New product release

Closed Circuit Research is pleased to announce the launch of our range of Universal Rebreather Monitors

Universal Rebreather Monitor (URBM)
Three cell / Independent backup

Key features and benefits include:

● Real-time PO2 and decompression information displayed on VR wrist unit

● A hard wired Heads Up Display (HUD) which indicates PO2 and decompression status

● Real-time PO2 monitoring from three Rebreather oxygen cells.

● PO2 set point alarms for the HUD, on user selected set points.

- Option of an independently powered backup display.

Please note that due to the substantial reprogramming that is required for the VR wrist unit to be compatible with the monitor(s) some standard features of a stand alone VR3 must be removed, as follows:

XB & XO the option to monitor information from a standard Rebreather 4th cell display and O2 analyzer has been disabled.

The IR link has been removed, therefore the VR can only be downloaded by using our USB hardwire connector and the new **Prolink 2007** software.

HP the stand alone High Pressure link option has been disabled. HP content information and features are only available via the Rebreather single PO2, 2 x HP monitor.

Calendar function has been disabled

Please note: The Core Module is potted and sealed; there is nothing to be adjusted inside. In the event of a failure, the entire Monitor must be returned intact. Any attempt to gain access to the Core Module will void the manufacturers' warranty.

Universal Rebreather Monitor (URBM)
Three cell version

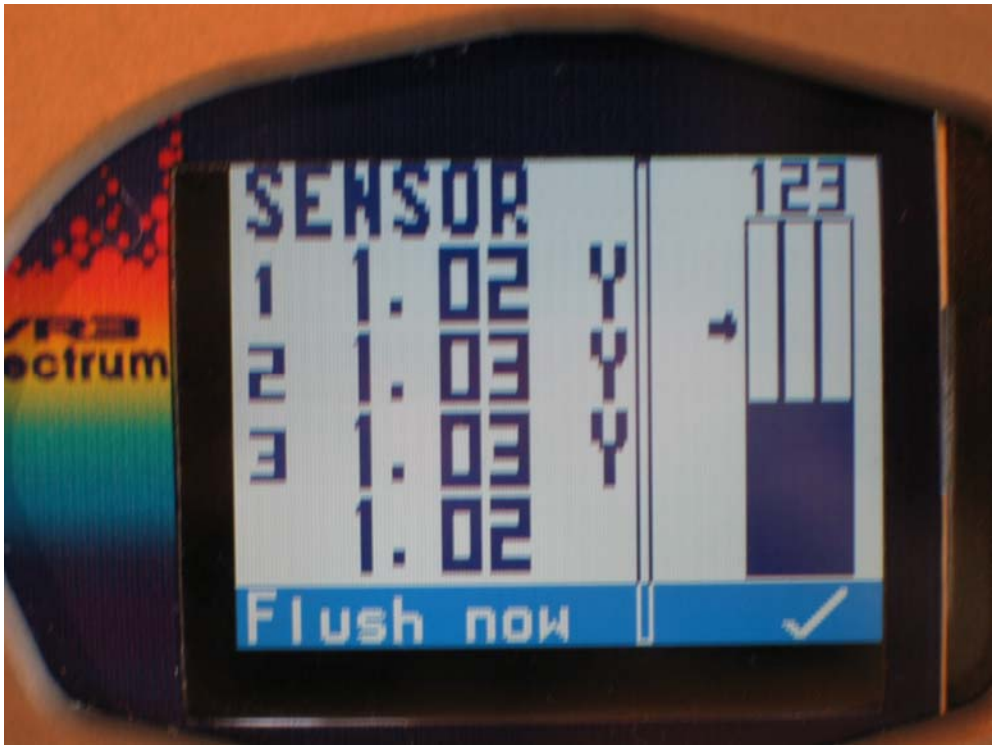
Hardware connections

- Connect URBM cable according to your Rebreather manufactures guidelines.

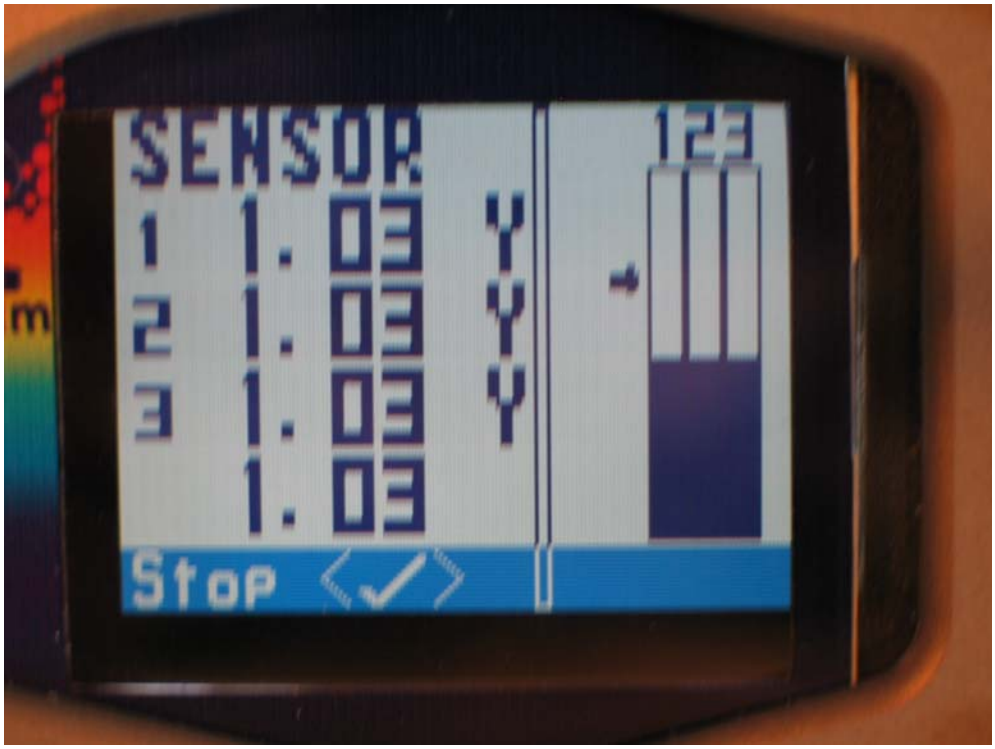
Calibration

- Select dive now (quick press on both switches) to keep the VR3 active for 5 minutes
- A long press on the left switch will take you into Gas select screen
- Make sure you are in Closed Circuit Mode and you see Closed CCT at the top of your screen.
- If not, go to Closed circuit mode by a long press on both switches.
- A quick press of both switches takes you into the Adjust screen.
- Move the cursor to select **NX 99** in your gas list and switch it ON.
- A long press of both switches will save NX 99 as your diluent.
- Save it as the calibration gas **(CAL)** by a further long press on both switches.
- **CAL GAS** will appear on the screen.
- Then a quick press on the right hand switch will confirm and a further quick press on the right hand switch will take you back to the Dive Now screen.
- **Remember, AFTER calibrating, to set the diluent setting back to the actual dive diluent.**
- In the dive now screen toggle the **O2** option by a quick press of the right hand switch.
- Then a long press on the right hand switch takes you into the **SENSOR** screen, where you will see the current PO2 displayed by the 3 cells. and a PO2 bar graph on the right.

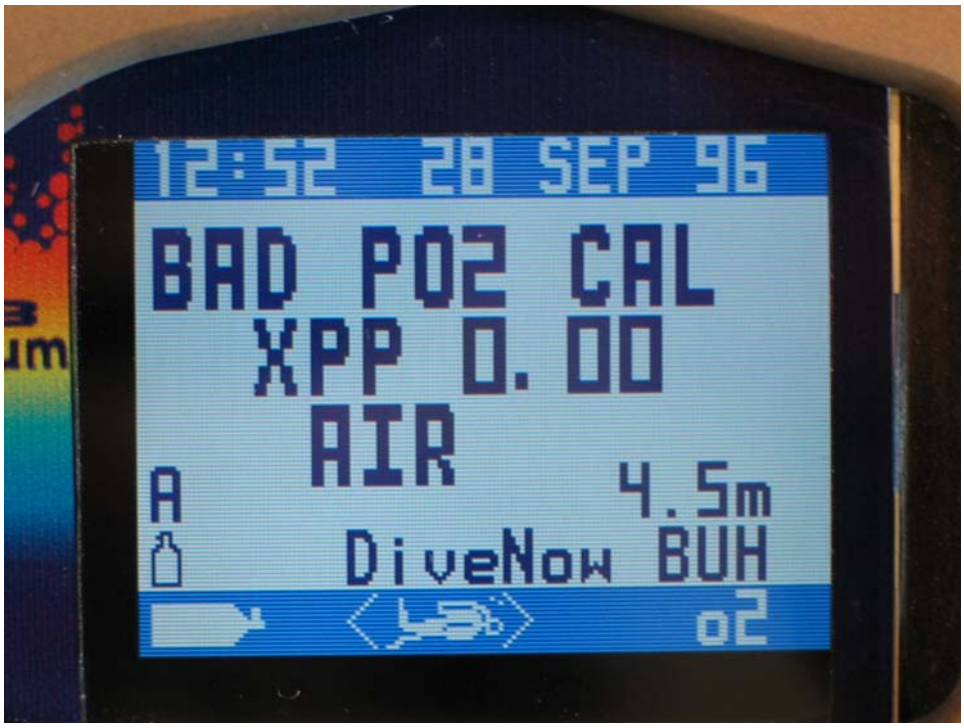
- A long press on both switches takes you into calibration mode **(CAL).**
- You will see the instructions **Flush now**
- Completely flood the Rebreather with oxygen, (usually achieved by flushing and emptying the loop with pure oxygen **3 times**) and a quick press of the right switch takes you to the **vent now screen.**



- Then quickly vent the counter lung to ambient pressure and perform a quick press on the right switch.



- This screen gives you the option to stop the calibration process by a quick press on the left switch or confirm the calibration with a quick press on both switches.
- The display will return to the original **Sensor** screen the Rebreather monitor is now calibrated.



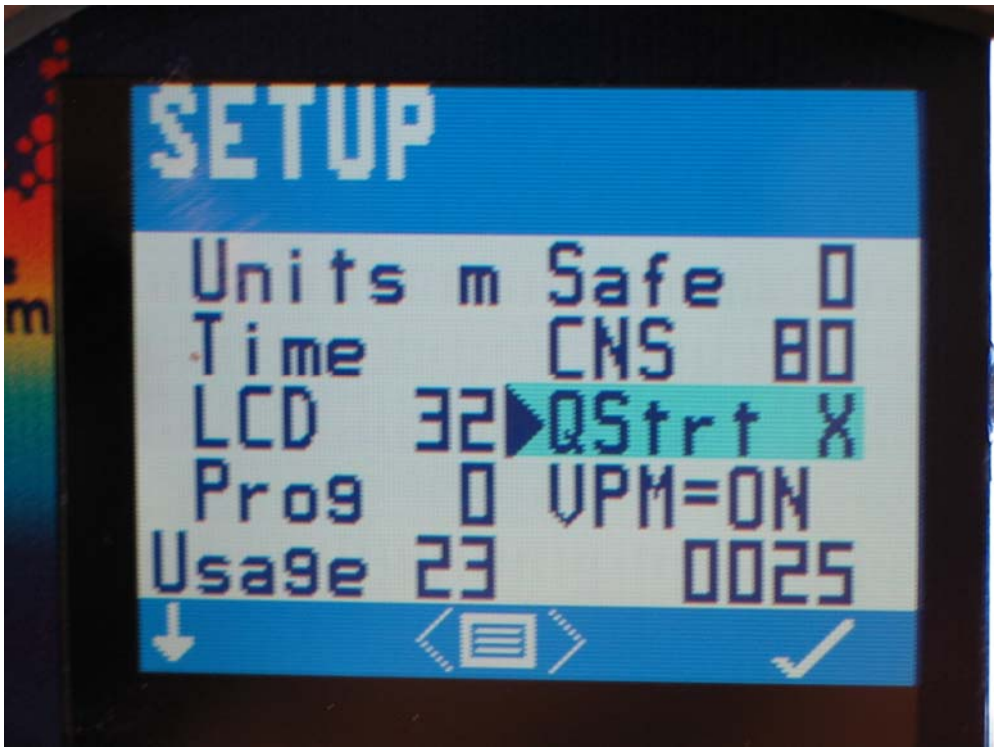
- If the unit is incorrectly calibrated you get the message **Bad PO2 Cal** in the home screen, **do not dive**, check the sensor connections and the health of the cells on the rebreather and repeat the calibration process again.

Setup screen Q start feature

- A new feature added to the setup menu on the Universal Re-breather monitor is **Q-Start.** This allows the user to choose between **X (expert)** and **N (normal) modes.**
- **N mode** has all the normal settings available on a standard VR3
- **X mode** gives the user a choice in the **DVo** screen to turn on Average depth display, and large PO2 screen saver, also the choice to use **Profile B** or diluent as a bailout gas when going from closed circuit to open circuit.
- Instructions on how to access and navigate the setup screen are covered on **page 19 and 25 in the VR3 manual.**

Normal mode and Expert mode

- The Rebreather monitor has two mode displays available **normal mode N** and **expert mode X**. These are user selectable via the setup screen before diving (you cannot change this setting during a dive).



- In the picture above **X mode** option is highlight and activated.

Dry screen savers

- This is the surface dry screen saver showing battery voltage and temperature along the top of the screen, average PO2 in large numbers on the left, selected diluent on the right and the actual PO2 of the three cells below.

Screen saver in dive mode

- Screensaver is the screen view that cuts in after a short delay when no switch has been pushed, (the delay period can be set in the DVo screen see **Pg 10** of this guide.) When a switch is pushed the screen view returns to dive or surface mode, whichever is appropriate.
- Average PO2 is displayed in large numbers on the left of the screen.
- Current depth and time is displayed at the top of the screen.
- Current tissue loading in shown as a graph on the top left hand of the screen.
- Selected diluent and each individual sensor PO2 is shown in the bottom right.

On screen warnings

- Any system warnings are shown in the top right hand display, the warning in this picture shows a low battery warning and no signals from the oxygen sensors.
- When using a colour screen the right hand side of the display changes to red to draw the diver's attention to the fact that a warning is in force.

DVo Screen

- This is the DVo screen accessible by a long press of the left switch when the DVo icon is displayed in the home screen.
- A quick press of both switches moves the cursor between functions.
- **XDec On** activates real-time decompression calculations based on the external sensor readings
- **XDec Off** diverts decompression calculations to the VR fixed set points.
- **HUD** allows the user to adjust the brightness of the HUD from completely **off** to **9** which is the brightest setting.
- **ScrSv** Adjusts the time between home screen and screen saver. It can also give you the option to switch the screen saver off.
- **BG** Is the option for bigger graphics
- **Light** adjusts the backlight options
- **Stop D** allows the user to choose the final stop depths; 3m (10ft), 4.5m (15ft) and 6m (20ft).
- For further information on the **DVo** screen please refer to **page 16 to 18 of the VR3 manual.**

HUD Operations

- The Heads Up Display (HUD) is designed to fit on a mounting bracket and attach to the side of the mouthpiece of the rebreather; it contains 2 LEDs, one red and one green.

PO2 HUD parameters

- **SOLID GREEN LED**
  PO2 within 0.2 of VR set point (normally set at the PO2 of the rebreather's set point controller). Instructions on how to adjust the VR set point is on **page 39 of the VR3 manual.**

- **SLOW FLASHING GREEN LED**
  PO2 more than 0.2 below VR set point.

- **FAST FLASHING GREEN LED**
  PO2 more than 0.2 above VR set point

- **SOLID RED LED**
  Within +/- 1 metre (3 feet) of decompression stop depth.

- **SLOW FLASHING RED LED**
  In decompression and below the decompression ceiling,

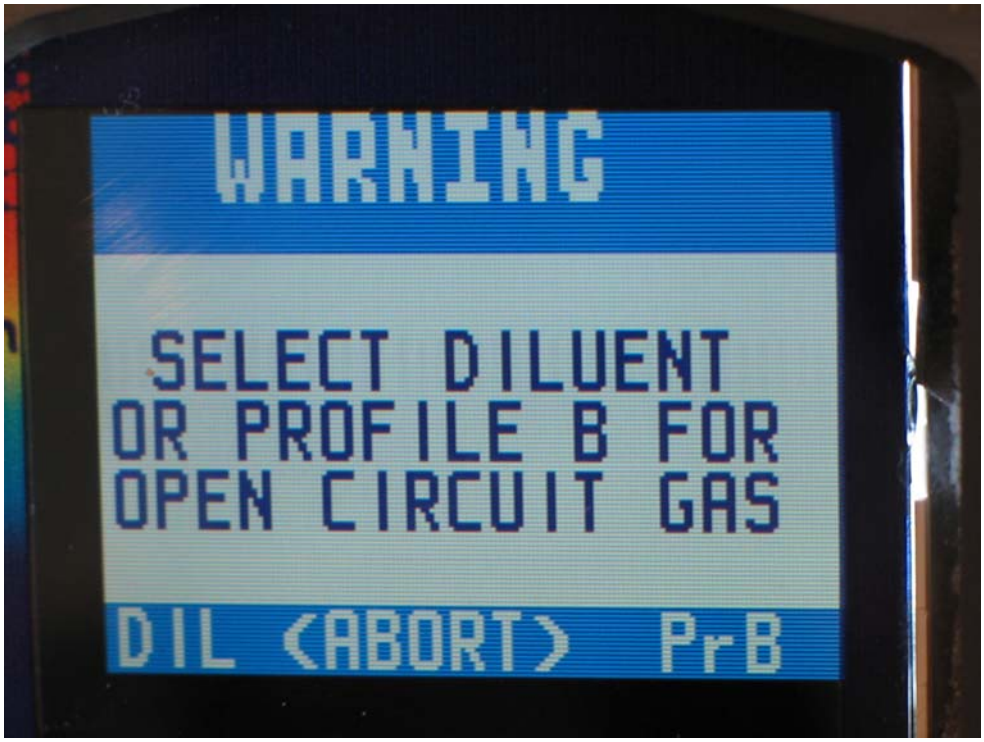
- **FAST FLASHING RED LED**
  Decompression ceiling violated (descend until RED LED turns SOLID)

- **FAST FLASHING RED LED**
  PO2 is > 1.6 or <0.3.

- **RED LED FLASH WHEN ON SURFACE BEFORE DIVE**
  Red LED will flash slowly on surface mode this is so the diver knows it is operational before a dive.

CCR Bailout Options

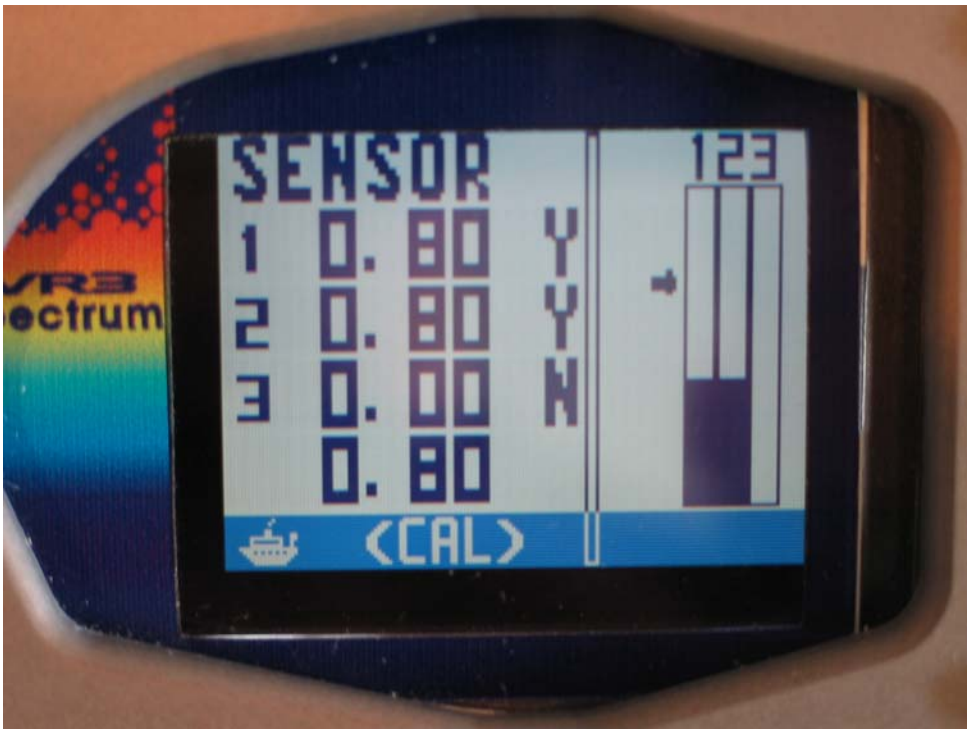
- When bailing out to open circuit follow the instructions on **page 40 of the VR3 manual.**



- When **X mode** is selected in **Q-Start** and you bailout to open circuit you get the option either to bailout to your diluent gas (**DIL**) or to one or more deco gases that you leave preset in profile B (**PrB**). To select this option make a quick switch on the corresponding symbol, check the details are correct on the select screen and tick it**. You are now on your bailout gas.** The instructions on how to add and save a profile are on **page 20 of the VR3 manual.**
- Once in open circuit mode the **XDec** information is automatically switched off, the
- Screen saver mode is also disabled. The red HUD decompression LED will still be active and can still be used as a guide when decompressing in open circuit mode.
- If Closed Circuit mode is activated again the **XDec** automatically switches on and calculates decompression based on the current PO2 reading from the external oxygen cell.

- If you enter the Bailout warning screen in error a long push on both switches (**ABORT**) will return you to the dive screen.

O2 Sensor Polling



- The rebreather monitor has a method of automatically removing O2 sensor cells from the PO2 averaging. This is based on a set of rules.

Rules:

1. If a single cell is below **0.15** bar or above **3.00** bar, then it will be disabled, **the system denotes this with a N next to the cell.**
2. If after item 1. all 3 cells are disabled for the same fault, then all cells will be re-enabled – this ensures that if the O2 is very high, or very low and all the cells agree, the O2 is probably very high or low accordingly
3. If all cells are enabled and have no faults, then each cell is checked to see how many other cells it is within **0.20** bar of.
   a. If all cells are within **0.20** bar of each other, then all cells will be enabled.
   b. If two cells are within **0.20** bar of each other and one cell is not, then the cell that is not within **0.20** bar of the others will be disabled.
   c. If no cells are within **0.20** bar of each other, then all cells will be kept enabled.
4. If all 3 cells are disabled with the same fault at this stage, then all will be re-enabled.
5. All enabled cells are then used in the PO2 averaging. Any cell disabled in these calculations will have a **N** shown against it in the **O2 sensor screen.**

- In the picture above cell **3** has automatically been disabled from the system.

Sensor Polling Examples

a. Cell 1 = 0.50 bar, cell 2 = 0.60 bar, cell 3 = 0.70 bar. All cells used (rule 3a).
b. Cell 1 = 0.30 bar, cell 2 = 0.60 bar, cell 3 = 0.70 bar. Cells 2 and 3 only used (rule 3 b).
c. Cell 1 = 0.30 bar, cell 2 = 0.60 bar, cell 3 = 0.14 bar. Cells 1 and 2 only used (rule 1).
d. Cell 1 = 0.30 bar, cell 2 = 0.60 bar, cell 3 = 0.90 bar. All cells used as no obvious fault in any single cell (rule 3c).

Optional Backup display

The backup display has 3 PPO2 readouts which read 3 individual sensors, an independent battery compartment, and 3 calibration potentiometers, one for each sensor.
To turn the display on push the top button; the PPO2 for each sensor will be displayed.
To display the sensor's millivolts, push the bottom button and hold. This should be done while exposing the sensors to air. To be safe to dive, the reading must be higher than 7 millivolts.
Note, you must be able to calibrate the sensors in both air and oxygen. If the sensors are unable to be calibrated in both air and oxygen, discard them. They are no longer safe to dive.

BATTERY

There is a red indicator LED light at the top of the display. When the battery needs to be changed, the red LED will stay on permanently **WHEN A BUTTON IS PRESSED**.

To change the battery, unscrew the battery compartment cap which is located at the bottom of the display, opposite the bottom button, on the other side of the cable. To open the compartment, use either the included tool or insert the tips of a set of pliers into the holes.
While the compartment is open inspect the O-rings. Check them to ensure they are in good condition, clean and then apply fresh lubricant.
The display takes a AA size battery. For best results, a 3.6v lithium battery should be used. Insert the battery with the "+" side inwards.
Secure the battery compartment cap.
Push the top button on the display to turn it on. Ensure that the red LED light is off. The display should turn off automatically after a few moments. Note that the red LED light will turn on for a moment, just as the display is about to turn off. This is normal.
WARNING: WHEN THE LOW BATTERY INDICATOR LIGHT COMES ON, THE BATTERY MUST BE CHANGED!!!! DIVING WITH A LOW BATTERY WILL AFFECT THE PPO2 READINGS!!!! THIS CAN CAUSE INJURY OR DEATH!!!!

CALIBRATION

First ensure that the battery is good.
To adjust, turn the black cap on the back side of the display. Each cap will have a number beside it that corresponds with a display. Turn the black cap using a large coin or similar tool. If you can not turn the cap and have run out of range, turn the cap all the way in and start over again.
BE VERY CAREFUL TO NOT SCREW THE CAP ALL THE WAY OUT. THIS WOULD EXPOSE THE SEALING O-RING AND IF TAKEN UNDERWATER, WOULD FLOOD THE DISPLAY!!!

If you have trouble calibrating the display, expose the sensors to air and check the millivolts.
They should read over 7 millivolts.
If the millivolts are correct, start the calibration procedure again. Screw the black cap all the way in and then back out again.
If for some reason the black calibration cap is completely undone, clean and lubricate the O-ring on the waterproof cover and also the internal O-ring. Replace the cap.
BE EXTREMELY CAREFUL TO NOT CROSS-THREAD THE CAP!!
The displays should be calibrated with oxygen. The procedure for this is as follows:

1. Ensure that the diluent tank valve is closed.
2. Draw all of the gas out of the loop. Do this by putting the DSV into your mouth, open the
loop, inhale the gas into your lungs and then exhale it out of your nose.
*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.
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
DSV quickly to bring the gas in the loop to ambient pressure. With the loop closed, calibrate to 1.00.
The readings can 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 DSV. Put the DSV 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.