Using
The
Mile High Oxygen Systems

High Flights has installed Mile High Oxygen (MHO2) systems in all gliders except the SGS 2-33. All systems operate the same. The MHO2 systems provide low pressure air for use with nasal cannulas (to 18,000') or light weight face masks (to 25,000'). Oxygen delivery is controlled with a simply dual scale flow meter. The MHO2 systems are permanently installed in the Blanik, SGS 1-34, and SGS 1-26 22S. The systems are installed in parallel with the existing A14 regulators. They use the same fill ports and pressure gauges as the A14.

The hoses for the A14s have been removed to protect them and the ports capped. The A14 hoses and the Oxygen masks for use on the A14 systems in the O2 equipment box along with all of the club inventory of cannulas and masks for use with the MHO2 system:

The system provided for SGS 1-26 47S is a portable system that must be installed prior to each flight. A separate section will address the installation and filling of this system. Once installed, it's operation is identical to the other aircraft.

Oxygen toxicity

There can be too much of a good thing. While we need to have oxygen at altitude, enough O2 is in fact enough. More is not better. Too much oxygen can lead to oxygen toxicity. Learn more here:

http://www.answers.com/topic/oxygen-toxicity

Cannuals

Warning

When using a nasal cannula it is critical that you NOT breathe thru your mouth. Mouth breathing dramatically reduces the effectiveness of the oxygen delivery. If you notice you have a consistently dry or cottony mouth – you are breathing thru your mouth – STOP doing it.

The preferred type of cannula is the Oxymizer oxygen conserving cannula. This cannula reduces O2 consumption to about 1/3 that of a regular cannula for the same altitude, effectively extending the duration of the bottle by a factor of 3. Some folks think they are more comfortable (if less attractive) to wear due to being made from a softer plastic compound. Also, if you look at the scale on the flow meter for the oxymizer cannulas, you'll noticed it is much compressed compared to the standard cannula. This results in the ozymizer cannula not being as sensitive to altitude changes as a standard cannula. These cannulas can be obtained from a number of sources. The price is $25-$30.

Mountain High (you'll need the XCR version of the cannula):

http://www.mhoxygen.com/index.phtml?nav_id=28&product_id=27

Aircraft Spruce (you'll need a MH XCR adapter):

http://www.aircraftspruce.com/catalog/pspages/aeroxsys.php

Wings and Wheels (you'll need a MH XCR adapter):

http://www.wingsandwheels.com/page35.htm

Cannulas not obtained from Mountain High will need a small adapter (a barb and short piece of hard poly-urethane tubing) in order to work with our O2 flow meter. The club has a small supply of these adapters available for sale. They can be reused on other cannulas.

You can also use regular hospital type cannulas, but you'll need the adapter. The club has a supply of these cannulas for sale to club members for $10.

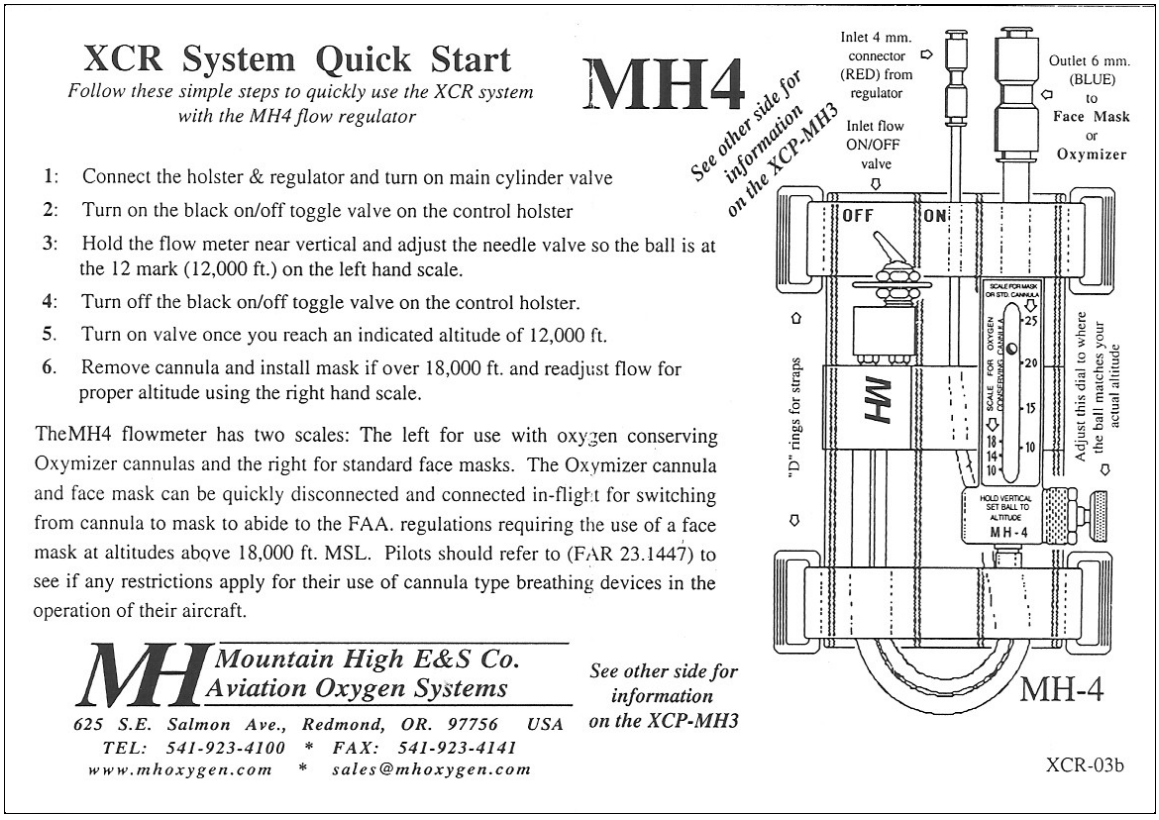
You can also use a light weight oxygen mask (hospital style), but again you'll need the MH adapter. The club has a small supply of these for sale for $10.

MH4 Flowmeter

Oxygen deliver to the cannula is controlled by a Mountain High MH4 dual scale flow meter. The flow meter is installed in a holster with an oxygen flow on/off switch. The holster has Velcro on the back to use to secure it in the aircraft. The left hand scale is for use with the oxymizer cannulas. The right hand scale is for use with the standard cannulas and lightweight masks.

The flow meter must be held vertically in order to set the flow rate. This is done by turning the adjustment needle until the ball is floating next to the desired altitude on the appropriate scale. Once adjusted, the flow meter does not need to remain vertical and can be secured in non-vertical attitude **if necessay**. However it is highly recommended that if possible the flow meter be secured vertically. This will keep the ball floating in the flowmeter and give a visual indication that oxygen is still flowing.

The switch should be used to stop the flow of oxygen until needed. The flow rate adjustment needle should not be used to stop the flow. **Turning the flow rate needle until it is completely seated (closed) can cause damage to the flowmeter.**



EDS Systems

Mountain High Oxygen also sells the EDS-D1 electronic pulse demand oxygen delivery unit. Culb members who have an EDS may substitute if for the MH-4 flow meter. The MHO2 regulators installed wil work with the EDS units. If the EDS unit can be secured in the aircraft with velcro the same as the flow meter.

HFSC has chosen not to provide any EDS units at this time for club member use.

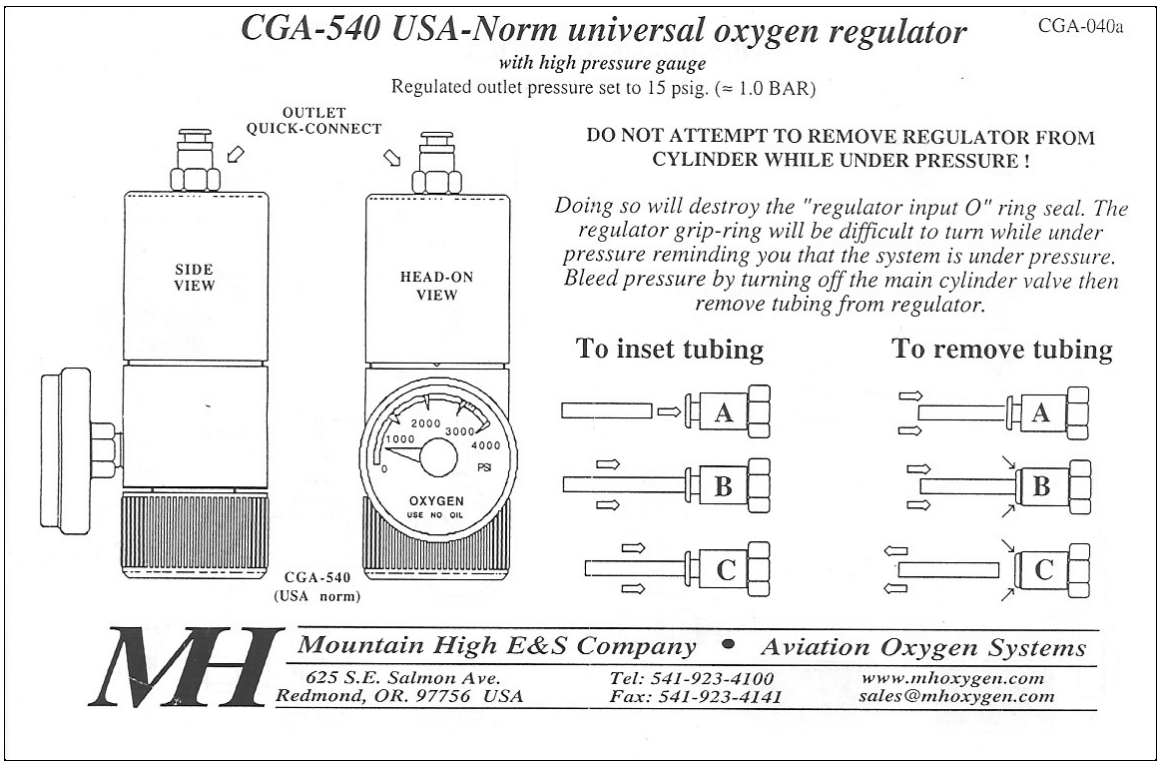
Oximeters

If you are expecting to do extended flying about 10,000', you would be well advised to consider the purchase and use of a pulse oximeter. This device goes over a finger and gives you a readout of you blood saturation level. To assure you are in good shape to fly, your blood saturation should be above 90%. In the past these devices have been fairly expensive, $400 and up. Recently the Checkmate Pulse Oximeter has come on the market for $200. This new unit has the added benefit of having an LCD readout, much more useful in a glider cockpit than and LED readout. These can be obtained from a number of locations, Mountain High, Wings and Wheels, Craggy Aero, or Knauff & Grove. Recommended. Particularly for wave flights.

Regulators

The MHO2 regulator is installed on the aircraft oxygen bottle in parallel with the high pressure A14 system using a T fitting. The regulator has a high pressure port for a guage, however, the gauges have been removed from the regulator and installed in the aircraft where they can be read in flight.

Note the instructions for inserting and removing the tubing in the XCR connector. These instruction apply to attaching the cannuals to the flow meter as well.



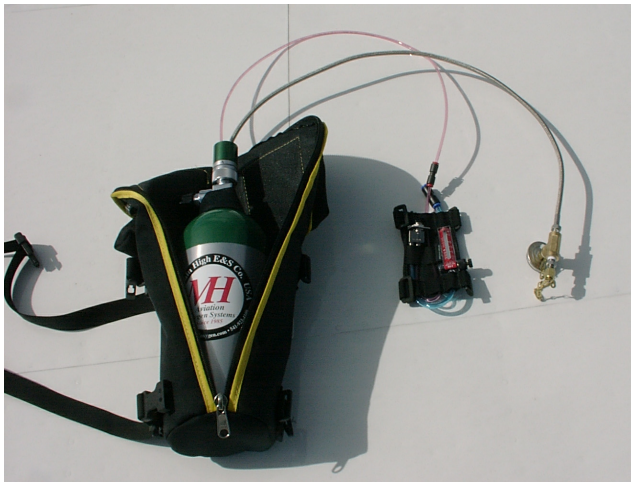
Refilling Aircraft Oxygen Bottles

High Flights oxygen refill system is a 3 bottle cascade kept on a trailer in the tow plane hanger. Additionally we have a single bottle stored in the Ops Trailer for use at camps. This bottle should not be used to refill aircraft O2 tanks at Meadowlake. Follow the oxygen bottle refill procedures below to refill the aircraft bottles.

All aircraft O2 systems should be filled at Meadowlake as a normal part of packing for a camp trip.

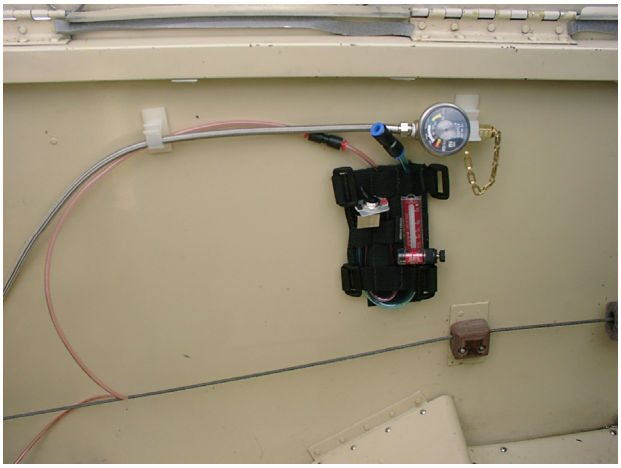
Installing the portable MHO2 system in N747S

The MHO2 system for N747S is stored in the front closet of the Ops Trailer. The cylinder, with regulator, flow meter, and remote fill tube with gauge are all stored in a nylon bag.



To install the system in the aircraft, the bag is opened and the tubes extended. The bag with cylinder enclosed is then zippered closed as much as possible without damage to the tubes. The straps near the top and bottom of the bag are released. The bag is placed across the aircraft frame, immediately behind the seat back. The tubes should exit towards the left side of the aircraft. The bag closure zipper should be facing up. The straps are routed around the frame tube and the bag, latched and tightened so the cylinder is held snugly against the frame tube.

The tubing, red tube with flow meter attached and braided high pressure tube, are routed along the left side of the fuselage and secured inside the plastic clips attached to the fuselage. Both tubes go thru the rear clip. The flow meter is secured to the velcro patch on the side of the fuselage. The braided high pressure tube extends thru the forward clip so that the gauge can be seen in flight.



Once installed, follow the same procedures as for the other aircraft for operation.

At the end of the day, the clips are opened, the tubes removed, the straps released, the bag and cylinder removed. If the O2 pressure level is below 1000 psi, refill the cylinder. Open the bag and carefully coil the tubes inside with the flow meter and gauge above the top of the cylinder. Close the bag and return it to the closet.

Oxygen System Procedures

Pre-flight Procedures

Check all tubing
- Properly connected
- No kinks

Install flow meter holster if necessary
Connect cannula/mask to be used during flight
Make sure O2 flow switch on holster is off
Turn on O2 with valve on bottle
Verify remaining pressure
Turn on O2 flow switch in holster and adjust flow for 12,000 feet
- Make sure to use the scale appropriate to the cannula in use

Turn off O2 flow switch to conserve oxygen until needed

In-flight Procedures

Turn on O2 flow switch upon reaching 10,000 -12,000 feet
Adjust flow meter for higher altitudes as necessary
Adjust flow meter for lower altitudes as necessary
Check flow meter occasionally to verify oxygen is continuing to flow
- This will require the flow meter to be in a vertical position

Check tank pressure occasionally
- If pressure is beginning to get low, begin decent to safe altitude

If you have an oximeter, check your blood oxygen level and adjust flow accordingly

Post-flight Procedures

Turn off O2 flow switch
Remove cannula from flow meter
Check remaining oxygen level, if below 1000 psi, refill bottle
Turn off valve on bottle

O2 filling procedures

Bring refill bottle cascade to aircraft
- At camp bring refill bottle to aircraft

Locate high pressure oxygen refill port on aircraft
- It will be capped with the cap attached with a short chain

Use 2 - 7/16” wrenches to remove the cap from the port
- Do not loosen port itself

Attach hose to port, again using 2 wrenches
Open valve on aircraft bottle
Start with the refill bottle with lowest pressure
Open valve on refill bottle
Observe pressure in aircraft bottle rise
Continually check aircraft oxygen bottle for temperature with hand
- **If aircraft bottle gets too hot to for hand, stop filling until it cools**

Allow aircraft bottle to cool
Close valve on refill bottle
Note date and final pressure on tape on bottle
Repeat with each higher pressure bottle in order from lowest to highest
Close all valves
Release high pressure in hose using relief valve on cart
Remove hose using 2 wrenches
Replace fill port cap and snug down with 2 wrenchs
Replace fill host on bottle cart
If a bottle has dropped below 500 psi, notify a board member so bottle can be replaced

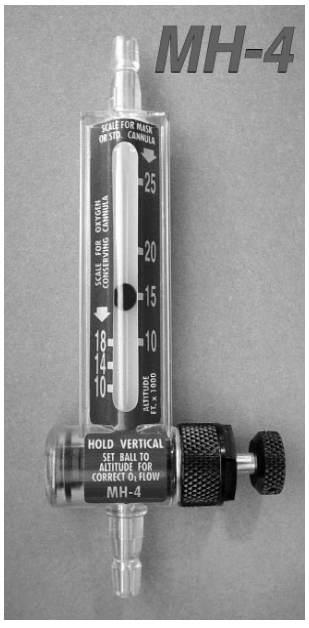
Cylinder Duration Chart

Cylinder Model	Max Liters	Max Cu. ft.	Max Service Pressure (psi)	Man Hours @ 10,000 ft. MH4	MH3	EDS	Man Hours @ 15,000 ft. MH4	MH3	EDS	Man Hours @ 18,000 ft. MH4	MH3	EDS
AL-102s	102	3.6	1800	1.4	4.2	**6.3**	1.0	2.3	**3.0**	0.8	1.8	**2.4**
Al-113	113	4.0	2216	1.6	4.7	**6.9**	1.1	2.6	**3.4**	0.9	2.0	**2.6**
AL-122s	122	4.3	1800	1.7	5.1	**7.5**	1.2	2.8	**3.6**	1.0	2.1	**2.8**
AL-142s	142	5.0	1800	2.0	5.9	**8.7**	1.4	3.2	**4.2**	1.2	2.5	**3.3**
AL-180	165	5.8	2216	2.3	6.9	**10.1**	1.6	3.8	**4.9**	1.3	2.9	**3.8**
AL-248	248	8.8	2015	3.5	10.3	**15.2**	2.4	5.7	**7.4**	2.0	4.3	**5.7**
AL-415	415	14.7	2015	5.8	17.2	**25.5**	4.0	9.5	**12.3**	3.4	7.2	**9.6**
AL-647	647	22.8	2216	9.1	26.9	**39.6**	6.3	14.8	**19.2**	5.3	11.3	**14.9**
AL-682	682	24.1	2015	9.6	28.3	**41.8**	6.6	15.6	**20.2**	5.6	11.9	**15.7**
CFF-480	515	18.2	3000	7.2	21.4	**31.6**	5.0	11.8	**15.3**	4.2	9.0	**11.9**
CFFC-048	1365	48.2	2216	19.1	56.7	**83.6**	13.2	31.2	**40.5**	11.2	23.8	**31.5**
KF-011	311	11.0	1850	4.4	12.9	**19.1**	3.0	7.1	**9.2**	2.5	5.4	**7.2**
KF-022	623	22.0	1850	8.7	25.9	**38.2**	6.0	14.2	**18.5**	5.1	10.8	**14.4**
KF-040	1132	40.0	1850	15.9	47.0	**69.4**	11.0	25.9	**33.6**	9.2	19.7	**26.1**
KF-050*	1416	50.0	1850	19.8	58.9	**86.8**	13.7	32.4	**42.0**	11.6	24.7	**32.7**
KF-077*	2180	77.0	1850	30.5	90.6	**133.6**	21.1	49.8	**64.7**	17.8	38.0	**50.3**
KF-115*	3257	115.0	1850	45.6	135.4	**199.6**	31.6	74.5	**96.6**	26.6	56.7	**75.2**

MH3 & **MH4** are the Mountain High flowmeters
The **MH4** flowmeter is used with a standard aviator's cannula or standard facemask.
The **MH4** flows at approximately 1.0 liter/minute per 10,000 ft.

The **MH3** flowmeter is used with the oxymizer cannula.
At 10,000 ft. the **MH3** flowmeter will yield about 3 times the duration of the **MH4** flowmeter.
At 15,000 ft. the **MH3** flowmeter will yield a 2.4 times savings over the **MH4**.
At 18,000 ft. the **MH3** flowmeter will yield a 2.1 times savings over the **MH4**.
A34 regulators have the same duration as **MH3** (w/Oxymizer) and **MH4** (w/face mask)

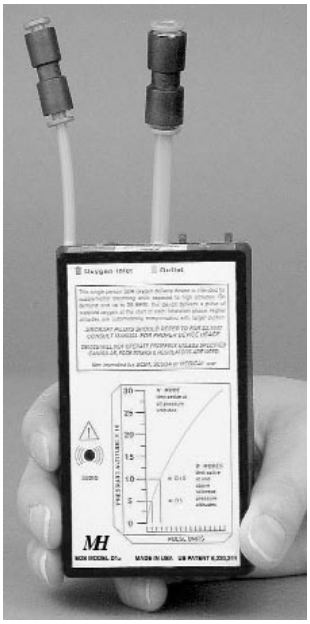
***** = Not considered as a portable cylinder (stationary or built-in recommended)



AL = Aluminum
CFF = Glass fiber
CFFC = Carbon fiber
KF = Kevlar fiber

Using the **EDS** will yield a longer duration over the **MH3** and **MH4** flowmeters at altitudes up to 30,000 ft.

Actual cylinder times will vary from person to person and conditions during use.



Aluminum cylinder selection chart

These seamless aluminum cylinders are manufactured with alloy 6061-T6, are DOT 3AL rated and in compliance with Transport Canada

Cylinder Model Type	Typ. O_2 Vol. Liters (cu. ft.) @ 127 bar (1850 psi)	Max. O_2 Vol. Manufactures Max. capacity Liters (Cu. ft..) @ bar (psig.)	Diameter Maximum cm (inch)	Length Maximum cm (inch)	Weight Maximum Kg (lb)
AL-113	94 (3.33)	113 (4.1) @ 153 (2216)	8.13 (3.20)	26.67 (10.50)	1.11 (2.45)
AL-180	137 (4.8)	164 (5.8) @ 153 (2216)	8.13 (3.20)	34.93 (13.75)	1.41 (3.13)
AL-248	227 (8.0)	248 (8.7) @ 139 (2015)	11.11 (4.375)	32.38 (12.75)	2.04 (4.50)
AL-415	381 (13.4)	415 (14.6) @ 139 (2015)	11.11 (4.375)	47.37 (18.65)	2.83 (6.25)
AL-647	540 (19.1)	647 (22.8) @ 153 (2216)	13.33 (5.250)	48.51 (19.10)	3.81 (8.40)
AL-682	626 (22.1)	682 (24.09) @ 139 (2015)	11.11 (4.375)	70.50 (27.75)	3.92 (8.65)

Silica (glass) fiber-wrapped cylinder selection chart

CFF & CF cylinders have an aluminum core with fiber wrap and are DOT-E 7277-3000 rated.

Cylinder Model Type	Typ. O2 Vol. Liters (Cu. ft.) @ 127 bar (1850 psi)	Max. O2 Vol. Manufactures Max. capacity Liters (Cu. ft.) @ bar (psig.)	DIAMETER Maximum cm (inch)	LENGTH Maximum cm (inch)	WEIGHT Maximum Kg (lb)
CFF-480	317 (11.21)	515 (18.18) @ 207 (3000)	11.43 (4.50)	40.00 (15.75)	1.87 (4.125)

Carbon filament fiber wrapped cylinder selection chart

CFFC cylinders have an aluminum core with carbon filament fiber wrap and are DOT-E 10945-2216 rated.

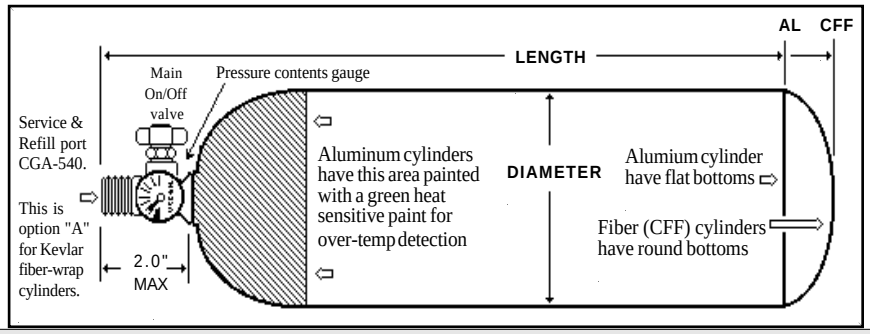
Cylinder Model Type	Typ. O2 Vol. Liters (Cu. ft.) @ 127 bar (1850 psi)	Max. O2 Vol. Manufactures Max. capacity Liters (Cu. ft.) @ bar (psig.)	DIAMETER Maximum cm (inch)	LENGTH Maximum cm (inch)	WEIGHT Maximum Kg (lb)
CFFC-048	1132 (40)	1365 (48) @ 153 (2216)	17.15 (6.75)	49.5 (19.50)	2.90 (6.4)

Kevlar fiber-wrapped cyinder selection chart

CYLINDER MODEL NAME	AVG. VOLUME Liters (Cu. Ft.)	MAX. DIAMETER CM. (IN.)	MAX. LENGTH CM. (IN.)	AVG. WEIGHT KG. (LB)	SERVICE PRESSURE BAR (PSIG.)
KF-011 *	311 (011)	9.27 (3.62)	48.00 (18.90)	0.91 (02.00)	128 (1850)
KF-022 *#	623 (022)	13.21 (5.20)	51.05 (20.10)	1.81 (04.00)	128 (1850)
KF-040 #†	1132 (040)	17.27 (6.80)	52.58 (20.70)	2.90 (06.40)	128 (1850)
KF-050 #†	1416 (050)	17.27 (6.80)	64.00 (25.20)	3.58 (07.90)	128 (1850)
KF-077 #†	2180 (077)	19.38 (7.60)	75.69 (29.80)	5.85 (12.90)	128 (1850)
KF-115 #†	3256 (115)	23.11 (9.10)	80.77 (31.80)	8.21 (18.10)	128 (1850)

Add an additional 1.56" to the length of a cylinder to account for mounting an XCR or XCP regulator.

Oxygen weights a mere 0.083 lb per cu. ft. Therefore, a filled 11 cu. ft. capacity cylinder will weigh a mere 0.913 lbs more.



Kevlar fiber wrap aircraft oxygen cylinders

These light-weight cylinders are for size and weight critical applications

Weights and dimensions are for the cylinder only

CYLINDER MODEL NAME	AVG. VOLUME Liters (Cu. Ft.)	MAX. DIAMETER CM. (IN.)	MAX. LENGTH CM. (IN.)	AVG. WEIGHT KG. (LB)	SERVICE PRESSURE BAR (PSIG.)
KF-011 *	311 (011)	9.27 (3.62)	48.00 (18.90)	0.91 (02.00)	128 (1850)
KF-022 *#	623 (022)	13.21 (5.20)	51.05 (20.10)	1.81 (04.00)	128 (1850)
KF-040 #†	1132 (040)	17.27 (6.80)	52.58 (20.70)	2.90 (06.40)	128 (1850)
KF-050 #†	1416 (050)	17.27 (6.80)	64.00 (25.20)	3.58 (07.90)	128 (1850)
KF-077 #†	2180 (077)	19.38 (7.60)	75.69 (29.80)	5.85 (12.90)	128 (1850)
KF-115 #†	3256 (115)	23.11 (9.10)	80.77 (31.80)	8.21 (18.10)	128 (1850)

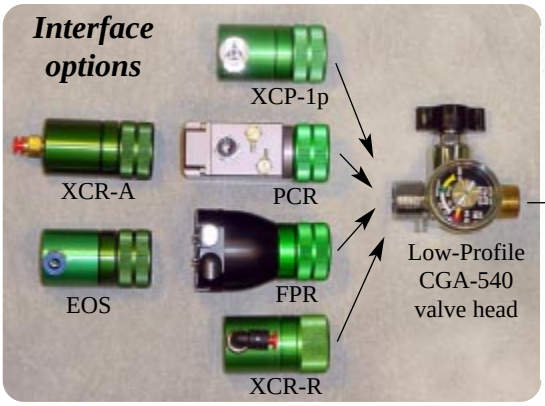
* **Full-Pack** carry-case available, # **Tuff-Pack** carry-case available, † Rigid installment recommended (see Cylinder Mounting Kits)

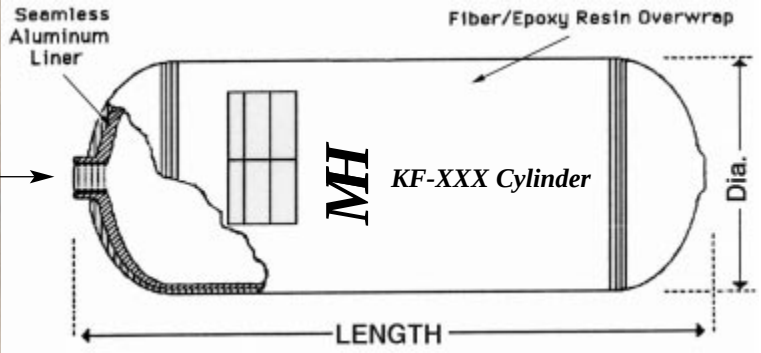
The KF series cylinders are specifically designed for aircraft applications to be the lightest and hold the most volume of oxygen.

The **KF** series (Kevlar® fiber wrapped) cylinders have been specifically designed for aviation applications. They are the lightest and strongest currently available that meet or exceed DOT, SAE and FAA specifications and manufactured and tested in accordance with a DOT-E exemption protocol. Current DOT regulations allow a 15-year cylinder service life starting with the first hydro-test date if the cylinder is for commercial or type certified applications. A thin-wall, seamless aluminum alloy cylinder (6061-T6) is reinforced by a full over-wrapping of Kevlar® fibers sealed in epoxy. The **KF** series cylinders have a 0.750-16 UN-2B (SAE-8) service port typically fitted with a low-profile CGA-540 axial service port valve-head with pressure gauge and over-pressure relief plug. The cylinder can be used with a wide range of high pressure pneumatic interface devices for built-in aircraft oxygen system applications. Cylinder hold-down kits (**CMK**) for rigid mounting or fabric harnesses are available (**Full-Pack** or **Tuff-Pack**) for carry-on and strap-on seat-back applications. These cylinders are preferred by many (with the **EDS**) in the new series of high-performance kit planes. The **KF-011** fits very well in the tight, 3.93" (100 mm.) diameter cylinder area unique to many European-built sailplanes. The **KF** series cylinders typically yield some 30 to 60% weight savings over conventional steel and aluminum cylinders.

Kevlar is a trademark of Dupont

The KF series of cylinders accept the low-profile CGA-540 valve head to then allow a wide selection of 'screw-on' CGA-540 compatable oxygen regulators.





Aluminum cylinder selection chart

These seamless aluminum cylinders are manufactured with alloy 6061-T6, are DOT 3AL rated and in compliance with Transport Canada

Cylinder Model Type	Typ. O_2 Vol. Liters (cu. ft.) @ 127 bar (1850 psi)	Max. O_2 Vol. Manufactures Max. capacity Liters (Cu. ft..) @ bar (psig.)	Diameter Maximum cm (inch)	Length Maximum cm (inch)	Weight Maximum Kg (lb)
AL-113 †*	94 (3.33)	113 (4.1) @ 153 (2216)	8.13 (3.20)	26.67 (10.50)	1.11 (2.45)
AL-180 †*	137 (4.8)	164 (5.8) @ 153 (2216)	8.13 (3.20)	34.93 (13.75)	1.41 (3.13)
AL-248 †	227 (8.0)	248 (8.7) @ 139 (2015)	11.11 (4.375)	32.38 (12.75)	2.04 (4.50)
AL-415 †	381 (13.4)	415 (14.6) @ 139 (2015)	11.11 (4.375)	47.37 (18.65)	2.68 (5.90)
AL-647 †	540 (19.1)	647 (22.8) @ 153 (2216)	13.33 (5.250)	45.97 (18.10)	3.81 (8.40)
AL-682 †	626 (22.1)	682 (24.09) @ 139 (2015)	11.11 (4.375)	68.58 (27.00)	3.92 (8.65)

Silica (glass) fiber-wrapped cylinder selection chart

CFF & CF cylinders have an aluminum core with fiber wrap and are DOT-E 7277-3000 rated.

Cylinder Model Type	Typ. O2 Vol. Liters (Cu. ft.) @ 127 bar (1850 psi)	Max. O2 Vol. Manufactures Max. capacity Liters (Cu. ft.) @ bar (psig.)	DIAMETER Maximum cm (inch)	LENGTH Maximum cm (inch)	WEIGHT Maximum Kg (lb)
CFF-480 † *	317 (11.21)	515 (18.18) @ 207 (3000)	11.43 (4.50)	40.00 (15.75)	1.87 (4.125)

Carbon filament fiber wrapped cylinder selection chart

CFFC cylinders have an aluminum core with carbon filament fiber wrap and are DOT-E 10945-2216 rated.

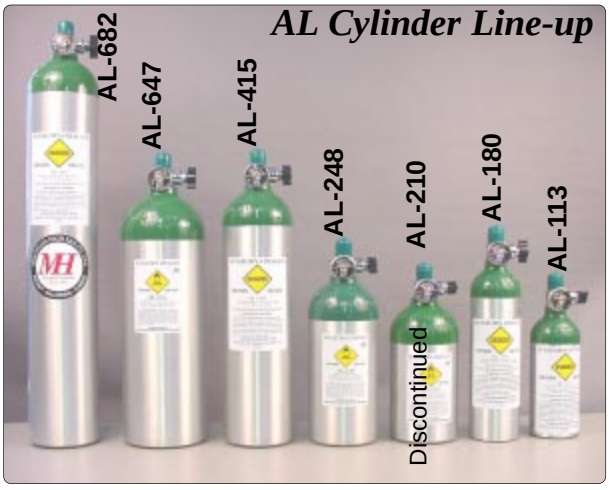
Cylinder Model Type	Typ. O2 Vol. Liters (Cu. ft.) @ 127 bar (1850 psi)	Max. O2 Vol. Manufactures Max. capacity Liters (Cu. ft.) @ bar (psig.)	DIAMETER Maximum cm (inch)	LENGTH Maximum cm (inch)	WEIGHT Maximum Kg (lb)
CFFC-048	1132 (40)	1365 (48) @ 153 (2216)	17.15 (6.75)	49.5 (19.50)	2.90 (6.4)

* These cylinders have an optional fabric holster/harness for tie-down and carry-on applications.

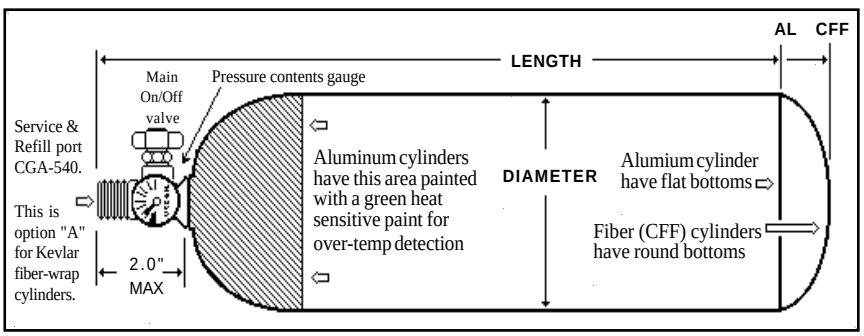
† These cylinders may be ordered with the Full-Pack fully-padded harness/carry case for seat-back mounting.

§ These cylinders use a standard right-angle CGA-540 valve head without a gauge or gauge port.
Add an additional 1.56" to the length of a cylinder to account for mounting an XCR or XCP regulator.

Oxygen weighs a mere 0.083 lb per cu. ft. Therefore, a filled 11 cu. ft. capacity cylinder will weigh a mere 0.913 lbs more.



New cylinders are added to our list periodically.
If you don't see what you are looking for, call us



Cylinder carry cases & harnesses


KF-040 in the Full-Pack


AL-682 (left) AL-415 (right) in the Full-Pack


AL-682 in the Full-Pack

KF-022 in the Full-Pack

All Full-Packs & Tuff-Packs have 'D' rings placed at balance-points to allow for rear-seat mounting.

Mountain High E&S Co. USA
MH
Aviation Oxygen Systems
Since 1985
800-468-8185 • MHoxygen.com • 541-923-4100

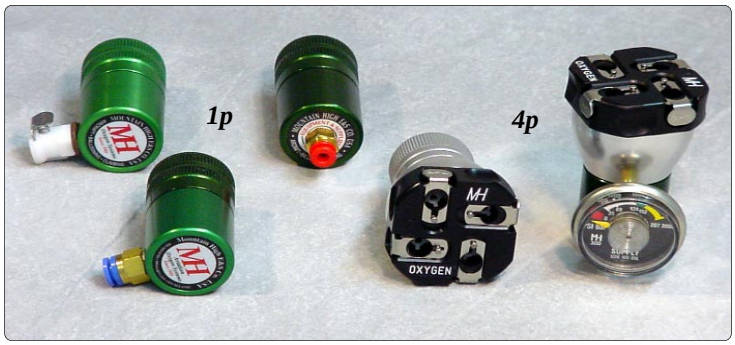

KF-022 in the Full-Pack


KF-011 in the Full-Pack


KF-077 in the Tuff-Pack

Oxygen regulators

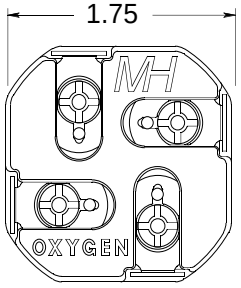
Oxygen regulators that directly connect to the outlet/service port of an oxygen cylinder that are featured in our portable systems

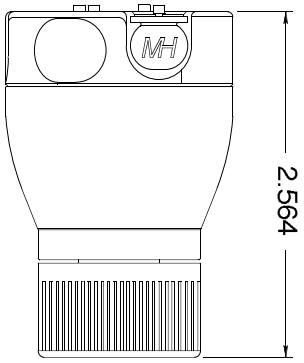


Our line of oxygen regulators are the piston type. This design is known for its ruggedness and flawless operation even in an extreme environment. Calibrated operation is ensured throughout a wide range of inlet pressures, temperatures and shock-vibration exposure. These regulators tolerate moisture ingestion so they do not freeze to clog or stop the regulating mechanism. Unlike other regulators, moisture just passes through. The regulators have sintered metal micro-particle filters in the inlet nipples to ensure proper operation without the worry of contamination.

The **XCR** series of regulators are essentially single-outlet. These regulators feature the **SMC** quick-lock system for the 4 mm. and 6 mm. polyurethane tubing. Standard issue with our **XCR** and **EDS** single-place system packages is the 4 mm. radial swivel-elbow regulator. The axial outlet versions are available in CGA-540 & DIN-477 with built-in cylinder pressure gauges.

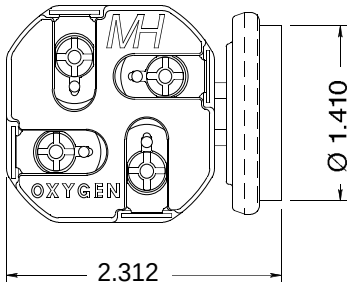
Please call if you don't see what you need

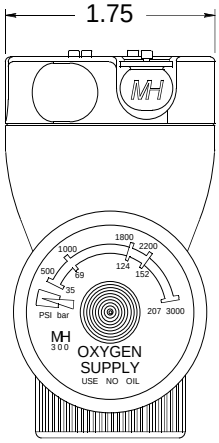


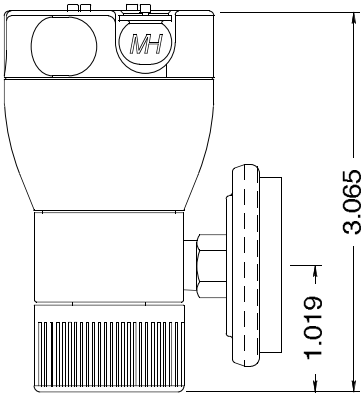


*Our oxygen regulators are constant-pressure calibrated to deliver about 15 psig. (1 bar) of pressure dynamically (that is while flowing). They have been designed to stop the high-pressure inlet side while the low-pressure outlet side is stopped (static no-flow condition) at a pressure of about 20 psig. This allows for a semi-remote on/off control action of the regulator. This is utilized in the **EDS**, **XCR** on/off control system and in the **XCP** systems while no stations are connected to any of the outlets.*

The dimensional aspects of our oxygen regulators have been carefully designed so they can be used in all sorts of tight-fitting applications!







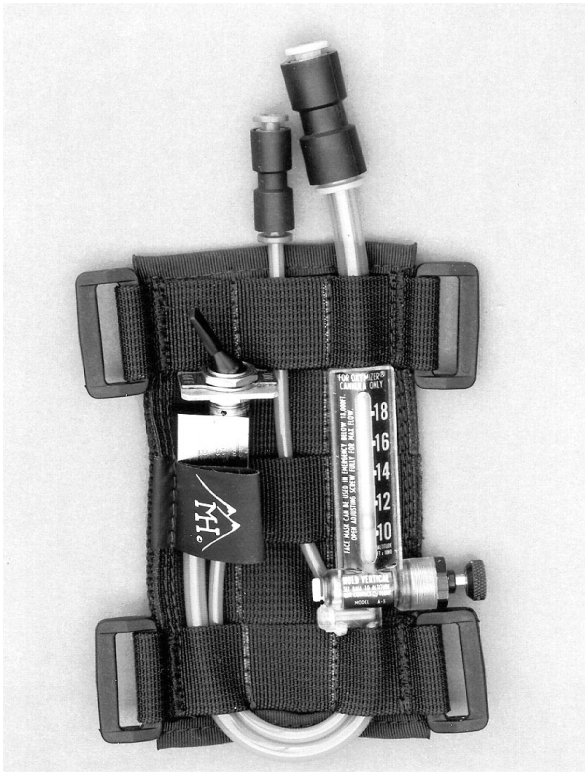
Operation & Safety Manual
for the

X C R

Cross Country Racer

Portable Aviation Oxygen Systems

R8



Using Nasal Cannulas in Aviation

The cannula type breathing device can be used up to 18,000 ft MSL. Pilots should refer to FAR 23.1447 to see if any restrictions apply for their use of cannula type breathing devices in the operation of their aircraft.

Basic Safety

The XCR Oxygen system deliver pure oxygen for the purpose of supplemental breathing. They are not intended for medical use. The administration of oxygen should be done by a doctor or emergency medical technician with equipment made for that use. Pure oxygen is a highly oxidizing gas in nature and can vigorously accelerates combustion. It can provide a catalyst for spontaneous combustion and may cause 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 use the system while smoking or near an open flame.

MH ***Aviation Oxygen Management Systems***

625 SE Salmon Ave, Redmond, OR. 97756
Tel: 541-923-4100 Fax: 541-923-4141

A word about oxygen in general

Oxygen is oxygen. There are no specific grades or purities with oxygen under pressure that has been produced by liquefaction. Therefore, oxygen under pressure regardless of the cylinders claim must be 99.9% pure or the cylinder will be damaged by rust or corrosion prematurely. All utility oxygen cylinders will (must) have a service fitting of type CGA-540. This will be for welding, aviation and medical purposes. Oxygen specifically intended for medical purposes will most likely have a service valve fitting of type CGA-870 (sometimes referred to as a post valve) to help make distinction with a hygiene protocol but is still no different. Oxygen for medical purposes does have a specific protocol for hygiene and transport. There are, however, various mixtures of air that may be used strictly for medical purposes or industrial and is not interchangeable and may be the reason many think that there is different grades of oxygen purities. Vessels holding these air mixtures will have a CGA-346 type service fitting that is not compatible with the CGA-540 fitting for oxygen. Once again oxygen is oxygen. It can't be under pressure without any adverse reaction if it is not as pure and dry as possible. The CGA, Compressed Gas Association has adopted and helped develop almost all the standards for compressed gasses used in the USA and adopted by the FDA, DOT and other government agencies as well as many foreign governments. They have a variety of documents about compressed gases, vessels and fittings. To receive specific information, contact the:

Compressed Gas Association, inc.
1235 Jefferson Davis Highway
Arlington, VA. 22202.
as of 1994

Hazards of high pressure oxygen and transfilling

(*refilling your cylinder*)

Transfilling of gaseous oxygen from one cylinder to another involves hazards associated with the handling of oxygen under pressure. A hazardous condition does exist if high pressure oxygen equipment becomes contaminated with hydrocarbons such as oil, grease or other combustible materials which may include oil from a person's hands or contaminated tools.

A cylinder will heat as it is filled from a high pressure source. The more rapidly the cylinder is filled, the higher the temperature rise in the cylinder resulting from the heat of compression of the gas. Excessive temperature may result in the ignition of any combustible materials that may be present in the system. Refill the cylinder at a flow rate that reduces heating of the cylinder. Use only equipment designed for refilling and transfilling.

Although oxygen itself is nonflammable, materials which burn in air, which is 21% oxygen, will burn much more vigorously and at higher temperatures in an oxygen enriched atmosphere. If ignited, some combustible materials such as oil will burn in oxygen with explosive violence. Many other materials which do not burn in air will burn vigorously in oxygen-enriched atmospheres. Ignition temperatures are reduced in oxygen-enriched atmospheres. Compressed oxygen presents a hazard in the form of stored energy.

Open the cylinder valve slowly. The rapid release of high pressure oxygen through orifices, control valves, etc. in the presence of foreign particles may cause friction or impact resulting in temperatures which may be sufficient to ignite any combustible materials that may be present in the system.

You can have your cylinder refilled by any industrial gas supply facility, airport and at some medical equipment companies. Each cylinder has been hydrostatically tested and stamped with the date of the test. This is good for 5 years. After this time frame, it will need to be tested and certified again before it can be filled and used. Again, almost any industrial gas and welding supply facility that services and/or refills oxygen cylinders can do this.

Cleaning for dirt, oil and greases

basic hygiene for oxygen equipment

If any part of the system should become contaminated or you suspect so, you can clean it with hot water and detergent. Do not use the system if it has become contaminated with oil or grease. If the contamination is mild a liquid form of automatic dishwasher detergent or the cleaning product "Formula 409" has shown to work well for this purpose. This type of detergent is able to cut and remove almost all types of oils or greases and will rinse off without any detectable residue.

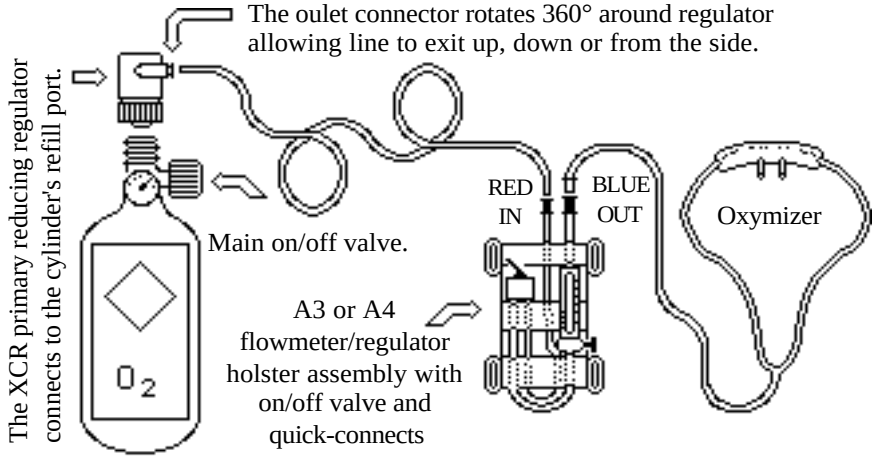
To test for contamination take a clean cotton swab "Q-Tip" and wipe the suspected area with it. With a cup or bowl of CLEAN water do this test. While you are observing a clear reflection of light on the water's calm surface, place the tip of the cotton swab into the water. You should not detect any oil what-so-ever bleed from the cotton tip fanning out over the waters surface. This is an accepted method for oil contamination detection. An oil clean surface will pass this visual test without any doubt.

If the service line should become contaminated internally by oil or grease it can be cleaned by soaking the entire line in a vat of hot water and a liquid form of automatic dishwasher detergent. Rinse the line in hot water and inspect. If contaminants are still present repeat soaking. Dry the line by hanging it vertically in a hot air or direct sunlight environment. However, if the contamination is more or so severe you may have to perform the cleaning process several times or use a solvent such as type "111 trichloroethane".

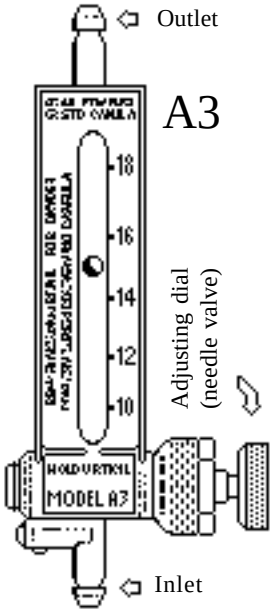
The XCR Oxygen Delivery system

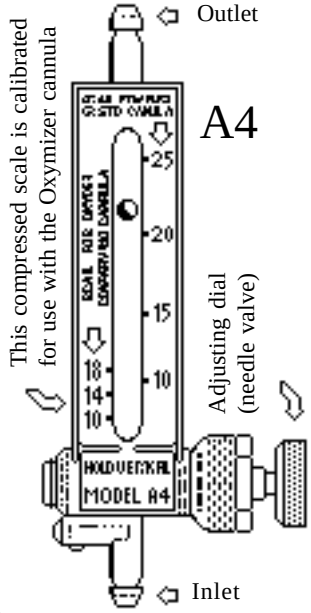
light-weight, compact, high-duration competition oxygen system

The XCR (Cross Country Racer) is a high-duration carry-on oxygen system for multiple aviation uses. The XCR system is comprised of the cylinder, the XCR primary reducing regulator, 5 feet of high-quality kink-proof polyurethane service line, one XCR holster with your choice of either A3 or A4 flow meter with remote on/off valve and an "M" type Oxymizer oxygen conserving cannula. You can add up to four (4) flow meters to one XCR regulator with optional split kits. "D" rings on the corners of the pilot control harness/holster allows freedom to mount it to your arm, leg, shoulder-strap, uprights or almost anything.



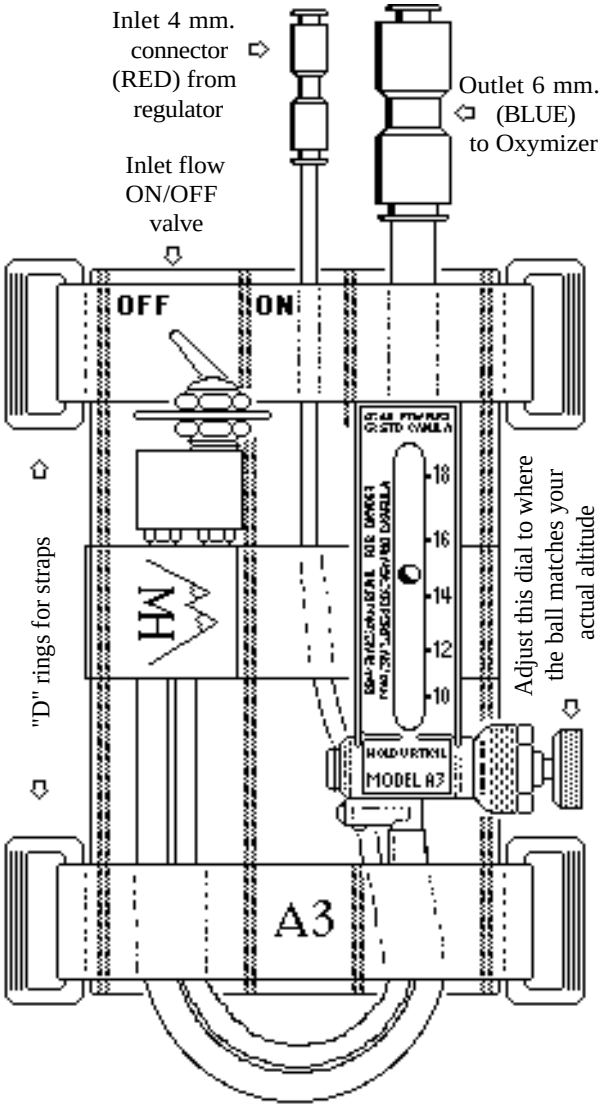
The XCP system comes with the A3 or A4 flow meter. The A3 has an altitude/flow scale calibrated for the unique Oxymizer oxygen-conserving cannula. The scale is marked in 2,000 ft. increments, for flight levels (up to 18,000 ft.). To receive the proper amount of oxygen, simply adjust the A3 to where the scale reads the same altitude you are flying. Example: If you are at 15,000 ft. you would hold the meter vertical and adjust the needle valve on the A3 to where the ball reads between the 14 and 16 on the scale. Counter clock-wise increases and clock-wise decreases oxygen flow. The outlet flow of the A3 can be adjusted well beyond the limits of the scale for emergency purposes.





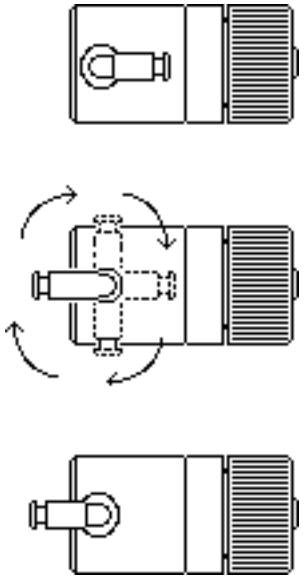
You can operate the XCP at flight levels (above 18,000 ft.) with the optional A4 flow meter and associated F1 face mask. This will, however, use much more oxygen. One (1) liter/min. per 10,000 ft. The A4 has two altitude/flow scales. The left (compressed) scale is calibrated for the Oxymizer cannula and is limited to flight levels (below 18,000 ft.). The right scale is calibrated for a standard cannula and face mask and is limited to 25,000 ft. The outlet flow of the A4 can be adjusted well beyond the limits of the indicated scale for emergency purposes.

The XCR holster/harness holds the A3 or A4 flowmeter and secondary on/off valve. The four "D" rings provide a method to use almost any type of straps. It can be mounted via straps to yourself, shoulder strap or almost anywhere desired.



Assembly of the XCR delivery system

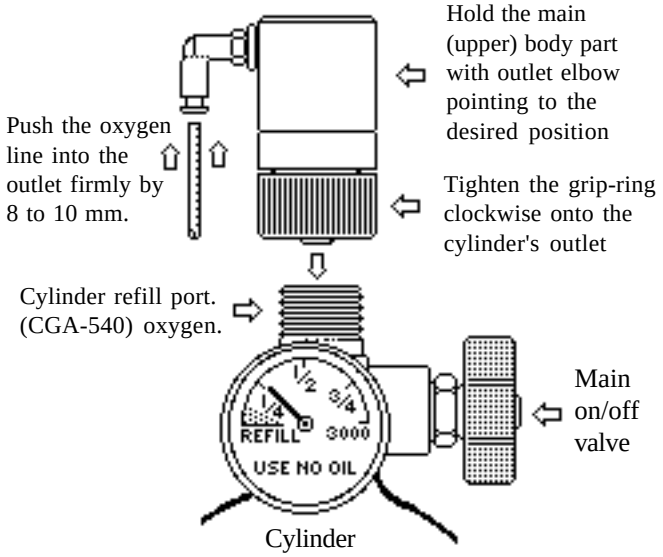
The flow of the XCR regulator is remotely controlled via a small ON/OFF toggle valve mounted in a fabric holster/harness that can be mounted conveniently close to the pilot. Because the XCR regulator is a "constant pressure" type, the system will not blow lines off fittings while the pilot control valve is off. The Oxymizer® nasal cannula in conjunction with your nasal cavity operate as a diluter demand regulator by conserving oxygen in a reservoir between breaths. This allows maximum use of your oxygen where only 1.0 liter/minute of oxygen enables persons (without any medical conditions) to get more than 90% Sat of O2 in their blood for pressure altitudes up to 20,000 ft. Standard cannulas need about 2.0 to 2.5 liters/minute to achieve this. The XCR regulator connects by hand to any O2 cylinder that has the industry standard CGA-540 outlet service connection.



The XCR regulator can by removed and replaced very easily by hand. It will be very hard to remove if under pressure to remind you to relieve the pressure before removal.

The XCR regulator's outlet port is a rotating elbow that helps to facilitate unique installation requirements and problems.

The XCR regulator can fit on to any cylinder that uses the industry standard (CGA-540) oxygen fitting.



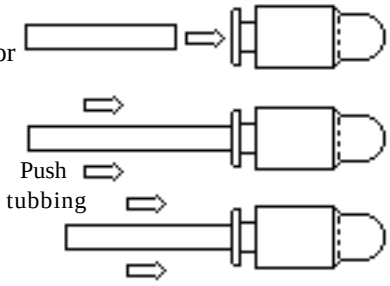
CAUTION

Do not attempt to remove the XCR regulator from cylinder while under pressure ! Doing so may destroy the O-ring on the inlet nipple of the XCR regulator. The grip-ring on the XCR regulator will be difficult to turn while under pressure reminding you to stop and follow these steps.

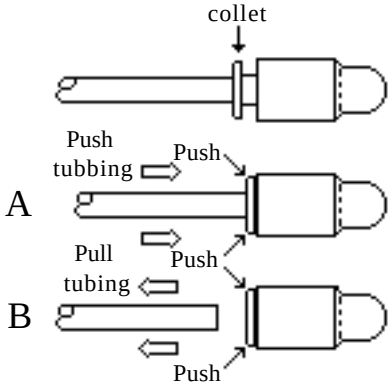
To bleed pressure:

1: Turn off main cylinder valve (fully clockwise) not much force is needed for full off.
2: Connect at least one A3 or A4 flowmeter to an outlet port of the XCP regulator.
3: Let remaining oxygen bleed via one of the A3 or A4 flowmeters still connected.

To insert tubing:
push firmly into connector by 8 to 10 mm.



To remove tubing:
"A" push tubing and collet in.
"B" while pushing in collet, pull tubing out.



CAUTION

Do not force the polyurethane tubing from the quick-connectors without performing steps A & B. Doing so will cut off the tip of the tubing inside the connector rendering it useless

Your XCR oxygen system comes as a kit or complete with the following material:

1: XCR regulator with rotating quick-connect outlet elbow connector.
1: 5.0 ft (3 meters) of high grade 5/16" (4 mm) polyurethane O2 service line.
1: XCR pilot control valve & holster/harness with A-3 or A-4 flow control.
1: "M"type Oxymizer® oxygen conserving nasal cannula.
1: Storage & travel zipper-bag for the XCR regulator, cannula and flowmeter.