



Digital HUD User Manual

v3.5



Heads Up Display

The Heads Up Display (HUD) is a visual display that provides the diver with essential PO₂ information. The FATHOM HUD utilizes a modified Smithers Code, which is a system of flashing lights that communicates PO₂ information to the diver. The HUD monitors each of the three sensors and displays the PO₂ on three LEDs. Each of the LEDs corresponds to a sensor. Each LED can flash red, white, blue, green, or amber. The brightness of the LEDs is adjusted automatically based on ambient light.

The HUD flash pattern is:

- A single amber flash is 1.0 bar/ata.
- The number of green flashes is the number of tenths above 1.0, so three green flashes is 1.3 bar/ata.
- The number of blue flashes is the number of tenths below 1.0, so two blue flashes is 0.8 bar/ata.

The HUD display has an accelerometer, which allows it to be turned on, turned off, and calibrated with taps. Five taps turns the HUD on, five taps turns it off, and three taps put it in calibrate mode, which must be accepted with three more taps

When the HUD is first switched on, all three LEDs will flash green at full brightness for one second (to load the battery), then the center LED (cell 2) will indicate the battery voltage, using one green flash for each 0.1 V above 3.0 V, and one red flash for each 0.1 V below (e.g. 3.3 V = 4 green flashes, 2.8 V = 2 red flashes). One amber flash indicates 3.0 V. It is worth replacing the battery when it gets to 2.9 V or below, indicated by red flashes at startup. Battery life will depend somewhat on LED brightness and how often they flash (i.e. how close to a PO₂ of 1.0 you are diving). A SAFT LS 14250 primary cell should provide 200+ hours of diving. The HUD has an auto-off feature. If the PO₂ does not change for an hour the HUD switches itself off.

PO ₂	Display
2.0 +	10 green, 5 red, 5 white
1.9	9 green, 5 red, 5 white
1.8	8 green, 5 red, 5 white
1.7	7 green, 5 red, 5 white
1.6	6 green, 5 red, 5 white
1.5	5 green, 5 red, 5 white
1.4	4 green, 5 red, 5 white
1.3	3 green, 5 red, 5 white
1.2	2 green, 5 red, 5 white
1.1	1 green, 5 red, 5 white
1.0	1 amber, 5 red, 5 white
0.9	1 blue, 5 red, 5 white
0.8	2 blue, 5 red, 5 white
0.7	3 blue, 5 red, 5 white
0.6	4 blue, 5 red, 5 white
0.5	5 blue, 5 red, 5 white
0.4	6 blue, 5 red, 5 white
0.3	7 blue, 5 red, 5 white
0.2	8 blue, 5 red, 5 white
0.1	9 blue, 5 red, 5 white
0	10 blue, 5 red, 5 white

The FATHOM HUD has a visual alarm feature, a distinctive high-visibility warning alternates with the flash pattern if the average PO₂ of enabled cells is below 0.4 PO₂ or above 1.6 PO₂. The visual alarm rapidly flashes alternating red and white LEDs at full brightness to get the diver's attention.

HUD Calibration

Calibration is the process on the rebreather's monitoring devices (handset or HUD) used to align the oxygen sensors' output in millivolts to a known partial pressure of oxygen.

To calibrate the FATHOM HUD, flush the loop with 100% oxygen and tap the HUD display three times. All three LEDs will come on for 5 seconds to indicate calibration mode. If you don't see that, it didn't get the command. Once in calibration mode, tap the HUD display three times again to confirm calibration. Cells that calibrate correctly flash green for 1 second, and if there is a problem with an individual cell, that cell's LED will flash red for 1 second. Each cell calibrates independently of the others. Calibration failure may occur because the cell voltage is out of range (e.g. below 35 mV in 100% oxygen) or the cell voltage is unstable. Calibration data (and other settings) are retained even if power is disconnected (e.g. when changing the battery). After you calibrate, each of the sensors should be flashing one amber. That means the PO_2 is between 0.95 and 1.05. The actual value that's used for calibration is 0.98.

HUD Calibration with a $PO_2 < 0.95$

Occasionally divers will encounter a situation where the available oxygen supply fO_2 is $< 95\%$ and the HUD will not calibrate properly. Altitude will have the same effect and even a 100% oxygen supply may be below a PO_2 of 0.95 preventing normal calibration. To calibrate in these situations, divers can flush the loop with oxygen, close the loop, and slowly add oxygen to the loop until the handset displays a PO_2 of 0.98. Once a PO_2 of 0.98 is reached, the HUD can be calibrated normally.

Change Log

v3.0 (Jun 25, 2024)

- Initial release (digital HUD display)

v3.1 (Jun 29, 2024)

- Alarms now only work if the HUD is in the water
- Auto power-off occurs after 20 minutes in the dry, and after 60 minutes in the water if no change in PO_2
- Display contacts must be wet for at least 2 seconds before system wakes up

v3.2 (Sep 19, 2024)

- Power-down can only occur if the HUD is dry

v3.3 (Feb 13, 2025)

- Wet switch disabled

v3.4 (Sep 22, 2025)

- Removed wet contact functionality
- Added accelerometer functionality

v3.5 (Apr 22, 2026)

- Reduced auto switch off time to 15 minutes (if alarm not active)



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