HOLLIS Explorer mCCR Conversion Kit

Assembly Manual & Instructions

READ THE MANUAL!!!!

IN ORDER TO FULLY UNDERSTAND YOUR NEW REBREATHER, THE COMPONENTS, HOW THEY WORK, HOW TO HANDLE AND TREAT THEM, YOU MUST READ THE MANUAL IN FULL, FOR YOUR RE-BREATHER.

ORCA SPIRIT OWNERS SHOULD READ THE OS MANUAL; SPORT KISS OWNERS SHOULD READ THE SPORT KISS MANUAL; KISS CLASSIC, & KISS CLASSIC EXPLORER OWNERS SHOULD READ THE KISS CLASSIC EXPLORER MANUAL; HOLLIS EXPLORER OWNERS SHOULD READ THE HOLLIS MCCR CONVERSION MANUAL, AND USE IT IN CONJUNCTION WITH THEIR HOLLIS MANUALS. ANY DIVER WHO HAS UPGRADED COMPONENTS TO THEIR REBREATHER SHOULD BECOME FAMILIAR WITH THOSE COMPONENTS, AND RECEIVE TRAINING.

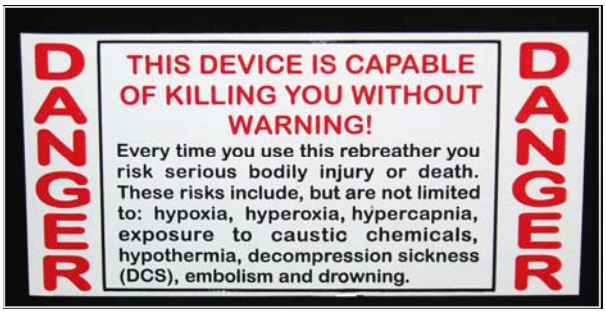
THIS SHOULD BE DONE PRIOR TO DIVING OR SERVICING THIS UNIT!!! SPECIAL ATTENTION SHOULD BE PAID TO ALL NOTES &/OR WARN-INGS; THEY MUST BE READ AND UNDERSTOOD!!!! FAILURE TO DO SO, MAY CAUSE SERIOUS INJURY OR DEATH!!!!

YOU MUST BE A LEGAL ADULT IN THE AREA IN WHICH YOU LIVE IN ORDER TO PURCHASE AND DIVE A KISS REBREATHER.

As with all scuba diving equipment, your KISS rebreather compo-nents should be serviced annually by a trained technician. For those diving frequently, servicing may be required more often.

ALL INFORMATION IN THIS MANUAL IS SUBJECT TO CHANGE.
Please visit our website, www.kissrebreathers.com
for updated manuals.

THIS IS NOT A JOKE!!



Participation in rebreather diving can result in serious injury or death to you, the diver!

The warning on the HOLLIS mCCR conversion is not a joke. Before beginning your dive, you must consider the risks involved. The rebreather consists of many parts. All of these components will eventually fail. Careful maintenance, assembly, and testing will not prevent this from happening. At best, it will delay the failure. The HOLLIS mCCR conversion rebreather is not automatic in any way. It requires constant monitoring, a complete awareness of the potential problems likely to be encountered, and full knowledge of how to deal with whatever problems may occur. If you do not have adequate training, equipment, physical conditioning, and a proper mind-set, do not get in the water.

The diver, YOU, has the final responsibility for his or her own safety and actions while using this rebreather. All components of the rebreather must be in good working order and be properly assembled and tested to reduce the risk of failure. Regardless of the training and experience of the diver and the reliability of the rebreather the risk of serious injury and/or death can never be reduced to zero. This manual is not a complete text on the maintenance and operation of the rebreather. The diver must complete a proper training course covering the maintenance, testing and operation of the rebreather before diving this equipment. The rebreather can malfunction while diving even when properly assembled and having passed all pre-dive tests. Only carrying adequate bailout gas and having the training and skills necessary to utilize the bailout system can reduce, but never eliminate, the risk of equipment failure.

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Introduction & Specifications

This manual is intended to describe the proper assembly and installation of the HOLLIS mCCR upgrade kit for the Hollis Explorer rebreather. The modifications described herein pertain only to the installation of parts available from KISS, and should only be performed by a KISS authorized, & current dealer or instructor. No one should attempt to modify their rebreather without an upgrade kit, and no part of the following manual should be applied to modify any rebreather other than the Hollis Explorer. Please review this manual completely before beginning any modifications.

The HOLLIS mCCR upgrade kit will allow the user of a Hollis Explorer to operate and dive their unit as a mechanical fully closed-circuit rebreather. This manual is not a complete text on the maintenance and operation of the Hollis Explorer as a closed-circuit rebreather. The user is responsible for being trained and certified to operate a closed-circuit rebreather, and complete a course of instruction before diving, even if they have been trained to operate a Hollis Explorer, or another brand of closed-circuit rebreather.

In addition, the diver is responsible for knowing and understanding the following:

- The conversion allows a Hollis Explorer to operate as a CCR. It does NOT enable the unit to exceed the depth and duration limits specified by Hollis for the Explorer.
- The converted unit should NEVER be used for decompression diving.
- The unit should never be used with trimix or with any gas other than oxygen, nitrox, or air.
- The user should continue to follow the maintenance and service guidelines specified by Hollis.
- This conversion kit is not intended to repair a non-functioning unit. The Hollis explorer should be in working order prior to the conversion.
- KISS cannot guarantee service or replacement of any parts not supplied in the kit.

CCR Conversion Kit

The HOLLIS mCCR conversion kit contains the following parts:

- Scrubber Head with cover
- Draw Nut
- Oxygen delivery manifold
- Oxygen injection plug
- KISS manual add valve
- LP swivel elbow
- Male and female quick-disconnect fittings
- 32” black LP hose for diluent
- 6” black LP hose for diluent
- 36” black LP hose for BOV
- 30” and 36” green LP for oxygen
- O-ring kit
- Oxygen-ready first stage regulator (fixed IP)

Not Included:

- Pressure gauges - the length of the HP gauge hose will depend on how the gauge is situated, and on the divers body type.
- Sensors
- Display

Assembly – Part 1

For the Dealer/Instructor

Begin by stripping down the unit. Remove the cover, loop hoses, scrubber body, HUD, and tank. The wing and harness may be left on the frame.

You will need to remove the first stage regulator at the top of the frame (all directions from the diver's perspective), and the HP and LP hoses which are attached to it.

Remove the LP hose connecting the nitrox input to solenoid. Leave the fittings on the regulator, as this will serve as the ADV. The other components here, the over-pressure valve and the loop control valve, will continue to serve their functions as well.

Remove the electronic head, and save the O-rings which seal the head to the scrubber body. These will be used in the same place on the new head. Disconnect the display cables; dealers will be provided with a tool to accomplish this. Once the cables are disconnected, you should be able to pull the head apart and remove the threaded ring which attaches the head to the scrubber body. This will also be used on the new head.
The head, cables, and displays can be discarded.

In the scrubber body, remove the LSS module and solenoid; save the retaining O-rings from the solenoid and LSS (they are the same size). You will have to remove the swivel elbow from the solenoid to do this.

Replace the two O-rings in the swivel elbow with the Viton 013 o-rings provided in the kit. This will be where oxygen is added into the loop.

Next, put the O-ring from the solenoid onto the oxygen manifold, and push it into place where the solenoid was. This will be easier later if you have the small rubber hose already in place on the manifold. Replace the swivel fitting, and ensure that the port plug on the manifold is secure.

Put the retaining O-ring from the LSS module onto the oxygen injection plug, and insert it into the center of the scrubber, where the LSS module was. There should be a 113 Viton O-ring on the end of the plug, which will seal against the inside of the scrubber canister. You do not need to have the scrubber in place to install this, and the scrubber can be removed and replaced without disturbing this part, as it will seat against the head.

Install the plug in the orientation shown, and push the rubber tube into the fitting to connect it. Tug on the tube slightly to make sure that it has made a good fit. Check that the port plug on this part has a good seal as well.

At this point, you will need to drill a small hole in the end of the scrubber canister. This hole does not need to be more than 1/8” in diameter. This will allow oxygen to be supplied to the exhale side of the unit, away from the O2 cells.

These instructions are intended for the dealer or instructor as the basis for converting a Hollis Explorer to an mCCR. The steps in this section should be followed exactly. The next section contains the recommended procedures for setting up the unit, and should be implemented under the supervision of a qualified instructor as part of a certifying course.

Assembly – Part 2

For the Diver

Attach the 3/8” end of your 30”green LP hose to the KISS manual add valve. This will connect to the unit. Check that the upstream port has a filter in place.

Connect the 36” green LP hose to the first stage regulator and route it to the right shoulder as shown.

Position the scrubber body and counterlungs as usual and connect the loop control valve to the counterlungs. Do not replace the bolts which mount the scrubber to the frame.

Attach the 36” black LP hose to the BOV, and attach the swivel elbow included in the kit to the other end of the hose. Run the hose over the right shoulder, and under the scrubber body. Connect the fitting to the ADV as shown.

Fit the 32” black LP hose with a check valve and quick disconnect, and pass this hose over the left shoulder and under the scrubber body. Connect it as shown to the ADV; this should be where gas was supplied on the original unit. This will be the supply hose for connecting offboard diluent.

Next, connect the oxygen supply. Connect the 30” green hose (with the MAV attached) to the swivel elbow mounted to the manifold. Route this hose over the right shoulder, and attach the 36” oxygen supply hose to the manual add valve.

Adjust the loop control valve to vent as little gas as possible, and secure the scrubber body to the frame using the mounting bolts.

Remove the O-rings from the oxygen cells, and install them in the head.

Lubricate and install the included 247 O-rings in the head. You will also need to install the O-rings you saved from the Hollis Explorer head.

Slide the threaded retaining ring from the Explorer head over the new head. Connect the cable to the cells using the molex connectors, and fit the cover onto the head. Be careful not to pinch the wires between the head and cover where these parts meet in the center. Install the two 113 O-rings on the draw nut, and fasten the nut to the head.

You may now secure the head to the scrubber body in the same way as the original Explorer head. Align the display cable in the correct direction before locking in the head. Do not adjust the cable position by turning the cover, as this will strain the cable and cells.

***WARNING: It is important that the display cables are properly wired. Failure to do so, may cause serious injury or death! Also, It is important that the sensors are properly installed. If the sensor O-ring is left on, or they are not turned all the way in-to the head, response times may be delayed!! Ensure that the O-rings are in good condition, that the area is clean and the components are not damaged. Lastly, if the wires are pinched under the plate, the scrubber head will not be water tight. Water damage in this area will ruin the sensors and/or the electronics. If the wires do get pinched, inspect them for damage!!**

Manual Add Valve - MAV

The MAV is the component that will add oxygen to your unit continuously and will also allow you to push a button to add gas as required.

Further on in this manual you will find a MAV trouble shooting & service section. For the purpose of gear assembly, the valve is ready to go. Once the unit is assembled and the wing/harness system in place, bring the MAV over the right shoulder of the harness and thread it through the D-ring. Alternatively, you may use a small bungee loop which is tied to the D-ring and slide the MAV through that. Securing the MAV in this manner will keep the valve in the proper position allowing the diver to find it easily.

Diluent Cylinder and the Off-Board Gas Accessory

The diluent cylinder on the HOLLIS mCCR kit is side mounted and doubles as the diver's bailout gas. In this configuration the diluent cylinder is referred to as off board diluent gas as the cylinder is not secured to the main rebreather. The advantages of this are that diver's may customize the system to suit their diving needs. It also keeps the main rebreather small, light, flexible, and easy to travel with.

KISS recommends that a minimum of 40 cuft should be used as the diluent/bailout cylinder when diving recreationally. Diver's must be certain that the cylinder they choose has the proper amount of gas for diluent, wing & drysuit inflation, and also for bailout. Ensure that it is appropriate for the dive that they are planning.

The kit includes one full set of the off-board accessory. This accessory is used to plumb the diluent/bailout gas into the rebreather via the manifold. The kit includes the rebreather side whip and the diluent cylinder side whip.

The off-board accessory rebreather side includes, 1 32 inch LP hose, 1 check valve with quick disconnect male. The off-board accessory cylinder side includes, 1 6 inch LP hose, 1 quick disconnect female.

The cylinder side whip should be secured to the diver's first stage on the diluent/bailout cylinder.

Those divers that wish to carry more then one diluent/bailout cylinder may purchase a second cylinder side whip. This would allow both diluent cylinder's to be open throughout the dive. When the diver swaps the main off-board whip from the first cylinder to the second, the check valve will prevent any water from entering the system.

AS WITH ANY NEW DIVING EQUIPMENT, USING THIS ACCESSORY WILL REQUIRE THE DIVER TO LEARN NEW SKILLS AND CREATE NEW MUSCLE MEMORY.

Sensor Installation, the Sensor Head, & Display Options

The HOLLIS mCCR is a diving system where the display's may be customized to suit each individual diver. It may be configured with a KISS PPO2 display, Shearwater, or Divesoft system. The HOLLIS mCCR has two display ports machined into the sensor head. Option's that diver's may choose include the following:

- Fischer display cable's hardwired into both ports.
- HW PPO2 display in both ports. (no Fischer connector, all hardwired)
- Fischer display cable hardwired into main port only.
- HW PPO2 display in main port only. (no Fischer connector, cable is hardwired)
- Fischer display cable hardwired into main port and HUD hardwired into secondary port.
- HW PPO2 display hardwired into main port and Shearwater HUD hardwired into secondary port.
- NO display system.

KISS Rebreather LLC recommends that all divers, recreational or technical, dive with 2 fully independent displays. As you can see above, there are options for no display and also for keeping the secondary port empty. We have offered these options so that our customers may have the head wired by another source and utilize a display system that we don't sell.

Should a customer choose to have their sensor head wired by another source, they must choose a facility that is qualified to do this type of work.

***WARNING: Diver's choosing to purchase the unit without the display system's wired to the sensor head must ensure that they have the display port's wired properly by a qualified facility prior to diving. Also, KISS Rebreather LLC strongly recommends that both display ports are wired with displays for redundancy.**

***WARNING: THERE ARE VARIOUS DISPLAY SYSTEMS AVAILABLE FOR THE KISS REBREATHERS. THEY INCLUDE, BUT ARE NOT LIMITED TO THE KISS REBREATHER DISPLAY, SHEARWATER COMPUTERS, HUD, & DIVESOFT COMPUTERS. As with all electronics, these components must be treated with care and respect. This includes taking care to not drop, bang, or roughly handle them. Also, do not leave these components in a hot environment, such as a car or direct sunlight. The heat &/or sun, can and will damage any electronic components.**

***WARNING: Do not mix sensor brands in your rebreather! There are various sensor brands available for purchase. If you mix brand "A" with brand "B", they will not work properly. As the response times are different for each brand, most electronics will not calibrate properly. If they do calibrate, they may not work correctly while diving as the different response times could cause an error reading.**

The KISS display's, Shearwater, and Divesoft products all use the KISS Rebreather sensor, K-22D. This kit does not include the sensors. Many of our dealers stock the KISS K-22D sensor and are available directly from them. Should you wish to order them with your kit, please let us know your wish to add this product.

Prior to installing them, it is best to open the bags and let them sit for at least 24 hours prior to calibration as they need to go through a "wake up" period. Ideally, open the bags about a week prior to use, if possible. New sensors will read low when first installed and will creep up slightly over the course of a week or so. After that, they seem to be stable for months on end.

Don't waste time calibrating the sensors if they are reading within a 1/2 percent. These sensors should be changed annually, sooner if they are damaged or abused. Oxygen sensors work on the same basis as a battery. The more that they are used, the more often they will need to be replaced.

An easy way to remember your sensors anniversary date is to write the date on the bag when you open it, and keep the bag in safe place. Also, use a Sharpie black marker to write the date on the top lip of the sensor. The K-22D sensors are safe to dive if the millivolt reading is between 9 and 13, AND they can be calibrated in both air and oxygen. Both the KISS display and the Shearwater computers will read the millivolts of the sensors or a volt meter can be purchased at your local hardware or electronics store.

***WARNING: It is extremely important that the sensors millivolt readings are in the correct range, and that they can be calibrated in both oxygen and air. If even just one of these 3 items doesn't comply, DO NOT DIVE!!!! Failure to ensure that the sensors are working properly, can result in serious injury or death!!!**

***WARNING: On the following pages are the calibration instructions for the displays systems. It is essential that the calibration procedures are followed properly. Failure to do so can cause injury or death!!**

SENSORS

When you open up your new K-22D sensors, they will have a millivolt reading between 9 and 13 millivolts. As long as they are in that range, they are safe to use.

***WARNING: You also need to ensure that they can be calibrated in Oxygen and that they read correctly in air. This is very important. Even if a sensor is reading in the proper range, as it ages you may no longer be able to calibrate it properly. Sensors should not be used for more than 1 year.**

*****IF THIS HAPPENS, THE SENSOR MUST BE DISCARDED. FAILURE TO USE A PROPER SENSOR WILL CAUSE SERIOUS INJURY OR DEATH!!!!!!!!!!**

In diving applications the sensor will last 1 year, depending on how often you dive and how they are stored. Sensors should be allowed to dry out after your day of diving, especially if you are diving in a humid environment. This means that you need to leave the loop hoses or scrubber canister off overnight to allow air to circulate through the scrubber head. Leaving the unit sealed up will not allow the condensation to evaporate.

*****If the rebreather has moisture in the head from diving or from being in a humid environment, and it is then sealed up tight, the wires from the end of the display will start to corrode!!!! If this happens, whatever display or computer you are using, will not work properly!!!! It is extremely important that the head is allowed to dry out if the unit is to be sealed up. This means that after a dive trip, don't just drop the unit on your work bench and walk away from it!!! At the very least, drop the canister's off and let the head's dry. This will help keep your wires in good working order.**

Sea water on the sensors will probably cause them to fail.

As your sensors start to age you will notice that they are harder to calibrate, slower to react and will drift more after calibration.

Electrolyte, which is a gel like substance is inside the sensors. If you notice this substance leaking out of the sensors, do not touch it as it is caustic. Do not dive with a leaking sensor. The readings will be high!!!!

Calibration

The following procedures are for preparing the HOLLIS mCCR for calibration. The steps outlined here must be done first, in order for the calibration to be accurate.

The displays should be calibrated with oxygen. The procedure for this, is as follows:

1. Ensure that the diluent and oxygen cylinder valves are closed. If the diluent cylinder is not attached to the off board accessory whip, then be certain that the sealing cap is attached to the whip.
2. Draw all of the gas out of the loop. Do this by putting the BOV into your mouth, open the loop, inhale the gas into your lungs and then exhale it out of your nose. When the loop is flat, close the BOV switch without allowing any gas to leak back into the loop.

***Note: it is important that you do not exhale any gas back into the loop while doing this.**

3. With the loop closed, open the oxygen tank and press the manual add valve button, adding oxygen into the loop until the exhaust valve burps. (the exhaust valve should be fully closed)
4. Repeat steps 2 & 3 until the loop has been completely flushed with oxygen. This usually takes 3 to 4 flushes.
5. Once the loop has been completely flushed, close the oxygen cylinder and open and close the mouthpiece quickly to bring the gas in the loop to ambient pressure. With the loop closed, calibrate to 1.00.

***Note: once the above procedures have been completed the calibration procedures for the display that is being used, must be followed.**

The readings should be verified with air. To verify with air, first ensure that both tank valves are turned off. Then, remove the loop hose which is attached to the exhaust side of the mouthpiece. Put the mouthpiece into your mouth, open the loop and breathe. This will draw fresh air through the loop and eliminate the pure oxygen which you flushed the loop with. It will take a few minutes for the oxygen percentage to drop.

The KISS rebreather should be flushed with oxygen prior to every dive to ensure that the displays are reading correctly, and re-calibrated every time the absorbent is changed.

CARE FOR YOUR FISCHER CONNECTOR AND THE CABLES

Having Fischer connectors on a rebreather display system is a convenience that many divers enjoy. While a lot of maintenance is not required, some care is important in order to ensure that they operate properly.

The Fischer connector port is watertight and any water that gets in to the port cannot harm your head, computer, or HUD. However, should sea water get inside the port or the ends of your linking cable, flush them with fresh water as soon as possible afterwards then leave them to dry completely BEFORE refitting the cap.

Regular maintenance should include:

1. Inspect the connectors and look for any signs of corrosion; parts will start to turn green.

2. If you see green/corrosion, rinse the connectors briefly with white vinegar and use a fine toothbrush to remove the build-up. Rinse well and let dry completely before refitting the protective caps.

3. Keep the inner O-ring lubricated by either applying a SMALL amount of grease on the metal end of the cable end that slides into the computer Fischer connector to lubricate the inner O ring of the bulkhead connector. Filling the connector with food grade mineral oil once a year will also work. This will serve to improve the seal and make the connection more reliable. If you have a sensor which is reading erratically, this could be a solution.

4. If you use the mineral oil, drain any excess prior to replacing the caps.

5. Use the protective caps. The caps will help keep your connectors clean, keep the lubricant in and any debris and water out.

Remember, the cleanliness of the contacts is essential to the integrity of the link. Following these simple steps will ensure that your system works properly. Look after your cable and connectors and they will look after you.

Also, be certain that you are using the correct Fischer cable for the computer that you are diving. There are some that are not compatible with all computers.

DISPLAY WARNING

Never risk your life on only one source of information. Use a second computer or tables. If you choose to make riskier dives, obtain the proper training and work up to them slowly to gain experience.

All display systems will fail. It is not whether it will fail but when it will fail. Do not depend on it. Always have a plan on how to handle failures. Automatic systems are no substitute for knowledge and training. No technology will keep you alive. Knowledge, skill, and practiced procedures are your best defense. (Except for not doing the dive, of course.)

Shearwater Computers

Some of the basic Shearwater information is included here. This information has been obtained from the Shearwater manual. Please note that this information is subject to change; for full and current information on the Shearwater computers, diver's should download the most current manual from the Shearwater website.

SHEARWATER PRODUCT CONFIGURATION

Shearwater Research Inc. designs and builds both computers and HUD's (Heads Up Display) for rebreather diving. These systems may be fitted to your rebreather by hardwiring a cable into the scrubber head, or utilizing a Fischer connector. For further information on any Shearwater product, please contact your local Shearwater dealer.

Buttons:

MENU button - Left

- From the default display, pressing MENU brings up the menu.
- Once in the menu system, MENU moves to the next menu item.
- If the current function is an edit, pressing MENU increments the current display.

SELECT button - Right

- In the menu system, the select button saves the current value or executes the command.
- Out of the menu system, the select button brings up information displays.

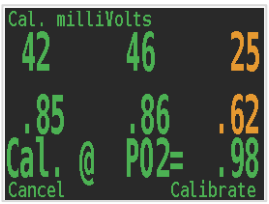
BOTH BUTTONS

- When the computer is off, pressing MENU and SELECT at the same time will turn the computer on.

Calibrate

Start by following the procedures on the calibration page. These instructions must be followed in order to ensure the unit is properly flushed with oxygen. This is an important step which is required to ensure the calibration will be accurate.

Once the unit is properly flushed with oxygen, push the left MENU button unit you see "Calibrate" on the computer. Push the right SELECT button and the confirmation message will display. On the top line, the millivolt reading will show. Good sensors should be in the range of 35- 60 mV at sea level in 100% oxygen. The valid millivolt range for calibration is 30- 70 mV. This scales with percentage of oxygen and barometric pressure.



Pressing the MENU button will prevent the calibration. Pressing the SELECT button will calibrate the sensor displays. The displays should now all read .98. If any display shows FAIL, the calibration has failed because the mV reading is out of range.

The system defaults to a calibration gas of 98% oxygen. This is to compensate for the difficulty in completely filling the loop with 100% oxygen and also to allow for water vapour. If you are using a calibration kit with no water vapour and 100% 02, you can set the calibration gas to 100. It can also be set to other values if pure oxygen is not available.

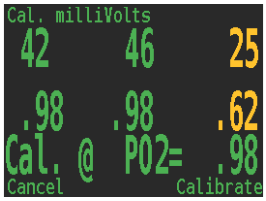
The calibration takes into account the altitude at which the computer was turned on. For example, if the altitude was 885 mBar or .87 ATA, then with a 98% calibration gas, the sensors would calibrate to .85.

The "Calibrate" menu item will not display during a dive.

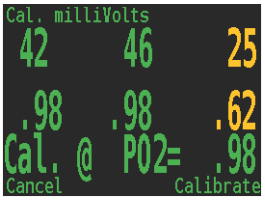
Calibration Problems:

Here are some examples of common calibration problems.

In this display, one sensor is flashing. This shows that the sensor is voted out. If it comes back within range, it will be voted back in, stop flashing and return to green.



A failed sensor is a different situation. In this case, the sensor failed calibration. Changing the sensor won't make it register again. Once a sensor has failed calibration, the only way to bring it back is to successfully calibrate. If the computer were to display a value with a new sensor, it would be a meaningless value without calibration.



This display indicates a faulty sensor. It is not within the normal range for a sensor in oxygen. Most sensors are designed to output 10 mV +/- 3 mV in air. If the output is linear, then that translates to a range of 30 to 70 as valid mV readings in 98% oxygen. The computer will refuse to calibrate outside that range.

Three sensors all showing FAIL is usually caused by an accidental calibration in air, or a calibration with the cable unplugged. Plugging the cable back in won't change anything. Failed calibrations can only be fixed by successful calibrations.

Heads Up Display (HUD)

INTRODUCTION TO THE HUD

In order to explain the logic behind the design of the HUD (originally designed & built by Shearwater Research Inc.), we have included the original Shearwater introduction in this write-up. The logic of the HUD is as follows:

The first point to consider is, there are “bad” alarms and “good” alarms. For example a fire bell is a bad alarm. It is bad because the absence of a ringing bell doesn’t mean there is no fire. It just means the alarm isn’t ringing. The fire bell may not be ringing because the battery is dead, the smoke detector isn’t in the right place, the installer screwed up the installation, there is a foreign object stuck in the ringer, etc. It doesn’t mean that everything is ok. A good alarm is one where there is an obvious difference between the lack of function and the lack of an alarm. A solid green light doesn’t do that.

The second point to consider is, there are integrated HUD’s and redundant HUD’s. Integrated HUD’s can notify you for features such as deco ceilings and distance from set-point. But they can’t do that and be redundant also. If you wish to have redundancy, then the HUD needs to be calibrated separately and it can’t display “deco” information unless it has a separate decompression computer with its own set of tissues, gases, etc., built into it.
The third point to consider is that there are HUD’s that just display the set-point or PPO2 of the gas in the rebreather. This version is very useful for scootering, low visibility, filming, and manually maintaining set-point.

With the HUD, we tried to find the best of all worlds. It displays the PPO2 only, which makes it a redundant PPO2 meter. Since it uses three LED's simultaneously, it can display them quickly. A typical 1.3 takes about 2 seconds to read. After a few dives, many divers have said that they do not need to consciously "read" the displays; they look at the display and their brain recognizes the number of flashes.

When there is a problem with a sensor, it is noticeable immediately as one of the LCD's flashes different from the others. As the diver knows what to expect, when something different happens it really jumps out at them.
The Shearwater HUD does not display continuously; there is usually 5 seconds between the displays. Also, as the PPO2 gets farther from 1.0, the light DENSITY gets higher. If you are more than 0.50 away from 1.00, the power is turned up to the high intensity LED's; so they get brighter! At 0.20 you have three very bright red LED's flashing just about continuously in the corner of your eye.

OPERATION
The HUD has a single button on the box, which is used for powering on/off, and calibration.

Power On/Off:
One push of the HUD button will turn the HUD on, while one subsequent push will turn the HUD off.

Calibration:
The Shearwater HUD calibrates only to oxygen; 0.98 to be exact. This allows for imperfect oxygen flushes and water vapour.

To calibrate, push the HUD button three times within 1 second. This may take a little practice, but it is intended to prevent accidental calibrations. Once you successfully do the calibration sequence, all three lights will come on bright red for 5 seconds. If this doesn't happen, then you didn't do the calibration command successfully; try again.

DISPLAY DESCRIPTIONS
After calibration, each of the sensors should be flashing one orange. That means the PP02 is between 0.95 and 1.05. Remember, the actual value it uses for calibration is 0.98.

If a sensor fails calibration, it will flash one red and one green. It can be useful to look at the millivolts on your alternate display to see why a sensor didn't calibrate. In these two example pictures, sensor one has failed and is alternating between red and green

GENERAL FLASH PATTERN:
The number of green flashes is the number of tenths above 1.0.
Therefore, 3 green flashes is 1.3 PPO2.
The number of red flashes is the number of tenths below 1.0. Therefore, 2 red is 0.8 PPO2
Example:
0.80 is RR_____ RR_____ RR_____
0.20 is RRRRRRRR__RRRRRRRR __RRRRRRRR__
1.3 is GGG_____GGG_____GGG_____

You will notice from the above example's that the farther away from 1.0, the shorter the interval between flash sets.

BATTERY WARNING:

When you turn the HUD on, if it flashes orange for 30 seconds, this indicates a low battery.

The battery is contained in the box with the processor. To change the battery, you will need to remove the top cover. Replace the battery with a 3.6 volt Lithium - Saft 14500. Ensure when replacing the cover that the O-rings are properly secured, cleaned and lubricated.

It would be beneficial to carry a spare battery in your spares kit, as they aren't available in some remote areas. This should not be a cause for concern as the battery should last many months, even years.

REBREATHER ATTACHMENT

The box should be attached to the loop hose, behind the divers head. Use the enclosed Velcro for this. In this location it will not be in the way and it is also possible to reach the button.

Attach the HUD tie to either side of the BOV. It is handy to attach it to the left side so that dumping the right loop hose after a dive isn't effected.

Wrap the cable for the HUD around the loop hose, and then snap on to the attachment.

The HUD attachment consists of 2 pieces; one part attaches to the BOV with the tie and the other the HUD snaps into. The two parts are joined by magnets. These are extremely strong magnets! Slide magnets apart and back together only.

KISS PPO2 Display - Crystal Monitor 1

Some of the basic Crystal information is included here. This information has been obtained from the Crystal manual. Please note that this information is subject to change; for full and current information on this product, diver's should download the most current manual from the KISS website.

The Oxygen Monitor is designed to be a very basic and easy to use instrument for your rebreather. It has very few operations or pieces of information other than the PPO2 read out of oxygen from 1, 2, or 3 sensor cells while in Dive Mode and the ability to calibrate the sensors while in Surface Mode. There is only 1 diving screen which will display the individual output of each cell along with the battery level. This is not a diving computer, it has no other purpose other than to read oxygen levels.

There are 2 operational modes available to you when you turn it on. Surface Mode and Dive Mode. Dive Mode only allows you to see the oxygen level display. Surface Mode allows you to calibrate, change settings, and run diagnostics.

Basics:

Turning On:

- 5 to 10 taps on the cable side

Turning Off:

- Dive Mode: 3 taps on the cable side (followed by 2 taps outside, then cable side)
- Surface Mode: Rotate (outside taps) through to the OFF screen and select.

Calibration:

- Select Surface Mode, rotate to Millivolt Screen.
- Flush with either air or oxygen, 2 cable side taps to initiate
- 1 pt calibration: Automatic detection of either air or oxygen
- 2 pt calibration: Do a successive flush with opposite gas and recalibrate.
  - 2pt calibration is automatic
  - Sensor Linearity is displayed
- Adjustments (Humidity, Altitude): Manual in Setup Mode

Battery:

It will run on either 4 AAA batteries or 1 9volt battery. The battery type can be selected in the setup menu but that only affects the battery level display.

Manual Add Valve/Metering Orifice

The manual add valve is for adding oxygen to the loop. The O-rings should be changed annually or if the flow rate changes, more the orifice. All components in the add valve must be clean, oil free, with the O-rings lightly lubricate frequently. The inlet of the valve is protected by a 15 micron filter. This filter will NOT stop seawater from contaminating the orifice. All components in the add valve must be clean, oil free, with the O-rings lightly lubricated with oxygen compatible grease.

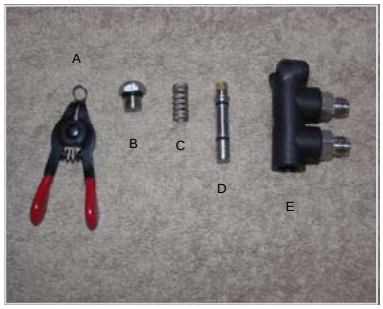


The tools required to disassemble the valve are a wrench or Allen key, small snap ring pliers and a jewellers screwdriver. First, insert the snap ring pliers into the snap ring on the button end of the valve and remove.



Remove the nut with either the wrench or Alan key, depending on which nut you have; pull out the spring. The spool and orifice are all that is left inside the valve.





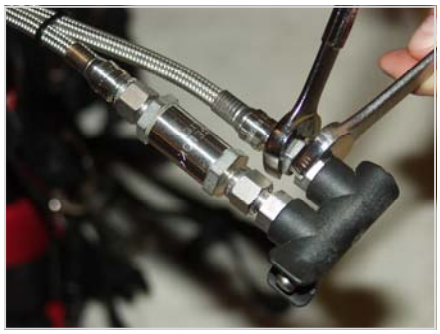
DO NOT SCRAPE OR GOUGE THE BORE!!!!!!

To remove the spool and orifice push in the button using a jewellers screwdriver. This will force the spool and orifice out the other end. When you have the spool removed, cut the old O-rings away with a sharp knife and replace them with new V75-008 O-rings which have been lubricated with an oxygen compatible lubricant such as Christolube. Do not scratch the O-ring grooves. The orifice does not need to be removed unless it is damaged or plugged.

The parts in the valve are: A. snap ring; B. nut; C. spring; D. spool & orifice; E. valve body

***WARNING: When reassembling the valve, ensure that you do not over-tighten the nut. Remember, when screwing any metal screws into plastic use only two fingers on the wrench. If you over-tighten the nut, it will strip the threads and the valve will leak.**





When attaching the valve to the filter and the hoses, it is very important that you use a second wrench to hold the nut next to the valve body in place. Do not allow this nut to spin as it will over-tighten and strip the plastic. This will cause the valve to leak. The valve body is not a substitute for a wrench.

Older KISS units were shipped with the Swagelok SS/Teflon hoses. New units are shipped with the Miflex hoses. When attaching the manual add valve to these hoses, remember that the inlet port is the one nearest the add button. The hose which is attached to the oxygen first stage is attached to the inlet port.

***NOTE: The oxygen delivery system attaches to the rebreather via the elbow on the side of the scrubber head. Please note that the male end of the elbow which screws into the head is NPT, or pipe thread. This is a tapered thread, NOT a straight thread. If you screw a fitting with a straight thread, such as a swivel elbow, into this port, it will damage the rebreather head! If this happens, it is NOT repairable.**

***NOTE: The Miflex hoses are tested and rated for oxygen use. As they have standard regulator hose fittings, they can be replaced with other rubber LP hoses. If you do so, please ensure that the hoses you use are rated for oxygen use!!**
Also, all low pressure hoses on the KISS should be inspected periodically to ensure that they are not damaged and in good working order. This includes the oxygen hoses, diluent hose, BOV 2nd stage regulator hose, ADV hose.

The KISS rebreather's are mechanically controlled. The oxygen manual add valve houses a orifice which allows oxygen to flow into the loop at all times. In the event that more oxygen is required, the button on this valve will need to be pushed. The difference between diving a KISS rebreather manually and other rebreather's is that the constant flow of oxygen keeps our divers from getting too busy underwater. Diving other rebreather's manually means that the only way oxygen gets into the loop is by pushing the button.

What does this mean to the diver? It means that when you get to your maximum depth, you will adjust your PPO2 and then unless you are working hard or going up and down in the water column, you will only be pushing the button every 10 to 20 minutes. This depends also on where the constant flow has been set. If you find yourself pushing the button all the time, then you need to increase the flow. If you find that your oxygen is creeping up during normal diving activities, then you will want to decrease the flow.

Adjusting the O2 Flow Rate

The oxygen injection rate can be adjusted to suit each individual diver. The required flow rate depends on the physical size of the diver and the degree of exertion used during the dive. If the flow rate is too high the PP02 will climb to dangerous levels and the breathing loop will have to be purged to reduce the oxygen partial pressure to a safe level. If the flow rate is set too low oxygen will have to be manually added more often during the dive.

TOO LOW IS BETTER AS IT IS QUICKER TO ADD OXYGEN TO THE LOOP, THEN TO FLUSH IT!!

To adjust the flow rate, disconnect the oxygen delivery line where it attaches to the stainless steel elbow on the side of the scrubber head. Attach a 0-1 litre per minute flow meter (Dwyer VFB-60 -SSV or equivalent) to this line.

Disconnect the manual add valve supply line where it attaches to the add valve filter and connect a 0-300 psi gauge between these fittings.

Remove the clamp ring from the oxygen regulator, (A) and lift the black plastic plug, (B) out of the regulator cap. Connect the regulator to an oxygen cylinder which has at least 800 psi remaining. Slowly (oxygen, remember) open the oxygen valve. Note the gauge pressure and flow meter reading. The relationship between the pressure setting and the O2 flow rate should match the table on the following page.

For those of you using the Miflex hoses. The following photos show how the flow system can be checked and which parts you need. All parts can be purchased through one of your local fittings suppliers. This is just one method that can be used.

First, remove the Miflex hose from the filter and attach an IP gauge. Determine where the IP is set, before you make any changes. After you record that information, reattach the hose. Then remove the miflex hose which is attached to the plug side of the valve. Attach your flow meter and short LP hose (see above photo). As per the instructions on the next page, adjust your flow. Once you have adjusted the flow, you can remove the flow meter and hose, and reattach the IP gauge. This will allow you to verify your flow reading with the IP of the first stage, using the chart on the next page.

NOTE: IT IS VERY IMPORTANT THAT TWO WRENCH'S ARE USED WHEN REMOVING HOSES OR FITTINGS FROM THE MANUAL ADD VALVE!!! ONE MUST BE USED TO ENSURE THAT THE FITTING ON THE VALVE DOES NOT SPIN!! SEE THE PHOTOS AT THE TOP OF THE PREVIOUS PAGE WHICH SHOW HOW TO DO THIS PROPERLY.

8.0 Bar (117.6 psi)	0.520 LPM
8.5 Bar (125 psi)	0.550 LPM
9.0 Bar (132.3 psi)	0.570 LPM
9.5 Bar (139.7)	0.600 LPM
10.0 Bar (147 psi)	0.630 LPM
10.5 Bar (154.4 psi)	0.660 LPM
11.0 Bar (161.7 psi)	0.70 LPM
11.5 Bar (169 psi)	0.730 LPM
12.0 Bar (176.4 psi)	0.770 LPM
12.5 Bar (183.8 psi)	0.800 LPM
13 Bar (191.1 psi)	0.830 LPM

Note that some of these pressure settings are beyond the recommended adjustment range of the regulator and may result in erratic performance. Use at your own risk!

These figures are typical but not absolute due to slight variations in the accuracy of the gauge and the tolerance of the metering orifice. If your flow rates are more than 15% different than these, see the troubleshooting guide to determine the problem.

To change the pressure use a 6mm hex key to turn the regulator adjustor under the black plastic plug. Clockwise increases the pressure, counter clockwise reduces the pressure. Turn the wrench slowly and do not insert it too far into the regulator or it will hit the diaphragm and cause the pressure to surge.

So where should the flow rate be set? 0.75 LPM is a good starting point. If you find you have to constantly add oxygen, try increasing the setting by 0.05 LPM. The PP02 should slowly rise when you are hanging motionless in the water but you should have to add 02 at regular intervals during the dive when maintaining a constant depth. The metering orifice flow rate will decrease as the depth (ambient pressure) increases. The amount it decreases depends on the upstream pressure (regulator pressure setting) versus the downstream pressure (depth). This is not a fault, it is physics.

Pre-dive Checklist's

This pre-dive checklist is a combination of the KISS checklist, and what some of the A.N.D.I. instructors are using. The instructors and divers who use this checklist have reported that their skill level on the rebreather increased quicker and that they understood their units better, which made them more organized and safe divers.

I have edited the check list to make it work for a KISS diver to use for every dive. The first part of our new check list, are items that must be addressed and/or confirmed prior to suiting up for the dive. Those that are using this tool, usually keep several blank copies in a small binder with their dive gear.

The second part of the check list are items that are usually checked shortly before a dive. This list can also be printed out, but other options are to copy it onto a dive slate or wet-notes in a permanent ink marker.

A point worth noting is that all pilots have a check list which they go through every time they fly. Diving a rebreather should be no different. While rebreather diving doesn't necessarily take more preparation or clean up time than open circuit diving, there are very specific things that need to be checked and confirmed prior to getting into the water.

Using this check list will only add a few seconds more time to your preparation, but could make all the difference in having a pleasurable time in the underwater environment. It certainly assists in creating competent, happy divers.

**One part of the 2nd check sheet is worth discussion. That is the 5 minute pre-breath that is required prior to diving. Note that this pre-breath is NOT to warm up the scrubber. It is to determine if the scrubber and the rebreather are working properly. It gives you a chance to monitor your display system to ensure that it is working. And most importantly, to determine how you feel during and after the pre-breath. It will help you determine if your scrubber has been properly packed, if you forgot to change the absorbent, or if the canister is completely empty!!! Also if your mouthpiece valve disks (mushroom valves) are in place and working properly. While some of these things may sound silly, very experienced divers have jumped into the water with either no absorbent, or with completely used up absorbent. The pre-breath is a minimum of 5 minutes as this much time is required for our bodies to tell us that something is wrong. The bottom line is that this 5 minute pre-breath confirms your system check has been done and that all is working.

DIVERS SHOULD FOLLOW THE PRE-DIVE CHECKLISTS BEFORE EVERY DIVE AND KEEP A COPY OF THE CHECKLIST WITH THE KISS REBREATHER AT ALL TIMES.

Predive Checklist

NAME: _____ DATE: _____

DIVE LOCATION: _____ PLANNED DEPTH: _____

PLANNED SET POINT: _____ TODAY'S DIVE NUMBER: _____

INITIALS ↓

____ I have checked my diluent/bailout system and it is in perfect working order.

____ My bailout system is appropriate for the dive depth I am planning of, _____feet/meter.

____ My sensors are _____ months old.

____ The millivolt readings on my sensors is: _____; _____; _____.

____ My PPO2 display uses _____ batteries and they have _____ hours left on them.

____ I have analysed my O2 cylinder and it has _____% O2

____ I am diving with _____ diluent in my main diluent/bailout cylinder. I have analysed it and have confirmed what percentage of O2/Nitrogen it contains.

____ If I am using more cylinders I will also write down the mixture and ensure that I have analysed them and have confirmed what percentage of O2/Nitrogen they contain.

____ My absorbent has been used for _____ hours, which means that I have _____ hours left on it.

____ My dive computer is in perfect working order.

____ The battery voltage on my computer is _____.

____ My buddy and I have practiced bailout procedures and understand what to do in an emergency.

____ My surface interval before this dive is _____.

____ My CNS before this dive is _____.

____ I am using _____ lb/kg of weight.

This pre-dive check should be done after your unit has been assembled, your scrubber canister filled, lungs attached, all fittings/hoses checked & secure, etc. It should be done prior to entering the water.

INITIALS ↓

____ I have ensured that the Valve Disks (mushroom valves) on the Valve Plates are flat and smooth. I have done a BOV/DSV positive and negative diaphragm test to ensure that they are sealing properly. I have also ensured that they have been installed correctly and the gas flow is going in the correct direction, left to right. The rubber mouthbite is properly secured and not damaged.

____ I have done a breathing hose positive and negative pressure test to ensure that my loop hoses are not damaged.

____ I have done a negative pressure test on the fully assembled KISS rebreather and it maintains full vacuum pressure.

____ I have done a positive pressure test on the fully assembled KISS rebreather and it maintains full pressure. I have ensured that the counterlung's are properly positioned and not twisted or restricted in any way.

____ I have turned my displays on.

____ I've connected my diluent/bailout cylinder to my rebreather. I have verified that the cylinder is full. It has_____ PSI/BAR in it. I've checked the pressure gauge for any sign of leakage of diluent in the system.

____ I've ensured that the ADV and the bailout regulator are working correctly. (The diluent gas I am using is appropriate for the dive that I am planning)

____ I've opened the oxygen valve and checked that the cylinder is full. It has _____ PSI/BAR in it. I've ensured that the manual add valve is working by pushing the button and watching the displays, while breathing on the unit. Also, I've ensured that the constant flow is working by listening for the flow.

____ I've calibrated the sensors in oxygen. I have verified the sensor readings in air.

____ I've ensured that the size of my bail-out gas cylinder is adequate for the dive that I am planning, that it is full and that the regulator is working correctly. I have also ensured that my wing and drysuit inflation are working correctly.

____ I have pre-breathed my rebreather for at least 5 minutes before entering the water.

____ I will double check that my oxygen and diluent cylinders are open, that my displays are on, and my computer is properly programmed before I enter the water.

____ Once in the water, I will do a bubble check with my buddy to double check that there are no leaks in my system.

The diluent tank is NOT an adequate gas supply for emergency situations.

POST DIVE CHECK LIST - DISASSEMBLY

After diving the rebreather, your diving system will need to be disassembled and cleaned. Follow the disassembly procedures in the manual; follow with the cleaning instructions below.

- Rinse the rebreather, wing & harness fully with fresh water. Be certain to rinse the first stages, valves and any regulators very well.
- The loop components should be rinsed and sanitized after diving. In order to disinfect the components, a product such as Virkon must be used. Virkon is a product that comes in powder form which must be mixed with water. Follow the package directions for use.
- After sanitizing, rinse all components in fresh water. Set out to dry. Counterlung's can easily be dried by turning them partially, inside out.

Once your components are dry, the unit may be stored for future use.

TRAINING & BASIC SKILLS

As with most rebreather's, training is a requirement for purchasing a KISS rebreather. Training can be done prior to purchasing a unit or in conjunction with purchasing a unit.

KISS courses are set up through a number of training agencies. Links to their websites are available on the KISS website at www.kissrebreathers.com. The instructor you choose must be a KISS certified and insured instructor that works with one of these agencies.

During your KISS rebreather training you will be required to learn and do various skills. These are skills that all re-breather divers need to know. How these skills are performed is dependent on the particular rebreather that you are diving. Therefore, even if a diver has already trained on a closed circuit rebreather, the diver will still need to learn KISS specific skills. It is very important that during your course, these skills are learned and mastered. And after training, reviewed on a regular basis.

It is important that all the skills covered in your training course are learned and mastered. Under no circumstances should anyone dive a KISS rebreather until they have completed an approved training course.

Some of these skills are listed below. Please note that this is only a partial list of the required skills.

- HYPOXIA - Low PPO2
- HYPEROXIA - High PPO2
- OC BAILOUT - Required when the loop is flooded, or there is a display or CO2 problem
- DILUENT FLUSH - Required when the diver needs to verify that the displays are reading correctly or to bring the PPO2 to a safe level
- HYPERCAPNIA - High CO2
- DILUENT LOSS

KISS CCR Minimum Training Standards

GENERAL REQUIREMENTS

- Diver must be at least 18 years old.
- Academic portion minimum of 8 hours.
- Equipment overview and maintenance minimum of 2 hours.
- Minimum of 1 hour in Confined Water.
- Minimum of 7 hours and 6 dives in Open Water.
- Minimum of 2 dives deeper than 15m/50 feet.
- Minimum of 1 dive deeper then 25m/90 feet. Minimum course duration 5 full days.
- Student to Instructor ratio for academic portion, unlimited as long as practical.
- Student to Instructor ratio for confined water, 4 students per active instructor.
- Student to instructor ratio for open water, 4 students per active instructor. This ratio should be reduced as re quired if the situation and/or environmental conditions call for it.
- It is recommended that the student finish the training course within 6 weeks of the starting date.
- It is recommended that the student have access to or purchase a unit within 3 months of completing the training program.
- Bailout cylinder must be carried on all dives
- Safety stops must be conducted on all dives; minimum of 3 minutes at 6m/20 feet.
- Depth limit not to exceed the diver's current certification level or the limit imposed by the training agencies course outline.
- Students must write a written exam and achieve a passing grade of 80% or higher.
- Only approved training agencies may teach a KISS rebreather course.
- For Sidekick CCR only
    - Student must have some level of technical diver training. At a minimum Advanced Nitrox or Recreational Trimix or equivalent.. Students must be able to rig a side mount rebreather as well as 2 cylinders.

SIDEKICK CCR CROSS OVER INFORMATION FOR KISS CERTIFIED DIVERS

A diver who is certified on a KISS CCR (Classic, Sport, Orca Spirit, Spirt LTE, Spirit Sidewinder) is still required to do a Sidekick CCR cross over. This includes:

- Minimum of 200 minutes of in water time.
- Minimum of 60 minutes of confined water training. (included in 200 minutes)
- Overview of the KISS GS CCR operating system.

SPIRIT SIDEWINDER CCR CROSS OVER INFORMATION FOR KISS CERTIFIED DIVERS

A diver who is certified on a KISS CCR (Classic, Sport, Orca Spirit, Spirit LTE) is still required to do a Spirit Sidewinder cross over. This includes:

- Minimum of 180 minutes of open water training, conducted over 3 open water dives.
- Overview of the KISS Spirit Sidewinder configuration, and unit set up.

CCR CROSS OVER INFORMATION

A diver who is certified by a KISS approved training agency on an approved closed circuit rebreather must meet all of the KISS training standards. The exception is as follows:

- Minimum of 60 minutes confined water training.
- Minimum of 180 minutes of open water training, conducted over 3 open water dives.

SCR CROSS OVER INFORMATION

A diver who is certified by a KISS approved training agency on an approved semi closed circuit rebreather must meet all of the KISS training standards. (For an SCR diver to qualify for this cross over, they must have at least 20 SCR dives, with one dive in the previous 3 month period.) This standard includes the KISS GEM and KISS GEM Sidekick SCR. The exception is as follows:

- Minimum of 60 minutes confined water training.
- Minimum of 360 minutes of open water training, conducted over 6 open water dives.

EQUIPMENT REQUIRED

- KISS Classic Explorer/Sport/Orca Spirit/Spirit LTE/Spirit Sidewinder/GS CCR unmodified and in good working condition. Or if the diving system was shipped in the "Basic" configuration, then the add-ons must meet the acknowledged standards for this system.
- Depth gauge & bottom timer, or dive computer.
- Mask, fins, weight, line cutter or knife.
- Wetnotes or slate, and pencil.
- Exposure suit suitable for the required dive
- Oxygen analyzer or access to one.
- Bailout cylinder and regulator set, appropriate for the planned dive.
- Off board diluent/bailout cylinder with regulator set, appropriate for the planned dive. (Orca Spirit/GS CCR)
- Off board oxygen cylinder and first stage, appropriate for the planned dive. (GS CCR)
- Training material as outlined by approved training agencies.

EQUIPMENT FAMILIARITY

UNDERSTAND LAYOUT AND DESIGN OF THE KISS REBREATHER

ASSEMBLY/DISASSEMBLY

The following objectives need to be done by the diver:

Fully disassemble and reassemble each of all the following components with reference to the KISS user's manual for their particular unit, paying attention to o-ring location and condition.

Oxygen Sensors / Sensor Housing/PPO2 display system

Classic/Classic Explorer Specific:
- Scrubber canister base o-rings x 2
- Head, canister o-rings x 2
- Head, Exhaust tube o-ring inside head x 1
- Counterlung attachment o-rings x 4
- Quick Disconnect Hose Stubs (8 in total)

Sport Kiss Specific:
- Inhale Pod:
  - Change sensors, check o-rings.
- Exhale Pod:
  - Check o-Ring

Orca Spirit, Spirit LTE, Spirit Sidewinder Specific:
- Scrubber head's
- Canister's
- Lung attachment and placement
- Harness configuration and set up (Spirt Sidewinder)

GEM Sidekick CCR Specific:
- Scrubber head/canister/lung attachment

MATCH OXYGEN FLOW RATE TO DIVER'S METABOLIC RATE

Diver must understand how the Manual Add Valve constant flow works. This includes how to determine if the diver's oxygen flow must be adjusted, and also how to either lower or raise the constant flow of oxygen.

AUTOMATIC DILUENT VALVE

Diver must understand how the Automatic Diluent Valve (ADV) works. Divers should understand how diluent gas is added on descent, automatically, and how the diver may add gas manually.

ASSEMBLY

Diver must use the KISS manuals and checklist to assemble their unit and carry out assembly checks.

CORRECT SCRUBBER PACKING PROCEDURES

LOOP VOLUME

Diver must know how to determine the correct counterlung sizes required and know how to attain minimum loop volume.

ASSEMBLY & PRE-DIVE CHECKLISTS

UNIT OPERATION

The diver must demonstrate proficiency with the following skills.

- Pre-Dive planning, & checks before every dive; proper assembly of unit prior to dive.
- Analyze all gas's prior to dive; oxygen, diluent, bailout cylinder.
- Calibration and verification of Oxygen sensors.
  - Calibrate in O2 and verify with air.
- Pre-breathing for 5 minutes before every dive
- Bubble checks at the start of every dive.
- Proper control of secondary equipment &/or dive computers used.
- For the GEM Sidekick CCR only
  - Ensure the student is comfortable rigging and securing the GS CCR, diluent cylinder, & oxygen cylinder.
  - Ensure the student knows how to rig the GS CCR for best work of breathing.
  - Ensure the student understands the risk of high work of breathing and how to resolve it.
- Buoyancy and trim control
  - During the dive at depth
  - During the dive at safety stop
  - Minimum loop volume
- BOV familiarity (GS CCR: student will bail out to second stage as this unit does not have a BOV)
  - OC to CC
  - CC to OC
  - Take rebreather mouthpiece out of mouth (in OC mode only!!!) and then return to BOV clearing it of water before switching to CC mode
- Bailout cylinder
  - Bailout cylinder familiarity drills.
  - Bailout completely to 2nd stage attached to bailout cylinder
- PPO2 monitoring and control
  - Raise PPO2 to desired level.
  - Drop PPO2 to desired level.
  - Start PPO2 level.
  - PPO2 monitoring every minute.
  - PPO2 not to exceed a working limit of 1.3.
- Manual Add Valve (MAV) check – Static at constant depth… monitor change in PO2 over a few minutes.
- Diluent flushes
  - Using ADV
  - Using BOV (GS CCR divers use 2nd stage)

Gas Shutdown Drills
Carry out oxygen sensor verification at depth.
Carry out a linearity check of sensors at approximately 15 feet (5m) on pure O2.
Open circuit bailout, including at least 2 OC ascents from approximately 60 feet (18m)
Demonstrate appropriate response to the following below. Each dive should have a minimum of 2 “diver emergencies” that the diver must react to.

- Hyperoxia, Hypoxia, & Hypercapnia
- Diluent gas loss, Oxygen gas loss
- Sensor(s) failure
- Dive computer failure, PPO2 display failure
- Water in loop
- SCR mode
- Post-dive cleaning of unit and briefing

Warranty

The HOLLIS mCCR conversion kit parts are warranted for the period of 1 year. All warranty and service work should be returned to our warehouse.

- The warranty applies to the original owner only.
- Mistreatment or neglect of the products will void the warranty.
- Parts not covered by the warranty are batteries and sensors.
- Circuit boards and meters sold separately (without the case) are not covered under the warranty.
- Completed liability waivers must be on file for the rebreather warranty to be valid.
- Modifications to the KISS HOLLIS mCCR conversion kit parts will void the warranty. Only approved modifications are allowed.
- We are unable to determine if the parts are covered by the warranty until they have been inspected.

PROCEDURES FOR WARRANTY & SERVICE WORK

Prior to shipping, please contact us to inform us of the shipment. You will need to print out the warranty/service form, fill it in and ship it with your item. This form can be obtained from the KISS website at www.kissrebreathers.com

Your product should be returned to us with the following items:

- A copy of your original purchase receipt.
- The warranty/service form.

Carefully box up the items being returned. KISS Rebreathers, LLC. is not responsible for any damage incurred during shipping. Ensure that the items are properly padded and shipped in a strong box, and also that it is well sealed. (Don't forget to insert the above mentioned paperwork!) Please write in large clear letters, WARRANTY RETURN, MADE IN USA on the outside of the parcel and on any paperwork. This is important as otherwise USA Customs will charge us a brokerage fee and duties, which we pass on to you.

The parcel may be shipped via the post office or a courier. All shipments must be prepaid and insured. Any fees that KISS Rebreather LLC. incurs must be paid for by the shipper. This includes duties and brokerage fees for the item re-entering the USA. Note that if you ship via a courier such as UPS or Federal Express, there will be a brokerage fee, even if there are no duties. While there may be no charges for the warranty work, this brokerage fee must be paid for by the shipper.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