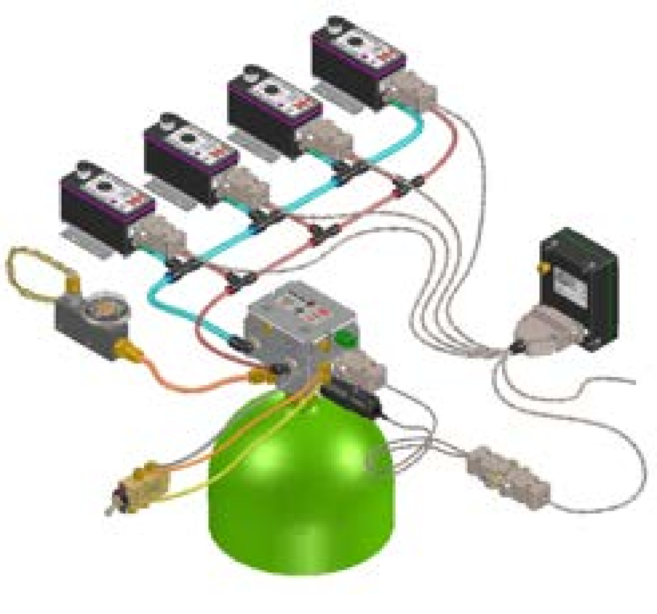
Oxygen Systems Overview

Mountain High Aircraft Oxygen Systems

Revision 1.0



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REVISION HISTORY			
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-	2025-11-11 2025-029	KQM	Initial Release

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INTRODUCTION

Mountain High Oxygen specializes in systems that deliver the maximum amount of oxygen per unit weight as efficiently as possible. Founded by pilot and engineer Patrick L. McLaughlin, Mountain High has been supplying aviation oxygen equipment and supplies since 1985. The company is known particularly for its patented 'Pulse-Demand™' Electronic Delivery System (EDS) devices. We have the ability to combine various systems into a configuration tailored to customer's specific aircraft mission requirements.

Note: The oxygen system Weight and Space requirements in the following system breakdowns depend on the cylinder chosen. See Cylinder Duration chart on last page for empty weights and raw cylinder lengths.

System Options:
Mountain High Oxygen Systems generally fall into the following categories:

- **Portable – Constant Flow**
- **Portable – Pulse Demand**
- **Built In – Constant Flow**
- **Built In – Pulse Demand**

Portable Constant Flow Systems:

Portable Constant Flow systems are the simplest and most cost effective oxygen systems available. These systems generally consist of a small tank with a manual valve and in-line pressure reducing regulator, which feed one or more small adjustable flow meters that each output to a conserving cannula or mask.

MH-XCP (Cross Country Pilot):

The MH XCP Constant Flow Series are our most economical, single and multi-place, portable oxygen systems for general aviation. Weight is kept to a minimum by the low profile, light weight regulators, MH-3 or MH-4 flowmeters and cylinders. The XCP systems come complete with cylinder, regulator, Mountain High MH-3 or MH-4 Flowmeters, Oxymizer® cannula, face mask, tote bag for each station and a padded full pack cylinder bag for easy carrying and seat back mounting. The XCP system can be used up to 30,000 ft. with the MH-4 Flowmeters and face masks. The MH-3 Flowmeter can be used for flights up to 18,000 ft.

MH-XCP System

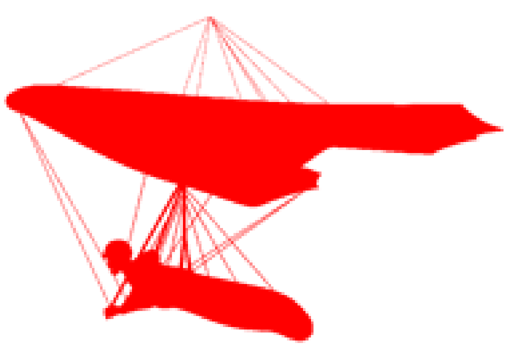
Portable Constant Flow Systems (Cont.):

MH-XCR (Cross Country Racer):

The XCR is a high-duration single-place carry-on oxygen system for multiple aviation uses. It is an excellent choice for the pilot who needs a small wearable system for hang gliding, paragliding or any situation where space is at a minimum and ease of use is a must. The XCR system is comprised of the cylinder, XCR cylinder, XCR primary reducing regulator, 5 feet of high-quality kink-proof 4 mm. OD polyurethane service line, one XCR control-holster with your choice of either a Mountain High MH-3 or MH-4 Flowmeter with remote on/off valve and moustache type Oxymizer® oxygen conserving cannula. The system can be strapped to your flight-suit or hang gliding harness. You can add up to four (4) flowmeters to one XCR regulator with optional split kits. There are “D” rings on the corners of the pilot control harness/holster allowing freedom to mount it to your arm, leg, shoulder-strap, uprights or almost any suitable object.

Typical MH-XCR Kit (Passport for scale)

MH-XCR



THE MH-XCR SYSTEM IS A POPULAR CHOICE FOR HANG GLIDING AND PARAGLIDING

Portable EOS (Emergency Oxygen Systems):

EOS Oxygen systems are intended for use during situations such as cabin depressurization and other emergencies where back-up oxygen is a must. Our EOS kits deliver a fixed 3 L/min of flow, allowing you to have a minimum of 10 minutes of oxygen per person. This is the required amount of oxygen delivery for emergency descents starting at 30,000 ft. in the event of a cabin depressurization as defined by the FAA.

EOS

To operate, simply don the masks and turn on the main cylinder valve. Oxygen will flow only if a mask is connected. A positive-flow indicator on each mask shows oxygen is being delivered (shown right).

00OEM-0010-00 (Roto)

00OEM-0020-00 (Toggle)

EOS-180 2-Place Portable Emergency Oxygen System:

2-place system with AL-180 (6 cu.ft.) aluminum cylinder, XCP-FPR 4-place regulator, 2 ea. EOS accumulating, non-rebreathing face masks with flow orifices and oxygen-flow indicators. A padded Full-Pack cylinder bag is included for strapping to a seat-back or other suitable surface. A built-in version is also available upon request.

EOS-180 2p

00EOS-0006-02

EOS-180 4-Place Portable Emergency Oxygen System:

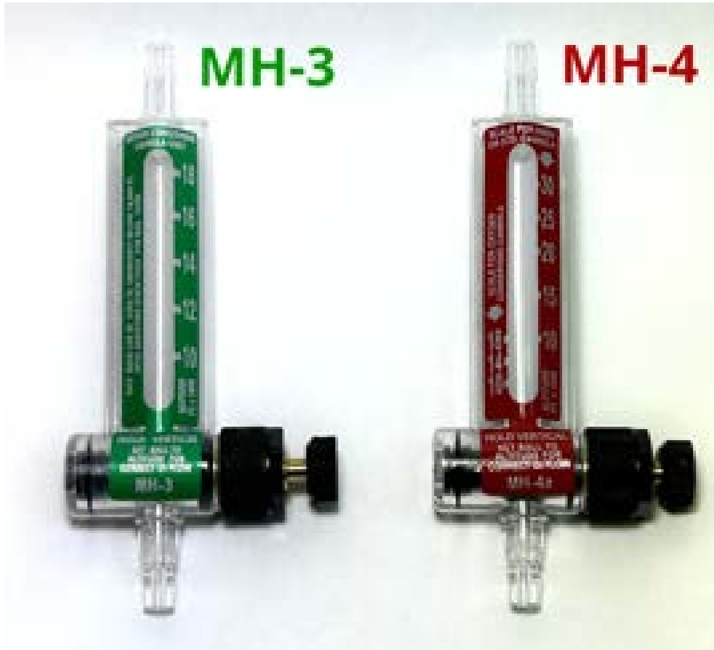
4-place system with AL-180 (6 cu.ft.) aluminum cylinder, XCP-FPR 4-Place regulator, 4 ea. EOS accumulating, non-rebreathing face masks with flow orifices and oxygen flow indicators. A padded Full-Pack cylinder bag is included for strapping to a seat-back or other suitable surface. A built-in version is also available upon request.

EOS-180 4p

00EOS-0006-04

Flowmeters (MH-3 & MH-4):

The MH-4 & MH-3 Flowmeters are featured in all of our portable constant flow oxygen systems (with the exception of the emergency systems). The MH-3 Flowmeter is calibrated for use with the Oxymizer® cannula for flight up to 18,000 ft. The MH-4 has two altitude/flow scales. The left (compressed) scale is calibrated for the Oxymizer® cannula and is limited to flights up to 18,000 ft. The right scale is calibrated for a standard cannula or facemask up to 30,000 ft. The MH-3 & MH-4 Flowmeters can be ordered with a connector and tubing to work with almost any type of built-in or portable aircraft oxygen system.



Portable Constant-Flow System Specifications:

Electrical Consumption:

None, constant-flow systems are exclusively pneumatic.

Weight:

Depends on kit. The total weight of the regulator, valve, polyurethane tubing, flow meters, full pack bag, and Oxymizer™ cannulas or masks for a 4-place MH-XCP system would be 7.1 pounds [3.22 kg] plus cylinder.

Space Requirements:

Raw cylinder length plus ≈ 5.5 inches [16.5cm] for valve, regulator, and connections. Each breathing station fits in a 12in x 12in [30.5cm x 30.5cm] tote bag.

Maintenance Requirements:

(See MH-XCP system documentation for specific maintenance requirements). Portable Constant Flow systems are very low maintenance. The only frequent maintenance item would be cleaning the crew and passenger masks/cannulas. Aluminum cylinders require hydro-static testing every 5 years. The regulator should also be tested and inspected at this time.

Cost:

General range between $599USD and 1,379USD, depending on size of aluminum cylinder and number of breathing stations. Also available in composite cylinder configurations.

Portable Pulse-Demand Systems:

Pulse-Demand

The patented MH Pulse Demand[TM] Electronic Delivery System (EDS), such as the O2D2 (2 Place) is another simple and cost effective oxygen solution and in our opinion is the best portable solution for aircraft without a built-in O_2 system. This system generally consists of a tank with a manual valve and pressure reducing regulator, which feeds into an EDS O2D1 or O2D2 Unit, and outputs regulated pulsed O_2 to a non-accumulating EDS cannula or face mask. A multi-station pressure reducing regulator can be used to feed multiple EDS Units, or an EDS Unit in tandem with constant flow breathing stations. The EDS is designed to deliver aviation O_2 in the most efficient and convenient manner possible.

What is Electronic EDS Pulse-Demand[TM]?

Our MH EDS devices have precision micro-electronic circuits that deliver a pulse of O_2 only when you breathe in and automatically adjust the volume of each pulse according to pressure altitude. Increases in altitude are compensated with pulses of greater volume. Unlike a constant flow system, the pulse demand system wastes no O_2 during the breathing cycle (exhaling and pausing before inhaling again) when O_2 is not being delivered to the lungs, which reduces O_2 supply consumption dramatically. Often this results in a cylinder duration increase of two to three times compared to the constant flow systems. The MH EDS can be set to a mode where it will not deliver O_2 below pressure altitudes of either 5,000 or 10,000 ft., saving O_2 below altitudes where it is not needed. It can be set to another mode where it delivers O_2 at all pressure altitudes. Both modes provide the same amount of oxygen for a given altitude and automatically track altitude changes. In addition, there are four additional modes to accommodate face masks or users who need extra oxygen. There are no scales to observe or knobs to turn as you climb or descend. Adjusting for climb or descent is not needed because the MH EDS responds automatically to pressure altitude. The MH EDS is a truly automatic hands-free O_2 delivery system that enhances your safety and comfort.

Why Use MH EDS Equipment:

By providing a measured pulse of O_2 every time you breathe in, the MH EDS supplies the O_2 you need to stay alert and comfortable while flying. In contrast to constant flow systems that waste O_2 by supplying more than your body can use, the MH EDS provides a short pulse of O_2 as you inhale, ensuring that your O_2 is used most efficiently, allowing you to fly further on a single O_2 refill or save space and weight with a smaller tank. You can also enjoy the advantages of O_2 while flying below the altitudes where O_2 is mandated – that can mean fewer headaches, increased alertness, better night vision, and feeling less exhausted when you reach your destination. The programmability of the MH EDS means that, unlike constant-flow oxygen systems, you can "set it and forget it". The MH EDS can be set to start providing O_2 immediately or at a specified altitude and will automatically adjust the O_2 flow as your altitude changes. When you're flying, you have more important things to do than adjust your O_2 flow during altitude changes.

The system operates for up to 100 hours on two (O2D1) or three (O2D2) 'AA' alkaline batteries. Two low battery warnings alert the pilot, at four hours remaining and one hour remaining. The system also features built in flow-fault and apnea warning alarms. The O2D2 is equipped with an external power jack enabling it to be operated from an external power source, and an audio-out jack, to connect to an audio panel or speaker. A feed tube is included in the kit to connect to existing portable or built-in Mh constant flow systems, making upgrading easy. Kits are also available to connect a portable EDS unit to a factory built-in system, greatly enhancing your delivery experience.

Portable Pulse-Demand EDS Unit Models:

Two EDS models fit most common needs for a portable oxygen system. The flagship EDS O2D2 device provides oxygen for either one or two users in a single compact unit, while the EDS O2D1 is the single-user “little brother” of the O2D2. The primary difference between the two models is the second-user capability of the O2D2, but otherwise the performance, features, operation and limitations of the O2D1 and O2D2 are essentially identical.

When the O2D2 is used in single-place mode it has basically the same oxygen consumption and battery duration as the O2D1. When the O2D2 is used with 2 people, oxygen consumption will be roughly double, and battery duration roughly half the indicated values. The O2D2 also has 2 unique features distinct from the O2D1: The option for external power input, and optional audio output via audio jack.

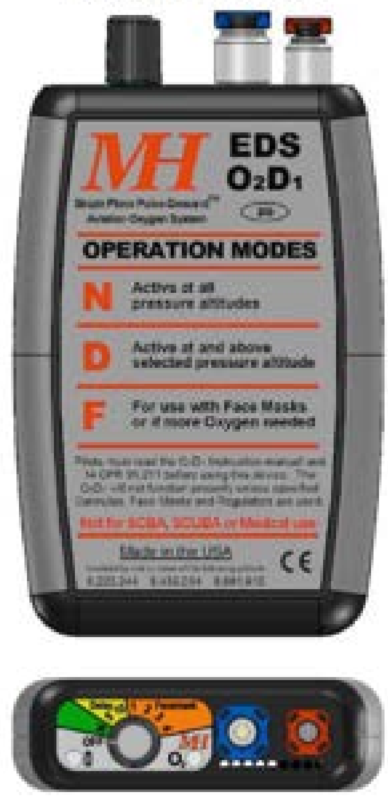
O2D2-2G

1 or 2 Person

O2D2

O2D1-2G

Single Person



O2D1

Portable Pulse-Demand Systems (Cont.):

Portable Pulse-Demand EDS Unit Features:

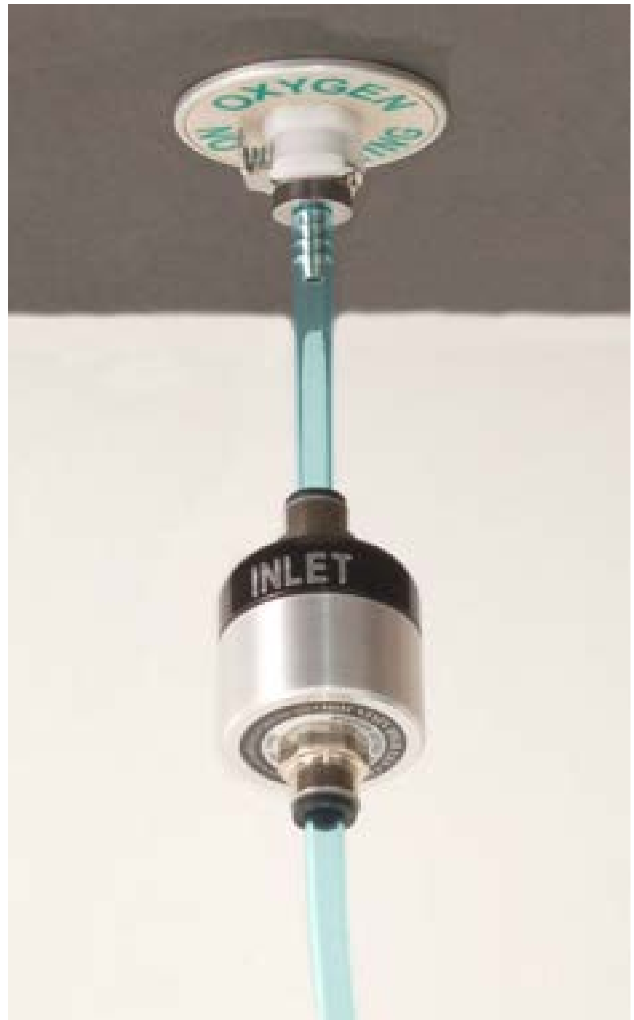
Using factory built-in oxygen systems with MH Pulse Demand EDS Units:

MH EDS (O2D1 & O2D2) units can be used in conjunction with a factory built-in oxygen system. This allows the pilot to get the full functionality of MH EDS Pulse-Demand technology, such as delayed delivery, hands free operation, and reduced oxygen consumption, out of what would otherwise be a constant flow system. However, MH EDS units require an oxygen inlet pressure of between 15 and 25 psig, while built-in aircraft oxygen systems typically provide an outlet pressure of between 30 and 90 psig. Therefore your MH EDS unit cannot be directly connected to the built-in oxygen supply, as this will likely damage your EDS unit and render it inoperable.

In order to connect the EDS unit to a factory built-in supply, an Inline Reducing Regulator is required between the factory built-in outlet port and the EDS unit inlet in order to drop the pressure to a level compatible with the MH EDS unit. The MH EDS-ILR In-Line Regulator (full description: In-Line Low-Pressure Stabilizing Reducing Regulator) is supplied as a "kit" which includes adapter tubing with one (or all) of the common OEM-type oxygen connectors found in most aircraft for convenient "Plug 'n' Fly" operation.

Multiple EDS units

The MH EDS-ILR can deliver sufficient oxygen for up to two (2) O2D1 units or one (1) O2D2 unit. Contact MH Sales for help with configuring your system. It is not recommended that more than (2) EDS users operate under one regulator connection, i.e. two EDS-ILR kits are needed to supply two O2D2s.



A typical arrangement is to leave a short piece of tubing on the connector end so that the EDS-ILR is positioned close to the built-in oxygen outlet as illustrated in the photo at right. In this case the light-weight EDS-ILR simply hangs from the overhead oxygen port. The tubing may also be cut longer to allow you to position the EDS-ILR elsewhere should you prefer.

MH-EDS-ILR

ILR Video Tutorial

Portable Pulse Demand System Specifications:

Electrical Consumption:

O2D1: 2 ‘AA’ Batteries provide up to 100 hours of operation. O2D2: 3 ‘AA’ Batteries provide up to 100 hours of operation, and in this configuration no aircraft electrical power is used. If the external power connector is used, the voltage input is 4.5 ±0.5Vdc and the current draw is ~3.75mA average and ~220mA peak (~500ms max).

Weight:

For full system weight it depends on the kit. Each EDS O2D1 weighs 7.5 oz [213 g] with batteries. Each EDS O2D2 weighs 12.1 oz [343 g] with batteries.

Space Requirements:

Each O2D1 Unit measures 3.1” [79mm] Wide x 5.23” [130mm] High x .95" [24mm] Thick. Each O2D2 Unit measures 4.3” [109mm] Wide x 3.85” [98mm] High x 1.25" [32mm] Thick. Additional space requirements: Cylinder raw length plus ≈ 5.5 inches [13.97cm] for valve, regulator, and connections. Crew cannulas and masks will fit in full pack bag.

Maintenance Requirements:

(See EDS system manual and documentation for specific maintenance requirements). Like the portable constant flow system, this system is very low maintenance. The only frequent maintenance items would be cleaning the crew and passenger masks/cannulas, and replacing the ‘AA’ batteries approximately every 50hrs. The O2D1 or O2D2 and regulator should be tested and inspected ever 2 years.

Cost:

General range between $1025 USD and $2,445 USD, depending on the size of the aluminum cylinder and number of users. Also available in composite cylinder configurations.

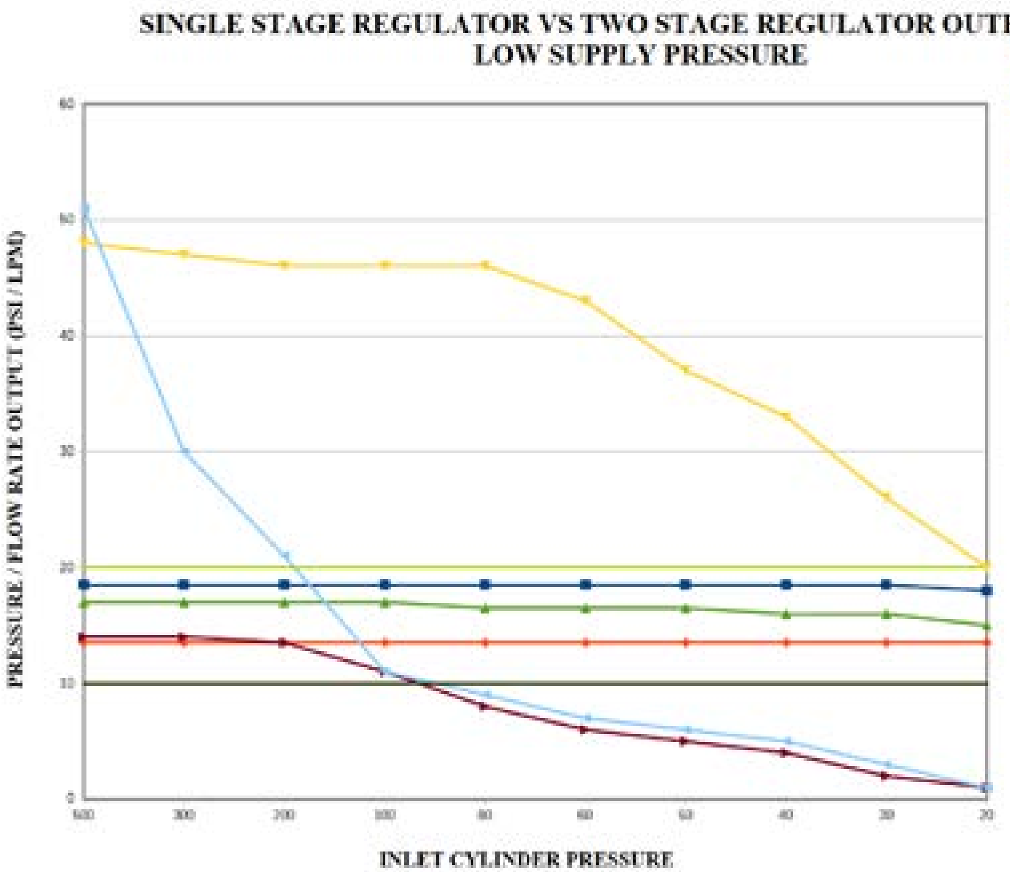
O2D1 Full System

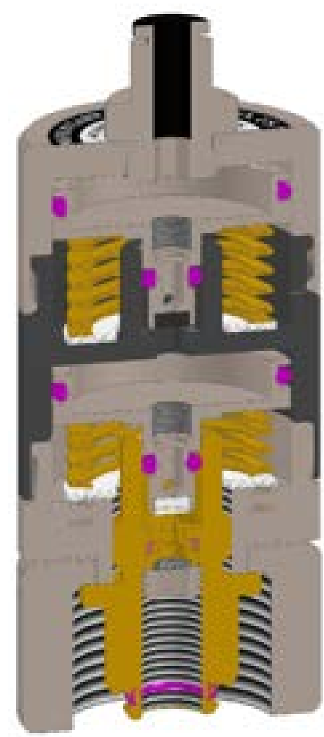
O2D2 Full System

O2D2 + ILR System

2-Stage Regulators:

Before discussing Built – In systems, it's important to understand the reason why Mountain High generally uses 2-stage (cascaded) oxygen regulators over traditional single – stage regulators. The benefits of using a 2-stage regulator are: consistent output pressure, and extended cylinder duration. Most pressure reducing regulators (single stage) often require a minimum of approximately 300psig of cylinder pressure for normal operation. This means that the oxygen in the cylinder after the pressure reaches below 300psig is unusable. However, our unique 2-stage cascaded type pressure reducing regulators enable virtually constant flow rates all the way down to about 50psig of cylinder pressure. This guarantees an additional 13%-23% duration from your O_2 cylinder, based on the previous "empty-low" window of 300-500psig when using single-stage regulators (see 'low supply regulator comparison graph' below). Using a 2-stage regulator will increase the lengths in the space requirements by 0.76in [1.91cm].





2-Stage Regs

Specialized Breathing Solutions:

In addition to standard (pulse demand) and oxymizer (constant flow) masks and cannulas, Mountain High also offers the following specialized breathing solutions:

MH Alps Facemask:

The high quality MH Alps Facemask has been designed and tested to operate with the MH EDS Pulse-Demand™ Systems, the MH-3 and MH-4 Constant-Flow systems and most other oxygen systems. The majority of ambient air is admitted passively through a bypass port. Oxygen admission from the EDS or constant flow-meters is admitted through the left or right port. The ALPS is easily donned and exceptionally comfortable with no polyvinyl bag to deal with. The MH ALPS Facemasks are available in small, medium and large, with or without Microphone.

The MH Alps Facemask comes with a Tote-Bag, Feed Tube and Manual. The Microphone model also includes a 5ft cable with PJ-068 jack. Adapters for Bose (Lemo) connections are also available. The ALPS Mask can also be used as an Emergency mask by using the appropriate Emergency Feed Tube. The MH Alps Mask can be converted to helmet use with our J-Bracket Strap/Harness Kit and a conversion kit is also available for an MBU-20 facemask.

E-Z Breathe Boom Cannula:

The E-Z Breathe Boom Cannula has been tested for best use with all of our EDS and XCP products. The E-Z Breathe nylon boom arm affixes to your headset (either left or right side) with a ball mount and adhesive pad. It can swivel about and slides in and out for best fit. The new improved arm incorporates an adjustable friction lock to eliminate slippage. The cannula assembly is easily replaceable, as is the aluminum mount ball. The arm can be easily removed from the headset when not in use. An optional Quick disconnect for the feed tube is also available

The E-Z Breathe Boom Cannula II™ kit from Mountain High has all the items needed to install onto almost any headset in use today.

ALPS Mask | EZ Breathe | MBU-20 Conversion

Built-In Systems:

A Built-In oxygen system generally consists of a tank on which is mounted a valve/regulator, which is designed to be remotely actuated in flight. The remote regulator sends oxygen through polyurethane lines to built-in outlet ports with check valves at the various crew and passenger locations. Tank pressure is read either via high pressure copper or aluminum lines that run from the regulator to a pneumatic gauge located in the flight deck, or via an electronic pressure transducer that sends a signal to an electronic pressure gauge. Built in systems also generally feature a remotely mounted fill port or gauged station.

A built-in system is ideal for when it is preferred to have the cylinder mounted out of reach during flight and much of the tubing and lines out of the way. The outlet ports can be installed where it best fits your usage needs, and into which either constant flow, EDS, or both types of delivery equipment can be connected. Note that when used with a Mountain High built-in system, EDS units do not require an In-Line Reducing Regulator. All mountain high regulators for both portable and built-in systems are designed to bring the pressure down to a level that is compatible with all EDS equipment (with the exception of custom built high-pressure high-flow regulators). The cylinder(s) in a built-in system can be mounted where they can be removed for filling or fully inaccessible and remotely filled via a fill port station. The valve/regulator can be actuated pneumatically or electronically via a switch during flight, depending on the system type.

Custom Designs:

In addition to the Plug-And-Play built in oxygen systems offered by Mountain High, we are also able work with aircraft manufacturers to design a custom system specifically for their aircraft. A custom built-in system may include:

- A cylinder or multiple cylinders daisy chained together to provide ample oxygen storage. We have various composite type tanks available such as Carbon, Glass, or Kevlar fiber which results in the lightest, strongest possible solution when every pound counts.
- A remotely controlled valve, such as an RCV-RCR or IPR (discussed in detail later).
- Built in oxygen stations, either simple connection points (that can be connected directly to a flow meter or connected to a portable pulse demand unit) or dedicated built-in Pulse Demand EDS distributors (discussed in detail later).
- A fill port, enabling easy re-filling without removing the tank.
- An oxygen management and monitoring system built into the flight deck. This could include a simple gauge with an on/off switch, an EDS control head for a plug-and-play solution (discussed in detail later), a data cable that interfaces directly with a Garmin digital display (MH ComMux system), or a custom oxygen management panel (discussed in detail later).
- A separate backup emergency oxygen system and control switch.
- Drop down masks with an automated cabin pressure monitoring and deployment system (pressurized aircraft only).

Built-in Emergency Oxygen Systems:

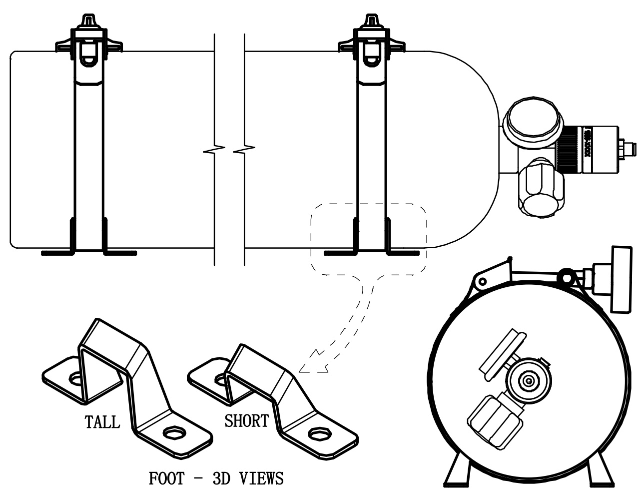
The most popular built-in emergency oxygen system offered by mountain high is the EOS-011. The EOS-011 is a 4-place emergency oxygen system that comes with a KF-011 (11 cu. ft.) Kevlar composite cylinder, EOS-1052 regulator, 4 ea. EOS face masks, cylinder mounting brackets and all hardware needed for a built-in EOS system. The EOS-011 is great for use in experimental pressurized aircraft.

All other portable MH EOS emergency oxygen systems are also available as built in kits (see pg. 3), contact MH Sales for help configuring your system.

EOS-011 4p

Cylinder Mounting Kits:

Cylinder mounting Brackets are the preferred method for securing oxygen cylinders for a built in configuration. The CMK bracket cylinder mounting kit is a rigid, low profile, high-strength method of securing Aluminum or Composite-Fiber cylinders to a flat surface. With the CMK brackets bolted in place, the cylinder is held into place by a set of stainless steel taut-bands. These are of the quick-release or ‘open-loop’ type bands where the cylinder is easily placed and removed by loosening the gripknobs, then uncoupling the quick-release latch on the bands. CMK kits used with composite cylindres come with a rubber cusion band that protects the composite material from the stainless steel strap.



CMKs

Built-In Systems (Cont.):

MH-PCR2:

This system generally consists of a tank with a tank-mounted valve, on which is mounted a PCR (Pneumatically Controlled Regulator). This system is designed to be accessible at pre- and post-flight to manually open/close the tank valve, and be remotely actuated in flight. The regulator is controlled via pressurized oxygen lines that run from the regulator to a pneumatic On/OFF switch located on the flight deck. The regulator outlet feeds check-valved outlet ports that are self sealing until tubing is connected. Constant flow or EDS delivery equipment can be used with the PCR, exclusively or in tandem with each other. This system, though built-in, still allows for the cylinder to be removed for filling. Three high pressure ports are available to connect peripheral equipment. Separate high pressure copper or aluminum lines can run from the regulator to a pneumatic gauge located in the flight deck, as well as to a fill port. Another option for monitoring tank pressure would be to use an electric pressure transducer with an electronic panel gauge. The PCR kit comes in a 2-place or 4-place kit, or the system configuration can be customized if needed.

PCR-2 with gauged valve, four outlet ports, remote pneumatic gauge, pneumatic on/off switch, & remote fill port

MH-PCR

PCR-2 System Specifications:

Electrical Consumption:
None, the base system is exclusively pneumatic.

Weight:
The approximate weight of the valve, PCR regulator, mount kit, polyurethane tubing, copper tubing, pneumatic switch, fill station, pressure gauge, and C.F. or pulse demand delivery equipment for 4 people would be around 12 pounds [5.44 kg] plus the tank.

Space Requirements:
Raw cylinder length plus ≈ 5.5 inches [13.97cm] for valve & PCR, and delivery equipment similar to portable systems. Additional space requirements depends on peripheral placement and routing.

Maint. Requirements:
(See MH-PCR2 system documentation for specific maintenance requirements). This system is very low maintenance. The only frequent maintenance item would be cleaning the crew and passenger masks/cannulas. PCR MTBF = ~3,650 Hours or ~2,735 full flowing on-off cycles. It is recommended to service the PCR regulator at the same interval as the cylinder hydrostatic testing (every 5 years).

Cost:
A base system generally ranges from $1,390 USD to $1,500 USD plus the price of the tank, the delivery equipment, any peripheral parts, the desired copper line, and feed tubing.

RCV/RCR:

The RCV/RCR (Remote Controlled Valve-Remote Controlled Regulator) is a more robust and customizeable built-in solution for enhanced oxygen delivery. Because it is fully remote controlled, and does not need to be accessible for any manual interfacing, the tank can be mounted fully out of the way.

The RCV can be installed directly onto any SAE-8 ported cylinder or remote mounted on a bulkhead and fed by a low profile manifold installed on the cylinder if space is an issue. A 2-Stage regulator (RCR) mounts directly to the RCV, hence the term RCV/RCR referencing the full package. The RCV can be ordered for a 12, 24, or 48Vdc application, consuming very little power, or in a non-electric pneumatically controlled configuration.

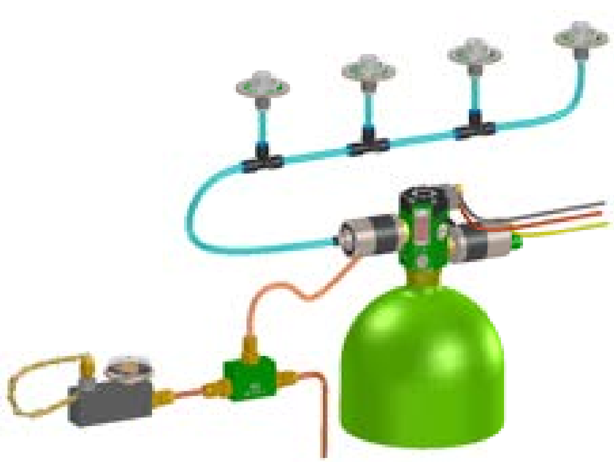
The RCV/RCR can easily supply enough oxygen flow for up to 8 places in its standard configuration, and can even accommodate (2) crew SCBA type QuickDon masks. All models have an available 'un-valved' port, that is directly connected to tank pressure, and two 'valved' ports that are active when the system is turned on. They are standard SAE-4 ports and can be used for remote fill connections, electric or pneumatic gauge feeds, cascading cylinder connection, or an additional regulator. The service regulator(s) can connect to crew and passenger check-valved outlet ports, where either constant flow or pulse demand delivery equipment can be connected. When the valve is on, the red ‘button’ indicator on top of the cap is up/out and when the valve is off, the indicator is down/flush.

For safety, there is a high pressure relief device in a dedicated port of the RCV body and a low pressure relief device on the pilot regulator. Both can be out-boarded from the cabin and can even be fed into an overboard discharge indicator on the exterior of the aircraft, which would provide a visual indication of an over-pressure discharge event during the pre-flight inspection.

The RCV is designed to meet both AEC-Q100 and DO-160 specifications.

RCV/RCR Versions:

The RCV/RCR comes in two main versions: The RCV-2DP (Manual Pneumatic) and the RCV-2D(or 2DL) (Electro-Pneumatic).



RCV-2DP (Manual Pneumatic)

RCV-2D(or 2DL) (Electro-Pneumatic).

RCV Pneumatically Controlled Configuration (RCV/RCR-2DP):

This configuration is similar to the MH-PCR2 built-in configuration, except that the pneumatic switch remotely controls the tank valve as well as the outlet regulator. It can be configured to feed a pneumatic pressure gauge, keeping it entirely mechanical or it can be fitted with a pressure sending transducer to feed an electric pressure gauge. A remote fill station can be connected to an available port via copper or aluminum line or a check-valved fill port can be installed directly on the RCV.

RCV/RCR-2DP System Specifications:

Electrical Consumption:

None, this system is exclusively pneumatic.

Weight:

Similar to MH-PCR2 system, around 12 pounds [5.44 kg] plus the tank.

Space Requirements:

Raw cylinder length plus ≈ 2.5 inches [6.35cm] for the RCV and delivery equipment similar to portable systems. Additional space requirements depends on peripheral placement and routing.

Maintenance Requirements:

Occasional servicing of the RCV/RCR may be required (recommended every 5 years, same time as the tank hydro-static testing), see RCV/RCR system documentation for specific maintenance requirements.

Cost:

Many configuration options are available and pricing varies with the specific configuration, contact Mountain High Oxygen for pricing.

RCV Electro-Pneumatically Controlled Configuration (RCV/RCR-2D & 2DL):

Similar to the pneumatically controlled RCV, the Electro-Pneumatic RCV sends oxygen through polyurethane lines to outlet ports at the various crew and passenger locations. In this configuration the RCV is operated remotely by electro-pneumatic means. An electrical switch from the cockpit (master switch or separate on/off switch) sends an electrical signal to a manifold attached to the RCV, which has an internal PCB and electro-pneumatic valves that control the flow of actuating gas from a pilot regulator to the main internal piston, which in turn opens/closes the valve. This RCV comes in a latching and non latching configuration. Non-latching means that if power is disconnected, the RCV will default to the off (closed) position.

The manifold on the non-latching version has a single LED that glows green when in the on (open) position, and turns off when in the off (closed) position.

Latching means that if power is removed, the pressurized gas remains in contact with the main internal piston and therefore the main valve seat remains in its current position (if the system was on when power was removed, the system will remain on, and vice-versa). This is due to the latching nature of the electro-pneumatic valves in the manifold. The manifold on the latching...........

Built-In Systems (Cont.):

...version has a single LED that glows green when in the on (open) position, and red when in the off (closed) position (and off when power is disconnected). A pressure transducer, referred to in MH documentation as the Pressure Sending Unit (PSU), is installed into an available port on the RCV, which reads tank pressure and outputs the data to a serial cable which is fed into an electronic pressure gauge in the flight deck.

A separate high pressure copper or aluminum line runs from the RCV to a remote fill station, or a fill port can be installed directly on the RCV. A pneumatic panel gauge, fed by copper or aluminum line from the RCV, can still be used in this configuration, to minimize electrical consumption.

RCV/RCR-2D(L) System Specifications:

Electrical Consumption:

The Electro-Pneumatic RCV Configurations require an initial current pulse of ≈350ma. for ≈25ms, 11-28Vdc for power on/off actuation. After the initial startup, the current then settles to < 50 ma. from the indicator LED. If an electrical gauge with pressure sending unit is used, the current draw is a maximum of 120mA.

Weight:

Approximately the same as the pneumatically controlled system, around 12 pounds [5.44 kg].

Space Requirements:

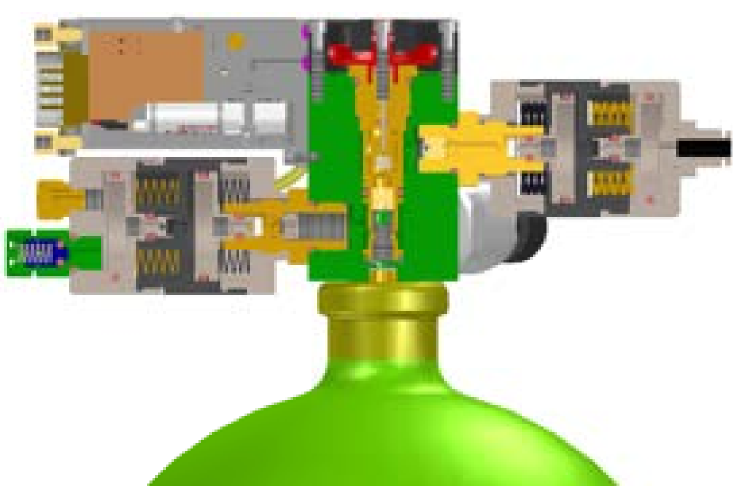
Raw cylinder length plus ≈ 2.5 inches [6.35 cm] for the RCV and delivery equipment similar to portable systems. Additional space requirements depends on peripheral placement and routing.

Maintenance Requirements:

Occasional servicing of the RCV/RCR may be required (recommended every 5 years, same time as the tank hydro-static testing), see RCV/RCR system documentation for specific maintenance requirements.

Cost:

Many configuration options are available and pricing varies with the specific configuration, contact Mountain High Oxygen for pricing.



Section through RCV Body, Electro-Pneumatic Manifold, Pilot Regulator, & Service Regulator

MH EDS-ip System:

Unlike the previous Built-In oxygen systems, which would need additional portable EDS units to take advantage of Pulse-Demand technology, a Built-In Dedicated Puse-Demand oxygen system incorporates Built-In Intelligent EDS Units.

This system integrates the functional capabilities and efficiency of the portable pulse demand units (O2D1 & O2D2) with an electro-pneumatic remotely controlled valve and regulator to create a fully-integrated, intelligent, built-in Pulse Demand system, of which various options exist. The most popular system is the MH-EDS 2ip & 4ip Electronic Oxygen Delivery System, ("ip" stands for Intelligent Peripheral).

This patented system was designed to utilize extremely precise multi-person in panel FADOC™ (Full Authority Digital Oxygen Control) aviation oxygen delivery systems, colloquially referred to as EDS (ip) Distributors. Each ip Distributor has a microcomputer that constantly monitors respiratory aspects of each person (micro-pressure changes from your breathing), delivering a precise individual pulse of oxygen at the instant each inhaling cycle is detected. Through the cannula or face mask, the ip system characterizes the physiological respiratory profile to adapt to individual needs and situational awareness, and can even glean a good approximation of a person's PaO_2 saturation (amount of O_2-carrying blood cells that are able to carry O_2 to the body). More importantly, the ip system has barometric altitude sensing components that automatically adjust dosage, ensuring that the proper amount of oxygen is delivered at various altitudes.

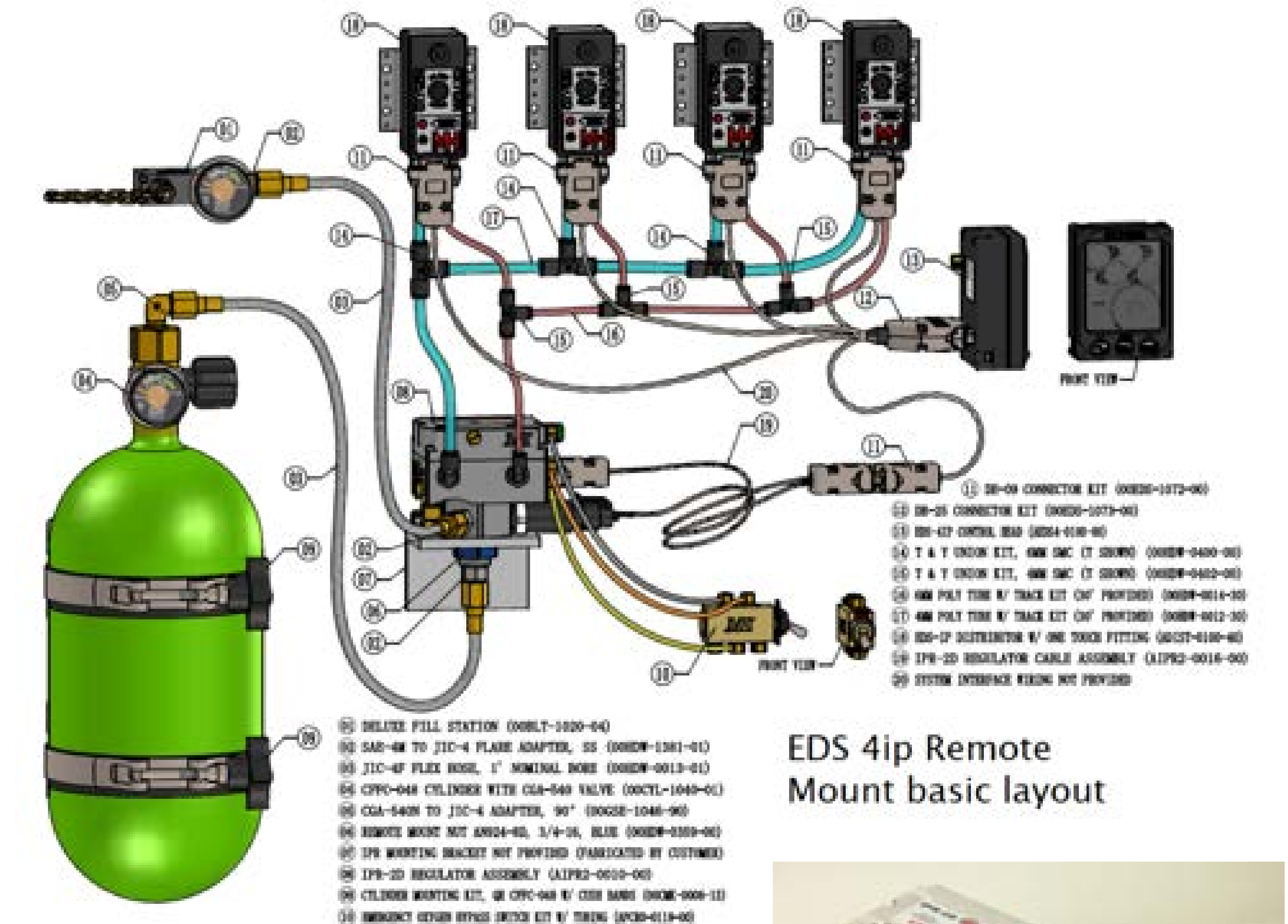
This is the same technology as used in the O2D1 & O2D2 system, and the EDS distributors can be thought of as the built-in version of an O2D2 with a single oxygen outlet. The Distributors are controlled via an EDS control head (2ip is the 2-place version, 4ip is the 4-place version) which features an LCD screen for detailed oxygen usage analysis and management. A six place aircraft would require a 4ip for the passenger section and a 2ip for crew oxygen. The advantage of this would be enabling separate configuration control for crew and passengers, as crew oxygen altitude requirements differ from the passenger requirements. The ip system is a completely integrated, adaptive, intelligent aviation oxygen system. No other aviation oxygen system can provide such conservation of your oxygen with unmatched safety and comfort.

The EDS 2ip & 4ip systems utilize an IPR (Intelligent Peripheral Regulator) as the remote controlled valve and regulator, providing regulated oxygen to the various Distributors. This regulator features a pneumatically actuated emergency bypass backup switch, which when actuated delivers constant flow emergency oxygen to the distributors through completely separate lines. This system redundancy results in greatly increased safety and fulfills various emergency backup requirements instituted by aviation regulating agencies around the world. The IPR also has the 2-stage regulator technology built into its design, providing the same extended cylinder duration benefits as the RCV/RCR. It can be mounted directly to any SAE-8 ported cylinder or remotely mounted and, like the RCV/RCR, the tank can be installed behind a panel or bulkhead.

Built-In Systems (Cont.):

As with the portable pulse demand, the ip control head will annunciate flow fault and apnea alarms, both visibly and audibly, as well as breathing sensing and pulse delivery. Additionally, it will display tank pressure, pressure altitude, delivery mode, & class A airspace, and will alarm for a low O_2 supply or if a distributor is not communicating. The system can be set to delay delivery, starting and stopping automatically as a specified altitude threshold is passed.

Basic Built-In EDS-ip System Overview (Remote Mount option shown):



EDS-2ip System

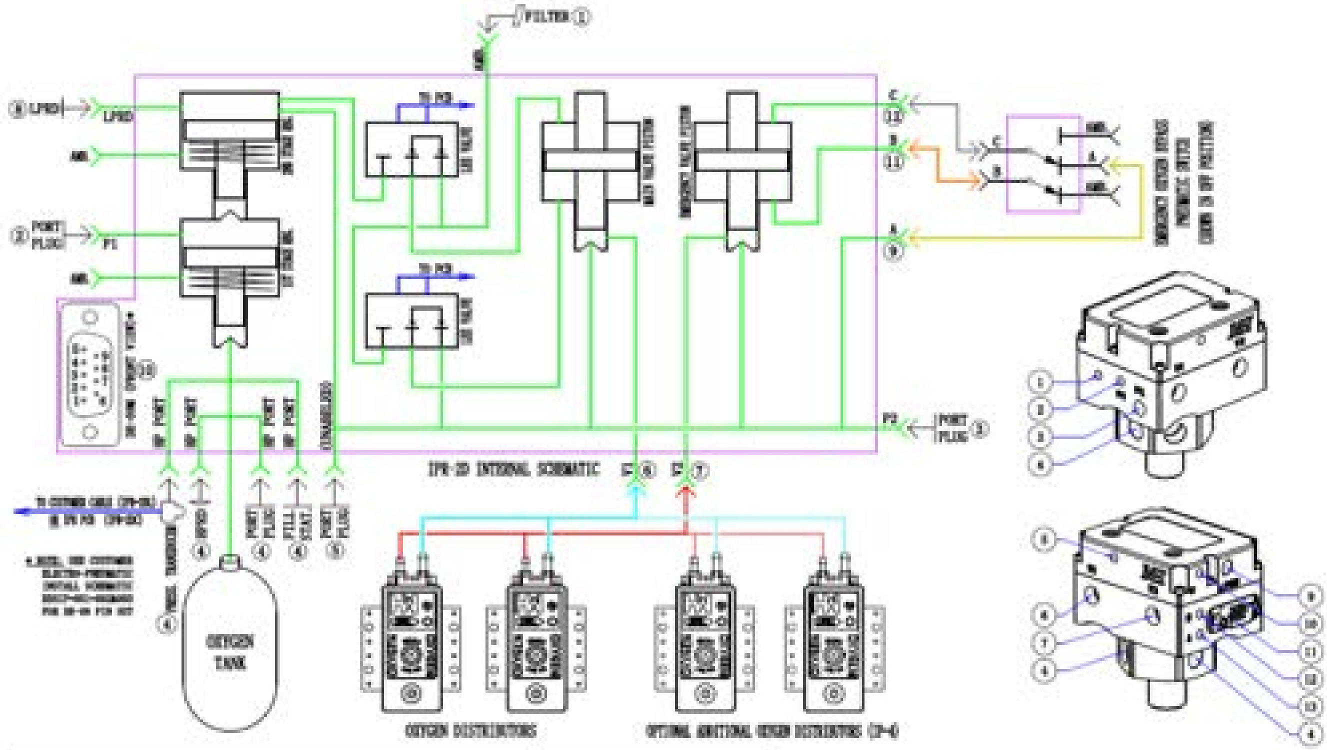
EDS-4ip System

EDS Distributor

IPR Regulator

Built-In Systems (Cont.):

Built-In EDS-ip System Operational Schematic:



IPR-2D PORTS & CONNECTIONS				HIGH PRESSURE PORT OPTIONS	
REF	DESCRIPTION	REF	DESCRIPTION	FITTING	PORT
1	UNLABELED AMBIENT PORT (FILTER)	7	"Y2" PORT (4mm ONE-TOUCH ELBOW FITTING)	PRESSURE TRANSDUCER	ANY
2	"P1" PORT (PORT PLUG)	8	"LPRD" PORT (LPRD)	FILL STATION	
3	"P2" PORT (PORT PLUG)	9	"A" PORT (BANJO FITTING, ORIFICED)	SPRD AND SAE-4 PORT ADAPTER	
4	HIGH PRESSURE PORT (SEE HP PORT OPTIONS)	10	DE-09 CONNECTOR	PORT PLUG OR OR CUSTOMER	
5	UNLABELED MACHINING PORT (PORT PLUG)	11	"B" PORT (BANJO FITTING)	SPECIFIED PERIPHERAL	
6	"Y1" PORT (4mm ONE-TOUCH ELBOW FITTING)	12	"C" PORT (BANJO FITTING)		

EDS-2ip Control Head (2-Place)

EDS-4ip Control Head (4-Place)

EDS-ip System Specifications:

Electrical Consumption:

The EDS-ip systems automatically operate from a 12- or 24-volt system and the 4ip has a current draw of $\approx$195mA average @ 12Vdc ($\approx$423mA peak) and $\approx$151mA average @ 24Vdc (279mA peak). The peak current is only at the initial turn on phase, and lasts for $\approx$500ms for each distributor as they initiate in sequence.

Weight:

Depends on configuration, approximately 20lbs with default CFFC-048 tank, see individual data sheets. See EDS Manual for IPR Regulator and EDS Distributor form factors for space requirements..

Maintenance Requirements:

Occasional servicing of the EDS-ip system components may be required, see system documentation for specific maintenance requirements. It is recommended to service the IPR every 5 years (in conjunction with cylinder hydro-static test), the control head and distributors are serviced as required.

Cost:

An EDS 4ip oxygen system kit costs $9,995 (00EDS-2004-01) (see www.mhoxygen.com for kit details), tank included.

MH ComMux Built In Dedicated Pulse Demand System:

This system is similar to the EDS system, except rather than a dedicated control head, the usage data from the distributors can be output via a serial cable directly to your aircraft's built in MFD. A separate MFD page user interface can be configured to display the data and control the distributors in the same way that the EDS control head would. The MFD system interface would need to be configured by the aircraft manufacturer to fit their unique requirements.

Additionally this system can make use of a hybrid IPR & RCV/RCR dual-tank dual regulator system to supply the crew and passengers separately, resulting in greater safety, redundancy, and configurability. Consult with Mountain High for further details on this specialized system. In our opinion this system would result in the most advanced and robust built-in solution for high-volume aircraft production.

Oxygen Management Panels:

Mountain High Oxygen has the ability to work directly with aircraft manufacturers to design customized aircraft oxygen management panels. The size and features of these panels can tailored to the specific needs of their aircraft (See MH New Product Announcement 5XKPM-001-000$-). Contact Mountain High Oxygen for details. A few examples are shown below.

Drop-down mask emergency oxygen systems for pressurized aircraft:

Mountain High has collaborated with O2Corp, who offer drop down mask boxes for pressurized aircraft, and we have the ability integrate our oxygen delivery and cabin pressure monitoring systems into O2Corp's automated emergency drop down mask system. Such systems have already been designed and engineered. Please contact Mountain High Oxygen for more details.

Please Note: This document provides only a very brief overview of the various oxygen systems and solutions available. Numerous configuration options and even the combination of various technologies are possible. Contact Mountain High for any questions you have regarding aircraft oxygen systems.

WHAT EVERY PILOT SHOULD KNOW ABOUT OXYGEN

What Is Air?

The air surrounding us is a mixture of gases consisting of 78% nitrogen and 21% oxygen. The remaining 1% is made up of argon, carbon dioxide, and traces of rare gases.

What Is Oxygen?

Pure oxygen is a colorless, tasteless, odorless gas and is non-combustible under normal conditions.

Why Is Oxygen So Important?

Although oxygen itself is nonflammable, it vigorously supports combustion, and in fact, without oxygen there can be no fire. Oxygen is also absolutely essential to support the process of "vital combustion" which maintains human life. Although a person can live for weeks without food or for days without water, they will die in minutes if deprived of oxygen. The human body maintains life by taking in fuel (the carbohydrates, fats, and proteins in our diet) and using oxygen to convert it to heat and energy in a process known as "metabolism". Metabolism is thus similar to combustion in that it utilizes the oxygen in the air to "burn" a "fuel" to produce heat and energy.

Where And How Do We Normally Obtain Our Oxygen?

With each breath, we fill our lungs with air containing 21% oxygen, inflating millions of tiny air sacs (known as "alveoli") like tiny balloons. Microscopic capillaries in the thin walls enclosing each sac transport oxygen from the lungs to every cell in the body. Because the body has no way to store oxygen, it leads a breath-to-breath existence.

How Much Oxygen Does the Human Body Need?

The rate of metabolism, which determines the need for oxygen, depends on the degree of physical and mental activity of the individual. Walking at a brisk pace will consume about.........

...four times as much oxygen as sitting quietly. Under severe exertion or stress, a person might consume eight times as much oxygen as when resting.

What Happens If The Body Does Not Receive Enough Oxygen?

When the body is deprived of an adequate supply of oxygen, even for a short period, various organs and processes in the body begin to suffer impairment. This condition is known as "hypoxia" and affects every cell in the body, but especially the brain and nervous system. This makes hypoxia extremely insidious and difficult to recognize, and a serious hazard for pilots.

What Are The Effects Of Hypoxia?

Hypoxia causes impairment of vision (especially at night), lassitude, drowsiness, fatigue, headache, euphoria (a false sense of exhilaration), and temporary psychological disturbance. These effects do not necessarily occur in the same sequence nor to the same extent in all individuals, but are typical in average persons affected by hypoxia.

When And Why Must We Use Extra Oxygen?

Supplementary oxygen must be used to compensate for either a deficiency on the part of an individual or a deficiency in the atmosphere. A person with a respiratory or circulatory impairment may not be able to fully utilize the 21% of oxygen in the air, so supplementary oxygen must be administered (by oxygen tent or mask) to enrich the inhaled air. The total volume of oxygen in each inhalation is then greater than normal and compensates for the individual's inability to utilize the normal atmospheric oxygen. When we ascend in altitude, a different condition is encountered wherein the atmosphere itself is deficient, and even an otherwise "normal" person will require supplemental oxygen.

Does The Percentage Of Oxygen In The Air Change With Altitude?

No. The ratio of oxygen to nitrogen in the composition of air does not change. The 21% of oxygen in the air remains relatively constant at altitudes of up to one hundred thousand feet.

Why Must We Use Extra Oxygen When We Ascend In Altitude?

The blanket of air surrounding our planet is several hundred miles thick. Air has weight and is compressible, so the air closest to the earth (supporting the weight of all the air above it) is denser and its molecules packed closer together. At higher altitudes, the air is less dense. At 10,000 feet the atmospheric pressure is only two-thirds of that at ground level, and although the percentage of oxygen is still the same, each lung-full of air consequently contains only two thirds as many molecules of oxygen. At 18,000 feet, there is only half the amount of oxygen. Therefore, as we ascend, there is a progressive reduction in the amount of oxygen taken into the lungs with each breath, and a corresponding decrease in the amount of oxygen available for the bloodstream to transport to every cell in the body. To compensate for this, we must supplement the air we breathe with additional oxygen in order to supply enough oxygen molecules for the metabolic needs of the body.

At What Altitudes Should Oxygen Be Used?

In general, a normal, healthy individual is unlikely to need supplemental oxygen at altitudes below 8,000 feet. An exception is night flying. The retina of the eye is affected by even extremely mild hypoxia, and night vision deteriorates significantly above 5,000 feet. Between 8,000 and 12,000 feet, hypoxia may cause the first signs of fatigue, drowsiness,..........

...sluggishness, headache, and slower reaction times. At 15,000 feet, hypoxia becomes increasingly apparent in terms of impaired efficiency, increased drowsiness, errors in judgment, and difficulty with simple tasks requiring mental alertness or muscular coordination. Symptoms become more intense with progressively higher ascent or with prolonged exposure. At 20,000 feet, a pilot may scarcely be able to see, much less read, the instruments. Hearing, perception, judgment, comprehension, and general mental and physical faculties are all severely compromised and the pilot may be on the verge of complete collapse.Therefore, the availability and use of supplemental oxygen is recommended on night flights where altitudes above 5,000 feet are contemplated, and for altitudes above 8,000 feet for daytime flights.

How Can You Tell When You Need Oxygen?

You can't. Therefore, oxygen should be used before it is needed. The most dangerous aspect of hypoxia is the insidious, "sneaky" nature of its onset. Hypoxia primarily affects the brain and nervous system with a gradual loss of mental faculties and impairment of judgment and coordination, but these changes are so gradual that they are completely unnoticed by the affected individual. The effects of hypoxia are very much like those of alcohol or other drugs that produce a false sense of well being. There is a complete loss of ability for self-criticism or self-analysis, and in fact, a person suffering from mild or moderate hypoxia is apt to feel a sense of exhilaration or security, and may be confident in their proficiency and performance even while on the verge of complete incompetence. Some people believe that a pilot can detect the need for oxygen by noting an increase in breathing rate, an accelerated heartbeat, and a slight bluish discoloration (cyanosis) of the fingernails. However, by the time these symptoms develop, the individual is likely to be mentally incapable of recognizing these signs.

Are All Individuals Equally Affected By Hypoxia?

NO. Just as there is a variation among individuals in the ability to tolerate heat or cold, some people can tolerate some degree of hypoxia without apparent effect, while others who are more sensitive to a lack of oxygen cannot. There is no way to measure or predict susceptibility to hypoxia because it can be affected by physical condition, fatigue, emotion, use of tobacco alcohol or drugs, diet and other factors. The individual who has flown at 14,000, 16,000, or even 18,000 feet without oxygen and survived, has no idea how close they may have been to disaster, and may believe that all this talk about oxygen need, if true at all, does not apply to them. Such a belief could some day prove fatal.

Is It True That Oxygen Is Toxic Or Harmful?

NO. Oxygen therapy is often used for prolonged periods in hospitals and homes with beneficial effects. It is generally agreed that a 60% oxygen concentration on the ground (equivalent to 100% at ~ 12,000 feet), will not cause any harmful effects.

Why Not Use Oxygen Intermittently For Short Periods?

Intermittent use of oxygen, at an altitude where there is an oxygen deficiency, would only temporarily alleviate the effects of hypoxia while the oxygen is being used. Because of the insidious nature of hypoxia, a person already mildly hypoxic is extremely unlikely to even think of using oxygen equipment, intermittently or otherwise. Nevertheless, the occasional use.....

...of oxygen for five or ten minutes (even at altitudes below 8,000 feet) can act as a "refresher" to relieve the effects of mild hypoxia, cigarette smoke, apprehension, or other factors. Such a "refresher" prior to the termination of a flight can help improve the pilot's mental and physical condition for the approach procedures and landing maneuvers.

How Can Oxygen Equipment Improve The Utility Of An Aircraft?

Higher altitudes often have the benefits of a smoother flight, more favorable winds, better performance from the Omni and other radio navigation equipment, higher speed, longer range, and better engine performance. With oxygen equipment aboard, a pilot can safely take advantage of these benefits knowing that their own performance will not be affected by hypoxia and that they will be just as efficient and capable as at lower altitudes or even on the ground. With oxygen equipment in use, pilot and passengers will arrive at their destination fresh and fit, without the headache, lassitude, and fatigue which often result from prolonged exposure to even mild hypoxia.

What Types Of Oxygen Equipment Are Available For Private And Executive Aircraft?

For general aviation small aircraft, the most practical option is often a portable system, which can be carried along when flight is anticipated at altitudes where hypoxia would be an issue. If flights at such altitudes are frequent, then a "built-in" oxygen system offers some advantages, especially for larger aircraft. For either portable or built-in systems, there is then a choice between "Continuous Flow" or "Pulse-Demand" type equipment. Continuous flow systems deliver oxygen at a fixed rate that the user must adjust when changing altitude. "Pulse-Demand" (MH EDS) equipment automatically delivers a prescribed amount of oxygen to the user during each inhalation in response to pressure altitude and their own breathing pattern. Pulse-Demand is significantly more efficient and requires no user adjustment when changing altitude.

How Should An Oxygen System Or Equipment Be Selected?

Contact Mountain High Equipment & Supply at 800-468-8185. An MH Sales Engineer will assist you in selecting the proper equipment best suited to your aircraft and specific needs.