltage cut-out: (Second low battery alarm) Very low voltage warning ~ 1 - 2 hours remaining - 2 flashes of Green/Yellow LED.

Battery Life: 100 Hours @ 75° F. (~ 25° C.) operating, assuming fresh alkaline batteries under normal conditions.

Storage: The MH EDS-O2D1 will not draw any current during storage while in the 'OFF' setting.

Battery type: 2 Standard AA alkaline DURACELL type MX1500 or equivalent.

Physical characteristics (EDS-O2D1 unit only):

Width:	3.15" (8.0 cm.)
Height:	5.25" (13.2 cm.) enclosure and ports
Depth:	.93" (2.23 cm.)
Weight:	8.2 oz. (0.233 kg.) with batteries



Testing and characterization was done under normal operating conditions i.e. 75°F (25°C) and responding to a respiration rate of about 15 breaths per minute. Specifications are subject to change without notice.

TROUBLESHOOTING

- **The O2D1 unit emits no sound or start-up oxygen pulse when turned on:**
 1. Check batteries to make certain they are fresh.
- **Start-up sound is heard, but no start-up oxygen pulse delivered:**
 1. Check oxygen cylinder valve is on.
 2. Check oxygen supply tube for proper connection.
 3. Check oxygen supply tube for obstructions.
 4. Check O2D1 outlet tubing for obstructions.
- **When using the face mask, no oxygen pulse on inhalation:**
 1. Make sure the face mask is sealed against the skin.
 2. Check for obstructions on the **O2D1** outlet tubing.
 3. Use only face masks provided by Mountain High Equipment & Supply.
NOTE: EDS face masks DO NOT have a dilution bag attached
- **Oxygen pulses are delivered, but an alarm is heard at the same time:**
 1. Check the battery to make certain it is fresh.
 2. Check for obstructions in the cannula/mask and tubing.
 3. Use only masks and cannulas supplied by Mountain High Equipment & Supply.
- **The O2D1 does not trigger at higher altitudes:**
 1. Try using the Flared-Tip cannula included with the kit (MH part number 00EDS-1084-01)

WARNING:

DO NOT increase or decrease length of cannula or face mask supply tubing.