

EDGE DIVE COMPUTER SIMULATOR

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Written in MPW C++ 3.1

INTRODUCTION

The program *Edge™ Dive Computer Simulator* is a simulator for the Edge Dive Computer. The program simulates diving with the

Edge for both no-decompression and decompression situations. The program uses the same decompression algorithms and shows the same display as the actual Edge dive computer.

This text serves the purpose of a manual for the program, but is actually an addition to the owner's instructions manual for the Edge dive computer. The reason is that familiarity is assumed with the usage of dive computers in general, and possibly with the Edge dive computer in particular. Also, this text is not intended to be a replacement for the Edge owner's instructions manual.

THE EDGE DIVE COMPUTER

The Edge (Electronic Dive Guide™) is manufactured by Orca Industries. The Edge Dive Computer, ©1984 by Orca Industries, is a compact submersible computer which provides the diver with information to plan a dive, it is a precision depth control, dive timer and surface interval timer. It handles single dives as well as repetitive dives. The Edge calculates continuously the decompression status based on the diver's individual dive profile, and gives the diver a continuous readout of this status.

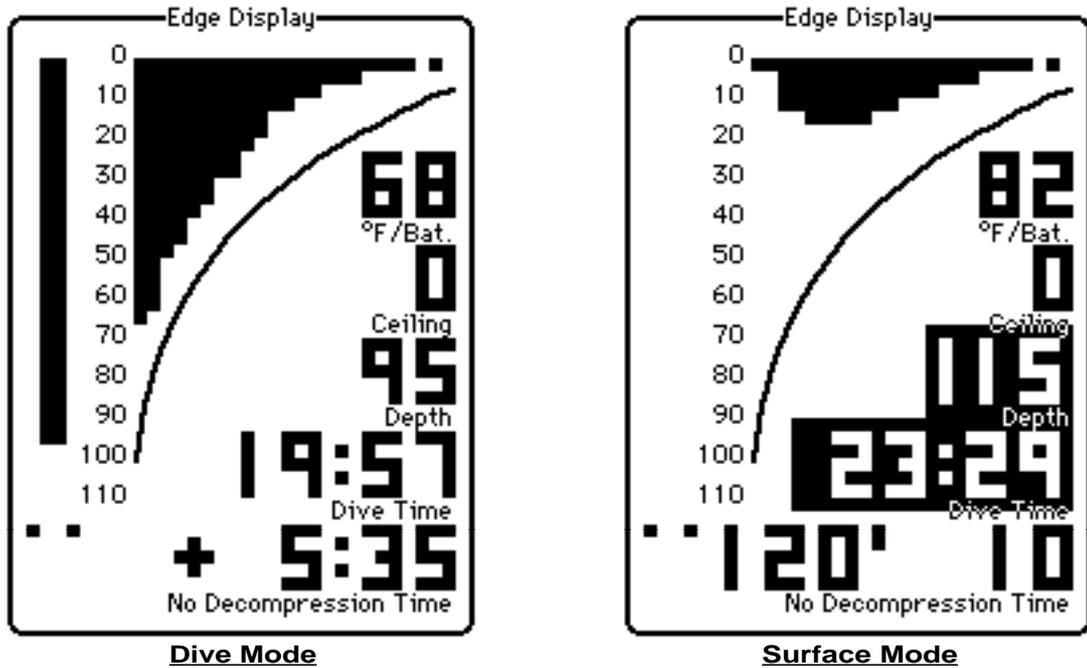


Figure 1 Edge display shown when underwater in a no-decompression situation, and at the surface.

The simulation program uses the same decompression model as the Edge, i.e. the Haldanian decompression model which is similar to the Navy standard air decompression model. The model is based on the uptake and elimination of nitrogen in twelve tissue groups with half times ranging from 5 to 480 minutes. As for the Edge, the update interval for the decompression status is 3 seconds.

THE SIMULATION WINDOW

The simulation window for the Edge contains all items to control the diving. The window contains the *Edge display*, a *depth control* for changing the diver's depth, a *time scale* to change the scaling for the actual time, a *clock* for the elapsed time, and *buttons* to control the simulation. There is only one menu item for program control, i.e. the *Quit* item in the *File* menu to quit the program (same function as the *close box* in the window). The *Edit* menu is supported for Desk Accessories, and has no usage for the program itself.

Edge Display

The main item in the simulation window is the Edge display (figure 1). Following is a short description of the numeric information that is shown on the simulation of the Edge's display. Other information shown is the depth bar, and the twelve tissue bars.

- **Temperature/Low Battery [F]**
While diving, the program shows 68 F, and at the surface, 82 F. This value has no relevance other than that the programmer likes to see these temperatures on the Edge dive computer while he is diving.
- **Ceiling [fsw¹]**
The shallowest depth to which the diver could safely ascend. The ceiling will be larger than 0, if the diver was in the decompression realm of the model.
- **Depth [fsw]**
While diving, the present depth is displayed, and at the surface, the maximum depth of the last dive is displayed.
- **Dive Time [mm:ss² or hh:mm³]**
While diving, the elapsed time for the current dive is displayed. At the surface, the total dive time of the last dive alternates is shown alternating with the surface interval time.
- **No Decompression Time [mm:ss]**
While diving, the remaining no-decompression time (preceded by "+" sign) if the diver is within the no-decompression realm of the model, or the remaining decompression time (preceded by "-" sign), if the diver is within the decompression realm of the model. If instead an arrow is displayed, the diver will need to ascend in order to decompress.
At the surface, the display will scroll through depths between 30 and 150 fsw and show the no-decompression time at that depth for the current decompression status of the diver.

As for the Edge dive computer, there are two warning messages that can appear in the Edge window. When the ceiling depth is violated by ascending to a shallower depth than the value for the ceiling indicates, a warning message will flash indicating to descend immediately. If the maximum depth range for the Edge dive computer, i.e. 160 fsw, is exceeded, a warning message will flash on the display during the remainder of the dive. The dive computer will assume 200 fsw in its calculation for safety as long as the diver is deeper than 160 fsw, and the maximum depth shown will be "OR" (Out of Range).

The ascend slower warning message will not occur because the simulator will not allow for ascends faster than the Edge dive computer allows for (see depth control).

¹ Feet of sea water

² Minutes and seconds

³ Hours and minutes

Depth Control

The depth control (figure 2) is used to control the diver's depth. The scroll bar sets the target depth for the diver. The simulator will let the diver descend with 90 fsw/min. The ascend follows the limits of the Edge, i.e. 20 fsw/min for 0-60 fsw, 40 fsw/min. for 60-120 fsw, and 60 fsw/min. for depth larger than 120 fsw. When the diver is ascending, the word *Ascend* in the depth control window will be highlighted, and when descending the word *Descend* in the window will be highlighted.

The Edge goes into underwater mode when the diver descends deeper than 6.6 fsw, and the Edge turns to surface mode when the diver ascends above 3.3 fsw.

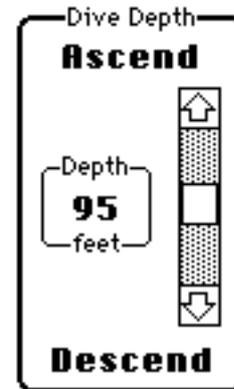


Figure 2 Depth Control display.

Buttons

Three buttons (figure 3) are used to control the simulation.



Figure 3 Buttons to control the simulator.

The *Start* button is used to turn the Edge on. When the Edge is started, the button becomes a *Restart* button which allows for restarting the dive simulation with a “clean” Edge. The *Freeze* button is used to stop the time, i.e. to freeze the dive situation. The *Resume* button is used to resume diving after the time was stopped with the *Freeze* button. The button can also be activated by typing the first upper-case character of the button's title.

Time scale

The time scale control element (figure 4) is used to change the scale for the time. When the program starts, the scale is 1:1 (1 sec = 1 sec), i.e. 1 second on the clock represents 1 second in real time. The scale can be changed by clicking the mouse on the up and down arrows of the control going 1 second up or down. When the option key is pressed while clicking the mouse, the scale value will double or halve its current value. The scale can be set to every value between 1 sec and 10 minutes, i.e. 1 second on the clock represents 10 minutes in real time (or in other words in 6 seconds a dive of 1 hours can be simulated).

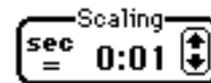


Figure 4 Time scale control.

Clock

The clock display element (figure 5) shows the total elapsed time since the Edge was turned on with the *Start* button. The clock's time will be adjusted in accordance with the time scale value.

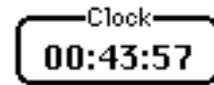


Figure 5 Clock.

SYSTEM REQUIREMENTS

This simulator is written to evaluate Object Oriented Design techniques and the C++ programming language. The program requires at least 82K RAM, but 96K of memory is recommended. The program runs on any Macintosh with 128K ROMs, and is tested on the Macintosh 512KE, Macintosh SE, and Macintosh IIfx, using System version 6.0.4. The program will automatically use colors (or grays), if the Macintosh supports colors (or grays) with more than 2 bits (i.e. at least 16 colors). Furthermore, the simulation will continue to run in background when using Multifinder.

DISCLAIMER

This program is not intended to be used for actual dive planning, and should not be used as a replacement for a dive computer and/or tables, depth control and/or timing device. The author will not accept any liability for accidents or injuries resulting from the use of the Edge Dive Computer Simulator or from the material contained herein.

ACKNOWLEDGEMENTS

The author would like to thank the people at Orca Industries who contributed considerably to the introduction and acceptance of dive computers in recreational diving.

AUTHOR

The author would appreciate to hear of any bugs in the simulator and/or suggestions for improvements. Please send any comments/suggestions to:

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LITERATURE

- 1 Karl E. Huggins: *Microprocessor applications to Multi-level Air Decompression Problems*; Michigan Sea Grant College Program.
- 2 *Edge Owner's Instruction Manual*; Orca Industries, Inc.