ap diving

built for adventure

2020VISION
Colour Display

User Instruction Manual

NOTE: Due to the limitations of the print process, the colour screen images in the printed user manual appear very dull compared to the bright, vivid reality of the product. For better facsimile please view the manual on PC/Mac screen.

Contents

⚠ **WARNING:** These user instructions do not replace the AP Diving Rebreather Manual in any way and do not explain the full rebreather functionality. These instructions will detail the 2020 VISION Colour Display as part of the rebreather system only.

⚠ **WARNING:** The 2020 VISION Colour Display is a sealed unit and no attempt should be made to disassemble the housing in any way. Trying to do so could cause irreversible damage to the display and electronics.

The 2020VISION Colour Display

The AP 2020VISION Colour Display (RBV11) is a 2.8" full colour, high contrast display that shows the diver real-time PPO_2 fed directly from the rebreather's two independent oxygen controllers. The Colour Display incorporates all the features of the previous monochrome display with the addition of new features to enrich the user's diving experience. Familiar features are carried forward such as programmable gas mixes, intuitive operation and continuous ceiling Bühlmann decompression with gradient factor adjustability; complimented with new features such as the large format high resolution display with larger fonts and icons, expanded memory, selectable colour themes, to name just a few. All within a smaller but durable aluminium housing with scratch resistant ionised glass lens which is pressure resistant to 200m.

The 2020 VISION Colour Display has been specially developed for use with AP Diving's range of rebreathers equipped with Vision electronics. It is intended as a factory fitted upgrade for existing customers as well as a standard item with new AP rebreathers.
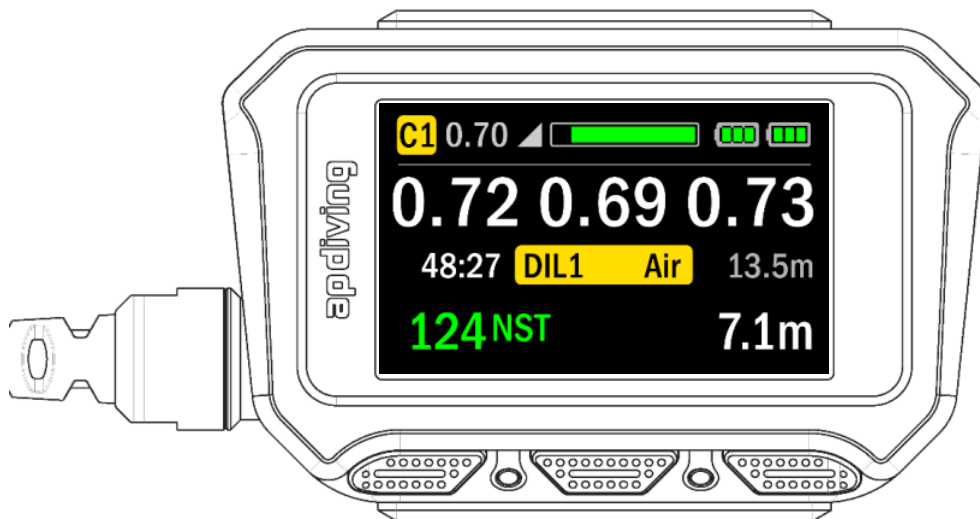
The full-colour display conveys all the key rebreather information with the added benefit of conditional colouring to highlight the current status of the information provided. Due to its size, brightness and clarity it can be read in very low visibility conditions and is excellent for those who may need to compensate for poor eyesight underwater.

It can be mounted on the wrist using an adjustable elasticated strap or clipped to the diver using the aluminium D ring on the strap. This gives flexible mounting options for each particular diver's preference, diving environment or scenario.

The 2020VISION Colour Display Features

- For use with all AP Diving rebreathers using Vision electronics with firmware Version 07.00.00 and onwards installed
- **Large format 2.8" full colour display** – 43% larger than previous Vision display
- Ultra-bright high resolution, high contrast, display – 96% sharper than previous Vision display
- **Conditional colouring** allows at a glance confirmation of "all is well" and emphasises critical and marginal warnings
- **Displayed data** includes depth, time, decompression obligation, PPO_2 values, Setpoint, Setpoint switch method, battery status and more
- **Intuitive graphical layout** complements the previous Vision handset and HUS
- **Familiar 3 button layout** giving instinctive operation for existing AP rebreather users
- **Excellent readability** even in very poor visibility conditions
- **Selectable colour themes** including 'Colour Blind' and 'Candy' themes
- **Customisable colour themes** using the 'AP Colour Theme Designer' program
- **Low power consumption**
- **Enhanced brightness control** features including auto-dimming for longer battery life, auto-brightness for warnings and brightness 'tilt activation'
- **Extreme durability** with hard-anodised marine grade aluminium housing and scratch-resistant ionised-toughened glass
- **Compact housing** design – 40% smaller than the previous Vision handset
- **Flexible mounting options** – either elasticated wrist-strap or D ring
- **Bespoke cable assembly with improved flexibility** and improved strength with Kevlar support
- **Self-activation** on water entry
- **Greatly expanded memory** – 500 times greater Dive Log memory than the Vision. Stores up to 3000 dive hours.
- **Bluetooth** dive download and software upload with PC or MAC - updates and downloads can be made without disassembly of the rebreather
- **Digital Compass** – a three axis, tilt compensated digital compass with the ability to mark a heading
- **Dive Display Log Book** – graphical display of Depth vs Time dive profile
- **Upgradable firmware** with the potential to unlock new features in the future
- **Compatible** with all existing AP Vision electronics peripheral devices including the Scrubber Monitor (Tempstick) and CO_2 Sensor
- **Independent** - driven off one I^2C bus arm giving appropriate isolation security from other peripherals
- **Multiple language options** including English, German, Dutch, Italian, French, Spanish, Portuguese, Danish, Swedish, Norwegian, Polish, Czech and Russian.
- **Type Tested for CE approval** according to the EN14143:2013 Rebreather Standard (Notified Body: SGS United Kingdom Ltd)

Important Information

DO: read the instruction manual fully before using the rebreather

DO: carry out all pre-dive checks prior to each dive

DO: use the Colour Display to monitor the rebreather's performance at all times

DO: protect the Colour Display against shock at all times and avoid lens scratches by replacing the lens protector if it starts to peel

DO: make sure that the Colour Display is free from mechanical damage and that the lens, buttons and depth pressure sensor holes are not impeded in any way that could affect its use

DO: wash the Colour Display with fresh water after each dive to avoid any salt or dirt build up

DO NOT: ignore warnings displayed by the Colour Display

DO NOT: dive without sufficient battery power or enter the water until the rebreather is correctly calibrated and in surface mode

DO NOT: mount the Colour Display in any way that obstructs the use of other rebreather functions, such as operating the mouthpiece / OCB, or the use of inflators

DO NOT: attempt to open the Colour Display as it is designed as a sealed unit

DO NOT: attempt to modify the rebreather or Colour Display in any way

DO NOT: use chemicals to clean the Colour Display

## Parts Supplied

RBV11FF
2020 VISION Colour Display

(Factory-fitted to the
Rebreather Lid,
via a new lid fitting)
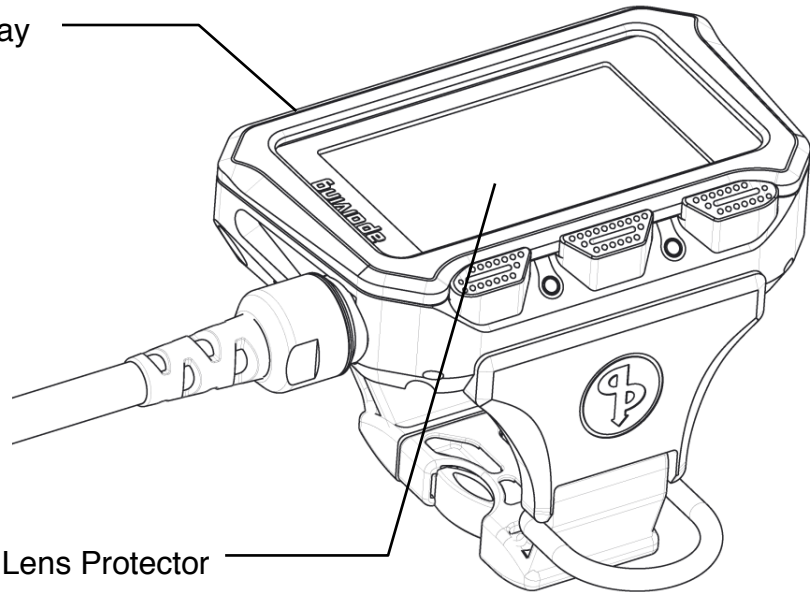
RBV11/19 Colour Display Lens Protector
(2 supplied)

The 2020 Colour Display comes factory-fitted to the Rebreather Lid. It is wired into the controllers via a new flexible cable assembly. The rebreather firmware must be V07.00.00 or higher for the Colour Display to work and this will be installed as standard.
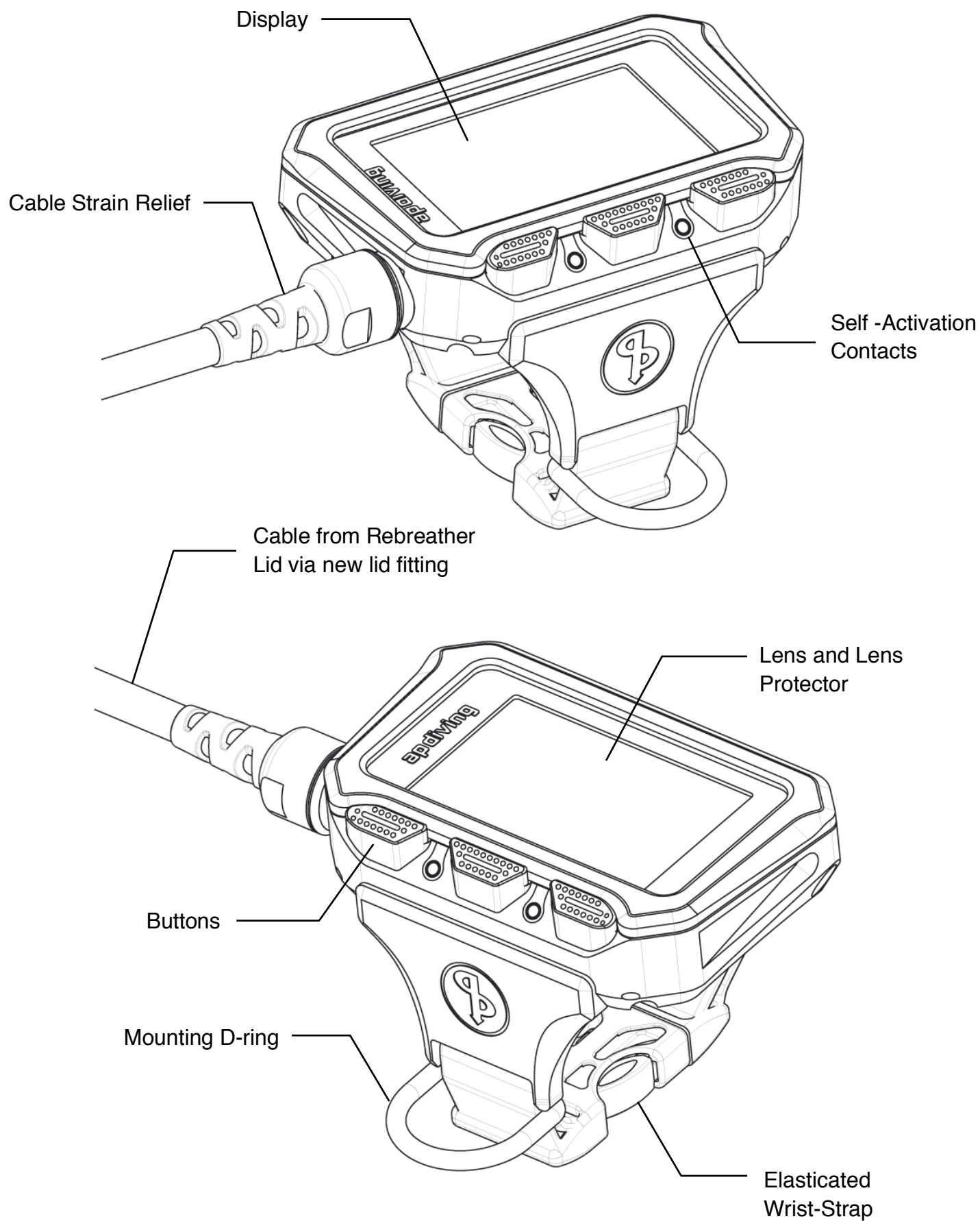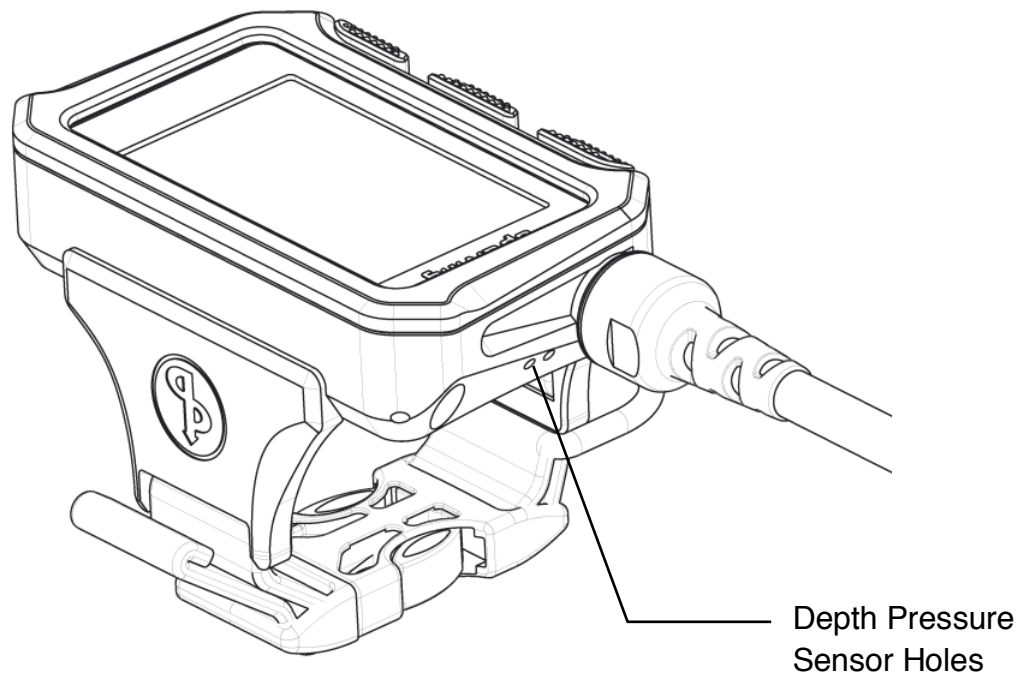
Optional Parts
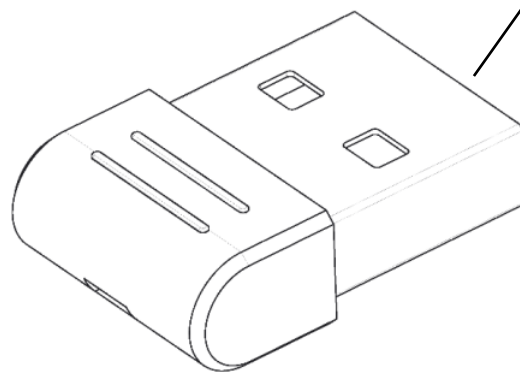
RBV91 Bluetooth
USB Adaptor
(complete with
driver CD)

If your computer does not have a built-in Bluetooth adapter, a Bluetooth USB dongle can be purchased. The Belkin Mini Bluetooth v4.0 USB adaptor (Belkin Part No. F8T065) is recommended. Available from AP Diving (www.apdiving.com)
(AP Part Code: RBV91)

The 2020VISION Colour Display Configuration

Display

Cable Strain Relief

Self -Activation Contacts

Cable from Rebreather Lid via new lid fitting

Lens and Lens Protector

Buttons

Mounting D-ring

Elasticated Wrist-Strap

Depth Pressure
Sensor Holes

Note: Make sure that the depth pressure sensor holes are not impeded in any way that could affect their use
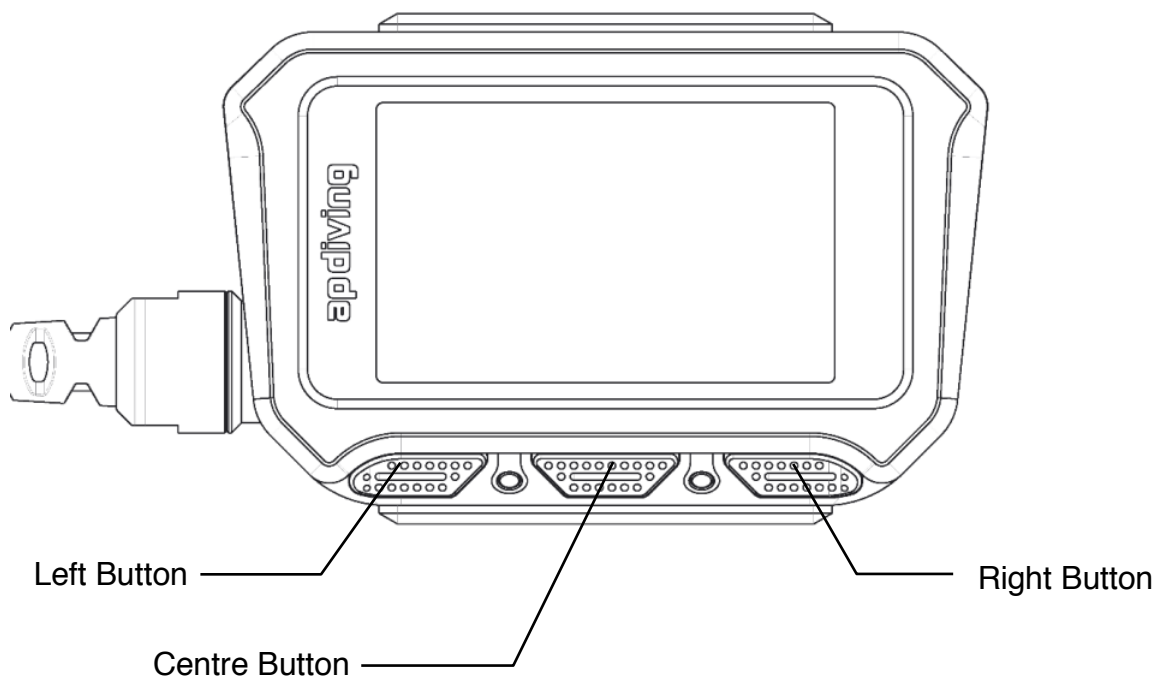

Left Button

Right Button

Centre Button

WARNING: The 2020 VISION Colour Display is a sealed unit and no attempt should be made to disassemble the housing in any way. Trying to do so could cause irreversible damage to the display and electronics.

Auto-Activation

Auto-activation has been added as a hardware feature to complement, in particular, the Recreational training requirements. There are two contacts, located on the front edge of the colour display. Once submerged or wetted these are designed to activate the rebreather.

> **NOTE:** This does not relieve you of the responsibility / need to switch the unit on before you enter the water. When you switch the handset on several automatic and essential power on self-tests are conducted and it's important to switch the rebreather on and allow your rebreather to do these tests before entering the water.

Self Activation Contacts
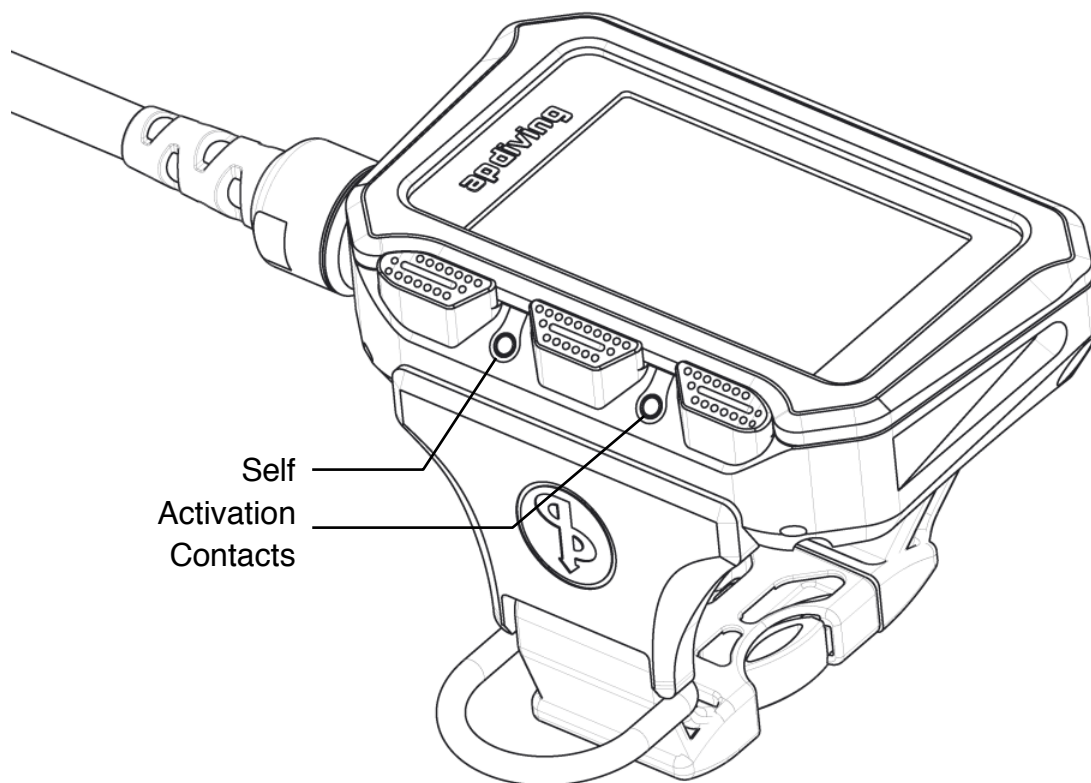
⚠ **WARNING:** All auto-activation systems rely on battery power. If your batteries do not have sufficient voltage the auto-activation will not work, you will receive no warnings and if you combine this scenario with submerging expecting it to work and fail to look at your handset, the oxygen pressure will soon drop, you will lose consciousness and die if not rescued by another person.

⚠ Switch on before use and **NEVER** breathe from the rebreather without first looking at the handset and knowing the PPO_2 is at a safe level & **ALWAYS** leave it switched on until you're safely out of the water.

⚠ **WARNING:** The auto-activation feature will not function properly in pure water.

The 2020VISION Colour Display Mounting

The 2020 Colour Display cable is designed to suit divers of all sizes, and for this reason has a cable length that will suit up to 95th percentile male arm length. This means that divers with shorter arms may want to manage excess cable by either wrapping the cable around the arm, tucking excess into the rebreather case or clipping the display to a harness D ring instead of wrist mounting.

We recommend that the 2020 Colour Display is mounted on the wrist.

Alternatively, leave the strap buckle assembled and clip the colour display to your equipment with the mounting D ring on the strap. Ensure that this is done in a position that allows you to monitor the display with ease.

Pre-Dive / Self-Checks and Calibration

Buttons

Button pressing methodology has been carried forward from the previous monochrome Vision handset.
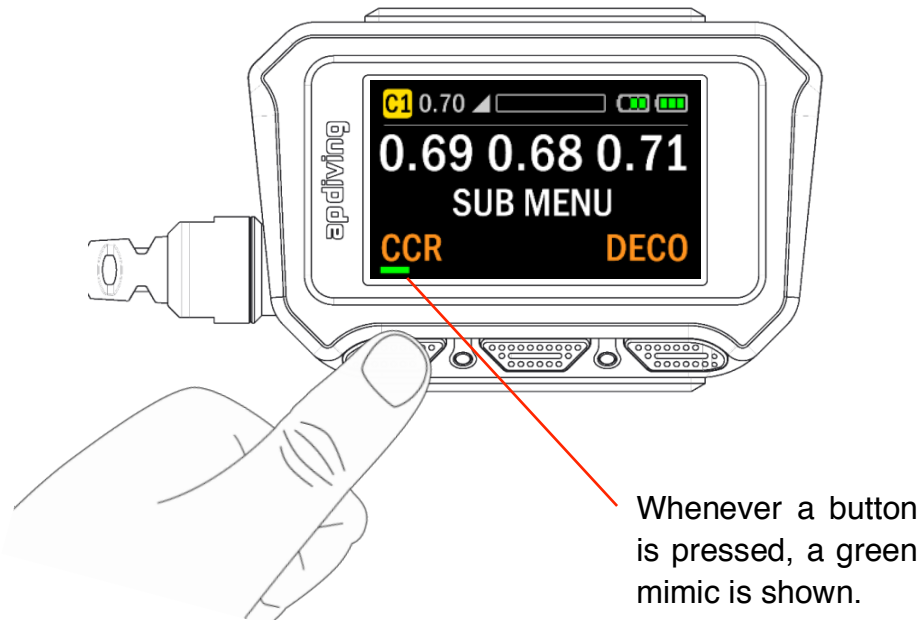
Whenever a button is pressed, a green mimic is shown.

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Button operation in Surface and Dive Mode

|	Left	Centre	Right
Switch On	Hold for 4 secs		
Backlight	Hold for 1 sec = Backlight for 5 secs	Hold for 1 sec = Backlight for 15 secs	Hold for 1 sec = Backlight for 15 secs
Display 2nd Controller	Hold for 2 secs		
Display millivolt outputs of O_2 sensors	Hold for 4 secs		
Toggle between High and Low Setpoints		Hold for 2 secs	
Suppress 1st Level Warnings			Hold for 1.5 secs
Access Compass			Hold for 2 secs
Button Combinations			
Menu Mode = L+R	⦿		⦿
Power Shut Down = C+R		⦿	⦿
PC Link – Serial USB = L for 2 secs (when Serial USB bridge is attached)	⦿ For 2 secs		
PC Link – Bluetooth = L+C for 2 secs	⦿ For 2 secs	⦿ For 2 secs	

Switch On

To switch on the unit, you press and hold the left button for 4 seconds. The two controllers perform their self-tests. If the connection to the display is operational the display backlight will come on and the AP DIVING splash screen is displayed.
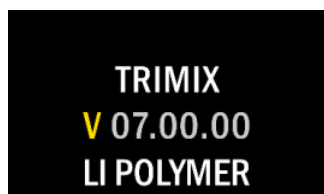
Pre-Dive Sequence

During the rebreather start-up process and self-tests, the 2020 VISION Colour Display's larger full colour format creates a much clearer interface making it easier to identify the rebreather status through the use of Conditional Colouring.
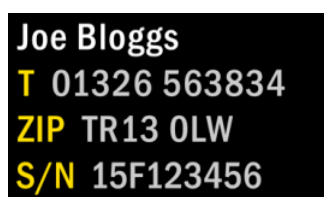
Pre-Dive Self-Tests
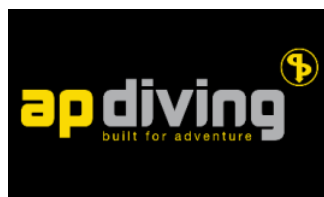
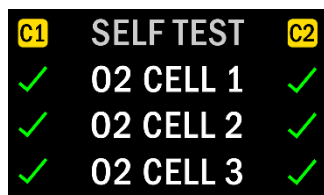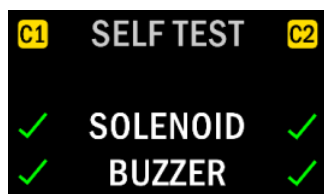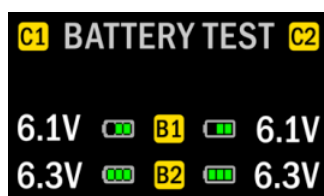|		
	Splash Screen	AP DIVING – Built For Adventure
TRIMIX V 07.00.00 LI POLYMER	**Software Version**	Trimix, Nitrox, Dive Timer, Recreational 1 or 2, Firmware version number and Rechargeable Battery Identification
Joe Bloggs T 01326 563834 ZIP TR13 0LW S/N 15F123456	**Customer Info**	Name, Telephone, ZIP and Serial Number (factory programmed) When details change, please contact the factory for a free update.
C1 **SELF TEST** C2 ✓ O2 CELL 1 ✓ ✓ O2 CELL 2 ✓ ✓ O2 CELL 3 ✓	**Self-Test**	Oxygen Sensors – connection test
C1 **SELF TEST** C2 ✓ **SOLENOID** ✓ ✓ **BUZZER** ✓	**Self-Test**	Connection test for Solenoid and Buzzer
DEVICE TEST **TEMPSTIK** ✓✓✓✓✓✓✓✓ **CO2 SENSOR** ✓	**Device Test**	Connection test for all of the sensors in the Tempstick and for the CO_2 Sensor
C1 **BATTERY TEST** C2 6.1V ▭ B1 ▭ 6.1V 6.3V ▭ B2 ▭ 6.3V	**Battery Test**	The voltage of each battery is measured by both oxygen controllers while the battery is under load
C1 **SELF TEST** C2 ▭ **BATTERY** ▭	**Self-Test**	The result of the battery test is shown.
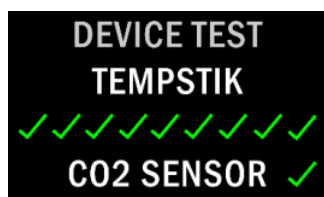
Pre-Dive Checklist

NOTE: These are vital checks. Do not take them lightly.
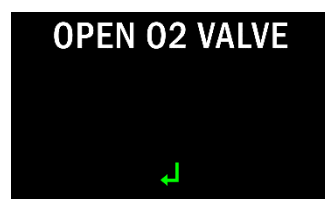
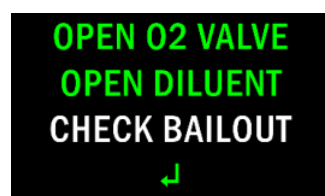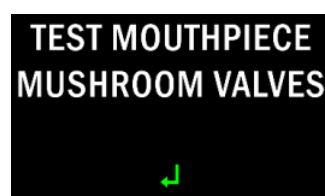|		
OPEN O2 VALVE ↵	**User Prompt**	**Confirm the Oxygen cylinder is open.** Look at the cylinder pressure gauge so you know the cylinder pressure. Then press the manual inflator while watching the pressure gauge. If the needle doesn't fall, you know the cylinder valve is open far enough and you know the hose is connected to the manual inflator.
OPEN O2 VALVE **OPEN DILUENT** ↵	**User Prompt**	**Confirm the Diluent cylinder is open.** Look at the cylinder pressure gauge so you know the cylinder pressure. Then press the manual inflator while watching the pressure gauge. If the needle doesn't fall, you know the cylinder valve is open far enough and you know the hose is connected to the manual inflator. Press the ADV purge to ensure gas is on.
OPEN O2 VALVE **OPEN DILUENT** **CHECK BAILOUT** ↵	**User Prompt**	**Check the location and function of your bailout system.** Pull it out - breathe from it. This check guarantees that you can reach your bailout, that the hose is long enough to allow you to put it in your mouth and that the gas is on.
OPEN COUNTERLUNG **AUTO PRESSURE** **RELIEF VALVE** ↵	**User Prompt**	Confirm the counterlung automatic pressure relief valve is set in the lower pressure 'DIVE' position Turn fully counter-clockwise – until it clicks.
TEST MOUTHPIECE **MUSHROOM VALVES** ↵	**User Prompt**	Confirm the operation of the mouthpiece mushroom valves Refer to the AP Rebreather Manual for details.
ELAPSED ON TIME **0** hrs **25** mins **RESET NOW?** Yes No	**Elapsed On Time**	Reset now – yes or no?
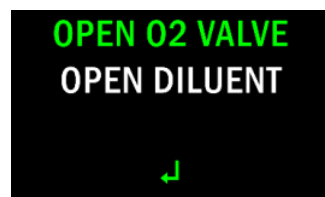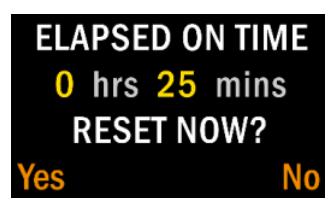
Calibration
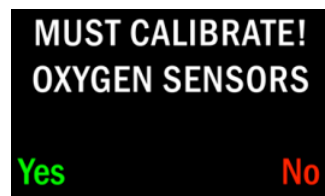
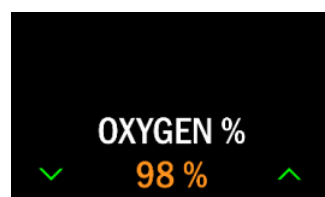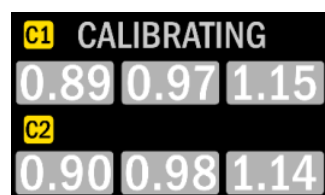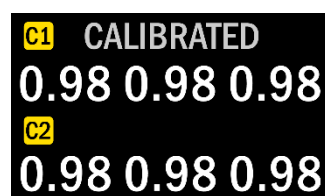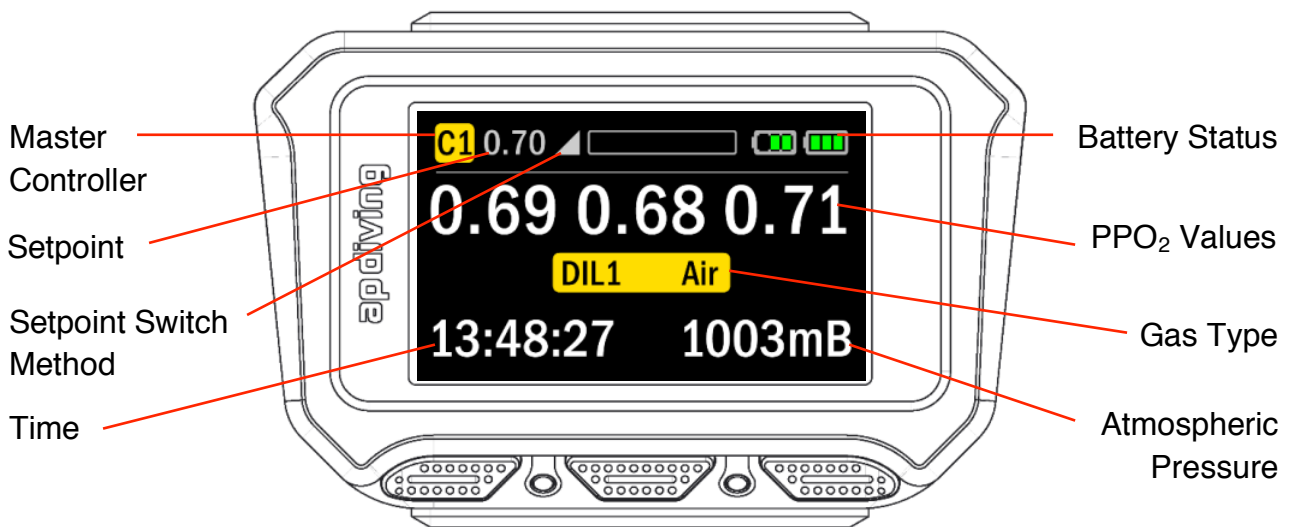|		
MUST CALIBRATE! OXYGEN SENSORS Yes　　　No	**Must Calibrate**	Select 'Yes' to calibrate the oxygen sensors and zero the CO_2 Sensor (if fitted)
AMBIENT PRESSURE 1007mB	**Ambient Pressure**	The ambient pressure as seen by the depth pressure sensor
OXYGEN % ∨　98 %　∧	**Oxygen %**	Enter the oxygen % to be used for calibration
OPEN MOUTHPIECE OCB = CC ↵	**User Prompt**	Confirm the rebreather mouthpiece is open in preparation for calibration Ensures the loop is at ambient pressure for the calibration.
C1 FLUSHING 0.17 0.19 0.20 C2 0.18 0.20 0.20	**Flushing**	PPO$_2$ values climb as they are flushed with oxygen
C1 CALIBRATING 0.89 0.97 1.15 C2 0.90 0.98 1.14	**Calibrating**	PPO$_2$ values stabilise and highlight as the oxygen sensors are calibrating
C1 CALIBRATED 0.98 0.98 0.98 C2 0.98 0.98 0.98	**Calibrated**	Calibration factor applied to PPO$_2$ values
C1 0.70 0.69 0.68 0.71 DIL1　Air 13:48:27　1003mB	**Surface Mode**	Unit is ready to dive after successful calibration. Now take a big breath and exhale into the loop and remove from your mouth, while you watch the display. The PPO$_2$ should fall rapidly and then immediately climb rapidly as oxygen is added.
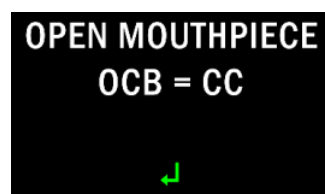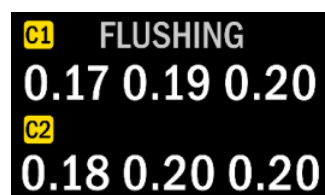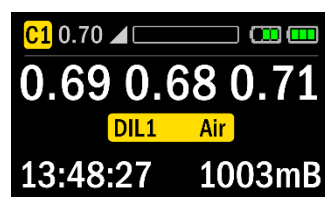
Surface Mode

Following a successful calibration the 2020 Colour Display will enter 'Surface Mode'.

Master Controller

Setpoint

Setpoint Switch Method

Time

Battery Status

PPO$_2$ Values

Gas Type

Atmospheric Pressure

C1 0.70

0.69 0.68 0.71

DIL1   Air

13:48:27   1003mB

The 2020 Colour Display has been laid out in a very similar fashion to the previous monochrome display so it is very easy for existing users to switch between the two displays.

High contrast colours are used to ensure readability and "conditional colours" are used to highlight important information. In general terms white, grey and green are "good", red is used to highlight conditions that are important to the diver. i.e. when a battery has low voltage, when they ascend too fast or have a warning of any sort. Yellow is used as an intermediate condition for decompression status, controller labelling and gas type.

The 'Surface Mode' is identified by the actual time and atmospheric pressure or after a dive by the dive time, maximum depth, surface interval and atmospheric pressure. On descent, at 1.2m, the display will change to 'Dive Mode' and show dive time, depth and decompression no stop time or obligation.

Dive Mode

### No Stop Time (NST) Display

Until sufficient depth and time causes a decompression obligation, the colour display will show a no stop time (NST) along with the dive time and current depth.

Scrubber Monitor — Dive Time — No Stop Time — Max Depth — Current Depth
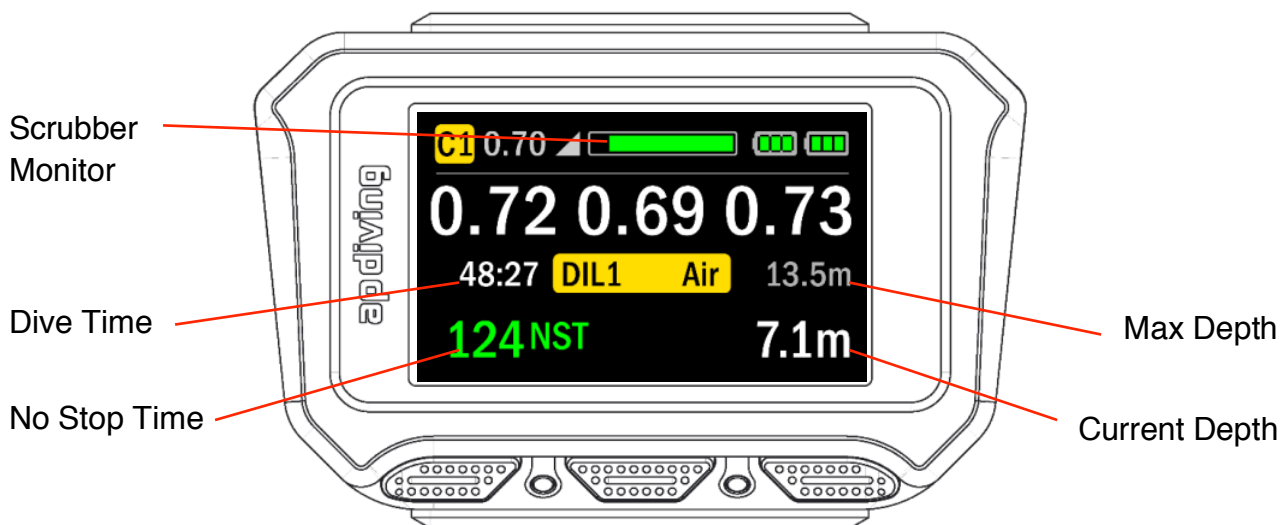
The no stop time is shown in green, meaning there is currently no decompression required. The scrubber monitor and battery status are also in green showing a good condition. All other information in this example is shown in white and grey as they are all within the appropriate limits.

Time To Surface (TTS) Display

When sufficient depth and time causes a decompression obligation, the Colour Display shows a time to surface (TTS) along with the dive time, current depth, max depth and a ceiling that the diver should not ascend above.

Dive Time — Time To Surface — Current Depth — Ceiling Depth
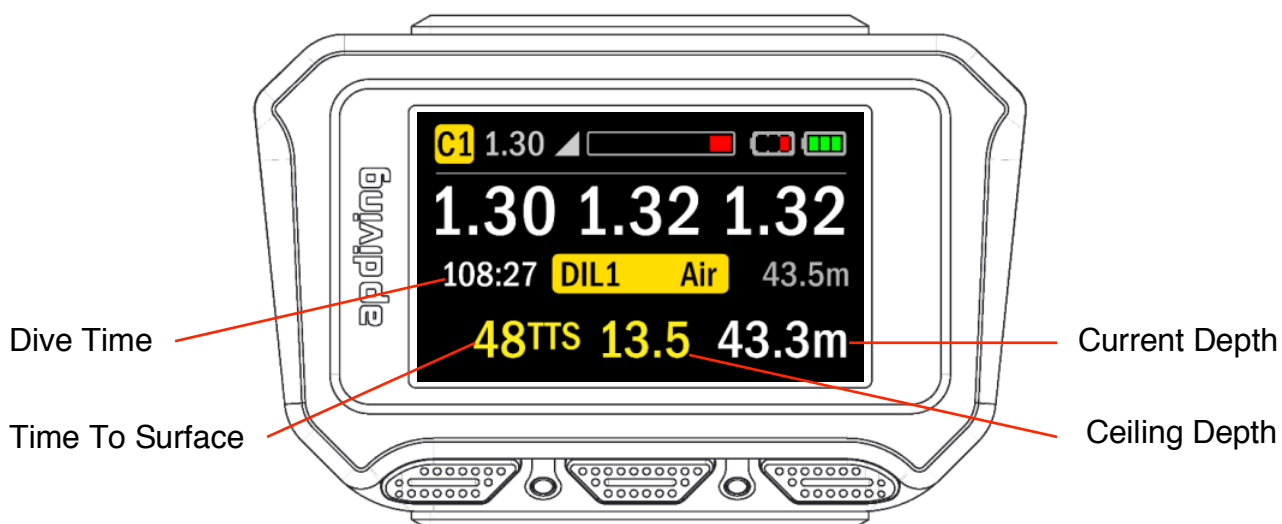
The time to surface and ceiling depth are shown in yellow, highlighting the decompression obligation currently in place. The scrubber monitor and B1 battery

status in this example are in red showing a low battery issue and poor condition of the CO_2 scrubber.

**Estimated Time To Surface (EST) Display**

When the current depth has been shallower than the ceiling depth for more than 2 minutes (a ceiling violation), the TTS will be replaced with an EST (estimated time to surface).

Dive Time

Estimated Time
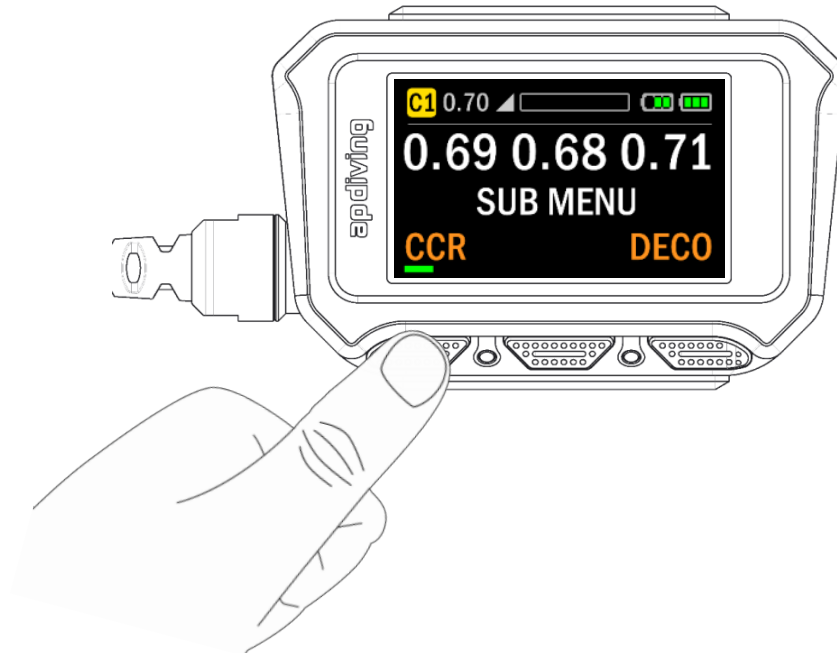To Surface

Current Depth

Ceiling Height
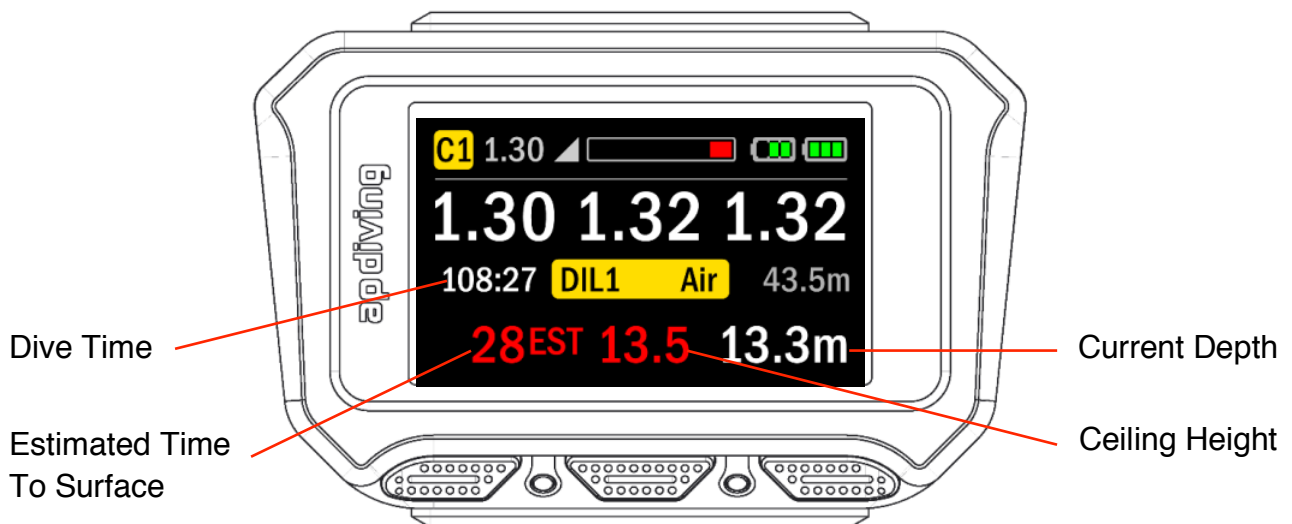
The estimated time to surface and ceiling depth are shown in red, highlighting the fact that the decompression is now estimated due to the ceiling violation.

Menus

Menu Entry
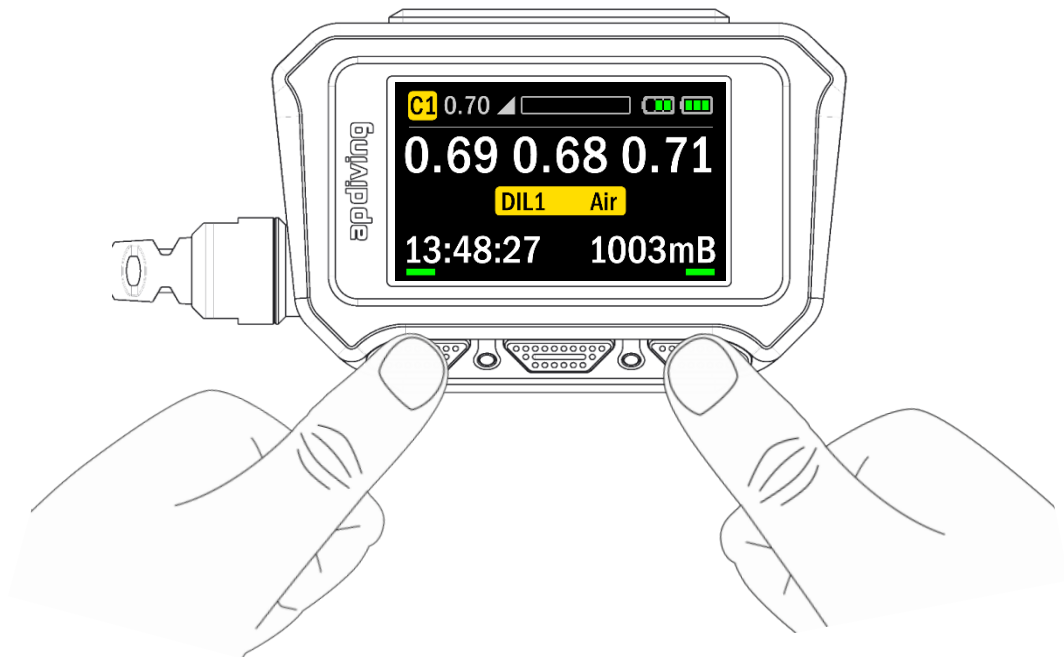
To enter or exit MENU Mode, press the outside two buttons simultaneously or within 0.5 seconds of each other.

The sub menus contain slightly different options depending on whether on the surface or underwater and the software version installed (Trimix, Nitrox, Dive Timer, Recreational 1 or 2). More details can be found in the main Inspiration Manual. However, the following is what you would expect to see on the 2020 VISION Colour Display from Trimix software on the surface:
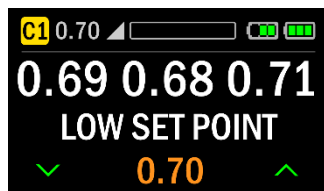
CCR Menu

Please note: the high Setpoint automatically defaults to 1.3 and the low Setpoint to 0.7 every time you switch on. All other options are user settable and remain on your chosen settings until you change them again.
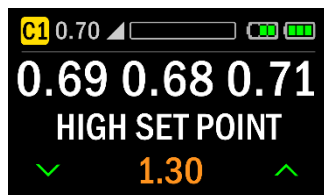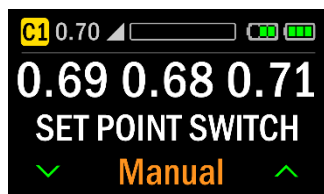
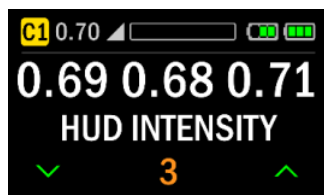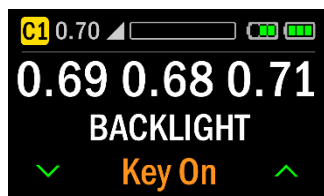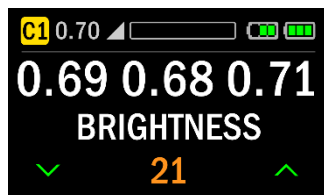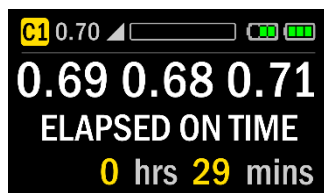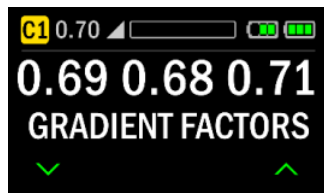|		
C1 0.70 0.69 0.68 0.71 HIGH SET POINT ˅ 1.30 ˄	**High Setpoint**	Adjustment range = 0.90 – 1.50. It automatically defaults to 1.3 every time you switch on. Tip: use 1.3
C1 0.70 0.69 0.68 0.71 LOW SET POINT ˅ 0.70 ˄	**Low Setpoint**	Adjustment range = 0.50 – 0.90. It automatically defaults to 0.7 every time you switch on. Tip: use 0.7
C1 0.70 0.69 0.68 0.71 SET POINT SWITCH ˅ Manual ˄	**Setpoint Switch**	Gradual, Manual or Auto. Tip: use Gradual. Should you enter decompression the highest possible Setpoint will be maintained to reduce decompression obligation.
C1 0.70 0.69 0.68 0.71 HUD INTENSITY ˅ 3 ˄	**HUD Intensity**	Adjustment range = 1 – 10. Tip: set to 7. It is bright enough for most conditions and requires considerably less power than 8 -10.
C1 0.70 0.69 0.68 0.71 BACKLIGHT ˅ Key On ˄	**Backlight**	Key On, Always On or Off Tip: when Key On is selected, the handset will tilt activate the backlight. A simple rotating action of the display towards the diver will turn the backlight on.
C1 0.70 0.69 0.68 0.71 BRIGHTNESS ˅ 21 ˄	**Brightness**	Adjustment range = 1 – 31 Tip: Set to 21
C1 0.70 0.69 0.68 0.71 COLOUR THEME ˅ SMART ˄	**Colour Theme**	Smart, Colour Blind, Candy, Custom 1 or Custom 2. The SMART colour scheme is shown throughout this manual.
C1 0.70 0.69 0.68 0.71 ELAPSED ON TIME 0 hrs 29 mins	**Elapsed On Time**	This can be reset at any time on the surface or underwater.

Deco Menu
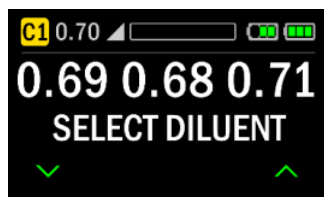
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71		
SELECT DILUENT	**Select Diluent**	9 programmable gases
⌄ ⌃		

C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Gradient Factors**	GF Low 5 – 90
GRADIENT FACTORS		GF High 30 – 98
⌄ ⌃		
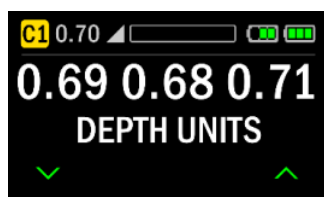
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Depth Units**	Feet or Metres
DEPTH UNITS		
⌄ ⌃		
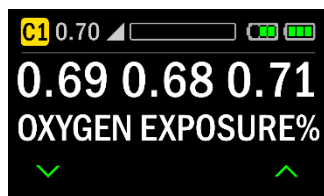
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Oxygen Exposure %**	CNS % and OTU %
OXYGEN EXPOSURE%		
⌄ ⌃		

C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Clock**	Edit Time and Date
CLOCK		
⌄ ⌃		
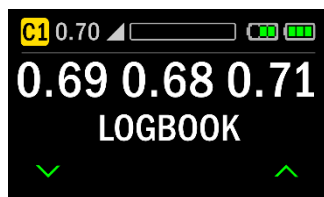
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**LogBook**	View Date, Time, Duration and
LOGBOOK		Max Depth of previous dives
⌄ ⌃		
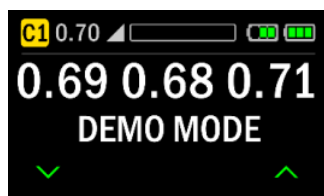
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Demo Mode**	Simulate a dive
DEMO MODE		
⌄ ⌃		
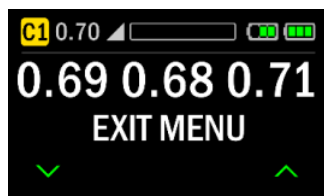
|		
C1 0.70 ▲ [____] 🔋🔋		
0.69 0.68 0.71	**Exit Menu**	Return to Surface/ready to dive
EXIT MENU		mode
⌄ ⌃		

Colour Themes

The 2020 Colour Display features selectable colour themes including 'Colour Blind' and 'Candy' themes. The default 'SMART' theme utilises high contrast white text on a black background and conditional red and green colouring for dynamic elements. It is clear, crisp and easy to interpret.

In a bid to help the 1 in 12 men and 1 in 200 women who suffer from colour blindness or colour vision deficiency the AP Colour Display includes a 'Colour Blind' theme. This replaces colours that are commonly 'unseen' with those that are more commonly 'seen' by sufferers. Careful consideration has also been given to which colours are used next to one another, ensuring there is always a good contrast.

The 'Candy' and high contrast black on white 'Mono White' themes have been created to be more striking in certain water conditions.
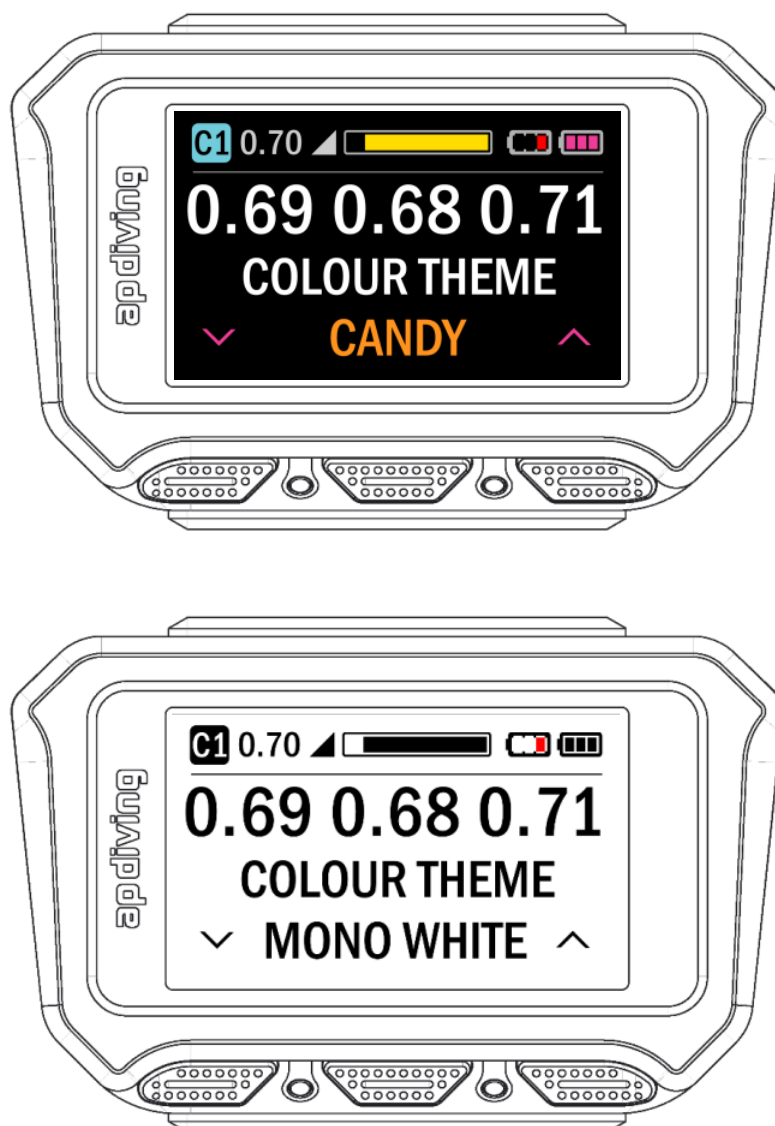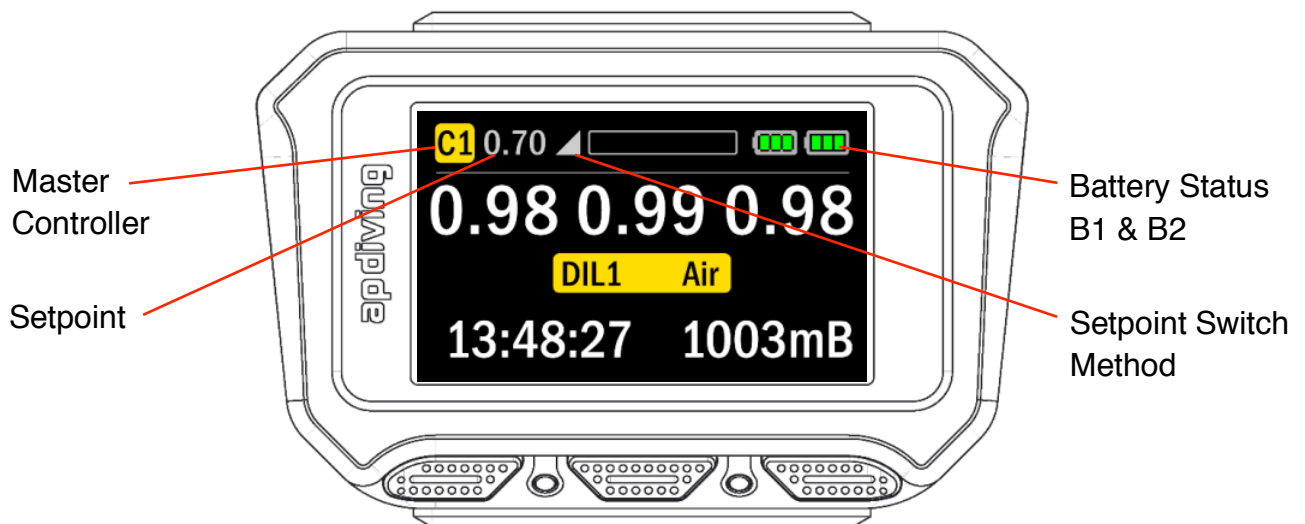

The new 'AP Colour Theme Designer' program allows divers to create and upload their own customised colour themes to 'Custom 1' and 'Custom 2'.

Setpoint and Battery Icons

Setpoint

Master Controller

Setpoint

Battery Status B1 & B2

Setpoint Switch Method

The Setpoint Switch Mode icons are shown below: manual, automatic, gradual and forced low (respectively). If the diver selects to switch to Open Circuit, the 'OC' symbol will replace the Setpoint mode icon.
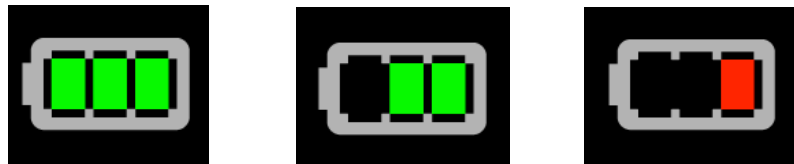
Battery Icons

The 2020 Colour Display incorporates the same highlighted frame to indicate which battery is the master (providing power to the solenoid and display).

B1 —————— —————— B2
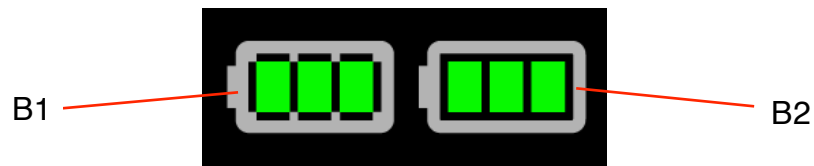
Conditional colouring is used to help highlight a low battery condition

Optional Connectivity

There are various options that can be used with AP rebreathers and these options are highlighted on the HUS (the AP Head-Up Screen - if fitted), as well as on the handset.

Scrubber Monitor —————————— —————————— Conditional Colouring

The Scrubber Monitor (Tempstick) is displayed in the same way as the previous handset but with the added benefit of Conditional Colouring. When the active area of the scrubber is becoming low the bar will change from green to red to highlight this issue.

CO₂ Sensor fitted

If a Scrubber Monitor is not fitted, but a CO_2 Sensor is present then '++++' is displayed. If both the Scrubber Monitor and CO_2 Sensor are fitted '++++' can be seen when the left button is pressed and held to verify that the CO_2 Sensor is fitted.
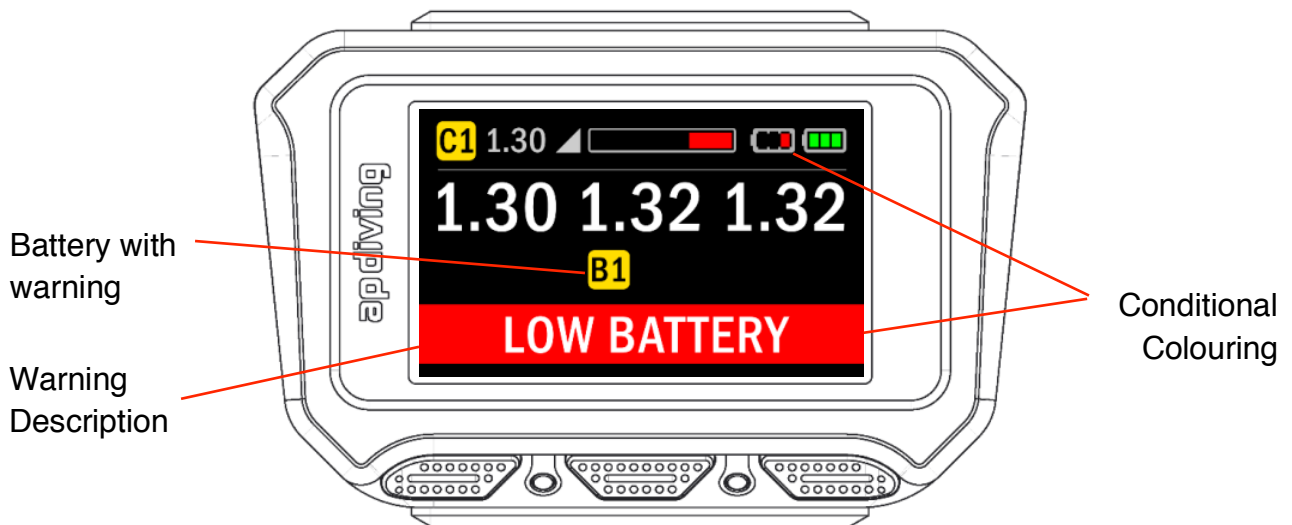
No options fitted

If neither a Scrubber Monitor nor CO_2 Sensor is fitted then '- - - -' is displayed.

Warnings

Warnings are shown on both the 2020 Colour Display and the HUS (if fitted).

Battery with warning

Warning Description

Conditional Colouring

The 2020 Colour Display shows which Controllers (or Batteries) are generating the warning and the warning is displayed in high contrast white on red.

Controllers with warning

Warning Description

Conditional Colouring
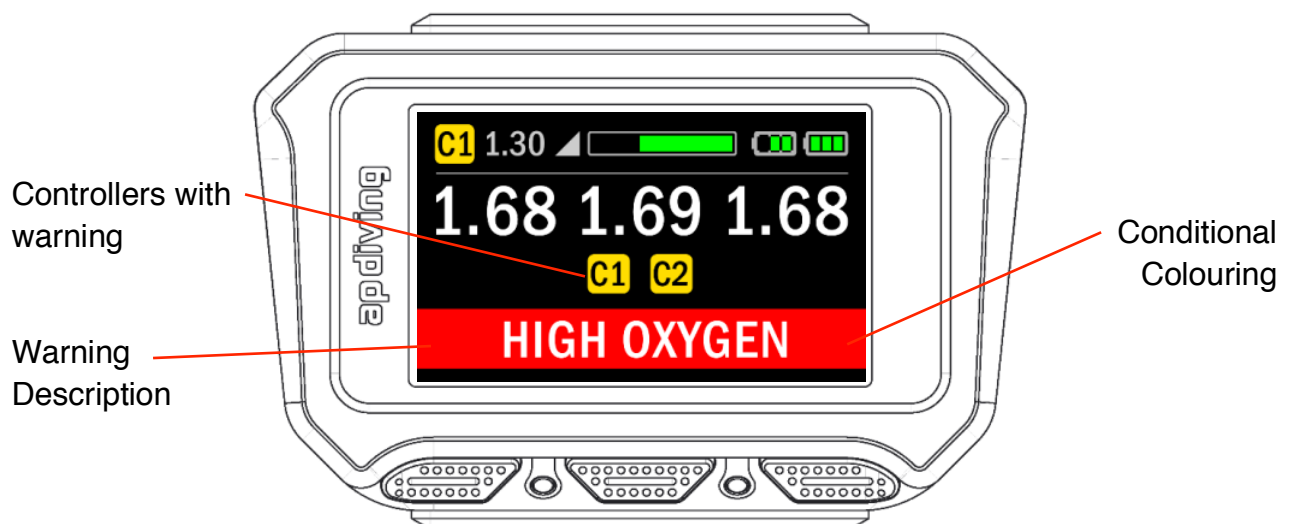
Other warnings displayed on the 2020 VISION Colour Display are as follows:

| Warning for	Warning text displayed
High Oxygen	HIGH OXYGEN
Low Oxygen	LOW OXYGEN
Scrubber Monitor - Ascend	SCRUBBER WARNING - ASCEND
Scrubber Monitor - Bailout	SCRUBBER WARNING - BAILOUT
CO_2 Alarm - Ascend	CO2 ALARM - ASCEND
CO_2 Alarm - Bailout	CO2 ALARM - BAILOUT
Oxygen Sensor	CELL WARNING
Low Battery	LOW BATTERY
PPO_2	HIGH / LOW OXYGEN
Fast Ascent	- - SLOW - -
Ceiling Violation	↓ ↓ DOWN ↓ ↓
CNS Exposure	CNS EXPOSURE
OTU Exposure	OTU EXPOSURE
Start Error	START ERROR!
Missed Decompression	MISSED DECO!
Decompression Alarm	DECO ALARM
Depth Pressure Sensor Failure	PRESSURE SENSOR FAILURE

Warning Suppression

Any warnings that can be temporarily suppressed by pressing and holding the right switch for 2 seconds or more will only have the HUD and buzzer warnings suppressed, leaving the 2020 Colour Display and HUS (if fitted) showing the warning, alternating with dive depth/time and decompression information.
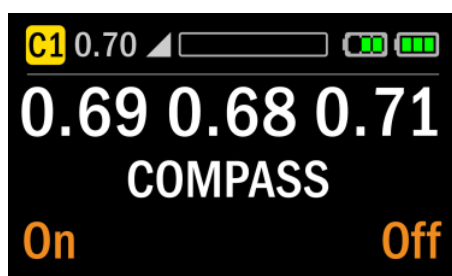
Compass

The 2020 Colour Display features a three axis, tilt compensated digital compass with the ability to mark a heading.

Compass Layout

When activated the compass replaces the top bar information. It is drawn as a horizontal band with fixed borders that include two small arrows marking your direction. The inner band features 8 cardinal and intercardinal points (N, NE, E and so on) and a further 8 orange dots that denote the secondary intercardinal points (NNE, ENE and so on). This inner band represents 120 degrees of the compass and scrolls smoothly in relation to your direction i.e. if you turn to the right, the band will scroll to the left. Your direction in degrees displayed in the central yellow box also updates constantly as you change direction.
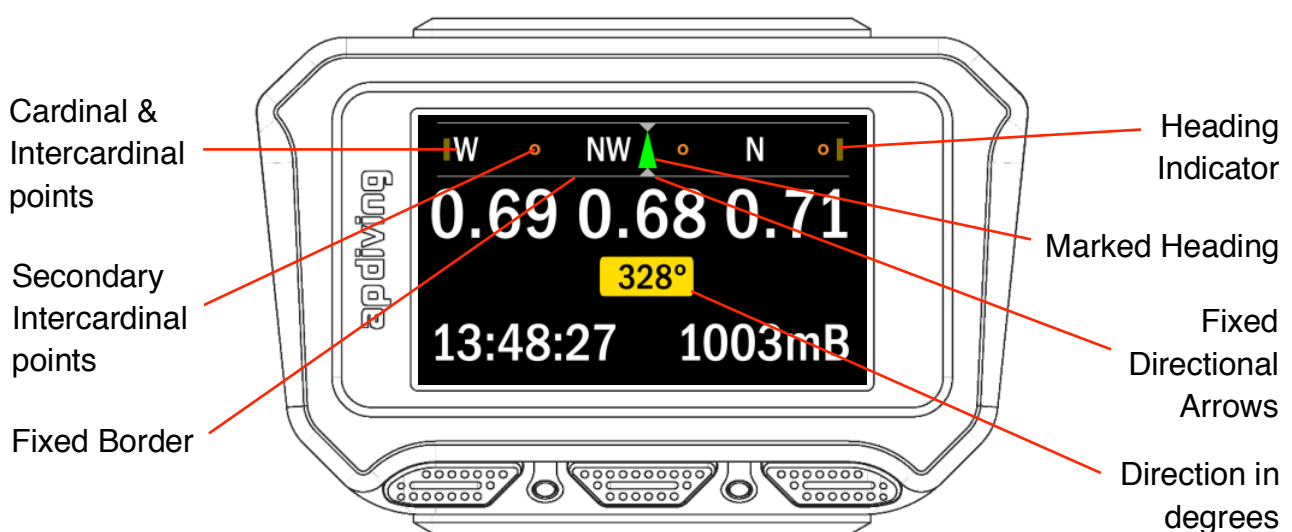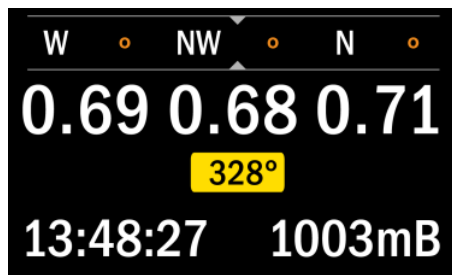

Activating the compass

Once within Surface or Dive Mode, the compass is accessed by holding the right button for 2 seconds. Pressing the left button then turns the compass on and pressing the right button continues with the compass off.

The compass band and direction in degrees then replaces the top line information and the diluent gas respectively. The top line information and diluent can be seen at any time whilst the compass is active by holding the left button for 2 seconds.
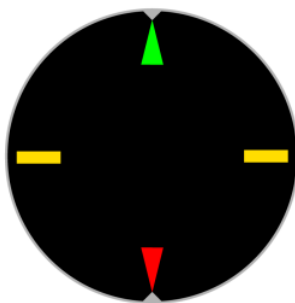
Set a heading

Once the compass is activated a heading can be set by holding the right button for 2 seconds


This displays the 'Set Heading?' option. Pressing the left button to select 'Yes' will set your current direction as a heading, by placing a marker on the inner band of the compass.

The heading is shown as a green arrow on the inner band. As you change direction the marked heading will scroll with the cardinal points on the inner band, giving an indication of which way to turn to get back to your original heading.


When a heading is set with a green arrow marker, 3 other markers are placed on the inner band at the same time. A red inverted arrow is placed at 180 degrees to the heading as a reciprocal marker and two yellow rectangular markers are also placed at 90 degrees to the heading. These are useful references when swimming perpendicular to the heading marker, for instance during a square search or to simply move along the reef.
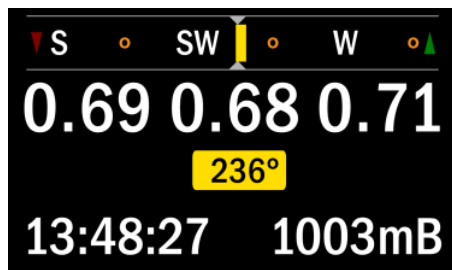
With a heading set, the compass features two heading indicators to show which way to turn to return to the original heading, reciprocal or 90 degree marker.

In this first example the small green arrow on the right of the compass band shows you would turn to the right to return to the original heading and the small red arrow on the left that you would turn to the left to follow the reciprocal heading.
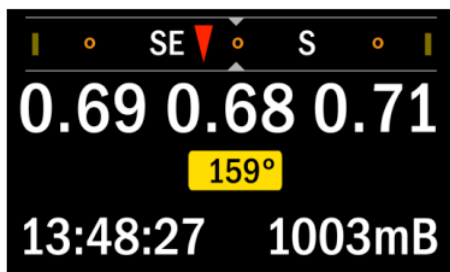
The second example shows a current direction just off the reciprocal heading and that if you were to turn left or right you would be turning towards either 90 degree marker.
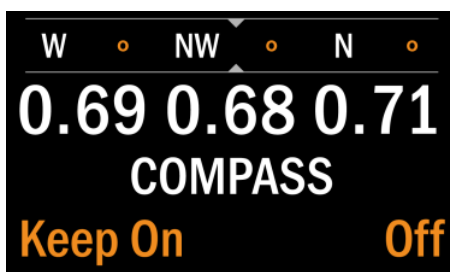
Turning the Compass Off

Once the Compass is activated either with or without a set heading, it can be turned off by again holding the right button for 2 seconds to display the 'Set Heading?' option.

Selecting 'Yes' by pressing the left button would set a new heading (replacing a current one if it had been previously set), but selecting 'No' by pressing the right button will give the option to turn the compass off:

Selecting the right button turns the compass off. Any set heading markers are still retained and displayed when the compass is turned on again. The heading markers are lost though when the handset is powered down and it will be necessary to reset heading markers prior to the next dive.
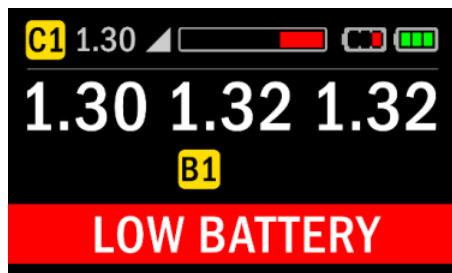
Monitoring the rebreather with the compass activated
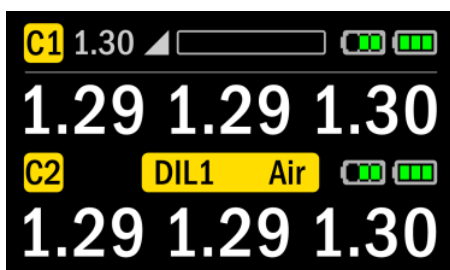
The top line controller 1 information, controller 2 information and diluent can be seen at any time whilst the compass is active by holding the left button for 2 seconds.
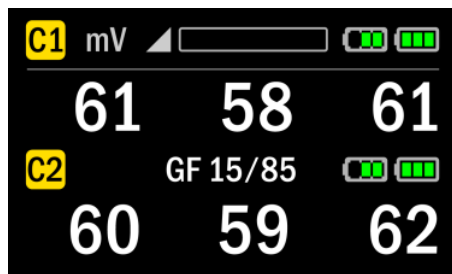
The oxygen sensor mV readings and gradient factor details can be seen by keeping the left button held for a further 2 seconds.

Whenever a warning is active on the display, the top bar information will be shown along with the warning but the compass details will still be shown as the warning alternates with the depth, time and decompression information.

Tilt Compensation

The compass is tilt compensated so the Colour Display does not need to be held completely level or horizontal to maintain a reasonably accurate reading. Properly calibrated an accuracy of $\pm 2^{o}$ for 60° of tilt is possible.
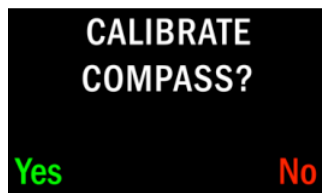
Calibrating the Compass

There are two elements to the compass; a magnetometer and an accelerometer. The accelerometer calibration is a one off calibration and should only need to be redone once per year. The Magnetometer though will require routine calibration particularly when used in a different geographic location or if the accuracy drifts or the handset is subjected to magnetic material. Inaccuracies can be identified by comparing the Colour Display compass to fixed references or a known good compass. During the calibration of the compass any nearby magnetic objects (including the magnets in the buttons of the handset) will be compensated for and will no longer have an effect on the compass readings. It is important that the Magnetometer calibration is done more than 3 feet away from any metallic objects that will not remain with the Colour Display during its use such as metal desks, radiators, wrist watches and parts of boats.
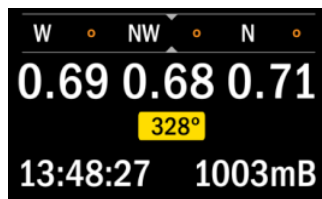
With the compass activated, press the left and right buttons simultaneously to show the menu options.

Enter the CCR Menu by pressing the left button and then navigate down to the bottom of the menu where you will find the option to calibrate the compass.

Selecting 'Yes' will start the calibration process and selecting 'No' will exit the menu.

Instructions on how to move the handset to calibrate the magnetometer will be displayed before the actual process begins.

Begin rotating the handset SLOWLY in all orientations when this screen is displayed. Try to place the handset in as many 3D positions as possible. There are 6 surfaces on the handset, ensure all 6 are alternately facing the floor during the rotations.
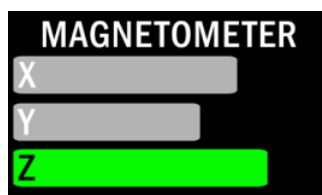
As the handset is rotated a bar for each 3 Dimensional plane (X, Y and Z) will begin to grow along the display.
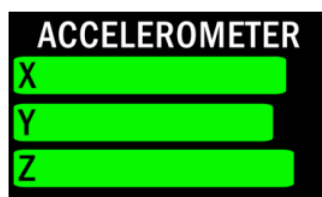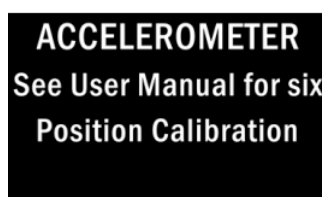
Keep rotating for the full 15 seconds with the goal of achieving a green bar for each plane, indicating that the magnetometer has been subjected to sufficient rotations. The longer the bar, the more accurate the calibration will be.

If each bar is green after 15 seconds, the magnetometer will calibrate successfully and this screen will be displayed.

An option to calibrate the Accelerometer is then given. This is something that is required less often than the calibration of the magnetometer and will only need to be carried out the first time you upgrade your software or if the accuracy of the compass is very poor.

The calibration process is similar to the magnetometer however the focus is on subjecting the handset to small movements around six planes.

Start with the display facing up and horizontal with the floor and slowly rotate ±5° around that plane. Then turn the display 90° towards you so the display is facing you and slowly rotate ±5° around that plane. Repeat this two more times rotating the handset 90° towards you each time and the X, Y and Z bars will grow.

Bring the handset back to its original horizontal position (display facing up) and then turn the handset 90° towards your left so the display is facing to the left (cable downwards) and slowly rotate ±5° around that plane. Repeat this but rotating 90° towards your right so the display is facing to the right and cable upwards to calibrate in all 6 planes.

Keep rotating in this fashion to achieve a green bar for each plane and a successful calibration.

A video of the calibration process can be found online http://www.apdiving.com/en/rebreathers/resources/videos/

Failed Compass Calibration
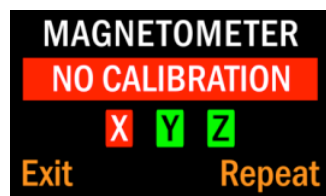
If the handset is not rotated sufficiently enough during either calibration process to give an accurate calibration, a 'No Calibration' screen will be displayed. This will indicate which plane did not receive enough rotations with a red box. In the first example the X plane caused the failed calibration and in the second example, it was the Y and Z. Simply select 'Repeat' and attempt to rotate the handset again or select 'Exit' to continue without calibrating the compass.

Backlight / Brightness Control

The 2020 Colour Display has enhanced brightness control features. The brightness of the backlight is dimmed automatically after 5 seconds to save power consumption. The diver can still select a desired brightness, opt to have the backlight on continuously, be activated by a key press or off continuously.

A tilt activation method has been added when the 'Key On' preference is selected. A simple rotating action of the display towards the diver will turn the backlight on.
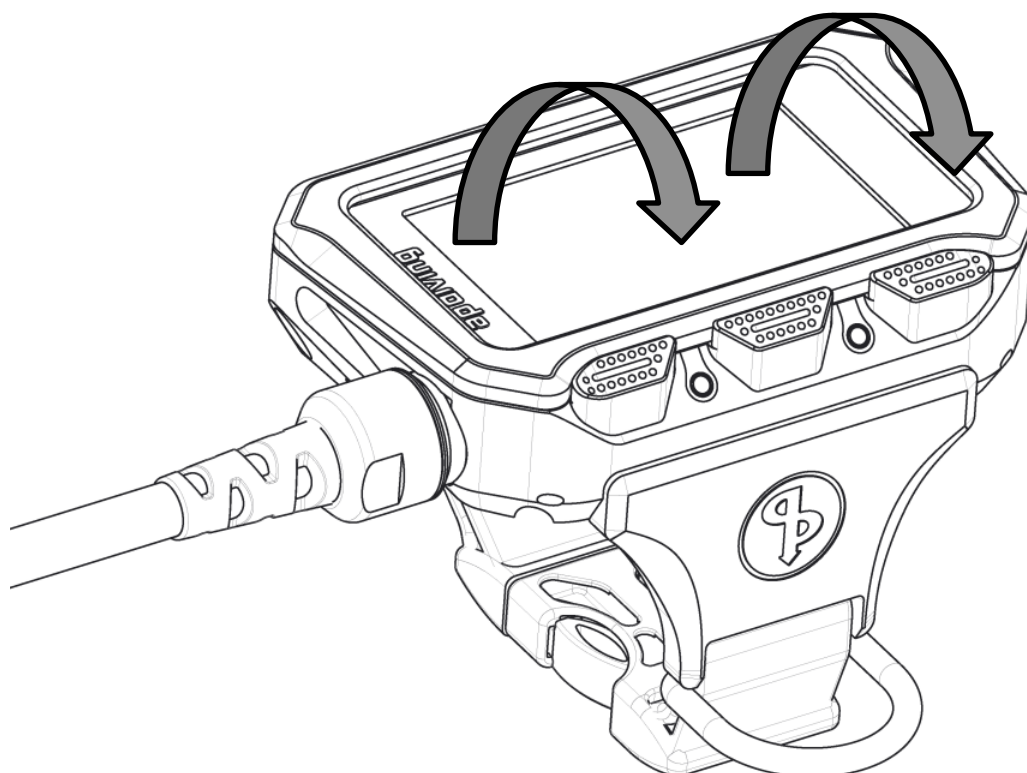
The backlight is activated automatically whenever a warning is displayed. The backlight setting may be changed on the surface and underwater if desired via the CCR menu.

Post-Dive

Power Control (Shutdown)
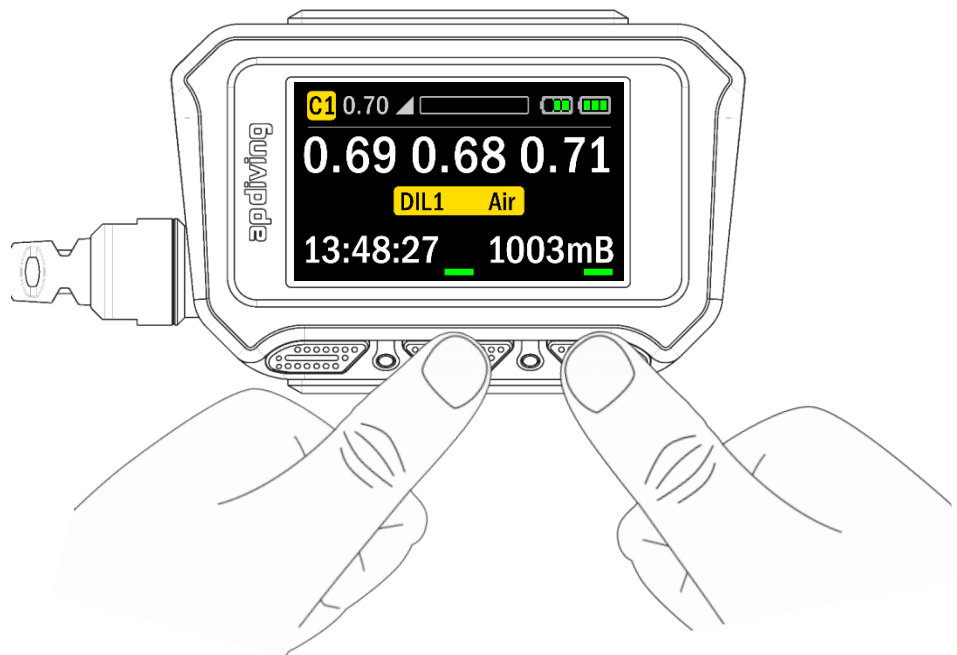
The Power Control screen may be entered at any time, from any screen by pressing the centre and right buttons simultaneously.
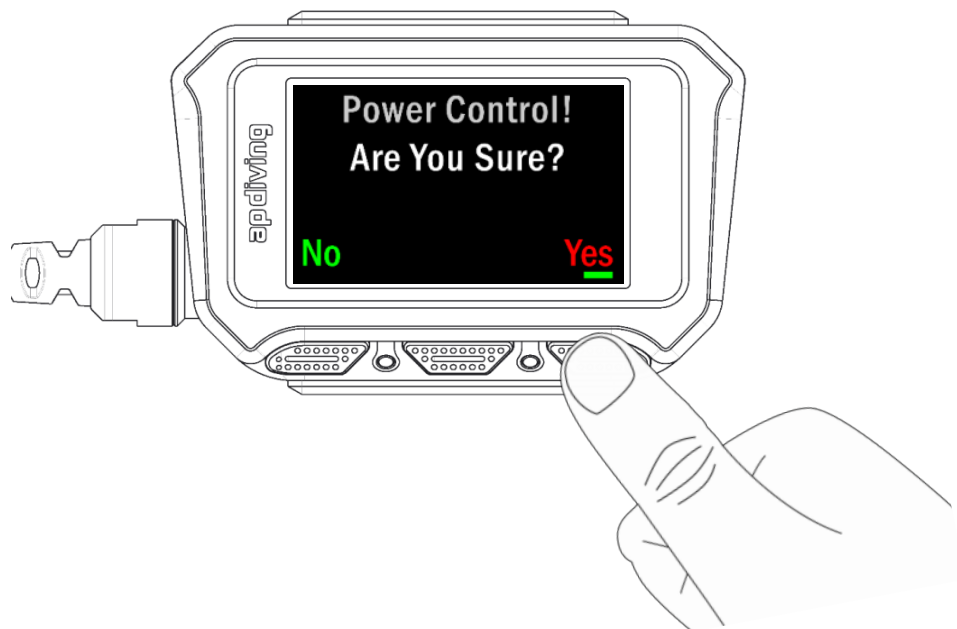
The Power Control allows the shutdown of either of the controllers or the whole system, except when underwater.
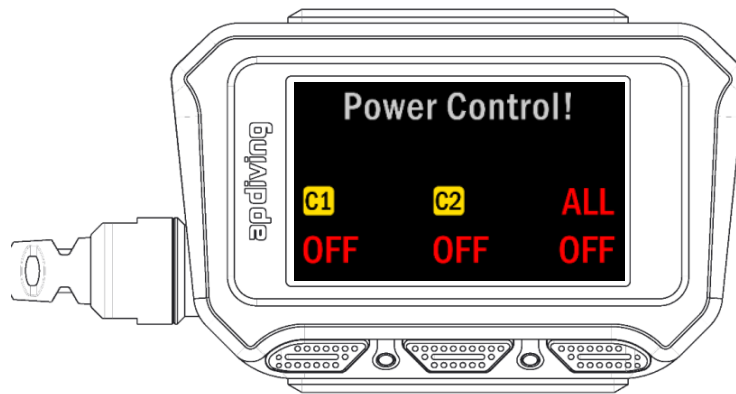
Whilst underwater you cannot turn off the entire system, the ALL OFF option shown at the surface becomes NONE OFF. If one controller is switched off it may be switched on again using the same power control screen.

Log Book

The 2020 Colour Display features an improved Log Book that graphically displays dive profiles. The Depth vs Time graphic shows both the actual dive profile in white and any accrued decompression obligation as a ceiling in red.

Dive Duration — Max. Depth

Ceiling — Dive Number

Dive Profile — Time of Dive

Date of Dive — Average Depth
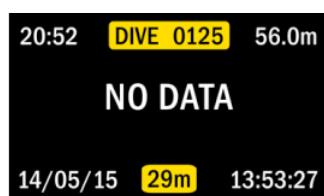
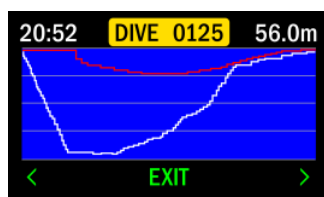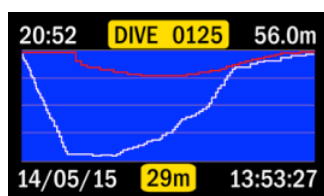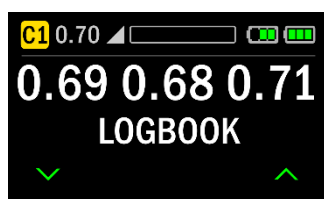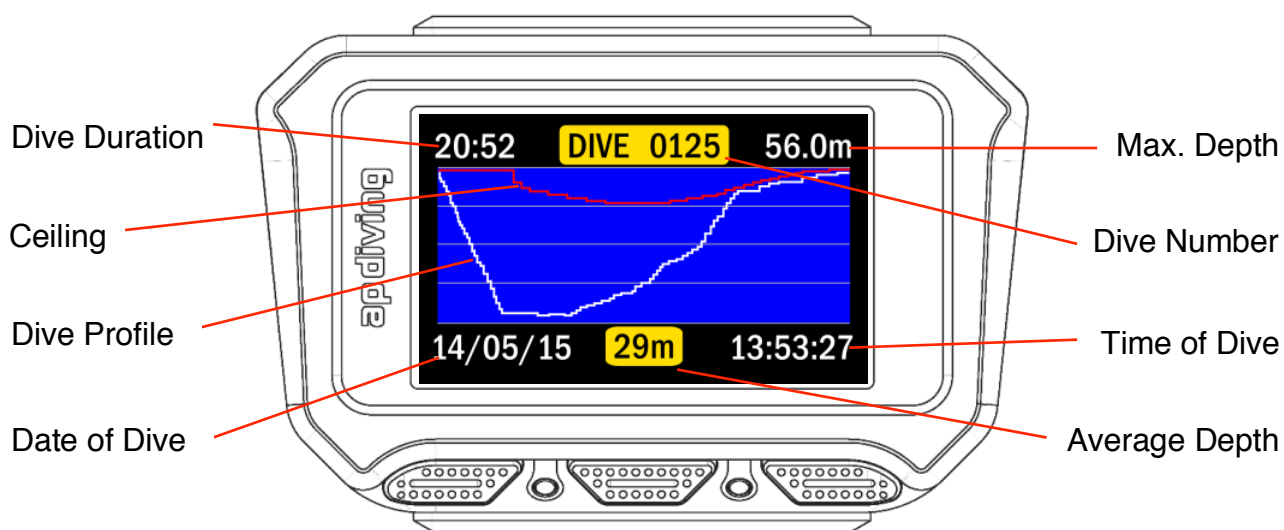To view logged dives, enter the DECO Menu, navigate down to 'Log Book' and then press the centre button to enter the Log Book feature.

The Dive Number, Dive Duration (mins/secs) and Maximum Depth (metres or feet) are shown on the top line. The dive profile in white and ceiling height in red plotted as depth vs time in the centre and the Date of Dive (dd/mm/yy), Time of Dive (hrs/mins/secs) and Average Depth (metres or feet) on the bottom line. Every 5 seconds the bottom line alternates to arrows and 'Exit' to show how to scroll through dives within the Log Book. Press the centre button to exit the Log Book at any time. The dive No. is incremented by one every time the rebreather descends below 1.2m providing the surface interval is greater than 5 mins. If the surface interval is less than 5 mins it is counted as an extension of the previous dive. The dive end is logged when the handset is at approx. 0.9m (3ft) or shallower.

If the dive profile can not be displayed for any reason, 'No Data' will be displayed.

Software Upgrades, Updates and Language Options

The software used in the 2020 Colour Display is user upgradable and it is important that the latest version of software is utilised as soon as it is released. Software upgrades will fix any potential bugs found within previous versions. Future software updates may also unlock new features.

The free software updates and language options (English, German, Dutch, Italian, French, Spanish, Portuguese, Danish, Swedish, Norwegian, Polish, Czech or Russian) can be downloaded from www.apdiving.com/en/rebreathers/resources/ and uploaded to your 2020 Colour Display using the AP Communicator program.

Software upgrades to Nitrox or Trimix decompression models are also user upgradeable from the AP communicator once purchased – for more information please contact AP Diving directly – 01326 563834.

Bluetooth Connectivity

The 2020 Colour Display has Bluetooth incorporated allowing easy data transfer to and from a PC or MAC. The Bluetooth connectivity allows updates and downloads to be done without disassembly of the rebreather as the 2020 Colour Display simply needs to be within Bluetooth range of the PC or MAC.

Revised computer programs; AP Communicator (V5_2_1_3 onwards) and AP LogViewer (V5_2_1_1 onwards) have been created to handle the new memory files and Colour Display code. The AP Communicator facilitates upload of new firmware and diver options as well as dive information downloads to and from the Vision electronics. The AP LogViewer is simply used to review the downloaded dive data. The AP programs are suitable for Windows 7 & 8 PCs and MACs running a Windows emulator such as Parallels or VM Fusion.

To check whether your PC has Bluetooth or not, click on the circular Windows icon in the bottom left corner and type Bluetooth into the "Search Programs and files" box, when a Bluetooth program will be evident if your computer has one. All MACs have Bluetooth capability.

If your computer does not have a built-in Bluetooth adapter, a Bluetooth USB dongle can be purchased. The Belkin Mini Bluetooth v4.0 USB adaptor (Belkin Part No. F8T065) is recommended. Available from the AP Diving site (www.apdiving.com) (AP Part Code: RBV91)

Bluetooth Setup

External Bluetooth adaptor (Computers without built-in Bluetooth)

First, the computer has to recognise the Bluetooth USB adaptor/dongle and allocate the correct driver for that adaptor. Second, the product has to be "paired" with your computer.

Internal Bluetooth adaptor (Computers with built in Bluetooth)

The process is easier with a built-in Bluetooth adapter. You simply have to ensure the built in Bluetooth adaptor is switched on and then pair the product with your computer.

Bluetooth Setup – Windows 7 example

Follow this one time setup to install the software required to be able to use Bluetooth communication with your rebreather.

1. Either switch on your Computer's Bluetooth or install the Belkin Bluetooth adapter on your PC using the CD and instructions provided in the Bluetooth USB adapter packaging. If your computer does not have a CD/DVD drive then the driver can be downloaded from Belkin's website: http://www.belkin.com/uk/support-article?articleNum=4867 . If that link is out of date, simply go to www.belkin.com and search for "Bluetooth USB Adapter F8T065 - Setup Driver".

2. Download and install the latest AP Communicator program from http://www.apdiving.com/en/rebreathers/resources/. There is no need to remove older versions of AP programs, simply install the new, ensuring you leave the box ticked "Create Desktop icon". The new icon will replace the old.

3. Move the Colour Display to within 0.5 metre of the Bluetooth dongle. With the Colour Display switched off, activate the Bluetooth mode on the handset by pressing and holding, for 2 seconds, both the left and centre buttons.

   Tip: pressing the centre button slightly before the left button will ensure the handset doesn't accidentally switch on as normal.

   Note: the handset will stay in Bluetooth mode for only 2 minutes. If the following steps take longer to perform, simply re-activate the Bluetooth mode by pressing and holding the left and centre buttons again.

PC LINK
Bluetooth
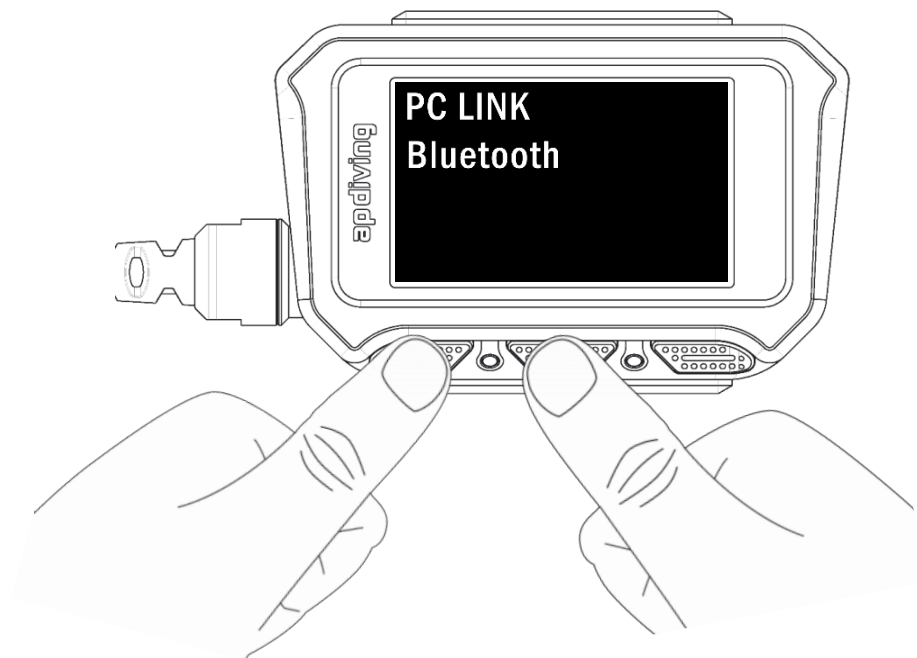
4. Click 'Start', 'Devices and Printers' and then 'Add a Device' at the top of the 'Devices and Printers' window.
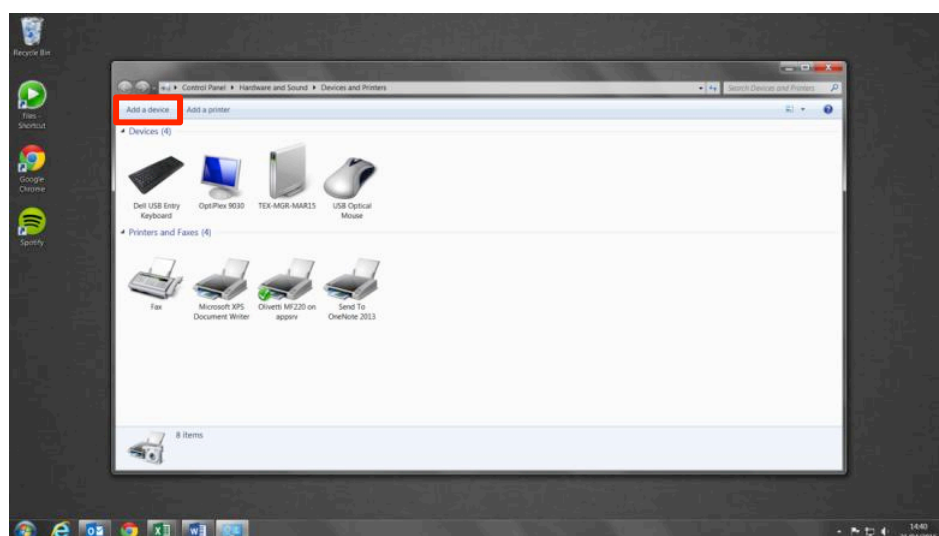
5. Double click the new Bluetooth device – AP Vision- xxxx
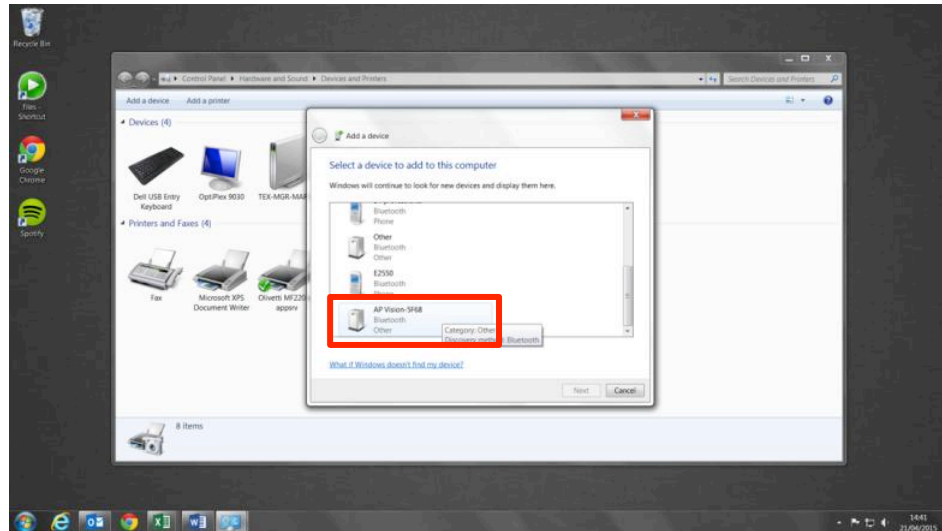
6. Often the device is automatically paired but on some systems you will be required to enter the "device's pairing code", which is ***apvision*** (all in lowercase, no spaces). This will pair the device and it will now be displayed in the 'Devices' of the 'Devices and Printers' window.
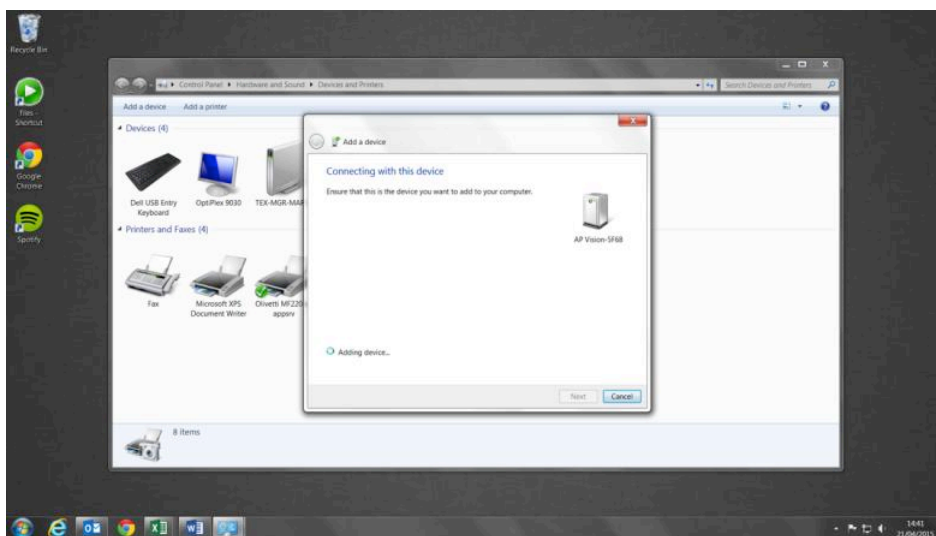
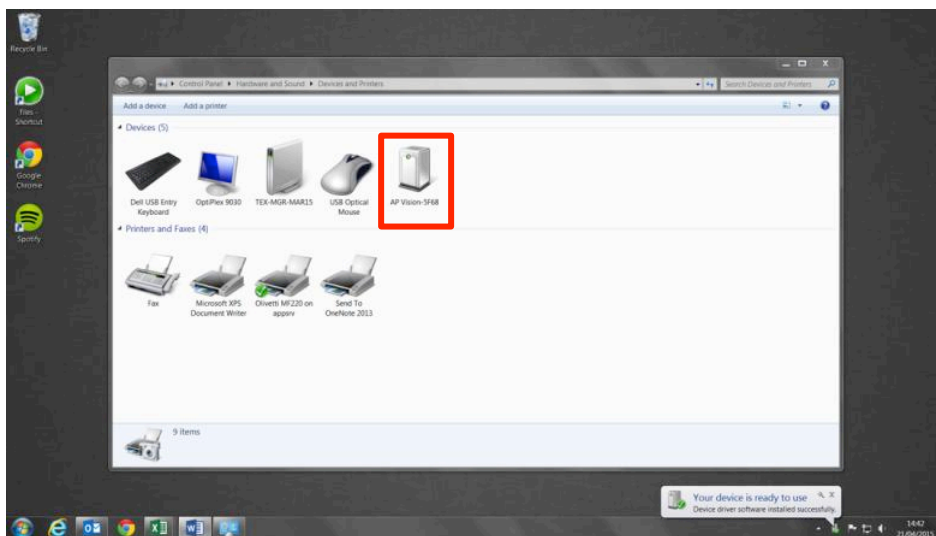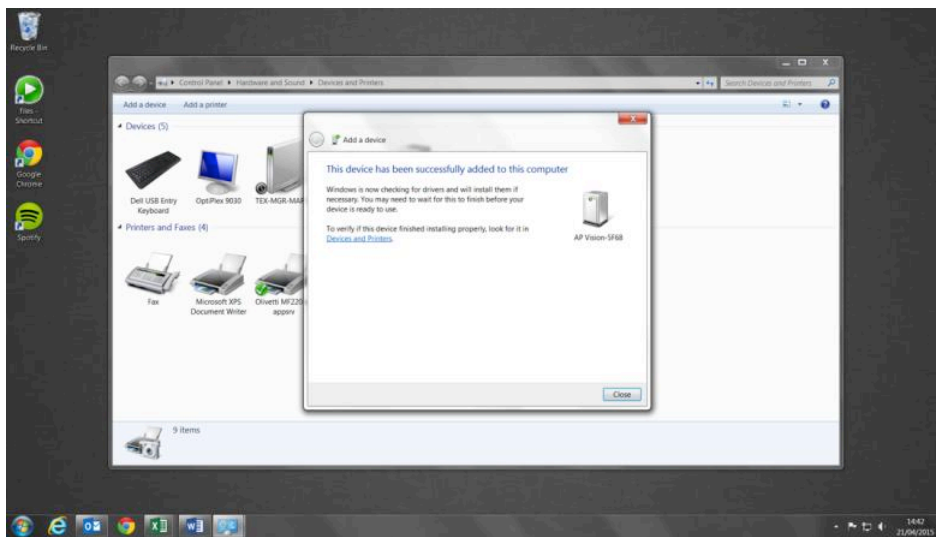7. Right click on the AP Vision-xxxx Bluetooth device logo, select Properties and then the Hardware tab and note the 'COM Port' allocated to the device. You will need to use this port in the AP Communicator program. If necessary you can go into Properties/Advanced and change the COM port number. If you have more than one AP Vision device it may be desirable to rename the device which you can do by clicking on the Bluetooth tab.
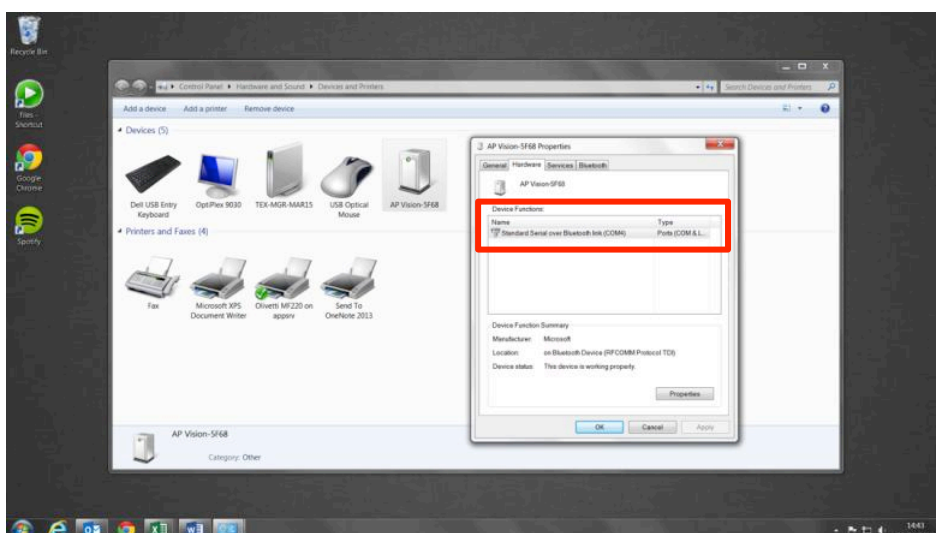
8. Start the AP Communicator program by double clicking on the Desktop icon, then click on Settings.
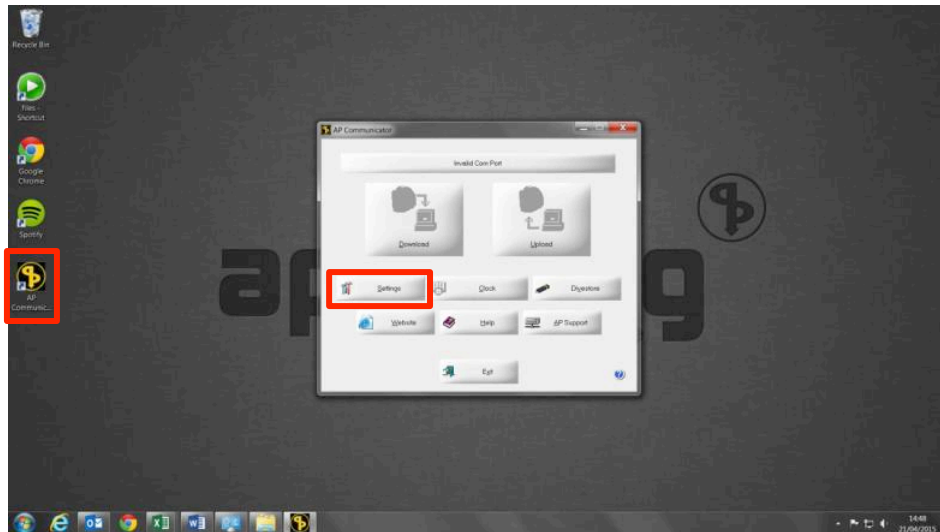
9. Click on the down arrow on the right of the Com Port Selections:
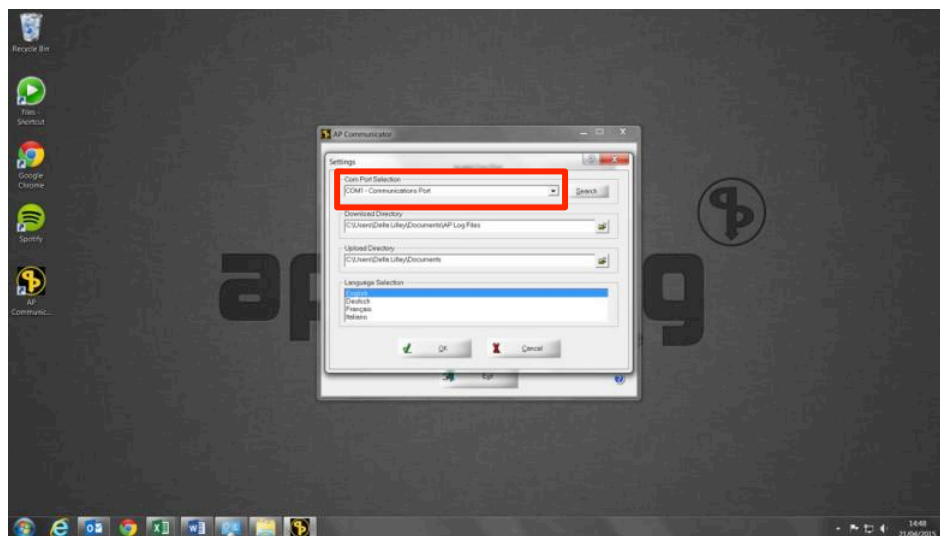
10. Select the COM port of the AP Vision-xxxx device:

Bluetooth Download

To download dives from the 2020 Colour Display:

1. Ensure the correct COM port is selected (as above).
2. Select an appropriate directory to store the dive logs.
3. Place the 2020 Colour Display into PC Link mode by pressing and holding the left and centre buttons.
4. Click 'Download' in the AP Communicator and the files will download to the directory selected. These can then be viewed with the AP LogViewer.

Bluetooth Upload

To upload new firmware and customer options to the 2020 Colour Display:

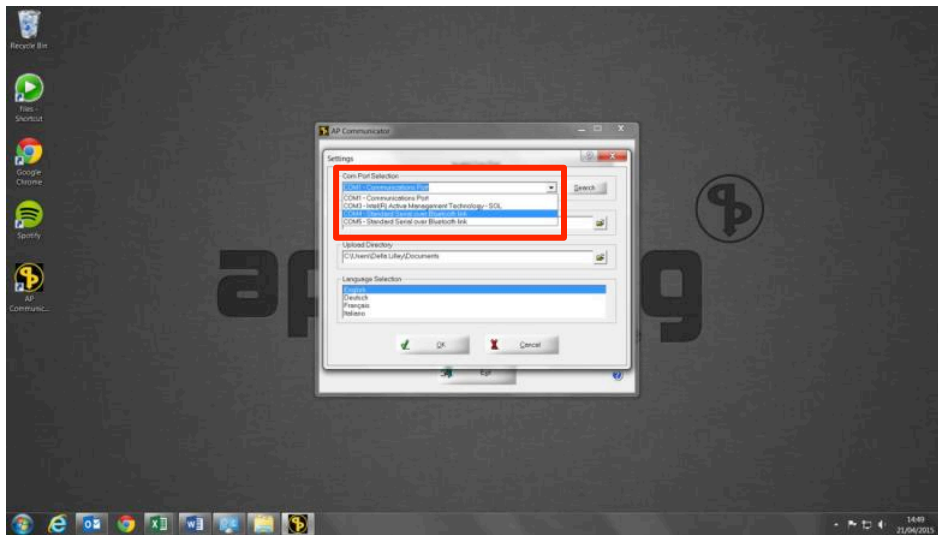1. Ensure the correct COM part is selected (as above).
2. Select the appropriate directory that contains the software file to be uploaded.
3. Place the 2020 Colour Display into PC Link mode by pressing and holding the left and centre buttons.
4. Click 'Upload' in the AP Communicator and the file will be uploaded to the Colour Display.
5. Turn off the 2020 Colour Display to exit PC Link mode.
6. Turn on the 2020 Colour Display by pressing and holding the left button and confirm the new software has been uploaded.

Logging

The Colour Display has a greatly expanded memory, 500x larger than the previous Vision (monochrome display) capacity. The 32Mb of memory allows approx. 500 to 3000 dives to be logged (depending on the duration of the dives).

The latest version of the AP LogViewer program is supplied with the 2020 VISION Colour Display (version V5_2_1_1 onwards) allowing all dive logs to be viewed and extra details added by the diver (location, weather, etc.) to produce a comprehensive history of your rebreather diving.
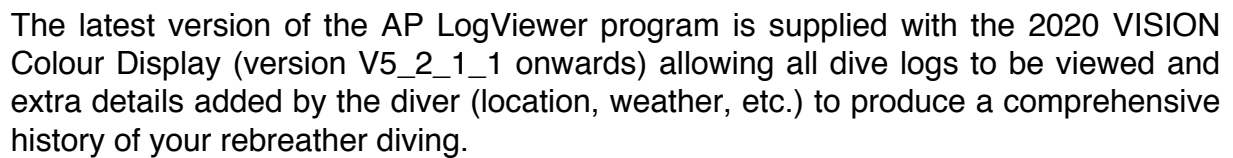
Maintenance

Post-dive, always store the rebreather lid in a clean, dry, environment and take care not to leave the lid and 2020 Colour Display exposed to high temperatures. Do not expose the 2020 Colour Display to disinfecting regimes. It should be protected against shock at all times and avoid scratches on the lens by replacing the lens protector if it is damaged or starts to peel.

It is recommended that the 2020 Colour Display is washed with fresh water after each dive to avoid dirt and salt build up. The buttons should be washed with fresh water in particular and then depressed several times to expel excess water before allowing the equipment to dry naturally and being stored.

Do not wash with high-pressure water jets as this may cause damage to the 2020 Colour Display.

Before each dive you should make sure that the 2020 Colour Display is free from mechanical damage and that the lens, strap, buttons and depth pressure sensor holes are not impeded in any way that could affect use.

The 2020 Colour Display is a sealed unit and no attempt should be made to disassemble the housing. Trying to do so could cause irreversible damage to the display and electronics.

Do not attempt to modify the rebreather or 2020 Colour Display.

The Colour Display will be inspected by AP Diving or one of their authorised service distributors during the rebreather lid annual service.

WARNING – Do not attempt to dispose of the Rebreather Lid or the 2020 VISION Colour Display at the end of their life. Contact AP Diving and we will advise on disposal.

Technical Data

Temperature Range	Operation:	4°C	to	32°C
	Short term air storage (hours):	-10°C	to	50°C
	Long term storage:	5°C	to	20°C

Atmospheric Range   650 – 1080 mbar

Digital Pressure Sensor   0 – 14 bar

Maximum Operating Depth   100m (this coincides with the maximum depth proven for all AP Diving rebreather parameters according to EN14143)

Display   2.8" ultra-bright full colour LCD

Housing   Hard-anodised marine grade aluminium

Glass lens   Scratch-resistant ionised-toughened glass

Battery   Powered by Rebreather Lid power source

Weight   Approx. 0.35Kg (handset and cable only)

Dimensions   Approx. 102 x 64 x 25mm (aluminium housing)

PPO_2 Display	Accuracy:	± 0.05 bar
	Resolution:	0.01 bar
Oxygen Setpoint Range	Low:	0.5 – 0.9 bar
	High:	0.9 – 1.5 bar
Oxygen Warning Level	Low:	0.4 bar
	High:	1.6 bar

Languages   English, German, Dutch, Italian, French, Spanish, Portuguese, Danish, Swedish, Norwegian, Polish, Czech or Russian

Communication   Hardwired to rebreather with flexible, Kevlar-reinforced cable

     Bluetooth download / upload with PC or MAC

Firmware Upgradable   Hardware included for future software update to unlock additional features such as: tilt activation, digital compass and colour customisation capabilities.

Warranty   1 year

EC TYPE Approval

EC Type approved by SGS United Kingdom Ltd, Unit 202b, Worle Parkway, Western-Super-Mare, Somerset, BA22 6WA. Notified Body number 0120.

The "Inspiration XPD", "Inspiration EVP" and "Inspiration EVO" (complete with Colour Display) are CE approved to 40m using an air diluent and 100m using a Heliox or Trimix (with a max. END of 30m at 70m, reducing to an END of 24m at 100m). The EC Type Approval was granted on the APD Manufacturer's Technical Specification and satisfactory user trials. The Technical Specification was based on the "Respiratory equipment-Self-contained re-breathing diving apparatus" standard EN14143:2013.

EC PPE Article 11B Approval

The on-going certification to allow CE marking under Article 11B Directive 89/686/EEC is granted by Lloyd's Register Quality Assurance Ltd. CE0088.

Manufacturer

Designed and Manufactured in the UK by:

Ambient Pressure Diving Ltd
Unit 2C, Water-ma-Trout Industrial Estate,
Helston, Cornwall. TR13 0LW.
Telephone: +44 (0)1326 563834
FAX: +44 (0)1326 573605
www.apdiving.com

For spares and accessories visit:
www.apdiving.com