EDS Model O$_2$D$_2$

INSTRUCTION MANUAL

**1- or 2-Person
Electronic Digital Pulse-Demand
Aviation Oxygen Delivery System**

Patent # 6,220,244
Other Patents Pending

MH

MOUNTAIN HIGH
Equipment & Supply Company

Aviation Oxygen Systems

800-468-8185
541-923-4100
Fax: 541-923-4141
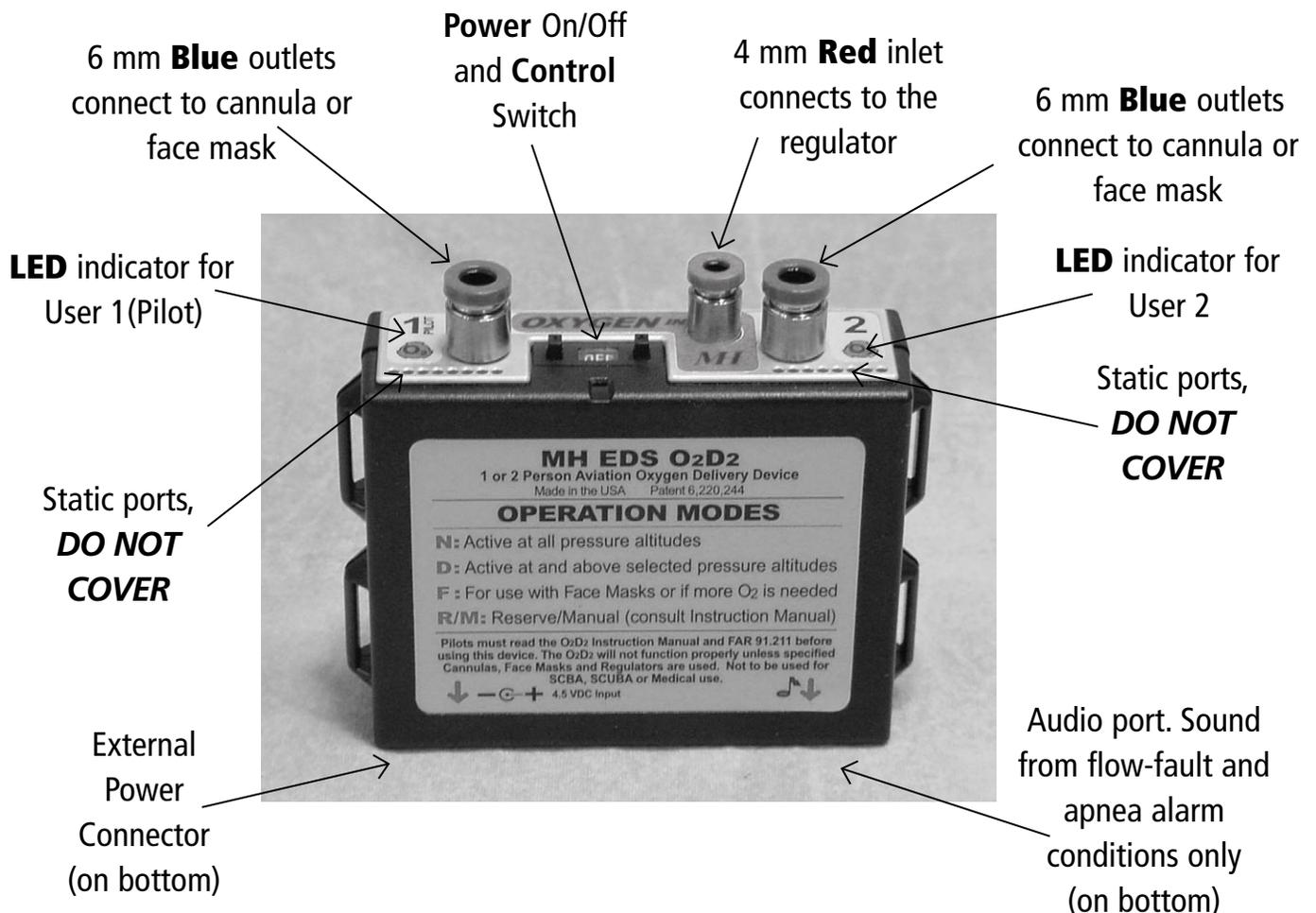
www.MHoxygen.com

625 SE Salmon Ave.
Redmond, OR 97756-8696
U S A

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6 mm **Blue** outlets
connect to cannula or
face mask

Power On/Off
and **Control**
Switch

4 mm **Red** inlet
connects to the
regulator

6 mm **Blue** outlets
connect to cannula or
face mask

LED indicator for
User 1(Pilot)

LED indicator for
User 2

Static ports,
***DO NOT
COVER***

Static ports,
***DO NOT
COVER***

MH EDS O$_2$D$_2$
1 or 2 Person Aviation Oxygen Delivery Device
Made in the USA   Patent 6,220,244
OPERATION MODES

N: Active at all pressure altitudes
D: Active at and above selected pressure altitudes
F : For use with Face Masks or if more O$_2$ is needed
R/M: Reserve/Manual (consult Instruction Manual)

Pilots must read the O$_2$D$_2$ Instruction Manual and FAR 91.211 before
using this device. The O$_2$D$_2$ will not function properly unless specified
Cannulas, Face Masks and Regulators are used. Not to be used for
SCBA, SCUBA or Medical use.

— ⊙ + 4.5 VDC Input

External
Power
Connector
(on bottom)

Audio port. Sound
from flow-fault and
apnea alarm
conditions only
(on bottom)

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LIMITED LIFETIME WARRANTY

Mountain High Equipment & Supply Company warrants your MH EDS-O2D2 unit or system against defects in materials and workmanship for as long as you own it. Should any part of the MH EDS-O2D2 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-O2D2 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.
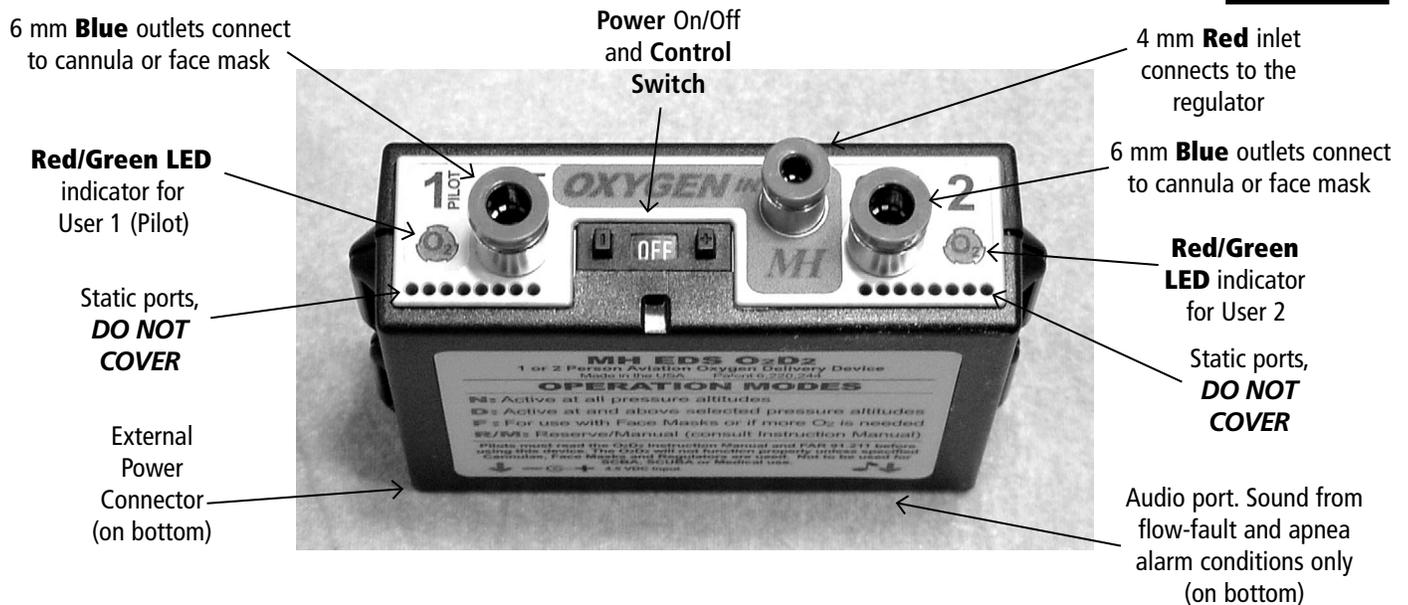
The patented MH EDS-O2D2 is a one- or two-person aviation oxygen delivery system. It is designed to deliver aviation oxygen in the most efficient, comfortable and convenient way possible. With its user-selectable settings, apnea alarm and small size, the MH EDS-O2D2 is the most portable and flexible electronic digital oxygen delivery system in the world.

By providing a measured pulse of oxygen every time you breathe in, the MH EDS-O2D2 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-O2D2 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-O2D2 means that, unlike constant-flow oxygen systems, you can "set it and forget it". By automatically detecting your pressure altitude, the MH EDS-O2D2 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?

FEATURES

6 mm **Blue** outlets connect to cannula or face mask

Power On/Off and **Control** Switch

4 mm **Red** inlet connects to the regulator

Red/Green LED indicator for User 1 (Pilot)

6 mm **Blue** outlets connect to cannula or face mask

Static ports, *DO NOT COVER*

Red/Green LED indicator for User 2

External Power Connector (on bottom)

Static ports, *DO NOT COVER*

Audio port. Sound from flow-fault and apnea alarm conditions only (on bottom)

- Easy-to-use two-button control, small size and light weight
- Automatically adjusts oxygen flow for different altitudes
- 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/Red 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
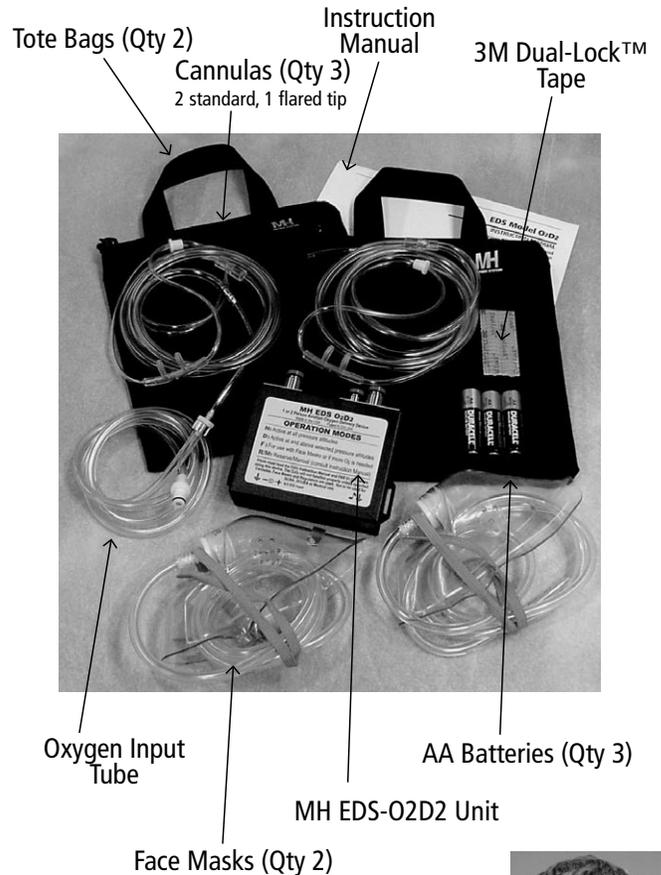- Reduced dry mouth discomfort compared to constant-flow oxygen systems

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.

The MH EDS O2D2 is intended to be used with regulators provided by Mountain High although some third-party oxygen regulators may be used. (See "Using a Third-Party Regulator" for details) Pilots who intend to fly with the MH EDS O2D2 are advised to familiarize themselves and their passenger with the system prior to using it. Two cannulas and face masks are included with the MH EDS O2D2 unit. The cannula may be used for flight operations up to 18,000 ft. MSL. Above 18,000 ft., the face mask must 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. 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).*

3. Open the MH EDS-O2D2 carton, inventory your system *(see photo) and* read the front face plate on the unit.

4. Open the battery cover on the back of the MH EDS-O2D2 unit, install the 3 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-O2D2 with a Mountain High multiport regulator (FPR), locate the air 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-O2D2 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 rather than the tube that came with your MH EDS-O2D2.

6. Insert the Blue end of the cannula or face mask tubing into the *blue* number 1 (Pilot) "Out" connector on the unit. For a second user, repeat with the number 2 connector. *Always use the number 1 connector when only one person will be using the system.* *(CAUTION: Use only the supplied MH EDS cannula. Other cannulas may not work properly with the MH EDS-O2D2. Do not lengthen or shorten the cannula tube.)*

7. Turn the cylinder valve on.

8. Push the "+" power/control button on the MH EDS-O2D2 unit once. This will turn the unit on and set it to "N" mode. A start-up pulse of oxygen and beeper test will verify battery power.

9. Put on the cannula or face mask (make sure the face mask seals against the skin) and take a breath. The bright green LED under the #1 should illuminate, and a pulse of oxygen should be delivered.

10. You are ready to fly.

Tote Bags (Qty 2)

Instruction Manual

Cannulas (Qty 3)
2 standard, 1 flared tip

3M Dual-Lock™ Tape

Oxygen Input Tube

AA Batteries (Qty 3)

MH EDS-O2D2 Unit

Face Masks (Qty 2)

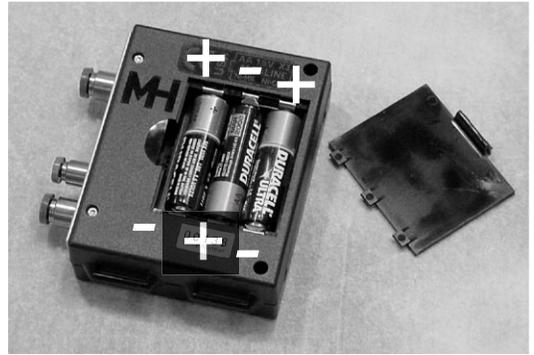Comfortable cannula position, looped over ears

O2D2 with two 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 tip the door out and away from the unit. The EDS-O2D2 unit uses 3 standard AA alkaline (or NiMH or NiCAD) batteries. Insert the batteries as shown (they will be a tight fit), then replace the door by setting the bottom of the door in place and tipping the top in until it snaps in place. Take care when removing and replacing the batteries to not damage the batteries and/or connectors.
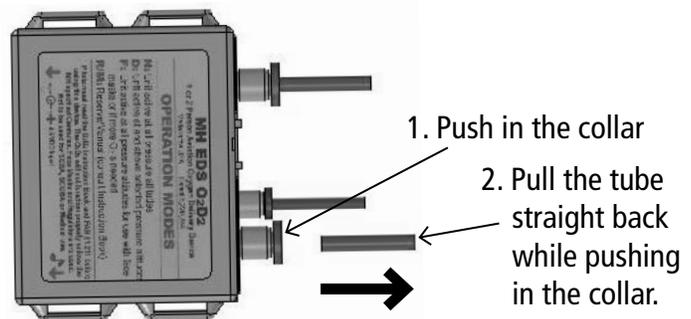
An optional external power connector is available. See our web site or call for additional information. *(MH Part Number: 39300 - 1245 - 00)*

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.

1. Push in the collar

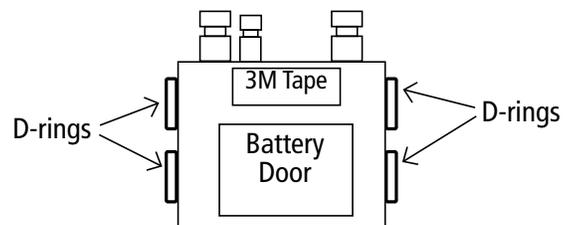2. Pull the tube straight back while pushing in the collar.

STORING THE MH EDS-O2D2

When not being used, the MH EDS-O2D2 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 become lodged in the inlet and outlet tubes. The supplied tote bags 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-O2D2

You may mount the MH EDS-O2D2 unit to a suitable place using the supplied piece of 3M DUAL LOCK tape. First, cut the piece of DUAL LOCK tape in half, lengthwise, creating two long rectangles. 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 and press the adhesive side to the chosen mounting area.

You may also mount the MH EDS-O2D2 by feeding 3/4"- wide straps (not included) through the D-rings molded into the unit.

3M Tape

D-rings

Battery Door

D-rings

CONTROL SWITCH SETTINGS AND MODES OF OPERATION

The MH EDS-O2D2 unit is controlled by two push button control switches. A stop inside the selector switch prevents inadvertently turning the unit off in flight.

Control switch settings

The MH EDS-O2D2 has three main modes of user controlled operation:
1. **Fully-Automatic (N, D5, D10)**
2. **Semi-Automatic (all F modes)**
3. **Manual (R/M)**

Reverse (-) Push Button | **OFF** | Advance (+) Push Button

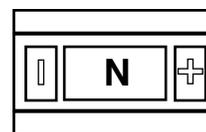Switch as seen in the full reverse (-), "OFF" setting

NOTE: The N and D modes are designed to provide the amount of oxygen needed by an average 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 may want to use a pulse oximeter (available from Mountain High) to determine your blood oxygen saturation (goal is 90-95%) at any given altitude. The selected MH EDS-O2D2 mode applies to both users and should be set to accommodate the user with the highest oxygen need.

N MODE: "Night" or "Now"

At this setting the MH EDS-O2D2 will immediately start the standard oxygen flow providing pulses of oxygen appropriate for an average healthy person using a cannula.

N

Flow start: Immediate
Flow amount: Standard
Use with: Cannula
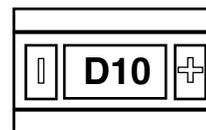**Altitude Compensating?**: Yes

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 sooner *(at a lower MSL flight altitude)* than when the barometric pressure is high.

D10

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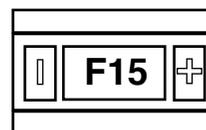**Use with:** Cannula
Altitude Compensating?: Yes

F MODES: "Floor" or "Face Mask"

The *F* mode settings *(F5, F10, F15, and F20)* are called the "*Floor*" or *"Face mask"* settings. They supplement the standard oxygen flow by adding the selected number of feet (in thousands) to the MH EDS-O2D2's perceived altitude.

Flow start: Immediate
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

F15

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.

R/M

Flow start: Immediate
Flow amount: Maximum
Use with: Cannula or face mask
Altitude Compensating?: No

DISPLAY AND ALARM INFORMATION

There are two LED displays on the MH EDS-O2D2, one for each user. In each, a **Green light** indicates oxygen flow for every breath. A rapidly flashing **Red light** on either side indicates a flow fault or apnea condition and an flashing **Red light** alternating between both sides indicates low battery.

FLOW FAULT ALARM

The MH EDS-O2D2 will produce a two second **Red light** 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-O2D2 will produce a visible **Red light (2 flashes)** and audible (2 beep) **Apnea** alarm to indicate that the pressure drop indicating breathing has not occurred within the past 45 seconds. This typically occurs for the following reasons: **(1)** The user has quit breathing for 45 seconds or the cannula/face mask is improperly worn. **(2)** The outlet tube from the MH EDS-O2D2 to the mask or cannula has become disconnected. **(3)** The outlet tubing has become pinched closed or is plugged off. The apnea alarm can be used as a "put-your-oxygen-on" alarm once you get to the preset D mode altitude (D5 or D10). In this case, the alarm will not sound if you already have the cannula or face mask on properly.

LOW BATTERY

The MH EDS-O2D2 provides two levels of low battery warning. The first warning will occur when the battery level reaches approximately 3.0 volts and will appear as alternate flashes of the Red LEDs for user 1 and user 2. There will be no audible alarm. The unit will continue to operate properly for about four hours @ 25° C after the indicator starts to flash. The second level warning occurs at approximately 2.5 volts. The **Red LED**s for each user will flash quickly and a continuous pattern of beeps will be heard. When this alarm occurs, the air flow will stop and batteries should be replaced IMMEDIATELY. The EDS-O2D2 will operate for 150 to 200 hours with a fresh set of alkaline batteries under normal operation.

EXTERNAL POWER

The MH EDS-O2D2 unit has an optional external power connector which allows the unit to operate from an external power supply (not included) that provides 4.5 volts DC. The inside conductor "tip" is positive (+) and the outside ring is negative (-). The MH EDS O2D2 power input is reverse polarity protected. *(MH Part Number: 39300 - 1245 - 00)*

USING THE MH EDS-O2D2 WITH A THIRD-PARTY REGULATOR

If the EDS-O2D2 will not be used with a MH Regulator, the alternate regulator must be able to deliver a pressure of between 12 and 35 psi. If the above listed pressure specifications are not met, the EDS-O2D2 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-O2D2 with a third-party regulator or built-in oxygen system with a pressure higher than 35 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-O2D2 to reduce the flow pressure to an appropriate level. Up to six (6) MH EDS-D1a or MH EDS-O2D2 users may be connected to the EDS-STR. Call MH for specific EDS-STR information.

Maximum respiration rate:

In R/M mode: Fixed @ 30 BPM *(Breaths per minute).*

In all other modes: 0-10K ft. = 20 BPM, 12-20K ft. = 22 BPM, 21 - 25K ft. = 25 BPM

Apnea time-out: 45 seconds

Apnea alarm does not respond in the "**D**" modes if your actual pressure altitude is below the D5 or D10 altitude setting.

Operating inlet pressures: min/max only

12 psi/35 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:	3.0 VDC	(Initial low battery alarm)
Low-Voltage cut-out: 2.5 VDC	(Second low battery alarm--Red LED on steady and no air pulses)	
Nom.:	4.5 VDC	
Max.:	5.5 VDC	

External Power is via a 3.5 mm. coaxial power-jack. Inside (tip) is positive (+). Outside (ring) is negative (-).

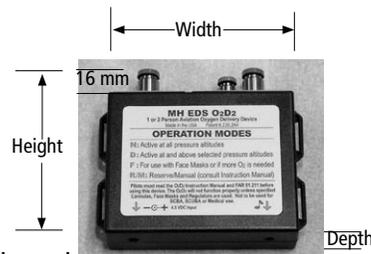|	
Battery Life:	150 to 200 Hours @ 25° C. operating, assuming fresh alkaline batteries under normal conditions.
Storage:	The MH EDS-O2D2 will not draw any current during storage while in the 'OFF' setting.
Battery type:	3 Standard AA alkaline DURACELL type MX1500 or equivalent.

Physical characteristics (EDS-O2D2 unit only):

Width:	4.25″ (10.80 cm.)
Height:	3.75″ (9.53 cm.) enclosure and ports
Depth:	1.25″ (3.18 cm.)
Weight:	8.5 oz. (1.17 kg.) without batteries
Audio Output:	1/8″ stereo jack, 15kΩ output impedance - each channel

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

TROUBLESHOOTING

● **The O2D2 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 O2D2 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 **O2D2** 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 O2D2 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.
DO NOT use the MH EPS (External Power Supply) with the O2D2 as the voltages are not compatible.