

AV1

dive computer

MANUAL

(revision 6/2014)



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WARNING

Decompression meter firmware calculates theoretical tissue saturation with inert gases based on a mathematical model. This model was made thanks to a variety of experimental data with the latest decompression theory developments. **Nevertheless, using the dive computer, as well as decompression tables cannot guarantee complete protection against Decompression Decease (DD).** Each diver has his own physiology that changes from day to day. None of mechanisms can foresee response of your body to any dive profile.

- **Never dive deeper than dive limit set by safe Oxygen Partial Pressure!**
- **Never breach decompression procedures!**
- **Never dive deeper the limit you are certified to!**
- **Always study local diving conditions and depths where you are planning to dive!**

1. AV1 DIVE COMPUTER GENERAL DESCRIPTION

AV1 dive computer (further – AV1) shows all important dive parameters and decompression information on the screen.

Body made of highly-durable Delrin plastics
Polycarbonate screen
Weight (kg): 0.27
Modern piezoceramic buttons
Multi-color graphic display of high-resolution (320x240) and high-contrast. Diagonal – 2.4"
LiPo battery; charging via USB port from any power source



AV1 main features:

- supported gases: any composition / air, Nitrox, Trimix and Heliox;
- modes: Open Circuit, Closed Circuit, Gauge;
- algorithm Buhlmann ZHL-16C, Gradient Factor model, 16 compartments;
- automatic switch-off after 2 minute surfacing;
- 8 gases for Open Circuit (OC) and Closed Circuit (CCR);
- convenient system of gas choice/change;
- opportunity to switch between OC and CCR during the dive;
- gas mixes or one gas can be added or changed during the dive;
- computer is not blocked during the dive when diving regime is violated;
- automatic switching between setpoints (can be set by user);
- 3 adjusted setpoints in Closed Circuit regime: High, Low and Deco;
- Computer firmware can be upgraded via USB port;
- 100 dives' logbook, detailed logbook – for 100 hours, detailed protocol – for 50 hours in nonvolatile memory; logging interval – 10 seconds;
- all warnings and diver's actions are recorded;
- information can be downloaded to a personal computer;
- CNS level indicator;
- digital indicator of descending/ascending speed;
- multi-level planner, required gas and CCR bailout calculation;
- opportunity to look through all forthcoming decompression stops during the dive;
- dive simulator;
- recreational mode;
- Gauge mode;
- Built-in game
- maximal tested depth – 200 meters;
- LiPo accumulator; charging via USB port from any power source;
- dimensions 90x65x28;
- weight 0.27 kg.

2. MAIN PARAMETERS AND DISPLAY FUNCTIONS

2.1 Control Buttons

Control buttons allow to choose display functions and access the required specific information. They are also used to enter display settings.

Two piezoceramic buttons are used to manage AV1 modes and settings. The buttons are located on both (left and right) sides of the computer. Both sequential and simultaneous pressing of the buttons are used. Current buttons' settings are displayed as context-sensitive hint in the bottom bar of the screen.

Symbol **>xxxx<** in the middle of the bottom bar means «simultaneous pressing of 2 buttons».

When you are in any MENU item in Surface mode and don't press any buttons for more than 60 seconds, the computer will leave the MENU item to the Main screen. In Dive mode buttons' timeout will take 15 seconds. The only exclusion is Dive Planner mode when automatic switching to the Main screen will happen in 5 minutes.

In Surface mode buttons are set to maximum sensitivity. You can set AV1 in such a way that AV1 could automatically decrease buttons' sensitivity in Dive mode in order to avoid occasional buttons' pressing. Sensitivity range is 0... -14. Do not set buttons' sensitivity too low. It can complicate managing AV1 in Dive mode. Range -5 ... -7 would be a good compromise for the majority of cases. You can test buttons' operation in the Simulator mode.

2.2 Power Supply

LiPo accumulator battery is used in AV1. Accumulator charging is automatic when the computer is linked to any device with power supply more than 500mA via USB port.

Green-color indicator will flash when you switch on the computer. The charging process will be marked with a red-color indicator. When charging is finished, the red-color indicator will disappear. It's recommended to leave AV1 connected to a power supply source for 30 minutes after charging process is finished (when the red indicator disappears). Battery charging will be better.

Dive computer re-charging can be done at any level of accumulator charging – it does not affect the accumulator capacity.

Try not to use AV1 at low temperatures (minus zero C) and keep it in a warm place right up to the dive.

Try to charge AV1 beforehand – before «**lo bat**» indicator appears on the screen.

Time of AV1 independent work depends on the preset screen brightness. Work time will decrease with higher screen brightness. Screen brightness will be decreased to 30% level when battery level goes down to 20%.

If the battery is discharged lower than recommended, AV1 will automatically turn off. You will be able to turn the AV1 on only upon battery charging. Information in the logbook will not be lost.

DO NOT START YOUR DIVE if lo bat indicator is on!

Operation time with fully charged battery is about 10 hours.

If you don't use AV1 for a long time, charge it at least once in 2 (two) months. It will prolong battery life.

**With full battery discharge all the information
(current settings, current tissue saturation) will be lost!**

Don't take too much effort when screwing the cap!

Don't forget to screw the AV1 USB-port cap tightly upon battery charging!

The cap is screwed until the tight contact between external O-ring of the cap and the device body.

Every time ensure that USB-port slot is clean and undamaged. Lubricate O-rings and thread with silicone grease when required.

3. TURNING ON AND OFF

To turn the dive computer on from the Sleep mode press, firstly, the left button, then right away – the left one.

AV1 will switch from Surface mode to the Sleep mode upon 2 minutes of idle time. The device can be switched into the Sleep mode forcefully by selecting **TurnOff** Menu. Automatic turning off will be deactivated in case at least one oxygen cell control function is on (in AVF1 and eCCR controller versions). In the Sleep mode AV1 keeps continuously recalculating the current tissues' saturation and CNS level taking into account your surface interval. You can switch to TurnOff menu from the Main menu in a Surface mode by pressing both buttons.

AV1 will automatically switch to Dive mode within 10 seconds of 2 meters' submerging.

AV1 will also automatically switch from Dive mode to Surface mode, if the depth is less than 1(one) meter within 2 minutes.

Two dives with surface time between these 2 (two) dives less than 2 minutes will be recorded as 1 (one) dive.

4. THE MENU

Description and function of the main menu items:

Turn OFF

(only in Surface mode) switching to the Sleep mode.

This menu item is also accessible by simultaneous pressing both buttons in the Main Menu Screen.

->Switch SP

(only in CCR mode)



manual switching between Low, High and Deco Setpoints. Choose the required Setpoint with button **Next** and confirm with button **OK**.

->Dive setup ->

Entry to the submenu of dive mode settings

->Edit mix

Gas list editing. Here you can add gases into active gases' list which will be available in **Select mix** menu item. You can also edit MOD field.



Navigating between fields is made with \rightarrow button, changing the field value is made with $+$ button. **MOD** field value is taken into account when best mix is offered at the moment of gas change via **->selectmix** menu item, and when TTS value calculation and when planning your dive.

Gas, set as an *active* one (Activ YES/NO) will be included into gas list available for changing and will be taken into account when planning your dive and TTS value calculation.

PO₂ field is for reference only and non-editible. It automatically indicates PO₂ at MOD depth with preset oxygen fraction. It will be offered to save results of editing upon navigating through all the editable fields.

->Setup SP

(only in CCR mode) Editing High, Low and Deco Setpoints and Depth of AutoSwitching.

Next – selection of High or Low Setpoint for editing.

Edit – access to editing mode.

Value range for Low Setpoint: 0.40-0.95, for High Setpoint: 1.00-1.60 with discrete interval of 0.05. Switching between digits is done with \rightarrow button, changing the value with $+$. It will be offered to save results of editing upon navigating through all the editable fields.

->AutoSwitch SP

(only in CCR mode) Turning On / Off AutoSwitch of Setpoints.

By pressing **ON** for this SubMenu AutoSwitch of Setpoints (from Low SP to High SP, and vice versa) will be made when crossing the depth level preset in **SW at** SubMenu in **->Setup SP**. By pressing **OFF** AutoSwitch of Setpoints can be made only manually via **>SwitchSP** SubMenu.

->Conservatism

Editing Low and High Gradient Factors.

Editing range 0.05-0.95 with discrete interval of 0.05. Switching between digits is done with **→** button, changing the value with **+**. It will be offered to save results of editing upon navigating through all the editable fields.

->Last STOP

Editing final decostop depth.

Available values: 3-4-5-6 meters.

->Select mix

Current gas selection.

Access to this menu item is also available from the main screen by pressing the right button.

Only active gases will be offered in the list (see Menu item **-> Edit mix**). The gas with the most suitable MOD value (Maximum Operating Depth for a breathing gas below which the partial pressure of Oxygen (ppO₂) will be offered as the first one.

Select gas by pressing **Next**, confirm your selection – press **OK**.

When you try to select a gas with PO₂ lower than 0.16 bar or PO₂ higher than 1.6 bar, the warning about dangerous choice will be displayed: **DANGER! SURE?** You can choose another gas by pressing **Next**, cancel by simultaneous pressing of two buttons **>Cancel<**, or confirm by pressing **OK**.



Fast navigation to Gas List Editing menu is also available. For this select **edit mix** menu in Gas List.

->switchOC/CCR

Switching to Open Circuit (OC) or Closed Circuit (CCR).

Switching is done by one pressing **OK** button.

>System Setup->

(only in Surface Interval mode) System settings of dive computer.

->Set date/time

(only in Surface Interval mode) System Time/Date setting.

Switching between digits is done with **→** button, changing the value with **+**. It will be offered to save results of editing upon navigating through all the editable fields.

->Up/Download

(only in Surface Interval mode) Switching to DFU – Device Firmware Update mode or Logbook Downloading.

When switching to this mode, the computer will be re-loaded. All the basic settings will be automatically saved in a non-volatile memory. Upon exiting the mode the computer will offer you either to reset all the default settings, or to upload the settings saved before.

NOTE! When switching to this mode your dive computer will be reloaded, and all the current settings, tissues' saturation, CNS and system time data will be lost!

->Mode

(only in Surface Interval mode) Switching between Technical, Recreational and Gauge (bottom timer) Modes. For details see **Gauge Mode** and **Recreational Mode**.

->Water density

(only in Surface Interval mode) Water Density setting.

Available values 0.900-1.050 with discretion interval of 0.005. This value affects the accuracy of depth indications with various water salinity level. **This setting does not**

affect any decompression calculations! All the decompression calculations are made based on measured pressure and do not depend on water salinity ratio.

->Flip screen

This mode turns the screen picture by 180 degrees.

->Info

(only in Surface mode)

Battery charging level and unique computer identification number will displayed on the screen.



->Display mode

(only in Surface mode)

Switching between Metric and Imperial units of depth and temperature measurement (meters and Celcius degrees or feet and Farenheit degrees). **Переключение между метрическими и имперскими единицами измерения глубины и температуры.**

Switching between fields is done with → button, saving with **OK**.

->Language

(only in Surface mode)

Choosing the language. Russian and English languages are available for choice.

Switching between fields is done with → button, saving with **OK**.

->Button Sensit

(only in Surface mode)

Buttons' sensitivity (in Dive mode) adjustment.

Sensitivity range is 0... -14. Do not set buttons' sensitivity too low at the beginning. It can complicate managing AV1 in Dive mode. Range -5 ... -7.

To save press **OK**.

->CompasCalibrate

(only in Surface mode)

Compass calibration procedure start-up. More about the procedure see in Article 7.1. Upon finishing calibration procedure press **Save** button to store results in non-volatile memory.

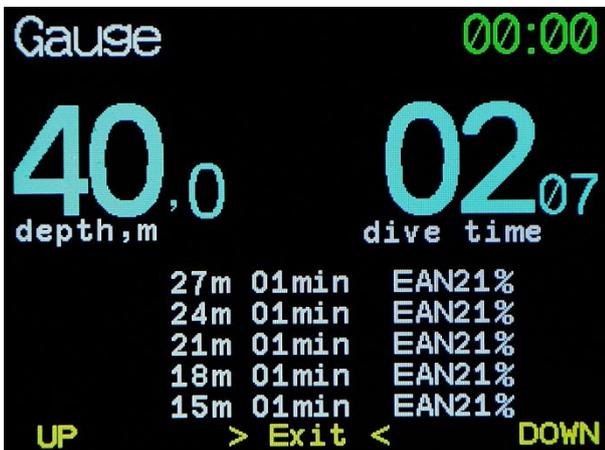
->diveplan

(only in Dive mode) Looking through forthcoming (planned) safety stops.



A list of forthcoming safety stops is in the bottom part of the screen. To browse through the list use buttons **Up** и **Down**. Exit from browse display - simultaneous pressing of 2 buttons.

If you use AV1 in Gauge Mode and have preliminarily planned your dive in a built-in Dive Planner, you will be able to look it through during your dive.



->logbook

(only in Surface Interval mode) logbook browsing.

Brief information, graph, complete information in table mode.

Depth profile (blue), temperature profile (green) and decompression ceiling (red) are presented in a graphic way.



Switching between modes is done by simultaneous pressing of 2 buttons.

In brief information and in graph modes switching between dives is done by pressing **Next** or **Prev**.

Note! Exit from logbook mode to main menu screen can be automatic within 30 seconds, or by consequential pressing buttons through Graph-Table modes.

->Plan dive

(only in Surface Interval mode) Dive planning mode.

Planning is done based on the list of current active gases and settings (GF, SP, laststop). See in detail - **Built-in Dive Planner**.

->Backlight

Adjusting backlight intensity.

Possible value range 1-10. The higher backlight intensity, the faster battery discharging. AV1 battery capacity at minimum brightness – not less than 20 hours. At maximum one – 10 hours.

->Switch screen

Sets the screen view: Main, Alternative (only in Dive Mode) or Compass.

Switching between screens in Dive Mode is made by pressing both buttons.

See in detail - **Dive Mode**.

->Dive Simulator

(only in Surface Interval mode) Turning On/Off Dive Simulator Mode. «Dive» Depth adjusting.

When the Dive Simulator mode is on, quick access to «Dive» Depth adjusting can be done by simultaneous pressing of 2 buttons. See in detail – **Dive Simulator mode**.

->Play game

The game can be activated both in Surface Interval mode and in Dive mode.

When the game is activated in Dive mode, the computer keeps calculating all the decompression procedures in the mode you chose for your dive.

You can leave Game mode by simultaneous pressing of 2 buttons.

Below is an example of AV1 screen in Game mode:

Available in all Modes.

Game «Python». Button "**<-**" - counterclockwise turn.

"**->**" – clockwise turn.

Pressing both buttons – game exit.



During the game all decompression calculations are made on a full scale in a background mode

->CellsControl

(only in CCR mode)

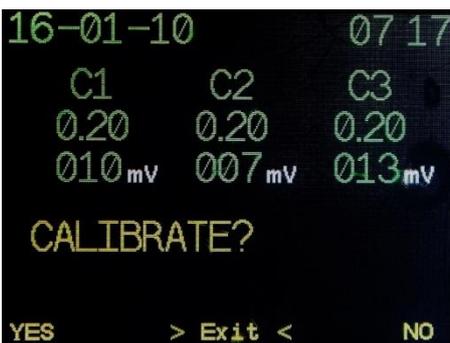
Turning On/Off PO₂ control mode managed by Oxygen cells.

AV1 in CCR mode can control PO₂ in the loop by means of one, two or three Oxygen cells of R22, R17 or similar type. Quantity and cell number is set in this menu. See in detail - PO₂ Cells Control.

AV1 also lets turn faulty cells' control off during your dive.

->Calibrate O₂

(only in CCR mode and in Surface Interval mode, provided control of at least one Oxygen cell is activated. See ->CellsControl menu).



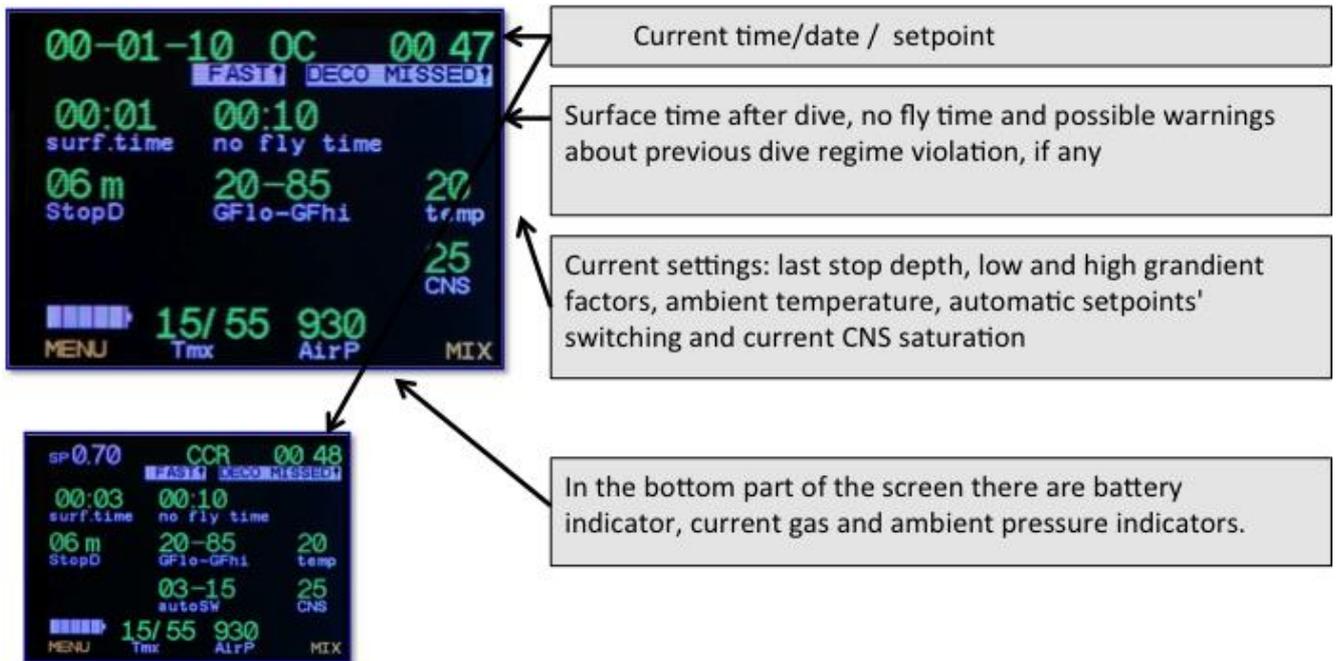
Start of calibration of connected Oxygen cells.

See in detail – Oxygen Cells' Control.

5. MAIN OPERATION MODES

If your AV1 is in Sleep mode, nothing is displayed on the screen. Nevertheless, the computer keeps monitoring ambient pressure and calculates desaturation. For switching from Sleep mode to Surface Interval mode – press subsequently left, then right buttons.

5.1 Surface Interval mode



By pressing **MENU** you move to AV1 Main menu .

By pressing **MIX** you move to SubMenu for selecting current gas.

When Surface Interval mode is activated, the following main settings will be displayed on the screen:

- selected Setpoint (in CCR mode), or current date, time;
- top safety stop;
- Gradient Factor;
- Temperature;
- Depth of automatic Setpoint switching (in CCR mode, if automatic switching is activated);
- CNS;
- battery charge capacity;
- current gas;
- ambient pressure.

If you have less than 48 hours after the last dive, there will be additional settings on the screen:

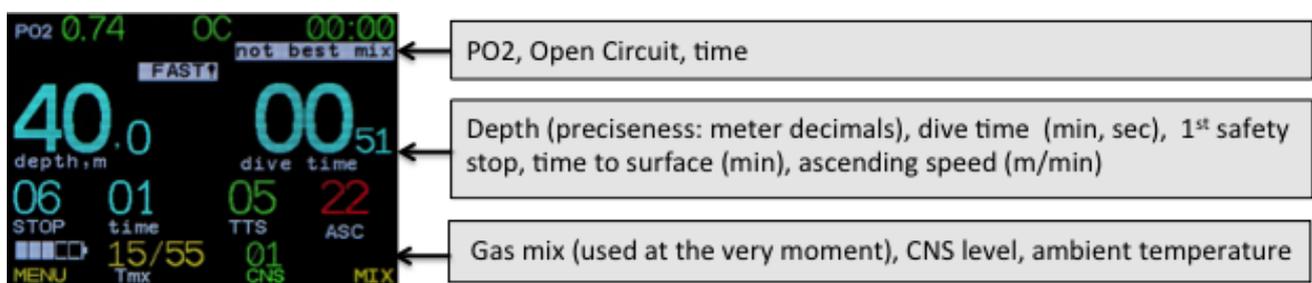
- Surface Interval time;
- Time to Fly;
- Violation warnings of the last dive (if any happened).

5.2 Dive mode

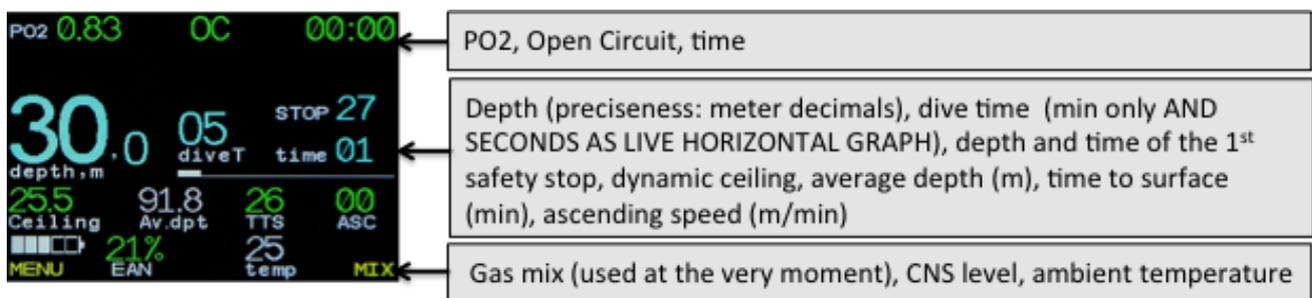
In Dive mode AV1 has two options of information indication on the screen: Basic and Alternative screens.

Both screen options can be turned on both in OC and in CCR mode.

Below is Basic screen, non-decompression mode, Open Circuit:



Alternative screen, non-decompression mode, Open Circuit:



where

PO₂ – partial Oxygen pressure at current depth

OC (CCR) – Open Circuit / Closed Circuit mode

00:00– current time

HI PO₂(LOPO₂) – high (low) PO₂. System warning, recorded in the logbook.

Not bestmix – it is recommended to change the gas. There is gas in the list of active gases which better than the current one. Gases are compared by MOD. The gas / gas mix with maximum MOD not higher than current depth is considered to be the best mix.

depth, m - current depth, meters

divetime – dive time, minutes

NDL – non-decompression limit at current depth, minutes. In decompression mode Total Time to Surface (TTS) is displayed.

stop – safety stop depth, meters

time – safety stop time, minutes

TTS – Total Time to Surface (all required safety stops are taken into account), minutes

ASC (DES) – ascending (descending) speed, meters/minute

EAN (tmx) – current gas mix

tempC (CNS) – ambient temperature, Celsius Degrees (accumulated Oxygen CNS%). These parameters are displayed in turns with 5 second interval.

Lobat – low battery charge indicator

MENU, MIX – buttons' current assignment

When coming closer to decompression ceiling a live vertical dynamic decompression (actual) ceiling graph will be displayed on the basic screen. The alternative screen shows this value in a digital way in Ceiling field.



BASIC SCREEN:

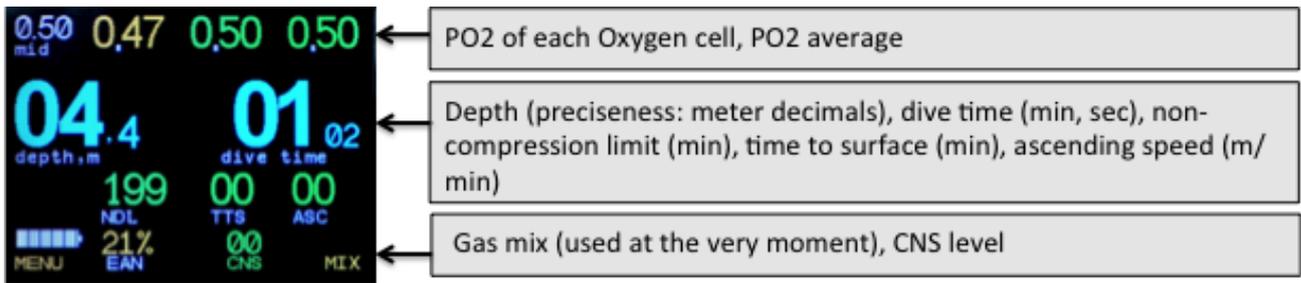
Dynamic decompression ceiling (actual one) is displayed as a live vertical line.



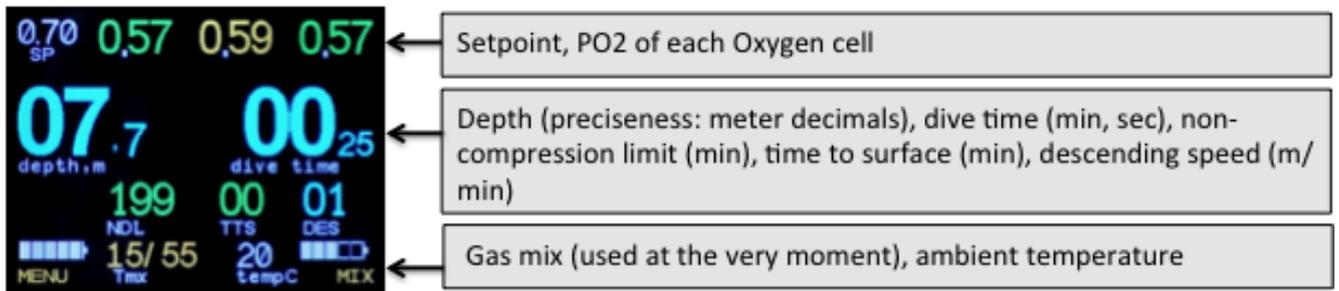
ALTERNATIVE SCREEN:

Dynamic decompression ceiling (actual one) is displayed in a digital way.

Basic AV1F screen:



Basic eCCR controller screen:



5.3 Gauge mode

In Gauge mode AV1 shows depth, dive time, timer, reflects maximal and average depth, temperature, ascending/descending speed.

In Gauge mode neither NDL, nor decompression is calculated!

PO₂ and CNS control is disabled.

Dive Planner, Gas Mix settings are not available.

AV1 Screen in Gauge mode:



5.3.1 Gauge mode Turning On/Off

Gauge mode is turned on/off only in Surface Interval mode.

Remember!

You are making ALL your dives in Gauge mode at your own risk!

IMPORTANT!

Upon diving in Gauge mode, do NOT dive with AV1 as decompression meter earlier than 48 hours since the last dive in Gauge mode !!!

Otherwise incorrect tissues' saturation probability is very high. As a consequence, you will be under high risk of decompression decease!

5.3.2 Average Depth calculation and Dive Segment Time

Average depth and dive segment time (timer) are calculated during the latest reset ("zero setting) and the current moment of time. Reset is made with **RST** button in the Main Menu and with further confirmation.



Average depth and current segment time can be reset by one pressing of the button with further confirmation

5.4 Recreational mode

Switching AV1 to Recreational mode is possible only on surface.

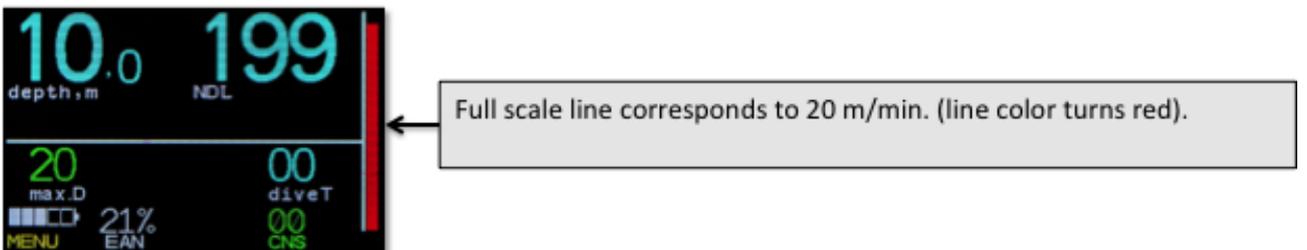
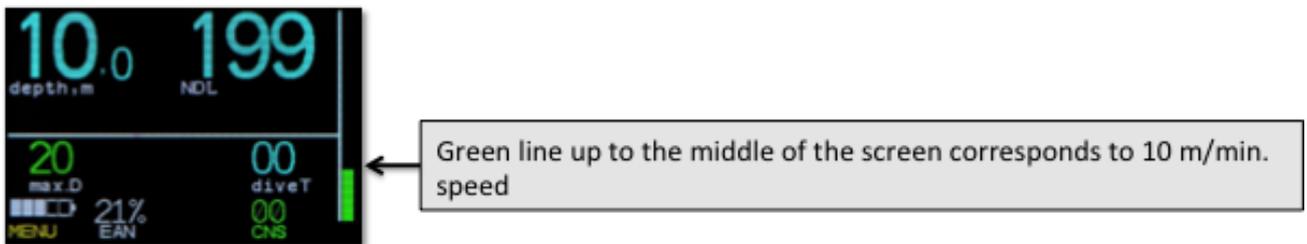
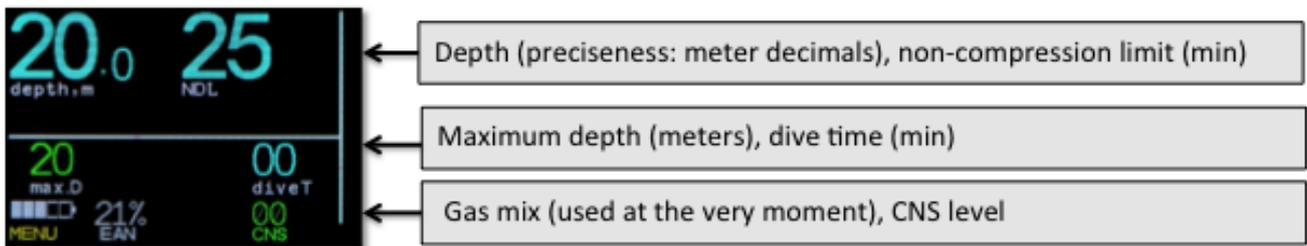


Settings are simplified in the Recreational mode at maximum.

Switching from Recreational to Closed Circuit is turned off. It is possible to use only one gas – EAN 21%-40%.



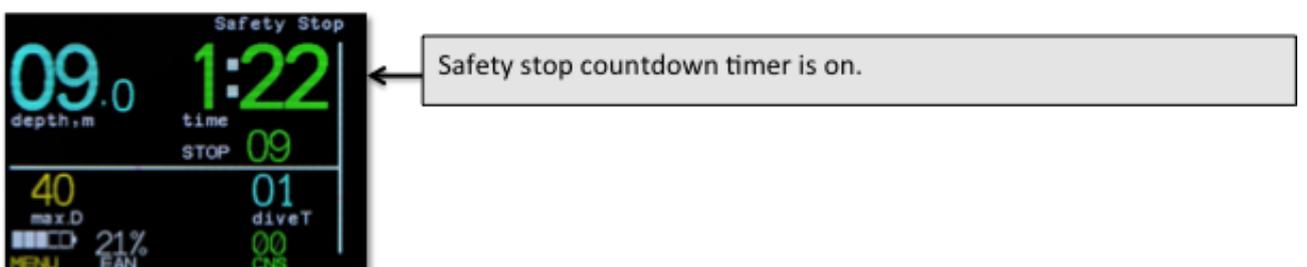
In Dive mode the ascending speed indicator is displayed as a graph on the right side of the screen. Green line up to the middle of the screen corresponds to 10 m/min. speed. Full scale line corresponds to 20 m/min. (line color turns red).



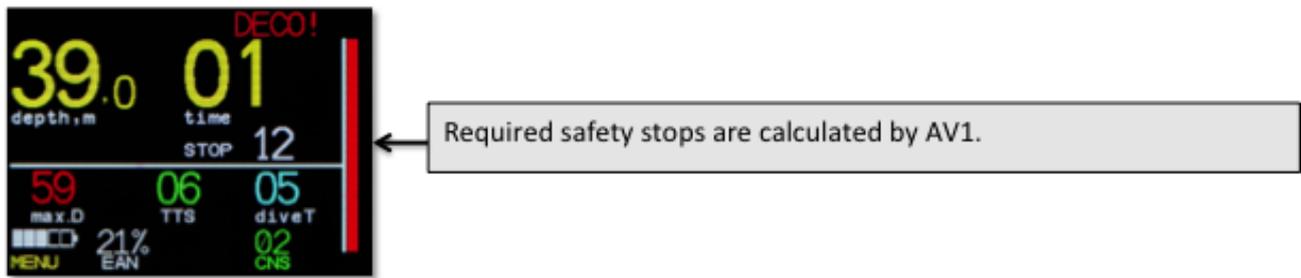
Depending on dive conditions non-obligatory safety stops in the range of 6-9-12 meters will be recommended.



When reaching the safety stop depth, safety stop countdown timer will automatically switch on.



When decompression levels are violated, AV1 will calculate all required safety stops.



5.5 Dive Simulator mode

With Dive Simulator you have a chance to learn AV1 operation in all the modes staying onshore.

In Dive Simulator mode dives are not recorded into the logbook, current saturation is not changed.

Dive depth change can be simulated manually by simultaneous pressing of the buttons.



5.6 Built-in Dive Planner

With your AV1 you can plan multi-level decompression dives both in Open Circuit and CCR modes. Flexible Dive Planner lets you set up separate ascending / descending speed to the next dive level.

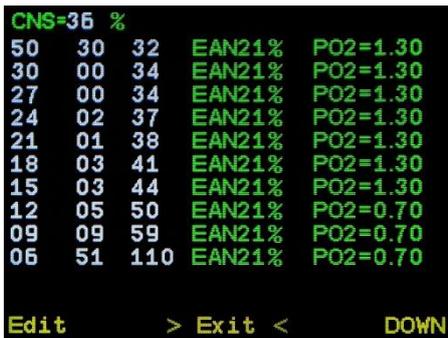
IMPORTANT!
Multi-level Dive Planner is available only in Surface Interval mode!

Dive Planning is made on AV1 current settings!

In OC mode you can also calculate gas required for dive itself and for decompression, in CCR mode – required bailout gas volume.



Dive Planning is made on AV1 current settings:



At any moment of the dive the whole diveplan with all the forthcoming decompression stops can be looked through!

5.7 PO₂ Cells Control mode (Only for AV1F and AV1 eCCR controller)

AV1F in CCR mode can control PO₂ level in the rebreather loop by means of one, two or three Oxygen cells of R22, R17 or similar types.

Calibration can be made with any gas: from Air to pure Oxygen.

Calibration range:

Low setpoint 0.40 – 0.95 bar

High and Deco setpoint 1.00 - 1.60 bar

Step - 0.05 bar

Switching between High and Low setpoints can be made both automatically (set depth) and manually.

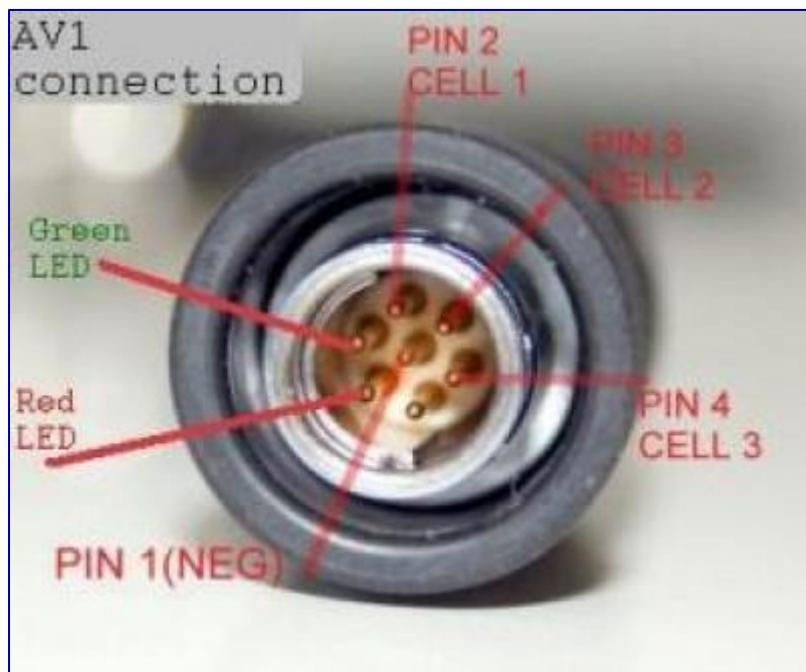
Switching to deco setpoint is possible only in manual mode.

In this mode automatic dive computer switch off on surface is not available (switched off).

Below is example of PO₂ Cells Control mode screen:



5.7.1 Pinout Scheme



5.7.2 PO₂ Calculation

With 3 (three) Oxygen cells connected, the controller ignores the value displayed by one cell that shows value much more different from the rest 2 (two) ones (this cell is considered as a failed one). PO₂ is averaged from the rest 2 (two) Oxygen cells. Such an approach is considered as the most sustainable towards failures and errors by Oxygen cells. Values displayed by the failed cell are in yellow on the screen. Values displayed by the rest 2 (two) ones are in green. In case values displayed by any cell differ from the rest by more than 0.4, **CelWarning** appears on the screen.

With 2 (two) Oxygen cells connected, PO₂ is averaged from these 2 (two) Oxygen cells. In case values displayed by any cell differ from the rest by more than 0.4, **CelWarning** appears on the screen. This dive mode (with 2 active cells) is less reliable than the one with 3 active cells connected.

With 1 (one) Oxygen cell connected, no accuracy control of cell operation is carried out. **This dive mode (with 1 active cell) is the least reliable one.**

All decompression calculations are made based on the actual PO₂ measured by Oxygen cells.

5.7.3 Alarm Warnings

AV1 with Fischer connector has a built-in buzzer. Red and green L.E.D. built-in the HUD are also activated via Fischer connector.

If PO₂ differs from the preset Setpoint by not more than 0.2, green indicator is on. If the difference – more than 0.2, but less than 0.4, green indicator is slowly flashing. If the difference is more than 0.4, green indicator is quickly flashing.

If PO₂ is BEYOND range of 1.6 – 0.4, green indicator is off, red indicator is quickly flashing, and warning buzzer is on.

If decompression ceiling depth is exceeded, low or high PO₂ – red indicator is quickly flashing, warning buzzer is on (quick beeping).

CelWarning and ascending speed is exceeded – red indicator is slowly flashing, and alarm buzzer is on (slow beeping).

Alarm warnings due to inappropriate PO₂ levels can not be switched off: buzzer will be beeping until PO₂ is back to appropriate range.

CelWarning, and decompression ceiling is exceeded – warning on the screen, alarm buzzer is on. It is possible to switch the buzzer off by simultaneous pressing of 2 (two) buttons. In this case the warning is still be on the screen.

5.7.4 PO2 Control Mode Turning On

Sequence of PO2 Control Mode turning on:

- connect the Oxygen cells' cable with AV1 connector;

NOTE!

**Waterproof sealing of this connection is reached via O-ring
inside the AV1 Fischer connector port.**

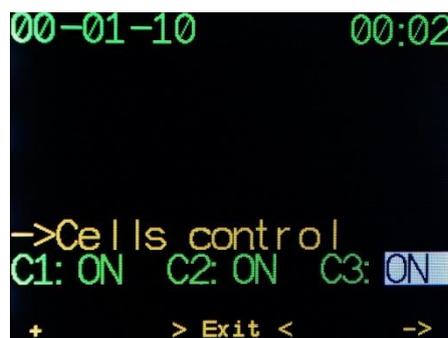
Always monitor and keep the connection clean!

ALWAYS KEEP THE CONNECTOR CLEAN!

Do NOT leave the port open without seal or AV1 connected!

Try to minimize a number of connections/disconnectons!

- Switch AV1 into CCR mode (See Menu item **->switch OC/CCR**);
In this mode **->CellsControl** SubMenu becomes available.
- Enter **->CellsControl** SubMenu to set required Oxygen cells **ON**;
- Save setting by pressing **YES** :



- With at least one Oxygen cell activated, AV1 will automatically offer to calibrate.

5.7.5 Oxygen cells Calibration

Oxygen cells Calibration mode is turned on by pressing **->Calibrate** in the Main Menu or automatically:

- when at least 1 (one) Oxygen cell is activated by pressing **->CellsControl** in the Main Menu;
- when AV1 is turned on, the Oxygen cells' cable is activated, CCR mode is chosen, and at least 1 (one) Oxygen cell is activated by pressing **->CellsControl** in the Main Menu;

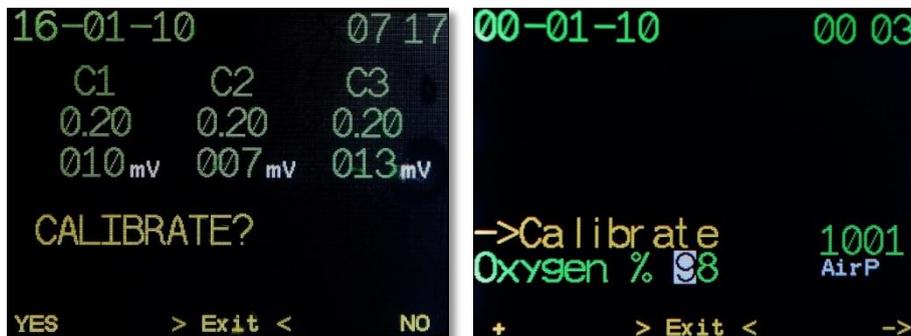
Calibration can be made based on any gas with known PO_2 (set during each calibration) and at any ambient pressure (measured automatically).

NOTE! For maximum calibration accuracy use pure Oxygen!

NOTE! Prior to calibration set the right PO_2 in calibration gas!

Calibration procedure sequence:

- set PO_2 in calibration gas;
- fully fill Oxygen cells with calibration gas;
- start calibration by pressing **YES**.
- save settings by pressing **YES**:



If cells show the same stable values within 10 seconds and are within the same working range, the cells will be automatically calibrated. Otherwise, the cell (cells) will be switched off – **OFF** mode.



When calibration is finished, press **OK** to save, or, if required press **Repeat** to repeat.

6. eCCR CONTROLLER

ECCR AV1 controller manages the solenoid and supports the preset setpoint based on the information received from Oxygen cells.

6.1 eCCR AV1 Controller Functions

Oxygen is supplied by the solenoid in cycles: every 5 seconds – fixed pause, and 0.2-20 seconds – Oxygen supply.

Time of Oxygen supply is calculated by the controller and depends on several factors:

- difference between the setpoint and O₂ level change in the loop (proportional share);
- O₂ level change speed in the loop (differential share);
- weighted error time (integral share).

eCCR AV1 controller can work with any solenoids: normal-closed, maximal operative current – not more than 500 mA and maximal voltage when the solenoid is safely & reliably opened is not more than 5V.

eCCR AV1 controller does not support redundancy system (Master-Slave) to manage the solenoid, though it is possible to use the second AV1 computer with Fischer-connector for redundancy monitoring of Oxygen cells' operation. In case if the main controller fails, this configuration allows you to finish your dive with manual Oxygen supply into the rebreather loop.

eCCR AV1 calibration procedure is simple. It starts automatically with each controller's switch on (though it is possible to cancel it), or you can force the calibration process via the Menu in Surface mode.

- O₂ % in calibration gas is set up (by default – 98%);
- upon confirmation the solenoid is opened for uninterrupted supply and fills the loop with calibration gas;
- at the moment of gas supply via the solenoid Oxygen cells are tested in uninterrupted way. As soon as indication of each Oxygen cell stops changing during the set time period, cell calibration is successfully finished. During this process testing for allowed cell indication level is made.

Important! Solenoid and cells must be calibrated in one gas volume, eg. eCCR Inspiration can serve as a good example.

6.2 Power supply system

eCCR AV1 controller, unlike AV1 dive computer, does NOT have a built-in accumulator. Power is supplied from external power sources.

eCCR AV1 controller works with two independent power sources B1 and B2. LiPo accumulators with 3.7V voltage are used as power source. Batteries are charged via USB port of the device.

By default B1 is the main power source. If during operation B1 discharged to less than 20% of nominal charge, the controller switches to using B2 battery. If then B2 battery also discharges down to 20% and less, power supply will be made from both batteries at the same time (connected in parallel).

6.3 HUD

The HUD has two L.E.D.s: red and green.

- If everything is in order, green L.E.D. indicator is on;
- If everything is in order, but PO₂ differs from the preset Setpoint by more than 0.2, but less than 0.4, green indicator is slowly flashing;
- If everything is in order, but PO₂ differs from the preset Setpoint by more than 0.4, green indicator is quickly flashing;

If:

- Ascending speed is high (faster than 10 meters/min.);
- Decompression ceiling depth is exceeded;
- Any Oxygen cell is out of order;
- PO₂ is more than 1.6;
- PO₂ is less than 0.4;
- Low battery charging level;

then green L.E.D. is off, and red L.E.D. indicator starts flashing, and Alarm warning appears on the screen.

7. BUILT-IN COMPASS

AV1 has a built-in magnetic compass with three-axes accelerometer for complete values' compensation based on angularity of the compass body. You can use the compass both in the Surface and Dive modes. In the Dive mode all the main dive values are displayed on the screen.

Values of straight and reverse course are displayed on the screen in the Compass mode.



7.1 Calibration

Magnetic compass is calibrated during production process, though in some cases re-calibration could be required.

It is strongly recommended to calibrate AV1 far away from massive metallic objects and electric wires.

For calibration proceed with the following:

- Switch AV1 to Compass Calibration mode (see Menu item);

- Rotate AV1 in all 3 (three) axes. Try to make 2 rotations round each axis within 4-5 seconds;
- Save the result by pressing the left button.

8. AV1 MANAGER MODE

AV1 Manager software is applied for Firmware upgrade and for logbook downloading to Windows-based computer*.

PC System Requirements for AV1 Manager successful work:

OS WindowsMe, XP, Win7.

Firmware upgrade procedure:

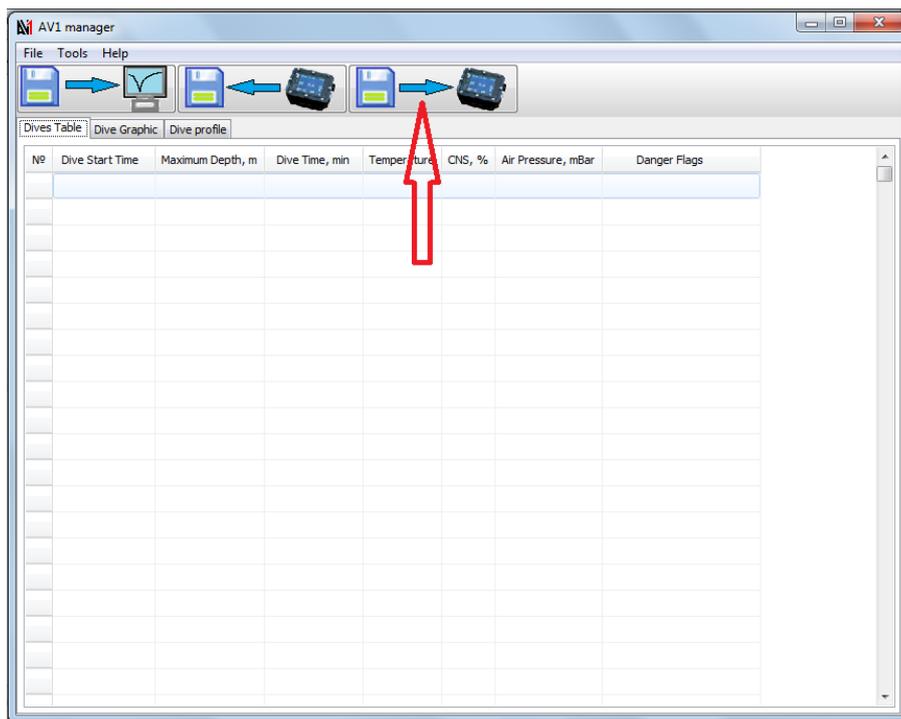
1. extract the archive file to any folder;
2. connect AV1 to the desktop via USB;
3. switch AV1 to Update mode:

System setup -> **Up\Down load** -> **OK**

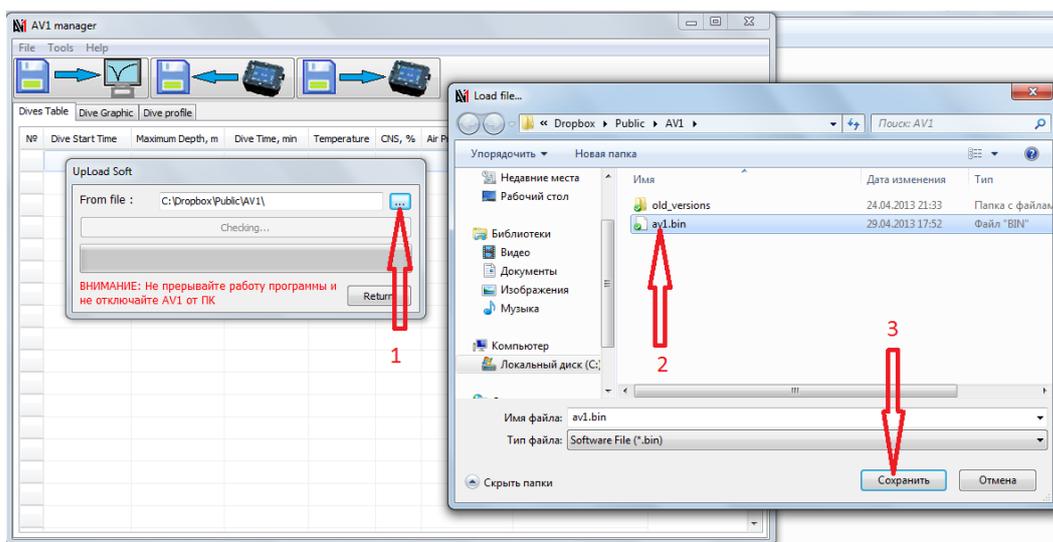
AV1 will switch to DFU mode (Device Firmware Update mode).

Windows will identify AV1 as a standard HID-device and automatically install all the required drivers.

4. launch AV1 Manager;
5. press **Upload soft** on the toolbar of the main screen;



6. Choose the folder with Firmware, then - the Firmware file, press **Save**.



7. Press **Start Upload** to start updating;

8. Updating process will take 1-3 minutes. When finished, press **Return**, switch the USB cable off;

9. Press two buttons simltenously to exit DFU mode and to reload AV1.

9. GAME

AV1 dive computer has a built-in game – “Python”.

The game can be ativated both in Surface Interval mode and in Dive mode.

When the game is activated in Dive more, the computer keeps calculating all the decompression procedures in the mode you chose for your dive.

You can leave Game mode by simultaneous pressing of 2 buttons.

Below is an example of AV1 screen in Game mode:



10. TECHNICAL CHARACTERISTICS AND SERVICE CONDITIONS

Maximum depth of pressure sensor: 130 meters

Maximum tested depth: 200 meters

Maximum dive time: 600 minutes

Maximum amount of safety stops: 80

Gas mix amount: 8

Battery life: not less than 500 chargings (charge/discharge with 70% of capacity left)

Operational temperature: от 0⁰С до 40⁰С

Depth accuracy: 0.1 meters

Operational range for PO₂ cells: from 4 to 300 mV

11. AV1 SERVICING

AV1 does not require much servicing. All the servicing required is recurring battery charging and rinsing in fresh water. Netherless, following some recommendations will help to avoid malfunctioning and to provide long life to the computer.

- Wash AV1 in fresh water after each dive;
- Avoid sharp blows;
- Store AV1 out of direct sunlight;
- Store AV1 in a dry and well-ventilated place;
- Do not store AV1 in a waterproof case;
- Do not use detergents or any other cleaning chemicals for AV1 washing;
- Check the battery capacity before each dive;
- If **lowbat** is on the scree, charge the battery;
- When diving with a power discharged AV1, your AV1 can switch off itself during your dive.

12. WARRANTY

AV1 dive computers and controllers are warranted for purchasers from authorized dealers/distributors or the manufacturer.

AV1 dive computers and controllers are warranted for the first purchaser for 24 calendar months since the date of purchase provided terms of Article 10 and device operation conditions stipulated by the present Manual are observed.

The manufacturer takes responsibility to repair faults caused by defects in materials or by manufacturing errors. Warranty claim can be satisfied by free repair by the manufacturer, replacement of fault parts of the device or complete replacement of the device with a new one. The manufacturer takes the exclusive decision about any warranty claim and about further repair or replacement.

Exclusions:

- AV1 misuse and/or negligence of operation and service manufacturer recommendations is NOT covered by the warranty;
- Use of inappropriate wear and spare parts is NOT covered by the warranty;
- External exposure, namely: transportation damages, mechanical damages;
- Force Majeure;
- Service works, repairs or opening of the computer body by personnel non-authorized by the manufacturer.