

## **New Firmware for AP Diving Rebreathers with Colour 2020Vision Electronics.**

**PLEASE NOTE: this update is only for the “Colour” products and is NOT for the pre-2015 “mono-chrome screens.”** (If you try and load incompatible code to the Vision, you will see relevant text on the display – “incompatible code”).

General Release Date: 26<sup>th</sup> April 2018

**New Firmware (embedded software) has been released for your Vision oxygen controllers and handset.**

Please read this entire document to ensure you do things in the correct order.

This new firmware “V07.01.00\_Language\_Sport\_System.ccr” is uploaded to the rebreather lid using the latest version of AP Connect. AP Connect software runs on both PCs and Macs.

This new firmware, V07.01.00, is the first general release since the colour screen launch and is suitable for upload to all colour Vision “lids”.

Firmware Version 07.01.00 is now available for download from the website:

<https://www.apdiving.com/en/rebreathers/resources/firmware/>

Select the language you would like to have on your Vision handset and download that language specific folder.

In the download folder, there is a new suite of PC Software to ensure compatibility with V07.01.00 firmware.

**PLEASE NOTE: DO NOT** use your existing AP Communicator to load the new firmware, **you MUST** use the program that has superseded Communicator, it’s called AP Connect – **and you MUST use** the latest version of Connect, which is in the download folder.

V07.01.00 is an open upgrade suitable for all colour Vision lids, regardless of the firmware version already on the lid, the decompression option chosen and regardless of the serial number, so one copy of the firmware can be uploaded to all (Vision) rebreathers. Your personal details will be retained on the handset as will the decompression version and basic dive details.

**Contents of this Document:**

New Firmware for AP Diving Rebreathers with Colour 2020Vision Electronics. ....	1
Changes to Code from V07.00.02 to V07.01.00 .....	2
PC/Mac Software.....	4
Update Instructions: .....	5
Quick Guide .....	7
Suppressible Warnings .....	8

**Changes to Code from V07.00.02 to V07.01.00**

- 1) New Bluetooth utility allows access to full dive log memory.
- 2) New logging format allows individual dive download, as opposed to downloading the whole file; all pre and post dive events are recorded; increased plotting accuracy: PPO<sub>2</sub> and depth are now logged every 3 secs, Tempstik, CO<sub>2</sub> and decompression data are now stored every 10 secs.
- 3) Basic data logging has been activated in the lid, which acts as a backup to the main logging, done in the handset.
- 4) Improved languages with some corrections and the addition of Chinese, Japanese and Korean.
- 5) Display programmed to allow half characters allowing proper centralisation of text.
- 6) Tilt compensated compass – the hardware is fitted and most customers will be able to use this feature immediately but there are 200 units in use, which will require a small hardware modification to enable compass calibration, which can be done at the next service. Load the new firmware, read the manual on compass operation, try the compass calibration, if it won't calibrate please contact the factory.
- 7) Tilt activated back light.
- 8) Backlight setting is now saved and recalled at switch on, so if you set it on "permanent" it will be on every time you switch on.
- 9) Graphical logbook showing the dive profile and average depth.
- 10) The number of diluents has been increased to nine. Please remember, the diluent entry is also used for the open circuit bail out gases.
- 11) A bug was found in the decompression calculation: if the handset was changed to open circuit/bailout mode and then Closed circuit mode was re-selected during a dive, the decompression required calculation was adjusted. This has now been addressed.

- 12) The CO<sub>2</sub> sensor initialisation routine at switch on has been improved; giving a slightly longer warm up period for better sensor stability to eliminate false positives on switch on.
- 13) Gradient Factor entry is now conditional. You can still enter largely what you want to but this new alteration prevents you entering a GF low as a higher value than GF High. In the previous versions, if you enter GF low of say 95 and a GF high of 30 then you would be faced with inappropriately long deco. The GF low always needs to be a lower value than the GF high and this firmware alteration ensures that is the case.
  - a. Diluent gas entry: the decompression calculated is based on the inert gas loading. The accuracy of the decompression calculation with most dive computers can only be as accurate as your gas entry. However, with the rebreather, where we measure the PPO<sub>2</sub>: If you use an air diluent and have what we call the Nitrox decompression firmware, then even if you enter a Nitrox mixture by mistake, any mixture with some Nitrogen in it then it will give you the correct decompression.
  - b. If you use a Heliox diluent and have what we call the Trimix decompression firmware then even if you enter the wrong Heliox mixture, then it will still give you the correct decompression, as it knows the PPO<sub>2</sub> and knows the only other gas is Helium.
  - c. If you enter the wrong Trimix, the decompression will be calculated based on the gas that you have inputted. The saving grace is that there's generally enough safety margin to keep most people safe providing the diluent used is similar to that entered.
  - d. The modification to this release of firmware is: If the diluent choice is inadvertently set to 100% O<sub>2</sub>; whereas previous versions of firmware would accept your input and assume there is no inert gas present. The latest version, once you are below 9m, will assume the inert gas based on your decompression firmware option. i.e. if you have the Nitrox option the inert gas will be assumed to be Nitrogen and it will give you the correct decompression. If you have the Trimix option then we assume the inert gas is Helium and calculate the decompression on that basis. With the Trimix option the decompression will be shown as EST, "estimated", a warning will be shown on the screen: "CHECK DILUENT SETTING". This warning is suppressible for 20 minutes at a time by pressing and holding the right button. The correct action though would be to simply enter the correct diluent in the menu; all menus are accessed the same way – by pressing the left and right buttons together, whether you are on the surface or underwater.
- 14) The low O<sub>2</sub> warning has been moved from 0.4 bar to 0.5 bar giving a slightly earlier warning than previously. The Low setpoint range has been changed from 0.5 - 0.9 to 0.6 - 0.9, it is recommended though to leave it on the default setting of 0.7.
- 15) The HUD light brightness is now increased to full brightness when low or high O<sub>2</sub> warnings are activated.
- 16) The alarm sounds have been changed to fast beeping for HIGH O<sub>2</sub> and continuous for LOW O<sub>2</sub>.
- 17) The Tissue Pressures are now recorded and displayed in DiveSight. It is displayed in two ways; % of limit or Absolute, changeable in Tools/Settings. The pressure limit for each tissue/compartments is different so the most valuable information is the % of limit display, with this option set you can see the leading tissues/compartments as you scroll through the dive.

## PC/Mac Software

AP Communicator has been replaced with AP Connect.

AP LogViewer has been replaced with AP DiveSight.

DiveSight and Connect are available for both Macs and PCs. Both programs are supplied free of charge.

New versions of AP Connect and AP DiveSight are issued to ensure compatibility with V07.01.00 Vision firmware. Both programs are backwards compatible and can be used on Vision units from 2005 and for viewing older dive files.

- AP Connect
  - Windows PC Version: APConnect\_Windows\_Setup\_V1\_0\_4\_3.exe and
  - MAC Version: APConnect\_OSX\_Setup\_V1\_0\_4\_3.dmg

For compatibility, the new version of AP Connect is to be used with V07.01.00 Vision Firmware.

- AP DiveSight
  - Windows PC Version: APDiveSight\_Windows\_Setup\_V1\_0\_9\_0.exe
  - MAC Version: APDiveSight\_OSX\_Setup\_V1\_0\_9\_0.dmg

For compatibility, the new version of DiveSight is to be used with V07.01.00 Vision Firmware.

## Update Instructions:

### Step 1)

Please note, this upgrade changes the divelog memory. Basic dive data, dive times, dates and depths will be transferred to the new format but the full dive data recorded to date will not be, so it is important to save that data to your PC if you want future access to it. Download the data (using your version of AP Communicator or the new version of AP Connect) from the Vision lid and store the dives on your PC.

### Step 2) Download the files from the website:

Go to <https://www.apdiving.com/en/rebreathers/resources/firmware/> and select the language version you require. Enter the required registration information and download the file to a readily accessible location on your PC or MAC such as the Desktop.

The file contains the firmware for your Vision electronics, the firmware has a suffix: \*.ccr . This is NOT an executable file; you can't just click on it and expect it to run on your PC or MAC. This file needs to be UP-loaded onto your rebreather lid using the AP Connect software.

### Step 3) Install the new AP Connect:

Once the files have been extracted, firstly install the AP Connect (PC/MAC software) by double-clicking on the setup file. It replaces any earlier versions of AP Connect, there is no need to "uninstall" the old version. Leave the "create a desktop icon" box ticked and it will simply overwrite your old AP Connect desktop icon. It will not over-write the AP Communicator program, which you may decide to keep on your PC: the AP Communicator has two features which are not available in the AP Connect – the DiveStore \*.ccx processor and the Remote Connection feature.

### Step 4)

Install new batteries into both battery boxes or recharge if you have rechargeable batteries.

### Step 5)

Connect your PC to the Vision lid using the cable and Bridge Interface if you have one. If not, connect via Bluetooth. For Bluetooth connection instructions refer to sections 12.1, 12.2 and 12.5 of the Inspiration manual. <https://www.apdiving.com/en/rebreathers/resources/manuals/>  
Please remember the handset needs to be within 30cm of the Bluetooth device on your PC/MAC.

### Step 6)

Run the APD Connect Program, by double clicking on the Desktop icon:

If using Bluetooth to connect the lid to the PC or Mac please go to Step 8.

### Step 7)

If using the Bridge and cable, press the left button on the Vision handset, the screen should say “PC LINK.” If it doesn’t, switch off, check the cable connections and re-try.

- a) The Two grey boxes on the AP Connect remain grey if there is no connection to a lid. Once the boxes turn yellow, that indicates a lid is connected. If they are grey, select “SEARCH” which is located top left. Providing the handset on the rebreather is displaying PC LINK the software should find the port the lid is connected to.
  - Sometimes it is necessary to go to Control Panel / Device Manager and select COM ports to see if your PC has identified the USB/serial adaptor. Then, restarting the AP Connect program is usually sufficient. If you have problems, please contact the factory for a copy of the trouble-shooting guide. The latest, white, USB/serial lead usually self-installs when you plug it into the USB port on your PC/Mac and gives few problems.
- b) Once the boxes are yellow then Upload the Vision firmware file “V07.01.00\_Language\_Sport\_System.ccr” to the rebreather by clicking on the large Upload button and selecting the new Vision\_V07.01.00\_Language\_Sport\_System.ccr upgrade file. Select Upload and the \*.ccr file will be loaded onto the lid and handset. Once it is 100% finished, exit Connect, switch off the handset by pressing the centre and right switches on the handset. When the handset screen is blank, disconnect the lid from the Bridge.

### Step 8)

If using the Bluetooth connection to update the firmware, press the centre and left buttons on the Vision handset to place the handset in PC LINK mode.

The firmware update using Bluetooth requires a two-stage process:

- a) The utility program “Sbl\_BT\_Loader\_SblR12\_V07.01.00\_English\_Sport\_Colour\_Display.ccr” needs to be up-loaded onto the handset. Then simply press the left button on the handset and that utility program will make the necessary changes to the Bluetooth bootloader in two seconds and the following is displayed to show the job is done: “NEW SBL READY”; “RESTART PC LINK AND UPLOAD THE LATEST CODE”. After this is displayed, SWITCH OFF handset by pressing the centre and right buttons and then switch on again in Bluetooth PC LINK mode by pressing the centre and left buttons, when PC LINK will be displayed.
- b) The main program “V07.01.00\_English\_Sport\_System.ccr” can then be uploaded to the lid.

### Step 9) Install the AP DiveSight Program

In the file you will find the latest version of the AP DiveSight. There is an \*.exe file, which is PC software and \*.dmg file for MAC users. Simply double click on it to run the install program. This version of DiveSight is backwards compatible with all previous Logfiles.

## Quick Guide

Step	Update Procedure	Type of File
1	Download the dives from the lid	
2	Go to the website: <a href="https://www.apdiving.com/en/rebreathers/resources/firmware/">https://www.apdiving.com/en/rebreathers/resources/firmware/</a> and Select and download your language folder and save the entire folder onto your Desktop.	Folder
3	Ensure you have good batteries in both Controllers.	
4	Install AP Connect onto your PC or MAC by double clicking on the relevant Connect Setup file: Windows PC Version: APConnect_Windows_Setup_V1_0_4_3.exe MAC Version: APConnect_OSX_Setup_V1_0_4_0.dmg	PC /MAC Application
5	Connect the lid to the PC using the Cable and Bridge Interface if available, press the left hand button of the handset to start PC LINK then go to Step 8.	
6	If you do not have a Cable and Bridge interface then the PC/MAC to lid connection may be done by Bluetooth. For Bluetooth connection instructions refer to sections 12.1, 12.2 and 12.5 of the user manual.	
7	Once paired, press the left and centre buttons on the handset to get it into PC LINK mode. i) Load the Bluetooth utility program to the lid first: Sbl_BT_Loader_SblR12_V07.01.00_English_Sport_Colour_Dis play.ccr ii) Switch off handset. iii) Press the left button on the handset to activate the Bluetooth loader. iv) At the prompt, switch off the handset	Bluetooth Utility
8	Upload the rebreather code V07.01.00_Language_Sport_System.ccr to the Vision lid. When done, switch off handset, disconnect from Bridge interface (if applicable) and switch the handset on again. The new code will be displayed on the start up screen.	AP Vision Firmware
8	Install the AP DiveSight by double clicking on the DiveSight Setup file Windows PC Version: APDiveSight_Windows_Setup_V1_0_9_0.exe MAC Version: APDiveSight_OSX_Setup_V1_0_9_0.dmg	PC /MAC Application
9	A copy of this notice is in the download folder document	PDF

## Suppressible Warnings

### Low and High O<sub>2</sub> warnings:

Please remember: oxygen warnings, low or high are not suppressible – we expect you to add gas, diluent or oxygen, to get the PPO<sub>2</sub> within the normal life sustaining range (0.4 to 1.6 bar) or bailout to open circuit.

Other warnings are suppressible by pressing and holding the right button.

### Cell Warnings:

Cell warnings have two levels of warnings: At 0.2 bar and 0.4 bar away from the average of the other two. At 0.2 bar the 1<sup>st</sup> level alarm is activated. Although this alarm is suppressible for 5 mins at a time, the appropriate action is to assess the cells: how do they react to gas addition, do they rise when oxygen is added? – if a cell doesn't rise then it could well be current limited so start to lower the setpoint until all the cells are acting appropriately, right down below 1.0 bar if necessary. In the event that one cell deviated from the average of the other two by 0.4 bar, then the 2<sup>nd</sup> level alarm is activated and cannot be suppressed. You have to do something about it – ignoring it could cost you your life. Lower the setpoint way down; take it to 0.7 bar if necessary. Flush with diluent, add a little oxygen, do all three cells behave appropriately to the gas change? – The ones that do change value appropriately are the ones to believe in.

### Just because two cells agree, doesn't mean they're correct.

Cell warnings can occur for a number of reasons. Sometimes it can be trivial, for instance when you instigate a big change in PPO<sub>2</sub>, one cell might react more slowly than another and you might get a momentary alarm. An example of this would be when changing from the low setpoint to the high.

But, usually it is not trivial and needs your attention.

Cell warnings are the catchall. It is telling you there is something wrong and your EARLY assessment and monitoring is required. Just ignoring or suppressing it has cost lives.

The PPO<sub>2</sub> control logic is very simple – the electronics are programmed to believe the closest two are correct and ignores the third cell. This gives very accurate PPO<sub>2</sub> control and it is easy for you to see at a glance which are the closest two cells and understand what the rebreather electronics are doing.

In the event that one cell goes adrift too far, the cell warning is activated and this is where you come in. Firstly, do NOT think that the closest two must be correct. It's your job to assess what is happening and check which cells are accurate and which are not. If the closest two are 1.28 and 1.31 but the third cell is rising rapidly to the maximum displayable value of 2.55 bar, you need to find out whether that wayward cell is faulty or is it the only good cell you have?

Assumption is the killer. Please don't assume that your old favourite cell, which hasn't caused a problem in the past, is still the best one. Please don't assume that the latest cell that you have just fitted is the faulty one. Check it – that's the smart thing to do.

Ensure your diluent flush technique is adequate. While looking at the display, hold the exhale counterlung's dump valve open and press the diluent inflator for at least 10 secs. (Tip: to eliminate buoyancy change, ensure the dump valve is at the highest point – achievable when upright when using the over the shoulder counterlungs or by lay horizontally when using the rear mounted counterlungs. This will change the gas over the sensors very quickly. Of course you will be fighting



against the oxygen controller, which will be trying to add gas so you need to be robust, add lots of diluent. With the gas changing rapidly it allows you to see which sensors are reacting properly and which are not.

Then add some oxygen, the cells should rise. The cells that don't rise are potentially current limited. If you are shallow enough to do an oxygen flush this is best-achieved upright, venting from your mouth around the outside of the mouthpiece and pressing the manual oxygen inflator.

Lower the setpoint to 1.1 bar – do all three cells now react appropriately to gas change? Lower the setpoint as low as is needed.

If you are in doubt, lower the setpoint until all three cells are within the normal life supporting range.

Understanding how the oxygen controller works and what affects the displayed cell values is much more important than trying to remember drills.

#### **CO<sub>2</sub> and Tempstik warnings:**

CO<sub>2</sub> sensor and Tempstik warnings have two alarm levels, the first at approximately 5 mbar, which is suppressible, and the 2<sup>nd</sup> warning at approximately 10 mbar which isn't suppressible. The Tempstik warnings only work properly with Sofnolime 797 and only work properly when the correct amount of sodalime is used: 2.4 kg on Inspiration XPD and EVP; 2.0 kg on Inspiration EVO (Evolution). Do not over or under fill.

#### **CNS:**

CNS and other warnings are suppressible for 20 minutes at a time. We often get asked to remove the CNS warning by divers doing long decompression dives. I have refused these requests for the following reasons:

- a) When you suppress the warning, it is suppressed for 20 mins at a time. It is no hardship to have your attention brought back to the handset 20 mins later, check to see what the display is saying then suppress it again if that is what you believe to be appropriate.
- b) if they don't know that they can suppress a CNS warning, then what else don't they know? They are clearly not as expert as they think they are. Do they really know what levels of CNS are safe for them? Of course they don't, none of us do, they are just pushing their luck.
- c) For us to not warn would be irresponsible.

If you bailout to OC and change the rebreather setting to OC, CCR specific warnings are automatically suppressed.

AP Diving  
Water-ma-Trout Industrial Estate,  
Helston,  
Cornwall,  
TR13 0LW  
Tel: +44 (0) 16 563834  
Email: [sales@apdiving.com](mailto:sales@apdiving.com)