FATHOM
D I V E   S Y S T E M S

HUD OPERATING INSTRUCTIONS

FATHOM Heads Up Display

The FATHOM Heads Up Display (HUD) monitors three sensors and displays the PO_2 on three LEDs. Each of the LEDs corresponds to a sensor. Each LED is a dual color LED that can show red, green, or orange (both red and green).

The built-in piezo button controls the HUD. One (1) push turns it on or off, three (3) pushes enters the settings menu (see below), and five (5) pushes calibrates (see below). To count as multiple pushes, each push of the piezo button must happen within one-third ($\frac{1}{3}$) of a second of the preceding push.

When the unit 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 0.1V above 3.0V, and one red flash for each 0.1V below (e.g. 3.4V = 4 green flashes, 2.8V = 2 red flashes). One orange flash indicates 3.0V. It is worth replacing the battery when it gets to 3.0V or below, indicated by orange or red flashes at startup.

When switched off, the unit consumes less than 1 microamp, less than the self-discharge rate of the battery. Battery life during use will depend somewhat on LED brightness and how often they flash (i.e. how close to a PO_2 of 1.0 you are diving). A non-rechargeable SAFT 14250 cell should provide 200+ hours of diving.

The HUD has an auto-off feature. If the PO_2 does not change for an hour, and the button is not pressed, the HUD switches itself off.

Calibration

To calibrate, flush the loop with oxygen and push the piezo button fives times within 1.5 seconds. It might take a little practice to get this, but it is intended to prevent accidental calibrations. If you successfully do the calibrate sequence, all three lights will come on bright red for 1 second. If you don't see that, it didn't get the calibration command. 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 orange. That means the PO_2 is between 0.95 and 1.05. The actual value that's used for calibration is 0.98.

The rest of the flash pattern is:

- The number of greens is the number of tenths above 1.0 so three green is 1.3 PO_2
- The number of reds is the number of tenths below 1.0 so two red is 0.8
- A distinctive high-visibility warning alternates with the flash pattern if the average PO_2 of enabled cells is below a user definable setting (0.2, 0.3 or 0.4 PO_2) or above 1.5 PO_2. This visual alarm can be switched off in the settings menu.

PO$_2$	Display	Alarm (when enabled)
2.0 +	🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢	🟢🔴🟢🔴🟢🟢🔴🔴 🟢
1.9	🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢	🟢🔴🟢🔴🟢🟢🔴🔴 🟢
1.8	🟢 🟢 🟢 🟢 🟢 🟢 🟢 🟢	🔴🟢🔴🟢🔴🟢🟢🔴 🟢
1.7	🟢 🟢 🟢 🟢 🟢 🟢 🟢	🔴🟢🔴🟢🔴🟢🔴🔴 🟢
1.6	🟢 🟢 🟢 🟢 🟢 🟢	🟢🔴🟢🔴🟢🟢🔴🔴 🟢
1.5	🟢 🟢 🟢 🟢 🟢	
1.4	🟢 🟢 🟢 🟢	
1.3	🟢 🟢 🟢	
1.2	🟢 🟢	
1.1	🟢	
1.0	🟠	
0.9	🔴	
0.8	🔴 🔴	
0.7	🔴 🔴 🔴	
0.6	🔴 🔴 🔴 🔴	
0.5	🔴 🔴 🔴 🔴 🔴	
0.4	🔴 🔴 🔴 🔴 🔴 🔴	
0.3	🔴 🔴 🔴 🔴 🔴 🔴 🔴	🔴🟢🔴🟢🔴🟢🔴🔴 🔴
0.2	🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴	🔴🟢🔴🟢🟢🔴🔴🟢 🔴
0.1	🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴	🔴🟢🔴🟢🔴🟢🔴🔴 🔴
0	🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴 🔴	🔴🟢🔴🟢🔴🟢🟢🔴 🔴

Settings

Enter the settings menu by pressing the piezo button 3 times in 1 second. In the settings menu, the menu item number is displayed in binary by slowly flashing red LEDs, and the menu setting number is displayed in binary by slowly flashing green LEDs.

The menu item and setting are displayed alternately. Press the button once to go to the next menu item and press it twice to change the setting. Press it 3 times to exit the settings menu.

Menu item	Binary (red LEDs)	Setting	Binary (green LEDs)
Press button once to change		Press button twice to change	
Disable cells	⚪ ⚪ 🔴	All cells enabled, default	🟢 🟢 🟢
		Cells 1 & 2 disabled	⚪ ⚪ 🟢
		Cells 1 & 3 disabled	⚪ 🟢 ⚪
		Cell 1 disabled	⚪ 🟢 🟢
		Cells 2 & 3 disabled	🟢 ⚪ ⚪
		Cell 2 disabled	🟢 ⚪ 🟢
		Cell 3 disabled	🟢 🟢 ⚪
Swap 1 & 3	⚪ 🔴 ⚪	Cell 1 outboard, default	🟢 ⚪ ⚪
		Cell 1 inboard	⚪ ⚪ 🟢
Brightness	⚪ 🔴 🔴	Auto brightness, default	⚪ 🟢 ⚪
		Dim	⚪ 🟢 ⚪
		Medium	⚪ 🟢 🟢
		Bright	🟢 ⚪ ⚪
Visual alarm	🔴 ⚪ ⚪	Disabled, default	⚪ 🟢 ⚪
		< 0.2 and >1.5 PO_2	⚪ 🟢 ⚪
		< 0.3 and >1.5 PO_2	⚪ 🟢 🟢
		< 0.4 and >1.5 PO_2	🟢 ⚪ ⚪

Notes:

1. Both menu items and settings scroll back to the beginning.
2. The settings menu is automatically exited after 30 seconds.

If an individual cell is not in use, it is possible to disable that cell's display in the settings menu. This feature is intended for specific applications where only 1 or 2 cells are required and should not be utilized to dive with less than the number of intended cells.

Cells 1 and 3 can be swapped, so that the HUD displays cells 1 to 3 going from left to right whichever orientation the display is in, so the cable can be routed along either loop hose. This setting takes effect immediately, affecting all subsequent displays, so you will need to rotate the display through 180 degrees, or it will get confusing!

The brightness of the LEDs is user adjustable in the settings menu. Available settings are automatic (based on ambient light, which is the default), low, medium, and high.

Installation

The External HUD with unterminated cable needs to be installed in your CCR head by a trained technician. An appropriate sized cable gland should be used to seal the 4.6 mm cable. After trimming the cable to length, it should be waterblocked to prevent moisture from traveling up the cable. The following table indicates which wires correspond to which cells.

Cell 1	Brown
Cell 2	White
Cell 3	Blue
Ground	Black

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