PETREL·3

Technical Modes
Operating Instructions

SHEARWATER

Powerful • Simple • Reliable

Table of Contents

DANGER

This computer is capable of calculating deco stop requirements. These calculations are at best a guess of real physiological decompression requirements. Dives requiring staged decompression are substantially more risky than dives that stay well within no-stop limits.

Diving with rebreathers and/or diving mixed gases and/or performing staged decompression dives and/or diving in overhead environments greatly increases the risk associated with scuba diving.

YOU REALLY ARE RISKING YOUR LIFE WITH THIS ACTIVITY.

WARNING

This computer has bugs. Although we haven't found them all yet, they are there. It is certain that there are things that this computer does that either we didn't think about, or planned for it to do something different. 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.

This computer will fail. It is not whether it will fail but when it will fail. Do not depend on it. Always have a plan for 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).

Conventions Used in this Manual

These conventions are used to highlight important information:

INFORMATION

Information boxes contain useful tips for getting the most out of your Petrel 3.

CAUTION

Caution boxes contain important instructions for operating your dive computer.

WARNING

Warning boxes contain critical information that may affect your personal safety.

1. Introduction

The Shearwater Petrel 3 is an advanced technical dive computer.

Please take the time to read this manual. Your safety may depend on your ability to read and understand your dive computer's displays.

Diving involves risk and education is your best tool for managing this risk.

Do not use this manual as a substitute for proper dive training and never dive beyond your training. What you don't know can hurt you.

Features

- High-contrast 2.6" AMOLED display
- Rugged computer construction
- Titanium bezel
- User replaceable battery
- Powerful vibration alerts
- Programmable depth sampling rates
- Depth sensor calibrated to 130 msw
- Depth sensor function past 300 msw
- Crush pressure rating of 290 msw
- 5 customizable gases in technical diving modes
- Any combination of Oxygen, Nitrogen and Helium (Air, Nitrox,Trimix)
- Full decompression and CCR Support
- External PPO2 monitoring of 1, 2 or 3 oxygen cells (PO2 Monitor Models Only)
- Bailout rebreather mode (PO2 Monitor Models Only)
- Bühlmann ZHL-16C with gradient factors standard
- Optional VPM-B and DCIEM decompression models
- No lockout for violating deco stops
- CNS Tracking
- Gas Density Tracking
- Quick NDL and full decompression planner built in
- Simultaneous wireless pressure monitoring of up to 4 cylinders
- Sidemount diving features
- Tilt compensated digital compass with multiple display options
- Bluetooth Dive log uploading to Shearwater Cloud
- Free firmware updates

1.1. Notes on this manual

This manual provides operating instructions for the Petrel 3 dive computer in technical operating modes only.

This manual contains cross-references between sections to make it easier to navigate.

Underlined text indicates the presence of a link to another section.

Do not change any settings on your Petrel 3 without understanding the consequence of the change. If you are unsure, consult the appropriate section of the manual for reference.

This manual is not a substitute for proper training.

Firmware Version: V91

This manual corresponds to firmware version V91.

Feature changes may have been made since this release and might not be documented here.

Check the release notes on Shearwater.com for a complete list of changes since the last release.

1.2. Models Covered by this Manual

This manual provides operating instructions for the following Petrel 3 Models:

• Stand Alone Model	SA
• Fischer Connector Model	FC
• Analog Cable Gland Model	ACG
• DiveCAN Rebreather Monitor Model	DCM

Some sections of this manual only apply to specific models of Petrel 3. To help identify which sections are applicable to your unit, look for the corresponding model icon throughout this manual. Sections with no mode icons are applicable to all Petrel 3 models.

1.3. Modes Covered by this Manual

This manual provides operating instructions for the Petrel 3 in the following technical operating modes:

- Open Circuit Technical (OC Tec)
- Closed Circuit / Bail Out (CC/BO)
- Semi-closed / Bail Out (SC/BO)
- Gauge
- PPO2

Read about Dive Mode Differentiation on page 8.

The Shearwater Petrel 3 also has 3 modes designed for open circuit recreational diving.

For instructions on operation in recreational modes, please see the Petrel 3 Recreational Modes Manual.

Some features of the Petrel 3 only apply to certain dive modes. If not otherwise indicated, features described are applicable in all dive modes.

Read more about Mode Setup on page 71.

2. Basic Operation

2.1. Turning On

To turn the Petrel 3 on, press both buttons together.

Auto-on
The Petrel 3 will automatically turn-on when submerged underwater. This is based on pressure increase and not on the presence of water. When auto-on is activated, the Petrel 3 will enter the last configured dive mode.

Do Not Rely On The Auto-On Feature

This feature is supplied as a backup for when you forget to turn on your Petrel 3.

Shearwater recommends turning your computer on manually before each dive to confirm proper operation and to double check battery status and setup.

Auto-on Details
The Petrel 3 turns on automatically and enters dive mode when the absolute pressure is greater than 1100 millibar (mbar).

For reference, normal sea level pressure is 1013 mbar and 1 mbar of pressure corresponds to approximately 1 cm (0.4”) of water. So, when at sea level, the Petrel 3 will automatically turn-on and enter dive mode when about 0.9 m (3 ft) underwater.

If at higher altitude, then the Petrel 3 auto-on will occur at a deeper depth. For example, when at 2000 m (6500 ft) altitude the atmospheric pressure is only about 800 mbar. Therefore, at this altitude the Petrel 3 must be submerged underwater by 300 mbar to reach an absolute pressure of 1100 mbar. This means the auto-on occurs at about 3 m (10 ft) underwater when at an altitude of 2000 m.

2.2. Buttons

Two titanium piezo-electric buttons are used to change settings and view menus.

All Petrel 3 operations are simple single button presses.

MENU (left) button

SELECT (right) button

Don't worry about remembering all the button rules below. Button hints make using the Petrel 3 easy.

MENU (Left) button	
From main screen	Brings up menu
In a menu	Moves to the next menu item
Editing a setting	Changes the setting's value

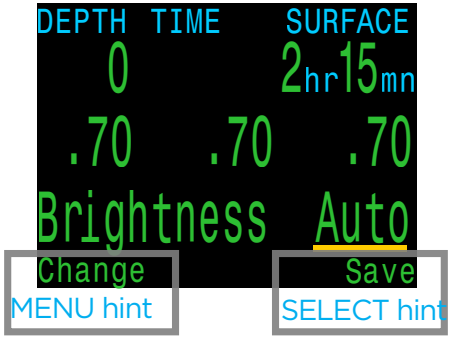
SELECT (Left) button	
From main screen	Steps through info screens
In a menu	Performs command or starts editing
Editing a setting	Saves the setting's value

BOTH BUTTONS

When Petrel 3 is off pressing MENU and SELECT at the same time will turn the Petrel 3 on. No other operation requires pressing both buttons at the same time.

Button Hints

When in a menu, button hints indicate the function of each button:



In the example above, the hints tell us:

- Use MENU to change the brightness value
- Use SELECT to save the current value

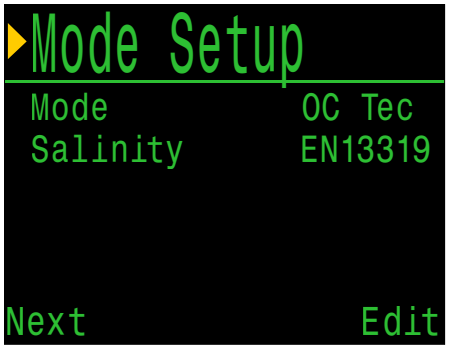
2.3. Changing between Modes

By default the Petrel 3 is set to 3 GasNx Mode.

Recreational Modes Layout

Recreational focused modes can be distinguished by the large-font layout.

For directions on how to use the recreational focused modes on the Petrel 3, see the Petrel 3 Recreational Modes Manual.



Mode Setup Menu

This manual covers operation in technical diving modes. Switch to one of these modes in the mode setup menu. See details on page 71.

Technical modes have a more dense layout and are capable of displaying more information on the screen.

OC Tec Mode

The circuit mode is indicated in the bottom left of technical dive mode displays.

2.4. Dive Mode Differentiation

Each dive mode is designed to best suit a particular type of diving. Use the correct mode to get the best experience from the Petrel 3.

Mode	Model Availability	Description
Air	SA FC ACG	Designed for use during recreational, air only, no-decompression diving activities. • Air (21% oxygen) only, not switchable underwater
Nitrox	SA FC ACG	Designed for use during recreational, Nitrox, no-decompression diving activities. • Single Gas Nitrox up to 40% oxygen • No gas switching underwater
3GasNx	SA FC ACG	Designed for introductory technical diving activities including diving involving planned decompression. • Three programmable gases • Support for gas switching • Nitrox up to 100%
OC Tec	SA FC ACG	Open Circuit Technical Designed for open circuit technical diving activities including planned decompression. • Full Trimix • No Safety stops

Mode	Model Availability	Description
CC/BO	SA FC ACG DCM	Closed Circuit with Open Circuit bailout. Designed for use with a closed circuit rebreather. • Fast switching from closed circuit to open circuit (BO) operating modes. • External PPO2 monitoring on some models.
SC/BO	FC ACG	Semi-Closed Circuit with Open Circuit bailout. Designed for use with a semi-closed circuit rebreather. • Decompression is calculated differently in SC mode versus CC, because the projected PPO2 at shallower depths is different. • Only external PPO2 monitoring is available.
Gauge	SA FC ACG	A simple depth and time display with a dedicated layout. See details on page 38. • No tissue tracking • No decompression information
PPO2	FC ACG DCM	Like Gauge but with PPO2 display. No decompression.

3. Dive Interface

3.1. Default Dive Setup

The Petrel 3 comes pre-configured for recreational diving. The default dive mode is 3 Gas Nitrox mode (3 GasNx).

As a quick reference, a diagram of the default diving display is shown below.

Default Dive Display - 3 GasNx mode

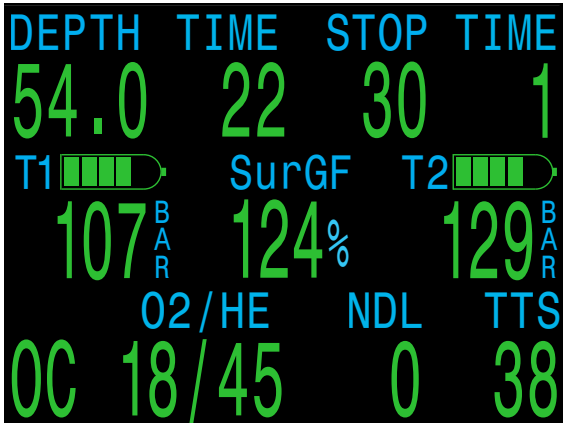
This manual is for technical dive modes only. Many features of the above default display are shared by the dive modes covered in this manual.

For directions on how to use Air, Nitrox or 3 GasNx modes, see the Petrel 3 Recreational Modes Manual.

3.2. Main Screen Layout

The main screen shows the most important information needed for technical diving.

Open Circuit



Top Row
Depth, Time & Deco Stops

Center Row
Configurable

Bottom Row
Mode, Gas, NDL & TTS

OC Tec mode

In every mode the top row contains important depth, time and decompression information. The bottom row shows the mode indicator, active gas, no-deco limit and time to surface.

Pressing the Select (right) button scrolls through additional data in the bottom row, temporarily obscuring this information. See the Info Screens section on page 16 for more information.

In OC Tec mode the entire center row contents can be configured to display the data that the user feels is most important.

See page 75 for Center Row configuration options.

Closed Circuit With Internal Setpoint

All models can be used in CC/BO mode operating with an “internal”, user defined setpoint. In this mode left and right positions can be configured, but the current setpoint is always displayed in the center position and cannot be removed.

Top Row
Depth, Time & Deco Stops

Center Row
Internal Setpoint, Configurable

Bottom Row
Mode, Gas, NDL & TTS

CC/BO mode, internal PPO2 = 1.3

Closed Circuit with External Setpoint

ACG FC

Models with external sensor monitoring can operate in CC/BO mode with external PPO2 monitoring. In this mode the center row prioritizes showing cell PPO2 values. If operating in 3 cell mode, no space is available for custom information in the center row.

Top Row
Depth, Time & Deco Stops

Center Row
Cell PPO2

Bottom Row
Mode, Gas, NDL & TTS

CC/BO mode, external PPO2

3.3. Detailed Descriptions

The Top Row

The top row shows depth, dive time, ascent rate, decompression information and battery status.

Depth
Displayed in feet or meters.

in feet

in meters

In feet, depth displays with no decimal places. In meters, depth displays with one decimal place up to 99.9m.

Note: If the depth shows a Flashing Red zero or shows a depth at the surface, then the depth sensor needs service.

Ascent Rate Display
Shows how fast you are currently ascending.

1 arrow per 3 meters per minute (mpm) or 10 feet per minute (fpm) of ascent rate.


GREEN when less than 9 mpm / 30 fpm (1 to 3 arrows)


YELLOW when greater than 9 mpm / 30 fpm and less than 18 mpm / 60 fpm (4 or 5 arrows)


FLASHING RED when greater than 18 mpm / 60 fpm (6 arrows)

Decompression calculations assume 10mpm (33fpm) ascent rate.

Dive Time

The first “TIME” item, on the left of the top row, is the length of the current dive in minutes.

Seconds display as a bar drawn below the word “Time.” It takes 15 seconds to underline each character in the word. The seconds bar is not displayed when not diving.

Decompression Stop Depth and Time

Stop at 27 meters for 2 minutes

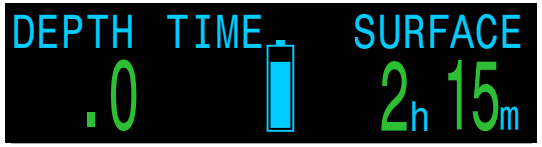
The third item in the Top row, “Stop”, indicates the next decompression stop depth in the current units (feet or meters). This is the shallowest depth to which you can ascend. The last item on the right in the top row, “time”, is how long in minutes to hold the stop.

Decompression Stop Violated

Decompression information will **Flash Red** if you ascend shallower than the current stop.

By default the Petrel 3 uses a 3m (10ft) last deco stop depth. You may perform your last deco stop deeper if you wish - deco calculations will remain accurate. If you choose to do this, depending on your breathing gas, the predicted time-to-surface may be shorter than the actual TTS since off-gassing may occur slower than the algorithm expects. There is also an option to set the last stop to 6m (20ft).

Surface Interval
When on the surface, decompression stop depth and time are replaced by a surface interval display showing the hours and minutes since the end of your last dive.

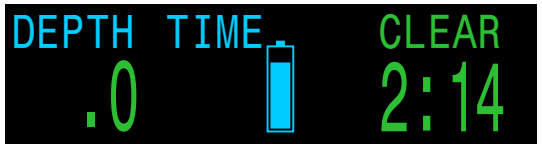


2 hour and 15 minute surface interval

Above 4 days, the surface interval is displayed in days.

The surface interval is reset when the decompression tissues are cleared. See the Decompression Tissue Loading section on page 87 for more information.

Deco Clear Counter
When deco clears the STOP DEPTH and TIME are replaced by a counter that begins counting up from 0.



Battery Icon
The default behavior is that the battery icon is shown on the surface but disappears when diving. If low or critical then the battery icon will appear while diving.

BLUE when battery charge is OK

YELLOW when battery needs to be replaced.

RED when battery must be replaced immediately.

The Center Row

The Center row layout depends on the current mode.

All 3 locations configurable in OC Tec mode

In OC Tec mode, center row information is entirely customizable. There are three configurable locations, each of which can be populated independently.

A list of data options is given on the next page. Center Row Setup instructions can be found on page 75 .

The middle location of the center row displays gas PPO2 by default. It has a smaller selection of data options because it is slightly narrower than the left and right slots.

For detailed descriptions of each screen element see Info Screen Descriptions on page 17

In CC/BO mode, when using an internal PPO2 setpoint, the center slot is not configurable. It always displays the currently selected rebreather setpoint with no title text. The right and left slots can still be customized.

Left and right locations configurable in CC/BO mode when using internal setpoint.

In CC/BO mode, when using external PPO2 monitoring, the Cell PPO2 values occupy the center row.

All center row positions show PPO2 information in CC/BO 3 sensor external PPO2 mode

In addition to the normal three cell mode, the dive computer can also be operated in single or dual cell mode. The unused location(s) can be customized in these operating modes. See details on page 57.

Switch between internal PPO2 setpoint and external PPO2 monitoring mode at the surface in the Mode Setup Menu (page 71.) or in the dive setup menu (page 61).

When using external sensors and you have bailed out to OC, the center row continues to display the external measured PPO2.

Note all PPO2 units are absolute atmospheres. (1ata=1013mbar).

Default PPO2 Limits

In CC mode, PPO2 displays in **Flashing Red** when less than 0.40 or greater than 1.6.

In OC Tech mode, PPO2 displays in **Flashing Red** when less than 0.19 or greater than 1.65.

The above limits can be adjusted in the Adv. Config 2 menu. See details on page 81

Home Screen Configuration Options

Option	Info Display	Option	Info Display
PPO2	PPO2 1.15	CLOCK	CLOCK 12:58
CNS %	CNS 11	Timer	TIMER 0:58
MOD	MOD 57 m	Dive End Time	DET 1:31
Gas Density	DENSITY 1.3 g/L	RATE	RATE ↓43 ft/min
GF99	GF99 15%	Temperature	TEMP 18°C
Surface GF	SurGF 44%	Compass	319°
Ceiling	CEIL 17	Max Depth	MAX 57 m
@+5	@+5 20	Avg. Depth	AVG 21 m
Δ+5	Δ+5 +8	Stack Time Remaining	Stack 2:55
Time To Surface	TTS 15	Tank Pressure	T1 175 BAR
Dil. PPO2	DilPO2 .99	Surface Air Consumption	SAC T1 1.5 Bar/min
FiO2	FiO2 .32	Gas Time Remaining	GTR T1 37
Mini Display	Δ+5 -4 GF99 37% SfGF 180	Redundant Time Remaining	RTR T1 16

Mini Displays

Mini Displays for the left and right custom slots can each hold 3 data displays. See details on page 23.

The Bottom Row

The bottom row of technical dive modes displays the current circuit mode, active gas, No Decompression Limit (NDL), and Time To Surface(TTS).

Current Circuit Mode
The active breathing mode configuration is displayed on the far left of the bottom row. The options are:

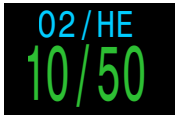
OC = Open circuit

CC = Closed circuit

BO = Bailout
(displays in **Yellow** to indicate bailout condition)

Active Gas
The current active gas shown as a percentage of Oxygen and Helium. The remainder is assumed to be Nitrogen.

Air:
21% O2
79% N2



Trimix:
10% O2
50% He
79% N2

A better deco gas is available

In open circuit mode, this is the breathing gas fraction. In closed circuit mode, this is the active diluent gas.

The active gas displays in yellow when there is a better gas available. Only turn on gases you plan to use on your dive.

No Decompression Limit (NDL)

The time remaining, in minutes, at the current depth until decompression stops will be necessary. Displays in **Yellow** when the NDL is less than the low NDL limit (Default 5 minutes).

NDL Replacement Options
Once NDL reaches 0 (i.e. deco stops needed), the NDL display can be replaced by a small selection of custom options to best utilize this space. See details on page 78. The Mini option is described in more detail on page 15.

NDL replacement options:
- **Ceiling**
- **@+5**
- **Delta+5**
- **GF99**
- **SurGF**
- **Mini**

Time To Surface (TTS)

The time-to-surface in minutes. This is the current time to ascend to the surface including the ascent plus all required deco stops.

Important!

All decompression information including Deco Stops, NDL, and Time to surface are predictions that assume:

- Ascent rate of 10mpm / 33fpm
- Decompression stops will be followed
- All programmed gases will be used as appropriate

See the Decompression Information Accuracy section on page 30 for more information.

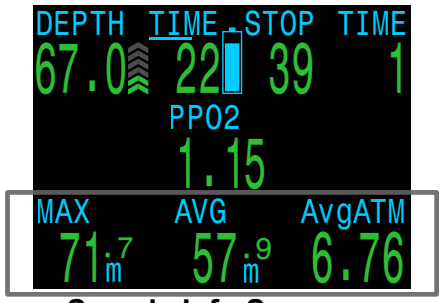
Additional Information
The bottom row is also used to show additional information.

Only the bottom row changes during a dive, so critical information contained on the Top and Center Rows is always available.

Additional information that can be displayed on the bottom row includes:

Info Screens:
Shows additional dive information.

Press SELECT (right button) to step through info screens.

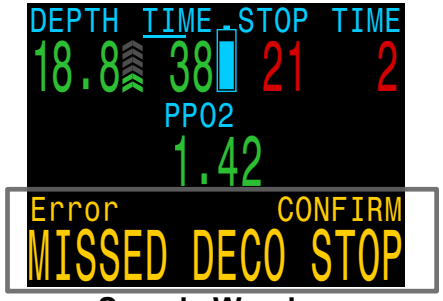


Sample Info Screen

Menus:
Allows changing settings.
Press MENU (left button) to enter menus.

Sample Menu

Warnings:
Provide important alerts.
Press any button to clear a warning.



Sample Warning

Mini NDL Replacement Display

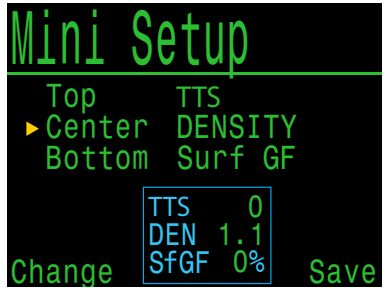
The Mini NDL replacement display option reconfigures the right side of the bottom row to allow two additional pieces of custom information to be displayed.

The Mini NDL replacement display can be configured from System Setup > Deco Setup described on page 72.

When the mini option is selected the chosen custom information is displayed at all times. This is unlike the other NDL replacement display options which only appear while the NDL is zero.

When in use, TTS is always the first row option of this mini display and cannot be changed. The NDL is relocated to the deco stop and time information section of the top row while there is no decompression obligation.

NDL Replacement Mini appearance



NDL Replacement Mini setup menu.

3.4. Info Screens

Info screens provide more information than is available on the main screen.

From the main screen, the SELECT (right) button steps through info screens.

When all info screens have been viewed, pressing SELECT again will return to the main screen.

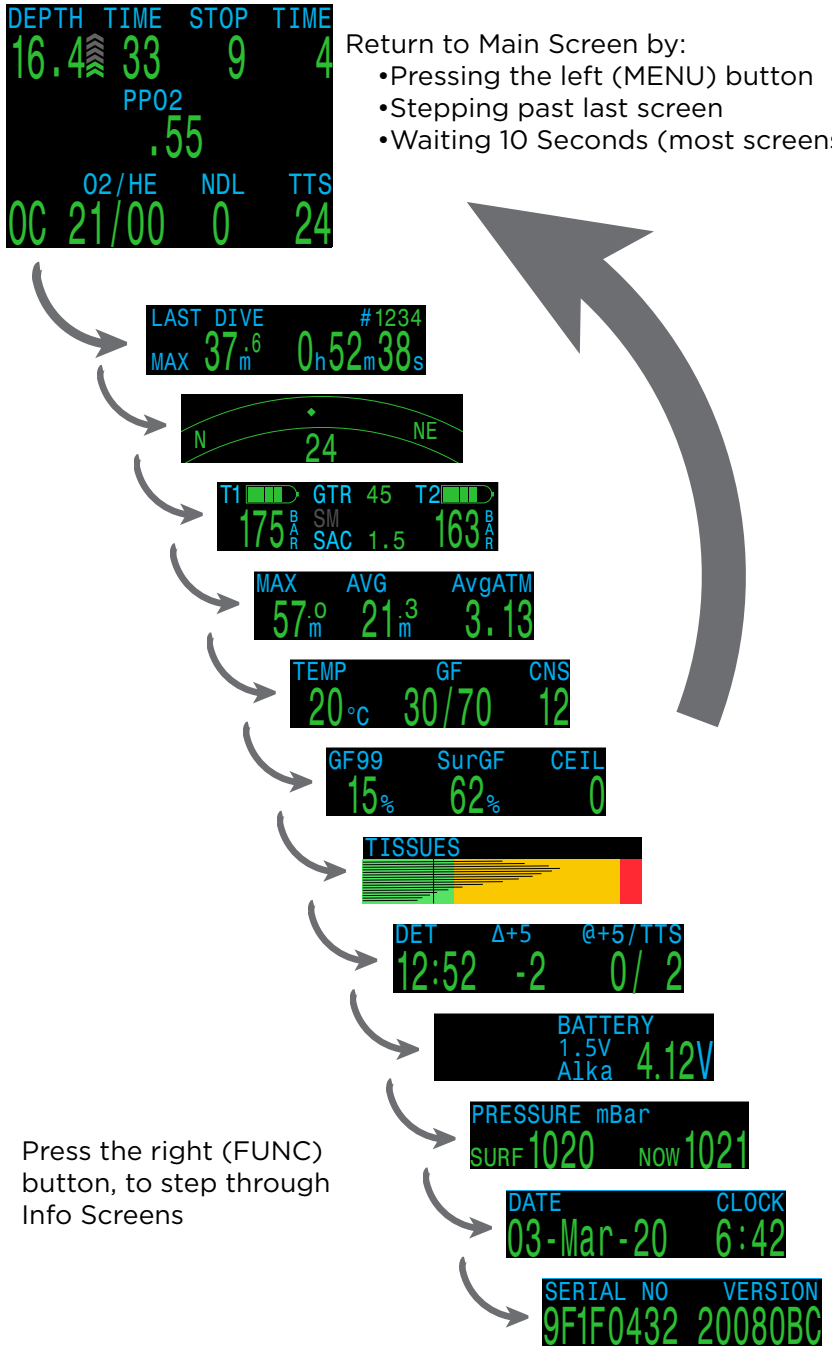
Info screens also automatically time-out after 10 seconds, returning to the home screen. This prevents active gas information from being hidden for an extended period.

Note that the Compass, Tissues and AI Info screens do not automatically time out when active.

Pressing the MENU (left) button will return to the home screen at any time.

Although these screens are generally representative of the Petrel 3 display, info screen content varies for each mode. For example, decompression related info screens are not available in gauge mode.

The next section gives detailed descriptions of the data elements shown on the info screens.



3.5. Info Screen Descriptions

This section contains detailed descriptions of all info screen and custom screen elements.

Last Dive Info

Maximum depth and dive time from the last dive. Only available at the surface.

Air Integration

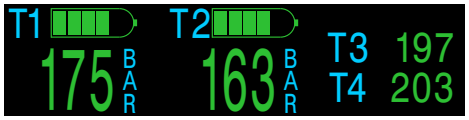
Only available if AI feature is turned on. The contents of the AI info line will automatically adapt to the current setup. Some examples include:

T1 Only

T1 & GTR/SAC

T1 & T2

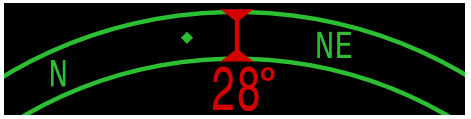
T1, T2 & GTR/SAC



T1, T2, T3, & T4

More information on AI features, limitations, and displays can be found in the Air Integration (AI) section on page 41.

Compass



Marked headings appear in green while reciprocal headings are shown in red. Green arrows point in the direction of your mark when off course by 5˚ or more.

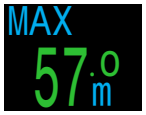
Compass info row will not time out and is only available when compass feature is turned on.

See the Compass section on page 40 for more information.

Millivolts FC ACG

Shows the raw millivolt outputs of external PPO2 cells. This is important information used to understand the O2 cell output behavior over time.

Maximum Depth



The maximum depth of the current dive. When not diving, displays the maximum depth of the last dive

Average Depth

Displays the average depth of the current dive, updated once per second. When not diving, displays the average depth of the last dive.

Average Atmospheres

The average depth of the current dive, measured in absolute atmospheres (i.e. a value of 1.0 at sea level). When not diving, shows the average of the last dive.

Temperature

The current temperature in degrees Fahrenheit or degrees Celsius as configured in Display Setup)

Maximum Operating Depth (MOD)

Only available as a custom display. In OC mode MOD is the maximum allowable depth of the current breathing gas as determined by PPO2 limits.

In CC mode, MOD is the maximum depth of the diluent.

Displays in **Flashing Red** when exceeded.

Read more about PPO2 Limits on page 81

Partial Pressure of Oxygen (PPO2)

In CC mode, displays in Flashing Red when less than 0.40 or greater than 1.6 by default.

In OC mode, displays in Flashing Red when less than 0.19 or greater than 1.65 by default.

Diluent PPO2

Only displayed in CC mode.
Displays in **Flashing Red** when the partial pressure of the diluent is less than 0.19 or greater than 1.65.

When performing a manual diluent flush, you can check this value to see what the expected PPO2 will be at the current depth.

Fraction of Inspired O2 (FiO2)

Only displayed in CC mode.
The fraction of the breathing gas composed of O2.
This value is independent of pressure.

CNS Toxicity Percentage

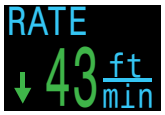
Central Nervous System oxygen toxicity loading percentage. Turns Yellow when greater than 90%. Turns **Red** when greater than 150%.

The CNS percentage is calculated continuously, even when on the surface and turned off. When deco tissues are reset, the CNS will also be reset.

The CNS value (short for Central Nervous System Oxygen Toxicity) is a measure of how long you have been exposed to elevated partial pressures of oxygen (PPO2) as a percentage of a maximum allowable exposure. As PPO2 goes up, the maximum allowable exposure time goes down. The table we use is from the NOAA Diving Manual (Fourth Edition). The computer linearly interpolates between these points and extrapolates beyond them when necessary. Above a PPO2 of 1.65 ATA, the CNS rate increases at a fixed rate of 1% every 4 seconds.

During a dive the CNS never decreases. When back at the surface, a half-life of elimination of 90 minutes is used. So for example, if at the end of the dive the CNS was 80%, then 90 minutes later it will be 40%. In 90 more minutes it will be 20%, etc. Typically after about 6 half-life times (9 hours), everything is back close to equilibrium (0%).

Rate



Numerical rate of ascent or descent. Same colour rules as ascent indicator. Available as a custom display only.

Mini Compass

A small compass that can be displayed at all times. The red arrow always points toward north. Only available as a custom display

Gradient Factor

The deco conservatism value when the deco model is set to GF. The low and high gradient factors control the conservatism of the Bühlmann GF algorithm. See “Clearing up the Confusion About Deep Stops” by Erik Baker for more information.

VPM-B (and VPM-BG)

The deco conservatism value when the deco model is set to VPM-B.

If the deco model is VPM-B/GFS, also displays the gradient factor for surfacing.

GF99

The current gradient factor as a percentage (i.e. super-saturation percent gradient)

0% means the leading tissue super-saturation is equal to ambient pressure. Displays “On Gas” when tissue tension is less than the inspired inert gas pressure.

100% means the leading tissue super-saturation is equal to the original M-Value limit in the Bühlmann ZHL-16C model.

GF99 is displayed in Yellow when the current gradient factor modified M-Value (GF High) is exceeded.

GF99 is displayed in **Red** when 100% (un-modified M-Value) is exceeded.

SurfGF

The surfacing gradient factor expected if the diver instantaneously surfaced.

SurfGF colour is based on the current GF (GF99). If the current GF is greater than GF High, SurfGF will be displayed in Yellow. If the current gradient factor is greater than 100%, SurfGF will be displayed in **Red.**

Ceiling

The current decompression ceiling not rounded to the next deeper stop increment. (i.e. not a multiple of 10ft or 3m)

@+5

"At plus 5" is the TTS if remaining at the current depth for 5 more minutes. This can be used as a measure of how fast you are on-gassing or off-gassing.

Δ+5

The predicted change in TTS if you were to stay at the current depth for 5 more minutes.

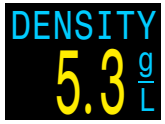
A positive "Delta plus 5" indicates that you are on-gassing the leading tissue while a negative number indicates that you are off-gassing the leading tissue.

Battery

The Petrel 3's battery voltage. Displays in Yellow when the battery is low and needs replacement. Displays in **Flashing Red** when the battery is critically low and must be replaced as soon as possible. Also shows battery type.

Gas Density Display

The Gas Density display is only available as a customizable display and is not available in the info row.



For open circuit diving, the gas density display turns yellow at 6.3 grams per liter. No other warnings are generated.

For closed circuit diving, the gas density display turns yellow at 5.2 grams per liter and red at 6.3 grams per liter. No other warnings are generated.

Gas density is an approximation based on the diluent gas and loop PPO2.

You may be surprised at how shallow gas density warning colors appear.

Read more about why we chose these levels starting on page 66 here (recommendations on page 73):

Anthony, T.G and Mitchell, S.J. Respiratory physiology of rebreatherdiving. In: Pollock NW, Sellers SH, Godfrey JM, eds. Rebreathers and Scientific Diving. Proceedings of NPS/NOAA/DAN/AAUS June 16-19, 2015 Workshop. Durham, NC; 2016.

Dive End Time (DET)

This is similar to TTS but is expressed as a time of day.

The time of day at which you can expect to surface if you depart immediately, ascend at 10mpm or 33fpm, change gases when prompted, and perform all decompression stops as directed.

Pressure

The pressure in millibars. Two values are shown, the surface (surf) pressure and the current (now) pressure.

Note that typical pressure at sea level is 1013 millibar, although it may vary with the weather (barometric pressure). For example, surface pressure may be as low as 980 millibar in a low pressure system, or as high as 1040 millibar in a high pressure system.

For this reason, the PPO2 displayed on the surface may not exactly match the FO2 (fraction of O2), although the displayed PPO2 is still correct.

The surface pressure is set based on the lowest pressure the dive computer sees in the 10 minutes prior to the start of a dive. Therefore, altitude is automatically accounted for and no special altitude setting is required.

Date and Time

In a 12 or 24 hour format. Time format can be changed in the watch settings menu.

Timer

A simple stopwatch. The timer is only available as a customizable display. It is not available in the info row.

Stack Timer

In CC mode a stack timer can be enabled to help keep track of CO2 Scrubber usage. When enabled in the Advanced Config 4 menu, this timer will display how much time has elapsed either diving or while the unit is turned on, and how much time is remaining.

For more stack timer configuration options and setup instructions, see page 82

When the stack time has less than 60 minutes remaining, the remaining stack time will show in inverted yellow and the STACK TIME WARN notification will be triggered.

When the stack time remaining is less than 30 minutes, the remaining stack time will flash red and the STACK TIME ALARM notification will be triggered. A persistent red **Stack Time** notification will remain on the screen to indicate that stack time requires immediate attention.

If stack time remaining drops below zero , it will continue counting down into the negative and flash red. Note the mini display stack time will not count down negative due to space constraints.

Tissues bar Graph

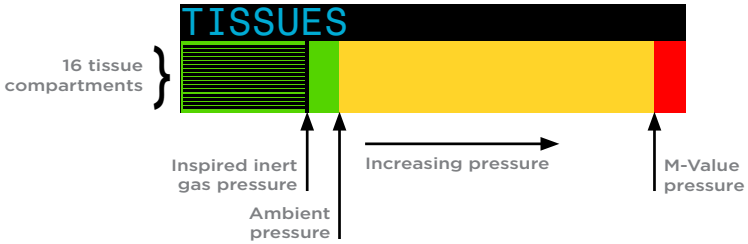
The tissues bar graph shows the tissue compartment inert gas tissue tensions based on the Bühlmann ZHL-16C model.

The fastest tissue compartment is shown on the top, and the slowest on the bottom. Each bar is the combined sum of the nitrogen and helium inert gas tensions. Pressure increases to the right.

The vertical cyan line shows the inert gas inspired pressure. The yellow line is the ambient pressure. The red line is the ZHL-16C M-Value pressure.

Tissues that are supersaturated above ambient pressure are shown in yellow, and tissues that are supersaturated above the M-Value are shown in red.

Note that the scale for each tissue compartment is different. The reason the bars are scaled in this way is so that the tissues tensions can be visualized in terms of risk (i.e. how close they are as a percentage to Bühlmann's original super- saturation limits). Also, this scale changes with depth, since the M-Value line also changes with depth.



Sample Tissue bar Graphs

On surface (sat. with air)
Note: Gas is 79% N_2 (21% O_2, or Air)

After descent

On-gassing

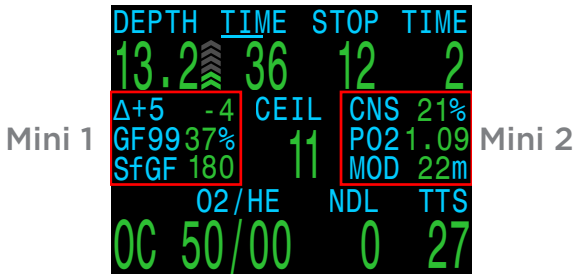
Deep stop

Last deco stop
Note: Gas is now 50% O_2 and 50% N_2

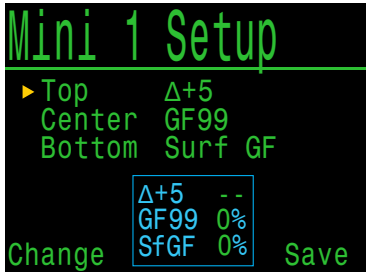
3.6. Mini Displays

Mini displays provide more options for data customization at the expense of font size.

There 2 separately configurable mini displays that are shared by both OC Tec and CC/BO mode. Mini displays are only available in the left and right custom positions.



Details about how to customize the mini displays can be found on page 75



Up to 9 customizable fields can be displayed simultaneously with fully populated Mini Displays, a customized center position and using the mini NDL replacement option. Managed improperly, this can be an overwhelming amount of information.

Care should be taken not to distract from the information that is most important to the type of diving you're doing.

3.7. Notifications

This section describes the different types of notifications the computer may present the diver.

See the List of primary notifications on page 25 that a diver may encounter.

Color Coding

Color coding of text draws attention to problems or unsafe situations.

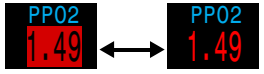
GREEN text indicates normal conditions by default.

Note that this normal condition color can be selected in the advanced configuration menu, described on page 80

YELLOW is used for warnings that are not immediately dangerous but should be addressed.

Sample warning - a better gas is available

FLASHING RED is used for critical warnings that could be life threatening if not immediately addressed.



Sample critical warning - Continuing to breathe this gas could be fatal

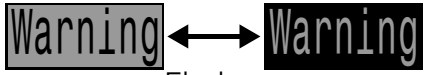
Color blind users

The warning or critical warning states can be determined without the use of color.

Warnings display on a solid inverted background.

Doesn't flash

Critical Warnings flash between inverted and normal text.



Flashes

Types of Notifications

There are two types of notifications displayed by this dive computer. Primary notifications and persistent notifications.

Primary Notifications

Each primary notification displays as a message in yellow across the bottom row until dismissed.

The notification is dismissed by pressing either button.

Sample Primary notification - High PPO2 Warning

For example, this “HIGH PPO2” message will appear if the average PPO2 goes above the high PPO2 limit for more than 30 seconds.

The highest priority notification is listed first. If multiple errors occur simultaneously, the notification with the highest priority will be displayed. Clear the first notification by pressing a button to see the next one.

If vibration alerts are on, the unit will vibrate when the alert first occurs and every 10 seconds until it is acknowledged.

A list of primary notifications a diver may see is given on page 25.

Persistent Notifications

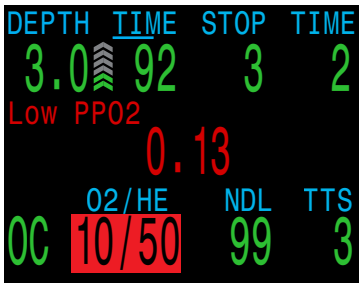
Persistent notifications complement primary notifications, displaying while a dangerous condition is present until the condition is resolved.

Persistent notifications cannot be cleared while the condition that caused them persists.

Example: when PPO2 is in an unsafe range,

- Center row text that shows a “Low PPO2” or “High PPO2” message.
- PPO2 and gas values are highlighted and flash.

These persistent notifications will clear automatically once a safe PPO2 is restored.



Sample "Low PPO2" Persistent Notification

Sample "High PPO2" Persistent Notification

Limitations Of Alarms

All alarm systems share common weaknesses.

They can alarm when no error condition exists (false positive). Or they can fail to alarm when a real error condition occurs (false negative).

Respond to alarms if you see them, but NEVER depend on them. Your judgment, education, and experience are your best defenses. Have a plan for failures, build experience slowly, and dive within your experience.

Vibration Alerts

In addition to visual notifications, the Petrel 3 has vibration alerts to help quickly notify the diver of warnings, errors and dive events.

If turned on, attention vibration alerts occur when a safety stop starts, pauses, or is completed. Vibration alerts also occur any time a primary notification is triggered and every 10 seconds until it is acknowledged.

There are some persistent conditions, such as low PPO2 that will cause vibration to continue until the condition is resolved.

The vibration alert can be toggled on or off in the System Setup menu as described in Alerts Setup described on page 77, or in the Dive Setup described on page 61.

A Test Vibration tool is also available in the Dive Setup menu and should be used regularly before diving to ensure the vibrator is functioning properly.

Vibration is Battery Dependant

Vibration Alerts are only available when using a 1.5V Lithium or 3.7V Rechargeable Li-ion battery.

Caution

Although vibration alerts are very useful, never rely on them for your safety. Electromechanical devices can and will eventually fail.

Always be proactively aware of your depth, no-decompression limit, gas supply, and other critical dive data. You are ultimately responsible for your own safety.

3.8. List of primary notifications

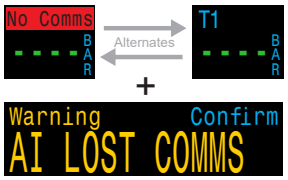
The following table lists primary notifications you may see, their meaning, and steps to take to solve any problems.

If multiple warnings are triggered simultaneously, the notification with the highest priority will be displayed. Clear that notification by pressing any button to see the next notification.

Contact Shearwater

The subsequent list of notifications is not exhaustive. Please contact Shearwater if you experience any unexpected errors: info@shearwater.com

Display	Meaning	Action to take
	The PPO2 is below the limit set in the PPO2 limits menu.	**Change your breathing gas to one safe for the current depth.**
	The PPO2 is above the limit set in the PPO2 limits menu.	**Change your breathing gas to one safe for the current depth.**
	A required decompression stop was violated.	**Descend deeper than the currently displayed stop depth. Monitor for symptoms of DCS. Use extra conservatism for future repetitive dives.**
	The ascent was sustained as faster than 10m/min (33ft/min)	**Use a slow ascent rate. Monitor for symptoms of DCS. Use extra conservatism for future repetitive dives.**

Display	Meaning	Action to take
	The internal battery is low.	**Replace the battery.**
	The decompression tissue inert gas loading has been set to default levels.	**Plan repetitive dives accordingly.**
	Central Nervous System (CNS) toxicity clock exceeded 150%	**Switch to a gas with a lower PPO2 or ascend shallower (decompression ceiling allowing)**
	Central Nervous System (CNS) toxicity clock exceeded 90%	**Switch to a gas with a lower PPO2 or ascend shallower (decompression ceiling allowing)**
	NDL is less than low NDL alert value. (Only if alert active)	**Ascend soon to avoid decompression obligation.**
	Depth is deeper than depth alert value. (Only if alert active)	**Ascend above depth limit.**
	Dive time has surpassed time alert value. (Only if alert active)	**End dive safely.**
	No communications for 30 to 90 seconds.	**See the Transmitter Connection Issues section on page 51 for more information.**
	No communications for 90+ seconds.	**See the Transmitter Connection Issues section on page 51 for more information.**

Display	Meaning	Action to take
	Low transmitter battery.	**Replace the transmitter battery.**
	Tank pressure exceeds rated pressure by more than 10%	**Properly set the rated pressure in the AI Setup menu. page 73.**
	Tank pressure has fallen below the critical pressure.	**Be aware that gas is running low. Begin to end your dive and perform a controlled ascent to the surface.**
	GTR is not available when on the surface.	**None. GTR will display during a dive.**
	GTR is not available when on the surface.	**None. After a few minutes, enough data has been collected for display.**
	Less than one hour of stack time remaining.	**End dive safely.**
	Less than 30 minutes of stack time remaining.	**End dive safely.**
	The computer has reset to recover from an unexpected software condition.	**If this occurs more than once over a long period, please report to Shearwater Research Inc.**

Display	Meaning	Action to take
	This reset shows up after a software update. This is the normal event that shows the computer has been rebooted after the software update.	N/A
	Firmware update failed, possibly due to a communications error or corrupted file.	**Try the firmware upgrade again. Contact Shearwater if problem persists.**

3.9. Decompression Stops

There are no Safety Stops in technical diving modes. Decompression stops are mandatory stops that must be followed in order to reduce the risk of decompression illness (DCI)

Do not dive beyond your training

Only perform decompression diving if you have received proper training to do so.

Diving with any type of overhead ceiling, whether in a cave or shipwreck, or from a decompression requirement, adds significant risk. Have a plan to handle failures and never rely solely on a single source of information.

Decompression stops occur at fixed 10ft (3m) intervals.

Decompression stops display as follows:

Decompression Stop Display
Once the NDL reaches zero, deco stop information will begin to populate the right side of the Top Row

Deco Stop Violation
If you ascend shallower than your current stop, the decompression information will **flash red**.

Significant decompression stop violations will result in a “MISSED STOP” notification. Press any button to clear this notification.

Deco Stops Complete
By default, the deco clear counter is enabled. Once all decompression stops are complete, the Deco Clear counter will begin counting up from zero.

If the Deco Clear Counter is turned off, the display will say “Clear”.

No Lockout for violating deco stops

There is no lock-out or other penalty for violating decompression stops.

Shearwater’s policy is to provide clear warnings that the decompression schedule was violated, to allow you to make decisions based on your training.

This may include contacting your dive insurance provider, contacting the nearest recompression chamber, or performing first aid based on your training.

4. Decompression and Gradient Factors

The basic decompression algorithm used by this computer is Bühlmann ZHL-16C. It has been modified by the use of Gradient Factors that were developed by Erik Baker. We have used his ideas to create our own code to implement it. We would like to give credit to Erik for his work in education about decompression algorithms, but he is in no way responsible for the code we have written.

The computer implements Gradient Factors creating varied levels of conservatism. The levels of conservatism are pairs of number like 30/70. For a more detailed explanation of their meaning, please refer to Erik Baker's excellent articles: "Clearing Up The Confusion About Deep Stops" and "Understanding M-values". The articles are readily available on the web. You might also want to search for "Gradient Factors" on the web.

The default conservatism of the system depends on the dive mode.

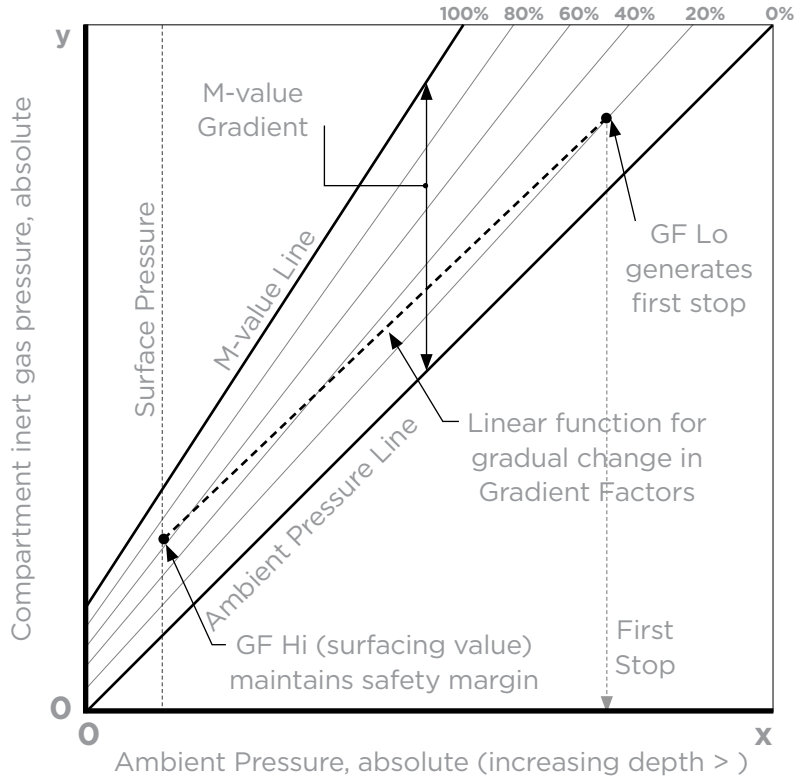
For OC Rec mode the default conservatism setting is medium (40/85).

For OC Tec and CC/BO modes where some decompression is presumed, the default is a more conservative 30/70. The system provides several settings that are more aggressive than the default.

Do not edit GF values until you understand the effects.

Graph from Erik Baker's "Clearing Up The Confusion About Deep Stops"

Pressure Graph: Gradient Factors



- A Gradient Factor is simply a decimal fraction (or percentage) of the M-value Gradient.
- Gradient Factors (GF) are defined from 0% to 100%.
- A Gradient Factor of 0% represents the ambient pressure line.
- A Gradient Factor of 100% represents the M-value line.
- Gradient Factors modify the original M-value equations for conservatism within the decompression zone.
- The lower Gradient Factor value (GF Lo) determines the depth of the first stop. Used to generate deep stops to the depth of the "deepest possible deco stop"
- The higher Gradient Factor value (GF Hi) determines the surfacing tissue supersaturation.

4.1. Decompression Information Accuracy

Decompression information displayed by this computer, including NDL, stop depth, stop time, and TTS are predictions. These values are continuously recalculated and will change with changing conditions. The accuracy of these predictions is dependent on several assumptions made by the decompression algorithm. It is important to understand these assumptions to ensure accurate decompression predictions.

It is assumed that the diver's ascent rate is 10m/min (33ft/min). Ascending significantly faster or slower than this will impact decompression obligations. It is also assumed that the diver is carrying and plans to use every gas that is currently turned on. Leaving gases that are not expected to be used turned on will result in inaccurate time to surface, decompression stop and decompression time information being displayed.

On ascent, it is assumed that the diver will perform decompression stops using the gas with the highest PPO2 below the OC Deco PPO2 value (default 1.61). If there is a better gas available, the current gas will be displayed in yellow, indicating that a gas change is expected. The decompression prediction displayed always assumes that the best gas will be used. Even if the switch to a better gas has not been completed yet, decompression predictions will be displayed as if the switch is about to occur in the next 5 seconds.

Divers can encounter longer than expected decompression stops as well as inaccurate time to surface predictions if they fail to switch to a better gas when prompted by the computer.

Example: A diver on a decompression dive to 40m/131ft for 40 minutes with GF settings of 45/85 has two gases programmed into their computer and turned on: 21/00 & 99/00. The diver's decompression schedule will be calculated based on breathing 21% oxygen for the descent, bottom and ascent phases of the dive until the diver ascends to 6m/20ft. At 6m/20ft the PPO2 of the 99/00 mix is 1.606 (less than 1.61), so it is the best decompression gas available.

Decompression information for the remaining stops will be calculated and displayed assuming the diver is going to switch to this better gas. This dive profile indicates these stops would be 8 minutes at 6m/20ft and 12 minutes at 3m/10ft. If the diver never makes the switch to 99/00, the computer will not allow them to surface until adequate off-gassing has occurred, but it will continue to assume the diver is about to make the gas switch and the decompression times given will be grossly inaccurate. The 6m/20ft stop will take 19 minutes to clear and the 3m/10ft stop will take 38 minutes to clear. That is a total time to surface difference of 37 minutes.

In a lost gas scenario or in the event a diver forgets to turn off a gas they are not carrying before a dive, gases can be turned off during the dive in Main menu -> Edit Gases.

5. Example Dives

5.1. Simple OC Tec Example Dive

This is an example of displays that might be seen on a simple decompression dive in OC Tec Mode.

1. Set Up Gases - Best practices include checking your gas lists before each dive. This screen is available in the System Setup menu. This dive only involves air. Turn off all gases you do not plan to use on the dive.

2. Verify Settings - It is also prudent to ensure all other settings are correct before starting the dive. Not all settings can be modified underwater.

3. Plan Dive - Use a deco planner to check the total runtime, decompression schedule and gas quantity needed.

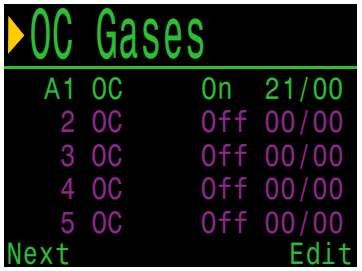
The on-board deco planner is limited in functionality. For complex dives we recommend planning using desktop or smartphone dive planning software.

4. Pre-Dive - This is the surface screen immediately before descending. It shows the computer is in OC mode and that 21% O2 is selected.

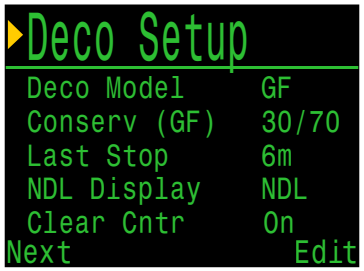
5. Descent - As we pass through 10 meters, the time-to-surface (TTS) shows one minute. This shows that the computer is expecting the diver to ascend at approximately 10 meters per minute or 33 feet per minute. Decompression predictions are based on this ascent rate.

6. NDL Decreasing - The no-decompression limit (NDL) starts off showing 99, but then starts to show a smaller number as the depth increases. This screen shows that we will go into deco in 12 minutes.

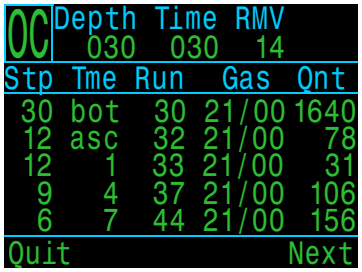
(Continued on next page)



1. Set Up Gases



2. Verify Settings



3. Plan Dive

4. Pre-Dive

5. Descent

6. NDL Decreasing

7. Max Depth - We now have a decompression requirement. Our first stop is at 12 meters and we will need to remain there for up to one minute. Although stops are shown in minutes, the computer will calculate and change the ceiling in real time and the stop may be less than a minute.

Time to surface (TTS) now indicates it will take 26 minutes to ascend to the surface following the currently calculated decompression schedule.

8. Ascent - As we ascend, the ascent rate indicator shows two chevrons, or about 6 mpm / 20 fpm. This is slower than the 10 mpm / 33 fpm that decompression calculations assume. As a result of this slow ascent, early decompression stops may clear before we arrive.

9. Missed Stop - When we go shallower than our 6 meter stop, the deco stop information starts to flash red. Significant stop violations will result in a missed deco stop notification.

10. Deco Clear - When we clear the last stop, the stop depth and time is replaced by the Deco clear counter that begins counting up from zero. We also see an NDL of 99 minutes again. Once we surface, the depth will return to 0 and a minute later when the computer comes out of dive mode, the NDL goes to 0 as well.

7. Max Depth

8. Ascent

9. Missed Stop

10. Deco Clear

No safety stop countdown in technical dive modes

It is widely believed that additional time spent at the last decompression stop reduces the overall risk of decompression sickness.

The decision not to include a safety stop countdown in technical dive modes is an acknowledgment that technical divers plan decompression ahead of their dives to manage decompression risk with this in mind.

The deco clear counter is a useful tool to aid divers in padding their final decompression stop for additional conservatism.

5.2. Complex OC Tec Example Dive

This is an example of displays that might be seen on a multi-gas trimix decompression dive in OC Tec Mode.

Max Depth: 60 meters	Bottom Gas: Trimix (18/45)
Bottom Time: 20 minutes	Deco Gases: 50% & 99% O2

1. OC Gas Setup - Best practices include checking your gas list before each dive. This screen is available in the System Setup menu. All gases that are turned on will be used to calculate the decompression schedule. Make sure to turn off gases you are not carrying or planning to use.

2. Verify Settings - It is also prudent to ensure all other settings are correct before starting every dive. In addition to checking gases, we recommend verifying the settings on all system setup pages.

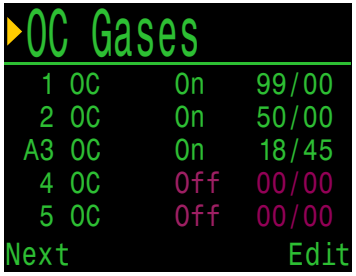
3. Plan Dive - Use the Deco Planner found in Dive Setup to check the total runtime, decompression scheduled and gas requirements for the dive.

We recommend using desktop or smart phone dive planning software for complex dives. The on-board deco planner is an effective tool for confirming computer settings produce a plan that meet your expectations.

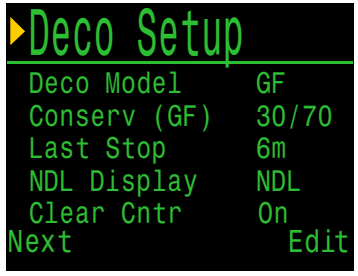
4. Pre-Dive - Prior to beginning the dive we can see our active gas is currently 18/45, and our battery is in a good state of charge. The decimal in the depth display indicates that meters are the selected units.

5. Descent - As we descend our dive time begins counting up, PPO2 increases, and the displayed NDL falls.

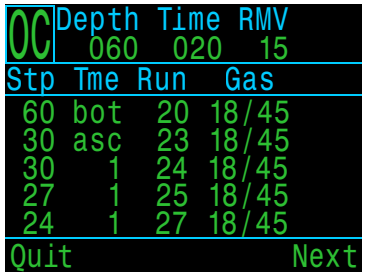
(Continued on next page)



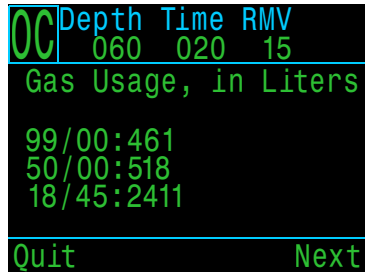
1. OC Gas Setup



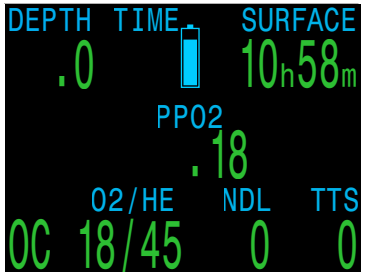
2. Verify Deco Settings



3. Plan Dive - Deco Scheduled



3. Plan Dive - Gas Requirement



4. Pre-Dive

5. Descent

6. Max depth - Once NDL hits 0, deco stops are needed. Stop requirements are now display in the top right of the screen. TTS has increased to include deco stop time.

7. Ascent - It is safe to ascend to 24 meters. 2 minutes must be spent at that deco stop. The bar graph to the right of the depth shows the ascent rate (10 mpm). All decompression predictions are made assuming an ascent rate of 10 meters per minute.

8. Gas Change - All decompression predictions are made assuming you will switch to the best available gas on ascent. At the 21m stop, the breathing gas turns yellow indicating that a better breathing gas is available. If the switch is not made, tissue loading will be calculated using the active gas, but predicted deco stop and time calculations assume the switch will occur within the next 5 seconds.
Available gases can be added or subtracted during the dive in the Dive Setup > Define Gas menu.

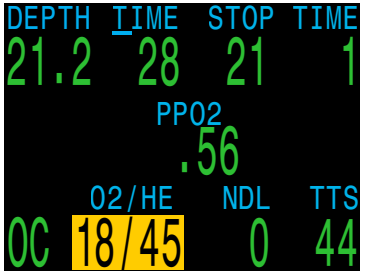
9. High PPO2 - After the switch to 50% O2, the diver has descended a couple meters, their inspired PPO2 has risen above the default warning value, and the high PPO2 warning has been triggered. Any button press will clear the primary notification, but for PPO2 warnings, the computer will continue to vibrate to get the divers attention until the PPO2 warning condition has been resolved.

10. Missed Deco Stop - The diver has ascended shallower than the decompression ceiling. Deco information flashes red and after a short time a missed deco stop warning is triggered. Clear the warning and stop the vibration alert by pressing any button. Re-descend deeper than the stop depth to clear the flashing text.

11. Deco Clear - Once all decompression obligation has been cleared, the deco clear counter begins counting up from zero.

6. Max Depth

7. Ascent



8. Gas Change

9.High PPO2

10. Missed Stop

11.Deco Clear

5.3. CC Example Dive

This is an example of displays that might be seen on a multi-gas decompression dive in CC/BO Mode.

Max Depth: 90 meters	Diluent Gas: Trimix (10/50)
Bottom Time: 20 minutes	Bailout Gases: 14/55, 21%, 50%

1. CC Gas Setup - Best practices include checking your gas lists before each dive. CC and BO Gas setup screens are available in the System Setup menu. For this dive the only diluent gas is Trimix 10/50. (10% O2, 50% He, 40% N2)

2. BO Gas Setup - Several bail out gases are required for this dive. If we switch to BO mode, we can also use the Dive Setup > Define Gas menu to edit, turn on, or turn off the bailout gases.

We will verify we are carrying sufficient bailout gas when we plan the dive.

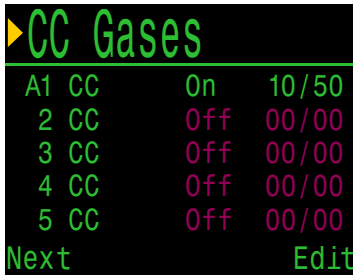
3. Verify Settings - It is prudent to ensure all other settings are correct before starting every dive. For advanced technical dives, it is especially important to double check the values on every screen of the system setup menu.

4. Plan Dive - Use the dive planner found in Dive Tools to check the total runtime, decompression schedules and bailout gas requirements for the dive.

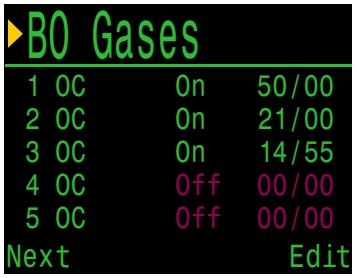
For closed circuit dives, two decompression schedules will be generated. A primary schedule for closed circuit deco, and a bailout decompression schedule.

The on-board deco planner is limited in functionality, so for complex dives we recommend using desktop or smart phone dive planning software. Using the on-board planner to double check your dive plan is an effective way of confirming decompression settings.

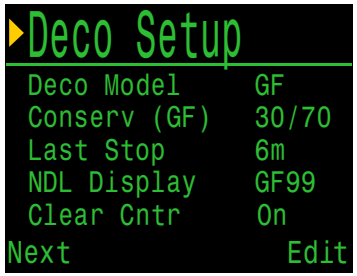
(Continued on next page)



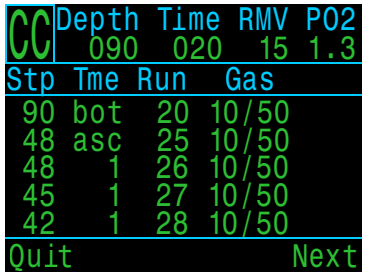
1. CC Gas Setup



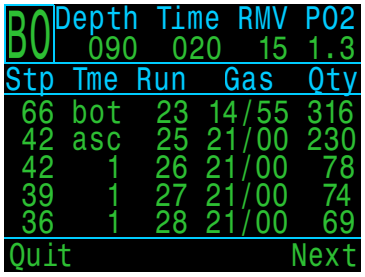
2. OC Gas Setup



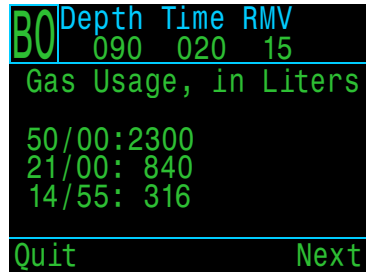
3. Verify Deco Settings



4. Plan Dive - CC Scheduled



4. Plan Dive - BO Scheduled



4. Plan Dive - Bailout Gas Requirement

CC Example Dive (cont.)

Note on Hypoxic Diluents

Hypoxic diluents such as 10/50 in this example require special training since they can be deadly near the surface.

5. PPO2 Calibration - If the PPO2 sensors need calibration, follow the instructions from your rebreather manufacturer.

Read more about system calibration on page 56

6. Pre-Dive - Prior to beginning the dive we can see from the mode indicator that we are in CC mode. Our active diluent gas is set to 10/50, our set point is 0.7, and the Petrel 3's battery is sufficiently charged.

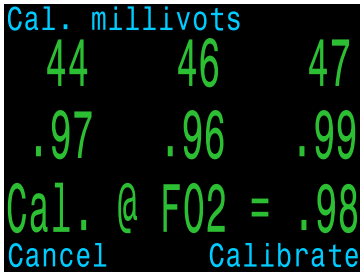
7. Diluent Check - Pressing the right button a few times brings up the diluent PPO2. The red indicates the diluent is unsafe to breath directly.

This information can be viewed at any time to verify the diluent is safe or to check what the expected PPO2 will be when flushing with diluent at depth.

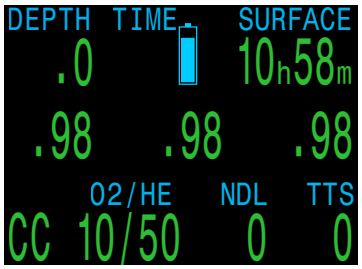
8. Decreasing NDL - As we descend deeper, the NDL decreases. The TTS shows it will take 5 minutes to ascend to the surface at 10m/min (33ft/min).

9. Bottom Time - We have completed the bottom time. The TTS indicates we have about 1.5 hours of decompression to do. The first stop will be at 48m for 1 minute. We have GF99 set to replace NDL while we have a decompression obligation.

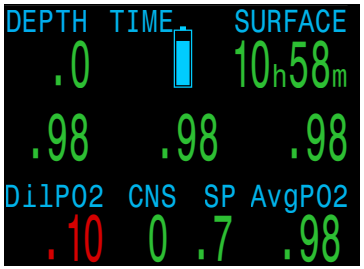
10. Ascending to the First Stop - Here we are ascending at 3m/min. This is slower than the expected 10m/min ascent rate. This slow ascent has caused the TTS to rise, as most tissues are still on-gassing.
(Continued on next page)



5. PPO2 Calibration



6. Pre-Dive



7. Diluent Check

8. Decreasing NDL

9. Bottom Time

10. Ascending to First Stop

CC Example Dive (cont.)

11. First Deco Stop - The slow ascent has caused the first stop to clear before we reached it. This often happens with slow ascents.

12. A Problem Has developed - The yellow cell reading is disagreeing with the other two. A flush with diluent has shown that the lone low cell is actually correct. It is decided to bailout to open circuit.
After physically switching the BOV or mouthpiece, the computer needs to be set to BO mode for proper deco calculations.
Two presses on MENU brings up the “SWITCH CC -> BO” menu. Pressing SELECT makes the change.

13. Bailout - Note that the loop PPO2 continues to display. This is important in case the diver later needs to go back onto the loop.
Also note that “BO” is displayed in yellow to indicate the bailout condition.
The best BO gas was automatically selected, and the deco schedule has been adjusted based on all of the available BO gases.

14. Gas Switch Required - We are now at 21m, having completed a few more deco stops. The gas is now displaying in yellow, indicating a better gas is available.

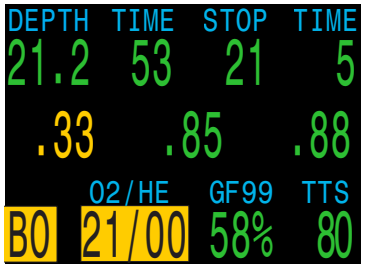
15. Gas Switch - Pressing left (MENU) button brings up the “SELECT GAS” option in the main menu. This example uses the “New” gas select menu. (page 60). The best available gas will be the initial selection when entering the gas select menu, just press SELECT one more time to make it the active gas.

16. Deco Clear - Follow the deco stops until they have all cleared and the Deco Clear Counter begins counting up from zero.

11. First Deco Stop

12. A problem has developed

13. Bailout



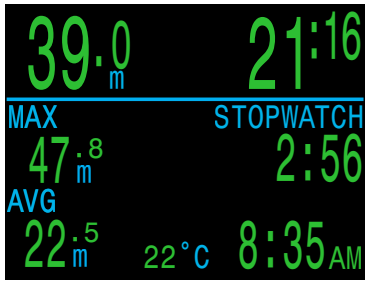
14. Gas Switch Required

15. Gas Switch

16. Deco Clear

6. Special Dive Modes

6.1. Gauge Mode



Gauge Mode

Gauge Mode turns the Petrel 3 into a simple depth and time display (a.k.a. a bottom timer).

Since decompression tissues are not tracked in Gauge Mode, changing to or from Gauge Mode resets the deco tissues.
`

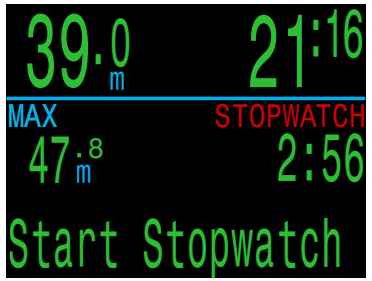
Change to Gauge Mode in the System Setup > Mode Setup menu. page 71.

Gauge Mode Features:
- Extra-large depth display (meters or feet)
- Extra-large time display (in minutes:seconds)
- Maximum and average depth on main screen.
- Resettable average depth
- Stopwatch

The Gauge Display is organized by:
- Depths along the left.
- Times along the right.
- Depth and Dive Time in the top row.

Stopwatch
When diving, starting or stopping the Stopwatch is the first menu option.

When stopped, the word “Stopwatch” displays in red.



When non-zero, the stopwatch can be reset. Reset behavior depends on state:
- If running when reset, it continues running, counting up again from 0.
- If stopped when reset, then it is set 0 and remains stopped.

Resettable Average Depth
During a dive, the average depth can be reset.

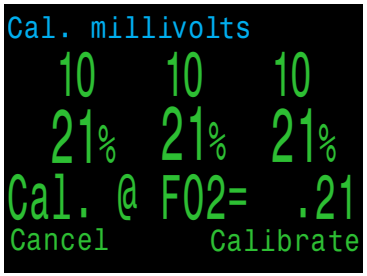
While on the surface, the MAX and AVG values display the maximum and average depth of the last dive. The AVG depth displayed on the surface is for the entire dive, regardless of whether the reset average depth option was used. The dive log also records the average depth for the entire dive.

6.2. Semi-Closed Mode ACG FC

Semi-Closed Rebreather Mode (SC/BO) behaves differently than Closed Circuit mode (CC/BO) in several important ways.

- SC mode only allows external PPO2 Monitoring. No internal (un-monitored) set point is available.
- SC mode allows calibration of oxygen sensors with a reference gas as low as 21% oxygen. Pure oxygen is often not available when using a semi-closed circuit rebreather.
- SC mode allows the fraction of inspired oxygen (FiO2) to be displayed from the external sensors in addition to showing the current PPO2 from those sensors.
- Like CC mode, SC mode allows the use of 1, 2 or 3 external oxygen sensors.

SC Mode - Surface

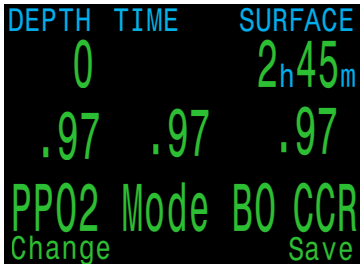


SC Mode - Calibration

6.3. Bailout Rebreather Mode ACG FC

Bailout Rebreather Mode improves the Petrel 3's functionality when used with a redundant bail-out rebreather.

When the Dive Mode is CC/BO, the PPO2 Mode can be set to "BO CCR" (other options are "Int" and "Ext").



The BO CCR option is a combination of Int and Ext.

• The external PPO2 cell measurements are displayed in the center row.

• However, the internal PPO2 setpoint displayed above the loop PPO2 readings is used for decompression and CNS calculations.

This allows the BO CCR to follow the decompression schedule of the primary CCR, while still displaying the current loop PPO2, in case the diver needs to start breathing from the BO CCR.

If the diver does switch to the BO CCR, they should not switch from "CC" to "BO" (since that BO is open-circuit bailout). Instead, the PPO2 Mode can be left as "BO CCR" if the PPO2 is near to the internal setpoint. This produces similar decompression schedules in most situations. For best decompression accuracy, the PPO2 Mode can be changed to "Ext".

7. Compass

The Petrel 3 contains a tilt-compensated digital compass.

Compass Features

- 1° resolution
- ±5° accuracy
- High-speed refresh rate
- User set heading marker with reciprocal
- True North (declination) adjustment
- Tilt compensation ±45°

Viewing the Compass

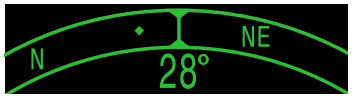
When enabled, the compass is viewed by pressing the SELECT (right) button once. Press SELECT again to continue on to view the regular info screens.

Unlike the regular info screens, the compass never times out back to the main screen. Press MENU (left) button to return to the main screen.

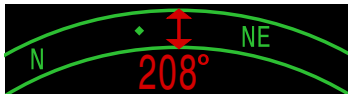
Marking a Heading

To mark a heading, when viewing the compass press the MENU (left) button. This brings up the "Exit/Mark" menu. Press the SELECT (right) button to mark the heading.

The marked heading is shown with a green arrow.



The reciprocal heading (180° from marked heading) is shown with a red arrow. When within ±5° of the reciprocal heading, the degrees display turns red.



When more than 5° off the marked heading, a green arrow shows the direction back to the marked heading.

Also, the offset degrees to the heading are displayed (16° in the example image). This offset is useful when navigating patterns. For example, a box pattern requires turns at 90° intervals, while a triangle pattern requires 120° turns.

Compass Limitations

Calibration - The digital compass needs occasional calibration. This can be done in the **System Setup ➡ Compass** menu. See details on page 78.

Battery Changes - When the battery is changed, the compass requires calibration.

Interference - Since a compass operates by reading the Earth's magnetic field, the compass heading is affected by anything that distorts that field or creates its own. Steel objects and electric motors or cabling (e.g. from dive lights) should be kept at a distance. Being close to or inside a shipwreck may also affect the compass.

Magnetic declination (also called magnetic variation) is the difference between magnetic and True North. This can be compensated in the Compass Setup menu using the True North setting. The magnetic declination varies around the world, so will need to be readjusted when traveling.

Magnetic inclination (or magnetic dip) is how much the Earth's magnetic field points up or down. The compass automatically compensates for this angle. However, near the poles, the inclination angle can exceed 80° (i.e. the magnetic field points almost directly up or down), in which case the specified accuracy may not be met.

8. Air Integration (AI)

The Petrel 3 is equipped with 4-transmitter air integration capability.

This section covers operation of the AI feature.

AI Features

- Simultaneous wireless pressure monitoring of up to 4 tanks.
- Units in psi or bar.
- Gas Time Remaining (GTR) and Surface Air Consumption (SAC) rate based on one tank.
- Sidemount support for SAC, GTR, and Redundant Time Remaining (RTR)
- Sidemount Tank Switch Notifications
- Logging of pressure, GTR and SAC
- Reserve and critical gas pressure warnings.

8.1. What is AI?

AI stands for Air Integration. On the Petrel 3, this refers to a system that uses wireless transmitters to measure the gas pressure in a SCUBA tank and transmit this information to the Petrel 3 dive computer for display and logging.

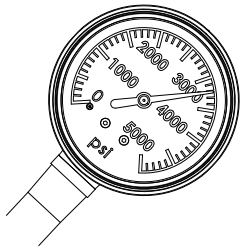
Data is transmitted using low-frequency (38kHz) radio frequency communications. A receiver in the Petrel 3 accepts this data and formats it for display.

The communication is one-way. The transmitter sends data to the Petrel 3, but the dive computer does not send any data to the transmitter.

Shearwater Swift Wireless Transmitter

Use a backup analog SPG

Always use a backup analog submersible pressure gauge as a redundant source of gas pressure information.



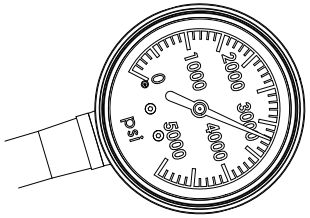
8.2. Basic AI Setup

This section will get you started with the basics of AI on the Petrel 3. Advanced setup and detailed descriptions will be covered in later sections.

Install the Transmitter

Before using the AI system, you will need to install one or more transmitters on a scuba tank first stage regulator.

The transmitter must be installed on a first stage port labeled “HP” (high pressure). Use a first stage regulator with at least two HP ports, so that a backup analog submersible pressure gauge (SPG) can be used.



A backup SPG is recommended

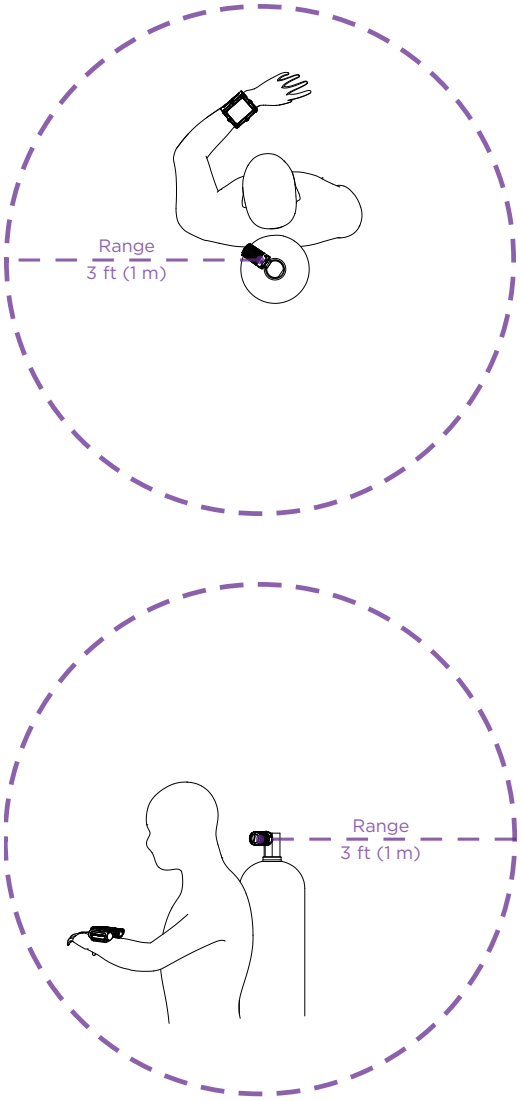
Position the transmitter such that it is on the same side of your body as you wear your Petrel 3 handset. Range is limited to approximately 1 m (3 ft).

A high-pressure hose may be used to relocate the transmitter for better reception or convenience. Use hoses rated for a working pressure of 300 bar (4500 psi) or higher.

Some transmitters require a wrench (11/16” or 17mm) to tighten or loosen

Avoid hand tightening or loosening unless otherwise specified by the transmitter manufacturer, as this may damage the transmitter.

The Shearwater Swift transmitter can be installed without tools.



Install transmitter on 1st stage HP port

Install transmitter on the same side of your body as the handset. Range is approximately 3 feet (1 m).

Turn on the Transmitter

Turn on the transmitter by opening the tank valve. The transmitter will automatically wake up when it detects pressure.

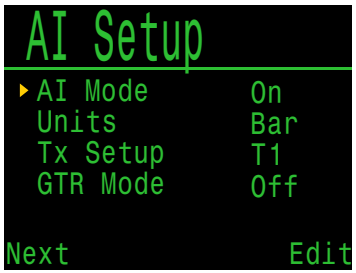
Pressure data is transmitted approximately every 5 seconds.

Turn off the Transmitter

To turn off the transmitter, close the tank valve and purge the second stage regulator to drain pressure from the hoses. The transmitter will automatically power down after 2 minutes of no applied pressure.

Enable AI on the Petrel 3

On the Petrel 3, navigate to the **System Setup** > **AI** Setup. Change the **AI Mode** setting to **On.**



When **AI Mode** is set to **Off**, the AI sub-system is completely powered down and does not consume any power. When on, the AI system increases power consumption by approximately 10%.

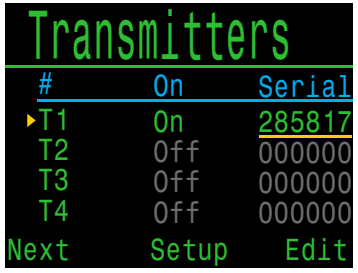
Note that AI is never on when the Petrel 3 is turned off.

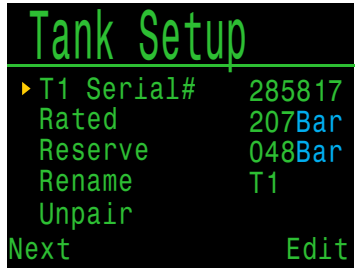
More information can be found in the AI Setup section on page 73.

Pair the Transmitter

Each transmitter has a unique serial number etched on its body. All communications are coded with this number so that the source of each pressure reading can be identified.

Pair the transmitter by going to the **Tx Setup** menu option, and selecting T1. Turn on T1, then enter the 6-digit transmitter serial number into the **T1 Serial #** setting. You only need to set this once, as it will be permanently saved in the settings memory.

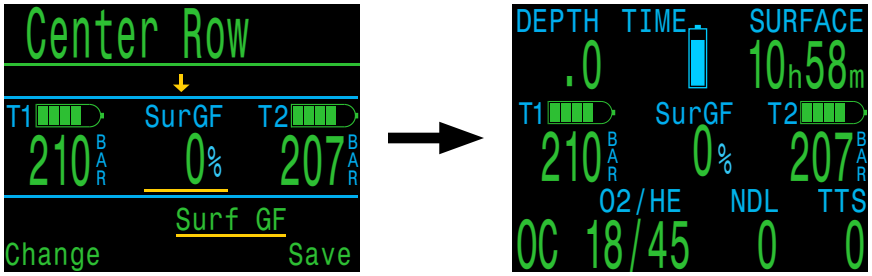




Add an AI display to the home screen

AI information is automatically displayed as an info screen when the AI feature is enabled, however, the main screen will not show AI information until manually added.

In technical diving modes, add AI to the home screen in the System Setup > Center Row menu.



The center row can be customized extensively to show a wide variety of information.

Find more information about how to configure the center row on page 75

Check that your tank valve is open

Always take a few breaths from your regulator or purge your regulator's second stage while monitoring your tank pressure for a full 10-15 seconds prior to entering the water to ensure your tank valve is turned on.

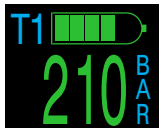
If the first stage regulator is charged but the tank valve has been closed, the breathing gas available to the diver will decrease rapidly and within a few breaths the diver will face an "out of air" situation. Unlike an analog gauge, the air pressure reported on the Petrel 3 will only update every 5 seconds, so the pressure reported by the Petrel 3 must be monitored for longer than that (we suggest 10-15 seconds) to ensure the tank valve is open.

Including a regulator purge test followed by 10-15 seconds of air pressure monitoring before entering the water as part of your pre-dive safety check is a good way to mitigate this risk.

8.3. AI Displays

This section describes the display field types that are used to display AI information. The display types are:

1) Tank Pressure
2) SAC
3) GTR
4) RTR (sidemount only)
5) AI combination display



Tank Pressure

Gas Time Remaining

Surface Air Consumption

AI Combination

These displays can be viewed in two ways:
1) Added to a customizable zone on the home screen
2) Most can be viewed on the AI info screen.

Renaming Transmitters

Transmitter titles can be customized in the transmitter setup menu. This makes it easier to keep track of which transmitter is reporting which cylinder pressure.

Each transmitter title has 2 characters that apply to all AI displays. The following options are available.

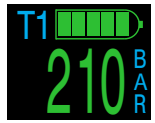
First Character: T, S, B, O, or D
Second Character: 1, 2, 3, or 4

4-tank sidemount configuration

Renaming is for display purposes only. There is no relationship between a transmitter title and gas fraction for decompression calculation purposes.

Tank Pressure Display

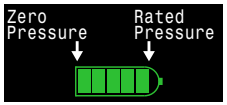
The pressure displays are the most fundamental AI displays, showing pressure in the current units (psi or bar).



bar Display

psi Display

At the top of each pressure display, a bar graph represents the pressure graphically. This bar graph is scaled from zero pressure up to the **rated pressure** setting. This is NOT a battery level indicator.



Tank pressure bar graph

Low Pressure warnings:

Reserve Pressure

Critical Pressure

Reserve Pressure thresholds can be managed in the AI Setup Menu. See details on page 73.

No Communication Warnings:

No communication for 30 to 90 seconds

No communication for more than 90 seconds

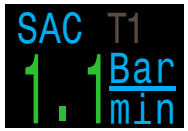
Low Transmitter Battery Warnings:

Transmitter battery should be replaced soon

Transmitter battery should be replaced immediately

SAC Display

The Surface Air Consumption (SAC) display shows the average rate of pressure change over the last two minutes, normalized to as if at 1 ATA pressure. Depending on the current units setting, SAC is either displayed in psi/minute or bar/minute.



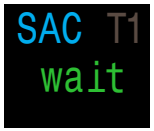
SAC can be displayed for a single tank, or for a sidemount configuration of two tanks of identical volume.

> Note that SAC in pressure per minute is NOT transferable between tanks of different sizes.

The title indicates which transmitter is being used for the SAC calculations in a dark gray font. “SM” indicates that Sidemount SAC is selected.

The tank(s) included in the SAC calculation are selected in the AI Setup menu (page 73).

During the first few minutes of a dive the SAC value is not available, while the initial data is being collected for averaging calculations. The SAC display will show “wait” during this time.



> **On surface, SAC is average from last dive**
>
> The average SAC from your last dive is shown when on the surface. When a dive ends, you may notice the SAC value suddenly changes. This is because the SAC display changes from showing the SAC over the last two minutes (when in dive mode) to showing the average SAC for the whole dive.

GTR Display

The Gas Time Remaining display shows the time, in minutes, that you could stay at the current depth until a direct ascent to the surface at a speed of 33 feet/min (10 m/min) would result in surfacing with the reserve gas pressure remaining.

The Value is displayed in yellow when less than or equal to 5 minutes. The value is displayed in red when less than or equal to 2 minutes.

GTR can only be based on a single tank or when sidemount is selected, with 2 tanks of identical volume.

The title indicates which transmitter is being used for the GTR calculations in a dark gray font. “SM” indicates that Sidemount GTR is selected.

When on the surface, the GTR displays “---”. **GTR is not shown when decompression stops are needed, and will display “deco”.**

SAC data from the first 30 seconds of each dive is discarded. It then takes an additional few minutes to calculate the average SAC. Therefore, for the first few minutes of each dive, the GTR will display “wait”, until enough data has been collected to begin making GTR predictions.

More information on how GTR is calculated can be found in the GTR calculations section on page 50.

No GTR on surface

At start of dive, wait for data to stabilize

RTR Display (Sidemount Only)

The Redundant Time Remaining (RTR) display indicates how much gas time remains if calculated only using the pressure of the sidemount tank with less pressure (i.e. all gas in the higher pressure tank was lost).

All of the same rules apply to RTR as they do to GTR and it is calculated in exactly the same way.

The title indicates the tank that is currently being used for the RTR calculation in dark grey.

AI Combination Displays

AI combination displays automatically populate the AI info row to pack more information into the limited available space. The format of the AI combinations is based on AI settings. Some examples are given below. This is not an exhaustive list of the possible displays.

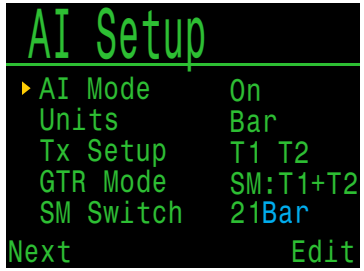
See the center row menu section on page 75 to learn how to place AI displays on your home screen.

GTR, RTR, and SAC may not have information available about what tank they are referencing due to space constraint.

AI Setting	Display
Tx Setup T1 GTR Mode T1	T1 210 BAR GTR T1 45 SAC T1 1.1 Bar/min
Tx Setup T1 T2 GTR Mode SM:T1+T2	T1 210 BAR GTR 45 SM SAC 1.1 T2 207 B
Tx Setup T1 T2 T3 T4 GTR Mode SM:T1+T2	T1 210 T2 207 GTR 45 SM SAC 1.1 T3 198 T4 180

8.4. Sidemount AI

The Petrel 3 offers some features that make gas tracking more convenient while sidemount diving. These include:



- Sidemount tank switch notifications
- Sidemount SAC calculations
- Sidemount GTR and RTR

All sidemount features are enabled in the AI setup menu by setting the GTR Mode option to the desired SM combination.

Use Identical Tanks For Sidemount

Sidemount features were designed assuming the sidemount tanks are of identical volume. This removes the need to enter tank volumes into the computer, simplifying the user interface and reducing the chances of input errors.

Do not use sidemount AI features with tanks of differing volumes.

Sidemount Tank Switch Notifications

When the sidemount feature is enabled switch notifications will appear as a green box highlighting the label of the tank you should be breathing from. This provides a subtle reminder to switch tanks when the difference between tank pressures rises above the SM Switch setting.

The switch notification setting has a range of 7 bar - 69 bar or 100 psi - 999 psi.

Sidemount SAC and GTR

Sidemount SAC and GTR are calculated the same way as single tank SAC and GTR except the tank pressures are pooled prior to each calculation. Essentially the two tanks are treated as one large tank.

Sidemount SAC and GTR calculations are dependent on the assumption that both sidemount tanks are of identical volume.

Note that SAC rate is not transferable between tanks of differing volumes. You must convert SAC to RMV for comparing gas consumption across different tank configurations.

For the purposes of RMV calculations using sidemount SAC, follow the same procedure outlined for a single tank in the SAC calculations section on page 49., but add all of the relevant tank attributes together as if you were using a single large tank.

Total volume = $Volume_{Tank\ 1}$ + $Volume_{Tank\ 2}$

Total rated pressure = $Rated\ presure_{Tank\ 1}$ + $Rated\ pressure_{Tank\ 2}$

8.5. Using Multiple Transmitters

When using multiple transmitters, best reception reliability will be attained by using transmitters with different transmission intervals or by using transmitters with active collision avoidance such as the Shearwater Swift Transmitter.

When two transmitters of the same transmission interval are used, the potential exists for their communication timing to become synchronized. When this occurs, data dropouts may result and could last up to 20 minutes or more.

Legacy Shearwater transmitters of different colors have different transmit timing. This reduces communication collisions that could potentially cause a loss of connection.

When using more than two transmitters, Shearwater recommends using the Swift transmitter which actively ‘listens’ for other transmitters in the vicinity and dynamically alters transmit timing to avoid interference.

There is no defined upper limit to the number of Swift transmitters that can be run concurrently. For more details, see the Swift Operating Instructions Manual.

Using Multiple Transmitters With The Same Transmission Interval May Result in Lost Comms

When using more than one transmitter, use transmitters with adaptive collision avoidance or legacy transmitters of different colors to prevent interference (see above).

8.6. SAC calculations

Surface Air Consumption (SAC) is the **rate of change of tank pressure**, normalized as if at 1 atmosphere of pressure. The units are either psi/minute or bar/minute.

The Petrel 3 calculates SAC averaged over the last two minutes. The data from the first 30 seconds of a dive are discarded to ignore the extra gas that is typically used during this time (inflating BCD, wing, or dry suit).

SAC vs RMV

Since SAC is simply based on rate of tank pressure change, the calculations do not need to know the tank size. However, this means that the SAC is NOT transferable to tanks of a different size.

Contrast this to respiratory minute volume (RMV) which is the volume of gas your lungs experience per minute, measured in Cuft/min or L/min. The RMV describes your personal breathing rate, and is therefore independent of tank size.

Why SAC instead of RMV?

Since RMV has the desirable property of being transferable between tanks of different sizes, it seems to be the better choice on which to base GTR calculations. However, the main drawback of using RMV is that it requires setting up tank size correctly for each tank. Such setup is easy to forget and is also easy to setup incorrectly.

SAC has the great property of not requiring any setup, making it the simplest and most reliable choice. The drawback is that it is not transferable between tanks of different sizes.

SAC Formula

The SAC is calculated as follows:

$$SAC = \frac{\frac{P_{tank}(t_1) - P_{tank}(t_2)}{t_2 - t_1}}{P_{amb,ATA}}$$

$P_{tank}(t) = Tank\ pressure\ at\ time\ t\ [PSI] or\ [Bar]$
$t = Time\ [minutes]$
$P_{amb,ATA} = Ambient\ pressure\ [ATA]$

The time samples are taken 2 minutes apart, and $P_{amb,ATA}$ is the average ambient pressure (i.e. depth) over this time frame.

Since the Petrel 3 displays and logs SAC, the formula for calculating RMV from SAC is useful. Knowing your RMV can help with planning dives using tanks of various sizes.

Calculating RMV from SAC - Imperial units

In the imperial system, tank sizes are described using two values; capacity in Cuft at a rated pressure in psi.

For example, a common tank size is 80 Cuft at 3000 psi.

To convert SAC in [psi/minute] to RMV in [Cuft/minute], calculate how many Cuft are stored per psi, then multiply this by the SAC to get RMV.

For example, a SAC of 23 psi/min with an 80 Cuft 3000 psi tank would be an RMV of (23 x (80/3000)) = 0.61 Cuft/min.

Calculating RMV from SAC - Metric units

In the metric system, tank sizes are described using a single number, the tank's physical size in liters [L]. This is how much gas could be stored at a pressure of 1 bar, so effectively the units of tank size are [L/bar].

This makes converting SAC to RMV easy. When using metric units, simply multiply the SAC by tank size.

For example, a SAC of 2.1 bar/min with a 10 L tank would be an RMV of (2.1 x 10) = 21 L/min.

8.7. GTR calculations

Gas Time Remaining (GTR) is the time in minutes that can be spent at the current depth until a direct ascent to the surface at a rate of 10 m/min (33 feet/min) would result in surfacing with the reserve pressure. This is calculated using the current SAC value.

Safety stops and decompression stops are not considered by the GTR calculations.

To calculate GTR, start with the known tank pressure, P_{tank}. The remaining gas pressure, $P_{remaining}$, is determined by subtracting off the reserve pressure and the pressure used for the ascent.

$$P_{remaining} = P_{tank} - P_{reserve} - P_{ascent} \quad \text{, all tank pressures in [psi] or [bar]}$$

Knowing $P_{remaining}$, divide this by the SAC adjusted to the current ambient pressure to get GTR in minutes.

$$GTR = P_{remaining} / (SAC \times P_{amb,ATA})$$

Why aren't safety stops included?

Safety stops aren't included to simplify the meaning of GTR, and make it consistent across operating modes that do not include safety stops.

Managing enough gas for a safety stop is quite simple, especially since they require a relatively small amount of gas. For example, consider if your SAC was 1.4 bar/min (20 psi/min). At a depth of 4.5m/15ft, the pressure is 1.45 ATA. So a 3 minute safety stop would use 1.4 x 1.45 x 3 = 6.1 bar (87 psi) of gas. This small amount of gas is easy to factor into the reserve pressure setting.

Why is GTR limited to no deco?

Currently, Shearwater does not believe that GTR is the proper tool for decompression dives, especially those involving multiple gases. This isn't to say AI in general is not a good fit for all technical diving, but the GTR function becomes increasingly complex to manage and understand when multiple gases are used.

Overall, the required complexity of menus and setup burden on the user would result in a system prone to mistakes and accidental misuse, and not fitting with Shearwater's design philosophies.

Gas management is an incredibly important and also complex activity, especially for technical diving. Education, training, and planning are critical for proper gas management for technical dives. Shearwater feels that a convenience feature such as GTR is not a good application of technology in this case, as its complexity and potential for misuse would outweigh its utility.

No compensation for ideal gas law deviations

Note that all SAC and GTR calculations assume that the ideal gas law is valid. This is a good approximation up to about 207 bar (3000 psi). Above this pressure, the change in gas compressibility as pressure increases becomes a noticeable factor. This is mainly an issue for European divers using 300 bar cylinders. The end result is early in the dive, when pressures are above 207 bar/3000 psi, the SAC is over-estimated, resulting in under-estimation of GTR (although this is the good way to err, as it is more conservative). As the dive progresses and pressure drops, this problem rectifies itself and the numbers become more accurate.

8.8. Transmitter Connection Issues

If you are seeing “No Comms” errors, follow these steps:

If the “No Comms” is persistent:

- Check that the proper serial number is entered into the AI Setup Transmitter Setup menu.
- Ensure the Transmitter battery is not dead.
- Ensure the transmitter is turned on, by connecting it to a first stage and turning on the tank valve. Applying high pressure > 3.5 bar (50 psi) is the only way to turn on the transmitter.

  The indicator light on a Swift transmitter will flash to indicate it is transmitting.

  All compatible transmitters will power off after 2 minutes of no pressure.
- Bring the handset within range (1m / 3ft) of the transmitter. Having the transmitter too close (less than5 cm / 2 inches) can also cause communication loss.

If the “No Comms” is intermittent:

- Search for sources of radio frequency (RF) interference, such as HID lights, scooters, suit heaters, or photo flashes. Try eliminating such sources to see if this solves the connection problem.
- Check the distance from transmitter to handset. If range related dropouts are occurring during diving, locating the transmitter on short length of high pressure hose is possible to decrease the transmitter to handset distance.
- If more than one legacy or compatible third party transmitter is in range of the computer, ensure that they have different transmit timings (grey vs. yellow coloured transmitters), to minimize interference. This is not usually a source of problems with Shearwater Swift transmitters.

9. Menus

Menus perform actions and allow settings to be changed.

If no buttons are pushed for 10 seconds, the menu system will time-out, returning to the main screen. Anything that had been previously saved will be retained. Anything that was in the middle of editing will be discarded.

The main Petrel 3 menu can be accessed using the left (Menu) button from the main screen.

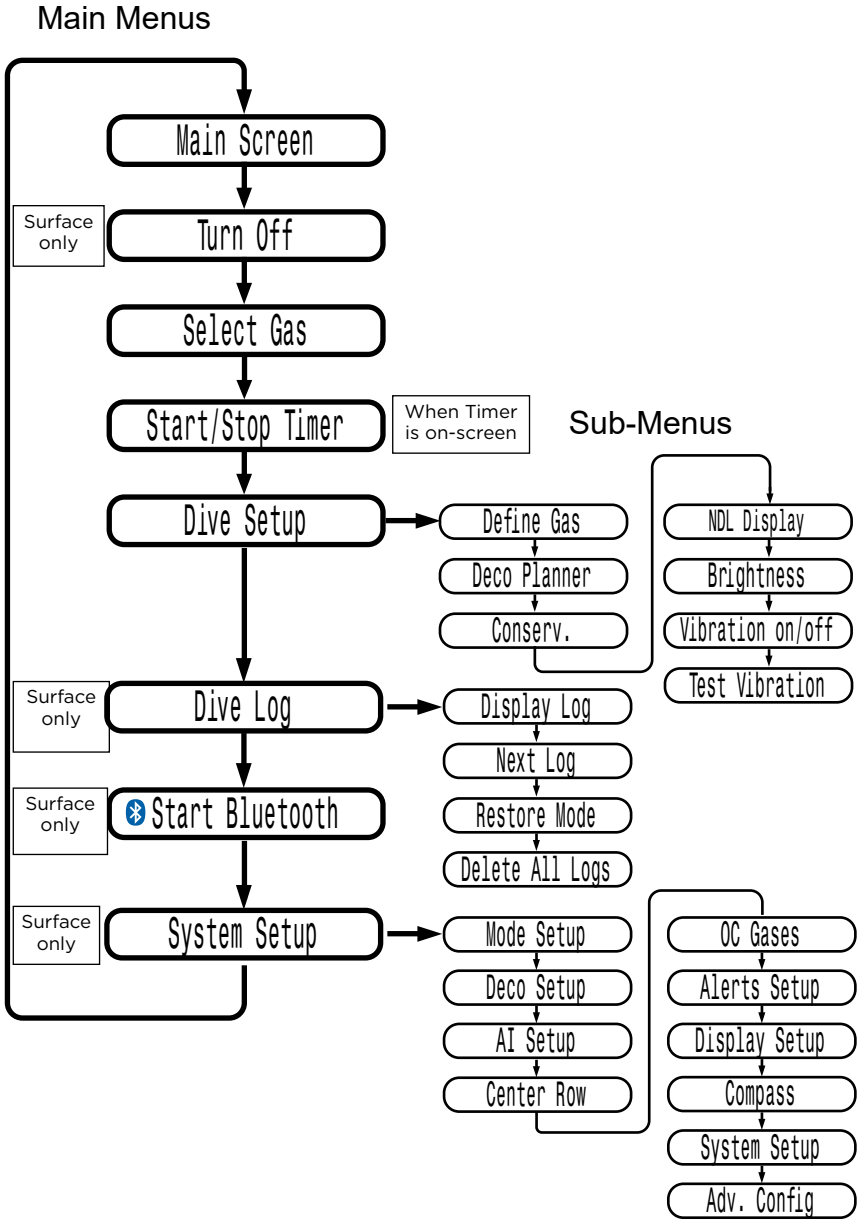
Main menu items differ by mode, as well as at the surface versus on a dive. The most commonly used menu items are placed first in the main menu to reduce button presses.

In the following section each item will be covered in detail.

> ***Adaptive Menus***
>
> Only menus necessary for the current mode are shown. This keeps operation simple, prevents mistakes, and reduces button presses.

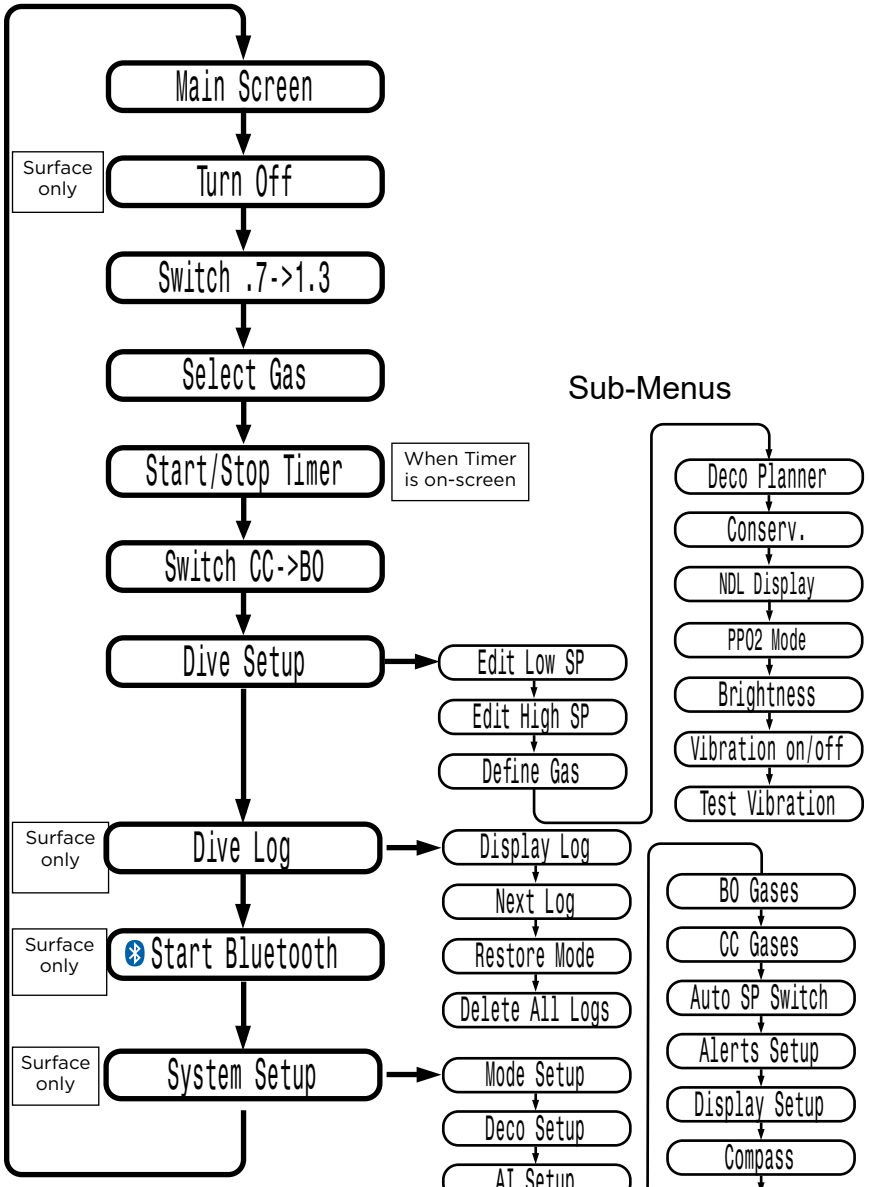
9.1. Menu Structure

Open Circuit Menu Structure



Closed Circuit (int PPO2) Menu Structure

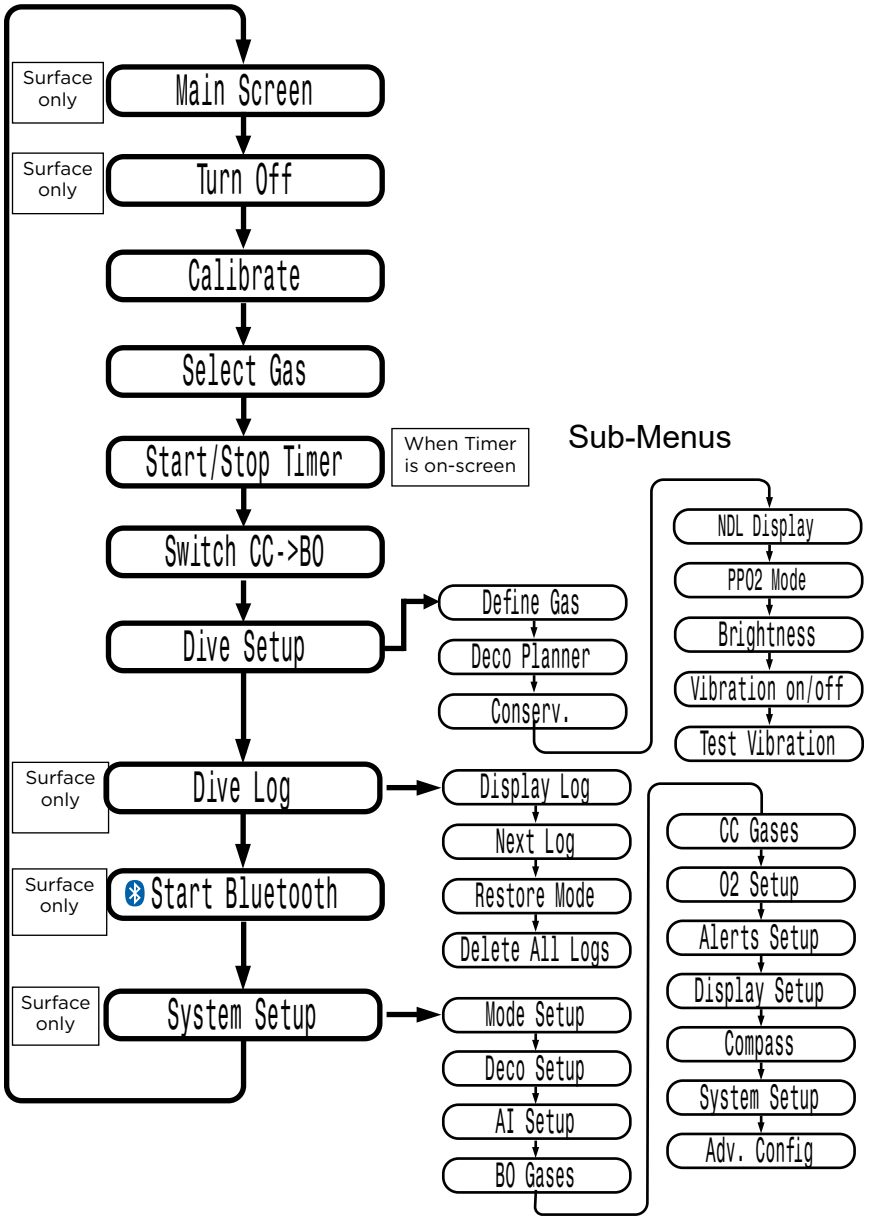
Main Menus



Closed Circuit (ext PPO2) Menu Structure

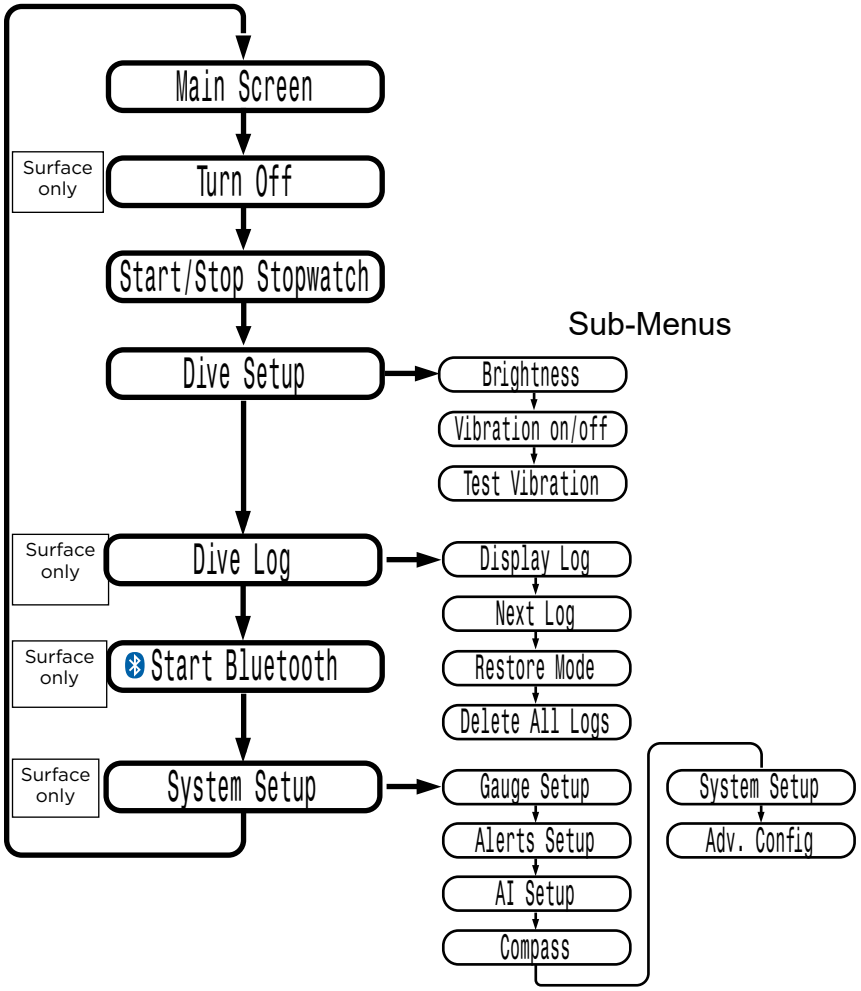
FC
ACG
DCM

Main Menus



Gauge Menu Structure

Main Menus



9.2. Main Menu Descriptions

Turn Off

The “Turn Off” item puts the computer to sleep. While sleeping, the screen is blank, but the tissue contents are maintained for repetitive diving. The “Turn Off” menu item will not appear during a dive. It will also not appear after a dive until the end dive delay time (60s) has expired to allow for a continuation dive.

End Dive

This menu item will replace Turn Off when on the surface and still in dive mode.

The Petrel 3 will automatically exit dive mode once 1 minute has been spent at the surface. Use this menu command to exit dive mode sooner.

Start Timer / Stop Timer (Stopwatch)

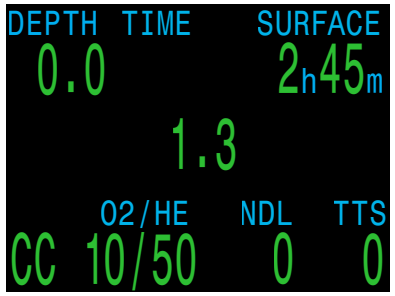
This menu item only appears when the timer has been added to the main screen. It is always available in gauge mode.

Reset Timer

This menu item only appears when the timer is not zero. If the timer is running, it will reset to zero and keep running.

Setpoint Switch CC ONLY

This menu is only available in CC mode with internal (int) PPO2 setpoint.



For closed circuit diving the Petrel 3 operates in internal PPO2 mode. This mode is used to calculate decompression for an unconnected rebreather.

The setpoint switch menu is used to switch between the low (default 0.7) and high (default 1.3) setpoints. These setpoints can be changed in the mode setup menu to approximate the rebreather setpoint.

During a dive the “Switch Setpoint” menu item will be the first item displayed, since the “Turn Off” displays are disabled when diving.

Pressing SELECT when this menu is displayed changes the PPO2 setpoint from the low setpoint to the high setpoint or vice-versa. To redefine the PPO2 value of a setpoint during a dive, use the Dive Setup menu.

This menu item performs a manual switching of PPO2 setpoint. The Petrel 3 can be setup to automatically perform setpoint switches at programmable depths in the System Setup > Auto SP Switch menu. When auto setpoint switches are enabled, this menu item is still available to provide manual control.

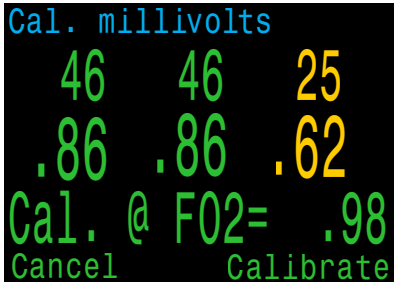
Calibration

ACG FC DCM

The Calibrate menu will only appear when in CC mode with the PPO2 mode set to Ext. This menu calibrates the mV output from the oxygen sensors to PPO2.

Upon selecting the calibration menu, the screen will show:

Top row:
Millivolt (mV) readings from the 3 O2 sensors.
Middle row:
PPO2 values (using the previous calibration).
Bottom row:
The calibration gas fraction of O2 (FO2).



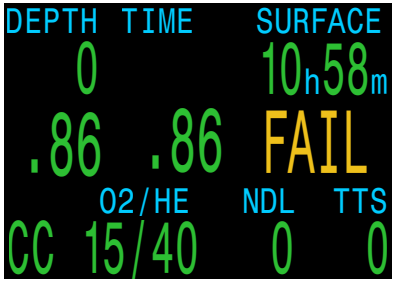
If you need to change the calibration gas FO2, do this in the System Setup O2 Setup menu.

After flooding the breathing loop with the calibration gas (typically pure oxygen), press the SELECT button to perform the calibration.

Good sensors should be in the range of 35 - 65 mV at sea level in 100% oxygen, so a sensor will fail calibration if not in the range of 30mV to 70 mV. This allowable range scales automatically with changes to FO2 and barometric pressure. A millivolt reading is shown in yellow if outside the allowable range.

Once the calibration completes, a report will be shown. This shows which sensors passed calibration, and the value of the expected PPO2 based on barometric pressure and the FO2.

Back at the main screen, the displays should now all read the expected PPO2. For example, if FO2 is 0.98 and barometric pressure is 1013 mbar (1 ata), then PPO2 will be 0.98. If any display shows FAIL, the calibration has failed because the mV reading is out of range.



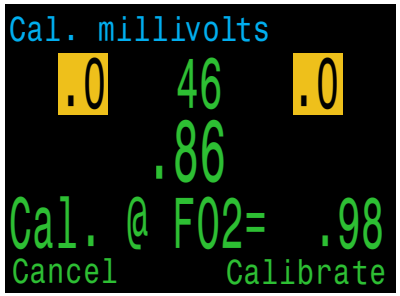
The “Calibrate” menu item will not display during a dive.

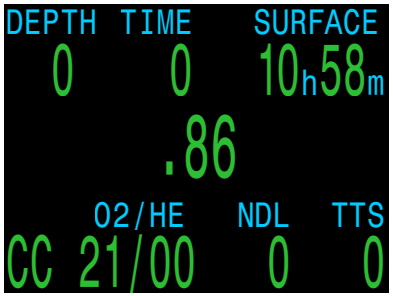
Single Sensor Mode ACG FC DCM

A single external O2 sensor may be used.

To enter this mode, perform the calibration with only the middle sensor connected (sensor #2).

The Petrel will see that only one sensor is connected, and automatically switch to single sensor mode.





Dual sensor mode ACG FC DCM

External PPO2 monitoring is also supported for 2 sensors.

Access the 2 sensor mode by performing a PPO2 calibration with only sensors #1 and #2 connected.

When using the 2 sensor mode, a configurable value may be displayed on the right side of the screen.

Voting Passed
If the sensors are within 20%, voting passes and the average PPO2 of the two sensors is used for decompression and CNS calculations.

Voting Failed
If the two sensors differ by more than 20%, voting has failed.

Failed sensors are shown in yellow (unless below 0.4 or above 1.6, then they will be shown in red).

PPO2 display will alternate with the message “VOTING FAILED”.

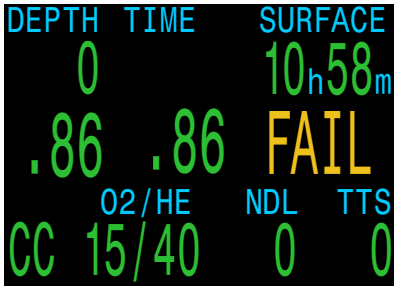
The lower PPO2 value will be used for decompression calculations.

The higher PPO2 value will be used for CNS calculations.

Calibration Problems ACG FC DCM

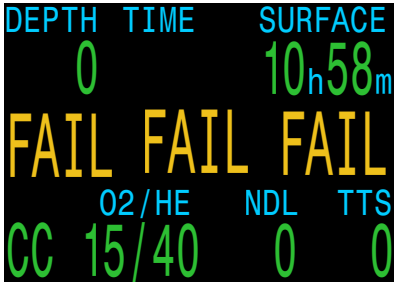
One sensor displays FAIL after calibration

This could indicate a bad sensor. It has failed because the mV output was not in range. The sensor could be old or damaged, and should be inspected. Damage and corrosion to wires or connectors is also a common problem. Fix the problem and recalibrate before diving.



All sensors display FAIL after calibration

This could be caused by an accidentally unplugged cable or a damaged cable or connector. Also, accidentally performing the calibration in air or without a proper oxygen flush could cause this problem. A failed calibration can only be fixed by performing a successful calibration.



PPO2 does not show 0.98 after calibration

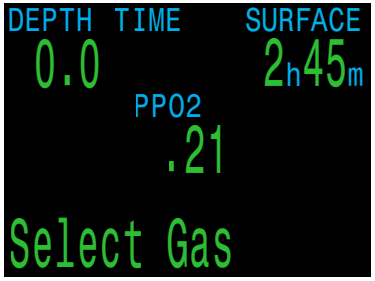
If you use a calibration FO2 setting of 0.98 and are at sea level, you probably expect the calibrated PPO2 to show 0.98. Sometimes you might correctly get a different value like 0.96 or 1.01.

This is because weather causes minor changes in barometric pressure. For example, say a low-pressure weather system has reduced the normal (1013mbar) barometric pressure to 990mbar. The PPO2 in absolute atmospheres is then 0.98 * (990/1013) = 0.96.

The 0.96 PPO2 result is, in this case, correct. At high altitudes, the difference between FO2 and PPO2 will be even larger. To see the current pressure, start at the main screen and press the SELECT button a few times (displays as Pressure mBar NOW).

Select Gas

This menu item allows you to pick a gas from the gases you have created. The selected gas will be used either as the breathing gas in open circuit and bailout modes, or the diluent in closed circuit mode.



Select Gas main menu

By default, the Classic gas select menu is enabled.

From left to right, each gas shows gas number, circuit mode (OC or CC), on or off, the fraction of oxygen then the fraction of helium.

Gas 1, Active Gas, 21% O2

Gases are always sorted from most to least oxygen content.

Gas 2, Turned on, 50% O2

Use the left (Next) button to increment to the desired diluent/gas, then press the right (Select) button to select that diluent/gas.

Gas 3, Turned Off, 18% O2, 50% He

An ‘A’ will appear next to the currently active gas. This is the gas being used for tissue compartment updating.

A gas that is off will be shown in **Magenta**, but can still be selected. It will be turned on automatically if it is selected.

Gases that are turned off are not used in decompression calculations. All gases that are turned on will be used in decompression calculations as appropriate. Read more about Decompression Information Accuracy on page 30 .

If you increment past the number of gases available, the display will fall back out of the “Select Gas”.

Radio Station Gases

For closed circuit mode, the system maintains two sets of gases - one for open circuit (bail out), and one for closed circuit.

The way they operate is very similar to the way car radios work with AM and FM stations.

When you are listening to an FM station and you push a station selection button, it will take you to another FM station. If you add a new station, it will be an FM station.

Similarly, if you are in the AM mode, adding or deleting a station would add or delete an AM station.

With radio station gases, when you are in open circuit, adding, deleting or selecting a gas will refer to an open circuit gas. Just like the FM stations are selected when your radio is in FM mode, the closed circuit gases are available in the closed circuit mode. When you switch to open circuit, the gases available will be open circuit gases.

Gases will not turn off automatically

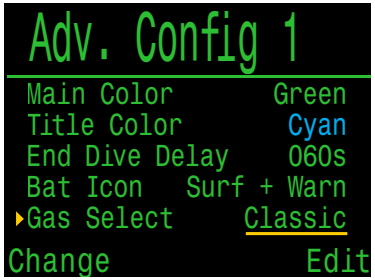
Selecting a new gas will turn that gas on if it is off, but gases will never turn off automatically.

It is important to turn off all gases you are not carrying and or do not plan to use on the dive in the Define Gas menu to ensure you receive accurate decompression information.

Select Gas Menu Style Options

Two styles of Select Gas menus are available, Classic (default) and New.

Change between the two styles in the Adv. Config 1 menu. See details on page 80.



Gas select menu style changed in Adv. Config 1

Classic Style Select Gas

The classic Select Gas style described on the previous page is the default.

Summary:

- One gas is shown at a time.
- Press Next to step through gases, and Select to select the shown gas.
- Gases are sorted from highest O2% to lowest O2%.
- Stepping past the last gas will exit the menu without changing the active gas.
- Upon entering the Select Gas menu, the first gas shown is always the highest O2% gas.

Classic style gas select menu

New Style Select Gas

The new style makes visualizing the gas list easier. It also reduces button presses for deco gas switches.

Summary:

- Shows all gases on the screen at once.
- Press Next to step through gases, and Select to choose the pointed to gas.
- A gas must be selected to exit the menu (scrolling past last gas wraps back to first gas).
- The active gas is shown with a green background.
- Turned off gases are shown in Magenta (purple).
- Gases are sorted from highest O2% to lowest O2%.
- When diving and there is a deco stop, the first gas pointed to will be the most appropriate gas (highest PPO2 less than 1.61). This reduces button presses in most cases.
- On the surface or when no deco stops are needed, the first gas pointed to will be the active gas.

New style gas select menu layout. 5 gases currently programmed and on

50% O2 turned off. Select to change to 50% and turn gas on

21% O2 is currently active gas, Select to exit menu making no changes.

Switch to CC/BO CC ONLY

This menu item is only available in CC/BO mode.

Menu appearance in CC mode

Menu appearance in BO mode

Depending on the current computer setting, this selection will show as either “Switch CC > BO” or “Switch BO > CC”.

Pressing the right (SELECT) button will change the mode for decompression calculations. When switching to Bail Out while diving, the most appropriate Bail Out gas will become the breathing gas for calculations.

At this point, the diver may want to switch to a different gas, but since the diver may have other things to deal with, the computer will make a “best guess” of which gas the diver would choose.

When external PPO2 monitoring is active, if you bailout to BO mode, the external PPO2 will continue to display on the main screen. The system PPO2 used for deco calculations will change to OC mode.

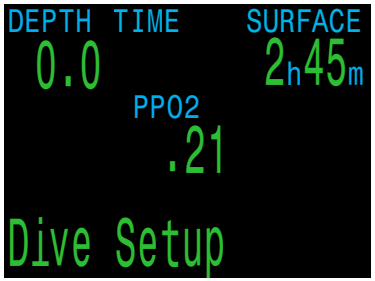
BO mode with external PPO2

The external PPO2 continues to display because the diver may need to return to the loop, and will need to know the PPO2 status of the loop, even though the sensor input is not being used as the system PPO2.

9.3. Dive Setup

All of the Dive Setup menus are available both on the surface and when diving.

The values in Dive Setup can also be accessed in the Systems Setup menu, but the System Setup menu is not available when diving.



Menu appearance in BO mode

Pressing the right (SELECT) button will enter the Dive Setup sub-menu.

Edit Low Setpoint CC ONLY

This item allows you to edit the low setpoint value. Initially it will display the currently selected value.

Edit Low Setpoint option shows current setpoint

Press the right (Edit) button to open the edit display. Press the left (Change) button to increment the setpoint.

Press the Change button to increment the setpoint

Values from 0.4 to 1.5 are allowed. Incrementing past 1.5 returns the value to 0.4. Press the right (Save) button to lock in new low setpoint.

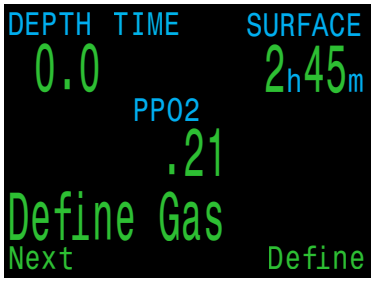
Edit High Setpoint

Works in exactly the same way as the Edit Low Setpoint function above. Edit Low Setpoint

Edit High Setpoint menu

Define Gas

The define gas function allows you to set up 5 gases in Closed Circuit and 5 gases in Open Circuit. You must be in Open Circuit mode to edit open circuit gases, and you must be in Closed Circuit to edit closed circuit diluents. For each gas, you can select the percentage of oxygen and helium in the gas. The remainder is assumed to be nitrogen.



Define Gas Menu

Pushing the right (Define) button presents the function to define gas number 1.

Press Next to increment to next gas

The left (Next) button increments to the next gas.

Press Edit to modify this gas

Press the right (Edit) button to edit a gas.

The first option is to toggle the gas on or off as indicated by the underline. Use the left (Change) button to toggle the gas on.

Press Change to toggle gas on

Continuing along, the gas contents are edited one digit at a time. The underline shows the digit being edited.

Press Next to move on to edit gas contents

Each push of the left (Change) button increments the digit being edited. When the digit reaches 9, it will roll over to 0.

Press Change to increment underlined digit

Pushing the right button (Next) will lock in the current digit, and move on to the next digit.

The "He%" indicator shows we are editing the fraction of helium

A helpful indicator of what is being edited is included in the center at the bottom.

Press Save after editing the last digit

Pushing the right (Save) button on the last digit will finish editing that gas, and bring you back to the gas number. You can continue to increment through the gases pressing the left (Next) button.

The "A" denotes the currently active gas

The "A" denotes the active gas. You cannot turn off the active gas in the Define Gas menu. If you try, it will generate an error. You can edit it, but cannot set both the O2 and HE to 00.

Setting any gas to 00/00 will automatically turn it off.

The computer will display all 5 gas entries available to allow you to enter new gases.

Pressing MENU one more time when the fifth gas is displayed will return you to the "Define Gas" menu item.

OC Tec and Bailout modes share gases

The OC Tec and Bailout gas lists are one and the same. It's important to review the gases you have turned on before every dive, especially if you often use your dive computer for both open and closed circuit diving.

New Style Define Gas

Similar to the New Style Select Gas menu, the New Style Define Gas menu shows all gases on the screen at once at the expense of font size.

If the Gas Select style is set to New, the computer will also display the New Style Define Gas Menu.

When the Define Gas menu is opened, all of the gases will be displayed. Turned on gases will be in green, turned off gases will be magenta, and the currently active gas will be highlighted.

Press the left (Next) button until the arrow points to the gas you would like to edit, then press the right (Edit) button.

Similar to the Classic Style Define Gas menu, the attribute being toggled is displayed at the bottom of the display.

Gases can be toggled on or off, and the gas fractions of oxygen and helium can be changed one digit at a time.

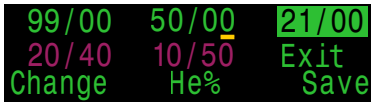
When you are finished editing move the arrow to the Exit option and press the right (Exit) button to leave the define gas menu.

Set Gas Select to "New" in Adv.1 to use New Style Define Gas menu

Press Next to increment to next gas

Press Change to toggle the gas on

Press Change increment gas fraction one digit at a time



Press Save when finished editing the last digit

Select the Exit item to leave the Define Gas Menu when finished

Turn off gases you are not carrying

Only turn on the gases you are actually carrying and plan to use on the dive. Failure to abide by this warning may result in inaccurate decompression information being displayed.

With radio station gases, the computer has a full picture of the OC and CC gases you are carrying and can make informed predictions about decompression times. There is no need to turn gases off and on when you switch from CC to OC, because the computer already knows what the gas sets are. You should only have the CC and OC gases you are actually carrying turned on.

If you often use other gases, you can enter the gas and turn it off. You can turn gases on and off during a dive and you can also add or remove a gas during the dive if needed.

Deco Planner

Introduction

- Calculates decompression profiles for simple dives.
- Calculates gas consumption based on RMV
- Can be used both on the surface and during a dive.

Deco Planner Menu

The Petrel 3 also contains a separate quick NDL Planner that can be found in the Dive Setup menu of recreational modes. See the Petrel 3 Recreational Modes Manual for details.

Setup

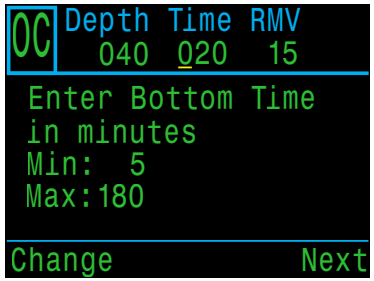
The planner uses the current gases programmed in the current dive mode, as well as the current conservatism (GF low/high) settings. VPM-B dive planning is available on units with the optional VPM-B unlock.

When used at the Surface

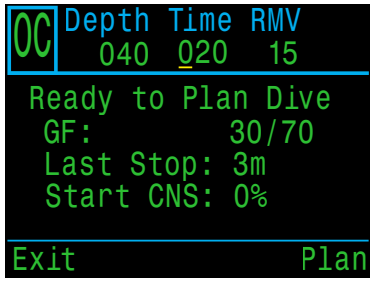
Enter the dive bottom depth, bottom time, respiratory minute volume (RMV) and PPO2 (closed-circuit only).

Note: Residual tissue loading (and CNS%) from recent dives will be used in calculating the profile

When the correct values are entered, confirm decompression settings and starting CNS, then select "Plan".



Enter dive details



Press Plan when ready

When used during a dive

Computes the decompression profile assuming the ascent will begin immediately. There are no settings to enter. (RMV is last used value).

Deco Planner Limitations

The Petrel 3's Deco Planner is intended for simple dives.

Multi-level dives are not supported.

The Deco Planner does not provide thorough validation of the profile. For example, it does not check for nitrogen narcosis limitations, gas usage limitations, or CNS percentage violations.

The user is responsible for ensuring a safe profile is followed.

Important!

The Petrel 3's Deco Planner makes the following assumptions:

- Descent rate is 18m/min (60ft/min) and the ascent rate is 10m/min (33ft/min).
- The gas in use at any time will be the gas with the highest PPO2 within the PPO2 limits.
- The planner will use the configured last stop depth.
- The RMV is the same during the bottom phase of the dive as it is while traveling and during deco

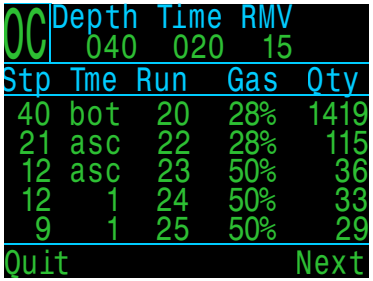
Read more about PPO2 Limits on page 81.

Result Screens

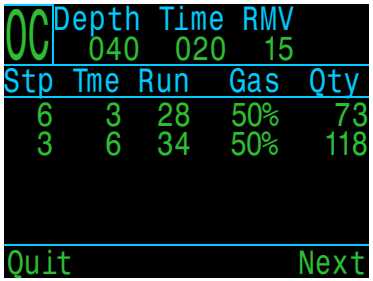
The results are given in tables showing:

Stp:	Stop Depth	In meters or feet
Tme	Stop Time	In minutes
Run	Run Time	In minutes
Gas	Gas Used	%O2
Qty	Quantity Used	In liters or Cuft

The first few rows will show the bottom time (bot) and the ascent time (asc) to ascend to the first stop. Multiple initial ascent legs may be shown if gas switches are needed.



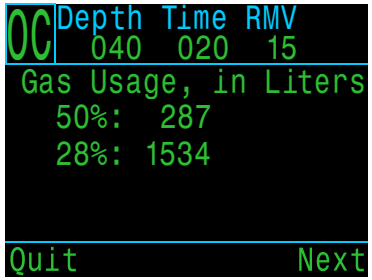
Open circuit deco plan page 1



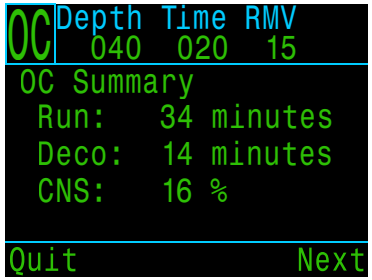
Open circuit deco plan page 2

If more than 2 stops are needed, the results will be split onto several screens.

After the last page of the deco schedule, gas usage and deco summary screens show the expected quantity of each gas used for the dive, the total dive time, the time spent on deco and final CNS%.

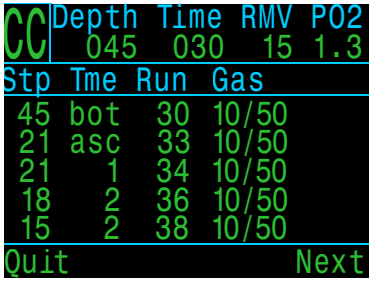


Open circuit gas usage summary

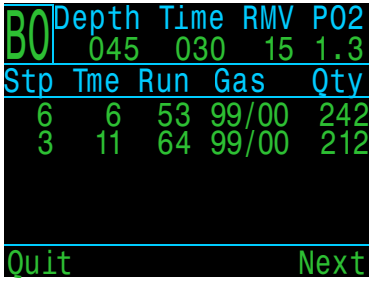


Open circuit deco summary

For closed circuit plans, a bailout plan based on the programmed bailout gases will automatically be generated after the closed circuit deco summary.

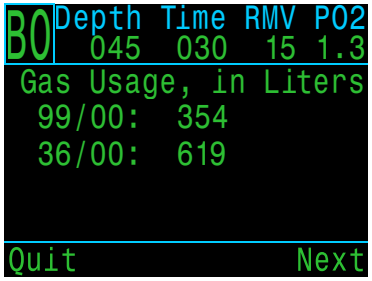


Closed circuit deco plan page 1

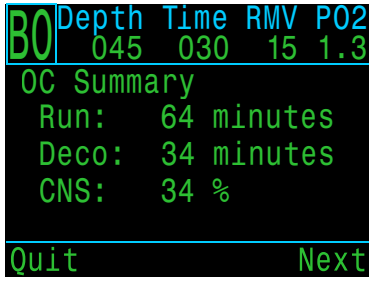


Bailout deco plan page 2

A bailout gas usage and deco summary will also be generated.

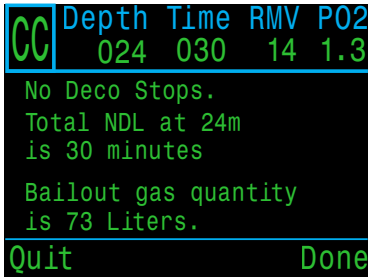


Bailout gas usage summary



Bailout deco summary

If no decompression is required, no table will be shown. Instead, the total No-Decompression-Limit (NDL) time in minutes, at the given bottom depth will be reported. Also, the gas quantity required to surface (bailout in CC) will be reported.



No decompression required

Conservatism

The conservatism settings (GF High and GF Low) can be edited in the Dive Setup menu. While diving, only the GF High value can be edited. This allows changing the surfacing conservatism during a dive. For example, if you worked much harder on the bottom segment than expected, you may wish to add conservatism by reducing the GF High setting

NDL Replacement Display

While in decompression, NDL is 0. This makes the NDL area wasted space until decompression is cleared.

The NDL Display option allows you to replace the NDL with different information once decompression is required and the NDL has gone to 0.

Unlike other custom displays, the NDL display option can be changed during the dive through the dive setup menu.

There are 7 options for NDL Display:

1. NDL
2. CEIL
3. GF99
4. SurfGF
5. @+5
6. Δ+5
7. Mini

Note that the Mini NDL replacement display can be selected, but not configured in this Menu and has a special appearance. Read more about Mini NDL Replacement Display on page 15.

Brightness

The display brightness has four fixed brightness settings plus an Auto mode.

The fixed options are:

- Cave: Longest battery life.
- Low: Second longest battery life.
- Med: Best mix of battery life and readability.
- High: Easiest readability, especially in bright sunlight.

Auto will use the light sensor to determine the brightness of the display. The more ambient light there is, the brighter the display will get. At depth, or in dark water, very little brightness is needed to see the display.

The Auto setting works well in most situations.

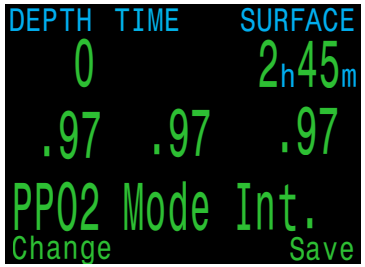
The brightness of the display is the major determinant of battery life. Up to 80% of the power consumption is to power the display. When a low battery alert occurs, the display brightness is automatically reduced to extend battery life.

PPO2 Mode ACG FC DCM

The next menu item is used to turn external PPO2 monitoring on and off. There are three settings:

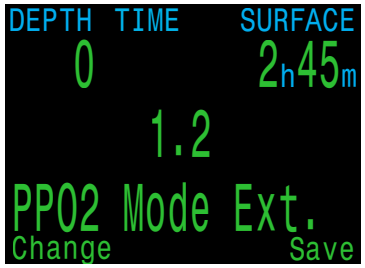
- **Int.** - Internal Setpoint
- **Ext.** - External PPO2 Monitoring
- **BO CCR** - Bailout Rebreather

"Int." is the default. When using Internal fixed setpoint mode, the user defines what setpoint their rebreather is running for decompression and CNS calculations.

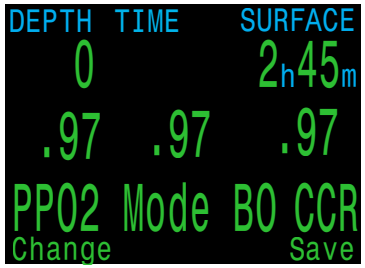


"Ext." mode enables external PPO2 monitoring from oxygen sensors. In this mode, average PPO2 from the available sensors is used for decompression calculations and CNS tracking.

A valid calibration must have been previously performed to use external sensor monitoring. See the Calibration section on page 56 for more information.



"BO CCR" is a special mode used when diving with multiple rebreathers. See the Bailout Rebreather Mode section on page 39 for more information.



Voting

A voting algorithm is used to decide which of the three sensors are likely to be correct. If a sensor matches either of the other two sensors within ±20%, it passes voting. The system average PPO2 is the average of all sensors that have passed voting.

For example, here sensor 3 has failed voting. The PPO2 is displayed in yellow to show that it has failed voting. The system average PPO2 is the average PPO2 of sensor 1 and 2.

If all sensors fail voting, then the display will alternate VOTING FAILED with the PPO2 measurements (which will all be yellow to indicate that voting has failed). When voting has failed, the lowest PPO2 reading will be used for deco calculations (i.e. the most conservative value).

Vibration On/Off

Shows current state of vibration function. Press the right (Edit) button to toggle the vibration function on or off.

Test Vibration

Press the right (Ok) button to quickly test the vibration function to ensure it's working correctly.

> Regularly test vibration alerts with the Test Vibration tool to ensure they are working and you can hear/feel them through your exposure suit.

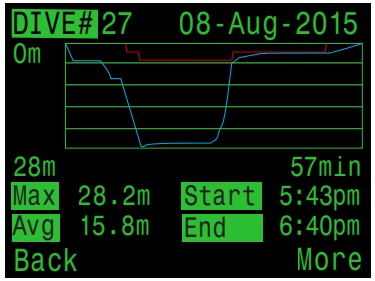
9.4. Dive Log

Use the Dive Log menu to review logs stored on the Petrel 3. Up to 1000 hours of detailed logs can be stored at the default sampling rate of 10 seconds.

The Dive Log menu is only available when on the surface.

Display Log

Use this menu to display a list of logged dives and view details.



Select a dive to view from the Dive log list.

The profile of the dive is plotted in blue, with decompression stops plotted in red. The following information is displayed by scrolling through the dive log screens:

- Maximum and Average depth
- Dive number
- Date (dd-mon-yyyy)
- Start - Time of day dive started
- End - Time of day dive ended
- Length of dive in minutes
- Minimum, maximum, and average temperature
- Dive mode (Air, Nitrox, etc.)
- Surface interval preceding the dive
- Recorded Surface Pressure at the beginning of the dive
- Gradient factor settings used
- Start and end CNS
- Start and end pressure for up to 4 AI transmitters
- Average surface air consumption rate

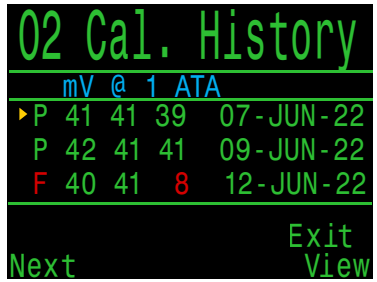
Edit Log
Scrolling past all screens of an individual log brings up the Edit Log page where Dive number, Date, and Time can be changed, or the dive log can be deleted.

O2 Cal. History

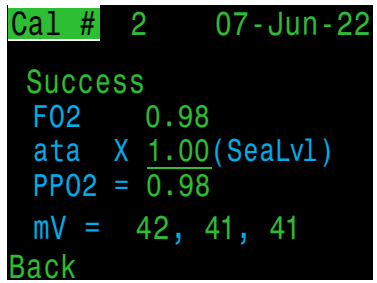
ACG FC DCM

This menu keeps a history of external O2 cell calibrations to make it easier to monitor cell health.

Each line in the main history represents an O2 calibration event. In the first column “P” means that the calibration passed, and “F” means the calibration failed.



The recorded mV value for each cell is shown here adjusted to sea level so the values can be usefully compared even if calibration occurred at different altitudes.



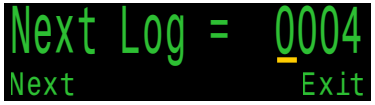
Viewing a calibration record displays more information about that specific calibration.

Calibrations can be deleted in this last screen to maintain a clean calibration history.

Deleted calibration logs can be restored using the restore mode function.

Next Log

The dive log number can be edited. This is useful if you want the dive computer log numbers to match your lifetime dive count.



This number will be applied to the next dive.

Restore Mode

Restore mode can be toggled on and off. When toggled on, it shows deleted logs and calibrations, grayed out in the “Display Log” and “O2 Cal. History” sub-menus. While in restore mode, these records can be restored.

The Delete All Logs option is also changed to Restore All Logs when Restore mode is enabled.

Delete All Logs

Deletes All of the Logs.

Deleted Logs can be restored by toggling Restore Mode to on.

Start Bluetooth

Bluetooth is used for both firmware uploading and dive log downloading. Use this option to initialize Bluetooth on your dive computer.

Reset Stack Time

This menu screen is only available when the stack timer is enabled. Read more about Advanced Config 4 on page 82

10. System Setup Reference

System Setup contains configuration settings together in a convenient format for updating the configuration before a dive.

The sub-menus, pages, and configuration options differ considerably in each dive mode. This manual only covers technical dive modes. See the Petrel 3 recreational modes manual for a comprehensive description of the menus in recreational modes.

System setup cannot be accessed during a dive.

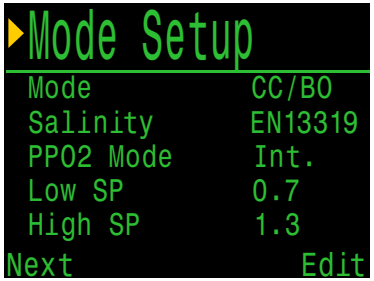
10.1. Mode Setup

The first sub-menu of System Setup is Mode Setup.

The appearance of this page changes depending on the selected mode.

Mode

Available dive modes:



- Air
- Nitrox
- 3 GasNx (default)
- OC Tec
- CC/BO
- SC/BO
- PPO2
- Gauge
  (E.g. bottom timer mode)

This manual covers Technical Diving modes. For the other modes, please see the Petrel 3 recreational diving manual.

When changing to or from Gauge Mode, the decompression tissues are cleared. This is because the Petrel 3 does not know what gas you are breathing in this mode, and therefore cannot track inert gas loading. Plan repetitive dives accordingly.

For more information on which mode to choose, see Dive Mode Differentiation on page 8.

Salinity

Water type (salinity) affects how the measured pressure is converted to depth.

Settings:
- Fresh
- EN13319 (default)
- Salt

Density of freshwater and saltwater differ by about 3%. Saltwater, being denser, will display a shallower depth for the same measured pressure versus the Fresh setting.

The EN13319 value is between Fresh and Salt. It is from the European CE standard for dive computers, and is the Petrel 3's default value.

Note that this setting only affects the depth displayed on the computer and has no impact on decompression calculations which rely on absolute pressure.

PPO2 Mode CC ONLY

PPO2 mode only appears in CC/BO mode.

On the Petrel 3 SA model this value is always "Int." (Internal fixed PPO2). On other models, this value can be changed to "ext.", or "BO CCR" when external O2 cells are used. See the PPO2 Mode section on page 67 for more information.

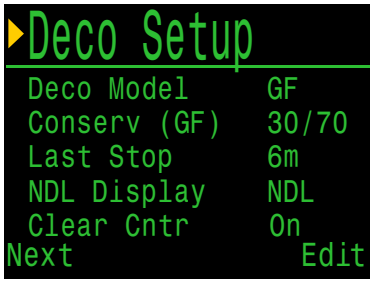
Low and High Setpoints CC ONLY

The Low and High PPO2 Setpoints are only available in CC/BO mode when "int." or "BO CCR" PPO2 mode is enabled.

Each setpoint can be set from 0.4 to 1.5.

The setpoints can also be edited during a dive, in the Dive Setup menu. See details on page 71.

10.2. Deco Setup



Deco Model

By default this will show "Buhlmann ZHL16C GF" indicating that the Bühlmann ZHL-16C with gradient factors model is being used.

Optional VPM-B and DCIEM decompression algorithm unlocks are available at an additional cost. If applied, the deco model item allows the user to change between the available algorithms.

Conservatism

In technical dive modes conservatism can be adjusted in either the GF or VPM model.

For a more detailed explanation of their meaning for the GF algorithm, please refer to Erik Baker's excellent articles: Clearing Up The Confusion About "Deep Stops" and Understanding M-values. The articles are readily available on the web.

VPM-B has conservatism settings from 0 to +5, with higher numbers being more conservative.

Also see Decompression and Gradient Factors on page 29.

Last Stop

Allows you to choose where to do your last mandatory decompression stop.

The choices are 3m/10ft and 6m/20ft.

NDL Display

These options were previously covered in the Dive Setup section. See NDL Replacement Display on page 66 for details.

Mini NDL Display setup
The Petrel 3 has an NDL mini display function that can only be configured from the Deco Setup menu. This option allows 2 pieces of custom information to be displayed in addition to TTS by reconfiguring the layout of the normal NDL and TTS location.

When the Mini option is selected for the NDL Display, a configuration menu will appear. This menu allows the user to change the middle and bottom mini display options. The first row of this mini display is fixed as TTS.

When the NDL mini display option is in use, NDL is displayed in place of the decompression information in the top row while there is no decompression obligation.

Clear Cntr

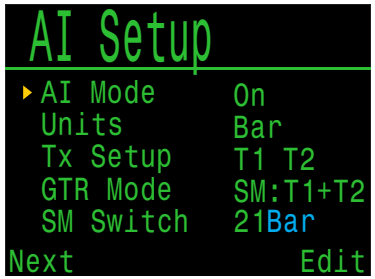
This option allows you to toggle the deco clear counter on or off.

When turned on, the counter will count up from zero in the deco area starting when decompression obligations are cleared.

Read more about Decompression Stops on page 28.

10.3. AI Setup

All AI settings must be configured on the surface before a dive, since the System Setup menu is not accessible during a dive.



AI Mode

AI Mode is used to easily enable or disable AI.

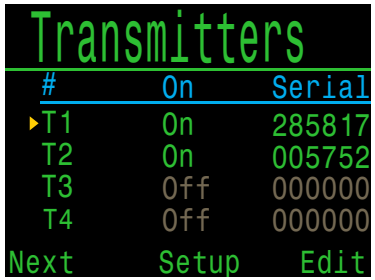
AI Mode Setting	Description
Off	AI sub-system is completely powered down and consumes no power.
On	AI is enabled. When on, AI increases power consumption by about 10%.

Units

Choices are bar or psi.

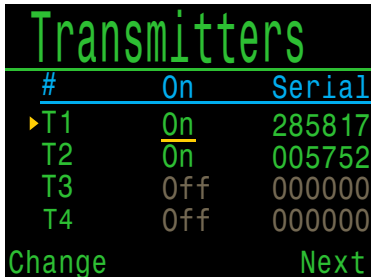
TX Setup

The Transmitter setup (TX Setup) menu is used to set up transmitters. Currently active transmitters are shown next to TX Setup in the top level AI menu.



Up to 4 transmitters can be configured in this menu. Select a transmitter to modify its attributes.

Transmitter On/ Off
Turn off transmitters that are not currently in use to save battery power.



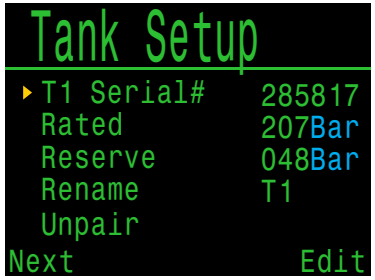
Set AI Mode to OFF when AI not in use

Leaving AI enabled when not in use will negatively impact battery life when the computer is turned on. When a paired transmitter is not communicating, the Petrel 3 goes into a higher power scan state. This increases power consumption to about 25% higher than with AI off. Once communications are established, power drops to about 10% higher than with AI off.

Note, AI is never active when the computer is off. There is no need to turn AI off when the computer is turned off.

Tank Setup

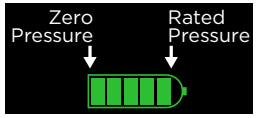
Navigate over to and select a transmitter's serial number in the transmitter setup menu to enter the tank set up menu for that transmitter.



Serial Number Setup
Every transmitter has a unique 6-digit serial number. This number is etched onto the side of the transmitter.

Enter the serial number to pair the transmitter to T1. This number only needs to be entered once. Like all settings, it is stored in permanent memory. Transmitter settings are saved across all dive modes.

Rated Pressure
Enter the rated pressure of the tank on which the transmitter is installed.



The valid range is 69 to 300 bar (1000 to 4350 psi).

The only use of this setting is to scale the full-scale range of the gas pressure bar graph that appears over the numerical tank pressure number.

Reserve Pressure
Enter the reserve pressure.

The valid range is 28 to 137 bar (400 to 2000 psi).

The reserve pressure setting is used for:
1. Low pressure warnings
2. Gas Time Remaining (GTR) calculations

A **"Reserve Pressure"** warning will be generated when the tank pressure falls below this setting.

A **"Critical Pressure"** warning will be generated when the tank pressure falls below the larger of 21 bar (300 psi) or half the reserve pressure.

For example, if reserve pressure is set to 48 bar, the critical warning will occur at 24 bar (48/2). If the reserve pressure is set to 27 bar, the critical warning will occur at 21 bar.

Rename
Allows the changing of the transmitters title as it appears on menus and screens throughout the dive computer. Two characters can be customized per tank. The options are:

First Character: T,S,B,O, or D.

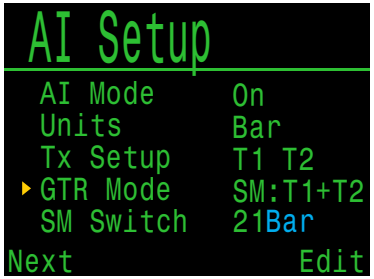
Second Character: 1,2,3, or 4.

Unpair
The unpair option is simply a shortcut to reset the serial number to 000000.

When not using T1 or T2, for lowest power consumption, disable receiving completely by setting the AI Mode setting to Off.

GTR Mode

Gas Time Remaining (GTR) is the time in minutes that can be spent at the current depth and SAC rate until a direct ascent to the surface at a rate of 10 m/min (33 feet/min) would result in surfacing with the reserve pressure. The SAC rate is averaged over the last two minutes of diving for calculating GTR.

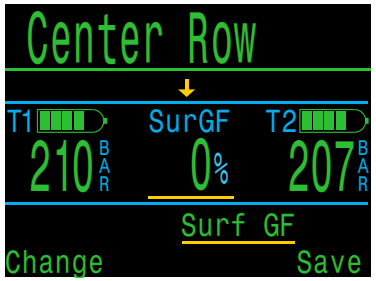


GTR and SAC are only based on one tank, or on two tanks in sidemount configuration. Note that for sidemount the tanks must be of identical volume for SAC to be accurate.

The GTR/SAC setting is also used for identifying sidemount mode. Selecting a SM option here will enable tank switch notifications.

GTR Mode Setting	Description
Off	GTR is disabled. SAC is also disabled.
T1, T2, T3, or T4	Selected Transmitter is used for GTR and SAC calculations.
SM:T1+T2 (Or similar)	Combined SAC for selected transmitters will be calculated and used for GTR. Sidemount switch notifications will be enabled.

10.4.Center Row



Configure and preview the Center row in this menu.

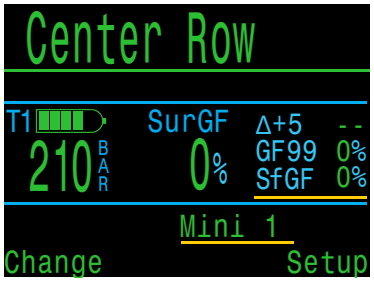
All three center row positions are user configurable in OC Tec mode.

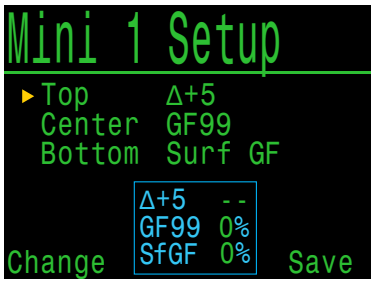
When using internal setpoint, only the left and right positions are configurable in CC/BO mode as the middle position is reserved for PPO2 Setpoint.

When using external monitoring with three cells, no center row positions are available configuration. When operating in dual or single sensor modes, one and two positions become available respectively.

For a complete list of configuration options, see the Home Screen Configuration Options section on page 13.

Mini Display Setup



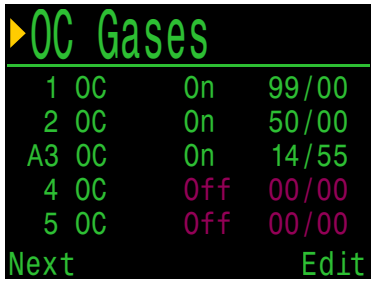


The Petrel 3 has a mini display function that allows it to show 3 pieces of information in each of the left and right custom slots at the expense of font size.

Selecting one of the two mini display items in the Center row setup menu will bring you to the Mini Display Setup Menu for that mini display.

Note that not all mini-displays will show units due to space constraints.

10.5.OC Gases (BO Gases)



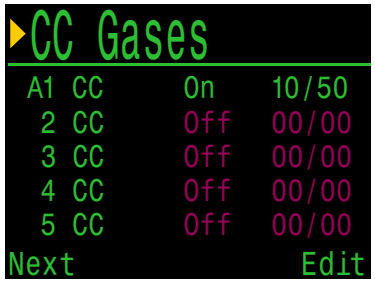
This menu allows the user to edit the open circuit gas list. The options contained here are the same as those in the “Define Gases” subsection of the “Dive Setup” section on page 61. This menu page conveniently displays all five gases simultaneously.

Each gas can be turned on or off and set to any concentration of O2 and helium. The remaining percentage is assumed to be nitrogen.

The active gas is shown with a leading ‘A’. All gases that are turned off are drawn in magenta (purple).

In CC/BO mode, this menu is titled “BO Gases”. Note that the gas list is shared between OC Tec and Bailout modes.

10.6.CC Gases CC ONLY

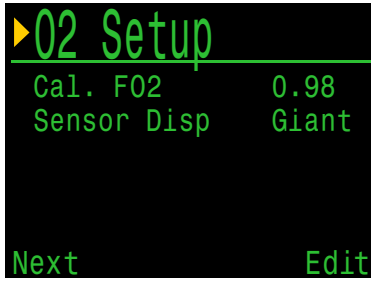


This menu allows the user to edit the closed circuit diluent gas list. The options contained here are the same as those in the OC Gas list setup menu.

10.7. O2 Setup ACG FC DCM

This menu page is only available in Closed-Circuit (CC) or Semi-Closed (SC) mode when external PPO2 monitoring is in use.

Cal. FO2
This setting allows you to set the fraction of oxygen (FO2) of the calibration gas.



In CC mode, the calibration gas FO2 can be set from 0.70 to 1.00. The default value of 0.98 is for pure oxygen, but assumes about 2% water vapor due to the diver's breathing on the loop during the flushing process.

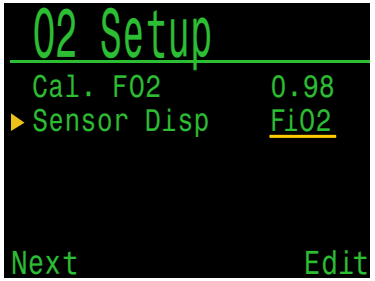
In SC mode, the calibration gas FO2 can be set from 0.20 to 1.00. This is because semi-closed divers do not always have oxygen available.

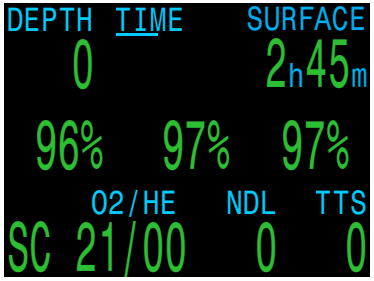
Note: When in SC mode the user cannot utilize internal PPO2 monitoring.

Sensor Disp
Sets the sensor display mode on the center row of the main screen.

In CC mode, the available settings are:
Large: the PPO2 text is the normal large font.
Giant: the PPO2 text is larger.

In SC mode, the available settings are:
PPO2: the PPO2 is shown.
FiO2: the Fraction of inspired O2 (FiO2) is shown.
Both: PPO2 shown is large font, FiO2 below in small font.

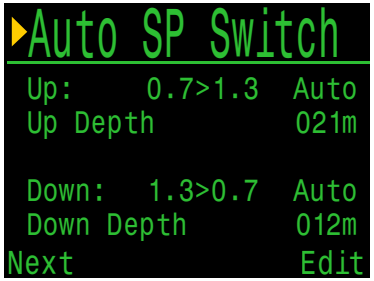




10.8. Auto Setpoint Switch CC ONLY

This menu page is only available in CC mode when using an internal setpoint for decompression tracking.

This page sets up automatic setpoint switching. The dive computer can be set up to auto switch the setpoint up only, down only, both, or neither.



First, you set whether the “Up” switch occurs automatically or manually. If “Up” is set to “Auto”, then you can set the depth at which the auto switch occurs.

The menu options are the same for the down setpoint switch.

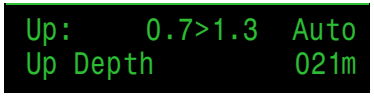
When a switch is set to “Auto”, you can always manually override the setting at any time during the dive.

The automatic switches only occur when crossing the specified depth. Say for example, the switch up depth is set to 15m. You start the dive on the low setpoint, then as you descend past 15m, the setpoint automatically switches up to high. If at say 24m you then manually switch back to the low setpoint, the setpoint will remain low. If you ascend shallower than 15m then re-descend deeper than 15m again, the automatic setpoint switch will occur again.

The Petrel 3 enforces a 6m (20ft) gap between switch up and switch down depths to prevent rapid automatic switching between setpoints for small depth changes. The values 0.7 and 1.3 are shown as examples only. Other values for the low and high setpoint can be adjusted in the Dive Setup or Mode Setup menu.

Auto setpoint switch example:

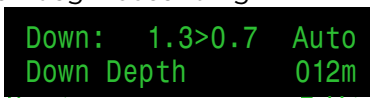
The settings displayed to the right would cause the computer to behave as follows.



The low to high auto setpoint switch is enabled at a depth of 21 meters.

The dive starts at the 0.7 setpoint. As you descend past 21m, the setpoint switches “up” to 1.3.

You finish your bottom time, then begin ascending.



The high to low auto setpoint switch is enabled at a depth of 12 meters.

When you ascend above 12m, the setpoint switches “down” to 0.7.

10.9. Alerts Setup

This page is used to set up custom dive alerts for Maximum Depth, Time, and Low NDL. Notifications will be triggered when these values are exceeded.

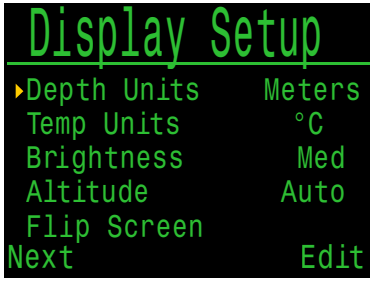
You can also toggle the vibration function from this page.

See Notifications on page 23 for more information on how these alerts are displayed.

10.10. Display Setup

Depth and Temperature

Depth: Feet or Meters
Temperature: °F or °C



Brightness

See brightness options on page 78.

Altitude

The altitude setting on the Petrel 3 is set to Auto by default. In this mode the computer will automatically compensate for pressure changes when diving at altitude. There is no reason to set the computer to SeaLvl except at the direction of technical support.

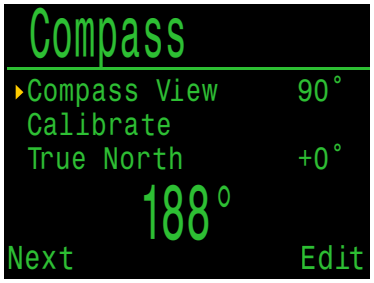
Flip Screen

Displays the contents of the screen upside down.

Determination of Surface Pressure

Accurate depth measurements and decompression calculations require knowing the ambient atmospheric pressure at the surface. Regardless of the turn on method, the surface pressure is determined the same way. While in the off state the surface pressure is measured and saved every 15 seconds. A 10 minute history of these pressure samples is kept. Immediately after turn on this history is examined and the minimum pressure is used as the surface pressure. The surface pressure is then remembered, and not updated again until the next turn on.

10.11. Compass



Compass View

The Compass View setting can be set to the following options:

Off: The compass is disabled.

60°, 90°, or 120°: Sets the range of the compass dial that is visible on the main screen. The actual amount of arc that there is room for on the screen is 60°, so this may feel the most natural. The 90° or 120° settings allow a wider range to be seen at once. The default is 90°.

True North (declination)

Enter the declination of current position to correct compass to true north.

This setting can be set from -99° to +99°.

If matching an uncompensated compass, or navigation is based on relative directions, then this setting can be left at 0°.

Calibrate

Calibration of the compass may be needed if the accuracy drifts over time or if a permanent magnet or ferromagnetic metal (e.g. iron or nickel) object is mounted very close to the Petrel 3. To be calibrated out, such an object must be mounted with the Petrel 3 such that it moves along with the Petrel 3.

Calibrate the Compass Each Battery Change

Each battery has its own magnetic signature, mostly due to its steel case. Therefore, recalibrating the compass when changing batteries is recommended.

Compare the Petrel 3 with a known good compass or fixed references to determine if calibration is needed. If comparing against fixed references, remember to consider the local deviation between Magnetic North and True North (declination). Calibration is typically not needed when traveling to different locations. The adjustment needed then is the True North (declination).

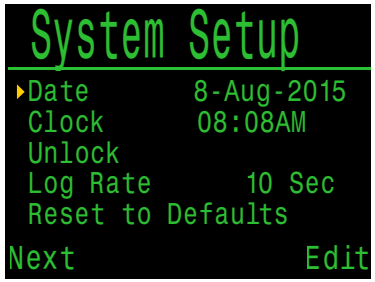
When calibrating, rotate the Petrel 3 smoothly through as many 3D twists and turns as possible in 15 seconds.

Compass Calibration Tips

The following tips will help ensure a good calibration:

- Stay away from metal (especially steel or iron) objects. For example, wrist watches, metal desks, boat decks, desktop computers, etc. These can all interfere with the Earth's magnetic field.
- Rotate to as many 3D positions as possible. Upside down, sideways, on edge, etc.
- Compare with an analog compass to check calibration.

10.12. System Setup



Date
Allows the user to set the current date.

Clock
Allows the user to set the current time. The format can be set to AM, PM or 24 hour time.

Unlock
Only to be used at the direction of Shearwater technical support.

Log Rate
Sets how often dive samples are added to the computer's log. More samples will give a higher resolution dive log at the expense of log memory. Default is 10 seconds. Maximum resolution is 2 seconds.

Reset to Defaults
The final 'System Setup' option is 'Reset to Defaults'. This will reset all user changed options to factory settings and/or clear the tissues on the dive computer. 'Reset to Defaults' cannot be reversed.

Note: This will not delete dive logs, or reset dive log numbers.

10.13. Advanced Config

Advanced configuration contains items that will be used infrequently and can be ignored by most users. They provide more detailed configurations.

The first screen allows you to enter the advanced configuration area, or to set the advanced configurations settings to their default.

Reset Adv. Config

This will reset all advanced config values to their default settings.

Note: This will not affect other computer settings, delete dive logs, or reset dive log numbers.

System Info

The System Info section lists the computer's serial number as well as other technical information you may be asked to provide to tech support for troubleshooting purposes.

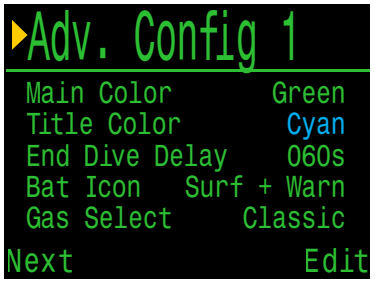
Battery Info

This section gives additional information on the type of battery being used and battery performance.

Regulatory Info

This section is where a user can find the specific model number of their computer as well as additional regulatory information.

Advanced Config 1



Main Colour

Main colours can also be changed for added contrast. Default is green but can be changed to red.

Title Colour

The title colors can be changed for added contrast or visual appeal. Default is Cyan, with gray, white, green, red, pink, and blue also available.

End Dive Delay

Sets the time in seconds to wait after surfacing before ending the current dive.

This value can be set from 20 seconds to 600 seconds (10 minutes). Default is 60s.

This value can be set to a longer time if you want brief surface intervals connected together into one dive. Alternatively, a shorter time can be used to exit dive mode more quickly upon surfacing.

Battery Icon

The behavior of the battery icon can be changed here. Options are:

- **Surf+Warn:** The battery icon always displays when on the surface. During dive it displays only if there is a low battery warning.
- **Always:** The battery icon always displays.
- **Warn Only:** The battery icon only appears when there is a low battery warning.

Gas Select

The feature is described in the Select Gas Menu Style Options section on page 60.

Advanced Config 2

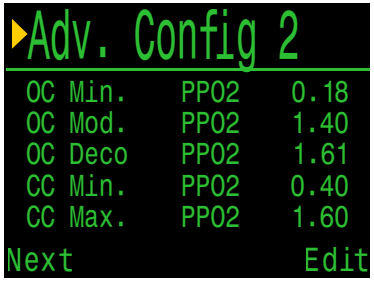
PPO2 Limits

This section allows changing of PPO2 limits.

WARNING

Do not change these values unless you fully understand the effect.

All values are in absolute atmospheres [ATA] of pressure. (1 ATA = 1.013 bar)



OC Low PPO2

PPO2 of all gases display in flashing red when less than this value. (Default 0.18)

OC MOD PPO2

This is the maximum allowable PPO2 during the bottom phase of the dive - **M**aximum **O**perating **D**epth. (Default 1.4)

OC Deco PPO2

All decompression predictions (Deco schedule and TTS) assume that the gas used for decompression at a given depth will be the gas with the highest PPO2 that is less than or equal to this value. (Default 1.61)

Suggested gas switches (when the current gas is displayed in yellow) are determined by this value. If you change this value, please be sure you understand its effect.

For example, if lowered to 1.50, then a switch to oxygen (99/00) will not be assumed at 6m/20ft.

CC Min PPO2

PPO2 displays in flashing red when less than this value. (Default 0.40)

CC Max PPO2

PPO2 displays in flashing red when greater than this value. (Default 1.60)

Note: In both OC and CC modes, “Low PPO2” or “High PPO2” alerts are displayed when the limits are violated for more than 30 seconds.

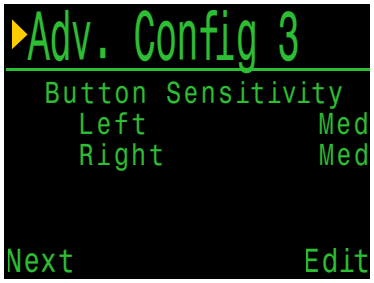
Bottom Gases Vs. Deco Gases

In OC Tec, and 3 GasNx modes, the least oxygen rich mix is considered a bottom gas and obeys the OC MOD PPO2 limit. Other gases are considered deco gases and obey Deco PPO2 limit.

This is another reason it is important to turn off all gases that you are not carrying.

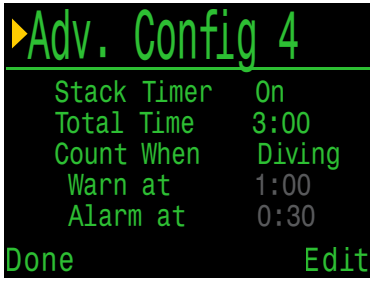
In Air only and Nitrox modes - not described in this manual - all gases are considered bottom gases and obey OC MOD PPO2 limit, even in decompression.

Advanced Config 3



Button Sensitivity
This menu allows some fine tuning of button sensitivity. This can be useful to adjust downward if you often experience accidental button presses.

Advanced Config 4 CC ONLY



Stack Timer
A stack timer is available for tracking the amount of time spent diving with a CO2 absorbent canister.

It can be toggled on and off in the Advanced Config. 4 menu. The total time can be set anywhere between and 1h and 9h 59m. The stack timer can be set to count down either when diving, or when the computer is ON. A warning will alert the diver when the stack timer has 1h remaining and an alarm will be displayed when the stack timer has 30 minutes remaining.

The current stack timer count used and remaining will be available as an info screen when the stack timer is enabled. The stack timer can also be reset from the main level menu. The stack timer cannot be reset during a dive.

> Note: Stack Timer information will reset in the event of a firmware update.

11. Firmware Update and Log Download

It is important to keep the firmware on your dive computer up to date. In addition to new features and improvements, firmware updates address important bug fixes.

There are two ways to update the firmware on your Petrel 3:

1) With Shearwater Cloud Desktop
2) With Shearwater Cloud Mobile

Upgrading the firmware resets decompression tissue loading. Plan repetitive dives accordingly.

During the update process, the screen may flicker or go blank for a few seconds

11.1. Shearwater Cloud Desktop

Ensure you have the most recent version of Shearwater Cloud Desktop. You can get it here.

Connect to Shearwater Cloud Desktop
On your Petrel 3, start Bluetooth by selecting the Bluetooth menu item from the main menu.

In Shearwater Cloud Desktop:

1. Click the connect icon to open the connect tab.
2. Scan for Dive Computer
3. Once you've connected the computer once, use the Petrel 3 tab to connect faster next time

Shearwater Cloud Desktop Connect Tab

Once the Petrel 3 is connected, the connect tab will show a picture of the dive computer.

Shearwater Cloud Desktop Connect Tab

Download Dives

Select “Download Dives” from the connect tab.

A list of dives will be generated. You can un-select any dive logs you don’t want to download, then press OK.

Shearwater Cloud Desktop will transfer the dives to your computer.

From the connect tab, you can give the Petrel 3 a name. If you have multiple Shearwater dive computers, you will be able to easily tell which dive was downloaded from which dive computer.

Select the dives you wish to download and press OK

Update Firmware

Select “Update Firmware” from the connect tab.

Shearwater Cloud Desktop will automatically select the latest available firmware.

When prompted, select your language and confirm the update.

The Petrel 3 screen will give percentile updates of receiving the firmware, and then the Personal Computer will read “Firmware successfully sent to the computer” on completion.

> Firmware updates can take up to 15 minutes.

Update Start-up Text

Start-Up text appears at the top of the start up splash screen when the Petrel 3 is turned on. It’s a great place to put your name and phone number so your computer can be more easily returned if mis-placed.

Update Start-up Image

Here you can also change the startup image that appears when the Petrel 3 turns on to help better differentiate your dive computer.

Update Start-up Image

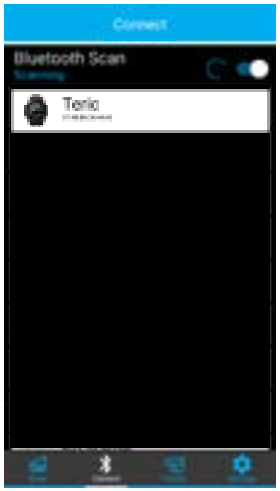
11.2. Shearwater Cloud Mobile

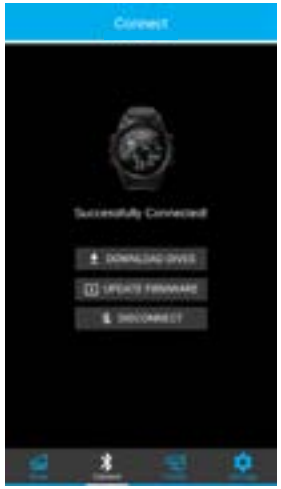
Ensure you have the most recent version of Shearwater Cloud Mobile.

Download it from Google Play or the Apple App Store.

Connect to Shearwater Cloud Mobile
On your Petrel 3, start Bluetooth by selecting the Bluetooth menu item from the main menu.

On Shearwater cloud mobile:
1. Press the connect icon at the bottom of the screen
2. Select your Petrel 3 from the list of Bluetooth devices





Download Dives

Select “Download Dives”

A list of dives will be generated and you can un-select any dive logs you don’t want to download, then press OK.

Shearwater Cloud will transfer the dives to your smart phone.

Update Firmware

Once the Petrel 3 is connected to Shearwater cloud mobile, select “Update Firmware” from the connect tab.

Shearwater Cloud mobile will automatically select the latest available firmware.

When prompted, select your language and confirm the update.

The Petrel 3 screen will give percentile updates of receiving the firmware, and then the mobile app will read “Firmware successfully sent to the computer” on completion.

Firmware updates can take up to 15 minutes.

12. Changing the Battery

A large coin or washer is required to change the battery

Remove the battery cap

Insert the coin or washer into the battery cap slot. Unscrew by turning counter clockwise until the battery cap is free. Be sure to store the battery cap in a clean dry space.

Exchange the battery

Remove the existing battery by tilting the Petrel 3 and letting the old battery slide out. Insert a new battery positive contact first. A small diagram on the bottom of the Petrel 3 shows the proper orientation.

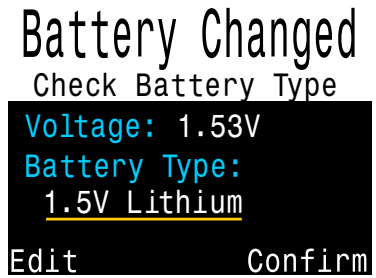
Reinstalling the battery cap

It is **very important that the battery cap O-rings are clear of dust or debris**. Carefully inspect the O-rings for any debris or damage and gently clean. It is recommended that the battery cap's O-ring is lubricated on a regular basis with an O-ring lubricant compatible with Buna-N (Nitrile) O-rings. Lubricating helps ensure that the O-ring seats properly and does not twist or bunch.

Insert the battery cap into the Petrel 3 and compress the battery contact springs. While the springs are compressed rotate the battery cap clockwise to engage the threads. Be sure not to cross thread the battery cap's threads. Tighten the battery cap until snug and the Petrel 3 powers on. Do not over tighten the battery cap.

NOTE: Battery cap O-rings are Type 112 Buna-N 70 durometer.

Battery Type Selection



After changing the battery, select the battery type used.

The Petrel 3 attempts to guess what type of battery is being used. If the battery type is incorrect, it should be manually edited.

The Petrel 3 can accept most AA sized (14500 size) batteries that output a voltage between 0.9V and 4.3V. However, some batteries are better than others.

- Not all batteries support vibration.
- Battery types that support the fuel gauge feature will give more warning before the computer dies.
- Some battery types perform better in cold water.

Shearwater recommends using Energizer Ultimate Lithium batteries for best performance.

Supported battery types:

Battery Type	Approx. Battery Life	Vibration Support	Fuel Gauge	Cold water Performance
1.5V Lithium **Recommended**	60 hours	Yes	Yes	Very Good
1.5V Alkaline	45 hours	No	Yes	Ok
1.2V NiMh Rechargeable	30 hours	No	No	Poor
3.6V Saft LS14500	100 hours	No	No	Poor
3.7V Li-Ion Rechargeable	35 hours	Yes	Yes	Good

Battery life is based on medium brightness.

Alkaline batteries are especially prone to leaking. This is a leading cause of dive computer failure. **Alkaline batteries are not recommended**.

12.1. Behavior on Battery Change

Settings

All settings are retained permanently. No loss of settings occurs when changing the battery.

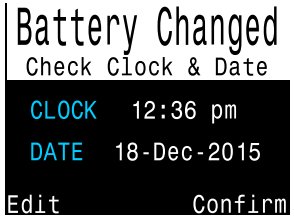
Clock

The clock (time and date) is saved to permanent memory every 16 seconds when the dive computer is on, and every 5 minutes when off. When the battery is removed, the clock stops running. Once the battery is replaced, the clock is restored to the last saved value (so it is best to remove the battery while the dive computer is on for lowest error).

Quick battery changes will not require any adjustment, but the time should be corrected if the battery is removed for more than a few minutes.

Expected clock drift is about 4 minutes per month. If there is higher drift, it is likely due to clock stoppage during battery changes, and is easily corrected at the time of a battery change.

The clock is also updated every time the dive computer is connected to Shearwater Desktop or Shearwater Mobile.



After replacing the battery a screen appears for quick adjustments to the time

Decompression Tissue Loading

The battery may be safely changed between repetitive dives.

Like the clock, the decompression tissue loading is saved every 16 seconds to permanent memory when on, and every 5 minutes when off.

When the battery is removed the tissues remain stored in the permanent memory and are restored once the battery is replaced, allowing for battery changes between repetitive dives. However, the dive computer does not know for how long the battery was removed, so no surface interval adjustment is applied for the time that the battery is removed.

For quick battery changes, the un-powered time interval is not significant. However, if the battery is removed shortly after a dive and then remains out for a long period, residual tissue loading will remain when the battery is replaced.

If at the time of battery replacement any tissue is below saturated with air at the current pressure, then that tissue is brought up to being saturated with air. This might happen after a decompression dive that used 100% O2, where the faster tissues are often completely depleted of inert gas loading. Bringing such tissues back up to saturated with air after a battery change is the most conservative approach.

When deco tissues are reset:

- Inert gas tissue loadings are set to saturated with air at current atmospheric pressure
- CNS Oxygen Toxicity set to 0%
- Surface Interval time set to 0
- All VPM-B values set to default levels

13.Storage and Maintenance

The Petrel 3 dive computer should be stored dry and clean.

Do not allow salt deposits to build up on the dive computer. Rinse the computer with fresh water to remove salt and other contaminants.

Do not wash under high pressure jets of water as it may cause damage to the depth sensor.

Do not use detergents or other cleaning chemicals as they may damage the dive computer. Allow to dry naturally before storing.

Store the dive computer **out of direct sunlight** in a cool, dry and dust free environment. Avoid exposure to direct ultra-violet radiation and radiant heat.

14. Servicing

There are no user serviceable parts inside the Petrel 3. Do not tighten or remove any faceplate screws.

Clean with water ONLY. Any solvents may damage the Petrel 3 dive computer.

Service of the Shearwater Petrel 3 may only be done at Shearwater Research, or by any of our authorized service centers.

Contact Info@shearwater.com for service requests.

Shearwater recommends service of all dive computers every 2 years by an authorized service center.

Evidence of tampering will void your warranty.

15. Glossary

CC - Closed circuit. Scuba diving using a rebreather where exhaled gas is recirculated with carbon dioxide removed.
GTR - Gas Time Remaining. The time, in minutes, that can be spent at the current depth and SAC rate until a direct ascent to the surface would result in surfacing with the reserve tank pressure.
NDL - No Decompression Limit. The time, in minutes, that can be spent at the current depth until mandatory decompression stops will be required.
O_2 - Oxygen gas.
OC - Open circuit. Scuba diving where gas is exhaled into the water (i.e. most diving).
PPO_2 - Partial Pressure of Oxygen, sometimes PPO2.
RMV - Respiratory Minute Volume. Gas usage rate measured as the volume of gas consumed, adjusted as if at a pressure of one atmosphere. Units of Cuft/minute or L/minute.
SAC - Surface Air Consumption. Gas usage rate measured as the rate of tank pressure change, adjusted as if at a pressure of one atmosphere (i.e. surface pressure). Units of psi/minute or bar/minute.

16. Petrel 3 Specifications

Specification	Petrel 3 Model
Operating Modes	Air Nitrox 3 GasNx (3 Gas Nitrox) OC Tec CC/BO SC/BO (FC & ACG Models only) PPO2 (FC & ACG Models only) Gauge
Display	Full color 2.6" AMOLED
Pressure (depth) sensor	Piezo-resistive
Accuracy	+/-20 mbar (at surface) +/-100 mbar (at 14bar)
Calibrated Depth Sensor Range (Maximum Rated Depth)	0 bar to 14 bar (130 msw, 426 fsw)
Crush Depth Limit	30 bar (~290msw) Note: this exceeds the calibrated depth sensor range.
Surface Pressure Range	500 mbar to 1040 mbar
Depth of dive start	1.6 m of sea water
Depth of dive end	0.9 m of sea water
Operating Temperature Range	+4ºC to +32ºC
Short-Term (hours) Temperature Range	-10ºC to +50ºC
Long-Term Storage Temperature Range	+5ºC to +20ºC
Battery	User Replaceable AA Size, 0.9V to 4.3V
Battery Operating Life (Display Medium Brightness)	45 Hours (AA 1.5V Alkaline) 60 Hours (1.5V Lithium) 130 Hours (SAFT LS14500)
Communications	Bluetooth Low Energy (4.0)
Compass Resolution	1°
Compass Accuracy	±5°
Compass Tilt Compensation	Yes, over ±45° pitch and roll
Dive Log Capacity	Approximately 1000 hours
Battery cap o-ring	Dual o-rings. Size: AS568-112 Material: Nitrile Durometer: 70A
Wrist Attachment	2 x 3/4" Elastic Straps with Buckles
Weight	Stand Alone (SA) Model - 266g Fischer Connector (FC) Model - 285g Analog Cable Gland (ACG) Model - 345g
Size (W X L X H)	83mm X 75.5mm X 39mm

17. Regulatory Information

A) USA-Federal Communications Commission (FCC)
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:
(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.
Changes to or modification of this equipment are not authorized, doing so may void the user's authority to operate this equipment.
Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help

Caution: Exposure to Radio Frequency Radiation.
This device must not be co-located or operating in conjunction with any other antenna or transmitter.
Petrel 3 Dive Computer **Contains TX FCC ID: 2AA9B04**

B) Canada - Industry Canada (IC)
This device complies with RSS 210 of Industry Canada.
Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of this device.

L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes :
(1) il ne doit pas produire d'interference, et
(2) l'utilisateur du dispositif doit être prêt à accepter toute interference radioélectrique reçu, même si celle-ci est susceptible de compromettre le fonctionnement du dispositif.

Caution: Exposure to Radio Frequency Radiation.
The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website.
Petrel 3 Dive Computer Contains TX IC: I2208A-04

C) EU and UK Conformance Statements
• EU EC Type examination conducted by: SGS Fimko Oy Ltd, Takomotie 8, FI-00380 Helsinki, Finland. Notified Body No. 0598.
• UK EC Type examination conducted by: SGS United Kingdom Ltd, Rossmore Business Park, Ellesmere Port, South Wirral, Cheshire, CH65 3EN, United Kingdom. Approved Body No. 0120.
• This device is in conforms with REGULATION (EU) 2016/425 on personal protective equipment.
• High pressure gas sensing components are in conformity with EN 250:2014 – respiratory equipment -open circuit self-contained compressed air diving apparatus – requirements, testing and marking – clause 6.11.1 Pressure Indicator. Pressure indication is designed to protect a trained diver from the risk of drowning.
• EN 250:2014 is the standard describing certain minimum performance requirements for SCUBA regulators to be used with air only sold in EU. EN 250:2014 testing is performed to a maximum depth of 50 M (165 FSW). A component of self-contained breathing apparatus as defined by EN 250:2014 is: Pressure Indicator, for use with air only. Products marked EN250 are intended for air use only. Products marked EN 13949 are intended for use with gases containing more than 22% oxygen and must not be used for air.
• Depth and time measurements conform with EN 13359:2000 - Diving Accessories - depth gauges and combined depth and time monitoring devices
•Electronic instruments are in compliance with:
- ETSI EN 301 489-1, v2.2.3: 2019 Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.
- ETSI 301 489-17 V3.2.4:2020 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems.
- EN 55035:2017/A11:2020 Electromagnetic compatibility of multimedia equipment. Immunity requirements.
- CISRP32/EN 55032, 2015. A11:2020 Electromagnetic compatibility of multimedia equipment. Emission requirements.
- DIRECTIVE 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS)
• Declarations of Conformity are available at: https://www.shearwater.com/iso-9001-2015-certified/

WARNING: Transmitters marked EN 250 are certified for use with air only. Transmitters marked EN 13949 are certified for use with Nitrox only.

CE UK CA

18. Contact

www.shearwater.com/contact

Headquarters
100-10200 Shellbridge Way,
Richmond, BC
V6X 2W7
Tel: +1.604.669.9958
info@shearwater.com