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# *HS EXPLORER* DIVE COMPUTER

# OWNER'S MANUAL

**( RGBM - Imperial)**


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## IF YOU READ NOTHING ELSE IN THIS MANUAL - READ THIS PAGE!

Scuba diving, especially technical diving, can be an extremely hazardous activity. While utilization of tools such as the *HS Explorer* dive computer can mitigate some of the risks associated with technical diving, misuse of this tool can actually increase or create new risks. Please read this Manual carefully before using your new *HS Explorer* dive computer, especially the warnings contained upon this page. We at HydroSpace Engineering hope that you will enjoy using your new *HS Explorer* Computer and trust it will bring you years of service and safe diving. The TRIMIX label indicates the model type over the display and 'NHe' on the startup screen.

The warnings contained in this section are designed to prevent harm to two things; you, and your new *HS Explorer* dive computer. Please read them carefully.

**WARNING!**
**IMPROPER USE OF THIS DEVICE CAN RESULT IN SERIOUS INJURY OR DEATH.**

Do not dive with a this device until you:
1. Have read the owner's manual
2. Understand fully how operate the device correctly
3. Have received proper training in the use of gas mixtures other than normal air
4. Have received proper training in conducting stage decompression dives.

Use of this device and/or its simulator software in any diving activity constitutes agreement by the user that he or she assumes and accepts full responsibility for all risks.

**WARNING!**
Insertion of the battery backwards (reverse polarity) will ruin the computer and VOID the warranty.

**The warranty is null and void if:**
- **The product is not registered within 10 days of purchase.**
- The battery has been inserted backward (reverse polarity).
- The unit has been dried with compress air (gas).
- The lens has been removed or lens screws loosened. This will invalidate the transducer calibration and will produce depth reading errors.
- The product has been modified in any way.
- The product has been abused.
- The product's limits have been exceeded or dry (chamber) exposure.
- The product has been exposed to any material, which causes damage to the case, lens or o-rings.
- The product has been maintained in a manor inconsistent with is usage or standard practices.
- Transducer damage by foreign objects.

**REPAIR CHARGES WILL BE ASSESSED ON INVALIDATED UNITS!**
- Minimum Charges, when there is no damage to electronics:
- Case Replacement - $400.00, Lens Replacement - $150.00, Battery Cap - $15.00
- Do not remove the lens or loosen the screws. The transducer has been carefully sealed and when the seal is broken, the transducer calibration is no longer valid. In addition, an internal integrity seal will be broken if the electronics are opened. You will be assessed $450.00 plus parts and labor to repair any *HS Explorer* dive computer found to have been opened!
- Repair prices are subject to change without notice.

**WARNING!**
**Never use spray lubricants. The chemicals may attack and ruin the housing materials.**

Questions ? Please email: support@hs-eng.com.

## QUICK REFERENCE FIELD SETUP GUIDE -

First read the previous page: IF YOU READ NOTHING ELSE IN THIS MANUAL - READ THIS PAGE!

### General

1. Press and Release the LEFT Button (A) to activate the Explorer.
2. Press BOTH Buttons (A & B) to activate the Setup Functions.
3. General Setup information: The LEFT button (A) increments the Function. The RIGHT button (B) increments the value. The count value only increments upward and will reset to the low value once the upper limit is exceeded.
4. Press Button A for a '3' count (then release) to exit the Setup Mode and save any changes. Less than a '3' count will exit but will not save changes.

### Date/Time Setup

1. Press BOTH Buttons for a '3' count on the display. You are now in the Date/Time setup mode.
2. Set the Date and Time. Once you have made a dive you will not be able to access the Date or Time to change them until 24 hours has passed after surfacing from the dive.
3. Press Button A for a '3' count to Exit the Date/Time Setup mode and SAVE the changes.

### Calculation Formula, Altitude, Metric Units Setup (CAM)

1. Press BOTH Buttons for a '2' count on the display. You are now in the CAM setup mode.
2. Press the Button B to increment the Calculation Formula (CF) until the desired CF is reached. Refer to Page 11 for the CF values.
3. Press Button A to move to the Altitude setup and set the Altitude. 0 = sea level.
4. Press Button A to move to the Imperial / Metric Units setup. IM = Imperial (0), M = Metric (1).
5. Press Button A to move to the Backlight ON/OFF setup. OFF increases battery life.
6. Press Button A to move to the Buzzer ON/OFF setup. OFF increases battery life.
7. Press Button A for a '3' count to Exit the CAM Setup mode and SAVE the changes.

### Mix Setup

The Mix being displayed at the time of Mix Setup exit will be the starting mix for the dive.

#### *Open Circuit*

In the Open Circuit Mode the Explorer will revert to Mix 1 when the dive is closed and Mix 1 will be set to Air (79% Nitrogen). Therefore it is suggested to use Mixes 0 and 2-9 for planned Mix values.

1. Press BOTH Buttons for a '1' count on the display. You are now in the Mix setup mode.
2. Press Button A and set the Nitrogen 10's percent value, Press A again and set the 1's percentage.
3. Press Button A again and set the Helium 10's percent value. Press A again and set the 1's percentage.
4. Press Button A again for the Change Depth setup. Set the Change Depth using Button B.
5. Press Button A again for the Change Direction setup. Set the Change Direction (Up/Dn) .
6. Press Button A to move to the Mix number. Repeat Steps 2 to 6 for the remainder of the mixes.
7. Press Button B to increment to the Starting Mix number.
8. Press Button A for a '3' count to Exit the Mix Setup mode and SAVE the changes

#### *Closed Circuit*

In the Closed Circuit Mode the Explorer will revert to Mix 0 when the dive is closed. ***Mixes 0 to 4 are Closed Circuit mixes (Constant PPO2). Mixes 5 to 9 are Open Circuit (bail out). mixes.***

1. Press Button B and increment to Mix 0.
2. Press BOTH Buttons for a '1' count on the display. You are now in the Mix setup mode.
3. Press Button A and set the Nitrogen 10's percent value, Press A again and set the 1's percentage.
4. Press Button A again and set the Helium 10's percent value. Press A again and set the 1's percentage.
5. Press Button A and the 'MODE' icon will flash. Press Button A to activate ('ON').
6. Press Button A to move to the PPO2 set point. Press Button B until the desired set point is displayed.
7. Set the Nitrogen. Helium, PPO2 Set Points, Change Depth, Change Direction per Steps 2 to 6 above.
8. Press Button A to move to the Mix number. Repeat Steps 2 to 6 for the remainder of the mixes.
9. Press Button B to increment to the Starting Mix number.
10. Press Button A for a '3' count to Exit the Mix Setup mode and SAVE the changes

**The Explorer is now setup and ready to dive.**

# INTRODUCTION

The purpose of this manual is to acquaint the new user with the procedures and techniques for using the *HS Explorer* dive computer. The manual is divided into two main sections. The first section covers the dive computer programming in the field setup mode, using it underwater, and retrieving data from it after the dive. It also covers maintenance procedures and warranty/service concerns.

The second part of the manual covers the *HS Explorer* simulation software. This software allows the user to program the computer, run simulated dive's, develop and print contingency dive tables, and download the history of the dive from the *HS Explorer* dive computer after the dive.

**Please read this manual fully prior to using the *HS Explorer* dive computer or its associated dive simulation software**. Because of the many features and broad range of options available to the end user, these computers are not as simple to utilize or to set up as other companies' dive computers. It is not uncommon for new users to spend several hours reading these instructions, and working with their new *HS Explorer* dive computer prior to understanding the functions sufficiently to utilize them during the dive.

Technical diving is an activity that involves many objective hazards and risks. While the *HS Explorer* dive computer can be used to mitigate some of those risks, if the dive computer is used improperly it can actually lead to a greater degree of risk associated with inert gas decompression sickness.

Use of the *HS Explorer* dive computer will not eliminate the chance of experiencing decompression sickness. Regardless of the decompression model that the diver uses, or how cautiously a diver dive's, there's always risk of decompression sickness. This risk will be increased if the gas mixes in the *HS Explorer* dive computer are improperly set up, or if an algorithm is selected that is inappropriate for the dive's to be conducted. Please take the time to read these directions, to insure that you know and understand the proper way of configuring your new *HS Explorer* dive computer.

Both the *HS Explorer* dive computer and the associated simulation software may be upgraded. As firmware upgrades are introduced, HydroSpace Engineering, Inc will provide notification of such upgrades on our web site. There may be a minimal or reduced charge for any firmware upgrades within the first 12 months after the unit has been purchased.

HydroSpace Engineering simulation software upgrades are available at no charge from. Please visit the HydroSpace Engineering Web site at *http://www.hs-eng.com*.

HydroSpace Engineering appreciates comments or suggestions you have for future upgrades to its *HS Explorer* dive computer or the simulation software. Please address suggestions to support@hs-eng.com.

MANUAL CHANGES/UPDATES - Changes from the previous version are in light blue color. When the manual is updated, previous changes will be set to dark blue from light blue and any previous dark blue changes will be reset to the normal color (usually black) for that section/type of text.

## Acknowledgements

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## Thank You

A special "Thank You" to all of you who have offered comments and suggestions that have enabled us to improve the *HS Explorer* to a friendlier and easier to use dive computer. A sincere apology to anyone whose name was omitted. Any omission was unintentional.

## GENERAL

**WARNING!**

**IMPROPER USE OF THIS DEVICE CAN RESULT IN SERIOUS INJURY OR DEATH. Do not dive with this device until you (1) have read the owner's manual, and (2) understand fully how to operate the device correctly, and (3) have received proper training in the use of gas mixtures other than normal air, and (4) have received proper training in conducting staged decompression dive's. Use of this device and/or its simulator software in any diving activity constitutes agreement by the user that s/he assumes and accepts full responsibility for all risks.**

**WARNING!**

**The *HS Explorer* Dive Computer and the simulator program perform no checks for the viability of any gas mix. It is the user's sole responsibility to verify the gas mixtures and dives are within acceptable limits considered safe.**

Dive Planning Recommendations -Reserve Mix 0 for Starting Closed Circuit operations. Any of the Mixes may be used to start the dive and the mix changes can be in any order of mixes. To avoid confusion during the dive, plan mix changes in ascending mix numbers. For example, start an open circuit dive with Mix 2, descending mix change to Mix 3, ascending mix change to Mix 4, decompression mix change to Mix 5, last decompression mix change to Mix 6. In this way it is easy to remember the dive starts with Mix 2 and finishes using Mix 6. The gas compositions and switch information should be written on a slate and carried during the dive for backup purposes. A printout of the dive decompression schedule should be carried in addition to the slate information. The printout contains planned gas switch information, compositions, and decompressions schedules. (LaserJet printouts only. Inkjet printouts will disappear as soon as the pages get wet.)

Ascent Rate - The decompression models used by this device require an ascent rate of 1Bar (1 Atmosphere, 33 ft, 10 M) per minute.

Time to Fly (TTF) and Surface Interval (SI) are asymmetrical calculations. In other words Off-Gassing is calculated at a slower rate than On-gassing. The *HS Explorer* use's the current selected Calculation Formula (CF) asymmetry for diving, TTF and SI. CF 1 is the fastest and CF 9 is the slowest.

Remember - At the end of each open-circuit dive the *HS Explorer* switches back to Mix 1 and sets Mix 1 to air. - At the end of each closed-circuit (constant $PPO_2$) dive the *HS Explorer* switches back to Mix 0 and remains in the closed circuit mode. All Change Depths and Directions are zero. During the dive, each time a Mix Change is performed that mix change information is reset for that dive. Ten minutes post dive the mix changes are restored and do not have to be reentered prior to the next dive. If dives are planned using the same mixes, plan the dive's using mixes other than Mix 1 and the mix compositions will not need to be reentered. Only the set the starting mix number..

Button Terminology - The Left Button is 'Button A' and the Right Button is 'Button B'.

# PREPARING YOUR *HS EXPLORER* DIVE COMPUTER FOR USE

## Wrist Strap Installation

The *HS Explorer* is shipped with the wrist straps installed. The use of silicon lubricants or oils on the straps is not recommended since they will make the strap slippery and cause the *HS Explorer* to rotate on your arm. Design Note: Four strap pins are used to help prevent the loss of your *HS Explorer*.

## Battery installation

The *HS Explorer* dive computer is shipped with the battery installed. It is important for the user to understand the proper procedure for replacing the battery. The *HS Explorer* dive computer utilizes a very small amount of power from the battery even when it is not being used. In order to extend battery life, whenever the dive computer is not going to be used for significant period of time (months) it should to be removed. To replace the battery, complete the following steps.

1. Wake up the HS Explorer and place it back into the sleep mode to preserve the current date and time.
2. Unscrew the knob covering the battery compartment by turning it counterclockwise. Ensure that the brass tab rotates freely. If the brass tab does not rotate freely, unscrew the screw that holds that to the cap by one quarter turn. Confirm that the brass tab will now rotate freely. If it still does not do so, continue to unscrew the screw by one-eighth turn until it rotates freely.
3. Inspect the two O-rings on the sealing cap. Utilizing a suitable silicone lubricant, lightly lubricate the O-rings. Confirm that the O-rings are intact and clean.
4. Confirm that the flat end of the battery (the negative side) is the end being lowered into the battery compartment first. Insert the battery into the computer's battery compartment . With the brass tang to the right (3 o'clock) (6 and 9 o'clock are secondary positions) slide the tang into the battery compartment between the battery and the brass sleeve (positive contact) . The tang should slide smoothly in place. If you encounter any resistance, STOP inserting and pull the tang back, inspect for a damaged tang and/or sleeve. If no damage is visible, retry the tang insertion. ***Failure to insert the battery properly will cause irreversible damage to the computer, and will void your warranty!*** Note: The fit of the battery with the brass tab while being lowered in the battery compartment is quite tight. This is to insure that a positive contact is made for the battery electrodes to the rest of the computer. If you have trouble inserting the battery, do not force the battery into place. It may be that the tab has not slipped fully into place inside the brass sleeve inside the battery compartment. Forcing the battery and cap into place may damage the brass tab! Such damage may necessitate a return of the battery and *HS Explorer* dive computer to the factory for repair or replacement.
5. Once the tang has been inserted in the compartment, begin to screw the battery housing cap closed, by rotating the cap clockwise. At some point after the first O-ring has made a seal, but prior to the second O-ring making a seal, it is likely that the computer will turn itself on. This is normal. Continue to screw the battery compartment plug again until the second O-ring just provides a seal. If the computer has not turned on by this point try repeating steps 1 – 3 above.

**WARNING!**

**Do not tighten the battery compartment plug any further. Over tightening the battery compartment plug may cause permanent damage to the battery and/or case (case cracking/flooding). Over tightening can also result in over tightening of the retaining screw for the brass tab which can cause further damage of the brass tab and battery cap!**

The battery is now installed properly in your *HS Explorer* dive computer.

## Battery Care and Information

Your *HS Explorer* Dive computer utilizes a 3.6V lithium AA battery. To replace it, utilize a Tadiran® TL-2100, Saft LS 14500 or equivalent battery. They may be purchased directly from HydroSpace Engineering, Inc. utilizing the order form from the back of this manual, or may be available from many electronics stores, photographic stores, or pharmacies. Improper use of these batteries may result in explosion, fire, or severe burns! Proper battery care includes the following:

- Do not recharge these batteries. They are not rechargeable.

- Do not heat above 40°C (104°F). Do not expose to fire or high heat.
- Do not expose to water.
- Do not short the contacts.

## Battery Duration

The length of time that the *HS Explorer* Dive computer will run on a battery is dependent on how the computer is set up. Whenever the battery is in the computer, there is always some power drain from the battery. Even when the computer is turned off, there is a continuous low-level power drain from the battery. In addition, battery life is dependent on whether optional features in the computer are being utilized. Options that reduce battery life include use of the backlight and audible alarm in the computer. The following table provides average battery life duration depending on how your computer is set up. Actual results may vary based on water temperature, frequency and duration of back lighting use.

| **Audible Alarm** | **Backlight** | **Water Temperature** | **Battery Life (hours)** |
|---|---|---|---|
| Off | Off | Warm | 150 |
| On | On | Warm | 120 |
| Off | Off | Cold | 110 |
| On | On | Cold | 90 |
| *HS Explorer* not in use | *HS Explorer* not in use | Surface | 2+ Years |

Your *HS Explorer* dive computer has an "Auto-Off" feature. On the surface, this places the *HS Explorer* in the sleep mode after 30 minutes. This state does minimize battery power consumption. Battery life will be minimally enhanced if the computer is turned off manually, rather than waiting for the "Auto-Off" to occur. Do this by following the directions for Mode 5, Shut-Down Mode, in the next section of the manual.

## Battery Voltage

Battery voltage is displayed on the *HS Explorer* Dive Computer in the upper right corner of the display panel. A fresh battery starts at 3.6 volts. As the battery is utilized, voltage drops until it reaches a level incapable of powering the computer properly. If battery voltage drops too low, the *HS Explorer* dive computer may spontaneously reboot, or cease operation. Since this is incompatible with safe diving practices, it is important to monitor battery voltage to insure that this event does not occur during a dive.

All features on the *HS Explorer* dive computer will operate with battery voltages of 3.6V to 3.1V. At or below 3.2V, the computer automatically disables the back lighting. This is done to conserve battery power, and to help prevent the battery failure during dives. At a power level of 3.1V, the battery volt indicator will start flashing. This is a warning that battery failure is imminent. You must ascend to the surface as soon as safely possible. Replace the battery before computer shutdown from low battery. This insures continuos tissue information for continued diving operations. At a voltage of 2.8V, the computer will not operate, and the display will be blank. If during the dive you experience a low battery voltage indication, take note of the maximum depth, dive time, and remaining decompression or no-decompression time. This will allow you to switch to a set of dive tables to complete your dive. HydroSpace Engineering, Inc. recommends that all divers carry a backup diving computer, or alternatively a timing device, depth gauge, and submersible dive tables whenever they are diving and using any dive computer. The following table indicates battery voltages and usage considerations:

| Voltage | **Status** |
|---|---|
| 3.5 | New battery |
| 3.4 - 3.2 | Operational voltage |
| <3.2 | Low battery, backlight, replacement is desirable |
| 3.1 | Flashing battery voltage on display, DO NOT DIVE with this battery |

Guidelines for maximizing battery life:

- Turn off the buzzer.
- Turn off the backlight feature.
- Manually turn off the *HS Explorer* dive computer by holding down both buttons for five seconds ( the "5" appears on the display).

- Keep the *HS Explorer* dive computer warm before and between dives. Air temperatures below 50°F (10°C) will reduce battery current capacity (shorten apparent capacity).
- Minimize the time the *HS Explorer* dive computer is used in the Communication mode (Mode 4). This mode increases battery power consumption by 40 As soon as you are finished uploading or downloading to the *HS Explorer* dive computer, exit the Communication mode by pressing the left button for one to three seconds (BT display scrolls “1-2-3”).
- Never leave the computer in Setup or manual programming mode, as the battery will operate the computer until it is completely drained.
- Always keep a spare battery on hand, and bring extra batteries when traveling to remote locations or on extended dive vacations.
- Prevent crushing or impact to battery when not in use.
- Store batteries in a cool environment when not in use.
- Allow batteries to warm to ambient temperature prior to installation.

### Inspecting the Computer

It is important to visually inspect your HydroSpace Engineering dive computer prior to using it in open water. Pay special attention to the following points:

1. Inspect the clear faceplate to insure that there are no cracks. Pay particular attention to the area around the screws that fasten the faceplate to the computer. Also look for any signs of moisture or water under the faceplate. If any cracks or moisture is observed, do not dive with the computer! Return the computer as quickly as possible to HydroSpace Engineering, at the address listed of the warranty service page at the back of this manual.

2. Confirm that the download interface circuit board has been removed from the computer. Do not dive with this circuit board in place!

3. Inspect the two wrist wraps for cracks, tears, or other weak points. If any damage is found in the straps, replace the strap prior to diving.

Your *HS Explorer* dive computer is now ready to dive. Continue reading for programming instructions prior to beginning the dive.

**WARNING!**

**Never use spray lubricants on the housing or wrist straps. The chemicals may attack and ruin the housing materials, seals and/or straps.**

## PROGRAMMING THE *HS EXPLORER* DIVE COMPUTER

There are two ways to program your *HS Explorer* dive computer. The easiest is to use a personal computer (PC) and the supplied *HS Explorer* simulation software. To do this, you must know how to place your *HS Explorer* dive computer in Communications mode (Mode 4). Go to page 12 to learn how to do this. Instructions for using the *HS Explorer* simulation software are included in Part II of this manual.

The second way to program your *HS Explorer* dive computer is to use the manual set modes on the computer itself. This involves using only the two buttons on the computer to program it. While more involved and time consuming, it does allow programming when a personal computer is not available. There are five set-up modes on your *HS Explorer* dive computer, as detailed in the following chart:

| Mode | Function |
|---|---|
| 1 | Gas mix programming (NITROX, TRIMIX, open and closed circuit mixes, change depths and direction) |
| 2 | Option programming (computational formula selection, altitude, units, backlight, audible alarm) |
| 3 | Time and date programming |
| 4 | Communications mode (PC interface) |
| 5 | Shut down mode (puts the *HS Explorer* dive computer in standby (sleep) mode) |
| 6 | $O_2$ Cell Calibration (Model O only) |
| 7 | Activate/Deactivate $O_2$ Cell, Set cell $O_2$ Calibration percentage (Model O only) |

The following sections cover each of the modes. All users should read the sections covering Modes 2 and 5, as they cover generic information with which all users should be familiar.

Here are some general guidelines used in all modes for programming your *HS Explorer* dive computer manually:

The Left (“A”) button scrolls to the next function or display field.
The Right (“B”) button scrolls or increments the value.
Press and hold the **LEFT** button (A) for two seconds (or until the number "1" or “2” is displayed) to exit *without* saving changes**.** ***Pressing two Buttons (A & B) will NOT Exit MIX Setup*****.**
Press and hold the **LEFT** button (A) for three seconds (or until the number “3” is displayed) to exit and save changes. (Use "A" button only when diving). *Pressing two Buttons (A and B) will NOT Exit MIX Setup*.
If you are in any Setup mode, the automatic shut-off timer is deactivated, and the computer *WILL NOT* turn off automatically after **30** minutes. It will continue to operate until the battery is completely drained. For this reason, do not leave the computer in setup mode. Exit setup mode by using following the instructions to conserve battery life as soon as you have finished programming the computer.
NOTE: If you are in Communication mode (Mode 4), battery consumption is 40% higher than normal when connected to the PC. Enter this mode only when you are ready to upload or download your *HS Explorer* dive computer, and exit it by following the instructions above as soon as you have finished.

### Mode 1—Gas Mix Programming

***To Activate the HS Explorer:***

Press the Button 'A' to "Wake Up" the *HS Explorer*. At this time the *HS Explorer* will automatically activate when entering the water. The left button will also activate the unit.

***Setting Mix Information* (Field Setup Procedure)*:***

**WARNING!**

**The Starting Mix may NOT be used as an Planned Switch Mix. Example: If Mix 1 was set as the Starting Mix and it was also set with a Change Depth and Ascending, when the change to the next mix is confirmed, Mix 1 Changes will be reset and the *HS Explorer* will not signal for a change to Mix 1 on Ascent.**

**NOTE**

**The MIX number displayed on exit will be the one used at the START OF THE DIVE. The Starting Mix may not be used to automatically detect a later Mix Change.**

**WARNING!**

**The *HS Explorer* Dive Computer and the Simulator software perform no checks for the viability of any gas mix. It is the user's sole responsibility to verify the gas mixtures and dives are within acceptable limits considered safe.**

***Mix Field Setup***

Enter MIX Setup Mode by Pressing Buttons A and B at the same time (simulated by pressing right mouse button for a '1' count). A second counter display starts when **both** buttons are pressed. ***This is the same procedure for a manual mix change while diving.*** Releasing both buttons prior to a '1' count has no effect. Review the Field Setup procedure in the Simulator software chapter for written instructions on the setup process.

Increment Mix Function - Button A increments the MIX functions as follows:

1. MIX - 0 to 9, start with MIX 0 for PPO2 MODE Setup.
2. N % - 10's, Button B increments the N tens count.
3. N % - 1's, Button B increments the N ones count.
4. He % - 10's, Button B increments the He tens count.
5. He % - 1's, Button B increments the He ones count.

(The balance oxygen (O2) percentage is displayed after incrementing to Mix Change Depth. If 100% O2 is entered the 02% will be displayed as 99.)

***Constant $PPO_2$ Mode***

If starting from MIX 0, PPO2 will be displayed, the MODE icon and 'on/off' will flash. Pressing Button B will set the *HS Explorer* for constant PPO2 (closed circuit rebreather) operation and the 'on/off' indication will change to confirm the set. This setup step is skipped in all other mixes. See Appendix A for EAD Tables.

To cancel PPO2 MODE, enter Setup from MIX 0, press Button A until the PPO2 icon position is reached. The MODE icon an 'on' will be flashing. Press Button B and the indication will change to 'off'. PPO2 MODE is deactivated at this point. Select any Mix number and program for Open Circuit use.

PPO2 Set Point. Set the Oxygen Partial Pressure (PPO2) to the same set point for which the rebreather is set. This step is skipped if PPO2 MODE is not active and for Mixes 5 through 9 which compute open circuit (OC) when PPO2 mode is active . Button B increments the set point by 0.1 ATA/Bar. The range is 0.4 to 2.0 ATA/Bar. Figure 1 illustrates the $PPO_2$ setup indication.

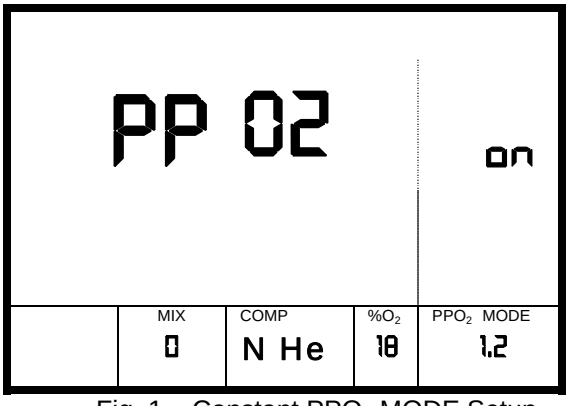



Fig. 1 Constant $PPO_2$ MODE Setup

**DANGER!**

**The PPO2 set point of 1.2 is above the levels determined safe by the U.S. Navy and NOAA. Setting the PPO2 set point above the USN/NOAA safe levels may result in**

**your death form acute oxygen toxicity. The feature of allowing the higher set point was added at the request of many divers who realize and accept the risk of death they will incorporate by setting the high PPO2 set point.**

MIX Change Depth - Button B increments the change depth by 10 ft/3m.
Ascending/Descending Switch (indicated by Ceiling Arrow and Ceiling Icon.
Increment Function Count -
Button B increments the count for the current function as indicated by the flashing digits: To set the % of inert gas present in mix, using air for example, set N % to 79.
Set Change Depth in Feet/Meters. Leaving Change Depth at 0 skips the Ascending / Descending function. Exceeding a PPO2 of 1.8 for the current mix and depth will reset the Change Depth to zero (0). PPO2 is shown in the lower right hand corner of the display
Set Ascending/Descending Change Direction. "cd up" = ascending, "cd dn" = descending.

***Exit MIX Setup:***

**Remember: The Mix showing on Exit will be the one used to start the** dive.
**Surface - EXIT MIX Setup,** continue through the functions until back to MIX Number and Press Button A (left mouse button) for a 3 count. *Single button confirmation when on the surface and when diving.*
**Diving - EXIT MIX Setup,** Press Button A (Left) for a 3 count. ***Single button confirmation when diving***.
***Pressing two (2) Buttons (A and B) will NOT Exit MIX Setup.***
Pressing Buttons A for *LESS THAN* 3 seconds will exit to values prior to starting setup and all changes will be lost. (Single Button feature surface and diving)
MIX configuration remains set until the MIX information is reprogrammed by the diver.

***Resetting All MIX Setup Configurations:***

There is no RESET function on the *HS Explorer* Dive Computer. Reset by resetting the mix table on the simulator and downloading to the *HS Explorer*.

## DISPLAY LAYOUT

The screen of your *HS Explorer* dive computer displays all of the information you need to conduct your NITROX or TRIMIX dive's. Because all of the information and data stored by your *HS Explorer* dive computer is not needed at any given time, only the data necessary for any given part of the dive is shown. This helps eliminate confusion and task loading, but requires that you understand what information is being displayed at any given time. Thus, it is important to see what part of the display shows what information, and when.

Figure 2 shows the complete display with display options (note that not all of these will be displayed simultaneously). Please read the sections entitled “Diving with your *HS Explorer* dive computer” and “Surface Interval Mode on your *HS Explorer* dive computer” for an explanation on when different data is shown.

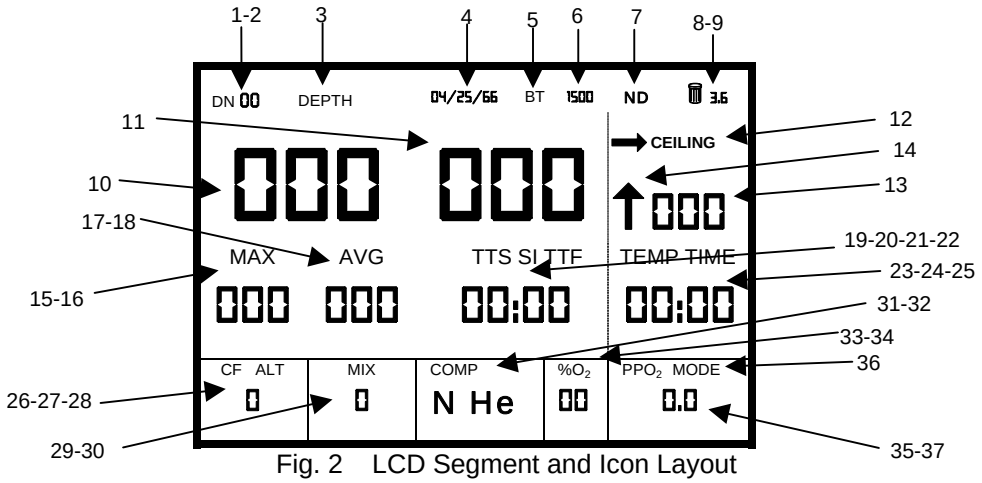



Fig. 2 LCD Segment and Icon Layout

| | | | |
|---|---|---|---|
| 1 | "Dive Number" label | 20 | "Surface Interval" label |
| 2 | Dive number in memory or in progress | 21 | "Time To Fly" label |
| 3 | "Depth" label | 22 | TTS, SI, TTF indication (hours/minutes) |
| 4 | Date (mm:dd:yy) | 23 | "Temperature" label |
| 5 | "Bottom Time" label | 24 | "Time" label for Decompression Stop Time |
| 6 | Time (hh:mm, in 24-hour format) | 25 | Temperature (°F/°C) or Deco Stop Time (min) indication |
| 7 | "No-Decompression" label | 26 | "Calculation Formula" label |
| 8 | Battery Voltage icon | 27 | "Altitude" label |
| 9 | Battery voltage | 28 | CF (0-9), Alt (0-9), Imperial/Metric (0-1) indication |
| 10 | Depth (fsw, msw)(based on $P_{absolute}$) | 29 | "Gas Mix number" label |
| 11 | Bottom time (minutes) | 30 | Gas Mix number (0-9) |
| 12 | Decompression ceiling icon & arrow | 31 | "Gas Mix COMPosition" label |
| 13 | Decompression ceiling depth (ft/m) or remaining no-decompression time (minutes) | 32 | Mix Composition (N, He, or NHe) |
| 14 | "OK to ascend" icon (up arrow) or ascent rate indication (solid = OK, blink = too fast) | 33 | "Percentage of oxygen" label |
| 15 | "Maximum dive depth" label | 34 | Percentage of oxygen (in %) or % N/He during setup |
| 16 | Maximum depth (ft/m) | 35 | "Partial pressure of oxygen" label |
| 17 | "Average dive depth" label | 36 | "Constant $PPO_2$ MODE" label (Yes if on) |
| 18 | Average depth (ft/m) , Metric Tenths Meter | 37 | Partial pressure of oxygen (in ATM) or $PPO_2$ Set Point |
| 19 | "Time To Surface" label | | |

## ACTIVATING THE *HS EXPLORER* DIVE COMPUTER

Your HS Explorer dive computer must be turned on and sufficient battery voltage for diving verified. Your *HS Explorer* dive computer will turn itself on automatically if you are just installing the battery. If it does not, or if the battery were previously installed, you can turn your *HS Explorer* dive computer on by pressing and releasing the Left ("A") button. This "wakes" the computer.

The first thing you will see is that the display will show all "8"s in all parts of the display. This allows you to see that all LCD areas of the display are functional. This display will remain active for two seconds. (See Figure 3).

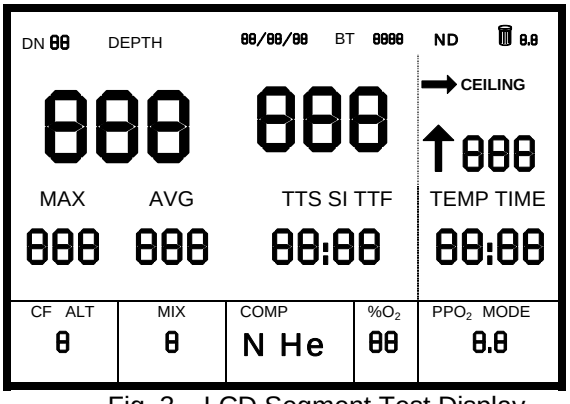



Fig. 3 LCD Segment Test Display

Next, the display will show the firmware version screen. It will display HSE (HydroSpace Engineering) on the upper line. The second line will show the year (i.e., "20 01"), and the firmware version, with the version/revision numbers separated by a colon (i.e., "2:12"). The bottom line will flash an indication of if this is a NITROX version (Model N) or TRIMIX version (Model M) of the *HS Explorer* dive computer. An "N" is

displayed if it is a NITROX model, while a “N He” is displayed if it is the TRIMIX model. This display will remain active for two seconds. (See Figure 4).

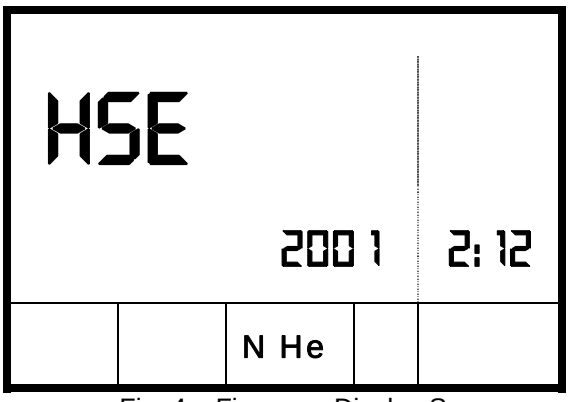



Fig. 4 Firmware Display Screen

Finally, the Surface Mode display appears. This screen contains a variety of information useful in planning your dive. Information includes the dive number (DN), date, time, battery voltage, temperature (TEMP), computational formula (CF), mix number, gas composition (COMP), fraction of oxygen (in percent), and partial pressure of oxygen (PPO2) in atmospheres. (See Figure 5).

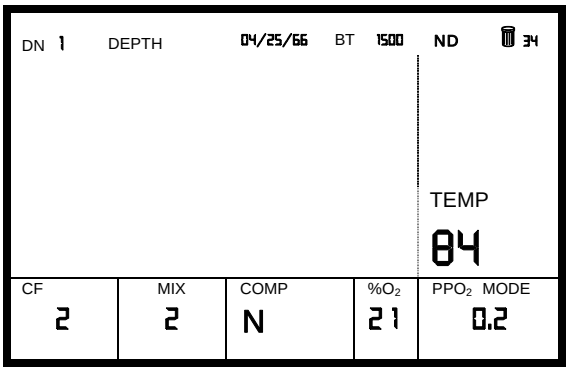



Fig.5 Surface Display

Figure 8, below, illustrates the setup screen, after all options have been set, for changing to Mix 3, 100%$0_2$, at 20 feet on ascent. Note: Effective with firmware version x.14, mix change depth and direction are restored 10 minutes post dive to the pre-dive settings. Prior to x.14 these settings were reset to zero.

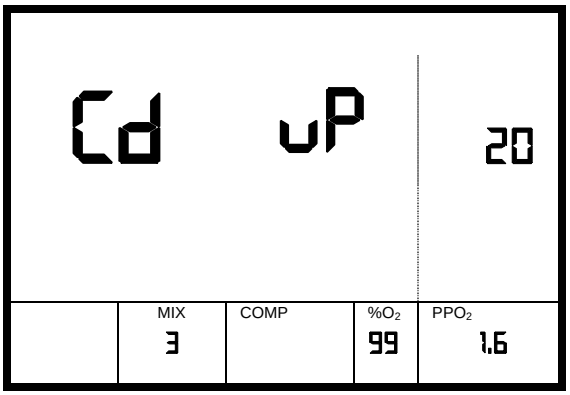



Fig. 6 Mix Setup Segments

## Mode 2—Option Programming

Start CAM (Computation Formula (CF), Altitude, Metric/English, Backlight And Buzzer)
Setup Mode by Pressing Buttons A and B at the same time for a 2 count (right mouse button). Button A increments function, CF = Calculation Formula, ALT = Altitude, Blank = Metric, "bl" = backlight ('off' = off, 'on' = on), "bu" = buzzer ('off' = off, 'on' = on).

The methods for decompression calculation differs between Dr. Buhlmann's model, the United States Navy' model and RGBM. Each produces similar but different results for AIR only. CF 3 through CF 9 are derived from the ZH-L16C model and have modifications which produce schedules that approximate the decompression schedules of Dr. Buhlmann's model with asymmetric off-gassing rates of 118% and 135%. CF 9 is the most conservative of the Buhlmann algorithms. A derivation of the Reduced Bubble Gas Model (RGBM) is applied to provide deeper initial stops in Buhlmann CF's with an 'F' number less than 100. RGBM was developed by Dr. Bruce Wienke / Southwest Enterprises, Inc. The RGBM in general requires much deeper stops but results in shorter decompression times. CF 2 is the most conservative of the RGBM algorithms. Suggested applications of the CF's are listed for each:

CF 0 = RGBM, F=100, -light work, warm water
CF 1 = RGBM, F=97, moderate work, colder water
CF 2 = RGBM, F=94 -heavy work, cold water
CF 3 = ZH-L16C Computer, Dr Buhlmann's Computer Model
CF 4 = ZH-L16C Computer, Asymmetric 118, RGBM F=100 - light work, warm water
CF 5 = ZH-L16C Computer, Asymmetric 118, RGBM F=97 - moderate work, warm water
CF 6 = ZH-L16C Computer, Asymmetric 118, RGBM F= 94 - heavy work, warm water
CF 7 = ZH-L16C Computer, Asymmetric 135, RGBM F=100 -light work, cool water
CF 8 = ZH-L16C Computer, Asymmetric 135, RGBM F=97 -moderate work, cold water
CF 9 = ZH-L16C Computer, Asymmetric 135, RGBM F=94 -heavy work, cold water

In general, the CF decompression requirements listed in **LEAST** decompression time requirements to the greatest are: CF 0, CF 1, CF 2, CF 3, CF 4, CF 5, CF 6, CF 7, CF 8, CF 9. There may be some variations to this listing depending on depth / bottom time combinations.

**WARNING!**

**Compare the results with the CF 1 (or greater) calculations. In any case, should the CF result in decompression requirements that are less than U.S. Navy Decompression Schedules PLUS 5%, use the next higher CF. Failure to increase decompression requirements can cause decompression illness and all of the associated problems, including permanent injury and death. IT IS YOUR RESPONSIBILITY TO ENSURE AN ADEQUATE DECOMPRESSION SCHEDULE IS SELECTED AND FOLLOWED.**

Altitude 0-9 corresponds to sea level to 10,000 feet (~3,000m). ~1000 ft or ~300m per Altitude number. See Diving at Altitude in next section for important information.

Metric/English, 0 = English Units, 1 = Metric Units. (The CF and ALT icons are not displayed). Above the CF/ALT icon a "M" is displayed for Metric and "I M" is displayed for Imperial along with the 0 and 1.

A (Bottom Time) indication of 'off' means the backlight is always off, an indication of 'on' means the backlight will be illuminated for 4 seconds when either button is pressed. Turning the backlight off will conserve the battery.

When "bu" is displayed in the Depth location, this indicates the change buzzer setting. A (Bottom Time) indication of 'off' means the buzzer is always off, an indication of 'on' means the buzzer will sound when either button is pressed. Turning the buzzer off will conserve the battery.

Exit CAM Setup: Press Button A for 3 seconds to SAVE changes. To exit without changes, Press Button A for 1 to 2 seconds.

CAM configuration remains set until the CAM information is reprogrammed.

**NOTE!**

**There is no RESET function on the *HS Explorer* Dive Computer. Reset by resetting the mix table on the simulator and downloading to the *HS Explorer*.**

## Mode 3—Time and Date Programming

Start DT Setup Mode by Pressing Buttons A and B at the same time for a 3 count.
Button A increments function starting with time then date.
Button B increments the number for the current function.

**NOTE!**

**The Dive Computers Date/Time is set each time the mix table is downloaded, EXCEPT in a post dive condition. The dive computer time can not be set for 24 hours post dive. Therefore leave the *HS Explorer* battery connected for at least 24 hours post dive to allow the Surface Interval to reset. If the battery must be changed: (1) activate the *HS Explorer*. (2) Go to Mode 5 (sleep). This will set the current time into non-volatile memory, which will be used to set the clock when the power is restored.**
**(3) Change the battery. When the new battery is installed the *HS Explorer* will activate with only a time difference of how long it took for the battery change.**

To Exit DT Setup:
Press Button A for 3 seconds to SAVE changes.
*Pressing Buttons A & B together will have no affect when in any setup mode.*
To exit without changes, Press Button A for 1 to 2 seconds.

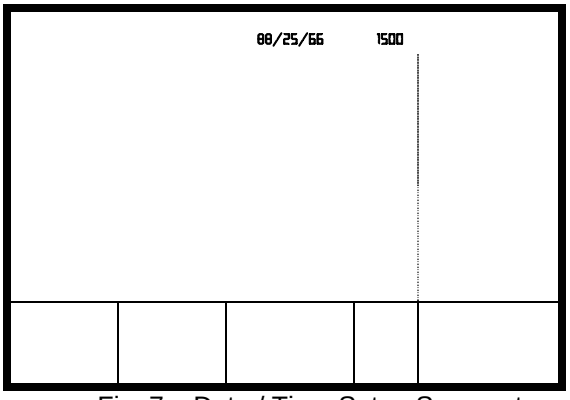



Fig. 7 Date / Time Setup Segments

## Mode 4—Communications Mode

The easiest way to program your *HS Explorer* dive computer is to connect it to your personal computer. (At this time, only IBM-compatible systems may be used.) You can also upload your dive profiles from your *HS Explorer* dive computer to your personal computer, so you can maintain a record of your dives. To perform either of these tasks, you must first enter the Communications mode on your *HS Explorer* dive computer.

To enter the Communications mode, from the Surface Display mode press both buttons down for four seconds, or until the display scrolls “1-2-3-4.” Release both buttons while the “4” is displayed. The display will read a large “CO.” This indicates that the *HS Explorer* dive computer is now ready to interface with your personal computer. (See Figure 10)

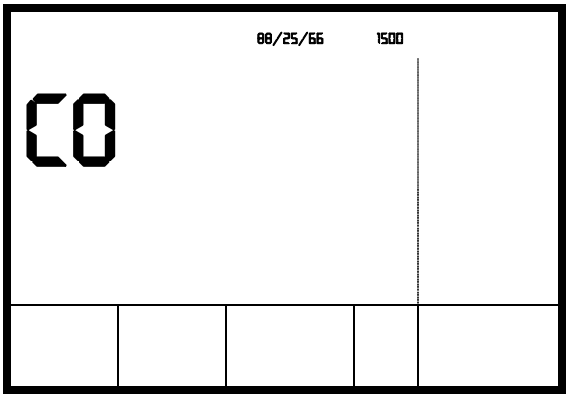


Fig. 8 Communication Mode Segments

To connect your *HS Explorer* dive computer to your personal computer, do the following:

1. Attach the supplied RS-232 cable to an open serial port on your personal computer.
2. Attach the supplied computer interface board to the *HS Explorer* dive computer. When installing and removing the computer interface board, press inward as you slide the board in or out. If the board "sticks," try pressing in a different spot. The curvature of the switch housing on the *HS Explorer* dive computer is designed to capture the board, with the connection being made by the brass contacts. If the brass contacts are not making a firm connection, remove the board and gently bend the contacts out slightly to increase tension.
3. Plug the 3-pin connector on the RS-232 cable to the plug on the computer interface board. Note that the plug and connector are keyed to allow it to be inserted in only one orientation. If it does not attach easily, do not force it. Alter the orientation and try again.
4. Start the *HS Explorer* simulation software on your personal computer.
5. Set up the date, time, mixes, and options in the *HS Explorer* simulation software as desired (see Part II of the manual for instructions on how to use the *HS Explorer* simulation software).
6. Turn on your *HS Explorer* dive computer and place into Communication mode as described above.
7. Initiate the download from the personal computer to your *HS Explorer* dive computer.
8. Exit the Communications mode by pressing the left button down for three seconds, or until the display scrolls "1-2-3." Release the button while the "3" is displayed. Your *HS Explorer* dive computer will return to the surface display mode.

If you have difficulties communicating with your personal computer, first insure that the COMM port you specify when starting the *HS Explorer* simulation software matches that of the physical COMM port you attached the RS-232 cable to on your personal computer. If your still have problems, you may need to shut down your *HS Explorer* dive computer, close the HydroSpace Engineering simulation software, and begin anew.

### Mode 5—Sleep Mode

Your *HS Explorer* dive computer will go into the "sleep" mode to conserve battery power 30 minutes after (1) activating and (2) surfacing from diving.

After setting the *HS Explorer*s configuration, you can manually place the *HS Explorer* into Mode 5 instead of waiting for the 30-minute time period to elapse. To do so, from the Surface Display mode press both buttons down for five seconds, or until the display scrolls "1-2-3-4-5." Release both buttons while the "5" is displayed. When the computer is turned back on, it will automatically calculate surface interval and calibrate for the next dive. ***Remember to preserve the system date and time, always active and then go to Mode 5 before disconnecting the battery.***

## DIVING WITH YOUR *HS EXPLORER* DIVE COMPUTER

### Activating the *Explorer*

The *Explorer* had a water activation circuit to activate itself when the contacts are immersed in water. Once activated the *Explorer* will remain on for 30 minutes in the surface zone. Once the dive starts the sleep timing is deactivated. If the unit is in the water and NOT on a dive when the 30 minutes occurs, it will go to sleep. A delayed entry after surface activation or a long surface swim will allow the *Explorer* to go to sleep. Check to verify the unit is active prior to descending. If the unit has gone to sleep (Mode 5), hold it out of the water for a short time to allow the water drain from the contact. It may then be activated by pressing the left button or simply immersing it. The reason for this is that if the unit goes to sleep while immersed in the surface zone, the wake-up trigger is activated prior to the unit going to sleep. Holding the unit out of the water removes the contact and allows the wake-up circuit to reset.

### No-decompression Mode

In the No-Decompression mode, No Decompression is indicated by the "ND" icon and the No Decompression countdown time is shown using the ceiling numbers. In the figure below, you have 11 minutes remaining at this depth until decompression starts. The No Deco countdown and TTS indications start after one minute of bottom time. No-Decompression time remaining is not displayed when shallower than 30 ft.

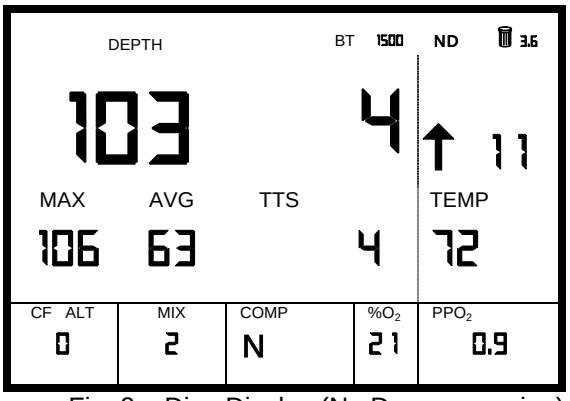



Fig. 9 Dive Display (No Decompression)

### Decompression Mode

The ceiling arrow and icon indicate decompression stops. Ascend to the indicated depth.
Once at the indicated depth for the decompression stop you must remain at the indicated depth or deeper.
If you ascend too shallow for the stop, the CEILING icon and Arrow will blink. When this indication is present, any time spent at this depth is calculated at 1/60th the normal rate. When you ascend shallower than the required stop you are increasing your statistical probability for decompression sickness and the consequences thereof.

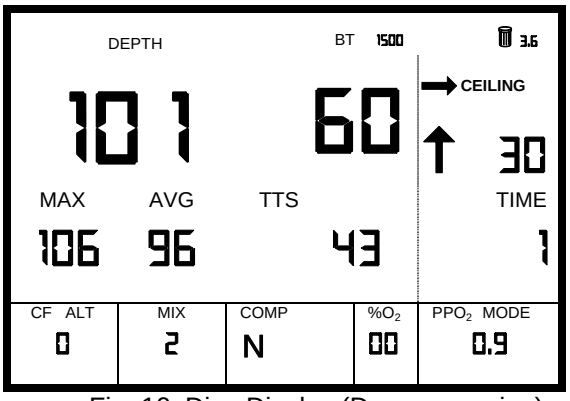



Fig. 10 Dive Display (Decompression)

### Metric 1/10th Meter / AVG Depth Display

When diving using metric display information, the 1/10th meter depth information is shown using the AVG Depth display. The AVG icon is blanked and the number represents the 1/10th meter of the depth. To display the average depth, press the right button and The average depth will be displayed. This is true on the surface and while diving. The 'normal' indication is the 0.1m of the depth in the metric display mode. The average depth is displayed in the imperial mode.

## TTS Display

The TTS display is intended for reference only. The actual TTS will vary due to variations in ascent rates and stop depths the diver will incur. Decompression ceiling and stop times usually update within 1 second of the bottom time update. The TTS is a different story. The Explorer must project the complete decompression profile, total the ascent times and stop times to arrive at a projected TTS. Because the TTS calculation is performed each minute on a real time basis, as the dive gets longer and deeper, the TTS display update can be delayed by as much as 25 seconds after the bottom time and stop information has been updated. Once the bottom time updates you will need to monitor the display and observe the TTS update to get the current projection.

## Mix Switching

Descending mixes are operative during the descending time period which is determined by the deepest mix change (ascending or descending) divided by 1 bar (ATM) / minute. If this time is less than 5 minutes then the descending time period is set to 5 minutes. This is to help when a 20-foot mix change is planned (1 min descent time) and a short delay occurs in reaching 20 feet. ***Caution: If you delay past the descent time, the Explorer will attempt to switch to the ascending mixes deepest to shallowest and cancel them.***

***Confirming preset mix switches***

1. Confirm by pressing the **left** button for a "3" count. A "1" or "2" count will cancel the mix change.
2. The gas change is canceled after 30 seconds of reaching the change depth or the change depth is missed by 10 feet/3m and Mix changes are reset as each depth is accessed.

***Manual gas switching***

Perform manual gas switching the same as in field setup:

1. Hold **both** buttons for a "1" count.
2. Press the right button until the Mix Number indicates the mix you want.
3. Confirm by pressing the **left** button for a "3" count. A "1" or "2" count will abort the mix change.

***Delayed Descent Procedure***

The *HS Explorer* default descent time period is calculated for the deepest mix change using a descent rate of 1 Bar/minute (33 feet/minute) or a minimum descent time of 5 minutes, which ever is greater. After descent time period has elapsed, the *HS Explorer* checking for descending mix changes and begins checking for ascending mix changes. When the descending time period has lapsed and the *HS Explorer* switches to ascending mix changes, any ascending mix change which is deeper than the current depth will be considered aborted and the mix change removed from the mix change table.

For example: A planned ascending mix change to Mix 3 is set for 100 feet. The descending time period is 5 minutes (100 ft / 33 ft/min = 3 min, which is less time than the default 5 minutes). At 5 minutes into the dive you are at 80 feet, The *Explorer* will attempt to set a mix change to Mix 3 and because the current depth is shallower than the planned mix change by more than 10 feet, the mix change will be aborted and the *HS Explorer* will look for the next shallower ascending mix change. In actuality you have not reached the Bottom Depth and are still continuing your descent. The 100-foot mix change will not be requested when returning to that depth on ascent.

For a known delayed descent time period which will be greater than the default or calculated time period (IE., beach descent to a drop off), a not-to-be-used (dummy) descending mix change which will provide greater descending time period can be used.

Caution!
This procedure may not be suitable for all delayed dive conditions.

While you can use any of the mixes for the purpose of the dummy descent depth mix change setting, the following are suggested. If diving open circuit use Mix 0 because you will be starting on Mix 1 or higher and switching up. If diving closed circuit then use Mix 9. Whatever mix number you choose, the descent change depth should be below the planned dive depth and set the dummy change mix to the same gas concentrations as your bottom mix gas concentration settings.

Remember: The descent time is 5 minutes or 1 minute for every 1 Bar (33 feet) of depth, which ever is greater. The table below illustrates the descending time period for various depth.

| | | |
|---|---|---|
| 198' = 6 min. | 333’ = 10 min. | 462’ = 14 min. |
| 231' = 7 min. | 363’ = 11 min. | 495’ = 15 min. |
| 264' = 8 min. | 396’ = 12 min. | 528’ = 16 min. |
| 300’ = 9 min. | 430’ = 13 min. | 561’ = 17 min. |

Open Circuit

- Set all Dive Mixes and change depths.
- Set Mix 0 Nitrogen and Helium the same as the Bottom Mix.
- Set Mix 0 with the change depth for the amount of time it will take you to reach your Target Operating Depth (TOD).
- Set to Starting Mix, Mix 1 , 2 , 3 etc… and Save the Setup.

Closed Circuit

- Use the same setup procedure as above except use Mix 9 for the dummy mix change instead of Mix 0.

**CAUTION!**
**Remember: During the descending time period, the Explorer will not detect ascending mix changes during the ascending time period.**

Note: At each minute when the Bottom Time (BT) updates the *Explorer* calculates Time To Surface (TTS)

***Audible alarms***

There are no audible alarms during the dive.

## Changing $PPO_2$ Set Points During Dive

The procedure for changing the PPO2 Set Point during a dive is the same as in the Field Setup. Briefly:

1. Enter the Mix Change Mode and select the mix for which you want to change the $PPO_2$ Set Point.
2. Use left button to increment to $PPO_2$.
3. Use the right button to change the $PPO_2$ Set Point. (Range - 0.4 to 2.0).
4. Left button for a 3 count to exit and activate new $PPO_2$ Set Point. (<3 count will not activate).

## Diving at Altitude

The *HS Explorer* does not automatically "sense" the decreased atmospheric pressure when diving at altitude. The pressure correction must be entered by the user for the altitude of the dive. The *HS Explorer* then applies the pressure reduction to the decompression calculations.

The decompression algorithm used by the *HS Explorer* requires that specific pressure reduction ratios be followed. All decompression stops are separated by 0.3 bar (10 ft/3m). When surfacing from the last decompression stop to sea level the atmospheric pressure is 1.0 (with minor pressure fluctuations due to weather). At altitude this pressure is less, so additional decompression is required at the 1.3 bar (last) stop to allow tissue equilibration for the reduced pressure on the surface at altitude.

**The *HS Explorer's* pressure senses absolute pressure and the computer is calibrated for sea level. Because the decompression algorithm works on absolute pressure, the *HS Explorer's* displays depth as if it were at sea level.** For example, the atmospheric pressure at 7000-ft (2136m) is about 0.8 bar. All decompression stops are adjusted deeper in the water column to provide the correct decompression pressure. For this altitude the 10 ft/3m linear from the surface pressure is 1.1 bar. 0.2 bar less than is required. Apply this to a sea level dive, it would be the equivalent to performing the 10-ft/3m stop at 3 ft/1m. Not a good practice for maintaining one's good health.

***When diving at altitude, the HS Explorer displays depth in ABSOLUTE PRESSURE DEPTHS.*** For the above altitude example, the displayed depth may be 10 ft/3m but the true linear depth from the surface will be around 16 ft/5m. The *HS Explorer* will always report depths in ABSOLUTE PRESSURE to maintain the correct pressure ratios for decompression stops. Reference Appendix G for corrections. Effective for units shipped after 15 Apr 03, pressing the right button will provide a temporary adjustment to the depth to indicate the linear depth to the surface. When the button is released, the pressure depth is displayed. When the altitude setting is other than 0, the ALT and CF numbers alternate on the display.

**WARNING**

**WHEN USING THE *HS EXPLORER* FOR DIVING AT ALTITUDE, ALWAYS DECOMPRESS AT THE INDICATED ABSOLUTE PRESSURE DEPTH. NEVER DECOMPRESS AT THE LINEAR DEPTH FROM THE SURFACE (which may be given by other depth instruments). AT THIS SHALLOWER DEPTH, THE PRESSURE RATIOS WILL BE INCORRECT FOR THE DECOMPRESSION ALGORITHMS USED BY THE *HS EXPLORER*.**

The formula for the reduced pressure at altitude is given by:

***Pressure(kPa)=101.3-(11.47*Alt(km))+(0.404*Alt(km)^2)***

If you dive at altitude and compare the *HS Explorer* with some other depth instrument, which reports linear distance (the *HS Explorer* depth will be less), the *HS Explorer* is reporting the correct depth for decompression purposes. To determine the linear depth at altitude, use the formula above to calculate the pressure reduction. Subtract that value from 1.0 and then multiply the result by 33 ft or 10 m. Add this to the reported depth and you will have the linear depth from the surface.

## DIVING USING AN EXTERNAL OXYGEN FUEL CELL

**WARNING**

**Never rely on a single $O_2$ Cell to set the Oxygen Partial Pressure for life support purposes. Failure of the $O_2$ Cell or electronics could quickly result in your death. The external Oxygen Fuel Cell is intended to be used for decompression use only and not to be used for PPO2 control. The use of a single monitoring device for critical control functions is in violation of Controls Engineering Standards.**

### Oxygen Fuel Cell Setup And Calibration Procedure

#### *General*

**This setup and calibration procedure is only applicable to *HS Explorer* models fitted with the external electrical connector for an Oxygen Fuel Cell** ($O_2$ Cell) **to monitor $PPO_2$.**

The setup and calibration of the $O_2$ Cell is in addition to the existing setup procedures used on the *HS Explorer*, which does not have the $O_2$ Cell connector. The setup procedure is the same for both models. The $O_2$ Cell setup procedures will not work on the standard model *HS Explorer*. At this time the $O_2$ Cell setup is only accessible as a field setup. It cannot be changed using the simulator.

Oxygen Cells are chemical batteries and therefore have a limited life span. While $O_2$ Cells can last longer than 12 months, HydroSpace Engineering, Inc. recommends replacement of the $O_2$ on an annual basis. This will help insure the reliability and accuracy of the $O_2$ Cell's usage. An aged cell may calibrate successfully with 100% Oxygen at sea level but fail to provide adequate output at the higher $PPO_2$'s encountered while diving.

The *HS Explorer* has been tested with the Teledyne R-22D Oxygen Cell. While other $O_2$ Cells may perform satisfactory, their use has not been tested. It is the responsibility of the user to verify the accuracy and response of the $O_2$ Cell in use. The use of $O_2$ Cells other than the R-22D and the results obtained are the sole responsibility of the end user. Specifications and information on the R-22D may be found on the Teledyne web site: *http://www.teledyne-ai.com/oem/diving.html*

Inaccurate or false Oxygen sensor readings can be caused by many factors. Some of the preventable factors include: water on membrane, touching the sensor face, contaminants, $CO_2$ exposure, heat, temperature extremes and impact damage. Oxygen fuel cells are delicate devices. Treat them accordingly.

The *Explorer* only displays the $PPO_2$ in units and tenths. For Example: A $PPO_2$ display of 1.3 will include 1.25 to 1.34. The dive record will show the PPO2 to two decimal places, ie. 1.30. (See sample record in at the end of Appendix B.)
The activation and calibration of the $O_2$ Cell is a three-step process.

1. Connect the $O_2$ Cell to the *Explorer*.
2. Activate the *Explorer* to read the $O_2$ Cell (and setting the Loop $O_2$ Calibration Percentage).
3. Calibrate the $O_2$ Cell output.

***Connecting the $O_2$ Cell***

The bulkhead receptacle on the *Explorer* and the corresponding cell connector both have red dots that facilitate pin alignment.

**WARNING**
**Never force the connector and do not use tools on the connector. The connector/receptacle may be damaged or loosened on the housing causing a leak.**

**WARNING**
**The connector is NOT designed to be connected/disconnected under water. Never connect/disconnect the connector under water.**

**CAUTION**
**When diving without the $O_2$ Cell connector, insure the receptacle sealing cap is installed. The connector may be damaged and/or leak if the sealing cap is not installed.**

- Remove the sealing cap from the receptacle.
- Inspect the connector and receptacle for cleanliness. Remove any dust, dirt, salt crystals or other debris. **Be careful not to damage the sealing O-ring at the bottom of the receptacle.**
- Place a light coat of silicon grease on the outer portion of the connector shell where it goes into the receptacle.
- Align the red dots, gently insert the connector into the receptacle until the connector is fully seated.

***Activating the $O_2$ Cell***

Activating the $O_2$ Cell and setting the Loop $O_2$ Calibration Percentage are additions to the existing setup method.

- Press both buttons on the *Explorer* for a '7' count. The *Explorer* in the $O_2$ Cell Setup Mode.
- The screen will be cleared, "$O_2$" will be displayed and the current state of 'OFF' or 'ON' will display.

- Press the right button to change the state to 'ON'. (Pressing it again will set it to 'OFF'.)
- If you are not changing the Loop $O_2$ Calibration Percentage, Press and hold the left button for a '3' count to save the settings and exit the setup mode. Otherwise continue to the next steps.

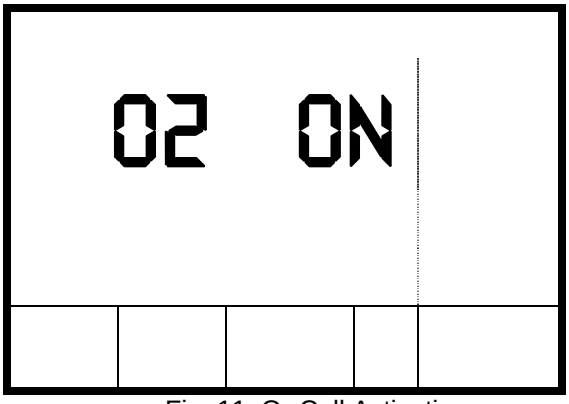



Fig. 11 $O_2$ Cell Activation

***Setting the Loop $O_2$ Calibration Percentage***

The $O_2$ cell calibration is an automatic process. However, it is based on the concentration of Oxygen present at the $O_2$ Cell. While it is possible to achieve $O_2$ percentages of 99% in the breathing loop, we caution that it is best to set the loop $O_2$ percentage at a more probable percentage of 98%. For decompression purposes it is better to set this value low than high. **The default setting is 98%** and the allowable range is 21% and 90% to 99%. The lower values allow for the use of Oxygen derived from membrane systems that do not produce 100% Oxygen but have Oxygen concentrations of 90% to 96%.

- Press the left button. This will now shift the *HS Explorer* to the Loop $O_2$ Calibration setup mode. The screen will display the $\%O_2$ icon and current setting in the Mix setup location.
- Pressing the right button increments the calibration percentage until the maximum of 99% then it resets to 21% with the next setting at 90%. Each press of the right button increases the percentage by 1.

**WARNING**
**When the 21% calibration is used, no check of the $O_2$ Cell's output linearity and any measurement error set in this range will be multiplied as you dive deeper. 100% $O_2$ calibration is recommended.**

- When the desired Loop $O_2$ Calibration Percentage has been obtained, Press and hold the left button for a '3' count to save the settings and exit the setup mode.

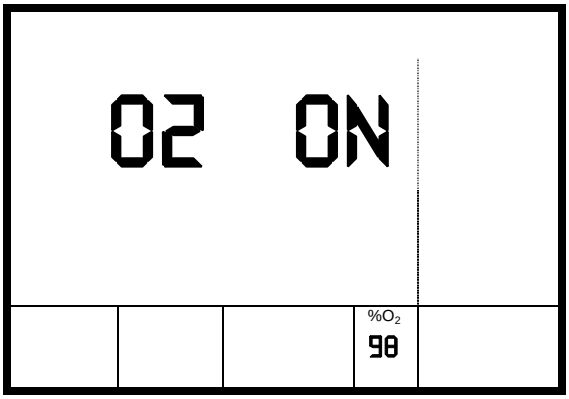



Fig. 12 Loop $O_2$ Calibration Percentage

### *Calibrating the $O_2$ Cell at Sea Level*

This will calibrate the $O_2$ Cell using the Loop Calibration Percentage. $O_2$ Calibration is a surface procedure only. It is recommended that you record the Loop $O_2$ Calibration Percentage on the rebreather checklist so there is a record of the setting.

- Flush the loop and calibrate the rebreather per the manufacturer instructions.
- While the loop is at it maximum surface Oxygen concentration, press and hold both buttons for a '6' count. "CC" will indicate ready for Cell Calibration.
- The $O_2$ Cell output will be displayed where the Bottom Time (and button press count) is located. For example, if the $O_2$ Cell is generating 52 millivolts, the indication will be 52. Tracking the cell output may help determine if the cell is not responding properly. The Altitude, Loop $O_2$ Percentage and $PPO_2$ will be displayed on the bottom row. See the Figure below.
- The *Explorer* will self calibrate and set the Partial Pressure of Oxygen ($PPO_2$) to 1.00. Note: While the display has one decimal place for the $PPO_2$ value the calculations are performed with the precision of floating point numbers.
- Press and hold the LEFT button for a '3' count to set the calibration. Less than 3 aborts calibration.

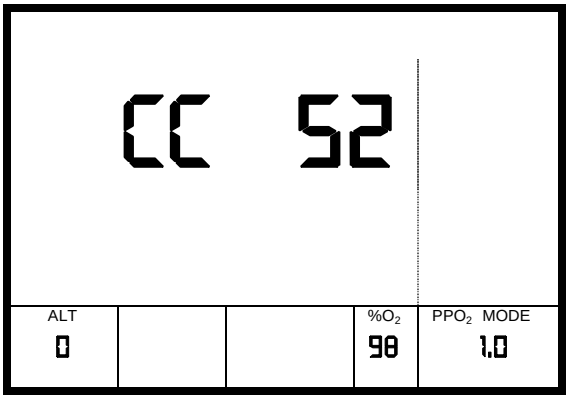



Fig. 13 $O_2$ Cell Calibration

### *Calibrating the $O_2$ Cell at Altitude*

Calibration at altitude the same as at sea level but with the additional requirement to set the altitude. Set the Explorer to the appropriate altitude. Refer to Appendix G, Altitude/Pressure/Oxygen Concentration Table. The *HS Explorer* r Altitude numbers correspond to thousands of feet. For example: If the altitude is set to 6 that will mean 6000 feet, 1.83 KM, and 100% Oxygen will indicate 79.56% (80%). Calibrate as above. The $O_2$ Cell output will be adjusted so that the $PPO_2$ indication will indicate 0.8 instead of 1.0. Atmospheric Oxygen will indicate 16.7% at this altitude.

## Diving Using The $O_2$ Cell For Decompression Calculations

Mixes 0, 1 and 2 are reserved for constant $PPO_2$ input from the $O_2$ Cell. Mixes 3 and 4 are set for constant $PPO_2$ but do not use the cell. Mixes 5 to 9 are open circuit (bailout) mixes. This will provide you with 3 mixes to use with the $O_2$ Cell. It is suggested to set Mixes 3 and 4 the same as Mixes 0 and 1. In the event of $O_2$ Cell failure, this will enable the *HS Explorer* to be shifted to the same mix but using the $PPO_2$ value to which the rebreather is set. **This is the preferred procedure for a suspected $O_2$ Cell failure.**

### *Turning Off the $O_2$ Cell While Diving*

If the $O_2$ Cell must be deactivated during the dive:

- Press and hold both buttons for a '7' count.
- Press the right button to turn the $O_2$ Cell Activation to 'off'.
- Press and hold the left button for a '3' count. The $O_2$ Cell is deactivated and the *Explorer* will remain on the current mix.

**WARNING**

**If Mix 0, 1 or 2 was in use at the time of $O_2$ Cell deactivation, the mix $PPO_2$ setpoint will be the same as the last output of the $O_2$ Cell and the $PPO_2$ must be set to the rebreather setpoint.**

For example: The rebreather is displaying a $PPO_2$ of 1.3 but the *HS Explorer* $PPO_2$ display initially dropped to 1.2 and now indicates 1.1. This is an indication of possible $O_2$ Cell failure. The *HS Explorer* is using Mix 0. After $O_2$ Cell deactivation, Mix 0 will have a $PPO_2$ set point of 1.1. Press both buttons for a '1' count to enter Mix setup. Press the left button unit the set point flashes. Press the right button to change the set point to the desired value. Press and hold the left button for a '3' count to exit and save the changes. Note: This is the existing procedure for the *HS Explorer* without an $O_2$ Cell.

***Connector Wiring***

The $O_2$ Cell Signal (Positive) lead must connect to Pin 1 or the pin closest to the Red Dot. The $O_2$ Cell Ground or Negative lead must go to Pin 2 which is the pin farthermost from the Red Dot.

The matching Cable Connector is locking plug connector. This connector may require an appropriate Cable Clamp Set for the cable diameter in use. Since the Cable Connector assembly is dependent on the equipment it will be used on, it is not furnished with the *Explorer* and must be purchased separately.

***Connector Parts and Assembly***

Cable, connector parts, cable/connector assembly and sealing caps are available from HydroSpace Engineering, Inc. *http://www.hs-eng.com*. $O_2$ Cells and $O_2$ Cell adapters for various rebreathers are available from OxyCheq, Inc. http://www.oxycheq.com.

## HS EXPLORER SET POINT CONTROLLER SETUP PROCEDURE

### General

The Set Point Controller (SPC) model of the Explorer operates the same as other models with the following exceptions. The SPC reads 3 $O_2$ cells instead of 1 cell as in the Model O. The SPC uses an external battery supply consisting of 4 standard 1.5v AA batteries. The battery operational time is calculated at 40 to 120 hours dependant on how often the solenoid is triggered. The setpoint controller works for Mixes 0, 1, and 2. Mixes 3 and 4 are constant $PPO_2$ mixes. The solenoid will only trigger if the $O_2$ cell reading is turned ON (Mode 7) and the mix is set at Mix 0, 1, or 2. The solenoid is limited to a $PPO_2$ of 0.7 on the surface . The PPO2 will switch to the Mix controlling setpoint on starting the dive.

To quote Gordon Smith (KISS rebreather) **"This device is capable of killing you without warning".** Heed these words.

### Setup

General setup procedures are same as the Model O except the $PPO_2$ setpoint must be set first.

**WARNING!**
**This procedure must be the last setup procedure performed on the Explorer prior to diving. Failure to follow this procedure will result in an incorrect setpoint which may result in your injury or death.**

***Setting the $PPO_2$ Set Point***

1. Set Mix, CAM and Date/Time information first.
2. Turn the $O_2$ cell reading **OFF**. (Mode 7)
3. Activate the PPO2 mode. (Mode 1 – Mix 0)
4. Set the constant $PPO_2$ value for Mix 0, Mix 1, Mix 2. **Note: It is not possible to perform this step if the $O_2$ cell reading is ON. Remember: Anytime the constant $PPO_2$ value is set for Mixes 0, 1 and 2, the $PPO_2$ set points will be changed.**
5. Exit Mode 1 with a 3 count to save the values. The PPO2 set points are now set to 0.03 less than the constant $PPO_2$ value. For example, if the value of 1.3 (1.30) was chosen, the solenoid will be triggered when the $PPO_2$ reaches 1.27. The PPO2 setting is saved for the 3 mix numbers and will remain at that value until it has been changed.
6. Turn the $O_2$ cell reading **ON** and set the calibration gas percentage. Exit Mode 7 with save (3 count).
7. Make sure all 3 $O_2$ cells are connected and calibrate the $O_2$ cells. Exit Mode 6 with save (3 count). The Explorer SPC should indicate the current loop $PPO_2$. **Note: If the battery is disconnected, the**

**$O_2$ cell calibration value is lost and the cells must be calibrated. Remember, the $O_2$ cell overrides the constant $PPO_2$ setting. The constant PPO2 setting is lost for Mixes 0, 1 and 2 if that mix is selected while the $O_2$ cell reading is activated.**

8. Setups are complete. The Explorer SCR is ready to dive. Make sure the rest of the rebreather has been carefully prepared for the dive. **Remember: The life you save may be your own.**

## PRE AND POST DIVE

### Pre-dive

Two additional functions other than setup routines are available on the surface.

***No Decompression Times***

Press Button A for a "2" count and the available No Decompression times will scroll through 30 ft to 190 ft. The display will be blanked while calculating for a few seconds then the No Decompression Depth will be displayed with the corresponding available Bottom Time. Each Depth/BT combination will be displayed for two (2) seconds. At completion the appropriate surface screen will be displayed.

***Dive Histories***

Press Button A for a "3" count and the previous 25 dive's will be displayed. The screen will blank then the dives will be displayed from the most recent to the oldest. The displayed information is the Max Depth and Dive Time. Each Max Depth/Dive Time combination will be displayed for two (2) seconds. At completion the appropriate surface screen will be displayed.

***Oxygen Tolerance Units (OTU)***

Press Button A for a "4" count and the OTU will be displayed. The screen will blank then the cumulative OTU's will be displayed. Each minute of surface interval reduces the OTU's by 1.

### Post Dive

For the first 10 minutes post dive the *HS Explorer* will count a new dive as a continuation of the dive. During this interval the display indication is in the dive mode. After 10 minutes the display changes to the surface mode and Time To Fly and Surface Interval are alternately displayed. Thirty (30) minutes after surfacing the *HS Explorer* will go to standby mode.

***Broken Decompression - 'Err'***

If you surface with decompression remaining, you have 10 minutes to return to the decompression stop depth and complete the decompression requirement. In the event decompression time is remaining, the *HS Explorer* will go into broken decompression mode and the cryptic "Err" will appear in the TTF/SI location. The *HS Explorer* now requires 24 hours to 'clear' the broken decompression mode. During this 24-hour period it will function as a bottom timer and depth gauge only. No decompression information is displayed. The gauge information is for emergency conditions only.

**CAUTION!**

**Under no circumstance remove the battery until 24 hours has passed. Removing the battery post dive will result in the *HS Explorer* activating with the surface interval from the time it went into MODE 5.**

***Changing the battery post dive***

Remember to always activate the *HS Explorer* and place in MODE 5 prior to changing the battery or the time will be set to the last shutdown time when the *HS Explorer* powers up.

***Preparing for the next dive***

Prepare for the next dive either by downloading the mix table information or use the field setup method.

***Post-Dive Care***

Proper post-dive care will extend the life of your *HS Explorer* dive computer, and will minimize maintenance problems. Follow these simple guidelines after diving:

1. Rinse your *HS Explorer* dive computer immediately with fresh water after diving in salt water.
2. Soak your *HS Explorer* dive computer in fresh water for 15 minutes after a day's diving activities.

3. **NEVER blow the computer dry with compressed air**. This will force water past the o-rings, and ruin the electronics. It may also embolize the transducer protective gel. If you do this, your warranty is no longer valid and you will be charged for repairs.
4. Dry the RS-232 contacts with soft towel. These contacts are connected to the "wake-up" circuit. Any residual water will be sensed and the unit may not stay in the sleep mode, thus shortening battery life.
5. Allow the *HS Explorer* dive computer to dry completely before connecting it to a PC.
6. After drying, store your *HS Explorer* dive computer in a secure location, with the polycarbonate faceplate padded and protected from abrasion or impacts that might scratch the plastic cover.
7. Always, before reinstalling the battery cap, clean and remove any sand, grit, or other debris from the threads and O-ring. Lightly lubricate the O-ring with an appropriate silicone grease prior to installation.

**WARNING!**

**Never use spray lubricants on the housing or wrist straps. The chemicals may attack and ruin the housing materials and or straps.**

**WARNING!**

**Under no circumstances should you open the computer. The transducer calibration will be ruined if the computer is opened. If the internal tamper seal is broken (indicating the computer has been opened), there is a minimum $450 service charge to service the computer.**

## GENERAL MAINTENANCE

While your *HS Explorer* dive computer is a robust and durable piece of diving equipment, it is also a sophisticated electronic tool with many sensitive parts and components. Many of these may be damaged if your *HS Explorer* dive computer is improperly treated. Abusive treatment or improper care of your *HS Explorer* dive computer may invalidate the warranty. Follow these guidelines to maintain your *HS Explorer* dive computer:

Follow the Post-Dive Care guidelines provided in the previous section.
Do not expose your *HS Explorer* dive computer to high temperatures.
Always insert the battery properly with reference to the polarity.
Use only approved 3.6V lithium batteries.
Prevent abrasion or impacts to the polycarbonate faceplate.
Never remove or tighten the screws connecting the polycarbonate faceplate to the computer.
Do not over-tighten the battery cap when installing the battery.
If any signs of water in the computer are noted, return the unit to HydroSpace Engineering, Inc. for inspection/repair as soon as possible.
Do not expose your *HS Explorer* dive computer to cleansers or other harsh chemicals.
Never insert anything other than the battery into the battery compartment.
Store your *HS Explorer* dive computer out of direct sunlight.
Clean sand, grit, or other debris from battery cap threads prior to installing battery cap.
Remove battery prior to long-term storage of your *HS Explorer* dive computer.
Always install the battery cap prior to immersion in water.
Always remove the computer interface board prior to immersion in water.
Do not immerse or dive with a computer if it shows signs of flooding or other damage, or if it seems to be operating improperly.
Do not expose your *HS Explorer* dive computer to organic solvents, as they will damage the housing, polycarbonate faceplate, and O-rings.
Do not insert anything into the transducer port (small hole located on the underside of the computer between the two buttons).
Insure the brass tab or tang in the battery compartment is capable of rotating freely at all times.
Do not tighten or loosen the PC computer interface screws on the *HS Explorer* dive computer.
Do not pull on the PC interface cable when it is connected to the PC or dive computer.

## *HS EXPLORER* SIMULATOR

The *HS Explorer* Simulator performs much the same as the Dive Computer. In addition to the ease of setting the Mix Table configuration and down loading the configuration it has the ability to produce (1) A dive schedule (NITROX and TRIMIX). (2) A NITROX No Decompression schedule, (3) A comparison schedule for the 10 calculation formulas. A dive schedule is to be printed and carried on each dive. This schedule will assist in gas requirements for the dive.

Functions not available on the Simulator include: No Deco Countdown, Gas Planning, Manual gas switches during dive simulations.

The Simulator was developed with Windows 95/98. Compatibility with other versions of Windows is unknown at this time. At this time, the program will not be ported to the Macintosh operating system. A mini version is planned for the Palm OS.

### Run Button - Simulating A Dive

Enter Depth and Bottom Time (BT) and Press (left click) on the RUN button.
Mix changes will be indicated at the preprogrammed depth and direction (descending/ ascending) by blinking Mix/Composition/%O2 display information. When a 100% O2 is selected during decompression, the N and He icons are blanked, and the O2% indication will be 99. LEFT click on Button A and holding for THREE (3) seconds will confirm the switch to the flashing mix. Left Click Button A LESS than 3 seconds, will cancel the mix change and continue the dive on the current mix. (Note: At this time the simulator does not display the count as the Explorer).

**NOTE!**

**Mix Changes during a actual dive will be cancelled if the Change Depth is exceeded by 6 feet (2m) or the change is not confirmed with thirty (30) seconds provided the depth is within the Change Depth limits. As the diver approaches to within 6ft (2m) (0.2bar) of a planned stop, the mix change is initiated. This provides a lead on the change window. If the diver goes more than the same amount past the designated change point or delay confirmation past 30 seconds the mix change is aborted and the *HS Explorer* looks for the next mix change and will set it provided there is one. Therefore the diver has a 12-ft(4m)/ 30 second window to confirm the gas switch.**

The *HS Explorer* Simulator does not provide for non-preprogrammed mix changes during the simulated dive. The Mix Change Depths and Direction are reset at each mix change. If mix change is Canceled, Depth and Direction are reset for that mix. At the completion of a dive (actual or simulated) all Change Depth and Direction are reset to the predive settings. (Note: The Change Depth/ Direction remains unchanged when Dive Schedules or CF Comparisons are Calculated. The Mix Table must be setup to obtain the desired schedule for the simulated dive.)

**NOTE!**

**Under certain dive Depth/Time conditions the first decompression stop will be cleared during ascent and be displayed as zero (0) time.**

**NOTE!**

**The Time To Fly (TTF) is zero (0) for short No Decompression dive's. TTF is based on residual gas tensions for a dive with an ascent to an altitude of 8000 ft (~2400 meters). TTF is updated each minute using tissue pressure calculations.**

To Review the Decompression Requirements:
Increment Decompression Stop to display decompression information using the up/down scroll button (in the lower right-hand corner) to change the decompression stop displayed.
Time To Fly (TTF) is displayed when reaching surface, Surface Interval (SI) is displayed after 10 minutes. (accelerated / simulated rate) TTF and SI clear after 18 hours.
Change Depths and Ascent/Descent flags set for mixes used during the dive are reset to zero (0) each time the designated mix is switched during the dive.

RESET BUTTON - (DIVE STATUS)
RESET Button returns all computational values to pre-dive conditions.
Setup information on mix compositions remain as set with the exception of MIX 1 which always resets to a default of air at the start of the surface interval.
RESET will NOT restore Change Depth and Ascent/Descent information to pre-dive configuration.
SLOW/FAST BUTTONS
The Slow/Fast Buttons control program display speed during a simulated dive. (Default = Slow)
TO EXIT (*HS EXPLORER* SIMULATOR PROGRAM)
Select Program|Exit or Click the (Exit) X Box in the upper right hand corner of the Simulator Display.

## Pull Down Menus

**WARNING!**

**IMPROPER USE OF THIS DEVICE CAN RESULT IN SERIOUS INJURY OR DEATH. Do not dive with this device until you (1) have read the owner's manual, and (2) understand fully how to operate the device correctly, and (3) have received proper training in the use of gas mixtures other than normal air, and (4) have received proper training in conducting staged decompression dive's. Use of this device and/or its simulator software in any diving activity constitutes agreement by the user that s/he assumes and accepts full responsibility for all risks.**

**WARNING!**

**This program and the *HS Explorer* Dive Computer perform no checks for the viability of any gas mix. It is the user's sole responsibility to verify the gas mixtures and dives are within acceptable limits considered safe.**

### *General*

The pull down menus are divided into five sections:
Program, Tables, Setup, Dive History and Help (Instructions).
Each section contains related Submenus, Branch Menus and are explained below:

### *Program*

Contact

Contact displays a screen providing contact information about the *HS Explorer* Dive Computer.

Run Dive

Run performs the same function as the RUN button. A simulated dive is run for the Depth and Bottom Time (BT) entered into the appropriate areas at the bottom left of the display.

Reset Dive

Reset will reset the program to predive conditions (Dive 1).

Exit

Exit terminates the *HS Explorer* Dive Computer Simulator Program.

### *Tables*

Save...

ET Schedule

**ET Schedule** generates an Elapsed Time Schedule for the currently entered depth and bottom time to a File (***ETSchedule.txt***) . This file is located in the Explorer Simulator default subdirectory (folder). This file may be imported into other programs using the same process as the dive schedule. ET Schedules are not generated for RGBM CF's per agreement with Dr. Wienke The Elapsed Time Schedule displays each segment of the dive in order with the segment time and ET listed for each segment.

CF Comparison

CF Comparison generates a Comparison Table for decompression times to a File (*CFTable.txt*) . Only the first/last stop and TTS are displayed per agreement with Dr. Wienke. The comparison nine schedules generated are comparisons of the decompression requirements based on CF's 1 through 9. The results are ordered from maximum decompression to minimum decompression. Note: This ordering is not absolute across all dive mix/change combinations. Please verify the results carefully. This file is located in the *HS Explorer* default subdirectory (folder). This file may be imported into other programs using the same process as the dive schedule.

Extended Schedule

Extended Schedule generates a dive schedule table for the Depths and Bottom Time entered on the main display. The Dive Schedule is generated for Depth plus 20 feet (6m) to one-half Depth and Bottom Times from BT plus 10 min to 5 minutes minimum. Extended Schedules are not generated for RGBM CF's per agreement with Dr. Wienke. The Decompression Schedule is for the MIX setup entered. This function requires that multi-mix dive's to have all planned gas switch points set. If no descending/ascending mixes are set, the schedule is printed for the current mix based on the depth and bottom time entered to a File (*N2DecoTable.txt* or *HeDecoTable.txt*). When the planned dive mixes contain only Nitrogen and Oxygen, *N2DecoTable.txt* is printed. Dives which have mixes using Helium/Nitrogen/Oxygen or Helium/Oxygen print to the *HeDecoTable.txt* file. The *N2DecoTable.txt* / *HeDecoTable.txt* file is overwritten each time the file is generated. To compare mix variations, rename the file after each printing to a filename of your choosing. This file is located in the *HS Explorer* default subdirectory (folder). See Appendix C for a sample dive schedule.

The files are fixed field width delimited and can be imported into *NotePad, WordPad, Word, WordPerfect, Quattro Pro, Excel, Access, etc.)* or similar programs for storage and/or comparison. It is recommended that the file be loaded into *Word* or *Word Perfect*, then convert the text shown into a table, save as the appropriate file format and import into the spreadsheet program. The tables are now saved in a tab delimited field format and will import easier. Otherwise the table will import but the text will be spread across many cells. (*Notepad, WordPad, Word, Excel* and *Access* are products of Microsoft Corp. *WordPerfect, Quattro Pro* are products of Corel Corp.)
(Note: The Change Depth/Direction remain unchanged when Dive Schedules are Calculated. Depth/BT are reset but Mix Table information is unchanged. The Mix Table must be set to obtain the desired schedule.)

No Decompression

No Decompression generates a maximum bottom time table for 21% to 50% NITROX to a File (*NoDecoTable.txt*) . This file is located in the *HS Explorer* default subdirectory (folder). This file may be imported into other programs using the same process as the dive schedule.
WARNING - HELIUM IS NOT USED IN THE CALCULATION OF THIS TABLE.

View...

This function opens the Table Viewing Window. The following menu functions are located on this window: The Load menu function will load the selected table to the viewer. The four files are the No Decompression Table, Air/NITROX Decompression Table, Heliox/TRIMIX Decompression Table and Calculation Formula (CF) Table. The display is read only. Text Size will resize the displayed text. Print-> Table will print the displayed table to the Windows default printer. Close will close the Table View Window. When the View menu is selected the last "Save" table will be automatically loaded. Any of the other tables can e loaded for viewing.

***Setup***

Edit Mix Table...

The Mix Table screen contains all setup functions available to the *HS Explorer* Dive Computer in the Field Setup Mode. The Edit Mix Table function also provides for saving a configuration and loading the saved information. The Mix Table has a separate Help Screen.

***Tools***

Bottom Mix Optimization

The Bottom Mix Optimization screen use's up/down buttons to set Depth (Step 10/3), Bottom Time (BT) (Step 5), Equivalent Nitrogen Depth (END) (Step 10/3), Percent Oxygen (Step 1), and Partial Pressure of Oxygen (also $PPO_2$ Setpoint) (Step 0.1). The "Best Mix" is determined by the lowest Time To Surface (TTS) with the most Helium present. The Open Circuit (OC) calculations are a square dive which switches to 100% Oxygen at 20 feet (6 meters). Closed Circuit (CC) calculations use the same PPO2 Set Point for the entire dive. The calculations use 100% Helium at the start and decreases it by 1% for each successive calculation. Nitrogen starts at zero and increases 1% for each successive calculation. There are 3 buttons: CALCULATE, VIEW AND CLOSE. CALCULATE performs the calculations and generates a text table "MOTable.txt". When the calculations are completed the "Best" mix number and gas percentages are displayed in the window. VIEW will display the generated table. The decompression trend can be inspected for all of the calculated mix variations. CLOSE will exit the Bottom Mix Optimization window. Use this tool as follows:

1. Set desired dive Depth.
2. Set Bottom Time.
3. Set END.
4. Set Percent of Oxygen to desired $PPO_2$ at depth.
5. Max PPO2 will not affect Open Circuit calculations. It will cause the PPO2 Maximum Depth Limit to change. This allows you to see what the maximum depth is for the selected PPO2. This function changes to the PPO2 Set Point for Closed Circuit calculations.
6. CALCULATE. - "Best Mix" percentages are displayed.
7. VIEW. Displays a table showing the decompression requirement for each mix.
8. CLOSE to return to main simulator window.

Blend

This tool provides mixing pressures using the Ideal Gas Laws or Van der Waals equation of state. Help instructions are accessed by using the help menu selection on the form. **Always analyze the cylinder contents prior to usage.**

HeliAir

This tool provides the final percentage of gas that results from adding Helium to a cylinder then topping the cylinder with air. Once the general result is obtained, the final percentages can be further refined by using the percentages with the blending tool**. Always analyze the cylinder contents prior to usage.**

***Dive History***

Upload from *HS Explorer*

Transfers the current dive histories to the history file.

To upload the dive history from the *HS Explorer* Dive Computer:

1. Connect the *HS Explorer*'s RS-232 cable's 9-pin DB-9 connector to the PC's communications port (COMM 1, 2, 3 or 4).
2. *Gently* slide the *HS Explorer* Dive Computer connection circuit board up (in the direction of the arrows) between the switches. The brass connections should make contact with the stainless steel button contacts.
3. Place the *HS Explorer* Dive Computer in the Communications Mode (Mode 4) by pressing and holding both buttons for a 4 count. "CO" will be displayed on the *HS Explorer* Dive Computer Screen.
4. Use the 'Upload Dive History" pull down menu.
5. A dialog window will open and ask for a file name. The default is *divehistory.txt.* Any selected file name will be overwritten. Select (or change) a file name and press "SAVE". The default directory is the one where the *HS Explorer* Simulator is located.
6. When the up load is completed, an "Upload completed" message is displayed and the connection is closed. The *HS Explorer* Dive Computer is reset to the Operations Mode and the current displayed mix table is stored in memory.

7. Disconnect the cable from the PC and the Dive Computer by *gently* pushing inward pulling down on the circuit board at the same time. Pulling on the cable will eventually break the wires where they are soldered into the circuit board and the connection will require repair.

**NOTE!**

**In the event the exit does not turn off the RS-232 port on the *HS Explorer* Dive Computer, (this will be indicated by a lower battery voltage reading) Place the *HS Explorer* Dive computer in Standby Mode by pressing and holding both buttons for a '5' count.**

***Connection Problems and Corrections:***

1. Brass contacts do not contact the stainless steel buttons. - *Gently* bend the contacts outward slightly and reinstall. Observe that contact is made.
2. COMM Port incorrectly identified - Use correct COMM Port when making connection.
3. Connection broken during download process. Close Mix Table window and reopen, Exit Mode 4 and reactivate. Upload. If the PC indicates the COMM Port is open and will not attempt the download, it may be necessary to exit the simulator and restart. In sever cases it may be necessary to restart the PC to clear the COMM Port settings. In that case save the Mix Table before exiting the simulator.

***Help***

Instructions
This Help file.

***Contact***

Contact displays a screen providing contact information about the *HS Explorer* Dive Computer.

***About***

Information about the *HS Explorer* Dive Computer Simulator.

## Mix Table Instructions

**WARNING!**

**IMPROPER USE OF THIS DEVICE CAN RESULT IN SERIOUS INJURY OR DEATH. Do not dive with this device until you (1) have read the owner's manual, and (2) understand fully how to operate the device correctly, and (3) have received proper training in the use of gas mixtures other than normal air, and (4) have received proper training in conducting staged decompression dive's. Use of this device and/or its simulator software in any diving activity constitutes agreement by the user that s/he assumes and accepts full responsibility for all risks.**

**WARNING!**

**This program and the *HS Explorer* Dive Computer perform no checks for the viability of any gas mix. It is the user's sole responsibility to verify the gas mixtures and dives are within acceptable limits considered safe.**

***General***

The Mix Table provides a PC interface to the *HS Explorer* Setup rather than simulate the field setup process. The following instructions will help you setup your *HS Explorer* Dive Computer. When you have finished setting the mixes and other information press the 'SET' button to transfer the Mix Table information to program memory. Then, when connected via the serial port interface cable to the *HS Explorer* Dive Computer, activate the pull down menu 'Setup|Download to *HS Explorer*' to transfer the current setup to the *HS Explorer* Dive Computer.

***Gas Percentage Convention***

Mixes are entered using the percentages of Inert gases. The percentage of Oxygen is then calculated. Since there are two possible inert gasses, they must both be set correctly for the Oxygen calculation to provide the correct amount. This will help provide a check that the correct gas fractions have been entered correctly.

Note: The breathing MIX used may be changed at any time during the dive by the diver. If the *HS Explorer* Dive Computer is operating in the Rebreather Mode (PPO2 Mode) the PPO2 Setpoint may be changed within the PPO2 Setpoint limits. All other setup functions can only be changed with the *HS Explorer* Dive Computer on the Surface.

***Mix Table Pull Down Menus***

Setup

Set Mix Table

Pressing the SET button, stores the information currently being displayed on the Mix Table to program.

Save Mix Table

Saves the currently displayed Mix Table configuration to program memory and to a file that can be recalled at a later date. Multiple Mix Table configurations can be saved. A save file dialog window will appear and ask for a file name. The default file name is *mixtable.cfg*. The file will be overwritten if the same file name is used. This file is located by default *HS Explorer* Demo directory. The file must have the .cfg extension. The file name *HS Explorer.cfg* is reserved for the configuration of the program, do not select this file!

Note:

**The *HS Explorer* program configuration is now set the same as clicking on the SET button or using the Set Mix Table menu option.**

Pressing the CANCEL button will close the Mix Table screen with the program set to the values displayed when saved. In other words, CANCEL has NO effect on the values in program memory once the Save Mix Table menu option is selected.

Remember: The values are loaded into memory. If more changes are made, then the current Mix Table information is loaded into program memory only when the Set Mix Table menu option or SET button is pressed.

Load Mix Table

Loads a previously saved Mix Table configuration. This will overwrite the current Mix Table values. This action is not reversible. The saved configuration is written into program memory and the configuration file.. Multiple Mix Table configurations can be loaded. An open file dialog window will appear and ask for a file name. The default file name is *mixtable.cfg*. Select the previously saved configuration file you want to load. This file is located by default *HS Explorer* Demo directory. The file must have the .cfg extension. The file name *HS Explorer.cfg* is reserved for the configuration of the program, do not select this file!

Download to *HS Explorer*

Sets the current table into program memory and downloads the table information to the *HS Explorer* Dive Computer.

To Download the mix table to the *HS Explorer* Dive Computer:

1. Connect the *HS Explorer*'s RS-232 cable's 9-pin DB-9 connector to the PC's communications port (COMM 1, 2, 3 or 4).
2. Gently slide the *HS Explorer* Dive Computer connection circuit board up (in the direction of the arrows) between the switches. The brass connections should make contact with the stainless steel button contacts.
3. Place the *HS Explorer* Dive Computer in the Communications Mode (Mode 4) by pressing and holding both buttons for a 4 count. "CO" will be displayed on the *HS Explorer* Dive Computer Screen.

4. To view the download process, open the Communications window by checking the box in the lower right hand corner of the Mix Table window.
5. Click on the 'Download' button or use the 'Download to *HS Explorer*' pull down menu.
6. When the download is completed, a "Download completed" message is displayed in the Communications window and the connection is closed. The *HS Explorer* Dive Computer is reset to the Operations Mode and the current displayed mix table is stored in memory.
7. Disconnect the cable from the PC and the Dive Computer by pulling down on the circuit board. Pulling on the cable will eventually break the wires where they are soldered into the circuit board and the connection will require repair.

**NOTE!**

**In the event the exit does not turn off the RS-232 port on the *HS Explorer* Dive Computer, (this will be indicated by a lower battery voltage reading) Place the *HS Explorer* Dive computer in Standby Mode by pressing and holding both buttons for a '5' count.**

Connection Problems and Corrections:

1. Brass contacts do not contact the stainless steel buttons. - Gently bend the contacts outward slightly and reinstall. Observe that contact is made.
2. COMM Port incorrectly identified - Use correct COMM Port when making connection.
3. Connection broken during download process. Close Mix Table window and reopen, Exit Mode 4 and reactivate. Download. If the PC indicates the COMM Port is open and will not attempt the download, it may be necessary to exit the simulator and restart. In sever cases it may be necessary to restart the PC to clear the COMM Port settings. In that case save the Mix Table before exiting the simulator.

Reset Mix Table

Resets all Mix Table values to air and dive mix to 1. (Same as the Reset button.)

Cancel

Cancel Mix Table and Exit without making any changes. ( Same as the Cancel button.)

Note: The Cancel option will have no effect on program memory if the Save Mix Table menu option was selected.

Help

Display this Help file

Show Hints

Checking the Show Hints box in the lower right hand corner will activate the hints for each active control. Un-Checking will deactivate the control hints.

ViewComm

Checking the ViewComm box in the lower right hand corner will activate a small communications window on the form which displays information when downloading the table to the *HS Explorer* Dive Computer. Un-Checking will close the communications window..

***SETUP INSTRUCTIONS***

**Mix**

The current dive MIX number is highlighted in yellow when the Mix Table is first displayed.

Select the MIX number to use at the START OF THE DIVE. The Starting Mix may not be used to automatically detect a Mix Change later in the dive.

**DANGER!**

**The Starting Mix may NOT be used as an Switch Mix Example: If Mix 1 was set as the Starting Mix and it was also set with a Change Depth and Ascending, when the change to the next mix is confirmed, Mix 1 Changes will be reset and the *HS Explorer* will not signal for a change to Mix 1 on Ascent.**

**DANGER!**

**Mixes which contain less than 16% Oxygen should not be used to start any dive. Delays in descending can cause anoxia with drowning/death as a result.**

**NOTE!**

**The MIX used for calculations can be manually selected during the dive. Use the Ascending/Descending Change Depth as a reminder to change Mixes or perform the switch manually.**

**N %**

Use the Up/Down Arrow buttons to change the Nitrogen percentage in the mix.
The nitrogen plus helium resultant oxygen percentage is displayed in the O2 % column.
The Maximum Nitrogen concentration is limited to 79%.

**WARNING!**

**This program and the *HS Explorer* Dive Computer perform no checks for the viability of any gas mix. It is the user's sole responsibility to verify the gas mixtures and dives are within acceptable limits considered safe.**

**He %**

Use the Up/Down Arrow buttons to change the Nitrogen percentage in the mix.
The nitrogen plus helium resultant oxygen percentage is displayed in the O2 % column.
The Maximum Helium concentration is limited to 95%.

**WARNING!**

**THIS PROGRAM AND THE *HS EXPLORER* DIVE COMPUTER PERFORM NO CHECKS FOR THE VIABILITY OF ANY GAS MIX. IT IS THE USER'S SOLE RESPONSIBILITY TO VERIFY THE GAS MIXTURES AND DIVES ARE WITHIN ACCEPTABLE LIMITS CONSIDERED SAFE.**

**O2 %**

The number in this column represents the Oxygen concentration in the mix based on the amount of Nitrogen and Helium entered. A 100% Oxygen concentration will be displayed as 99%.

**PPO2 Depth - 0.2 Min**

The numbers in this column represent the Depth at which a PPO2 of 0.2 ATA is reached. Zero (0) and Negative (-1) numbers indicate O2 Concentrations greater than 20%. Mixtures which have an oxygen concentration of 20% or greater have a gray background and are presumed breathable from the surface. When the O2 concentration drops below 19%, the background color changes to Fuchsia to indicate that this mix O2 concentration may not have an adequate PPO2 for breathing until the depth shown is reached. The depth is in Meters when the Metric Check Box is Checked and Feet when Unchecked.

**PPO2 Depth - 1.8 Max**

The numbers in this column represent the Depth at which a PPO2 of 1.8 ATA (Bar) is reached. The depth is in Meters when the Metric Check Box is Checked and Feet when Unchecked.

**Change Depth**

Use the Up/Down Arrow buttons to change the Depth at which this MIX will be Changed. A non-zero value will display Change Direction information. The depth shown is in Meters when the Metric Check Box is Checked and Feet when Unchecked. A Non-Zero change depth activates Change Direction. The default Change Direction is Descending when a mix's Change Depth is activated (non-zero).

**PPO2**
The Partial Pressure of Oxygen ( PPO2) for the current mix is computed at the Change Depth.
Change Direction
The default Change Direction is Ascending when a mix's Change Depth is activated (non-zero). Place a check in the right check box (Descending) using left click with the mouse to set the Change Direction to Descending. Checking the left check box will change the direction back to Ascending.

**PPO2 Mode**
MIX 0 controls whether the *HS Explorer* Dive Computer operates in the Open Circuit Mode or Closed Circuit Mode (PPO2 Mode). In the Closed Circuit or PPO2 Mode, calculations are performed at a constant Partial Pressure of Oxygen and the percentage of Inert Gas changes with depth. In the Open Circuit Mode, calculations are performed using a constant percentage of Inert Gas (Nitrogen and Helium) at all depths.

Click the check box with the mouse to place a check in the box to place the unit into PPO2 Mode. Mixes 1 through 4 are automatically activated and reserved for PPO2 Mode calculations until the PPO2 Mode is canceled. Mixes 5 through 9 remain in Open Circuit Mode for all modes of operation at all times.

**PPO2 Setpoint**
Use the Up/Down Arrow buttons to change the Partial Pressure of Oxygen to the rebreathers PPO2 Set Point. The minimum PPO2 Setpoint value for 0.4 ATA (BAR) and the maximum PPO2 Setpoint value is 1.8 ATA (BAR).

**DANGER!**

**The PPO2 setpoint of 1.2 and above are greater than the level determined safe by the U.S. Navy and NOAA. Setting the PPO2 setpoint above the USN/NOAA safe levels may result in your death form acute oxygen toxicity. The feature of allowing the higher setpoint was added at the request of many divers who realize and accept the risk of death they will incorporate by setting the high PPO2 setpoint.**

**The intent of the *HS Explorer* is to not tell the diver how to dive, but to provide an instrument to assist the diver in his/her endeavor.**

Note: The PPO2 Setpoint for any of the PPO2 Mode Mixes (0-5) may be changed at any time during the dive by the diver using the field setup procedure provided for real-time changes.

**Metric**
Click the check box with the mouse to place a check in the box to place the unit in the Metric Display Mode. Depth information is displayed in Meters. The date display mm/dd/yy in the imperial and metric modes.

**Backlight**
Click the check box with the mouse to place a check in the box marked "On" or "Off" to turn the backlight on or off when the buttons are pressed. Turning the backlight off will extend the operational time between battery changes.

**Buzzer**
Click the check box with the mouse to place a check in the box marked "On" or "Off" to turn the buzzer on or off when the buttons are pressed. Turning the buzzer off will extend the operational time between battery changes.

**CF**
Use the Up/Down Arrow buttons to change the Calculation Formula. The Calculation Formula's used by the *HS Explorer* Dive Computer and Simulator Program:

The methods for decompression calculation differs between Dr. Buhlmann' model, the United States Navy' model and RGBM. Each produces similar but different results for AIR only. CF 3 through CF 9 are derived from the ZH-L16C model and have modifications which produce schedules that approximate the decompression schedules of Dr. Buhlmann's model with asymmetric off-gassing rates of 118% and 135%. CF 9 is the most conservative of the Buhlmann algorithms. A derivation of the Reduced Bubble Gas Model (RGBM) is applied to provide deeper initial stops in Buhlmann CF's with an 'F' number less than 100. RGBM was developed by Dr. Bruce Wienke / Southwest Enterprises, Inc. The RGBM in general requires much deeper stops but results in shorter decompression times. CF 2 is the most conservative of the RGBM algorithms. Suggested applications of the CF's are listed for each:

In general, the CF decompression requirements listed in **LEAST** decompression time requirements to the greatest are: CF 0, CF 1, CF 2, CF 3, CF 4, CF 5, CF 6, CF 7, CF 8, CF 9. There may be some variations to this listing depending on depth / bottom time combinations.

**WARNING!**

**Compare the results with the CF calculations. In any case, should the CF result in decompression requirements that are less than U.S. Navy Decompression Schedules PLUS 5%, use the next higher CF. Failure to increase decompression requirements can cause decompression illness and all of the associated problems, including permanent injury and death.**

**IT IS THE DIVERS RESPONSIBILITY TO ENSURE AN ADEQUATE DECOMPRESSION SCHEDULE IS SELECTED AND FOLLOWED.**

**ALT**
Use the Up/Down Arrow buttons to change the Altitude. ALT determines the final surfacing Altitude.

**DATE/TIME DISPLAY**
Mon - Month of the year
Day - Day of year.
Year - Calendar Year.
Hour - Hour of day based on 24-hour clock.
Min - Minutes of hour.
Sec - Seconds of minute.

**BUTTONS**
**RESET**
Pressing the RESET button, resets the program setup to the Factory default condition of the *HS Explorer* dive computer. ALL MIX, CF, ALT and Metric setup values will be reset. Press the SET button when finished with setup.

**SET**
Pressing the SET button, stores the information currently being displayed on the Mix Table to program.

**DOWNLOAD**
Pressing the DOWNLOAD button, sets the current information in the simulator and downloads the information currently being displayed on the Mix Table to the *HS Explorer* Dive Computer.
To Download the mix table to the *HS Explorer* Dive Computer:
Connect the *HS Explorer*'s RS-232 cable's 9-pin DB-9 connector to the PC's communications port (COMM 1, 2, 3 or 4).
*Gently* slide the *HS Explorer* Dive Computer connection circuit board up (in the direction of the arrows) between the switches. The brass connections should make contact with the stainless steel button contacts.
Place the *HS Explorer* Dive Computer in the Communications Mode (Mode 4) by pressing and holding both buttons for a 4 count. "CO" will be displayed on the *HS Explorer* Dive Computer Screen.

To view the download process, open the Communications window by checking the box in the lower right hand corner of the Mix Table window.
Click on the 'Download' button or use the 'Download to *HS Explorer*' pull down menu.
When the download is completed, a "Download completed" message is displayed in the Communications window and the connection is closed. The *HS Explorer* Dive Computer is reset to the Operations Mode and the current displayed mix table is stored in memory.
Disconnect the cable from the PC and the Dive Computer by *gently* pushing in and pulling down on the circuit board. Pulling on the cable will eventually break the wires where they are soldered into the circuit board and the connection will require repair.
Note: In the event the exit does not turn off the RS-232 port on the *HS Explorer* Dive Computer, (this will be indicated by a lower battery voltage reading) Place the *HS Explorer* Dive computer in Standby Mode by pressing and holding both buttons for a '5' count.

Connection Problems and Corrections:
Brass contacts do not contact the stainless steel buttons. - Gently bend the contacts outward slightly and reinstall. Observe that contact is made.
COMM Port incorrectly identified - Use correct COMM Port when making connection.
Connection broken during download process. Close Mix Table window and reopen, Exit Mode 4 and reactivate. Download. If the PC indicates the COMM Port is open and will not attempt the download, it may be necessary to exit the simulator and restart. In sever cases it may be necessary to restart the PC to clear the COMM Port settings. In that case save the Mix Table before exiting the simulator.

**CLOSE**
Pressing the CLOSE button, exits the Mix Table Setup. Pressing close without first pressing the SET button will cancel any changes made on the table.

## WARRANTY AND SERVICE

While HydroSpace Engineering has taken every possible precaution to prevent problems in the *HS Explorer* dive computers it produces, occasional units with unidentified manufacturing defects may slip through the Quality Assurance Program that HydroSpace Engineering has in place. HydroSpace Engineering remains committed to producing only the finest dive computers, and stands behind their product 100 percent. If you should experience difficulties with your *HS Explorer* dive computer, please follow the instructions below.

1. Contact HydroSpace Engineering at 904.794.7896, or e-mail us at support@hs-eng.com, to obtain a return merchandise authorization (RMA) number.

2. Return the *HS Explorer* dive computer to Repair Department , HydroSpace Engineering, freight prepaid, at 6920 Cypress Lake Court, St. Augustine, Fla. 3206, USA.

3. Enclose a written explanation of the problems experienced with the unit. Be as specific as possible, explaining exactly what you were doing when the problem arose. Specify whether the problem occurred above or below the surface, and whether it occurred prior, during, or after a scuba dive.

4. Enclosed a sheet with the address to return the repaired *HS Explorer* dive computer to. Also enclose your daytime telephone number, and your e-mail address if available. Specify the best time for one of our technicians to contact you if we have further questions about the problem you experienced with your *HS Explorer* computer.

5. If your *HS Explorer* computers being repaired under warranty, it will be repaired or replaced at no charge to you. To activate your warranty, you must have returned the *HS Explorer* product registration form sent to you with your *HS Explorer* Computer within 10 days of purchase. Please enclose a copy of that product registration form, along with a receipt from the vendor showing the date of purchase that you acquired the *HS Explorer* computer.

6. If your *HS Explorer* Computer is not being repaired under warranty, there is a minimum repair/evaluation charge of $75. An estimate will be provided to you for the total cost of repair or replacement after our technicians have had an opportunity to evaluate your computer. If additional charges are indicated, the repair will not be completed until you have provided authorization to do so, with prepayment of the repair charges.

7. The return merchandise authorization (RMA) number must be included inside your shipment container, and must also be written on the address label to HydroSpace Engineering.

HydroSpace Engineering reserves the right to determine if the user has invalidated the warranty by misuse of the *HS Explorer* dive computer, or by improper treatment or maintenance protocols.

## *HS EXPLORER* FIRMWARE UPDATE LISTING

One of the primary advantages of your *HS Explorer* dive computer is that its firmware can be upgraded. Many suggestions that are recommended by users are incorporated into subsequent versions of the *HS Explorer* dive computer. As new features and programming options become available, older units can have the firmware upgraded to incorporate the newest features. Upgrades are free for the first year, and are available at a nominal charge thereafter.

The following list details the changes incorporated into each firmware upgrade. The firmware version incorporated in your *HS Explorer* dive computer is indicated on the display face on the far right side when the computer is initially turned on, indicated by a number in the "x:xx" format. The initial number (to the left of the colon) is immaterial in the firmware version determination.

While this information is correct and up to date as of the time the manual was printed, it may be superceded by subsequent firmware upgrades. To determine the most recent firmware upgrade available, visit the HydroSpace Engineering, Inc. web site at www.hs-eng.com.

## RETURN POLICY

1. The HS Explorer may be returned unused within 30 days for a refund. A 20% restocking fee will be assessed.
2. After 30 days, no refunds will be given.

## REPAIR AND UPGRADE POLICY

1. Contact HydroSpace Engineering, Inc. for a Return Authorization Number. Write this number on the outside of the package. Be sure to include your name and address on the inside.
2. All units are to be returned freight prepaid.
3. Repairs and firmware upgrades will be processed for rapid turn around.
4. Units requiring repair may be repaired or replaced as required by the circumstances.
5. Any return prepaid shipping will be UPS ground.
6. There is a $10.00 (U.S.A.) and $20.00 (International) shipping and handling charge assessed for firmware upgrades on units older than 30 days. Additional charges may apply to special courier.

# Appendix A - Equivalent Depth Tables

| | PPO2 Setpoint | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Depth** | **0.21** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** | **1.0** | **1.1** | **1.2** | **1.3** | **1.4** | **1.5** | **1.6** | **1.7** | **1.8** |
| **30** | 36 | 32 | 28 | 24 | 20 | 16 | 11 | 7 | 3 | -1 | -5 | -9 | -14 | -18 | -22 | -26 | -30 |
| **40** | 49 | 45 | 41 | 37 | 32 | 28 | 24 | 20 | 16 | 12 | 7 | 3 | -1 | -5 | -9 | -14 | -18 |
| **50** | 61 | 58 | 53 | 49 | 45 | 41 | 37 | 33 | 28 | 24 | 20 | 16 | 12 | 7 | 3 | -1 | -5 |
| **60** | 76 | 72 | 68 | 64 | 60 | 55 | 51 | 47 | 43 | 39 | 35 | 30 | 26 | 22 | 18 | 14 | 10 |
| **70** | 87 | 83 | 79 | 75 | 70 | 66 | 62 | 58 | 54 | 49 | 45 | 41 | 37 | 33 | 29 | 24 | 20 |
| **80** | 99 | 96 | 91 | 87 | 83 | 79 | 75 | 71 | 66 | 62 | 58 | 54 | 50 | 45 | 41 | 37 | 33 |
| **90** | 112 | 108 | 104 | 100 | 96 | 92 | 87 | 83 | 79 | 75 | 71 | 66 | 62 | 58 | 54 | 50 | 46 |
| **100** | 125 | 121 | 117 | 113 | 108 | 104 | 100 | 96 | 92 | 87 | 83 | 79 | 75 | 71 | 67 | 62 | 58 |
| **110** | 137 | 134 | 129 | 125 | 121 | 117 | 113 | 108 | 104 | 100 | 96 | 92 | 88 | 83 | 79 | 75 | 71 |
| **120** | 150 | 146 | 142 | 138 | 134 | 129 | 125 | 121 | 117 | 113 | 109 | 104 | 100 | 96 | 92 | 88 | 84 |
| **130** | 163 | 159 | 155 | 151 | 146 | 142 | 138 | 134 | 130 | 125 | 121 | 117 | 113 | 109 | 105 | 100 | 96 |
| **140** | 175 | 172 | 167 | 163 | 159 | 155 | 151 | 146 | 142 | 138 | 134 | 130 | 126 | 121 | 117 | 113 | 109 |
| **150** | 188 | 184 | 180 | 176 | 172 | 167 | 163 | 159 | 155 | 151 | 147 | 142 | 138 | 134 | 130 | 126 | 122 |
| **160** | 201 | 197 | 193 | 188 | 184 | 180 | 176 | 172 | 168 | 163 | 159 | 155 | 151 | 147 | 143 | 138 | 134 |
| **170** | 213 | 209 | 205 | 201 | 197 | 193 | 189 | 184 | 180 | 176 | 172 | 168 | 164 | 159 | 155 | 151 | 147 |
| **180** | 226 | 222 | 218 | 214 | 210 | 205 | 201 | 197 | 193 | 189 | 185 | 180 | 176 | 172 | 168 | 164 | 159 |
| **190** | 239 | 235 | 231 | 226 | 222 | 218 | 214 | 210 | 206 | 201 | 197 | 193 | 189 | 185 | 181 | 176 | 172 |
| **200** | 251 | 247 | 243 | 239 | 235 | 231 | 227 | 222 | 218 | 214 | 210 | 206 | 202 | 197 | 193 | 189 | 185 |
| **210** | 264 | 260 | 256 | 252 | 248 | 243 | 239 | 235 | 231 | 227 | 223 | 218 | 214 | 210 | 206 | 202 | 197 |
| **220** | 277 | 273 | 269 | 264 | 260 | 256 | 252 | 248 | 244 | 239 | 235 | 231 | 227 | 223 | 218 | 214 | 210 |
| **230** | 289 | 285 | 281 | 277 | 273 | 269 | 265 | 260 | 256 | 252 | 248 | 244 | 239 | 235 | 231 | 227 | 223 |
| **240** | 302 | 298 | 294 | 290 | 286 | 281 | 277 | 273 | 269 | 265 | 261 | 256 | 252 | 248 | 244 | 240 | 235 |
| **250** | 315 | 311 | 307 | 302 | 298 | 294 | 290 | 286 | 282 | 277 | 273 | 269 | 265 | 261 | 256 | 252 | 248 |
| **260** | 327 | 323 | 319 | 315 | 311 | 307 | 303 | 298 | 294 | 290 | 286 | 282 | 277 | 273 | 269 | 265 | 261 |
| **270** | 340 | 336 | 332 | 328 | 324 | 319 | 315 | 311 | 307 | 303 | 298 | 294 | 290 | 286 | 282 | 278 | 273 |
| **280** | 352 | 349 | 345 | 340 | 336 | 332 | 328 | 324 | 319 | 315 | 311 | 307 | 303 | 299 | 294 | 290 | 286 |
| **290** | 365 | 361 | 357 | 353 | 349 | 345 | 341 | 336 | 332 | 328 | 324 | 320 | 315 | 311 | 307 | 303 | 299 |
| **300** | 378 | 374 | 370 | 366 | 362 | 357 | 353 | 349 | 345 | 341 | 336 | 332 | 328 | 324 | 320 | 316 | 311 |

**Equivalent Depth in Feet**

Inspired gas pressure compensated for water vapor pressure

## Appendix A (continued)

| | PPO2 Setpoint | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Depth** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** | **1.0** | **1.1** | **1.2** | **1.3** | **1.4** | **1.5** | **1.6** | **1.7** | **1.8** |
| **30** | 1.65 | 1.56 | 1.46 | 1.36 | 1.26 | 1.16 | 1.06 | 0.96 | 0.86 | 0.76 | 0.66 | 0.56 | 0.46 | 0.36 | 0.26 | 0.16 | 0.06 |
| **40** | 1.96 | 1.87 | 1.77 | 1.67 | 1.57 | 1.47 | 1.37 | 1.27 | 1.17 | 1.07 | 0.97 | 0.87 | 0.77 | 0.67 | 0.57 | 0.47 | 0.37 |
| **50** | 2.26 | 2.17 | 2.07 | 1.97 | 1.87 | 1.77 | 1.67 | 1.57 | 1.47 | 1.37 | 1.27 | 1.17 | 1.07 | 0.97 | 0.87 | 0.77 | 0.67 |
| **60** | 2.56 | 2.47 | 2.37 | 2.27 | 2.17 | 2.07 | 1.97 | 1.87 | 1.77 | 1.67 | 1.57 | 1.47 | 1.37 | 1.27 | 1.17 | 1.07 | 0.97 |
| **70** | 2.86 | 2.77 | 2.67 | 2.57 | 2.47 | 2.37 | 2.27 | 2.17 | 2.07 | 1.97 | 1.87 | 1.77 | 1.67 | 1.57 | 1.47 | 1.37 | 1.27 |
| **80** | 3.17 | 3.08 | 2.98 | 2.88 | 2.78 | 2.68 | 2.58 | 2.48 | 2.38 | 2.28 | 2.18 | 2.08 | 1.98 | 1.88 | 1.78 | 1.68 | 1.58 |
| **90** | 3.47 | 3.38 | 3.28 | 3.18 | 3.08 | 2.98 | 2.88 | 2.78 | 2.68 | 2.58 | 2.48 | 2.38 | 2.28 | 2.18 | 2.08 | 1.98 | 1.88 |
| **100** | 3.77 | 3.68 | 3.58 | 3.48 | 3.38 | 3.28 | 3.18 | 3.08 | 2.98 | 2.88 | 2.78 | 2.68 | 2.58 | 2.48 | 2.38 | 2.28 | 2.18 |
| **110** | 4.08 | 3.99 | 3.89 | 3.79 | 3.69 | 3.59 | 3.49 | 3.39 | 3.29 | 3.19 | 3.09 | 2.99 | 2.89 | 2.79 | 2.69 | 2.59 | 2.49 |
| **120** | 4.38 | 4.29 | 4.19 | 4.09 | 3.99 | 3.89 | 3.79 | 3.69 | 3.59 | 3.49 | 3.39 | 3.29 | 3.19 | 3.09 | 2.99 | 2.89 | 2.79 |
| **130** | 4.68 | 4.59 | 4.49 | 4.39 | 4.29 | 4.19 | 4.09 | 3.99 | 3.89 | 3.79 | 3.69 | 3.59 | 3.49 | 3.39 | 3.29 | 3.19 | 3.09 |
| **140** | 4.99 | 4.90 | 4.80 | 4.70 | 4.60 | 4.50 | 4.40 | 4.30 | 4.20 | 4.10 | 4.00 | 3.90 | 3.80 | 3.70 | 3.60 | 3.50 | 3.40 |
| **150** | 5.29 | 5.20 | 5.10 | 5.00 | 4.90 | 4.80 | 4.70 | 4.60 | 4.50 | 4.40 | 4.30 | 4.20 | 4.10 | 4.00 | 3.90 | 3.80 | 3.70 |
| **160** | 5.59 | 5.50 | 5.40 | 5.30 | 5.20 | 5.10 | 5.00 | 4.90 | 4.80 | 4.70 | 4.60 | 4.50 | 4.40 | 4.30 | 4.20 | 4.10 | 4.00 |
| **170** | 5.90 | 5.81 | 5.71 | 5.61 | 5.51 | 5.41 | 5.31 | 5.21 | 5.11 | 5.01 | 4.91 | 4.81 | 4.71 | 4.61 | 4.51 | 4.41 | 4.31 |
| **180** | 6.20 | 6.11 | 6.01 | 5.91 | 5.81 | 5.71 | 5.61 | 5.51 | 5.41 | 5.31 | 5.21 | 5.11 | 5.01 | 4.91 | 4.81 | 4.71 | 4.61 |
| **190** | 6.50 | 6.41 | 6.31 | 6.21 | 6.11 | 6.01 | 5.91 | 5.81 | 5.71 | 5.61 | 5.51 | 5.41 | 5.31 | 5.21 | 5.11 | 5.01 | 4.91 |
| **200** | 6.80 | 6.71 | 6.61 | 6.51 | 6.41 | 6.31 | 6.21 | 6.11 | 6.01 | 5.91 | 5.81 | 5.71 | 5.61 | 5.51 | 5.41 | 5.31 | 5.21 |
| **210** | 7.11 | 7.02 | 6.92 | 6.82 | 6.72 | 6.62 | 6.52 | 6.42 | 6.32 | 6.22 | 6.12 | 6.02 | 5.92 | 5.82 | 5.72 | 5.62 | 5.52 |
| **220** | 7.41 | 7.32 | 7.22 | 7.12 | 7.02 | 6.92 | 6.82 | 6.72 | 6.62 | 6.52 | 6.42 | 6.32 | 6.22 | 6.12 | 6.02 | 5.92 | 5.82 |
| **230** | 7.71 | 7.62 | 7.52 | 7.42 | 7.32 | 7.22 | 7.12 | 7.02 | 6.92 | 6.82 | 6.72 | 6.62 | 6.52 | 6.42 | 6.32 | 6.22 | 6.12 |
| **240** | 8.02 | 7.93 | 7.83 | 7.73 | 7.63 | 7.53 | 7.43 | 7.33 | 7.23 | 7.13 | 7.03 | 6.93 | 6.83 | 6.73 | 6.63 | 6.53 | 6.43 |
| **250** | 8.32 | 8.23 | 8.13 | 8.03 | 7.93 | 7.83 | 7.73 | 7.63 | 7.53 | 7.43 | 7.33 | 7.23 | 7.13 | 7.03 | 6.93 | 6.83 | 6.73 |
| **260** | 8.62 | 8.53 | 8.43 | 8.33 | 8.23 | 8.13 | 8.03 | 7.93 | 7.83 | 7.73 | 7.63 | 7.53 | 7.43 | 7.33 | 7.23 | 7.13 | 7.03 |
| **270** | 8.93 | 8.84 | 8.74 | 8.64 | 8.54 | 8.44 | 8.34 | 8.24 | 8.14 | 8.04 | 7.94 | 7.84 | 7.74 | 7.64 | 7.54 | 7.44 | 7.34 |
| **280** | 9.23 | 9.14 | 9.04 | 8.94 | 8.84 | 8.74 | 8.64 | 8.54 | 8.44 | 8.34 | 8.24 | 8.14 | 8.04 | 7.94 | 7.84 | 7.74 | 7.64 |
| **290** | 9.53 | 9.44 | 9.34 | 9.24 | 9.14 | 9.04 | 8.94 | 8.84 | 8.74 | 8.64 | 8.54 | 8.44 | 8.34 | 8.24 | 8.14 | 8.04 | 7.94 |
| **300** | 9.83 | 9.74 | 9.64 | 9.54 | 9.44 | 9.34 | 9.24 | 9.14 | 9.04 | 8.94 | 8.84 | 8.74 | 8.64 | 8.54 | 8.44 | 8.34 | 8.24 |

**Inert Gas Partial Pressure**

Inspired gas pressure compensated for water vapor pressure

## Appendix B - Sample Dive History Record

The following dive started on Mix 0, Closed Circuit. Changed to Mix 1, CC, at 120 seconds. Changed to Mix 7, Open Circuit, at 420 seconds and back to Mix 1, CC, at 470 seconds and lastly to Mix 6, OC, at 705 seconds. The maximum depth attained was 148 feet and the average depth of the dive was 92 feet.

```
Dive History - Imperial
Explorer S/N: X09FD   Firmware Ver: 2.18.6
Dive Record Number - 01
Daily Dive Number - 01
Date - 10/10/01       Time - 1122
Previous Surface Interval - 0000
Alt - 00
Calculation Formula (CF) - 03


Mix     Composition
No      %N      %He     %O2
00      79      00       21
01      79      00       21
02      79      00       21
03      79      00       21
04      79      00       21
05      79      00       21
06      00      00      100
07      79      00       21
08      79      00       21
09      79      00       21


Mix     PPO2
No      Set Point
00      0.7
01      1.3
02      0.8
03      1.0
04      1.2


Mix     Dir     Depth
00      -       -
01      Dn      0080
02      -       -
03      -       -
04      -       -
05      -       -
06      -       -
07      -       -
08      -       -
09      -       -


Start PPO2 Set Point - 0.7
Time Surfaced - 1134
Dive Time - 0012 min.
Max Depth (ft) - 0148
Avg Depth (ft) - 0092


001D 001F
OC = Open Circuit
CC = Closed Circuit


Time            Dive    Mix     Depth   Temp
Sec's           Mode    No      Feet    Deg F
000015  CC      00      0003    84
000030  CC      00      0003    84
000045  CC      00      0013    84
000060  CC      00      0040    84
```

```
000075  CC      00      0049    84
000090  CC      00      0059    84
000105  CC      00      0071    84
000120  CC      01      0074    84
000135  CC      01      0089    84
000150  CC      01      0106    84
000165  CC      01      0117    84
000180  CC      01      0135    84
000195  CC      01      0145    84
000210  CC      01      0145    84
000225  CC      01      0145    84
000240  CC      01      0145    84
000255  CC      01      0145    84
000270  CC      01      0145    84
000285  CC      01      0145    84
000300  CC      01      0145    84
000315  CC      01      0139    84
000330  CC      01      0135    84
000345  CC      01      0135    84
000360  CC      01      0135    84
000375  CC      01      0135    84
000390  CC      01      0135    84
000405  CC      01      0145    84
000420  OC      07      0148    84
000435  OC      07      0148    84
000450  OC      07      0148    84
000465  OC      07      0148    84
000480  CC      01      0148    84
000495  CC      01      0110    84
000510  CC      01      0100    84
000525  CC      01      0087    84
000540  CC      01      0080    84
000555  CC      01      0073    84
000570  CC      01      0071    84
000585  CC      01      0068    84
000600  CC      01      0061    84
000615  CC      01      0045    84
000630  CC      01      0031    84
000645  CC      01      0023    84
000660  CC      01      0014    84
000675  CC      01      0011    84
000690  CC      01      0011    84
000705  OC      06      0010    84
000720  OC      06      0010    84
000735  OC      06      0012    84
000750  OC      06      0008    84
000765  OC      06      0003    84
Total 13 minutes

OTU 74

End of Record 01

Dive History Complete
```

**Example of PPO2 Cell Dive Data**

```
Time    Dive    Mix     Depth   Temp
Sec's   Mode    No      Meters  Deg C   PPO2
000015  CC      00      0000.0          0.26
000030  CC      00      0005.7          0.36
000045  CC      00      0010.3          0.26
000060  CC      00      0014.9          0.31
000075  CC      00      0018.8          0.31
000090  CC      00      0021.9          0.31
000105  CC      00      0024.9          0.29
000120  CC      00      0028.6          0.28
000135  CC      00      0031.6          0.31
000150  CC      00      0034.7  28
000165  CC      00      0037.7          0.31
000180  CC      00      0040.8          0.31
```

**Dive data in spreadsheet format with ascent/descent rate calculations.**

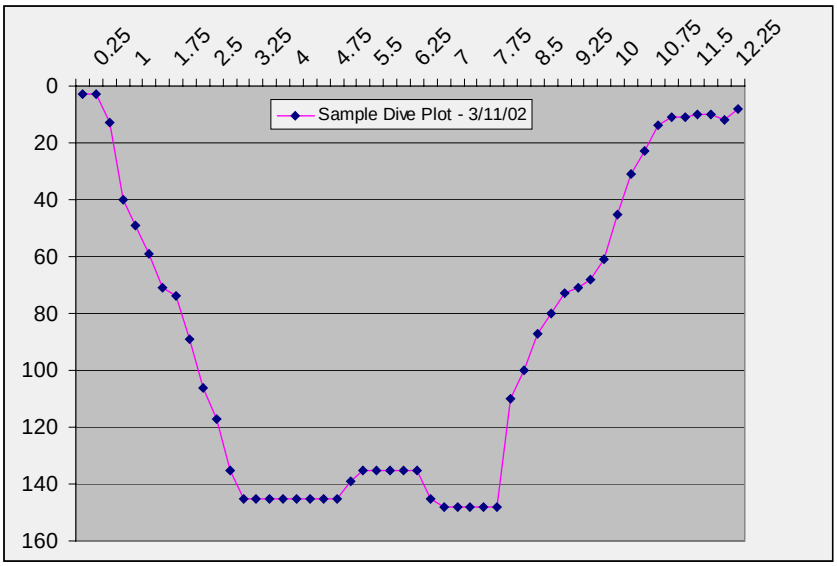
| Time | Mode | Mix No. | Depth | Temp | Ft. / Min. | Time | Mode | Mix No. | Depth | Temp | Ft. / Min. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | CC | 0 | 3 | 84 | | 405 | CC | 1 | 145 | 84 | 40 |
| 30 | CC | 0 | 3 | 84 | 0 | 420 | OC | 7 | 148 | 84 | 12 |
| 45 | CC | 0 | 13 | 84 | 40 | 435 | OC | 7 | 148 | 84 | 0 |
| 60 | CC | 0 | 40 | 84 | 108 | 450 | OC | 7 | 148 | 84 | 0 |
| 75 | CC | 0 | 49 | 84 | 36 | 465 | OC | 7 | 148 | 84 | 0 |
| 90 | CC | 0 | 59 | 84 | 40 | 480 | CC | 1 | 148 | 84 | 0 |
| 105 | CC | 0 | 71 | 84 | 48 | 495 | CC | 1 | 110 | 84 | -152 |
| 120 | CC | 1 | 74 | 84 | 12 | 510 | CC | 1 | 100 | 84 | -40 |
| 135 | CC | 1 | 89 | 84 | 60 | 525 | CC | 1 | 87 | 84 | -52 |
| 150 | CC | 1 | 106 | 84 | 68 | 540 | CC | 1 | 80 | 84 | -28 |
| 165 | CC | 1 | 117 | 84 | 44 | 555 | CC | 1 | 73 | 84 | -28 |
| 180 | CC | 1 | 135 | 84 | 72 | 570 | CC | 1 | 71 | 84 | -8 |
| 195 | CC | 1 | 145 | 84 | 40 | 585 | CC | 1 | 68 | 84 | -12 |
| 210 | CC | 1 | 145 | 84 | 0 | 600 | CC | 1 | 61 | 84 | -28 |
| 225 | CC | 1 | 145 | 84 | 0 | 615 | CC | 1 | 45 | 84 | -64 |
| 240 | CC | 1 | 145 | 84 | 0 | 630 | CC | 1 | 31 | 84 | -56 |
| 255 | CC | 1 | 145 | 84 | 0 | 645 | CC | 1 | 23 | 84 | -32 |
| 270 | CC | 1 | 145 | 84 | 0 | 660 | CC | 1 | 14 | 84 | -36 |
| 285 | CC | 1 | 145 | 84 | 0 | 675 | CC | 1 | 11 | 84 | -12 |
| 300 | CC | 1 | 145 | 84 | 0 | 690 | CC | 1 | 11 | 84 | 0 |
| 315 | CC | 1 | 139 | 84 | -24 | 705 | OC | 6 | 10 | 84 | -4 |
| 330 | CC | 1 | 135 | 84 | -16 | 720 | OC | 6 | 10 | 84 | 0 |
| 345 | CC | 1 | 135 | 84 | 0 | 735 | OC | 6 | 12 | 84 | 8 |
| 360 | CC | 1 | 135 | 84 | 0 | 750 | OC | 6 | 8 | 84 | -16 |
| 375 | CC | 1 | 135 | 84 | 0 | 765 | OC | 6 | 3 | 84 | -20 |
| 390 | CC | 1 | 135 | 84 | 0 | | | | | | |

**Instructions for creating a chart**

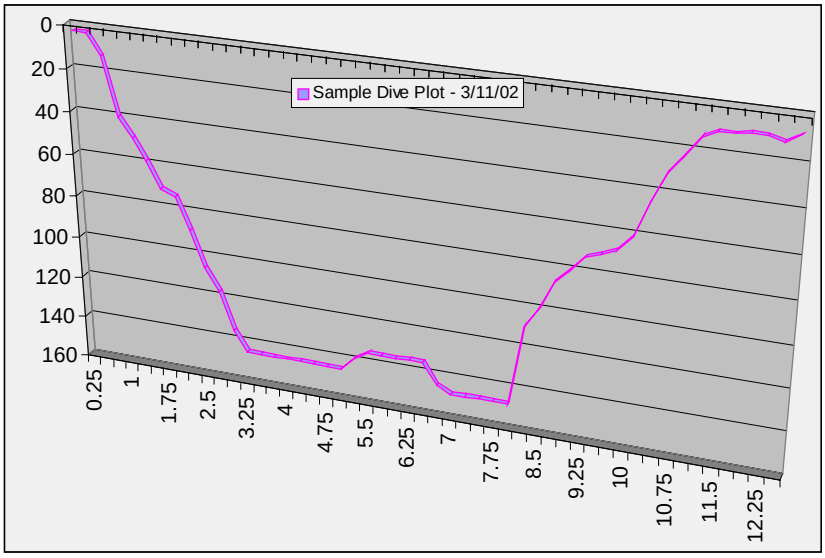
1. Cut and paste the dive data to a Microsoft Excel 97/2000 work sheet.
2. Highlight the depth data.
3. Using the pull-down menu, select **Insert / Chart**.
4. Step 1 - Standard Types Tab, Chart Type: **Line**, Chart Sub-type: Line with data markers displayed at each value.
5. The chart will appear on the worksheet with the Y-Axis inverted.
6. Right click on the Y-Axis number area and select **Format Axis**.
7. Select the Scale Tab and place a check mark in the check box **Values in reverse order**.
8. Click on the OK button.
9. Your chart will now show the dive profile with the deepest values at the bottom.
10. Now to add the time: Right click in the middle of the chart and select **Source Data** from the pop-up menu.
11. Select the Series Tab and place the cursor in the data area for the **Category (X) axis labels:**.
12. Now highlight the time cell range. The range will automatically appear in the window in which you had placed the cursor.
    Note: If you want the time to read in minutes instead of seconds, click on an empty cell to the right of the first time cell, press the "=" key on your keyboard, select the first time cell, then add "/60" in the cell data/formula window. For example the data should look like: =A3/60, click OK or press the "Enter" key, place the cursor on the bottom right corner of the cell you just created, it will change to a black "+", press the left mouse button and drag the cursor down that column until you reach the bottom of the time data, release the cursor. You now have a time column in minutes for the X-Axis label.
13. Place the cursor in the data area for the **Name:** and type in the name for the dive.
14. Click on the OK button.
15. You now have a chart with the layout similar to the one above.

Quattro Pro users follow the procedure above. Only right click on the Y-Axis number area, select the Scale Tab, then switch the "High" and "Low" values.

**Spreadsheet chart of sample dive data above.**




3-D Version




The dive data provides an accurate table of the important information at any 15-second interval. Using the data from the dive, you can create your own charts and are not limited by the information that would be contained in a chart alone. You can easily customize your chart and have it available in a format that will transfer to a presentation.

## Appendix C - Sample Dive Schedule (Table)

```
           *** Explorer Heliox/Trimix Decompression Tables ***
           *** Copyright 2001  HydroSpace Engineering Inc. ***
=========================================================================
Date: 11-09-2001                                        Time: 1447 hrs
 Alt = 0, CF = 3, Algorithm: ZH-L16C Computer (Asymmetrical 105) F=100, Mode = Open Circuit
Start Mix = 2, N2 = 0.50, He = 0.00, O2 = 0.50, PPO2 1.8 Depth = 627 fsw
Descent Mixes [(#) N2\He\O2, Switch Depth]:
             (2) 0.50\0.00\0.50,   0 fsw;  Vol =   1 ft^3
             (3) 0.36\0.55\0.09,  50 fsw;  Vol = 249 ft^3
Bottom Mix = (3) 0.36\0.55\0.09, PPO2 1.8 Depth = 627 fsw, END = 164 fsw, Vol = 249 ft^3
Deco Mixes  [(#) N2\He\O2, Switch Depth]:
             (4) 0.32\0.53\0.15, 270 fsw;  Vol =  32 ft^3
             (5) 0.60\0.10\0.30, 150 fsw;  Vol =  84 ft^3
             (6) 0.50\0.00\0.50,  70 fsw;  Vol = 102 ft^3
             (7) 0.00\0.00\1.00,  20 fsw;  Vol = 113 ft^3
  Decompression Stops in Feet ==========================================================================================
   D    BT   AT  200  190  180  170  160  150  140  130  120  110  100   90   80   70   60   50   40   30   20   10  TTS   (BT)  [D]
  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  _____ _____
  380   40    5    1    1    1    2    2    4    1    4    3    5    5    6   12    6   11   19   23   29   36   74  256  ( 40) [380]
  380   35    5         1    1    1    2    2    2    3    3    3    6    5    7    9    8   16   17   31   28   63  219  ( 35) [380]
  380   30    5              1    1    1    2    1    2    3    3    3    4    9    4   10   10   18   20   25   53  181  ( 30) [380]
  380   25    6                   1    1    1    1    1    2    2    4    3    5    6    5   11   11   21   20   40  146  ( 25) [380]
  380   20    6                        1    1    1    1    1    1    2    3    4    3    5    8    7   18   15   31  113  ( 20) [380]
  380   15    7                             1    1    1    1    1    1    2    3    4    4    8    9   12   22   81  ( 15) [380]

  ======================================================================================================================
   D    BT   AT  200  190  180  170  160  150  140  130  120  110  100   90   80   70   60   50   40   30   20   10  TTS   (BT)  [D]
  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  _____ _____
  370   40    5    1    1    1    1    3    3    2    3    3    5    5    6   11    7   10   18   24   28   35   72  250  ( 40) [370]
  370   35    5         1    1    1    1    3    1    3    3    3    5    6    6    9    8   11   22   29   28   60  212  ( 35) [370]
  370   30    5              1    1    1    1    2    1    3    3    4    3    9    4   10    9   13   26   23   51  176  ( 30) [370]
  370   25    6                   1    1    1    1    1    2    2    3    4    4    6    5    8   15   19   18   40  142  ( 25) [370]
  370   20    6                        1    1    1    1    1    2    2    3    5    4    8    7   17   14   30  108  ( 20) [370]
  370   15    7                             1    1    1    1    1    2    3    3    5    5   12   11   21   78  ( 15) [370]
  370   10    8                                  1    1    1    1    1    4    3    7    7   14   51  ( 10) [370]
  370    5   10                                                                        4    3    7   25  (  5) [370]

  ======================================================================================================================
   D    BT   AT  200  190  180  170  160  150  140  130  120  110  100   90   80   70   60   50   40   30   20   10  TTS   (BT)  [D]
  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  _____ _____
  360   40    5         1    1    1    2    2    3    2    3    5    5    5   10    7   10   17   17   34   31   68  235  ( 40) [360]
  360   35    5              1    1    1    2    1    2    4    3    3    8    4    7   11    9   21   27   27   55  198  ( 35) [360]
  360   30    5                   1    1    1    1    2    2    4    2    5    6    5    6   13   11   25   22   47  164  ( 30) [360]
  360   25    5                        1    1    1    1    1    1    3    2    4    4    4    7    7   14   13   20   38  131  ( 25) [360]
  360   20    6                             1    1    1    1    1    1    3    2    5    3    8    7   16   13   28  102  ( 20) [360]
  360   15    6                                  1    1    1    1    1    1    3    2    6    5   10   11   19   72  ( 15) [360]
  360   10    7                                       1    1    1    1    1    3    3    7    7   12   47  ( 10) [360]
  360    5    9                                                                        4    3    6   23  (  5) [360]
```

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 350 | 40 | 5 | | | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 7 | 4 | 7 | 10 | 8 | 17 | 16 | 34 | 29 | 66 | 226 | ( 40) | [350] |
| 350 | 35 | 5 | | | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 6 | 6 | 5 | 12 | 9 | 20 | 27 | 23 | 56 | 193 | ( 35) | [350] |
| 350 | 30 | 5 | | | | 1 | 1 | 1 | 1 | 2 | 1 | 3 | 4 | 4 | 6 | 5 | 6 | 13 | 10 | 25 | 21 | 46 | 160 | ( 30) | [350] |
| 350 | 25 | 5 | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 4 | 7 | 6 | 14 | 13 | 19 | 37 | 127 | ( 25) | [350] |
| 350 | 20 | 6 | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 3 | 7 | 8 | 14 | 12 | 29 | 98 | ( 20) | [350] |
| 350 | 15 | 6 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 5 | 11 | 10 | 19 | 71 | ( 15) | [350] |
| 350 | 10 | 7 | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 6 | 6 | 13 | 46 | ( 10) | [350] |
| 350 | 5 | 9 | | | | | | | | | | | | | | | | | | 3 | 3 | 6 | 22 | ( 5) | [350] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 340 | 40 | 4 | | | 1 | 1 | 1 | 2 | 1 | 4 | 2 | 3 | 6 | 5 | 6 | 9 | 9 | 14 | 17 | 31 | 28 | 61 | 211 | ( 40) | [340] |
| 340 | 35 | 5 | | | | 1 | 1 | 1 | 1 | 3 | 2 | 3 | 4 | 5 | 6 | 5 | 10 | 10 | 18 | 20 | 26 | 52 | 178 | ( 35) | [340] |
| 340 | 30 | 5 | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 4 | 3 | 5 | 6 | 6 | 11 | 11 | 22 | 21 | 41 | 148 | ( 30) | [340] |
| 340 | 25 | 5 | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 4 | 6 | 7 | 12 | 13 | 17 | 35 | 119 | ( 25) | [340] |
| 340 | 20 | 5 | | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 9 | 13 | 12 | 26 | 91 | ( 20) | [340] |
| 340 | 15 | 6 | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 5 | 10 | 9 | 18 | 66 | ( 15) | [340] |
| 340 | 10 | 7 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 6 | 5 | 12 | 42 | ( 10) | [340] |
| 340 | 5 | 9 | | | | | | | | | | | | | | | | | | 3 | 2 | 6 | 21 | ( 5) | [340] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 330 | 40 | 4 | | | | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 5 | 5 | 7 | 8 | 8 | 11 | 21 | 29 | 27 | 59 | 203 | ( 40) | [330] |
| 330 | 35 | 4 | | | | 1 | 1 | 1 | 1 | 2 | 2 | 4 | 3 | 4 | 7 | 5 | 10 | 9 | 18 | 20 | 24 | 52 | 173 | ( 35) | [330] |
| 330 | 30 | 5 | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 6 | 6 | 10 | 12 | 21 | 20 | 40 | 144 | ( 30) | [330] |
| 330 | 25 | 5 | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 6 | 6 | 12 | 13 | 17 | 33 | 115 | ( 25) | [330] |
| 330 | 20 | 6 | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 10 | 12 | 11 | 26 | 89 | ( 20) | [330] |
| 330 | 15 | 6 | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 4 | 6 | 9 | 8 | 18 | 64 | ( 15) | [330] |
| 330 | 10 | 7 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 6 | 11 | 41 | ( 10) | [330] |
| 330 | 5 | 9 | | | | | | | | | | | | | | | | | | 2 | 2 | 6 | 20 | ( 5) | [330] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 320 | 40 | 4 | | | | 1 | 1 | 1 | 1 | 2 | 4 | 2 | 4 | 6 | 6 | 5 | 12 | 9 | 20 | 27 | 26 | 54 | 190 | ( 40) | [320] |
| 320 | 35 | 4 | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 2 | 5 | 6 | 5 | 6 | 13 | 11 | 25 | 22 | 47 | 161 | ( 35) | [320] |
| 320 | 30 | 5 | | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 4 | 8 | 6 | 15 | 18 | 17 | 40 | 134 | ( 30) | [320] |
| 320 | 25 | 5 | | | | | | | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 4 | 8 | 8 | 17 | 15 | 30 | 107 | ( 25) | [320] |
| 320 | 20 | 5 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 4 | 8 | 9 | 13 | 24 | 82 | ( 20) | [320] |
| 320 | 15 | 6 | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 6 | 8 | 8 | 17 | 59 | ( 15) | [320] |
| 320 | 10 | 6 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 6 | 11 | 38 | ( 10) | [320] |
| 320 | 5 | 8 | | | | | | | | | | | | | | | | | | 2 | 2 | 5 | 18 | ( 5) | [320] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 310 | 40 | 4 | | | | | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 5 | 6 | 5 | 10 | 10 | 18 | 20 | 25 | 53 | 175 | ( 40) | [310] |
| 310 | 35 | 4 | | | | | | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 4 | 7 | 5 | 12 | 11 | 23 | 20 | 43 | 148 | ( 35) | [310] |
| 310 | 30 | 4 | | | | | | | 1 | 1 | 1 | 2 | 2 | 4 | 3 | 4 | 7 | 7 | 13 | 13 | 19 | 37 | 122 | ( 30) | [310] |
| 310 | 25 | 5 | | | | | | | | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 3 | 8 | 7 | 16 | 14 | 28 | 99 | ( 25) | [310] |
| 310 | 20 | 5 | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 5 | 7 | 9 | 12 | 22 | 76 | ( 20) | [310] |
| 310 | 15 | 5 | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 6 | 5 | 9 | 16 | 54 | ( 15) | [310] |
| 310 | 10 | 6 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 5 | 5 | 10 | 34 | ( 10) | [310] |
| 310 | 5 | 8 | | | | | | | | | | | | | | | | | | 1 | 2 | 4 | 16 | ( 5) | [310] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 40 | 4 | | | | | | 1 | 1 | 1 | 2 | 4 | 3 | 4 | 7 | 5 | 9 | 10 | 17 | 20 | 24 | 51 | 168 | ( 40) | [300] |
| 300 | 35 | 4 | | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 3 | 4 | 7 | 5 | 11 | 11 | 22 | 20 | 41 | 143 | ( 35) | [300] |
| 300 | 30 | 4 | | | | | | | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 3 | 7 | 7 | 12 | 14 | 17 | 36 | 118 | ( 30) | [300] |
| 300 | 25 | 5 | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 7 | 7 | 15 | 12 | 29 | 96 | ( 25) | [300] |
| 300 | 20 | 5 | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 4 | 5 | 12 | 10 | 22 | 74 | ( 20) | [300] |
| 300 | 15 | 5 | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 5 | 6 | 8 | 15 | 51 | ( 15) | [300] |
| 300 | 10 | 6 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 5 | 9 | 32 | ( 10) | [300] |
| 300 | 5 | 8 | | | | | | | | | | | | | | | | | | 1 | 2 | 4 | 16 | ( 5) | [300] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 290 | 40 | 4 | | | | | | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 6 | 5 | 6 | 13 | 11 | 24 | 22 | 47 | 157 | ( 40) | [290] |
| 290 | 35 | 4 | | | | | | | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 6 | 5 | 7 | 15 | 19 | 17 | 41 | 133 | ( 35) | [290] |
| 290 | 30 | 4 | | | | | | | | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 6 | 7 | 11 | 13 | 17 | 32 | 109 | ( 30) | [290] |
| 290 | 25 | 4 | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 9 | 13 | 12 | 26 | 88 | ( 25) | [290] |
| 290 | 20 | 5 | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 5 | 11 | 10 | 19 | 67 | ( 20) | [290] |
| 290 | 15 | 5 | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 7 | 7 | 14 | 48 | ( 15) | [290] |
| 290 | 10 | 6 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 8 | 30 | ( 10) | [290] |
| 290 | 5 | 7 | | | | | | | | | | | | | | | | | | 1 | 1 | 4 | 14 | ( 5) | [290] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 40 | 4 | | | | | | | 1 | 1 | 1 | 2 | 5 | 2 | 5 | 7 | 5 | 12 | 11 | 23 | 21 | 45 | 149 | ( 40) | [280] |
| 280 | 35 | 4 | | | | | | | 1 | 1 | 1 | 1 | 2 | 5 | 3 | 4 | 7 | 7 | 14 | 18 | 17 | 39 | 128 | ( 35) | [280] |
| 280 | 30 | 4 | | | | | | | | 1 | 1 | 1 | 1 | 3 | 4 | 3 | 5 | 8 | 10 | 13 | 16 | 31 | 105 | ( 30) | [280] |
| 280 | 25 | 4 | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 5 | 9 | 12 | 11 | 26 | 85 | ( 25) | [280] |
| 280 | 20 | 5 | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 6 | 9 | 10 | 19 | 65 | ( 20) | [280] |
| 280 | 15 | 5 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 4 | 6 | 7 | 13 | 45 | ( 15) | [280] |
| 280 | 10 | 6 | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 5 | 8 | 28 | ( 10) | [280] |
| 280 | 5 | 7 | | | | | | | | | | | | | | | | | | 1 | 1 | 3 | 13 | ( 5) | [280] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 270 | 40 | 4 | | | | | | | | 1 | 1 | 2 | 3 | 4 | 3 | 7 | 5 | 11 | 10 | 22 | 20 | 41 | 138 | ( 40) | [270] |
| 270 | 35 | 4 | | | | | | | | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 6 | 7 | 13 | 12 | 19 | 36 | 117 | ( 35) | [270] |
| 270 | 30 | 4 | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 7 | 8 | 15 | 15 | 28 | 97 | ( 30) | [270] |
| 270 | 25 | 4 | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 9 | 8 | 13 | 23 | 76 | ( 25) | [270] |
| 270 | 20 | 4 | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 3 | 7 | 8 | 9 | 17 | 58 | ( 20) | [270] |
| 270 | 15 | 5 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 6 | 7 | 12 | 43 | ( 15) | [270] |
| 270 | 10 | 5 | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 8 | 25 | ( 10) | [270] |
| 270 | 5 | 7 | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 12 | ( 5) | [270] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260 | 40 | 3 | | | | | | | | 1 | 1 | 1 | 3 | 4 | 3 | 6 | 6 | 9 | 12 | 20 | 20 | 39 | 132 | ( 40) | [260] |
| 260 | 35 | 4 | | | | | | | | | 1 | 1 | 2 | 2 | 5 | 3 | 7 | 6 | 12 | 13 | 17 | 35 | 112 | ( 35) | [260] |
| 260 | 30 | 4 | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 4 | 4 | 7 | 7 | 16 | 13 | 28 | 94 | ( 30) | [260] |
| 260 | 25 | 4 | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 4 | 5 | 7 | 9 | 12 | 23 | 74 | ( 25) | [260] |
| 260 | 20 | 4 | | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 3 | 6 | 8 | 8 | 17 | 56 | ( 20) | [260] |
| 260 | 15 | 5 | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 3 | 6 | 6 | 12 | 41 | ( 15) | [260] |
| 260 | 10 | 5 | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 2 | 4 | 7 | 24 | ( 10) | [260] |
| 260 | 5 | 6 | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 11 | ( 5) | [260] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 40 | 3 | | | | | | | | | 1 | 1 | 2 | 3 | 5 | 4 | 6 | 6 | 14 | 13 | 20 | 38 | 120 | ( 40) | [250] |
| 250 | 35 | 3 | | | | | | | | | 1 | 1 | 1 | 2 | 4 | 3 | 5 | 8 | 10 | 13 | 16 | 31 | 102 | ( 35) | [250] |
| 250 | 30 | 4 | | | | | | | | | | 1 | 1 | 1 | 3 | 3 | 4 | 4 | 10 | 13 | 11 | 27 | 85 | ( 30) | [250] |
| 250 | 25 | 4 | | | | | | | | | | | 1 | 1 | 1 | 3 | 2 | 6 | 6 | 9 | 11 | 20 | 67 | ( 25) | [250] |
| 250 | 20 | 4 | | | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 6 | 5 | 9 | 16 | 51 | ( 20) | [250] |
| 250 | 15 | 4 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 4 | 5 | 5 | 12 | 36 | ( 15) | [250] |
| 250 | 10 | 5 | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 7 | 22 | ( 10) | [250] |
| 250 | 5 | 6 | | | | | | | | | | | | | | | | | | | 1 | 2 | 9 | ( 5) | [250] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 240 | 40 | 3 | | | | | | | | | 1 | 1 | 1 | 3 | 5 | 3 | 7 | 6 | 13 | 13 | 19 | 37 | 116 | ( 40) | [240] |
| 240 | 35 | 3 | | | | | | | | | | 1 | 1 | 2 | 3 | 4 | 4 | 8 | 7 | 16 | 15 | 30 | 97 | ( 35) | [240] |
| 240 | 30 | 3 | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 10 | 12 | 11 | 26 | 81 | ( 30) | [240] |
| 240 | 25 | 4 | | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 5 | 4 | 11 | 10 | 20 | 65 | ( 25) | [240] |
| 240 | 20 | 4 | | | | | | | | | | | | 1 | 1 | 1 | 2 | 3 | 5 | 6 | 8 | 15 | 49 | ( 20) | [240] |
| 240 | 15 | 4 | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 4 | 6 | 11 | 34 | ( 15) | [240] |
| 240 | 10 | 5 | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 4 | 6 | 21 | ( 10) | [240] |
| 240 | 5 | 6 | | | | | | | | | | | | | | | | | | | 1 | 1 | 8 | ( 5) | [240] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | 40 | 3 | | | | | | | | | | 1 | 1 | 2 | 4 | 3 | 6 | 6 | 12 | 13 | 17 | 33 | 104 | ( 40) | [230] |
| 230 | 35 | 3 | | | | | | | | | | 1 | 1 | 1 | 2 | 4 | 4 | 6 | 8 | 15 | 13 | 28 | 89 | ( 35) | [230] |
| 230 | 30 | 3 | | | | | | | | | | | 1 | 1 | 1 | 3 | 4 | 4 | 8 | 9 | 12 | 23 | 72 | ( 30) | [230] |
| 230 | 25 | 4 | | | | | | | | | | | | 1 | 1 | 1 | 3 | 4 | 5 | 10 | 9 | 18 | 59 | ( 25) | [230] |
| 230 | 20 | 4 | | | | | | | | | | | | | 1 | 1 | 1 | 3 | 3 | 8 | 7 | 14 | 44 | ( 20) | [230] |
| 230 | 15 | 4 | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 4 | 5 | 10 | 30 | ( 15) | [230] |
| 230 | 10 | 4 | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 3 | 6 | 19 | ( 10) | [230] |
| 230 | 5 | 6 | | | | | | | | | | | | | | | | | | | 1 | 1 | 8 | ( 5) | [230] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220 | 40 | 3 | | | | | | | | | | 1 | 1 | 1 | 3 | 4 | 4 | 8 | 10 | 13 | 16 | 31 | 98 | ( 40) | [220] |
| 220 | 35 | 3 | | | | | | | | | | | 1 | 1 | 2 | 4 | 3 | 5 | 9 | 14 | 11 | 28 | 84 | ( 35) | [220] |
| 220 | 30 | 3 | | | | | | | | | | | 1 | 1 | 1 | 2 | 4 | 4 | 8 | 8 | 12 | 22 | 69 | ( 30) | [220] |
| 220 | 25 | 3 | | | | | | | | | | | | 1 | 1 | 1 | 3 | 3 | 6 | 8 | 9 | 17 | 55 | ( 25) | [220] |
| 220 | 20 | 4 | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 4 | 7 | 7 | 13 | 42 | ( 20) | [220] |
| 220 | 15 | 4 | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 5 | 5 | 9 | 29 | ( 15) | [220] |
| 220 | 10 | 5 | | | | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 6 | 17 | ( 10) | [220] |
| 220 | 5 | 5 | | | | | | | | | | | | | | | | | | | 1 | | 6 | ( 5) | [220] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210 | 40 | 3 | | | | | | | | | | | 1 | 1 | 2 | 4 | 3 | 8 | 6 | 16 | 14 | 28 | 89 | ( 40) | [210] |
| 210 | 35 | 3 | | | | | | | | | | | | 1 | 1 | 3 | 4 | 4 | 9 | 12 | 10 | 25 | 75 | ( 35) | [210] |
| 210 | 30 | 3 | | | | | | | | | | | | 1 | 1 | 1 | 3 | 5 | 5 | 10 | 11 | 20 | 63 | ( 30) | [210] |
| 210 | 25 | 3 | | | | | | | | | | | | | 1 | 1 | 2 | 3 | 5 | 6 | 9 | 16 | 48 | ( 25) | [210] |
| 210 | 20 | 4 | | | | | | | | | | | | | | 1 | 1 | 1 | 4 | 6 | 6 | 12 | 37 | ( 20) | [210] |
| 210 | 15 | 4 | | | | | | | | | | | | | | | 1 | 1 | 1 | 4 | 5 | 8 | 26 | ( 15) | [210] |
| 210 | 10 | 4 | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 6 | 15 | ( 10) | [210] |
| 210 | 5 | 5 | | | | | | | | | | | | | | | | | | | 1 | | 6 | ( 5) | [210] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 40 | 3 | | | | | | | | | | | | 1 | 2 | 3 | 4 | 6 | 8 | 14 | 13 | 28 | 85 | ( 40) | [200] |
| 200 | 35 | 3 | | | | | | | | | | | | 1 | 1 | 2 | 4 | 4 | 8 | 9 | 12 | 24 | 71 | ( 35) | [200] |
| 200 | 30 | 3 | | | | | | | | | | | | 1 | 1 | 1 | 2 | 5 | 5 | 10 | 10 | 19 | 60 | ( 30) | [200] |
| 200 | 25 | 3 | | | | | | | | | | | | | 1 | 1 | 1 | 3 | 5 | 6 | 8 | 16 | 46 | ( 25) | [200] |
| 200 | 20 | 3 | | | | | | | | | | | | | | 1 | 1 | 1 | 4 | 5 | 5 | 12 | 34 | ( 20) | [200] |
| 200 | 15 | 4 | | | | | | | | | | | | | | | 1 | 1 | 1 | 3 | 4 | 8 | 24 | ( 15) | [200] |
| 200 | 10 | 4 | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 5 | 14 | ( 10) | [200] |

| D | BT | AT | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | TTS | (BT) | [D] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 190 | 40 | 2 | | | | | | | | | | | | 1 | 1 | 1 | 5 | 4 | 9 | 12 | 11 | 26 | 75 | ( 40) | [190] |
| 190 | 35 | 3 | | | | | | | | | | | | | 1 | 1 | 3 | 5 | 6 | 9 | 11 | 21 | 62 | ( 35) | [190] |
| 190 | 30 | 3 | | | | | | | | | | | | | 1 | 1 | 1 | 4 | 5 | 9 | 8 | 18 | 52 | ( 30) | [190] |
| 190 | 25 | 3 | | | | | | | | | | | | | | 1 | 1 | 2 | 4 | 6 | 8 | 13 | 40 | ( 25) | [190] |
| 190 | 20 | 3 | | | | | | | | | | | | | | | 1 | 1 | 3 | 3 | 6 | 11 | 30 | ( 20) | [190] |
| 190 | 15 | 4 | | | | | | | | | | | | | | | | 1 | 1 | 2 | 4 | 7 | 20 | ( 15) | [190] |
| 190 | 10 | 4 | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 4 | 12 | ( 10) | [190] |

D = Depth, BT = Bottom Time, AT = Ascent Time, TTS = Time To Surface
TTS includes Ascent Time, Decompression Time and Ascent Time between Stops
Equivalent Nitrogen Depth (END) is calculated on deepest depth
Gas Volumes (Vol) are listed for planning purposes, individual consumption will vary
Gas Volumes are based on a Surface Consumption Rate of 0.5 ft^3/min (14.2 L/min)
Adjust the Required Gas Volume for your Surface Consumption Rate plus Safety Factors

********** End of Heliox/Trimix Deco Table **********

# Appendix D - Sample Calculation Formula (CF) Comparison Table

```
*** Explorer Calculation Formula Comparison Table ***
  *** Copyright 2000-2003  HydroSpace Engineering Inc. ***
  ========================================================================
  Date: 01-14-2003                                          Time: 1650 hrs
  Alt = 0, Mode = Open Circuit
  Start Mix = 2, N2 = 0.55, He = 0.25, O2 = 0.20, PPO2 1.8 Depth = 297 fsw
  Descent Mixes [(#) O2\He\N2, Switch Depth]:
              (2) 0.20\0.25\0.55,   0 fsw;
              (3) 0.12\0.55\0.33,  50 fsw;
  Bottom Mix = (3) 0.12\0.55\0.33, PPO2 1.8 Depth = 462 fsw, END = 125 fsw
  Deco Mixes  [(#) O2\He\N2, Switch Depth]:
              (4) 0.20\0.25\0.55, 200 fsw;
              (5) 0.40\0.00\0.60, 100 fsw;
              (6) 1.00\0.00\0.00,  20 fsw;
    Decompression Stops in Feet ==========================================================================================================
     D    BT   AT  230  220  210  200  190  180  170  160  150  140  130  120  110  100   90   80   70   60   50   40   30   20   10  TTS   (BT)  [D]      OTU
    ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  ___  _____ _____    ____

    CF = 2, Algorithm: Reduced Gradient Bubble Model (RGBM), F=94

    300   30    1    1    0    1    1    0    1    1    1    1    1    2    3    3    2    3    3    4    6    7    9   15   13   19  105  ( 30) [300]          158

    CF = 1, Algorithm: Reduced Gradient Bubble Model (RGBM), F=97

    300   30    1         1    1    1    0    1    1    1    1    1    2    2    3    2    3    3    4    5    7    8   14   12   18   99  ( 30) [300]          151

    CF = 0, Algorithm: Reduced Gradient Bubble Model (RGBM), F=100

    300   30    1         1    1    1    0    1    0    1    1    1    2    3    2    2    2    3    4    5    6    8   12   11   17   92  ( 30) [300]          142

    CF = 9, Algorithm: ZH-L16C Computer, Asymmetrical 135, F=94

    300   30    4                                                  1    1    1    3    3    4    4    7    8   10   16   23   27   51  167  ( 30) [300]          248

    CF = 8, Algorithm: ZH-L16C Computer, Asymmetrical 135, F=97

    300   30    4                                                  1    1    1    3    3    4    4    6    9    9   17   21   26   50  163  ( 30) [300]          243

    CF = 7, Algorithm: ZH-L16C Computer, Asymmetrical 135, F=100

    300   30    4                                                  1    1    1    3    2    5    4    5   10    9   17   19   25   48  158  ( 30) [300]          238

    CF = 6, Algorithm: ZH-L16C Computer, Asymmetrical 118, F=94

    300   30    4                                                  1    1    1    3    2    4    4    6    7    8   16   19   24   43  147  ( 30) [300]          223

    CF = 5, Algorithm: ZH-L16C Computer, Asymmetrical 118, F=97

    300   30    4                                                  1    1    1    2    3    4    3    5    9    8   16   16   23   44  144  ( 30) [300]          220

    CF = 4, Algorithm: ZH-L16C Computer, Asymmetrical 118, F=100

    300   30    4                                                  1    1    1    2    3    4    3    5    9    8   16   16   21   42  140  ( 30) [300]          214

    CF = 3, Algorithm: ZH-L16C Computer, Asymmetrical 100, F=100

    300   30    4                                                  1    1    1    2    2    4    2    5    8    6   16   13   18   36  123  ( 30) [300]          191

 D = Depth, BT = Bottom Time, AT = Ascent Time, TTS = Time To Surface
 TTS includes Ascent Time, Decompression Time and Ascent Time between Stops
 Equivalent Nitrogen Depth (END) is calculated on deepest depth
 Gas Volumes (Vol) are listed for planning purposes, individual consumption will vary
 Gas Volumes are based on a Surface Consumption Rate of 0.5 ft^3/min (14.2 L/min)
 Adjust the Required Gas Volume for your Surface Consumption Rate plus Safety Factors
********************* End of Calculation Formula Table *********************
```

## Appendix E - Sample Elapsed Time Decompression Schedule

```
           *** Explorer Elapsed Time Decompression Schedule ***
            *** Copyright 2002  HydroSpace Engineering Inc. ***
  ============================================================================
  Date: 10-30-2002                                                Time: 1343 hrs
  Alt = 0, CF = 3, Algorithm: ZH-L16C Computer, Asymmetrical 100, F=100
  Mode = Open Circuit
  Start Mix = 2, O2 = 0.21, He = 0.00, N2 = 0.79, PPO2 1.8 Depth = 462 fsw
  Descent Mixes [(#) O2\He\N2, Switch Depth]:
              (2) 0.21\0.00\0.79,   0 fsw;
              (3) 0.12\0.55\0.33, 150 fsw;
  Bottom Mix = (3) 0.12\0.55\0.33, PPO2 1.8 Depth = 462 fsw, END = 125 fsw
  Deco Mixes  [(#) O2\He\N2, Switch Depth]:
              (4) 0.20\0.25\0.55, 291 fsw;
              (5) 0.40\0.00\0.60, 131 fsw;
              (6) 1.00\0.00\0.00,  31 fsw;

  Depth     SegT      ElT   Mix   O2/He/N2  Mode
     0      0:00     0:00    2    21/00/79   OC
   150      2:12     2:12    3    12/55/33   OC
   300     25:30    30:00    3    12/55/33   OC
   294      0:12    30:12    4    20/25/55   OC
   140      1:00    36:06    4    20/25/55   OC
   130      1:00    37:24    5    40/00/59   OC
   120      1:00    38:42    5    40/00/59   OC
   110      1:00    40:00    5    40/00/59   OC
   100      1:00    41:18    5    40/00/59   OC
    90      3:00    44:36    5    40/00/59   OC
    80      4:00    48:54    5    40/00/59   OC
    70      3:00    52:12    5    40/00/59   OC
    60      9:00  1:01:30    5    40/00/59   OC
    50      6:00  1:07:48    5    40/00/59   OC
    40     14:00  1:22:06    5    40/00/59   OC
    30      8:00  1:30:24    6   100/00/00   OC
    20     18:00  1:48:42    6   100/00/00   OC
    10     31:00  2:20:00    6   100/00/00   OC
     0      0:18  2:20:18    6   100/00/00   OC

  Segment time for stops which have cleared during ascent or previous stop,
       display the travel time between stops.
  Elapsed Time includes ascent time between stops instead of '0'.
********** End of Elapsed Time Decompression Schedule **********
```

## Appendix F - Pressure Conversions

Units of pressure are converted according to the following primary definitions (Ref. 1):

1 atm = 760.000 torr
1 bar = 100,000 Pa
1 psi = 6,894.76 Pa
1 torr = 133.322 Pa

Units of pressure expressed as water depth below sea-level are converted using the following additional standard definitions as adopted by the Undersea and Hyperbaric Medical Society:

1 bar = 32.6457 fsw (assumes seawater density = 1.02480 gm/cc)
1 msw = 10.0000 kPa (assumes seawater density = 1.01972 gm/cc)
1 bar = 33.4702 fsw (assumes freshwater density = 0.999552 gm/cc)
1 msw = 9.80229 kPa (assumes freshwater density = 0.999552 gm/cc)

Units of pressure expressed in terms of geometric altitude above sea level are converted using defining equations for the *U.S. Standard Atmosphere,1976* (Ref. 2). These equations give pressure P in atmospheres absolute (atm abs) as functions of geometric altitude above seal-level A in kilometers (km):

$$P = \left[\frac{288.15}{288.15 - 6.5A}\right]^{-5.25588} \quad ; A < 11 \text{ km}$$

$$P = 0.22336 \cdot \exp\left[0.15769 \cdot (11 - A)\right] \quad ; 20\text{km} > A \geq 11 \text{ km}.$$

These equations are inverted to obtain the following expressions for geometric altitude A in kilometers (km) as functions of pressure P in atmospheres absolute (atm abs):

$$A = \left\{\frac{288.15 - \exp\left[\ln(288.15) + \frac{\ln(P)}{5.25588}\right]}{6.5}\right\} ; \; P > 0.22336 \text{ atm abs}$$

$$A = 11 - \left\{\frac{\ln\left(\frac{P}{0.22336}\right)}{0.15769}\right\} ; \; 0.05403 \text{ atm abs} < P \leq 0.22336 \text{ atm abs}$$

The above expressions cover the relationship between geometric altitude and atmospheric pressure over the entire physiological range; from below sea-level to above the Armstrong line at 62,800 ft (19.14 km), where atmospheric pressure equals the vapor pressure of water at 37°C (47 mm-Hg). In this physiological region, the *U.S. Standard Atmosphere, 1976*, of the United States Committee on Extension to the Standard Atmosphere (COESA) is the same as COESA's *"U.S. Standard Atmosphere, 1962,"* and is identical with the International Civil Aviation Organization (ICAO) "Manual of the ICAO Standard Atmosphere," as revised in 1964. The definition of the Standard in this region was also adopted in the *ISO Standard Atmosphere* (ISO 1973) by the International Standards Organization (ISO) in 1973.

Note: 1 atm abs = 1.01325 bar,
1 bar = 0.9869 atm abs

## Appendix G - Altitude/Pressure/Depth Correction/Oxygen Concentration Table

| Altitude | | Pressure | | Depth Correction | | 100% $O_2$ | | Oxygen Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KFt | KM | ATA | Bar | Ft FW | M FW | $PPO_2$ | Eq. O2% | 20.9% (.3) | 20.9% (.1) | 21% (.3) | 21% (.1) |
| **0.0** | 0.000 | 1.0000 | 1.0133 | 0.03 | 0.01 | 1.0000 | 100% | 20.900 | 20.9 | 21.000 | 21.0 |
| **1.0** | 0.305 | 0.9626 | 0.9754 | 0.84 | 0.26 | 0.9626 | 96% | 20.119 | 20.1 | 20.215 | 20.2 |
| **2.0** | 0.610 | 0.9266 | 0.9389 | 2.08 | 0.63 | 0.9266 | 93% | 19.367 | 19.4 | 19.459 | 19.5 |
| **3.0** | 0.914 | 0.8920 | 0.9038 | 3.27 | 1.00 | 0.8920 | 89% | 18.643 | 18.6 | 18.732 | 18.7 |
| **4.0** | 1.219 | 0.8586 | 0.8700 | 4.42 | 1.35 | 0.8586 | 86% | 17.946 | 17.9 | 18.032 | 18.0 |
| **5.0** | 1.524 | 0.8265 | 0.8375 | 5.53 | 1.68 | 0.8265 | 83% | 17.275 | 17.3 | 17.357 | 17.4 |
| **6.0** | 1.829 | 0.7956 | 0.8062 | 6.59 | 2.01 | 0.7956 | 80% | 16.629 | 16.6 | 16.709 | 16.7 |
| **7.0** | 2.134 | 0.7659 | 0.7761 | 7.61 | 2.32 | 0.7659 | 77% | 16.007 | 16.0 | 16.084 | 16.1 |
| **8.0** | 2.438 | 0.7373 | 0.7470 | 8.60 | 2.62 | 0.7373 | 74% | 15.409 | 15.4 | 15.483 | 15.5 |
| **9.0** | 2.743 | 0.7097 | 0.7191 | 9.55 | 2.91 | 0.7097 | 71% | 14.833 | 14.8 | 14.904 | 14.9 |
| **10.0** | 3.048 | 0.6832 | 0.6922 | 10.46 | 3.19 | 0.6832 | 68% | 14.278 | 14.3 | 14.347 | 14.3 |
| **11.0** | 3.353 | 0.6576 | 0.6664 | 11.34 | 3.46 | 0.6576 | 66% | 13.745 | 13.7 | 13.810 | 13.8 |
| **12.0** | 3.658 | 0.6331 | 0.6414 | 12.19 | 3.72 | 0.6331 | 63% | 13.231 | 13.2 | 13.294 | 13.3 |
| **13.0** | 3.962 | 0.6094 | 0.6175 | 13.01 | 3.96 | 0.6094 | 61% | 12.736 | 12.7 | 12.797 | 12.8 |
| **14.0** | 4.267 | 0.5866 | 0.5944 | 13.79 | 4.20 | 0.5866 | 59% | 12.260 | 12.3 | 12.319 | 12.3 |
| **15.0** | 4.572 | 0.5647 | 0.5722 | 14.55 | 4.43 | 0.5647 | 56% | 11.802 | 11.8 | 11.858 | 11.9 |
| **16.0** | 4.877 | 0.5436 | 0.5508 | 15.27 | 4.66 | 0.5436 | 54% | 11.361 | 11.4 | 11.415 | 11.4 |
| **17.0** | 5.182 | 0.5232 | 0.5302 | 15.97 | 4.87 | 0.5232 | 52% | 10.936 | 10.9 | 10.988 | 11.0 |
| **18.0** | 5.486 | 0.5037 | 0.5104 | 16.65 | 5.07 | 0.5037 | 50% | 10.527 | 10.5 | 10.577 | 10.6 |
| **19.0** | 5.791 | 0.4849 | 0.4913 | 17.30 | 5.27 | 0.4849 | 48% | 10.134 | 10.1 | 10.182 | 10.2 |
| **20.0** | 6.096 | 0.4667 | 0.4729 | 17.92 | 5.46 | 0.4667 | 47% | 9.755 | 9.8 | 9.801 | 9.8 |

The altitude settings on the HS Explorer range from 0 to 9 and correspond to the table altitudes of 0.0 to 9.0 KFt.

For depth gauges which display the depth as a function of absolute pressure or bar as the *HS Explorer* does, the linear depth to the surface can be calculated by adding the Depth Correction to the displayed depth. For example, when diving at 5000 Ft./1.52 KM add 5.53 Ft./1.68 M to the indicated depth.

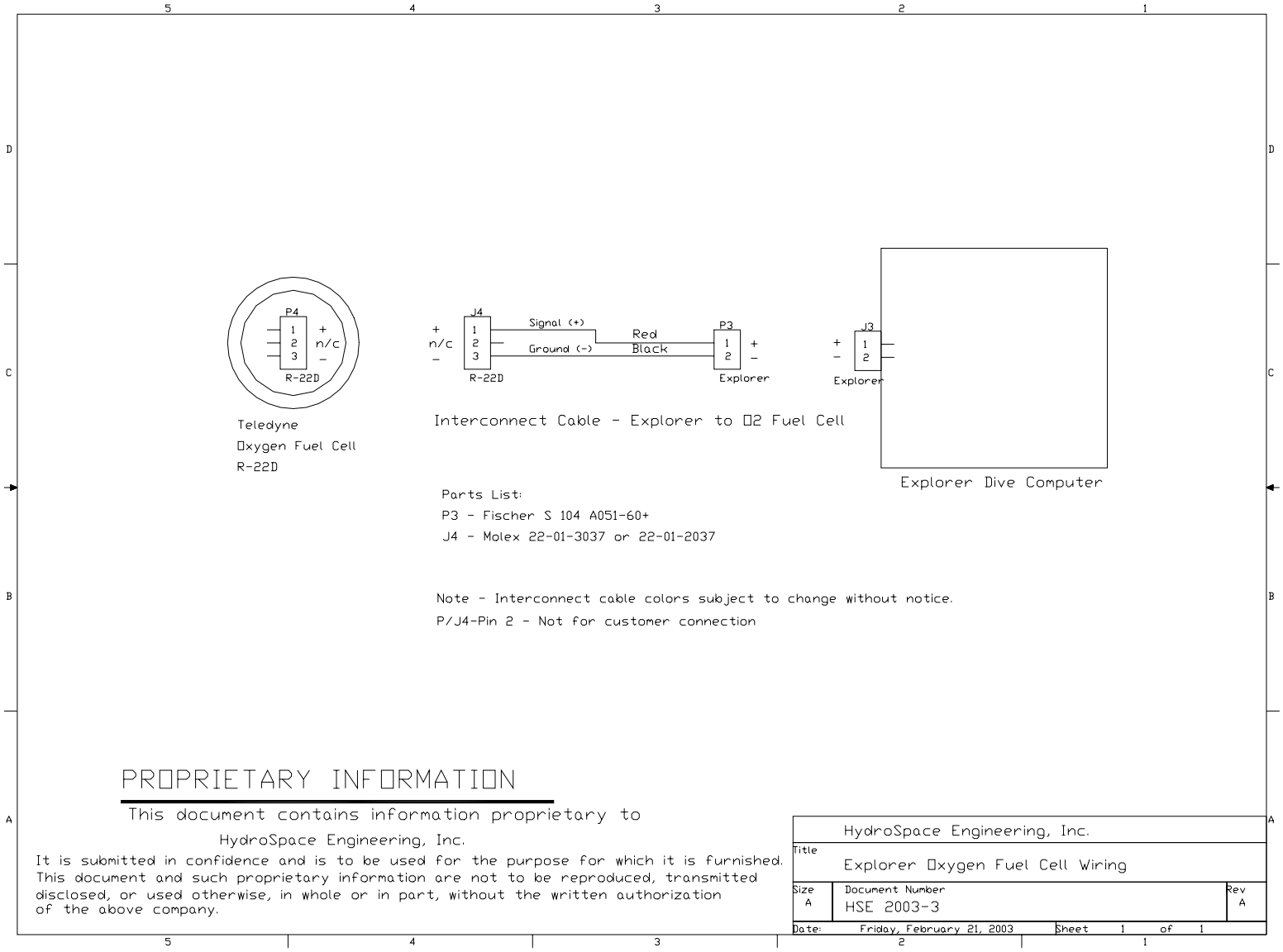
### Altitude Factors

***Altitude pressures - Reference table below for the pressure reduction values for diving at altitude.***

| Altitude above sea level (thousands of feet) | 0 - 2.3 | 2.3 - 4.9 | 4.9 - 8.2 | 8.2 - 11.5 |
|---|---|---|---|---|
| Pressure (bar) | 1 - 0.93 | 0.93 - 0.84 | 0.84 - 0.74 | 0.74 - 0.65 |
| Surface pressure at end of decompression | 0.95 | 0.86 | 0.76 | 0.67 |

At altitude, the depth is displayed as the sea level equivalent depth not linear distance from the surface.

## Appendix H - Explorer Oxygen Cell Interconnect Wiring



## References:

1) Standard Practice for Use of the International System of Units (SI). Document E380-89a, American Society for Testing and Materials. Philadelphia, PA, 1989.

2) U.S. Standard Atmosphere, 1976. United States Committee on Extension to the Standard Atmosphere. National Oceanic and Atmospheric Administration, Washington, D.C. (NOAA-S/T 76-15672): Supt. of Docs., U.S. Govt. Print. Off. (Stock No. 003-017-00323-0), 1976.

3) Decompression - Decompression Sickness, Professor Dr. med A. A. Bühlmann, Springer-Verlag (ISBN 3-540-12514-9), 1983.

4) Tauchmedizin, Professor Dr. med A. A. Bühlmann, Springer-Verlag (ISBN 3-540-58970-8), 1995.

5) NOAA Diving Manual, Diving for Science and Technology. United States Department of Commerce. National Oceanic and Atmospheric Administration, Washington, D.C, 1991.

6) U.S. Navy Air Decompression Table Handbook And Decompression Chamber Operators Handbook. United States Department of the Navy. Naval See Systems Command, Best Publishing Company.

7) Decompression Theory, a monograph by B. R. Wienke, Ph.D., Los Alamos National Laboratory.

8) Mastering Rebreathers, Jeffrey E. Bozanic, Best Publishing Company, (ISBN 0-941332-96-9), 2002

## GLOSSARY

Many abbreviations are used in manual. The following listing provides a convenient listing if you cannot remember a particular abbreviation.

| | |
|---|---|
| ATA | Atmosphere Absolute |
| ATM | Atmosphere |
| AVG | Average Dive Depth |
| BT | Bottom Time |
| CC | Closed circuit |
| CD | Change Depth |
| CF | Computational Formula or Calculation Formula |
| CO | Communication Mode (Mode 4) |
| COMP | Gas Mix Composition |
| Deco | Decompression |
| DN | Dive Number |
| END | Equivalent Nitrogen Depth |
| Err | Error |
| fsw | feet of sea water |
| ft | feet |
| He | Helium |
| HSE | HydroSpace Engineering, Inc |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| m | meters |
| min | minutes |
| msw | meters of sea water |
| N | Nitrogen |
| N He | TRIMIX, Nitrogen, Helium |
| $N_2$ | Nitrogen |
| ND | No-Decompression |
| $O_2$ | Oxygen |
| OC | Open Circuit |
| OTU | Oxygen Tolerance Units (Same as UPTD) |
| PC | Personal Computer |
| $PPO_2$ | Partial Pressure of Oxygen (in Atmospheres or Bar) |
| sec | Second |
| SI | Surface Interval |
| TEMP | Temperature |
| TTF | Time To Fly |
| TTS | Time To Surface |
| UPTD | Unit Pulmonary Toxicity Dose |
| V | Volt |

**Conversions**

| | |
|---|---|
| 1 ml = 1 cc | Volume to weight = cc x Specific Gravity = Grams |
| 1000 ml = 1 Liter | Weight to Volume = Grams ÷ Specific Gravity = cc |
| 29.5 ml = 1 fl. oz. | Temperature: °F – 32 x 0.556 = °C |
| 3.78 Liters = 1 Gallon | °C x 1.8 + 32 = °F |
| 473 ml = 1 Pint | 1 cubic foot = 28.31605 Liters |
| 947 ml = 1 Quart | 1 Meter = 3.2808399 Feet = 39.370079 Inches |
| 454 Grams = 1 Pound | 1 Atmosphere = 1.01325 Bar = 14.6960 PSI = 33 FSW |
| 1 Kilogram = 2.2 lbs. | 1 Cubic Inch = 0.01638661 Liters |
| Density = Specific Gravity (SG) x 0.99823 | 30 Feet/min. = 9 .1440 Meters/min. |

## REGISTRATION FORM

Model _____ Serial Number: _____ (Located on green circuit board) Purchase Date: _____

Owners Name: _____

Address: _____

City, State, Zip _____

Phone, Fax _____

E-mail _____

**WARNING!**
**IMPROPER USE OF THIS DEVICE CAN RESULT IN SERIOUS INJURY OR DEATH**.
Do not dive with this device until you
(1) have read the owner's manual, and
(2) understand fully how to operate the device correctly, and
(3) have received proper training in the use of gas mixtures other than normal air, and
(4) have received proper training in conducting staged decompression dives.
Use of this device and/or its simulator software in any diving activity constitutes agreement by the user that s/he assumes and accepts full responsibility for all risks.

Owners Signature: _____

**Warranty**

This *HS Explorer* was tested prior to shipment and found to be free from material defects and workmanship. Should the original owner experience any problems with this device, he/she should contact HydroSpace Engineering, Inc. at the address listed below preferably via email or fax. HydroSpace Engineering, Inc. will authorize a return and repair or replace the unit. The *HS Explorer* shall be returned freight prepaid. A return shipping and handling charge may be assessed on *HS Explorer's* from 30 days of original shipment. The owner will be contacted for expenses outside the scope of this warranty.

The warranty is null and void if:

- **The product is not registered within 10 days of purchase.**
- The battery has been inserted backwards (reverse polarity).
- The unit has been dried with compress air (gas).
- The lens has been removed or the lens screws loosened. This will invalidate the transducer calibration and produce depth reading errors.
- The product has been modified in any way.
- The product has been abused.
- The product's limits have been exceeded or dry (chamber) exposure.
- The product has been exposed to any material that causes damage to the case, lens or o-rings.
- The product has been maintained in a manor inconsistent with is usage or standard practices.
- Transducer damage by foreign objects.

REPAIR CHARGES WILL BE ASSESSED ON INVALIDATED UNITS!

Make a copy of this registration for your records and send the original to:

HydroSpace Engineering, Inc.
6920 Cypress Lake Ct.
St. Augustine, FL 32086 USA

Tel: 904.794.7896 Fax: 904.794.1529
E-mail: support@hs-eng.com