Liquivision Xeo

Dive computer, version 1.06

CONTENTS

IMPORTANT NOTICES

DANGER

Scuba diving is a dangerous sport, and can lead to injury, disability or death. Always dive within the limits of your training, skills and experience. Technical diving activities, including decompression diving, mixed gas diving, rebreather diving, wreck and/or cave diving all substantially increase the risks of scuba diving.

The XEO dive computer is capable of calculating decompression requirements based on the Bühlmann ZH-L16C algorithm first published in 1990[1]. Decompression is an inexact science. It is possible to follow a decompression plan exactly and still suffer decompression sickness. Following a decompression plan does not, in any way, guarantee the avoidance of decompression sickness. The same profile that gets you out of the water safely one day, may cause decompression sickness another day, and lead to temporary or permanent injury or death.

You can die while diving.

WARNING

The XEO dive computer software likely still has bugs. We have looked for them and tried to eliminate them, but they can still appear during use. Bugs can cause the unit to provide inaccurate or incomplete information, or cause the unit to reset or turn off and stop providing any information at all.

You should always check for software updates
(www.liquivision.com/downloads/XeoSoftwareHistory.php)
and install all applicable updates, every time you prepare to use the Xeo.

The XEO dive computer hardware will fail, like any electronic equipment whose components mature and age. It can fail during your dive and stop providing you with critical information.

It is your responsibility to monitor battery voltage and ensure the XEO dive computer has enough battery life to complete your planned dive.

You must have a plan to handle a XEO dive computer failure during your dive. Do not risk your life on only one source of information.

User Agreement and Warranty

Use of your Liquivision XEO is subject to the User Agreement and Warranty ("Agreement") available at the Liquivision website: www.liquivision.com/xeo_manuals.php .

You must read the entire Agreement before using your XEO. If you do not agree with any term of the Agreement, you must not use the XEO, and you may return the XEO to Liquivision or the authorized Liquivision dealer from which you purchased the XEO for a full refund within 30 days after your date of purchase.

If you use the XEO, you are deemed to have agreed to the User Agreement and Warranty.

User Manual

You must read this entire User Manual before using your XEO. Incorrect use of the XEO or its accessories could invalidate your Warranty and can cause permanent damage to the XEO or its accessories.

Liquivision Limitation of Liability

The Agreement includes exclusions and limitations of Liquivision's liability to you. These exclusions and limitations include, but are not limited to, the following:

YOU AGREE THAT YOU UNDERSTAND AND ACCEPT ALL RISKS ASSOCIATED WITH DIVING, AND THAT LIQUIVISION IS NOT LIABLE TO YOU OR ANY OTHER PERSON, INCLUDING YOUR HEIRS, EXECUTORS OR PERSONAL REPRESENTATIVES, FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO YOUR PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF YOUR PERSONAL INJURY OR DEATH IS CAUSED, IN WHOLE OR IN PART AND DIRECTLY OR INDIRECTLY, BY THE XEO OR YOUR USE OF THE XEO, AND REGARDLESS OF WHETHER OR NOT THE XEO FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.

YOU HEREBY IRREVOCABLY WAIVE AND RELEASE LIQUIVISION FROM ANY LIABILITY OR OBLIGATION TO YOU OR YOUR HEIRS, EXECUTORS OR PERSONAL REPRESENTATIVES FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO YOUR PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF YOUR PERSONAL INJURY OR DEATH IS CAUSED, IN WHOLE OR IN PART AND DIRECTLY OR INDIRECTLY, BY THE XEO OR YOUR USE OF THE XEO, AND REGARDLESS OF WHETHER OR NOT THE XEO FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.

You must read the Agreement for all limitations and exclusions of Liquivision's liability to you.

Trademark Notice

Liquivision, the Liquivision logo, XEO, and the XEO logo are all registered and unregistered trademarks, trade names and service marks of Liquivision Products, Inc. All rights are reserved.

Patent Notice

U.S. and international patents have been applied for to protect the Liquivision Tap-Based Navigation and the Liquivision Ceramic Pressure Sensor Technology.

CE

The Liquivision XEO conforms to the requirements of EN 13319 (including EN 61000) and has thus obtained CE certification.

INTRODUCTION – XEO FEATURES

Welcome, and thank you for choosing the Liquivision XEO dive computer!

The XEO is the most affordable color OLED dive computer designed for air, nitrox and trimix divers of all levels. It brings you an exciting set of features focused specifically on your needs:

Hardware Features
• Color OLED (Organic Light Emitting Display) with:
- Display face angled towards the diver
- Large fonts
- User-customizable display colors

• Liquivision's patent-pending intuitive tap-based user interface

• Liquivision's patent-pending ceramic pressure sensor technology

• User-changeable lithium battery

• Maximum depth -200m (656 ft)

• Accuracy exceeds the limits of EN13319:2000

• The XEO will function when its internal temperature is between - 0 to 40°C (32 to 104°F).

  If the XEO's internal temperature exceeds 40°C/104°F (in direct sunlight, for example) the OLED display could show some visual disturbances. This is not a product failure – the display will return to normal when the unit is cooled down.

Software Features
• Air, nitrox and trimix capability, allowing up to 10 gas mixes

• CCR upgrade allows accurate decompression for rebreather divers based on fixed PO2 setpoints (requires the purchase of a CCR Unlock PIN)

• Bühlmann ZH-L16C[1], with optional Gradient Factors

• Visual alarms

• Built-in dive planner

• Built-in dive simulator

• Lifetime dive log memory (3500 hrs)

• Imperial/Metric settings

• Windows and Mac downloadable (PC interface hardware sold separately)

GETTING STARTED – BEFORE DIVING

Register Your Unit/Activate Your OC Software (Free)

Your XEO comes pre-loaded with Open Circuit dive software (Bühlmann ZH-L16C algorithm[1] with optional Gradient Factors). You will be able to interact with your unit on the surface and run dive simulations immediately. However, the software will not run underwater until you register your unit, obtain a free XEO Unlock PIN code, and enter this code into your XEO to activate the Open Circuit part of the software.

To register your unit, you must visit: http://www.liquivision.com/activate.php.

During registration, you will be asked to enter your XEO serial number, your real name, address, phone number and a valid email address. You will also be asked to agree and accept the User Agreement and Warranty. Liquivision will then issue you a free XEO Unlock PIN code that you will be able to enter into your XEO unit (detailed instructions are available here: E.g. Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date). At this time, your XEO will unlock its OC diving features.

Liquivision requires you to register for two reasons:
   a) To Mark the Start of Your Warranty Period: the date and time of your registration will be considered the start of your limited warranty period
   b) To Collect Contact Information For Critical Customer Communications: the contact information you provide will be used to contact customers in the event of a critical software upgrade, hardware upgrade, or recall.

If you purchase a second-hand XEO unit, you must email Liquivision at info@liquivision.ca and provide the following information:
- XEO serial number
- Date purchased
- Who you purchased your unit from
- Your address, email and phone number
- The sentence "I agree and accept the XEO User Agreement and Warranty"

This is required to transfer the balance of the Warranty from the previous owner to yourself.

Setup Gradient Factors, Time & Date

Once you have registered and unlocked your XEO unit, the main screen will still say "NOT Ready To Dive: Edit Your GFs, Time and Date".

Liquivision asks you to review the Gradient Factor settings, as it has a critical impact on your decompression profile. The default setting is 100/100 and is equivalent to classic Bühlmann ZH-L16C algorithm[1]. You may change these values to add conservatism according to you personal preferences.

You will find step-by-step information on how to enter your desired Gradient Factor value here: E.g. Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date

You can find more information on Gradient Factors theory here: Gradient Factors.

Liquivision asks you to enter the current Time and Date as they have an impact on the accuracy and reliability of the XEO's decompression calculations. If you do not set these values initially and change them later on when using your XEO, it could introduce errors into the surface interval calculations.

You will find step-by-step information on how to setup the Time and Date here:
E.g. Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date

Unlock CCR functionality (Paid Upgrade)

To access the XEO's closed-circuit rebreather (CCR) functionality, you must purchase a XEO CCR Unlock Scratch-Card and follow these steps:
1. Scratch off the silver security strip to obtain your alphanumeric Scratch-Off PIN code
2. Log into the XEO owner profile you created during registration, by visiting: www.liquivision.com/update_owner.php and entering the required information (email, password, and XEO serial number)
3. Scroll down to the "CCR Unlock" section, and enter the alphanumeric Scratch-Off PIN code in the field provided.
4. Obtain your purely numeric CCR Unlock PIN, and enter it into your XEO unit through the menu item "7.8. Enter CCR PIN". This will unlock the paid CCR functionality of your XEO.

Read The Manual

Before your first dive with the XEO, read this manual and make sure you fully understand it. After any period of not using your XEO, we recommend that you re-read the manual to make sure you fully know and understand how to use it.

If you have any questions, refer first to this manual, then to the FAQ on the Liquivision website and finally to your XEO dealer.

If none of this helps, contact Liquivision support at www.liquivision.com/contact.php .

Familiarize Yourself With Tap-Navigation

Liquivision's tap-based navigation has what we call a "one beer learning curve". Sit down on your sofa for half an hour with a beer, and tap through the XEO menus to familiarize yourself with the tapping interaction and the general menu layouts.

GETTING STARTED – FEATURES OF YOUR XEO UNIT

Customizable Color OLED Display

Battery Compartment

Front Bungee Holes

Front Strap Holes

Back Strap Holes

Back Bungee Holes

Infra Red Aperture
(for connection to PC Interface)

Serial Number & CE Mark

HOW TO INSERT THE BUNGEE CORD

 - We recommend splitting the bungee in two and using two separate pieces to secure your unit, so if one breaks, the other holds.
 - We recommend heat-sealing the knots at the end of the bungee cord (pull the knot away from the XEO casing, heat it up lightly, and form the hot plastic into a hard ball that can't slip back through the bungee hole).

GETTING STARTED – HOW TO TURN ON/TAP YOUR UNIT

DOWN TAP
Aim for the center of the unit.
✓ Tap on the vertical surface (shown in green)
✗ DO NOT tap on the angled surface (shown in red)

Plane for "Up" and "Down" Tapping:
Your Up and Down taps should follow this imaginary line (parallel to screen)

LEFT TAP
Aim for the center of the unit

Plane for "Left" and "Right" Tapping:
Your Left and Right taps should follow this imaginary line (parallel to screen)

RIGHT TAP
Aim for the center of the unit

UP TAP
Aim for the center & center-left of the unit

Please refer to the short video on tapping provided here: www.liquivision.com/videos.php

For your first XEO interactions, hold your XEO in one hand, and use the other hand to tap it. Once you are familiar with the tapping technique, you will find it easy to tap your XEO when it is on your wrist.

General Tapping/Menu Guidelines:
1) tap "Down" three/five times* to turn the unit on, or to enter into menu mode
2) tap "Down" or "Up" to scroll through menu items
3) tap "Left" or "Right" to enter a menu item

*Everywhere in this manual, you will find references to tapping three/five (3/5) times to turn the unit on, or to enter menu mode. The default setting is three times, but you can adjust it to five times if you are concerned about accidental taps causing you to enter menu mode (Preferences -> Tap Count).

Before you can complete a menu action that can cause loss of information, you will be taken to another screen asking you "Are you sure?". The default answer is "No". To confirm, you will need to scroll down, and choose "Yes".

The last item in a menu is "Exit". On the surface, "Exit" will take you to the previous menu. Underwater, "Exit" will take you back to the dive screen.

There is also a menu timeout:
- if you stay in a surface menu for more than 60 sec., the XEO will timeout to the surface display.
- if you stay in an underwater menu for more than 10 sec., the XEO will timeout to the dive display.

E.g. Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date
To turn your XEO on, tap Down three/five times in quick succession.

1. Your XEO will turn on and you will see this screen:

2. To enter menu mode, tap Down three times in quick succession.

3. Your XEO will enter menu mode, and you will see this screen:

4. Tap Down once to reach the "Enter PIN" menu.

5. Tap Left to enter the "Enter PIN" menu. You will see a line of nine zeroes, and the first one will have a cursor on it.
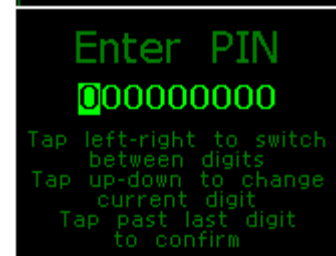
6. Tap Up or Down to change the first zero to the first digit of your PIN code. Tapping Up will bring the numbers 1-2-3-4-5… in sequence. Tapping Down will bring the numbers 9-8-7-6-5…. in sequence.
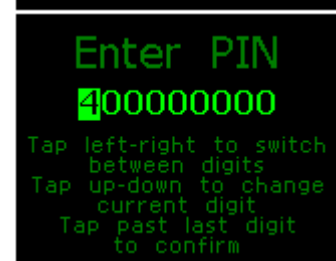
7. Tap Left to move the cursor to the next zero, and once again tap Up and Down to set the correct value.
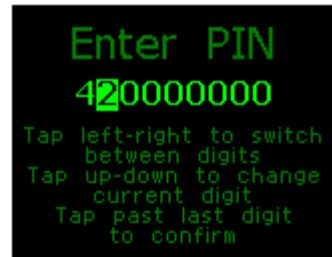
8. Repeat this sequence until you have set all digits of the PIN.
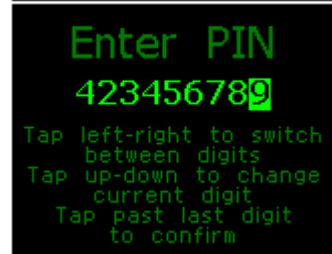
9. Once you have entered all the digits of the PIN, tap Left once more.

If you enter the correct PIN, you will see the following screen:

If you made a mistake in the PIN, you will return to the "Unit Is Locked" main screen, and you will need to repeats Steps 1-9 again.

If you did enter the correct PIN, you must now setup/confirm your Gradient Factors (Steps 10-14) and setup the Time and Date (Steps 15-18) to fully activate your unit.

10. To enter menu mode, tap Down three/five times in quick succession.

11. Your XEO will enter menu mode, and you will see this screen:
(You may notice that the "Enter PIN" line has disappeared, since you have successfully entered your PIN)

12. Tap "Down" twice to reach the "Dive Planning" menu.

13. Tap Left to enter the "Dive Planning" menu. You will see the following list of options. Tap Down four times to reach the "Deco Settings" submenu.

14. Tap Left to enter the Deco Settings submenu. The first line item will be "GF L/H", where you can setup your Gradient Factors.

For more information on Gradient Factors, please review the section: Gradient Factors. They are in the format Low/High and both are in range 0-100. The Low value (the factor at the deepest decompression stop) must be less than or equal to the High value (the factor at the surface).

14a. Confirming 100/100 Setting: 100/100 signifies you are running Bühlmann ZH-L16C algorithm[1] with no additional conservatism. If you wish to confirm this setting, simply leave this menu as-is, without even editing the Gradient Factors.

14b. Altering the Gradient Factors: If you wish to alter your Gradient Factors, tap Left once to move the cursor to the first number, and then tap Down to set the first, or Low value.

14b. Altering the Gradient Factors: Once you have reached the Low value you wish to achieve (30, in this case), tap Left once to move the cursor over to the second, or High value. Tap Down again, until you reach your desired High value (85, in this case).

14c. Exiting the Deco Settings Menu: Once you have either confirmed the default setting, or chosen your desired custom setting, tap Left/Right again to return to the word GFs. Tap Down six times to move the cursor to the word "Exit". Tap Left/Right to exit the submenu.
You will return to the Deco Settings menu item. Tap Down three times to move the cursor to the word "Exit". Tap Left/Right to exit this submenu. You will return to the Dive Planning menu item.

15a. Once you are back in the main menu with the cursor on Dive Planning…

15b. … tap Down five times to reach the Time/Date item.

16. Tap Left to enter the Time/Date menu. You will see the following list of options. Set up your preferred time format (12h/24h), the time of day, the date and the year, then select Exit.
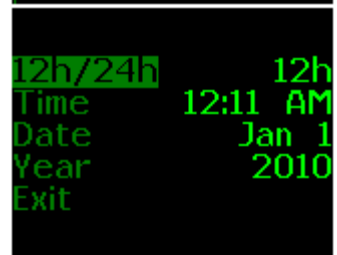
17. You will now be back in the main menu. Tap Down three times to reach "Exit" again, and tap Left to select.

18. This will take you back to the main Surface Display of the XEO, which should now say "Ready To Dive".
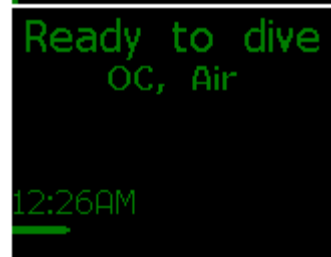
GETTING STARTED

XEO Surface Display
When you turn your XEO on by tapping Down three/five times, it will go to the "Ready To Dive" Surface Display (provided you have unlocked it, set up the Bias Factors, Time and Date as per the steps listed here).

This Surface Display shows your: dive setup (OC/CCR), gas setting (Air), time of day (12:00AM) and the battery status.

If you have already dove your XEO, it will display information about last dive. For more about this, refer to the "Exiting the water" section of the Manual.

If you do not access menus, or enter the water, it will go into sleep mode after 5 minutes. It will continue to monitor pressure in sleep mode so it will wake up again once you jump in the water and descend below 1.6m/5ft.

XEO Scroll Bar
Once you have entered the Surface Display, you can enter Menu Mode by tapping your unit three/five times again.

If the list of menu items exceeds the space on the screen, a Scroll Bar will appear on the right of the screen, indicating where you are in the list. A Scroll Bar at the top of your screen means you are the top of the list, a Scroll Bar at the bottom of your screen means you are at the bottom.
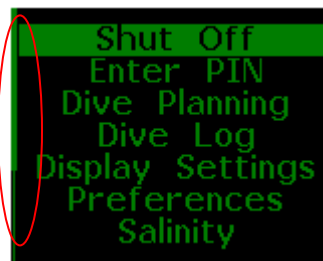
First, Check Your Battery!
The XEO displays battery status on its surface display so that you can check your battery power before you dive. It is very important to make sure that you have enough battery power left to complete your planned dive.

The battery status is represented graphically with a battery icon.

The battery icon is solid green when the battery voltage is more than 3.30V.
The battery icon is solid yellow when there is less than 3.30V left of battery power (about 2h of diving)
The battery icon is solid red when there is less than 3.15V left of battery power.

> You must change your battery immediately when the indicator turns red. Lithium batteries sustain high power for a long time, but once the power drops, it does so very fast. A red battery indicator shows that the battery power will drop to insufficient power within a few minutes.

Optimizing Battery Life
The battery life is significantly affected by the brightness setting of your display and the display colors you select. Learn more about optimizing your XEO's battery in the section "Important Information About XEO's Battery".

SURFACE MENUS

Main Menu
1. Shut Off
2. Enter PIN (only if you haven't entered it yet)
3. LOCK / UNLOCK (only if the device have been unlocked)
4. Dive Planning
    4.1. Dive Setup
    4.2. Gases
    4.3. Runtime
    4.4. Alarms
        4.4.1. Alarms On/Off
        4.4.2. Depth
        4.4.3. Time
        4.4.4. Ascent Rate
        4.4.5. Descent Rate
    4.5. Deco Settings
        4.5.1. GFs L/H
        4.5.2. PO2 dive
        4.5.3. PO2 deco
        4.5.4. Min PO2
        4.5.5. Max END
        4.5.6. Last deco stops
    4.6. Your Saturation
    4.7. Simulate Dive
5. Dive Log
    5.1. Log Summary
    5.2. Log Detail
    5.3. Depth Graph
    5.4. Temperature Graph
6. Display Settings
    6.1. Brightness
    6.2. Auto Dim
    6.3. Refresh
    6.4. Layout
    6.5. Velocity
    6.6. Analog Clock
    6.7. Show Hours
    6.8. Colors
    6.9. Simulate Dive
7. Preferences
    7.1. Units
    7.2. Log Period
    7.3. Tap Sensitivity
    7.4. Tap Count
    7.5. Minimum Dive
    7.6. Minimum Surface Interval

1. Shut Off

Choosing this menu option will put your XEO in Sleep Mode, which is designed to use minimum battery. The XEO will still wake up when tapped 3/5 times. It will also still keep track of surrounding pressure so it can wake up once you enter the water.

2. Enter PIN

This is where you enter the free PIN you receive upon registering your XEO unit. There is a step-by-step description of the PIN entry process in the Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date section of the manual. You may be required to re-enter this PIN after a software update, so please keep a written record of it for reference.

3. LOCK / UNLOCK

This menu item allows you to lock all your menu settings so they cannot change accidentally due to random shaking e.g. during a bumpy ride to the dive site or knocking around in your backpack.

To lock, just select the "LOCK" menu item by tapping on the side of your unit. Your XEO is now locked, and the menu item will change to "UNLOCK"

To unlock, just select "UNLOCK" by tapping on the side of your unit. You will have to enter the unlock sequence. It is "123" and you input it in the same way as you input your PIN number (refer to Entering Your Free OC Software Activation PIN, Setting Up Gradient Factors, Time & Date if you have trouble entering the number). The screen will also remind you how to perform the unlock sequence. The unlock sequence prevents random unlocking of the unit – it is very improbable that random shakes will input that sequence.

4. Dive Planning

This whole submenu is devoted to planning your dive – here you can set up your unit for Open Circuit or Closed Circuit diving and automatic gas switching, you can enter your gases, set up alarms and compute your ascent schedule – you will get the exact same one that the XEO will display during your dive, provided of course you follow the dive plan precisely.

4.1. Dive Setup

Dive Setup: OC/CCR
This menu item allows you to choose between Open Circuit "OC" or Closed Circuit Rebreather "CCR" modes. To choose CCR, you must purchase an additional CCR Unlock and follow the steps in the Unlocking CCR functionality section.

Auto Switch: OFF/ON
This menu item allows you to set Auto Switch to either "On" or "Off":
- When Auto Switch is "On" and you are in OC mode, your XEO will automatically switch your gas to the Best Gas of all your Dive and Deco gases.
- When Auto Switch is "On" and you are in CCR mode, your XEO will automatically switch your setpoint from Low to High, and vice versa. For details, please refer to the Dive Setup settings subsection of the Dive Planning section of the manual.

If you choose to run your XEO in CCR mode, you can configure your "Low" and High setpoints:
- "Low" will be between 0.3-1.0
- "High" will be between 0.5-2.0
Setpoints progress in 0.1 increments. The Low setting has to be lower than the "High" one.

Two more options relating to your Setpoints are "On Descent" and "On Ascent". These options allow you to configure the depth at which your XEO will automatically switch from Low to High Setpoint, and from High to Low Setpoint, respectively, assuming that you have turned Auto Switch to "On". Your XEO will also assume, when computing the ascent schedule, that below the "On Descent" depth you have your Setpoint set to High and, above the "On Ascent" depth, to Low. Again, for details, please refer to the Dive Setup settings subsection of the Dive Planning section of the manual.

4.2. Gases
Here you can configure up to 10 different gases for use in your dives.

Add
If you select the "Add" option, you will see the following screen, in which you can set the specifications of your gas:
- O2: oxygen percentage in the gas, between 0-100
- He: helium percentage in the gas, between 0-100
- Mode: Dive Gas, Deco Gas, Backup Gas, or Off.
Please note that O2+He cannot be more than 100%. Also, the nitrogen percentage of a gas is calculated as 100% – O2 – He.
This submenu will also display Maximum Operating Depth (MOD) of all Dive and Deco Gases. This number is calculated by the XEO based on all your settings, and has a limit of 200m/650ft. No MOD will be displayed for Backup and Off Gases. If you change a Backup or Off Gas into a Dive or Deco Gas, its MOD will be calculated.
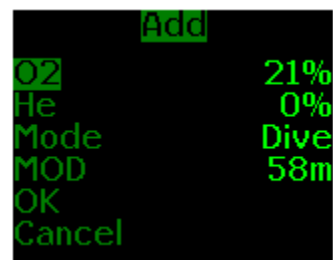
Existing Gases
If you tap into any of existing gases, you will see this submenu:
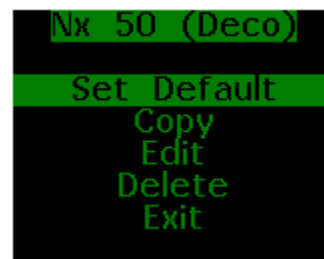
- Set Default – this option will appear only if this gas is not already set as the default. "Default Gas" is the gas you start breathing when you begin your dive on OC, or the diluent when you dive on CCR. The "Default Gas" must always be a Dive Gas, so if you change a Backup or

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Deco Gas to "Default", this will automatically make it into a Dive Gas (see Gas settings for more info).

- Copy – this option works in a similar way as "Add Gas", but it has the additional benefit of pre-populating the gas parameters with same values as the gas you chose. You can then edit these parameters to create a new gas.
- Edit – once again, this option has a similar interface as "Add Gas", but when you select "OK", the gas will be edited, not added.
- Delete – this option will appear only if gas you have chosen is not the only gas configured.

For more details on gas modes, refer to Gas settings subsection of Dive Planning section of the manual.

4.3. Runtime

In this section you can enter your dive plan and review it later underwater. You can also enter the beginning of your dive plan (such as the deep portion of it), and see what ascent schedule will XEO compute underwater, assuming that you follow the dive plan precisely.

Each portion of the dive plan is a waypoint. It consists of:

- Type – it can be a "Normal" or a "Switch" waypoint
- Depth – depth of the waypoint
- Time – time when the waypoint "ends"

If you select a "Switch" waypoint, you will have the option of specifying the gas you wish to change to, or the new setpoint you would like.
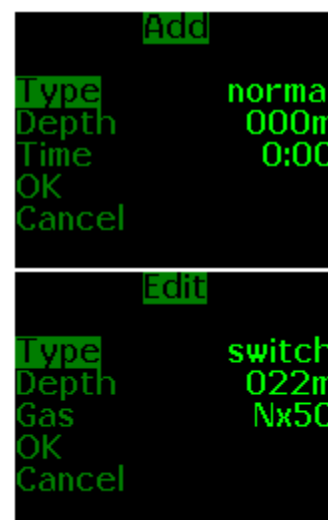
In the case of a "Normal" waypoint, you can configure Depth and Time. This waypoint describes the ascent or descent from the depth of the previous waypoint to the depth of this waypoint, starting at the moment the previous waypoint ends, and at the ascent/descent rates configured in the Ascent Rate/Descent Rate submenu of the Alarms menu. If it is a first waypoint, then the "previous" waypoint is assumed to end at time 0, and depth 0.

In the case of "Switch" waypoint, you can configure Depth and Gas/Setpoint. This waypoint will describe ascent/descent from the depth of the previous waypoint to the depth of this waypoint, starting at the moment the previous waypoint ends, and at the ascent/descent rates configured in Ascent Rate/Descent Rate submenu. The time of this waypoint is calculated automatically, as the moment the diver reaches the depth of this waypoint.

If you have recently been diving, and are still saturated from those dives, there will be an additional item in the Runtime submenu, which is "Remain. SI", or "Remaining Surface Interval". Here you can configure the number of hours and minutes that you plan to stay at the surface, before going on the dive that you are planning.

Keep in mind that the gas or setpoint switches configured in this submenu have little to do with XEO gas or setpoint switch suggestions (or automatic switches, if your Auto Switch feature is On). The latter are based on the Best Gas concept (see Gas settings), or the pre-programmed On Descent and On Ascent values (see Dive Setup settings above).

Once you set up your waypoint and choose "OK", you will have the option to:

- Add another waypoint
- Compute your deco
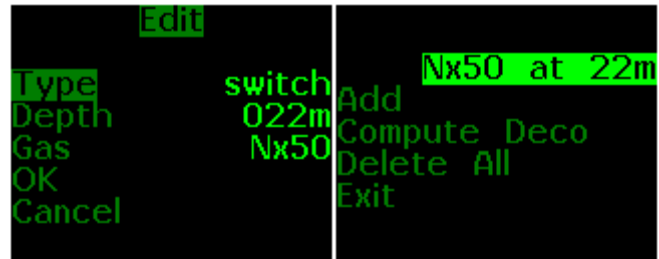
Other thing to remember is that the "Compute Deco" feature might produce unexpected (and wrong) results if you manually enter waypoints that are breaching your decompression ceiling. As an example: if you enter a 90m / 300ft waypoint, after which your decompression should start at 42m / 140ft, but you manually overwrite it by creating next waypoint at 30m / 100ft, then you would get erroneous decompression computations.

4.4. Alarms

Your XEO can display visual alarms when you exceed any of the following parameters:

- Maximum depth
- Maximum dive time
- Maximum ascent rate
- Maximum descent rate
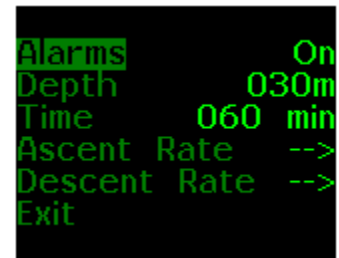
When the alarm is activated for any parameter, that piece of information will start blinking on your screen for one minute. If you do not correct the situation within one minute, the parameter display will invert (i.e. it will appear as black letters on colored background) until you correct situation causing the alarm. Once you do that, the alarm will turn off.

The only exception is a time alarm. It will blink for 1 minute, after which it will go back to normal. The reason for this is that you cannot correct the fact that you exceeded your maximum time.

4.4.1. Alarms On/Off

The default setting for Alarms is "On". Selecting "Off" allows you to turn all the alarms off entirely. If you select "Off", even if some alarm limits are exceeded, you will not see ANY alarm. The use of this option is discouraged.

4.4.2. Depth

Here you can set the depth at which you want your Depth alarm to activate.

4.4.3. Time

Here you can set the time during your dive, when you would like the Time alarm to activate. One of the uses for this feature could be to remind you that your maximum bottom time has been reached.

4.4.4. Ascent Rate

Here you can create a set of ascent rate rules. You can set up to 5 different rules.

The first rule is the one with "Start" on the left. This will apply at all depths of your dive, unless you set additional rules. This will also be the default rule for any depths not covered by other rules. If, for example, you set it to 10 meters per minute / 33 feet per minute, and set no other rule, then at any depth, exceeding this ascent rate will cause an alarm.

Alternatively, you can add more rules, in the format "Start Depth" - "Maximum Rate". These additional rules will apply once you get **shallower** than specified depth. For example, you might choose to limit yourself to 1 meter per minute / 3 feet per minute once you're past your last deco stop, which is planned at a depth of 3 meters / 10 feet. In this case, you would set a rule "Start Depth: 3 metres" and "Maximum Rate: 1 meter per minute".
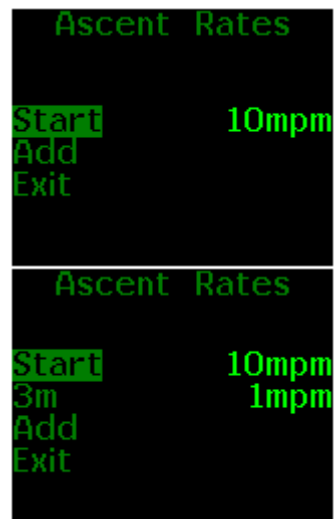
4.4.5. Descent Rate

This menu works in the same manner as the previous menu – the Ascent Rate menu. In this case, though, a rule is in effect once you're **deeper** than your specified start depth, and first rule will apply from surface downward, until you reach you next rule's start depth.

4.5. Deco Settings

In this submenu there is a set of parameters that affect how your XEO calculates your ascent schedule:
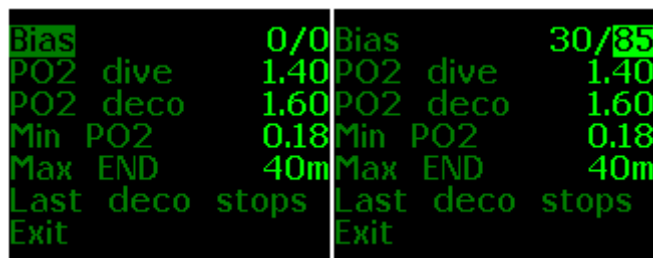
4.5.1. GFs L/H

You will be asked to enter your chosen Gradient Factors prior to your first dive. You can either confirm the default 100/100 setting (Bühlmann ZH-L16C algorithm[1]) or modify the numbers to increase conservatism. The factors are listed in the sequence Low/High. Low represents the factor at the deepest decompression stop, and "High" represents the factor at the surface. Both factors can range from 0-100, although Low must be less than or equal to High. In this example, Low is set to 30 and High is set to 85. For more information about bias factors, refer to Gradient Factors section.

4.5.2. PO2 dive

Here you can setup the maximum PO2 for your Dive Gas. This will define how deep your Dive Gas will still be considered breathable. You can set it to any value between 1.0-2.0 bar, in 0.05 increments.

4.5.3. PO2 deco

Here you configure the maximum PO2 for your Deco Gas. This will define how deep your Deco Gas will still be considered breathable. You can set it to any value between 1.0-2.0 bar, in 0.05 increments.

4.5.4. Min PO2

Here you configure the minimum PO2 for any of your gases. This will define how shallow your gases will still be considered breathable. You can set it to any value between 0.1-0.21, in 0.01 increments.

4.5.5. Max END

Here you configure the maximum END (Equivalent Narcotic Depth) for any of your gases. This will define how deep your gases will still be considered breathable. Your XEO assumes that oxygen is also narcotic – therefore, the END for nitrox mixes will be the same as the END of air. Only helium can reduce the END of a gas.

4.5.6. Last deco stops

In this submenu you can define a set of Last Deco Stops. As a default, XEO will compute deco schedule so that the last deco stop is 3m / 10ft, then 6m / 20ft, 9m / 30ft, etc. Here you can configure your own set of last decompression stops, if you want them to be different from the default. One very popular example is to set the last decompression stop at 6m / 20ft, so that you won't be affected as much by wave action. You may wish to configure them in yet another way for your own reasons. Please keep in mind, however, that you should not put them too far apart.

You can create up to 5 Last Deco Stops. By tapping into each one, you can Copy, Edit, or Delete it. The "Copy" and "Add" options are only available if there are fewer than 5 Last Deco Stops.

4.6. Your Saturation

This menu item displays a screen with your current saturation:
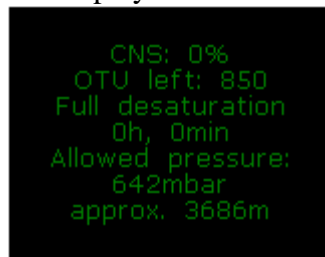
Your Saturation screen after a period of no diving   Your Saturation screen after a deep dive
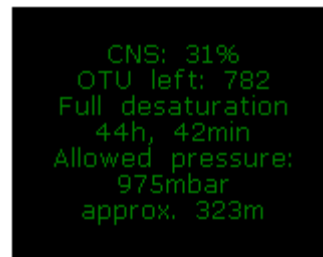
- Your current CNS (Central Nervous System) oxygen saturation (refer to Oxygen loading section)
- OTU (Oxygen Toxicity Units) left for today (refer to Oxygen loading section)
- Time to full desaturation from inert gases
- Your theoretical allowed pressure, and the altitude to which it corresponds

The theoretical allowed pressure refers to tolerated ambient pressure, calculated with the Bühlmann ZH-L16C algorithm[1]. It is a strictly theoretical calculation, and you should not use it as a definite way to figure out when is it OK to fly or drive into the mountains. It is provided as an additional point of reference for your decision about going into higher altitude. Use your training agency's and/or DAN guidelines about flying after diving. The corresponding altitude is yet another theoretical calculation, based on average pressures at altitudes.

4.7. Simulate Dive

This item is here so you can experiment with ascent schedule calculations, gas switches, emergency modes, etc., without getting yourself or your XEO wet. When you enter "Simulation", it will open sub-

menu asking you for depth and time of the dive, its speed (whether it's normal – 1x, or faster – 2x, 4x, etc., up to 16x faster than normal), and then you can select "Start".

A couple of things to note about the XEO simulator:
- The simulator follows descent and ascent rate limits
- It takes a moment to turn on, since the simulation starts at 0m / 0ft but the XEO considers a dive after divers descends below 1.6m / 5.2ft
- If the time you set is too short to reach the specified depth, the simulator will just keep descending for the allotted time, and then start ascending without reaching the depth you specified
- Please note that the Auto Dim option is not available during a simulation

You can stop the simulation at any time by tapping the unit 3/5 times to enter the underwater menus, and choosing "Stop Simulation" (to learn more, refer to the "Stop Simulation" section of the manual.)

5. Dive Log

The Dive Log keeps track of dives you did with your XEO, including their depth and temperature profiles. With use of a XEO PC Interface and related software you can download this information to your desktop or laptop (for more information on this, please read the XEO PC Interface section of the manual). Your XEO is capable of remembering hundreds of dives. Older dives, though, will not have their depth and temperature profiles available.

The number of dives recorded by the Dive Log depends on the Log Period you select. If you set the Log Period to 1 second (1s), there is space for more than 60 hours of dive profiles. This will increase substantially if you increase the Log Period. For example, with the Log Period set to 60 seconds (60s), your XEO would be capable to remember 3600 hours of dives.

To learn how to change the Log Period, refer to the Log Period section of the manual

5.1. Log Summary

In the Log Summary, you will see two things:
- a menu item called "Page"
- a list of your most recent dives

The "Page" menu item allows you to scroll through your dives page by page. At first, it will be showing "1" and the list of dives below it will be your most recent dives. If you set "Page" to "2", it will bring up the dives that occurred immediately before that. As you increase the Page number, you will see a list of older and older dives.

The list of dives will display a short summary of each dive, that is, the date and time of the dive. Scroll down to highlight a particular dive, and you will also see its maximum depth and duration at the bottom of the screen. If you select a particular dive, you will enter its Log Detail page.

5.2 Log Detail

In this page, you will see more detailed information on the selected dive. Below is a list of data you will see, in the same order as it will be displayed:
- Dive No – the number of this dive, numbered in the sequence that it occurred
- Max Depth

- Avg. Depth – this is average depth of your whole dive, so if you have reset average depth during the dive, it won't affect this number
- Duration – dive time, in hours and minutes
- Date – day of the month, month and year of the dive
- Time – the time of day at which you entered the water
- Min. Temp. – minimum temperature over the whole duration of the dive
- Max. Temp. – maximum temperature over the whole duration of the dive
- Surf. Int. – the surface interval since last dive
- CNS start – the central nervous system oxygen saturation, in percent, at the beginning of the dive
- CNS finish – the same value at the end of the dive
- OTU – oxygen toxicity units acquired throughout the duration of this dive
- Depth Graph – by choosing this option, you will see depth profile of your dive
- Temp. Graph – by choosing this option, you will see temperature profile

5.3. Depth Graph

The depth graph spans whole width of the screen, with the start of the dive at the left-most part, and the end of dive at the right-most part. The top of the screen represents the surface of the water, and the bottom of the screen represents the maximum depth reached (this number is also printed on the screen). By tapping, you exit back into the "Log Detail" menu.

5.4. Temperature Graph

The temperature graph also spans whole width of the screen, with start of dive at the left-most part, and the end of dive at the right-most part. There are two numbers printed on the screen, one in bottom-left – that is temperature represented at the bottom of the screen, and one in top-left – that is temperature represented at the top of the screen. By tapping, you exit back to the "Log Detail" menu.

6. Display Settings

This is a series of settings you can use to personalize your XEO's display.

6.1. Brightness

The "Brightness" setting has three levels – low, medium and high. The darker the water, the lower brightness you need to see your display clearly. Also, you might find high brightness in the dark water too bright – that is, it could emit too much light, compared to environment you're diving in. On the other hand, in clear, shallow water, with lots of sunlight, you will need high brightness to see the display properly. Keep in mind that higher brightness burns more battery, so you should select the lowest brightness that meets your needs on a given dive.

6.2. Auto Dim

You can use the "Auto Dim" feature to fine-tune the brightness of your display. If you need high brightness on the surface and lower brightness at depth, you do not need to adjust it manually. Instead, you can set your "Auto Dim" setting to the depth at which you want your display brightness to be reduced to Low. By using the "Auto Dim" feature, here is what will happen:
- At the surface, display brightness will be at the setting chosen in the "Brightness" menu
- Once you reach your Auto Dim depth, and below, the brightness will switch to Low
- Between these two, the brightness will decrease linearly with depth (e.g., at half of the Auto Dim depth, it will be halfway between the surface brightness setting, and Low)

If you set your Brightness setting to "Low", the Auto Dim feature will have no effect.

The default Auto Dim setting is "Off". You can adjust it in 10m / 30ft increments.

6.3. Refresh

You can either set refresh rate to "Fast", or "Normal". The default setting is "Normal". In most cases, you will not notice the refresh rate when set to "Normal", but if you do, you can set it to "Fast". Using the "Fast" setting will shorten the battery life.

6.4. Layout

Your XEO comes with a single underwater display layout. We welcome user feedback regarding this layout and we remain open to the possibility of creating additional layouts in future software updates.

6.5. Velocity

This setting changes whether or not ascent/descent rates will be displayed. It will show the rate as a number of meters or feet per minute, and an arrow showing whether you are ascending or descending.
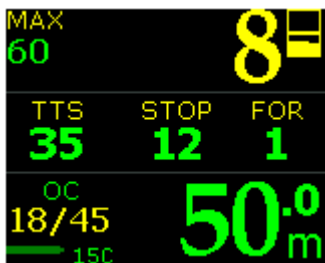
Velocity off or not ascending/descending   Velocity on – ascending at 12 mpm (current units - metric)

6.6. Analog Clock

This setting affects how the seconds portion of your dive time is displayed. By selecting "Off", you will have the seconds value printed as a number on your display. By selecting "On", you will see a graphical indication of the seconds elapsed: a bar display filling up over time to a full minute.
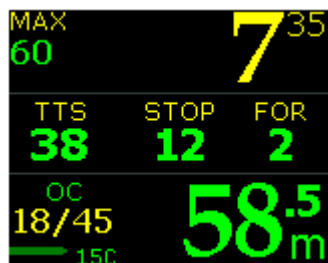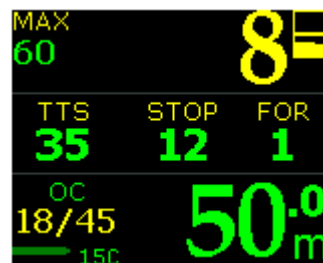
Analog Clock: OFF   Analog Clock: ON

6.7. Show Hours

This setting affects how your total dive time will be displayed. By selecting "Off", you will have the dive time shown as minutes:seconds, with the minutes value exceeding 60 once more than an hour has

elapsed. By selecting "On", you will have the dive time show as hours:minutes:seconds, with the minutes value only reaching 59 before being converted into 1 hour and 0 minutes.
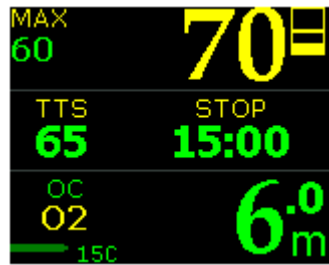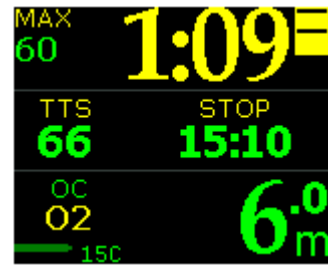
Show Hours: OFF   Show Hours: ON

6.8. Colors

Choosing this option will take you to entire sub-menu, where you can choose colors for different parts of your display. You can set the colors of the following values:

- Depth
- Total dive time
- Maximum depth
- Maximum depth label („MAX" printed on the screen)
- Unit label
- Gas / Setpoint
- Time of day
- Temperature
- Depth units
- Menu text
- Menu parameters

Scroll down to the value you wish to change by tapping "Down". Tap "Left" to move the cursor over to the color indicator for that value. You can then scroll through all available colors by tapping Up or Down. Once you reach a color that you like, you can tap "Right" to return to the list of values. Once you have completed all the changes you wish to make, scroll all the way down until you reach "Exit".

6.9. Simulate Dive

The final item in the "Display" menu is "Simulate Dive". This is so you can test all your display settings, without getting yourself or your XEO wet. When you enter "Simulation", it will open sub-menu asking you for depth and time of the dive, its speed (whether it's normal – 1x, or faster – 2x, 4x, etc., up to 16x faster than normal), and then you can select "Start".

A couple of things to note about the XEO simulator:

- The simulator follows descent and ascent rate limits
- It takes a moment to turn on, since the simulation starts at 0m / 0ft but the XEO considers a dive after divers descends below 1.6m / 5.25ft
- If the time you set is too short to reach the specified depth, the simulator will just keep descending for the allotted time, and then start ascending without reaching the depth you specified
- Please note that the Auto Dim option is not available during a simulation

You can stop the simulation at any time by tapping the unit 3/5 times to enter the underwater menus, and choosing "Stop Simulation" (to learn more, refer to the "Stop Simulation" section of the manual.)

7. Preferences

In this menu, you are able to adjust and fine-tune settings of your device. You are probably going to use this menu only once, before you start diving with your XEO.

7.1. Units

Here, you can choose the units in which data will be displayed on your XEO:
  - Metric units: meters, meters per minute, Celsius
  - Imperial units: feet, feet per minute, Fahrenheit

7.2. Log Period

The Log Period is the frequency with which dive data will be saved to memory. Your XEO collects depth and temperature data for each dive. If you chose a Log Period of 2 seconds, then your XEO will store depth and temperature data to memory every 2 seconds.

The number of dives recorded by the XEO's Dive Log depends on the Log Period you select. If you set the Log Period to 1 second (1s), there is space for more than 60 hours of dive profiles. This will increase substantially if you increase the Log Period. For example, with the Log Period set to 60 seconds (60s), your XEO would be capable of remembering 3600 hours of dive time.

7.3. Tap Sensitivity

You can set Tap Sensitivity to Low or High. This allows you to adjust how softly or firmly you must tap your XEO for it to react. High sensitivity means it will be very sensitive and react to light taps. Low sensitivity means it will be less sensitive and react to stronger taps only.

Some divers like to set their Tap Sensitivity to Low when in caves or wrecks to prevent accidental bumps on the surrounding rock or wreck to launch their unit into menu mode.

7.4. Tap Count

You can set this either to "3" or to "5". By choosing either of these, you set the number of taps that will wake up your XEO from Sleep Mode, and the number of taps that will take you to the menus.

The default setting is "3". Some divers find that the XEO can wake up at random due to a bumpy ride to a dive site or due to accidental impacts during a dive in a closed environment, for example. In those cases, we recommend changing the setting to "5".

7.5. Minimum Dive

This allows you to control the minimum dive time required for the dive to be classified as an actual dive. For example, if you set it to 1 minute, then any dive shorter than that will not be logged. You can control this number in increments of 10 seconds. Minimum value is 0, maximum – 600 seconds.

7.6. Minimum Surface Interval

This allows you to control the minimum time of surface interval before next dive is classified as new dive. If you stay on the surface for shorter time than the specified interval, your next descent will still be considered a part of the previous dive, and both descents will be logged as one dive. You can control this value in increments of 1 minute. Minimum value is 0, maximum – 30 minutes.

7.7. Status

If you tap into this menu setting, you will see basic information concerning your device, such as type, hardware version, software version, etc.

7.8. Enter CCR PIN

To access the XEO's closed-circuit rebreather (CCR) functionality, you must purchase a XEO CCR Unlock Scratch-Card and follow these steps:

5. Scratch off the silver security strip to obtain your alphanumeric Scratch-Off PIN code
6. Log into the XEO owner profile you created during registration, by visiting: www.liquivision.com/update_owner.php and entering the required information (email, password, and XEO serial number)
7. Scroll down to the "CCR Unlock" section, and enter the alphanumeric Scratch-Off PIN code in the field provided.
8. Obtain your purely numeric CCR Unlock PIN, and enter it into your XEO unit through the menu item "Enter CCR PIN". This will unlock your XEO's paid CCR functionality.

Enter the "Preferences" menu, then scroll down to the "Enter CCR PIN" menu item. Tap Left/Right to enter the PIN screen, then tap Up or Down to set the first digit of the PIN. Tap "Left" to move the cursor to the second digit of the PIN, and once again tap Up or Down to set it.

Once you have set all the digits, tap Left/Right again.

8. Salinity

You can adjust salinity settings here. There are three available modes:
- fresh (1 kg / l, such as freshwater lake or river)
- brackish (1.012 kg / l, such as some estuaries, inland seas, etc.)
- saline (1.025 kg / l, such as open sea)

By selecting the correct salinity, you ensure that your displayed depth will be accurate. XEO, like any other depth gauge or computer, in order to measure depth, measures pressure. Depending on water salinity, there will be a slight variation in pressure at the same depth.

If you are unsure of the water salinity, choose the salinity that your dive / decompression tables were calibrated to.

9. Time/Date

In this submenu, you can set all the options connected with time and date.

9.1 12h/24h

Choose the one you prefer – the AM/PM type time format, or the 24-hour format.

9.2 Time

Time of day, displayed as hours and minutes.

9.3 Date

Day of month and month.

9.4 Year

A current year. The year should be within period of 2010 to 2025.

10. Connect to PC

Tap into this menu item before starting the download of your dive logs in your PC application of choice. Refer to its manual for more information.

If you tap into this item accidentally, don't worry – the wait for PC communication will time out after 30 seconds, and you will be back to main menu.

For more information on connecting to your PC, downloading your dives or uploading new software onto your XEO, please refer to the "XEO PC Interface" section of the manual.

UNDERWATER MENUS

Main Underwater Menu
- 1   EMERGENCY
  - 1.1   Bailout / Undo Bailout (only when on CCR)
  - 1.2   GFs Off / Undo GFs Off
  - 1.3   Lost Gas (only when on OC or in bailout)
- 2   Silence Alarms (only available if any alarm is on)
- 3   Change Setpoint (only when on CCR)
- 4   Change Gas (only when on OC)
- 5   Review Runtime
- 6   Display
  - 6.1   Brightness
  - 6.2   Auto Dim
- 7   Stop Simulation (only if it is a simulated dive, not a real dive)

1. EMERGENCY

This submenu is meant for emergencies only. With the settings in it you can affect how XEO calculates your ascent schedule. You can familiarize yourself with them by using Simulate option in Dive Planning submenu.

1.1. Bailout / Undo Bailout

This option will appear in the menu if you are diving in CCR mode. By selecting this option you are informing your XEO that you have just switched to OC to bailout. The XEO will assume that you are now breathing your diluent in OC mode, and will also use all the other gases you have configured as Dive Gas or Deco Gas (see Gas Settings section) to plan your ascent.

You can reverse your bailout by returning to the EMERGENCY submenu and choosing Undo Bailout.

1.2. GFs Off / Undo GFs Off

This option is meant for a situation in which you need to get out of the water as soon as possible. It will remove any Gradient Factor-based conservatism you have set up, and will compute your ascent schedule with the bare Bühlmann ZH-L16C algorithm[1].

1.3. Lost Gas

If you have lost a gas that was to be used later for decompression, it is very important to use this menu option to mark it as "Lost". This will prevent this Lost Gas from being used in ascent schedule planning. If you fail to do this, your ascent schedule will be wrong, as the XEO will assume that you can still use that gas.

EXAMPLE: Let's say you are planning to use Air and Nx50 on your dive, and let's say your deco time would be 30 minutes on Air and only 20 minutes on Nx50. If you were to lose Nx50, but not mark it as "Lost", then your XEO would tell you that your total Time To Surface is 20 minutes, because it would think that you can still use the Nx50. However, as long as you keep your XEO set to Air throughout your decompression, the XEO will continuously adjust its calculations, and in effect will keep you decompressing for 30 minutes.

At first, the Lost Gas submenu displays only gases that are breathable at your current depth (including your current gas). If you select "Show All", it will display all Dive and Deco gases available, except for those that you marked as "Lost".

2. Silence Alarms

If an alarm is annoying you, *and you are confident that you should continue the decompression violation that is causing the alarm*, you can switch that alarm off. Choosing the "Silence Alarms" option will cause ALL of the alarms that are on at that moment to be silenced until the end of the dive.

Alarms you can silence are:
- Depth alarm
- Time alarm
- Ascent/Descent Rate alarm

Other alarms, i.e. deco ceiling alarm and gas-related alarms cannot be silenced.

For example, if you have exceeded your maximum depth and time alarm settings, both of these alarms will be on. If you choose to "Silence Alarms", you will turn both of these alarms off and neither of them will be displayed on this dive anymore – no matter what depth you go to or how long you stay there for. However, if you exceed your maximum ascent rate on the same dive, it will still cause an alarm.

Keep in mind that the descent and ascent rate alarms are the same alarm – if you silence the descent rate alarm on the way down, you will not see alarm go off if you ascend too fast on the way up!

> Use of the "Silence Alarms" option is discouraged. If you decide to use alarms, set, and then exceed them – this means you exceed limits of your dive plan, and put yourself at a very serious risk. Always dive your plan.

3. Change Setpoint

This menu item appears only when you are diving in CCR mode, and provided you are not bailing out.

In the surface menus, you can configure your "High" and "Low" setpoints (see Dive Setup menu item). If you are currently diving either the High or the "Low" setpoint, then only the alternate option will be displayed. This means that if you're at the "Low" setpoint, the first item will be High and, conversely, if you're at the "High" setpoint, the first item will be Low.

If you are currently diving a custom setpoint, both options will be displayed (High and Low).

Also, there is a "Custom Setpoint" option. By choosing it, you can change your setpoint to any value between 0.3 up to 2.0, in 0.1 increments.

4. Change Gas

This menu item appears only when you are diving OC, or when you are diving CCR in bailout mode.

In the surface menus, you can configure your gas settings (see Gases menu item). When you tap into this submenu, you will see list of gases that are allowed for the depth you're at. This list is based on:
- your min / max PO2 / END settings (see Deco Settings menu item), and
- your gas settings. A gas set in "Dive" mode will use "PO2 dive" as maximum PO2, while a gas set in "Deco" mode will use "PO2 deco" as maximum PO2

The gases will be listed from one with the highest content of O2 to the one with the lowest.
This list will only display gases that are configured as "Dive" or "Deco" gases.
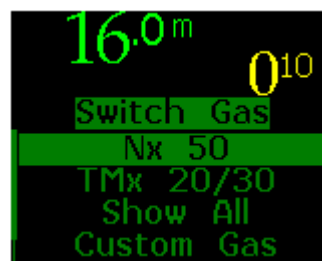
There is also an option to „Show All", that will display ALL available gases, in the order they are in the Gases menu. It will also include gases that are configured as "Backup" gases, and ones that you have set as "Lost" during your dive.

Finally, there is an option called "Custom Gas", with which you can configure an additional gas underwater. Doing this while diving is very troublesome, so we highly recommend that you take steps BEFORE the dive to avoid using this option. The best thing is to input every gas you and your buddies

are taking underwater. If your buddies use different gases than you do, then you should enter them as "Backup" gases and revert to them in case of an emergency.

5. Review Runtime

With this menu option, you can view your pre-planned runtime. It is the same runtime you have been editing in Runtime menu. It will highlight your current waypoint, based on the time of the dive. If you have deviated from your dive plan, this highlight is not reliable. Also, this runtime should NOT be used as deco information, only as a reference to original plan. If you overstay at depth, or otherwise deviate from your plan, this runtime becomes useless (it is not recomputed).

By tapping into any of the waypoints, you exit back to the dive screen.

6. Display

You can adjust a limited set of display features underwater.

6.1. Brightness

The "Brightness" setting has three levels – low, medium and high. The darker the water, the lower brightness you need to see your display clearly. Also, you might find high brightness in the dark water too bright – that is, it could be too much light, compared to environment you're diving in. On the other hand, in clear, shallow water, with lots of sunlight, you will need high brightness to see the display properly. Keep in mind that higher brightness burns more battery, so you should select the lowest brightness that meets your needs on a given dive.

6.2. Auto Dim

You can use the "Auto Dim" feature to fine-tune the brightness of your display. If you need high brightness on the surface and lower brightness at depth, you do not need to adjust it manually. Instead, you can set your "Auto Dim" setting to the depth at which you want your display brightness to be reduced to Low. By using the "Auto Dim" feature, here's what will happen:
- At the surface, display brightness will be at the setting chosen in the "Brightness" menu
- Once you reach your Auto Dim depth, and below, the brightness will switch to Low
- Between these two, the brightness will decrease linearly with depth (e.g., at half of the Auto Dim depth, it will be halfway between the surface brightness setting, and Low)

If you set your Brightness setting to "Low", the Auto Dim feature will have no effect.

The default Auto Dim setting is "Off". You can adjust it in 10m / 30ft increments.

7. Stop Simulation

This option is displayed only if you are "underwater" in a simulated dive (to learn more about dive simulation, please refer to the "Simulate Dive" section of the manual). In such a case, choosing this will immediately stop simulation, and return back to the surface menus.

DIVING WITH YOUR XEO

Dive Planning

Your XEO has a wide set of features that can assist you with your dive planning and preparation. You can configure the basic mode of the unit you are diving with ("OC" or "CCR" mode, refer to the "Unit" menu section), the gases that you plan to take with you on the dive (refer to the "Gases" menu section), as well as your decompression schedule (refer to the "Runtime" menu section). You can also configure various alarms (depth alarm, time alarm, and ascent/descent rate alarms – refer to the "Alarms" menu section). Finally, you can configure minimum and maximum gas parameters, last decompression stops (if you would like different last stops than the standard 3m, 6m, 9m/10ft, 20ft, 30ft.) and algorithm conservatism parameters, called *Gradient Factors* (refer to the "Deco Settings" menu section).

<div style="background-color: yellow;">

Never attempt to plan or undergo a decompression dive without proper training.

Do not use the XEO ascent schedule as a definite source of decompression information. The Dive Planning feature is provided ONLY as a way to predict the XEO's ascent schedule computed during dive, assuming you follow the dive plan perfectly.

Both the XEO Dive Planning and In-Water Decompression Calculations likely still have bugs. We have looked for them and tried to eliminate them, but they can still appear during use. Bugs can cause the unit to provide inaccurate or incomplete information, or cause the unit to reset or turn off and stop providing any information at all.

You should always check for software updates
(www.liquivision.com/downloads/XeoSoftwareHistory.php)
and install all applicable updates, every time you prepare to use the Xeo.

You must have a plan to handle a XEO dive computer failure during your dive. Do not risk your life on only one source of information.

</div>

Settings That Will Affect Your Deco Plan

The following settings affect the data your XEO will use to compute your ascent schedule, so please take a while to read and understand this section.

Dive Setup settings

In the "Dive Setup" submenu, you can choose the mode you wish to dive in – Open Circuit "OC" or Closed Circuit Rebreather "CCR". Please note that while OC features are included in the standard software of your XEO unit, CCR features require the purchase of an additional CCR Unlock PIN.

Settings related to OC Dives
When diving OC, one additional option you can set is Auto Switch – you can turn it "On" or "Off". When it is "Off", there will be no automatic gas switches – you will have to do every switch manually. When it is "On", your XEO will automatically switch gas to the Best Gas (see below, in Gas Settings), as long as following criteria are met:
- There is a Best Gas (that is, there is at least one gas that is breathable at your depth)
- And gas Manual Override is "Off".

Gas Manual Override Concept
Gas Manual Override is a feature that makes sure your XEO will not stubbornly switch your gas
to the Best Gas for your current depth, even though you switched gas manually to another gas.

Normally, according to the Best Gas concept, the Auto Switch would switch you to your Deco Gases
when you start the dive, until you exceed their respective MODs. Similarly, if you were to switch gas
manually, the Auto Switch would try to switch you back to your Best Gas.

To prevent this, we created Manual Override, which turns on every time you start a dive or switch gas.
The Manual Override turns off once you reach a depth where the gas you are actually breathing
becomes the Best Gas.

Here are some examples:
- If you start your dive with the Default Gas being Air, and a couple of Nitrox mixes as Deco Gases,
  Manual Override will be on. Manual Override will prevent your XEO's Auto Switch from switching
  you to any gas other than Air on your way down, until you reach the depth where only Air is
  breathable, i.e. where Air is the Best Gas.
- If you decide to switch to your first Deco Gas on a decompression stop slightly deeper than the
  MOD of that gas, your XEO will let you do so manually (although it will display a high PO2
  warning). It will not switch you back to Air, because Manual Override will be in place. When you
  ascend to the depth where that Deco Gas is breathable, i.e. where it is considered the Best Gas,
  Manual Override will turn off. This way, when you reach depth where the next Deco Gas is
  breathable, Auto Switch will switch you to that gas.
- If you decide NOT to switch to your first Deco Gas at the XEO-calculated switch depth, and your
  Auto Switch is on, you will have to wait until XEO switches automatically to the Deco Gas before
  you can switch back manually to your Dive Gas (thus activating Manual Override).
- Once you are ready to switch to your Deco Gas, you will have to do so manually. As soon as you do
  so, Manual Override will turn off again, since you will have selected gas that is considered the Best
  Gas at that moment.

Settings related to CCR Dives
When diving CCR, there is a larger set of settings to configure. First, you must set values for your
"Low" and High setpoints. You can set them to any value between 0.3-1.0 and 0.5-2.0, respectively, in
0.1 increments. The Low setpoint must be less than the "High" setpoint.

You can use these pre-configured Low and "High" setpoints to quickly change setpoints underwater
(this way, you don't have to create a new setpoint while underwater). These pre-configured setpoints
will be used to calculate your ascent schedules.

There are two more values related to these setpoints that you will need to configure: "On Descent" and
"On Ascent". "On Descent" allows you to configure at what depth you want to switch from the Low
setpoint to the High setpoint during your descent. "On Ascent" allows you to configure at what depth
you want to switch from the High setpoint to the Low setpoint during your ascent. If you follow a
different schedule – e.g., you spend all your bottom phase on the "Low" setpoint – you should turn
Auto Switch "Off".

Even when you turn your Auto Switch "Off", you should make sure to configure your "On Descent"
and "On Ascent" depths. Here is how they will affect ascent schedule:

- When the ascent schedule calculation starts, it considers your current setpoint, whatever it is.
- If your depth is at least the "On Descent" or deeper, the setpoint used to calculate your schedule will be High. This means that, if you are using the "Low" setpoint during your bottom phase, your XEO assumes that after you start your ascent, you will manually switch to High.
- When your depth on the schedule becomes equal or less than the "On Ascent" value, the setpoint on your schedule will be changed to Low.

If you choose your Auto Switch to be "On", it will switch your setpoint to:
- "High" if your current setpoint is Low (but not any custom setpoint), and the depth you are at is more than or equal to the "On Descent" depth.
- Low if your current setpoint is High (again, not any custom setpoint), and the depth you are at is less than or equal to the "On Ascent" depth.

Gas settings

In the Gases submenu, you can configure up to 10 different gases to be used during your dives. For each of these gases, you can specify the following: oxygen content, helium content, as well as a "Mode". The "Mode" setting defines how you plan to use this gas during the dive. Available modes are:

- Dive
- Deco
- Backup
- Off
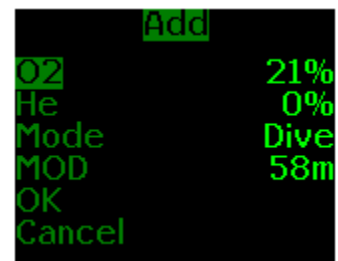
Setting a gas to "Off" means that you do not plan to use this gas at all during your current dive, but it gives you the option to easily turn it "On" in the future. The other gas modes are described below, together with few other labels XEO uses with respect to gases:

Best Gas – your XEO uses a "Best Gas" concept to determine the gas you ought to be breathing at a specific depth, both during Dive Planning and during Auto Switching while diving. To determine the "Best Gas", your XEO first reviews all the "Dive" and "Deco" gases you have set up for this dive (with the exception of any "Lost" gases). Then it chooses a subset of gases that are breathable at this depth – based on your min / max PO2 / END settings. Finally, it chooses one that has the highest content of oxygen among those gases – that is your "Best Gas".

Default Gas – the gas you set as "Default" is the gas your XEO will assume you are breathing the moment you begin the dive. You can later switch to other gases during your dive.

Default Gas Rules:
- Only one gas can be configured as the "Default Gas"
- There always has to be a "Default Gas"
- The "Default Gas" will always be a Dive Gas

If you remove a "Default Gas", or change its mode from "Dive Gas" to "Deco", "Backup" or "Off", the "Default" setting will be passed to the first Dive Gas on the list of gases. If there is no such gas configured, it will be passed to first gas on the list, and its mode will be changed to Dive Gas.

If you are in CCR mode, the Default Gas will be your diluent, and it will be impossible to switch diluent while diving.

Dive Gas – Dive Gases will be available for switches during the dive, and will be used in ascent schedule calculation. Their maximum PO2 is determined by the PO2 dive menu item.

Deco Gas – Deco Gases will be available for switches during the dive, and will be used in ascent schedule calculation. Their maximum PO2 is determined by PO2 deco menu item.

Backup Gas – Backup Gases will be available for switches during the dive, after choosing option "Show All" in the Change Gas underwater menu. A Backup Gas will be used in ascent schedule calculation only after you switch into it, and only until your ascent schedule reaches a depth where it can switch to another Dive or Deco gas. You can alter this by marking some of Dive or Deco Gases as "Lost" (see below).

A typical example of Backup Gases would be to configure the Gases your dive buddy is taking, but that you don't have. That way, you can quickly switch into them in an emergency.

Custom Gas – you can configure a Custom Gas during your dive, via the Change Gas underwater menu. It can take a lot of time to configure a Custom Gas underwater, so we urge you to avoid it as much as possible by pre-configuring any gases you may want to use on the surface, before your dive.

A Custom Gas will be used in ascent schedule calculation only after you switch into it, and only until your ascent schedule reaches a depth where it can switch to some other Dive or Deco gas. You can alter this by marking some of Dive or Deco Gases as "Lost" (see below).

Lost Gas – you can mark any of your Dive or Deco gases as "Lost", by entering the EMERGENCY-> Lost Gas underwater submenu. This gas will then no longer be suggested as a Best Gas, and will not be used in calculating your ascent schedule. You should use this option when you actually lose a specified gas, and do not expect to be able to use it on your ascent. You can still access this gas by choosing "Show All" in the Change Gas underwater menu.

Decompression planning

Your XEO runs the well documented and Bühlmann ZH-L16C algorithm[1], with optional Bias Factors available as a method of adding additional conservatism. It consists of three parts:

- *Actual decompression planning* – these calculations run continuously, including while you dive, stay at the surface, put your XEO to sleep, and so on, and their purpose is to track your current inert gas and oxygen saturation. Also, while you are diving, these calculations compute your ascent schedule based on the theoretical Bühlmann[1] model. Your ascent schedule information is displayed on your dive screen as Time To Surface, No Decompression Limit, Deepest Stop, etc. (more details on this in Dive Display section)
- *Simulated decompression planning* – these calculations only occur when you run Simulate Dive on your XEO. The Dive Simulator starts with your actual inert gas and oxygen saturation, but after that it tracks your simulated inert gas and oxygen saturation. Also, it follows the pressure implied by the dive simulation, and not the actual ambient pressure around you.
  After the simulated dive is finished, the simulated saturation is wiped out. If you start a new simulation, it will start again from your actual saturation. Also, the simulated dive will not, of course, affect your actual saturation.
  See also 4.7. Simulate Dive in the Dive Planning submenu, and 6.9. Simulate Dive in the Display Settings submenu for more information on the Dive Simulator.

- *Dive planning* – these calculations start with your current actual inert gas and oxygen saturation. If you are not yet fully desaturated from previous dives, then you can tell the Dive Planner to "wait" certain amount of time on the surface (equivalent to whatever time is left of your surface interval). The Dive Planner will assume your next dive will begin once your Remaining Surface Interval has elapsed, and it will compute your ascent schedule taking into account the Waypoints you set up and the saturations you would expect to reach based on these Waypoints. See also the Runtime submenu for more information.

Whenever you begin a dive, be it an actual dive, a simulated dive, or dive planning, your XEO will assume that you are using your Default Gas (see the Gas Settings section), which, when diving OC, is the gas that you are breathing at the start of your dive or, when diving CCR, is your diluent. Also, in the case of CCR diving, your XEO assumes that you start your dive using the Low setpoint.

Your gas or setpoint will change, during an actual dive or simulated dive, when:
  o You enter the main underwater menu and use the Change Setpoint or Change Gas options.
  o You enter the EMERGENCY underwater menu, and use the Bailout option. In bailout mode, you are considered to be diving OC and breathing your diluent as a gas. To change this, you can use Change Gas.
  o If the Auto Switch option is on, either in OC or in CCR mode, your current Gas or Setpoint may change as outlined in Settings That Will Affect Your Deco Plan.

Your gas or setpoint will change, during dive planning, when:
  o You manually enter a Switch (gas switch for OC, setpoint switch for CCR) – see Runtime submenu for details.
  o Your XEO computes ascent schedule – more on this below

When your XEO is computing your ascent schedule, it is assuming you will be changing your gas or setpoint on the way up, irrespective of the Auto Switch option.
- When diving OC, your gas will be updated always to the Best Gas for a specific depth of your ascent schedule. If there is not a single gas breathable at that depth – a hypothetical situation, which definitely is to be avoided – it is not changed. The Best Gas is chosen among all Dive and Deco Gases you have set up, that have not been flagged as "Lost".
- When diving CCR it does not change your setpoint, until:
  o Your depth at this point of your ascent schedule is below On Descent option – then, the setpoint will be changed to High.
  o Your depth at this point of your ascent schedule is above On Ascent option – then, the setpoint is changed to "Low".

Gradient Factors

Gradient Factors are a method used to increase the conservatism of the bare Bühlmann ZH-L16C algorithm. Gradient Factors range from 100/100 (bare Bühlmann ZH-L16C algorithm, no added conservatism) to 0/0 (most added conservatism). In fact, the 0/0 setting refers to decompression based only on the oxygen window effect (no tissue compartment supersaturation).

As an example, if we consider a 30/85 GF setting, then the first value "30" is the "Low" one (influences the deep portion of the dive), and "85" is the "High" one (influences the shallow portion of the dive).

Decreasing the "Low" value from 100 to 30, for example, adds conservatism in the deep part of the decompression, i.e. it might introduce additional deep stops, and lengthen the deepest stops' duration. Decreasing the "High" value from 100 to 85, for example, adds conservatism in the shallow part of the dive, i.e. it might substantially lengthen shallow decompression stops.

For more details on Gradient Factors, please refer to the publications in our Bibliography.

Oxygen loading

Apart from inert gas loading, your XEO also calculates your CNS (Central Nervous System) and OTU (Oxygen Toxicity Unit) loading. Your current CNS/OTU levels are easy to access through the Your Saturation menu item.

Both your CNS and OTU loading increases during your dive when the partial pressure of oxygen is above 0.5 bar. On the surface, your CNS loading decreases in a similar way to the inert gas loading – it has a 90 minute half-time. Your OTU loading, however, does not drop on the surface. Theoretically, you can accumulate certain amount of OTU over a period of up to 30 days, and your XEO uses the US Navy REPEX method to figure out how much more OTU can you accumulate on a given day.

You can view your CNS information and OTU remaining in two ways:

- Access the Your Saturation menu item. This will show you how much more OTU you have left for this day.

- Plan your next dive using the Runtime function. After you select "Compute Deco", a window will pop up showing, among other values, the OTU left for the day of that dive. If you plan a dive on the next day (which you can do by using "Remaining SI" option), then the OTU left will be displayed for day after that dive, not for today.

- If you exceed your CNS limit during the dive, you will see a Gas Alarm noting it: the blinking red PO2 label on the screen.

Entering the water

Turning Your XEO On

We recommend that you turn your XEO on yourself before you enter the water to check the remaining battery power and to make sure that all is functioning properly. You can turn it on by tapping the unit in the Down direction 3/5 times.

Otherwise, it will turn on automatically few seconds after you take it deeper than 1.6 meters / 5.25 feet.

Beginning Your Dive
When you start to descend and go below 1.6 meters / 5.25 feet, your XEO will turn into dive mode.

Dive Display

Currently, there is a single underwater display layout. You can edit the colors of all the items on your screen, although you should be careful to consider how the changes you make will impact battery consumption. Refer to the Colors menu item for more information on setting colors, and to the Important Information on XEO's Battery for impact of color on power consumption.

Dive Time
The large yellow number in the upper-right-hand corner of your display is the Dive Time.
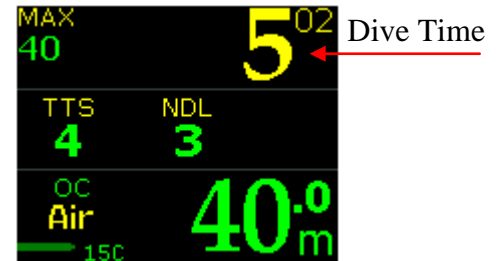
Dive time is measured in seconds, starting from the moment your XEO reaches 1.6 meters / 5.25 feet. It will stop once you surface, and it will reset once you have been on the surface for more than the Minimum Surface Interval.
Dive time can be displayed in several ways:

The minutes of your dive can be displayed as follows:
- minutes:seconds, e.g. 135:00
- hours:minutes:seconds, e.g. 2:15:00

Please refer to the "Show Hours" section of the manual for details.

The seconds of your dive can be displayed as follows:
- as a number, e.g. 135:00
- a graphical indication of the seconds elapsed: a bar display filling up to a full minute

Please refer to the "Analog Clock" section of the manual for details.
Depth
The green number in the lower-right-hand corner of the display is your Current Depth.

If you chose metric units, you will see the depth in meters, with one decimal place in smaller font.

If you chose imperial units, you will see the depth in feet, with no decimal places.
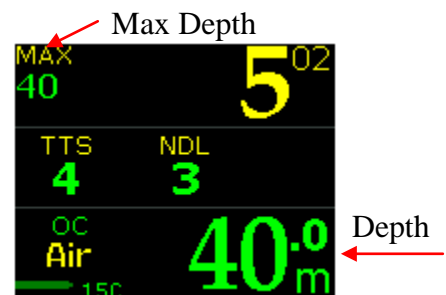
Please refer to the "Units" section of the manual for details on choosing units.

Maximum Depth
The label "MAX" refers to the maximum depth you have reached over your entire dive. It is displayed as a single number, without decimal places.

It is displayed either in meters or in feet, depending on your Units setting (refer to the "Units" section of the manual for details).

Your maximum depth will reset if you surface for more than the Minimum Surface Interval.

Decompression Information Zone
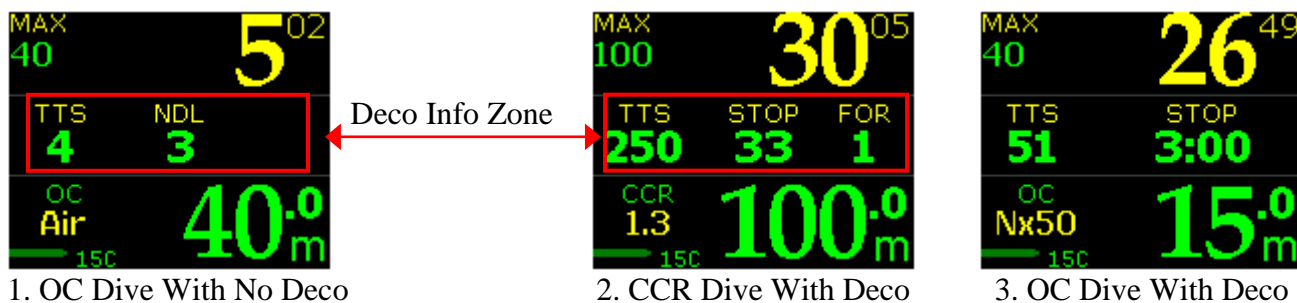The horizontal section in the middle of the screen is reserved for your decompression information. Each number in this section has an short name or label right above it. Here is a list of available data:

1. OC Dive With No Deco   2. CCR Dive With Deco   3. OC Dive With Deco

- TTS – Time To Surface is total time it should take you to get to the surface, if you were to precisely follow your XEO's ascent schedule, including all the stops and recommended gas switches. It is printed in minutes, and rounded up to the nearest minute.
- NDL – No Decompression Limit is the maximum time you can still stay at your current depth, before the XEO ascent schedule will include decompression stops. It is displayed in minutes, and rounded down to the nearest minute.
- STOP/FOR – Shown together (see Picture 2), this pair describes the deepest decompression stop on your XEO's ascent schedule. Below "STOP" there is depth of this stop (in meters or feet, depending on your Units settings), and below "FOR" is its duration, in minutes, rounded up to the nearest minute. If you are shallower than this stop, depth below "STOP" will be blinking to remind you to go back deeper.
- STOP – Shown as a stand alone value (see Picture 3), "STOP" shows the length of the deepest decompression stop on your XEO's ascent schedule when you are currently at this stop (that is, within 0.5m / 1.6ft from it). It is displayed in minutes and seconds, rounded up to 10 seconds.

Now these numbers are displayed in various configurations, depending on your depth and XEO ascent schedule.
- If your XEO's ascent schedule contains no decompression stops, TTS and NDL are displayed (Picture 1 above)
- If your XEO's ascent schedule contains decompression stops, but you are not at the deepest one at the moment, TTS and STOP/FOR are displayed (Picture 2 above)
- If your XEO's ascent schedule contains decompression stops, and you are at the deepest one at the moment, TTS and STOP are displayed (Picture 3 above)

Depth

Dive Setup
Based on your Dive Setup settings, the moment you begin your dive, your XEO will enter either OC or CCR dive mode. This will be displayed in the lower-left corner with either "OC" or "CCR". Furthermore, if during CCR dive you bailout (and indicate that by using Bailout menu option), this label will change to "BAIL".

Gas or Setpoint
When you are diving OC or CCR in Bailout Mode, below the type of dive (OC/BAIL) you will have your current gas displayed. It will be "O2" for oxygen, "NxXX" for nitrox (e.g "Nx50" for nitrox with 50% oxygen), "XX/XX" for trimix (e.g. "20/30" for trimix with 20% oxygen and 30% helium), or "Air" for air, that is, gas with 21% oxygen and no helium.

You can switch your current gas in Change Gas menu section.

When you are diving CCR with bailout mode off, below the type of dive (CCR) you will have your current setpoint displayed, with one decimal place.

You can switch your current setpoint in Change Setpoint menu section.

Gas Alarms
Gas alarms will be displayed in the same place as your gas or setpoint.

If you are diving OC, or CCR in Bailout Mode, then:

Your "Best Gas" is the gas with the highest content of oxygen, among gases that are breathable at your pressure (taking into account your min / max PO2 / END settings). If there is such a gas (i.e., there is at least one gas in your gas list that is breathable), and you are breathing different gas, then "Switch Alarm" is triggered. It is displayed as a "Blinking Gas Label".
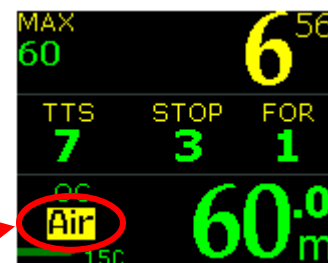
Furthermore, you can experience following alarms:
- **PO2** – is triggered if the gas you are breathing, at your current pressure, has either lower PO2 than your Min PO2, or higher PO2 than:
    - PO2 dive, if this gas is configured as Dive Gas
    - PO2 deco, if this gas is configured as Deco Gas
    - Both PO2 dive and PO2 deco, if this gas is configured as Backup Gas or Custom Gas
- **END** – it is triggered is gas you are breathing, at your current pressure, has higher END than than your configured Max END
- **OTU** – if you have exceeded your OTU limit, within the last few days (refer to Oxygen loading section to learn more about how XEO computes those limits)
- **CNS** – if you have exceeded your CNS limit (refer to Oxygen loading section to learn more about CNS tracking)

Each of the above alarms is displayed as a Blinking Gas Label, alternating with the red label of the alarm ("PO2", "END", "CNS"). If more than one of them is on, they will alternate as well.
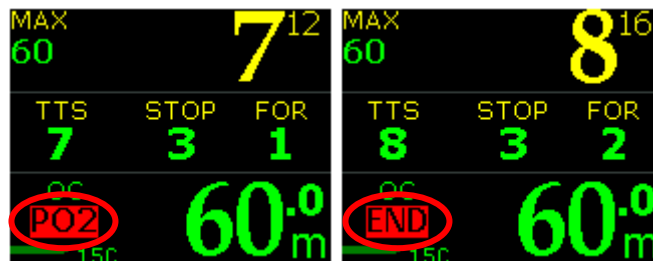
Temperature

The current temperature of the surrounding environment is displayed in the lower-left-hand corner, next to the battery indicator.

It is displayed either in Celsius or in Fahrenheit, depending on your Units setting (refer to the "Units" section of the manual for details). You will see a "C" or "F" letter next to the temperature value to let you know which units you have selected.
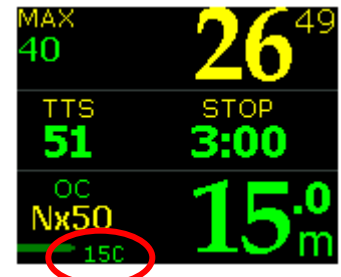
Keep in mind that the temperature sensor is inside the XEO unit, so it may take a moment for it to adjust to a rapid external temperature change.

The XEO will function when its internal temperature is between - 0 to 40°C (32 to 104°F). If the XEO's internal temperature exceeds 40°C/104°F (in direct sunlight, for example) the OLED display could show some visual disturbances. This is not a product failure – the display will return to normal when the unit is cooled down.

Battery Indicator

The battery status is represented graphically with a battery icon:

- The battery icon is solid green when the battery voltage is more than 3.30V.
- The battery icon is solid yellow when there is less than 3.30V left of battery power (about 2h of diving)
- The battery icon is solid red when there is less than 3.15V left of battery power.
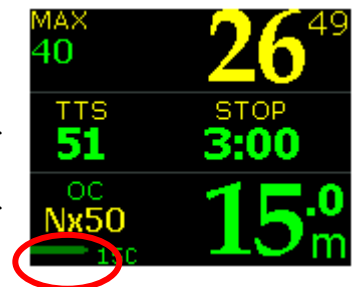
> You must change your battery immediately when the indicator turns red. Lithium batteries sustain high power for a long time, but once the power drops, it does so very fast. A red battery indicator shows that the battery power will drop to insufficient power within a few minutes.

Learn more about your XEO's battery in the section "Important Information About XEO's Battery".

"Battery Savings" mode

In the event that your battery is very low during the dive, your XEO will go into "Battery Savings" mode. It is a mode that tries to preserve the battery as much as possible, so that the XEO keeps functioning as long as possible. This mode changes the following things:

- all the information on the display will turn green (the color that is most power-economical)
- the display brightness will be set to low

For more details, please refer to Battery Savings Mode: When Your Battery Voltage Drops Below A Critical Level

Exiting the water

Once you are shallower than 0.6 meters / 2 feet, your XEO will go back into surface mode and offer you access to surface menus.

However, for next few minutes, it will remain in post-dive mode. You can control length of this period, in menu setting Minimum Surface Interval. This means that if you resume your dive within that period, it will be counted as continuation of previous dive, instead of a new one. This also means, that all the numbers, such as maximum depth, average depth, dive time, etc. will not be reset.

After that, if you decide to dive again, it will be counted as a new dive.

Last dive information
When on the surface, and not in Sleep Mode, your XEO will display information about the last dive that you have done.

Surface interval – it is time elapsed since your last dive. If it is less than 24 hours, you will see the number of hours and minutes. If it is more than 24 hours, you will see number of days and hours. If it is more than 10 days ago, you will not see any surface interval.

Last depth – is the maximum depth of your last dive, with one decimal place. Depending on your unit settings, it will be either in meters, or in feet, and you will see "m" or "ft" printed after the number.

Last time – is the total time of the last dive, displayed according to your dive time settings – either as total number of minutes, or as hours:minutes.

Altitude Compensation/Surface Pressure Adjustments
The XEO does not have a water sensor that can sense whether it is in the water based on "wetness".

Instead, your XEO continuously tracks atmospheric pressure to determine the surface pressure at the start of your dive. When it senses a sudden change in ambient pressure, it understands that you have entered the water and that a dive is beginning.

Your XEO can generally distinguish between a sudden change in pressure caused by water entry, vs. other types of sudden changes in pressure, such as a plane taking off, or driving up a mountain.

This method of surface pressure detection has proven quite reliable, but it is always possible to trick your XEO, for example:
- if you place your XEO in shallow and very stable body of water (such as a bucket full of dive gear being rinsed), your XEO may assume that current surface pressure is more than it is in reality. If you go diving immediately after this, your depth reading may be distorted.
- if you increase ambient pressure very quickly after the XEO has adjusted for being at altitude (e.g. if you were to skydive with a XEO), it might go into a phantom dive, as it will assume that you have entered the water. In this highly unlikely case, the only solution is to reset your XEO by removing the battery (please refer to the Changing The XEO's Battery section for details).

You can always check what XEO assumes as the current surface pressure by going to the "Status" screen (please refer to Status section for details).

CARING FOR YOUR XEO

The XEO is designed to be a robust device. However, it is still possible to damage it, or to shorten its life by improper use. Please follow these steps to care properly for your unit.

Post-Dive Care and Storage

You should turn off your XEO once you have completed your dive. It will eventually turn off on its own, but you will conserve battery power by turning it off once you are done using it.

You should rise your XEO in clear (non-salty) water after use, to prevent the accumulation of dried salt in the infrared apertures that communicate with the PC Interface and in the pressure sensor aperture.

You should then wipe your XEO dry and store it in a dry place.

Long-Term XEO Storage

If you are planning to store your unit for more than 1 month, you should remove the battery. This will only cause you to lose time of day and date information. All other settings and dive logs will remain.

We do not recommend removing your battery for shorter storage periods. Every time you open and close the battery compartment, there is a small risk of doing so improperly, opening the possibility of flooding the battery compartment.

Replacement Battery Storage

You should generally have at least one spare battery on hand, to make sure you have the possibility of changing your battery should the situation require you to do so.

Spare batteries should be stored in a cool, dry place, away from direct sunlight.

Service information

While we feel confident of the ongoing accuracy, European (CE) regulations require the unit to be periodically checked for the accuracy of its depth and time readings.

You may contact your dealer regarding testing every 5 years.

IMPORTANT INFORMATION ABOUT XEO's BATTERY

XEO Battery Type

The Liquivision XEO uses one ER14335M lithium 3.6V battery. Only ER14335M batteries are authorized for use with your XEO. ER14335 batteries (no M) are NOT compatible. Only the batteries contained in Liquivision battery packs can be guaranteed to perform to Liquivision standards.

We strongly recommend always having a spare battery on hand, since spare batteries have a long shelf life and do not require any special storage environment (just dry and away from direct sunlight or heat).

Spare batteries are sold as follows:

Battery 1-Pack   **Battery 3-Pack**
 - 1 ER14335M battery   **-** 3 ER14335M battery
 - 1 spare O-ring   - 3 spare O-rings
                                                                  - 1 resealable tube of O-ring lubricant

XEO O-rings

You should inspect your battery cap O-ring with every battery change. Check for cracking, damage or dirt. If you choose to replace your O-ring, always make sure to clean the battery cap properly to remove any residue that may prevent a good seal and to lubricate the new O-ring with silicone O-ring lubricant. Only O-rings contained in Liquivision battery packs can be guaranteed to perform to Liquivision standards.

To order spare batteries and O-rings for your XEO, please contact your local Liquivision dealer.

How To Determine XEO Battery Life Remaining

The ER14335M XEO batteries can provide up to 41 hours of dive time with your unit (low brightness, green font, battery used within a month of initial use), although 20-30 hours is more typical if you use the standard Liquivision color scheme on medium brightness and all the dives are done within a month of first using the battery.

Battery life is shown by the battery indicator on your XEO.
 - A **Green** indicator means that you have enough battery power to complete a normal 2 hour dive. The safest way to perform a long dive (5+ hours) is to insert a fresh battery prior to the start of your dive.
 - A **Yellow** indicator means a battery change is strongly recommended.
 - A **Red** indicator means that you must immediately change your battery.

You should always check the battery life remaining on the surface, prior to beginning your dive, **by briefly entering simulator mode with your unit.** Your XEO uses more power in dive mode than in surface mode. It may show a green indicator in surface mode, but a yellow one in dive mode and you can check this by starting a dive simulation.

Once the battery voltage drops well below red zone, the unit will enter power failure mode. If that happens, you need to change the battery and wake up your unit with taps – it will perform a software check to make sure that a new battery is in place.

The discharge curve of lithium-thionyl-chloride batteries is very flat, with a very sudden drop-off, as shown in the graph below.
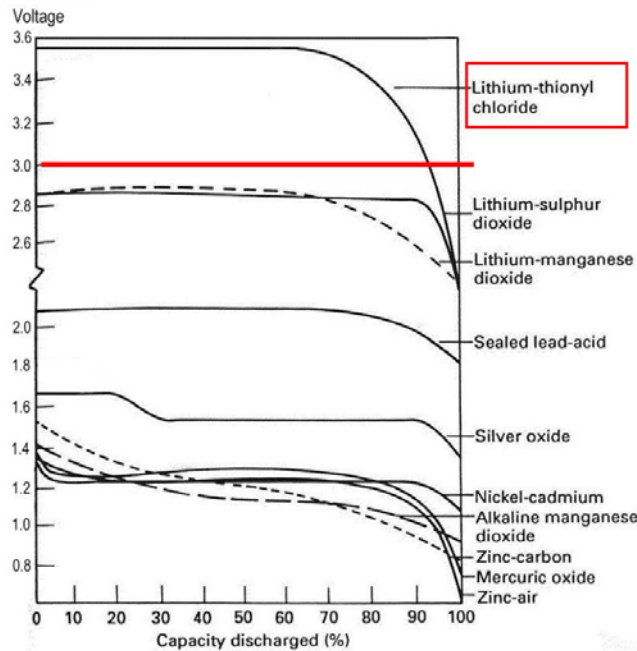
This means three things:

 - It is hard to estimate level of charge: The battery shows a steady 3.6V for most of its life - there is no slow battery voltage decrease that can inform your XEO about the amount of power that has been used and the amount of power left.

 - It is hard to estimate the amount of time left. Even if your XEO knew exactly how much battery power is left, it is still hard for your unit to judge how much dive time is left. Dive time will be greatly affected by user settings such as **screen brightness** and **colors**.

 - Once the battery voltage starts to drop, it drops fast. Your XEO will stop functionning entirely once the voltage drops below 2.90V. For this reason, it is important to pay attention to the **Yellow** battery indication - it means there is really very little time left.

Basic Rules For Optimizing Battery Life

You can extend/optimize your battery life in several ways:

 - Always choose the lowest screen brightness setting you need for your dive. The XEO has an "Auto-Dim" feature, where the unit uses your chosen brightness setting on the surface, and slowly reduces brightness to Low as you descend to a selected depth.

 - Keep battery life in mind when setting screen colors. The OLED screen is an RGB screen, which means it has red, green and blue pixels. To display the color green, for example, it only needs to light up one pixel - the green one. To display any other colors, the screen must light up a combination of pixels. To display white, it must light up three pixels, full-force. Therefore, the most economical display colors would be red, green and blue. The least economical display color is white. The standard Liquivision display color scheme is designed to balance readability with economical battery use.

Detailed Rules For Optimizing Battery Life

1. Brightness. Brightness has the biggest effect on battery life. As a general rule, HIGH brightness gives you HALF the battery life compared to MEDIUM brightness. Similarly, MEDIUM gives you HALF the battery life of LOW. This means that LOW brightness gives you FOUR TIMES more battery life than HIGH brightness. The best way to optimize battery life is the "Auto Dim" feature.

2. Colors. Colors have a dramatic impact as well. Primary colors (pure green, pure red, dark blue) consume the least battery power. Compound colors such as yellow, orange, and gray burn more battery power. Compound colors (those that require all three colors), such as light blue and light gray, burn the most battery power. You should use compound colors with caution.

3. Refresh rate. The refresh rate changes how fast information is updated on the screen. It has two settings, "Normal" and "Fast". If you can use Normal and you don't notice anything, that is the best choice. If you use Normal and you find that you can see the screen flickering when you move the unit, then select Fast. Also, if you plan on taking any pictures or video of the XEO, select Fast.
The Fast refresh rate burns about 20% more battery power than Normal. So battery life on "Fast" is reduced by about 20%.

4. Display mode. The display mode (standard, alternate, simple) has a small effect on battery life. Simple burns the least power. Alternate burns 10-15% more than simple. Standard burns 10% more than alternate.

5. Water temperature. Diving in cold water (water temperature below 12°C / 54°F) shortens the life of your battery. We strongly recommend using conservative colors and brightness settings when diving in cold water to maximize your battery life.

Battery Savings Mode: When Your Battery Voltage Drops Below A Critical Level

The XEO circuit requires a minimum voltage in order to measure the depth properly. In certain cases of aggressive brightness, aggressive colors, or extremely cold water, the voltage of the battery may drop below a critical voltage. Below that critical voltage, it is no longer possible to measure depth accurately. If that happens, the XEO will automatically switch into "Battery Savings Mode": all colors will be changed to green, and the brightness will be changed to low. The refresh rate will not be changed.

Battery Savings Mode is an emergency mode designed to raise the voltage of the battery to an acceptable level. The unit will remain with green colors and low brightness until the dive ends. When the next dive starts, your custom colors and brightness will be used. Again if the voltage drops below a critical level, Battery Savings Mode will be entered to raise the battery voltage.

If you find that your unit is repeatedly entering into Battery Savings Mode (all green text), then you are using too aggressive colors or brightness settings. Entry into Battery Savings Mode is more likely if the battery is nearing the end of its life, or if the water is very cold. However, entry into Battery Savings Mode does not necessarily mean the battery is nearing the end of its life. In some cases you could still have 10-20 more hours of dive time remaining, even if you notice a transition into Battery Savings Mode.

Tables Showing Estimated Battery Life Depending On User Settings

The following tables shows the approximate number of dive hours achieved with different settings, assuming the diving is done within one month of changing the battery, in warm water:

Table 1 (Default yellow/green colors, Standard Display Layout, diving over 1 month)

	High Brightness	**Medium Brightness**	**Low Brightness**
Slow refresh	11.7h	23.2h	38.1h
Fast refresh	10.3h	19.0h	31.2h

Table 2 (Custom Colors, Standard Display Layout, diving over 1 month)

	High Brightness	**Medium Brightness**	**Low Brightness**
All green, slow refresh	12.9h	23.4h	41.4h
All light blue, fast refresh	6.3h	12.2h	23.5h

As you can see, the dive hours on a battery vary from about 6 hours to 41 hours based on the settings.

The longest battery life is obtained by using all green colors and slow refresh rate. This gives about 41 hours of diving over 1 month.

The standby battery life of the XEO is about 5 months. If you are not going to use the XEO for 1 month or more, you should remove the battery during storage.

CHANGING THE XEO's BATTERY

Here is a description of the battery change and O-ring change procedure. You can also refer to the short video on correct battery changes provided here: www.liquivision.com/videos.php

1. Make sure your work area is dry and clean.
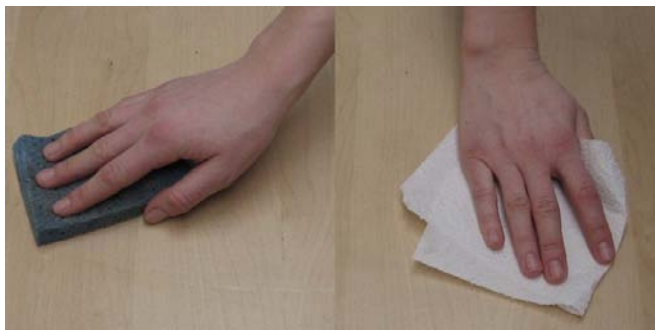
2. Prepare all your materials:

For keeping XEO & O-ring clean:
 - Lint-free cloth
   (e.g. cloth for cleaning your eye/sunglasses)
 - Glove

For battery change:
 - Spare battery
 - Coin (to unscrew battery cap)

For O-ring change:
 - Spare O-ring
 - O-ring lubricant

3. Clean your XEO unit

 - Wash of any salt or other residue
 - Dry the unit
 - Wipe off any dust or lint with a lint-free cloth

4. Unscrew the battery cap with a coin

- Gently turn counter-clockwise

5. Continue with your fingers

6. Place the battery cap aside, on its back

7. GENTLY pull the battery holder out

- Use your fingers to grab the little screw sticking out of the battery holder
- GENTLY pull the battery holder out of the casing

-☞ Pulling too hard can break the wires!!!

8. Pull out just enough to access the battery

- ☞ DO NOT pull out all the way! It can break the wires!

9. Remove the old battery

- Lift at the front of the battery, away from the spring

10. Insert new battery

- Flat end against the spring in the back
- "Bumpy" end in the front

11. Slide battery holder back in CORRECTLY

CORRECT:
- The black wire is in line with bottom of the XEO case (as shown by red line), and
- The two green "edges" of the battery holder are parallel to the blue line (about 90° to red line)

INCORRECT: in any other position, the battery holder will not slide into the casing all the way.

12. The battery holder should go in deeply

- A correctly inserted battery holder should slide deep into the casing.
- The top of the battery holder should be in line with the lowest battery cap thread, shown with a dotted red line in the picture

CORRECT   INCORRECT

OPTION 1 – CHANGE O-RING
If the O-ring looks dry, cracked or worn, you may like to change the O-ring in the battery cap. If you wish to do this, continue with Step 13.

OPTION 2 – DON'T CHANGE O-RING
If the O-ring is still in good shape, please skip to Step 18.

13. Remove O-ring by squeezing with fingers

 - Slide your fingers along the sides of the battery holder, squeezing tightly, to make the O-ring stick out a bit
 - Then, grab the edge of the O-ring and slide it off

DO NOT USE PLIERS

 - ☝ DO NOT use pliers or any tool to remove the O-ring, because you can scratch the casing plastic and damage it. This can prevent a good O-ring seal in the future.

14. Inspect the new O-ring for dust or defects

 - ☝ DO NOT use a dusty O-ring!
 - If the new O-ring is not clean, wash it with clear water and let it air-dry

15. Lubricate the new O-ring

 - Use silicone O-ring lubricant
 - Apply a tiny amount to a dry O-ring (it will not absorb properly if the O-ring is wet)
 - Roll the O-ring between your fingers to spread the lubricant
 - Remove any excess lubricant with your fingers

16. Ease O-ring onto battery cap

 - Starting at one side, gently ease O-ring over the battery cap

17. Check again for any dust or debris

 - Remove any debris
 - If there is something really stuck to the O-ring, better remove it, clean it and start again

18. Also check the casing for dust or debris

19. Screw in the battery cap
1. Place the cap lightly in the opening
2. **First…**Turn counterclockwise until it "clicks" – this will help align the threads.
3. **Then…** turn clockwise to tighten the cap.
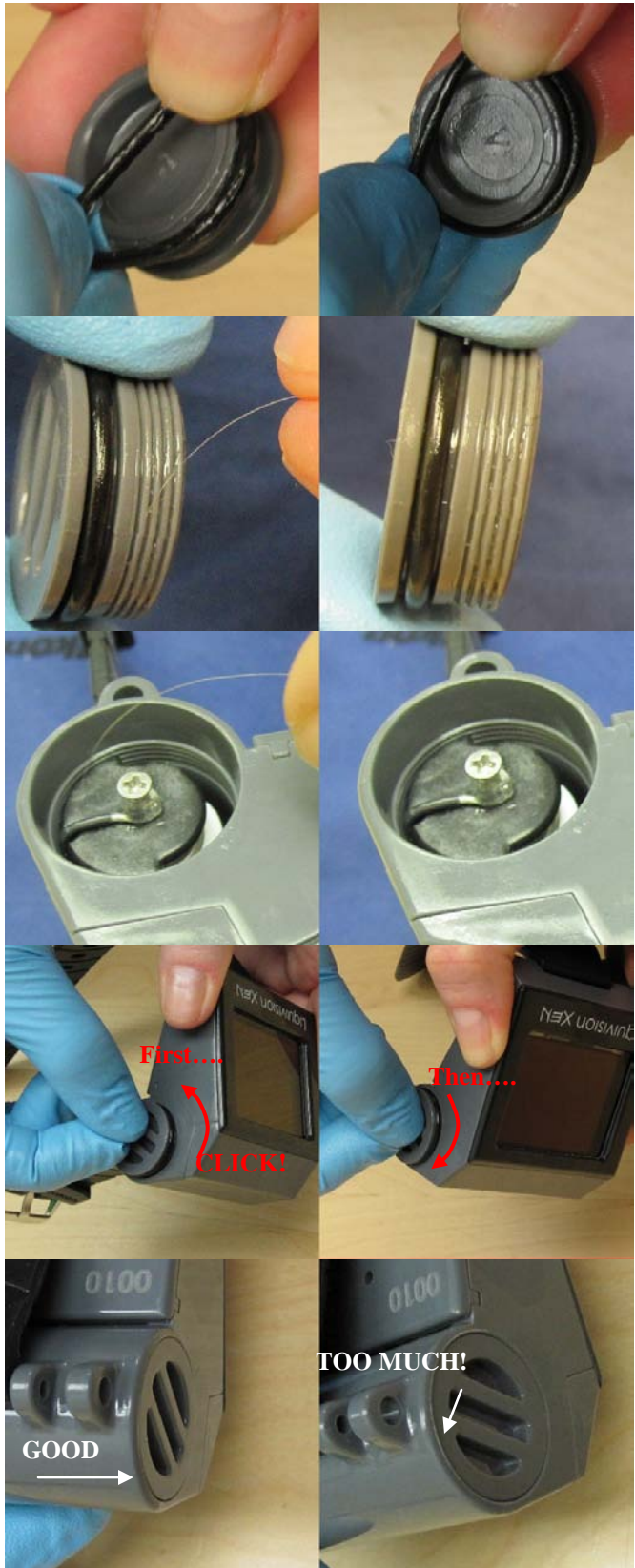If something feels wrong, stop and start again.

- ☞ DO NOT force the cap – your could damage the threads!

DO NOT Overtighten!

The battery cap should be flush (in-line) with the surface of the XEO unit.

☞ DO NOT screw the cap in too far!!!

YOU ARE DONE!!!

XEO PC INTERFACE

The XEO PC Interface can be used to download your dives and to update your XEO software. This requires a few different steps.

1) Install Drivers onto your PC, so your PC knows how to "talk" to the PC interface.
2) Install the Liquivision Dive Logger onto your PC, so your PC knows how to interpret the dive log data emitted by the XEO.
3) Install the Liquivision Firmware Updater onto your PC, so your PC knows how to transmit a Firmware Update to your XEO
4) Install Liquivision Firmware Updates onto your XEO.

We will walk you through all these steps in some detail, with links to all the relevant downloads.

> **IMPORTANT - Installing new software on your Xeo may reset your unit's memory. For this reason, prior to starting the install, you should make sure:**
> You have downloaded any dive logs
> You have your free Xeo Unlock PIN Code available
> You have your paid Xeo CCR Unlock PIN Code available, if you purchased it

First, You Need To Install Drivers Onto Your PC

Before you can download dive logs or upgrade your XEO firmware, you need to download and install the appropriate drivers for your PC or Mac. The drivers are made by FTDI. If you are technically-minded and want more information on them, you can visit www.ftdichip.com.

Make sure that your XEO PC interface is NOT plugged in to your desktop computer. If it is plugged in, then please UNPLUG it before proceeding.

PC Drivers: Internet Explorer
- Click here to download the driver install package. (http://liquivision.com/downloads/XENXEODriversSetup.exe)
- You will be asked if you want to "Run" or "Save" the program. Click "Run."
- The file will download and launch.
- The drivers will be installed. You will briefly see a black window pop up and then disappear.
- If you do NOT see the black command window pop up for several seconds, then please repeat the process.
- Once the black command window has appeared and finished (disappeared), then plug in the XEO PC interface into your desktop computer. Plug the USB cable into the XEO PC interface box, and then plug the other end of the USB cable into your PC. The "Found New Hardware" wizard will launch. Click "Do not connect to the Internet", and continue the prompts. At the end, Windows should inform you that your "New Hardware is Ready to Use."

PC Drivers: Firefox
- Click here to download the driver install package. (http://liquivision.com/downloads/XENXEODriversSetup.exe)
- You will be asked if you want to save the file. Click "Save File."
- The downloads window will pop up (if it does not, go to Tools->Downloads)

- The top item in the downloads window will be "XENXEODriversSetup.exe". Double click on it.
- You will be asked "Are you sure you want to launch XENXEODriversSetup.exe"? Click OK.
- The drivers will be installed. You will briefly see a black window pop up and then disappear.
- If you do NOT see the black command window pop up for several seconds, then please double click on "XENXEODriversSetup.exe" for a second time, in the downloads window.
- On some computers, anti-virus software will clear the download window automatically. If that is the case on your computer, you will need to browse to your personal downloads folder, and launch XENXEODriversSetup.exe from there directly.
- Once the black command window has appeared and finished (disappeared), then plug in the XEO PC interface into your desktop computer. Plug the USB cable into the XEO PC interface box, and then plug the other end of the USB cable into your PC. The "Found New Hardware" wizard will launch. Click "Do not connect to the Internet", and continue the prompts. At the end, Windows should inform you that your "New Hardware is Ready to Use."

PC Drivers: Google Chrome
- Click here to download the driver install package.
  (http://liquivision.com/downloads/XENXEODriversSetup.exe)
- When the download is finished, a tab will appear in the far lower left corner of Chrome.
- Left click on the "XENXEODriversSetup.exe" tab that appears in the far lower left corner of Chrome.
- You will be prompted to run the program, click "Run."
- The drivers will be installed. You will see a black command window pop up and then disappear.
- If you do not see the black command window, please click on the "XENXEODriversSetup.exe" tab on the lower left of the screen, for a second time.
- Once the black command window has appeared and finished (disappeared), then plug in the XEO PC interface into your desktop computer. Plug the USB cable into the XEO PC interface box, and then plug the other end of the USB cable into your PC. The "Found New Hardware" wizard will launch. Click "Do not connect to the Internet", and continue the prompts. At the end, Windows should inform you that your "New Hardware is Ready to Use."

Mac-OSX Drivers
The drivers can be downloaded from FTDI's website by clicking here.
(http://www.ftdichip.com/Drivers/D2XX/MacOSX/D2XX1.0.4.dmg)

Advanced Users
If you are an advanced PC user and would like more information, click here
(http://www.ftdichip.com/Drivers/D2XX.htm) to visit the FTDI's website, and select your OS and install the latest version of the D2XX drivers manually.

Then You Can Install the Liquivision Dive Logger Onto Your PC
The Liquivision Dive Logger program allows you to download your dive logs from your XEO. In order to use it you must have the XEO PC interface device and the FTDI drivers must be installed on your computer (as described above).

PC Dive Logger: Internet Explorer
- Click here to download the Liquivision Dive Logger installation package.
  (http://liquivision.com/downloads/LVDiveLogSetup.exe)

- You will be asked if you want to "Run" or "Save" the program. Click "Run."
- The file will download and the install wizard will launch.
- Follow the wizard and the Liquivision Dive Logger software will be installed.
- The wizard will install a shortcut to the Liquivision Dive Logger on your desktop. To launch the logger, double click on the shortcut. Create a username for yourself, and you're ready to go!

PC Dive Logger: Firefox
- Click here to download the Liquivision Dive Logger installation package. (http://liquivision.com/downloads/LVDiveLogSetup.exe)
- You will be asked if you want to save the file. Click "Save File."
- The downloads window will pop up (if it does not, go to Tools->Downloads)
- The top item in the downloads window will be "LVDiveLogSetup.exe". Double click on it.
- You will be asked "Are you sure you want to launch LVDiveLogSetup.exe"? Click OK.
- Follow the wizard and the Liquivision Dive Logger software will be installed.
- The wizard will install a shortcut to the Liquivision Dive Logger on your desktop. To launch the logger, double click on the shortcut. Create a username for yourself, and you're ready to go!

PC Dive Logger: Google Chrome
- Click here to download the Liquivision Dive Logger installation package. (http://liquivision.com/downloads/LVDiveLogSetup.exe)
- When the download is finished, a tab will appear in the far lower left corner of Chrome.
- Left click on the "LVDiveLogSetup.exe" tab that appears in the far lower left corner of Chrome.
- You will be prompted to run the program, click "Run."
- Follow the wizard and the Liquivision Dive Logger software will be installed.
- The wizard will install a shortcut to the Liquivision Dive Logger on your desktop. To launch the logger, double click on the shortcut. Create a username for yourself, and you're ready to go!

Mac-OSX Dive Logger
The Mac-OSX version of the Liquivision Dive Logger program will be available once we release the XEO (currently expected end July 2011).

How To Connect the XEO PC Interface To Your Computer

- Connect the USB cable provided to your PC and to the PC Interface
- At this point, you should get a message "New Hardware Detected"
- Place the XEO unit on its side, with the PC interface aiming for the eight holes on the backplate
- The distance from the PC interface to the XEO should be 2-4 cm or 1-2 inches

How To Launch A Dive Log Download

You can download your dive logs onto your PC, either by using the Liquivision Dive Logger or any other available dive logging program that supports downloading logs from your XEO bottom timer. To download your dives, first:

- Make sure the XEN/XEO FTDI drivers have been installed on your computer (Instructions).
- Make sure the Liquivision Dive Logger has been installed on your computer (Instructions).
- Then launch the Dive Logger program by double-clicking on the shortcut on your PC desktop.
- Make sure the XEO PC Interface is properly connected to your computer (Instructions).

Then, pretty quickly:
- Pick up your XEO and turn on its wireless transmitting function:
    - tap it three times to wake it up
    - tap it three times again to enter menu mode
    - tap down through the menu options until you reach "Connect To PC"
    - tap the side of your XEO to select this option
    - you will see a message "WAIT FOR PC"

- Replace your XEO in alignment with the PC Interface.
- Return to the Dive Logger Software and turn on its transmitting function:
    - Select "Computer" from the top menu
    - Select "Connect"
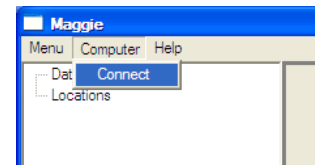
You should see a window like this pop up:
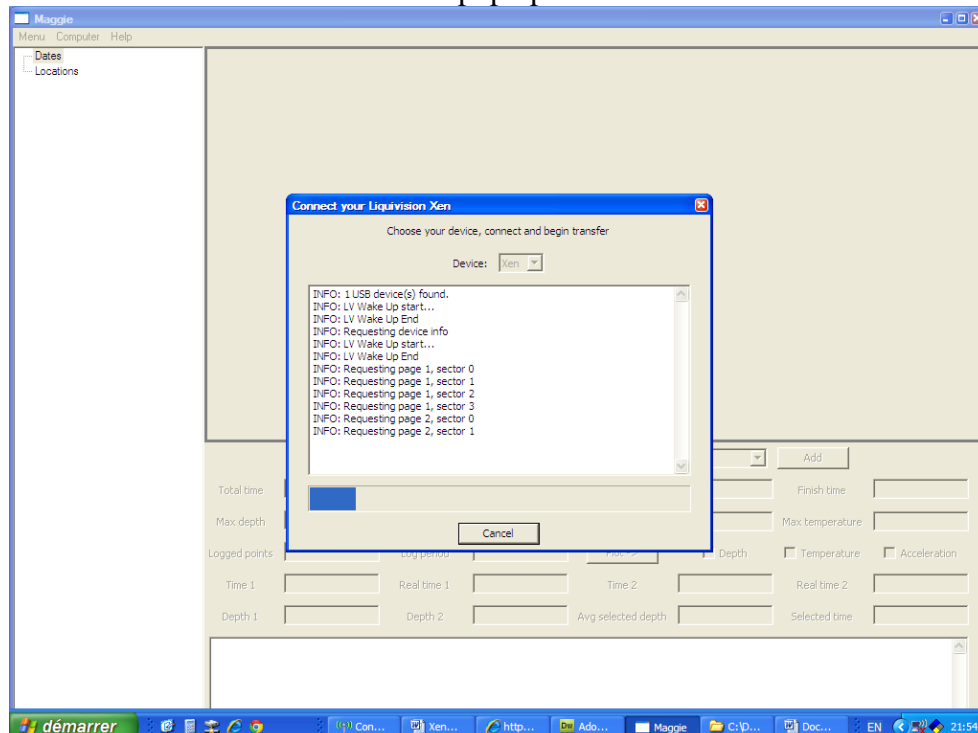
How To Install The Liquivision Firmware Updater Onto Your PC

In order to update the firmware inside your XEO, you need the XEO PC interface device, and you need to install a utility called the "Liquivision Firmware Updater." If you do not have a XEO PC interface and you would like to update the firmware on your unit, your dealer should be able to do it for you.

PC Firmware Updater: Internet Explorer
- Click here to download the driver install package. (http://liquivision.com/downloads/LVFirmwareSetup.exe)
- You will be asked if you want to "Run" or "Save" the program. Click "Run."
- The file will download and the install wizard will launch.
- Follow the wizard and the Liquivision Firmware Updater will be installed.

PC Firmware Updater: Firefox
- Click here to download the driver install package. (http://liquivision.com/downloads/LVFirmwareSetup.exe)
- You will be asked if you want to save the file. Click "Save File."
- The downloads window will pop up (if it does not, go to Tools->Downloads)
- The top item in the downloads window will be "LVFirmwareSetup.exe". Double click on it.
- You will be asked "Are you sure you want to launch LVFirmwareSetup.exe"? Click OK.
- Follow the wizard and the Liquivision Firmware Updater will be installed.
(If for some reason the downloads window is empty, then browse to the location that Firefox stores downloaded files, and double click on LVFirmwareSetup.exe from there).

PC Firmware Updater: Google Chrome
- Click here to download the driver install package. (http://liquivision.com/downloads/LVFirmwareSetup.exe)
- When the download is finished, a tab will appear in the far lower left corner of Chrome.
- Left click on the "LVFirmwareSetup.exe" tab that appears in the far lower left corner of Chrome.
- You will be prompted to run the program, click "Run."
- Follow the wizard and the Liquivision Firmware Updater will be installed.

Mac-OSX Firmware Updater
The Liquivision Firmware Updater (Mac-OSX version) should be available once we release the XEO (currently expected end July 2011). Prior to then if you want to upgrade your firmware, you will need to use a PC or have your dealer upgrade your software.

How To Install the Newest Firmware On Your XEO

You should always run the latest and most recent software on your XEO. You may already have the latest version, which makes an upgrade unnecessary. You can find out which version you are running and whether you need to upgrade by checking the XEO Software History (http://liquivision.com/downloads/XEOSoftwareHistory.php). Some early versions of the software have minor bugs which were fixed in later versions.

If you have determined that your software should be upgraded, follow the steps below. For starters:
- Make sure the XEN/XEO FTDI drivers have been installed on your computer (Instructions).
- Make sure the Liquivision Firmware Updater has been installed on your computer (Instructions)
- Connect the XEO PC interface to your computer with the included USB cable (Instructions)

PC: Internet Explorer Firmware Install
- Click XEO Software History to download the latest XEO firmware. The first file at the top of the page will be the most recent version.
- You will be asked if you want to "Open" or "Save" the program. Click "Open."
- The file will download and the Liquivision Firmware Updater will automatically launch.
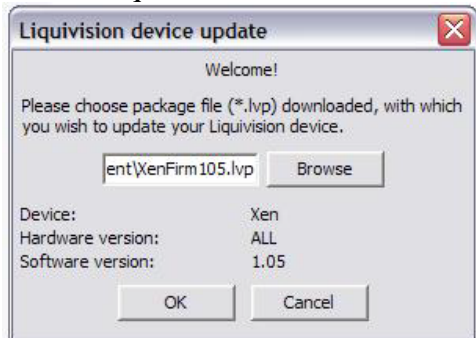- You should see something like this:

Click OK, then click UPLOAD.
For further instructions, please see the "All Users" section, below.

PC: Firefox Firmware Install
- Click XEO Software History to download the latest XEO firmware. The first file at the top of the page will be the most recent version.
- You will be asked to open the file with the suggestion "liquivision.lvp". Click Open then OK.
- The Liquivision Firmware Installer should launch and you should see something like this:

Click OK, then click UPLOAD.
For further instructions, please see the "All Users" section, below.

PC: Google Chrome Firmware Install
- Click XEO Software History to download the latest XEO firmware. The first file at the top of the page will be the most recent version.
- When the download is finished, a tab will appear in the far lower left corner of Chrome.
- Left click on the "XEOFirmware.lvp" tab that appears in the far lower left corner of Chrome.
- You will be prompted to open the file, click "Open."
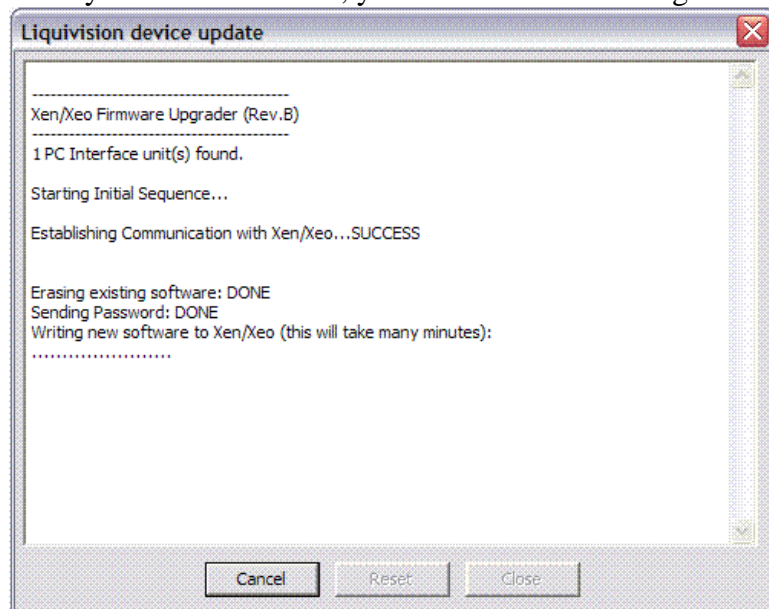
- You should see something like this:
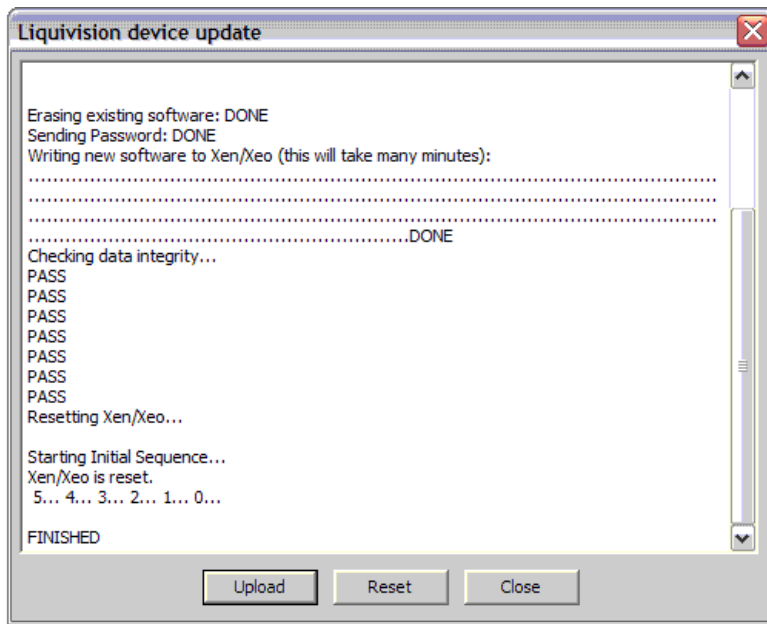

Click OK, then click UPLOAD.
For further instructions, please see the "All Users" section, below.

All Users
Once you click UPLOAD, you should see something like this:

After several minutes of further data transfer, the install will finish and you should see this:

If you do NOT see the seven words "PASS" as shown above, or six words "PASS" followed by a "FAIL" (this is OK too) then the install did not succeed and you should try again.

If the install succeeded, you should now be able to pick up your XEO and use it. To verify that the install succeeded, enter the main menu, and go to Preferences->Status, and the software version should be the same as the version that you tried to install (i.e. 1.09 or something like that).

SUPPORT CONTACTS

For general information, please visit www.liquivision.com.
If you need immediate assistance, we recommend that you contact your XEO dealer.
If you need futher help, please contact us via: www.liquivision.com/contact.php .

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