

# Owner's Manual



ORCA®  
Division of EIT, Inc.  
100 Carpenter Drive  
Suite 102  
P.O. Box 1337  
Sterling, VA 22170

Phone: (703) 478-0333 FAX: (703) 478-0815



## PHOENIX™

CEILING ALARM

0% ALLOWED NITROGEN 100%

REMAINING ND TIME 91 MIN

DEPTH 41 Ft

DIVE TIME 32 MIN

0 500 1000 1500 2000

TANK PRESS. 1270 PSI

78 F | AIR LIMIT 13 MIN

ASCEND SLOWER

ORCA, Division of EIT, Inc.  
100 Carpenter Drive, Suite 102 Sterling, VA 22170  
Phone: (703) 478-0333 FAX: (703) 478-0815

**WARNING**

**IMPROPER USE OF A DIVE COMPUTER CAN LEAD TO SERIOUS INJURY OR DEATH.**

**THE PHOENIX™ CAN NOT ELIMINATE ALL RISK OF GETTING THE BENDS, EVEN WHEN USED PRECISELY ACCORDING TO MANUFACTURER'S INSTRUCTIONS.**

**ANY DIVING INVOLVES SOME RISK OF GETTING SOME FORM OF DECOMPRESSION SICKNESS. YOU MUST BE WILLING TO ACCEPT THIS RISK WHEN YOU DIVE.**

No dive computer is a substitute for training and common sense. A dive computer should never be relied upon as the sole means of planning and monitoring a dive. Use back-up equipment and check it regularly.

Do not use this instrument until you have read this manual and the accompanying booklet "DIVE COMPUTERS AND DIVING SAFETY."

ORCA®  
A Division of EIT Inc.  
P. O. Box 1337  
Sterling, VA 22170  
Phone: 703-478-0333 FAX: 703-478-0815

***Why read this manual?***

Operation of the Phoenix is so clear that it is possible to use it without even looking at this manual.

On the other hand, to use the Phoenix safely it is absolutely necessary to read this manual. The Phoenix is a tool. It tells you about important conditions of your dive and gives you advice about what to do. Both this manual and a recent course in dive safety are necessary in order for you to know how to use the Phoenix's advice properly.

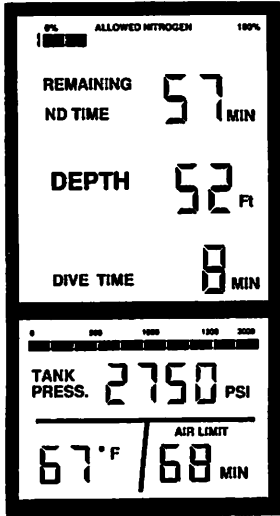
Some special features of the Phoenix are NOT obvious. Some of the numbers provided by the Phoenix are limits and need to be understood as starting points, not rules. This manual explains what those limits mean and how they are generated so that you can know how to use them properly.

Also before you start, appreciate that a dive is no place to take your safety lightly. We'd like to keep you a healthy and happy customer! Please read carefully the accompanying booklet, "DIVE COMPUTERS AND DIVING SAFETY." If you did not receive the booklet, call ORCA (number on back) immediately and one will be sent to you free of charge.

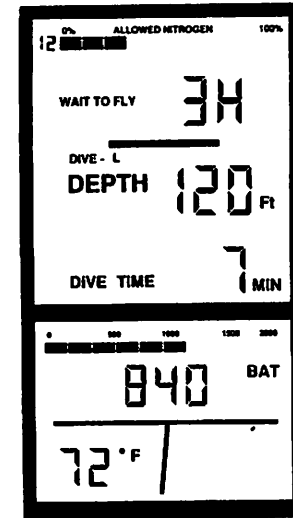
Next, place your Phoenix under the one-year warranty by returning your warranty card.

# SURFACE MODE

### SCREEN #1 Scrolling Dive Tables

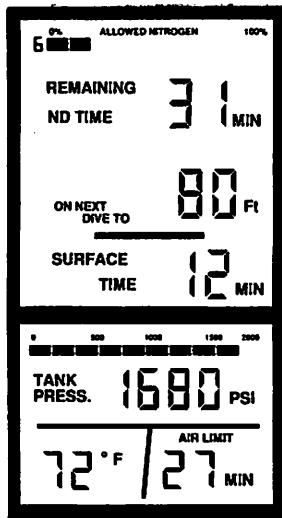


### SCREEN #2 Wait to Fly & Dive Logs

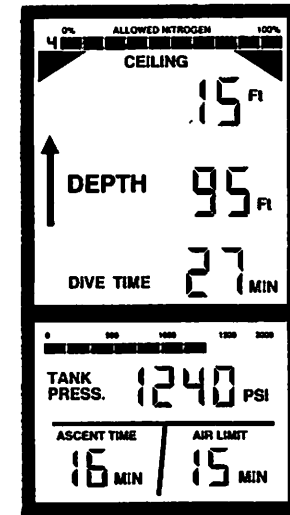


# DIVE MODE

### SCREEN #3 No Decompression



### SCREEN #4 Decompression



**HOW TO USE THIS MANUAL**

Throughout this manual, words or phrases in **BOLD ITALICS** refer to numbers in the instrument window. "WARNINGS" are included in some places to point out where special care is required because the degree of risk is unusually high.

**WARNING**

**THIS MANUAL CANNOT POSSIBLY POINT OUT ALL THE AREAS OF POTENTIAL DANGER. THIS MANUAL IS NOT A SUBSTITUTE FOR A COURSE IN DIVING SAFETY.**

**WARNING**

**TO USE THE PHOENIX SAFELY, YOU MUST NOT BLINDLY FOLLOW RNDT, CEILING, AND "WAIT TO FLY" NUMBERS. THESE NUMBERS ARE LIMITS. YOU MUST KNOW HOW TO INTERPRET LIMITS AND KNOW HOW TO ADD PERSONAL SAFETY MARGINS.**

Like all water sports, diving contains an element of risk. The Phoenix cannot eliminate risk. It is only a tool to help you manage the degree of risk you wish to accept. The limit numbers shown by the Phoenix give you the starting point. **To these limits you must add SAFETY MARGINS** to achieve the degree of risk you wish to take. And remember, the **SAFETY MARGINS** you choose should vary from day to day depending on your condition on the day of the dive.

Remember also that new information is continually being learned about diving physiology. The advice in this manual is based on the best information available at the time it was printed. It is your responsibility to stay up to date.

Also, don't forget that diving is an activity that is not natural to humans and therefore many safety practices will not be instinctive to you. Reread the safety booklet occasionally and keep up your training with refresher courses.

Finally, don't let the marvels of Phoenix keep you from using proper back-up equipment. Be prepared to know if your instrument is not acting properly.

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## INTRODUCTION

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Each minute underwater is to be cherished. The Phoenix was designed for serious divers who need a rugged, reliable instrument that will help them get the most out of each of those valuable minutes. The Phoenix has:

**Simplicity**—so that precious time is not wasted trying to understand the instrument.

**Large display**—so that it can be easily read through a fogged mask or in murky water.

**Field replaceable battery**—so you don't have to send your computer back to factory, to have a battery changed.

**Aviation-quality electronics**—for ruggedness. The Phoenix does not use the less expensive technology used in watches and toys.

The Decompression Model used by the Phoenix is the same Orca Decompression Model that has been in use for more than nine years and (at this printing) over five million dives. On square profile dives, the Orca Model will provide limits that are more conservative than the U.S. Navy Table limits. Yet on most sport dives, the Orca Model limits will give you more bottom time than the Navy limits. This apparent contradiction works because most sport dives are multi-level. Sport divers rarely spend their entire dive at one depth. The Phoenix computes your **REMAINING ND TIME** (Remaining No-Decompression Time) limits by taking into account every depth change.

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PHOENIX systems Dive Computers are covered under U.S. Patent 4,192,001, 4,782,338 and 5,049,864.

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## CHAPTER 1/USING YOUR PHOENIX

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This chapter walks you through a step-by-step sequence of operations. Refer to pages 4 and 5 as you read through the chapter.

### GETTING STARTED

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#### 1. Attach the PHOENIX to the Regulator.

The Phoenix should be attached to the high pressure port of the regulator in place of the pressure gauge. On most regulators it is a simple procedure. If you are uncertain how to do this, your local dive store can help.

#### 2. Attach the regulator to a SCUBA tank.

#### 3. Turn on the air.

Within 10 seconds, your Phoenix will turn on automatically, provided the tank has at least 250 psi. (The Phoenix will stay on until the air is turned off **AND** all residual nitrogen has been cleared.) For the first 15 seconds after your Phoenix turns on, the screen will light every segment of the display and illuminate all of the LEDs (See Chapter 5.). If the air is turned off and you do not dive within 1/2 hour after turning off the air, your Phoenix will turn itself off

#### 4. Plan your dive.

The Phoenix will now give you information to help plan your next dive or review your last three dives.

Refer to pages 4 and 5 of this manual to review the meaning of the terms that appear on the Phoenix display and in this manual (words on the display are in **BOLD ITALICS**).

## **DEFINITION OF TERMS**

**CEILING ALARM**—Top red light flashes to warn you that you need decompression and therefore have a "Ceiling Limit" above which you may not ascend.

**ALLOWED NITROGEN**—A patented bar graph showing the controlling tissue number and the calculated tissue nitrogen level as a percent of its Theoretical Nitrogen Over-pressure Limit.

**CEILING**—The shallowest depth LIMIT above which you may not ascend without exceeding your Theoretical Nitrogen Over-pressure Limit. "Ceiling" is similar to a first decompression stop depth.

**REMAINING ND TIME**—The maximum time LIMIT you may spend at the displayed depth without mandatory need for decompression. It is the amount of time left before your most critical tissue will reach 100%.

**WAIT TO FLY**—The minimum time LIMIT that must pass before you can fly in a pressurized aircraft without exceeding your Theoretical Nitrogen Over-pressure Limit.

**ACTION ARROW/BAR**—Advises you to go up, stay put, or go down.

**SURFACE TIME**—Time elapsed since surfacing at the end of last dive.

**DIVE TIME**—(Shown on surface) - Duration underwater of previous dive, sometimes erroneously referred to as "bottom time."

**DIVE TIME**—(Shown underwater) - Time since descending below 6 feet on this dive.

**ASCENT TIME**—In a situation requiring decompression, the time required to reach the surface at the ORCA ascent rates, including delays for decompression.

**AIR LIMIT**—The time LIMIT, in minutes, at your current depth and consumption rate until your tank pressure reaches 500 psi.

**ASCEND SLOWER**—Bottom amber light flashes to warn you that you are ascending too rapidly.

## **OTHER TERMS FOUND IN THIS MANUAL**

**Limit**—A time or ceiling number that should not be followed absolutely, but must be interpreted to use properly. (See Chapter 2, Limits, Risk Level, and Safety Margins.)

**Surface Mode**—The method of operation when the Phoenix is on the surface.

**Dive Mode**—The method of operation when the Phoenix is on a dive.

**Repetitive Dive**—Any dive made when body tissues still contain residual excess nitrogen from an earlier dive.

**Decompression Model**—The mathematical model of the human body used to calculate dive tables and computer limits.

**Theoretical Nitrogen Over-pressure Limit**—The limit of calculated excess nitrogen allowed to be present in your tissues without decompression being required by the Decompression Model.

**For the next section please refer to the diagrams on pages 4 & 5.**

## EXPLANATION OF SCREENS (SURFACE)

The Phoenix has 2 Modes - Surface and Dive.

Each Mode has 2 screen sets.

At the top of the screen in all modes is an **ALLOWED NITROGEN** bar with a small number to its left. This bar provides information for use by advanced divers. Throughout the Surface Mode displays, this bar displays the saturation level of various tissues. The number on the left tells which of the 12 tissues is being displayed. (See Chapter 4 for details.)

**Note:** Below the surface, the Phoenix will scroll tissue data when you're shallower than 12' in a non-decompression dive.

### Surface Mode

**Screen #1 - Scrolling Dive Tables**—For planning your dive:

In the upper window, **REMAINING ND TIME, ON NEXT DIVE TO**, are used to display the Scrolling Dive Table.

The Scrolling Dive Table is a slowly changing display that shows what the **REMAINING ND TIME** Limit is on your **NEXT DIVE TO** various depths. These Limits are shown for depths from 30 to 130 feet in 10-foot increments.

The **SURFACE TIME** window displays the elapsed time since you turned on your instrument (if you haven't yet been in the water) or since the end of your last dive.

In the lower window, tank pressure is displayed as both a bar graph and as a number. Tank pressure numbers will read accurately up to 5000 psi. The accompanying bar, however, registers "full" at 2000 psi.

The **AIR LIMIT** window shows how long your air will last at each depth of the Scrolling Dive table—based on the tank size and air consumption on your last dive. Changing to a different size tank will make the AIR LIMIT number inaccurate until you are several minutes into your next dive.

In the "Scrolling Dive Table" example on pages 4 & 5, your **REMAINING ND TIME** Limit would be 31 minutes on your **NEXT DIVE TO** 80 feet. The **SURFACE TIME** is 12 minutes.

**TANK PRESS.** is 1680PSI., the temperature is 72°F, and you have enough air to stay 27 minutes at the 80-foot depth.

**Screen #2 -Wait To Fly & Dive Logs**—For planning a flight or reviewing your last dive:

After each complete cycle through the Scrolling Dive Table, the display changes for 18 seconds to show **WAIT TO FLY** and logs of your last three dives.

Below **WAIT TO FLY**, the screen shows a record of your **LAST** dive (**DIVE 1**)—the maximum **DEPTH** and total **DIVE TIME** on that dive. After the 6 seconds, the display changes to show you a log of the dive immediately preceding your last dive (**DIVE-2**). After another 6 seconds, the log changes to the dive before dive 2, (**DIVE-3**).

During the display of dive log information, the tank pressure display changes to a battery voltage display (explained in Chapter 3).

After all three logs have been displayed, the Scrolling Dive Table will begin again from 30 feet.

The "Wait to Fly and Dive Log" example on the fold-out shows that you must **WAIT TO FLY** at least 3 HOURS; the maximum **DEPTH** of the last dive was 120 feet, and your **DIVE TIME** was 7 minutes. The battery level is 8.40 volts (the decimal is not shown on the PHOENIX display), the temperature is 72°F, and the **AIR LIMIT** is blank (as it will always be in this screen).

# EXPLANATION OF SCREENS (Dive Mode)

## Dive Mode

### **WARNING!**

**ALWAYS TURN ON YOUR PHOENIX WHEN IT IS ABOVE THE WATER SURFACE.**

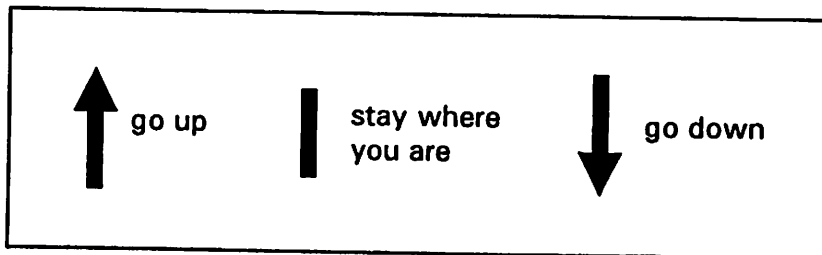
**Caution:** Check that your Phoenix is on and displaying tank pressure before entering the water.

**SCREEN #3—No-Decompression Screens**—For normal sport dives:

When you descend below 6 feet, the Phoenix goes into Dive Mode. Once in Dive Mode, the **ALLOWED NITROGEN** tissue bar displays the status and number of the controlling tissue. The **REMAINING ND TIME** shows the Limit of time at the present depth until the tissue bar will reach 100%. If you ascend, your **REMAINING ND TIME** Limit will increase, reflecting credit for the off-gassing which occurs during the shallow portions of the dive. Descending will cause your **REMAINING ND TIME** Limit to decrease.

The first appearance of a **REMAINING ND TIME** Limit will occur as you descend below 12 feet. At first, the reading will be in hours (*H*), then in minutes. (See Chapter 5, Time Displays.)

On the left side of the display next to the **DEPTH** window is the Action arrow or Action Bar. The **Action Arrow/Bar** advises you of what to do in critical situations. It advises you to:



The **Action Arrow/Bar** is normally not seen until you get close to or exceed some Limit (such as ascent rate). When the **Action Arrow/Bar** changes from steady to flashing, it is warning you of increased danger and its message is urgent.

**DIVE TIME** activates when you go below 6 feet and turns off when you ascend above 4 feet. It will only reset if you spend more than 10 minutes on the surface, so surfacing briefly during a dive will not disturb your dive timer logbook reading.

**AIR LIMIT** tells you how much time your air will last at your current depth and consumption rate before your tank pressure drops below 500 psi. **AIR LIMIT** becomes more accurate as the dive progresses.

SCREEN #3 on page 4 shows a diver at 52 feet. He has a 57-minute **REMAINING ND TIME** Limit left and has been below 6 feet for 8 minutes. He has 2750 psi of air remaining, which will last for about 68 minutes at this depth and consumption rate.

### **WARNING**

The next section deals with decompression diving. Decompression diving should be attempted only by divers trained in decompression diving. **DO NOT** attempt decompression diving without first going through a decompression course administered by a certified professional.



**SCREEN #4 -DECOMPRESSION SCREENS**—For experts only (most sport divers will never see this screen):

**WARNING!**

**DECOMPRESSION DIVING CAN BE EXCEEDINGLY DANGEROUS.** No attempt is made in this manual to explain the many considerations essential to safe decompression diving. Reading this manual cannot replace a professional course of instruction or professional supervision.

When the **REMAINING ND TIME** Limit has dropped to 0, the **ALLOWED NITROGEN** tissue bar will reach 100%. The upper window will change to display the **CEILING**. The **CEILING ALARM** light will begin flashing. Additionally, the instrument will assume you wish to decompress and will show a steady Up Action Arrow.

Decompression divers are concerned with 4 zones:

Action Arrow Display	Zone	Tissue Status
↓ Flashing Down Arrow	Ceiling Violation	Probable Bubbling
	Optimum	Optimum Decompression
None	Sub-Optimum	Some Decompression
↑ Steady Up Arrow	Take-up	Adding Nitrogen

The Optimum Decompression Zone is from the **CEILING** Limit to 10 feet below the **CEILING** Limit. To decompress optimally, simply ascend at the proper ascent rate until your depth is 10 feet under the **CEILING** Limit. Then follow the "stay where you are" Action Bar as it rises slowly to the surface (see "Riding the Bar" on next page).

**WARNING!**

**NEVER ASCEND ABOVE YOUR CEILING LIMIT.** If you do ascend above your **CEILING** Limit, don't dive again until you can be sure that any bubbles that may have formed in your body have dissipated. If you develop decompression sickness symptoms, consult a doctor immediately. (See Chapter 2, Tissue Bubbles.)

Screen #4 on page 5 shows a diver on a decompression dive at 95 feet. He has a 15-foot **CEILING** Limit and has been below 6 feet for 27 minutes. He has 1240 psi of air remaining, which will last for about 15 minutes at this depth and consumption rate. If he starts now, his **ASCENT TIME** to the surface, allowing for decompression, will be 16 minutes. (He should start now!) The Up Arrow indicates that he is continuing to take-up nitrogen at this depth and, therefore, must ascend to decompress.

## ASCENDING WITH THE PHOENIX

### **WARNING!**

**EXCEEDING THE RECOMMENDED RATE OF ASCENT OR CEILING LIMIT CAN CAUSE SERIOUS INJURY OR DEATH. (See Chapter 2, Tissue Bubbles.)**

Your rate of ascent is very important to safety. If you come up too fast, the Phoenix flashes its depth number and illuminates the amber "ASCEND SLOWER" light. Should that happen, HALT YOUR ASCENT! Wait until the light goes out and the numbers stop flashing. This will happen when your proper maximum ascent rate catches up to where you are. Then restart your ascent, but slower. Adjust your ascent rate so that you just "Ride the Bar" and do not trigger the ASCEND SLOWER alarm.

### Riding the Bar

About 5 feet below the point where you would be ascending too fast, or 10 feet below your CEILING Limit, the Action Arrow will show a steady Bar. Your best ascent rate is easily followed if you ascend until the bar shows, then stop until it disappears. Then rise until you get a bar again, and stop until it disappears. By using this technique, you will get to the surface optimally and never be in danger of exceeding either your ascent rate or ceiling. With a little practice, you will be able to make a smooth ascent, staying just in the optimum zone where the Bar slowly appears and disappears.

## AFTER THE DIVE

Back on the surface, the Phoenix returns to its Surface Mode.

If you descend again within 10 minutes of surfacing, the *DIVE TIME* will restart where it left off, adding new time to the last dive time. (This is in accordance with standard practice that treats two close-together dives as a single dive.)

After a dive, turn off your air and bleed the regulator to relieve all pressure. You may remove your Phoenix from the tank if you wish. It will continue to calculate until your nitrogen levels are computed to be back at sea level, then turn itself off. When the Phoenix is on the surface with residual nitrogen, but without tank pressure, the Scrolling Dive Table screens last for six seconds each instead of three. The *AIR LIMIT* will be blank, since no air is attached. When in this mode, the Phoenix is not ready to dive. It must be reattached to the tank and pressurized before the next dive.

## CHAPTER 2/SPECIAL SITUATIONS AND SAFETY

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This is the most important chapter in this manual. It deals with your safety and some special features of the Phoenix.

### LIMITS, RISK LEVEL & SAFETY MARGINS

It is becoming apparent that some people are unusually vulnerable to decompression sickness. While the *REMAINING ND TIME* Limits and *CEILING* Limits calculated by the Phoenix are generally more conservative than Navy Table Limits, we are finding even that degree of risk is not suitable for some sport divers. The Phoenix is designed to allow you to adjust your exposure to risk to suit your own requirements. Adding a Safety Margin to a Phoenix Limit number reduces the risk. Unfortunately there is not yet enough data to know how much a given Safety Margin reduces risk. Data is being collected that should eventually give answers to these questions. In the meantime, we recommend that you monitor your condition carefully and use the Safety Margins that make you comfortable.

Safety Margins can generally be applied in four places:

1. During the Dive—by ascending before the *REMAINING ND TIME* Limit reaches 0 or before the *ALLOWED NITROGEN* bar reaches 100% (i.e., a specific degree of conservatism can be attained by ascending when the tissue bar has 1, 2, or 3 segments still unlit);
2. During the Ascent—by slowing ascent rate and adding a decompression stop to all dives;
3. Between Dives—by increasing the minimum surface interval between repetitive dives, and
4. Before Flying—by significantly extending the time that you *WAIT TO FLY*.

### REPETITIVE DEEP DIVES

Data on the safety of deep dives made in rapid succession is very sparse. Until more information is available, **sport divers should not make repeated dives deeper than 80 feet unless the surface interval between dives is greater than 1 hour.** For dives deeper than 100 feet or after more than three dives in a series, the interval should be even longer. Some people even advise sport divers against making more than one dive per day.

### TISSUE BUBBLES

Tissue bubbles should not occur in a properly conducted dive. Dive Tables and Computer Decompression Models assume that the excess nitrogen is dissolved in your blood and tissues and has not formed bubbles. If you fail to use adequate Safety Margins or exceed your Ascent Rate or Ceiling Limits, the dissolved nitrogen may become bubbles. Once bubbles are formed they dissipate much more slowly than the nitrogen out-gas rate predicted by the Decompression Model. It may take many days after the formation of bubbles for your body to return to normal. During that time, you are extremely susceptible to decompression sickness.

#### **WARNING**

**THE PRESENCE OF TISSUE BUBBLES WILL MAKE THE LIMITS CALCULATED BY A DIVE TABLE OR COMPUTER INVALID FOR YOUR BODY UNTIL THE BUBBLES HAVE DISSIPATED.**

#### **WARNING**

**THE PRESENCE OF TISSUE BUBBLES MAY REQUIRE A SPECIAL DECOMPRESSION SCHEDULE OR TREATMENT BY A RECOMPRESSION CHAMBER.**

#### **WARNING**

**ANY SYMPTOMS OF DECOMPRESSION SICKNESS COULD INDICATE THE PRESENCE OF BUBBLES. DO NOT FLY OR DIVE AGAIN UNTIL YOUR DOCTOR PERMITS.**

Your Phoenix cannot "know" if bubbles have formed. It warns you of some of the conditions that could form bubbles in the following ways:

1. If you should ascend above the *CEILING* Limit, the top Limit numbers will flash alternately and the Down Arrow will flash.
2. If you ascend too fast, the Phoenix will flash its *ASCEND SLOWER* light and the down arrow until you have stopped and your proper ascent rate has caught up with you.

If bubbles have formed in your tissues, the *REMAINING ND TIME* Limit calculations for future dives will be inaccurate until all bubbles have dissipated. IT IS YOUR RESPONSIBILITY TO DIVE PROPERLY AND STAY CLEAR OF SITUATIONS WHICH MAY CREATE BUBBLES.

## OPTIMUM ASCENT RATES

The optimum ascent rate varies according to depth. As you approach the surface, your ascent rate should slow down. This is because as you get closer to the surface, each foot of ascent represents a greater percentage change in pressure. Part of the Orca Model's success lies in its variable ascent rate.

Depth	Maximum Allowed Ascent Rate
0 - 60 Feet	20 Feet per Minute
61 - 120 Feet	40 Feet per Minute
121- 300 Feet	60 Feet per Minute

## PREVIOUS DIVE HISTORY

### **WARNING**

**DO NOT BEGIN USING ANY DIVE COMPUTER IF YOU HAVE BEEN DIVING DURING THE PRECEDING 24 HOURS.**

When you first turn a dive computer on, it assumes your tissues are equilibrated to the surface atmospheric pressure. If you have been diving in the preceding 24 hours without using that particular computer, you probably have residual excess nitrogen in your tissues that the computer does not "know about." In this case, naturally, the Limits calculated by your computer will be invalid.

## FLYING AFTER DIVING

Flying after diving, even as much as a week later, is part of the diving environment. So is traveling to a high altitude. Be alert for symptoms of decompression sickness.

## OUT OF RANGE

THIS SITUATION SHOULD APPLY ONLY TO PROFESSIONAL DIVES WHO ARE USING THE PHOENIX AS A BACKUP ON VERY DEEP DIVES. The Phoenix is not designed for diving below 299 feet. Taken below 299 feet, the Phoenix will display "or," or out of range, while you are there. Upon returning within range, "or" will flash every three seconds for the remainder of the dive to remind you of this infraction.

Below 299 feet, the Phoenix cannot make accurate pressure readings for the decompression calculations. Calculations made when the unit is below 299 feet assume that the depth is below 308 feet. Therefore, when the Phoenix is showing "or," none of the calculations should be considered valid. For this reason the "or" will continue to be displayed even in surface mode until the unit turns off.

## **ALTITUDE CONSIDERATIONS AND HIGH ALTITUDE DIVING**

This section is not intended to replace proper training, but merely to point out features of the Phoenix which are applicable to altitude diving. Do not attempt diving at altitude unless you have had professional training in high altitude diving.

Under proper conditions, the Phoenix can be used for diving in lakes up to altitudes of 10,000 feet.

### **WARNING**

**WAIT AT LEAST 48 HOURS AFTER TRAVELING FROM LOW ALTITUDE BEFORE DIVING IN A HIGH ALTITUDE LAKE.**

When you take your body with its sea level nitrogen content to the low pressure of a higher altitude, you place it under decompression stress. The 48-hour wait allows time for your tissues to equilibrate to the low pressure of the lake altitude.

Here is a procedure that can be used for high altitude emergencies (i.e., by rescue divers who cannot wait 48 hours): BEFORE leaving sea level, start the Phoenix by attaching it to the tank and turning on the air. This begins the tissue tracking based on the sea level pressures. Then, just before entering the high altitude water, reset the Phoenix's surface reference by removing the tank air pressure (turning off tank and bleeding regulator) for 5 minutes. When the air is turned back on, the Phoenix will still be making its calculations based on your saturated sea level tissue pressures but with the new high altitude surface reference pressure.

### **WARNING!**

**DO NOT TURN THE PHOENIX ON AT SEA LEVEL AND THEN DIVE AT HIGH ALTITUDE WITHOUT RESETTING.**

## **CHAPTER 3/PHOENIX BATTERY AND POWER SYSTEM**

Use only Ultralife Lithium Batteries or high quality alkaline's.

To get the most life out of your battery, keep your air off and hose depressurized except when you are actually diving. The Phoenix draws a small amount of power from its battery even when it is off. If you put your Phoenix away for several weeks, remove the battery.

### **PHOENIX BATTERY**

#### **Battery Life Estimates**

The current Phoenix battery life estimate of 300 hours, or 15 days, is based on the use of an Ultralife Lithium 9Volt battery in warm water. With three dives per day, for one hour each, this produces about 45 dives. At four dives per day, 11 days would produce the same 45 dives.

Excessive use of warning lights, such as intensive decompression diving or excessive ascent rates, will result in shorter battery life.

All estimates assume that the Phoenix is placed on the tank one half-hour before each one-hour dive, and removed from pressure within one half-hour of surfacing. If the Phoenix is left pressurized more than this, the actual battery life will be shorter. Leaving the Phoenix pressurized constantly would result in a battery life of about ten days. Cold water will further reduce battery life.

Alkaline batteries are rated at 550 mAh, about half of the Ultralife Lithium's 1200 mAh, with an estimated battery life of about seven days at three dives per day, or 20 dives. Similar reductions in battery life occur for the use of LEDs, flashing warnings, and leaving the Phoenix pressurized between dives. Leaving a Phoenix pressurized constantly, while using an alkaline battery, should produce a battery life of about 3-4 days, or about 10 dives.

## **Shelf Life:**

The Phoenix uses power while on the shelf with the battery connected. After about two years on the shelf, the battery will be dead. For extended storage of a Phoenix, remove the battery and store it separately. Cold storage will prolong the battery's shelf life. Avoid shorting the terminals during storage.

## **Troubleshooting:**

If problems with the Phoenix battery system are suspected, check the following items before calling for repair:

1. Is it a fresh battery? Although lithium batteries have excellent shelf life—about five years—is it possible that the battery has been stored too long, shorted its terminals in storage, or been previously used? If consistent behavior is seen from one battery to the next, the batteries are probably fresh.

2. Is the Phoenix left pressurized between dives? This can significantly reduce battery life. Leave the Phoenix unpressurized until shortly before entering the water. Remove the pressure from the Phoenix within one half-hour of finishing a dive. Don't forget that long surface swims with the air on will also consume extra power. If the air is turned off for a swim, make sure to hold the Phoenix out of the water when turning it back on.

3. Are the LED warning lights being over-used? Rapid ascents can cause serious problems. Use the Phoenix ascent rate "bar" to avoid the use of the LED. Decompression diving, although calculated by the Phoenix, uses more power and should not be done without proper training.

## **CHANGING THE BATTERY**

Batteries are available from the Orca Service Center, your dive store, or many drug stores and retail outlets. In an emergency, you can use alkaline 9volt batteries, but they will last only a week.

## **WARNING**

### **DO NOT USE A RECHARGEABLE BATTERY.**

Rechargeable batteries, such as nickel cadmium cells (Ni-Cads) will give little or no low-battery warnings, before loss of power. They may also give off gas and cause damage to the instrument or to you.

Although change-over is simple to accomplish, it is best to read this section thoroughly and practice before you get on a pitching boat.

Keeping the battery clip attached, remove the old battery from the compartment. Have the new battery ready to go in. Move the clip from the used battery to the new battery. You have 15 seconds to make this move without endangering the computer's memory. (In this situation, 15 seconds is longer than it sounds.) The screen will go blank during the change—that is normal.

Ensure that the clip is securely pressed on the new battery and insert the new battery into the battery compartment. The extra wire can be fed down alongside the battery.

When the new battery has been properly installed, Phoenix will turn on within five seconds and display the battery change screen showing the current battery voltage. The battery change screen remains displayed for thirty seconds, at which point the Phoenix continues where it left off when the battery was removed. If the battery is not installed, or installed incorrectly, the Phoenix will turn off and lose memory.

Inspect the O-ring on the battery door and its mating surface in the case. Both should be clean and lightly greased with SILICONE grease only. If necessary, remove the O-ring, clean the groove, and put a coating of silicone grease on it.

**CAUTION: Vaseline or petroleum grease will damage the case and void the warranty.**

Replace the door by engaging the threads, gently pushing and turning.

**CAUTION:** Make sure the wire is out of the way of the door threads. Be careful here. **DON'T JAM THE THREADS!** When the threads catch, screw down the door until it seats against the case. The O-ring makes the seal, not the torque applied to the door. **DON'T OVER-TIGHTEN.**

If you should make a mistake and lose power when changing the Phoenix battery, residual nitrogen information will be lost and (if you have been diving in the preceding 24 hours) you will need to refrain from diving for 24 hours before restarting your computer.

## LOW BATTERY WARNING

The Phoenix has a unique warning system designed to give you many days advance notice of impending need to change batteries. The word "Lo" appears in one or more places on the screen depending on how much battery life is left. The following chart shows the various warning levels:

Voltage	Display	Life	Phoenix Operation
Over 9Volts	Normal	300+ Hours	Normal
7.5 - 8.0Volts	Lo	75+ Hours	Normal
7.2 - 7.5Volts	Lo Lo	15+ Hours	No Lights
7.1 - 7.2Volts	Lo Lo Lo	3+ Hours	Don't Dive!
Under 7.1Volts	Lo Lo Lo Lo	0 Hours	Shut down

**Safety Note:** Lithium batteries rebound somewhat during periods of non-use. The battery life times given here are worst-case situations involving continuous, first time use. Depending on the battery use history, actual time remaining between the various "Lo" indications could be greater or less than described above.

## CHAPTER 4/SPECIAL FEATURES

### ACTION ARROW BAR

At one time or another, most divers encounter periods of confusion. The Action Arrow/Bar will tell you at a glance when you need to do something. It flashes when the need is urgent. Here are the three indications and what they can mean:

↓ "Down Arrow"—Go down! You have exceeded your ceiling or ascent rate. Your instrument readings may be no longer valid.

█ "Bar"—Stay where you are! You are in the ideal zone. If you rise further, you will exceed your ascent rate or ceiling. Wait until the bar disappears before ascending further.

↑ "Up Arrow"—Go up! You are beyond the no-decompression limit. If the Arrow is flashing, you have descended into over-range and your instrument readings are not valid without modification. The "Up Arrow" also flashes if your battery is dangerously low.

If you dive properly, you should never see the Up or Down Arrows. You will routinely use the Bar to regulate your normal ascents.

### GRAPHIC TISSUE BAR

The Phoenix contains two advanced features, which are not essential to basic use of the instrument:

**ALLOWED NITROGEN Tissue Bar and Tissue Number:**

The **ALLOWED NITROGEN** bar graph shows the status of a tissue in the mathematical Orca Model. The number to the left shows which tissue is being displayed.

Tissue Bar Position	Meaning
0% - No segments lit	Tissue is at Sea Level (or Surf. Pressure)
100% - All segments lit	Tissue is at Maximum permitted N <sub>2</sub> Level

On the surface, the **ALLOWED NITROGEN** bar sequentially displays the status of all 12 tissues. Underwater, the **ALLOWED NITROGEN** bar displays only the controlling tissue—the tissue which is calculated to reach 100% first. When a tissue reaches 100%, it has reached its Theoretical Nitrogen Over-pressure Limit and the Model will not allow the diver to surface without decompression. The number of the controlling tissue is displayed to the left of the tissue bar, as 1 through 12. Tissue number 1 is the fastest tissue, with a 5-minute half time. Tissue number 12 is the slowest tissue, with a 480-minute half time. In general, the slower the controlling tissue, the longer the no-decompression limit and the longer the required decompression if the No-Decompression limit is exceeded.

## DIVE/DATALOGGER™:

The Phoenix displays logs for the last three dives as part of the Scrolling Dive Table. It doesn't matter whether these dives were made earlier in the day, or last year, it always displays the last three. Internally, the Phoenix remembers much more than it displays. Ten previous dive logs are actually stored in internal memory. Dive logs, however, don't really give adequate information when dives are multi-level. Therefore, in addition to the dive logs, the Phoenix's DataLogger™ stores detailed profiles of the most recent 35 underwater hours. The profile data points represent the greatest depth reached during each 2.5 minute segment of time spent underwater. Time between dives is also recorded.

The DataLogger is in permanent non-volatile memory, it cannot be damaged or erased by removing the battery. The DataLogger memory is accessible through use of the optional

ORCA DataReader™. The DataReader extracts the information from the Phoenix for display on a personal computer.

DataLogger can be read and the information printed out for the owner by your local ORCA dealer. The information can also be fed into a data bank to assist further research into the human body's reaction to diving. By using your Phoenix and returning it regularly for service, you are taking part in diving research that has never before been possible.

## ACCESSORIES

The Slate Kit mounts on the back of the Phoenix. The slate is attached to the back of the unit with the four screws provided and can be used as a large writing surface.

The Protective Pouch is a padded bag for travel protection of your Phoenix.



## CHAPTER 5/OPERATING NOTES

### ALPHA MESSAGES

The following messages may be displayed by the Phoenix during operation:

***LO***w battery (*LO*)

comput*Er* Error (*EE*)

***Q***ut of ***R***ange (*OR*)

***go dn*** (danger, you have violated your CEILING)

***go uP*** (begin ascent)

### INITIAL POWER-UP

After applying air to the Phoenix by turning on your air, the Phoenix will light up all segments of its display and LEDs. Immediately following this the display will go blank and then the Phoenix will read its battery voltage and establish the ambient surface pressure.

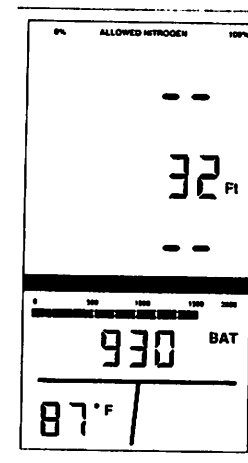
Battery voltage is indicated by the number in the tank pressure window and by the bar graph. New batteries show a voltage above 9.00. The bar graph reads full at 10.00 volts, and empty at 5.00 volts. Each of the graph's 10 segments represents .5 volts. When the voltage drops below 7.10, the Phoenix shuts off. (See the chart on page 28.)

The Phoenix displays the ambient "surface reference" pressure in feet of sea water equivalent (31, 32, 33, or 34 at sea level). It will, of course, read less at altitude (if you are doing high altitude diving, see Chapter 2, Altitude Considerations And High Altitude Diving). If the reading is greater than 36 or less than 16, the computer will not accept these values as a valid surface pressure and will not proceed further.

Displayed for 2  
seconds during  
power-up.

Surface Reference  
Pressure

Battery Voltage



### TIME DISPLAYS

All times are in minutes unless followed by an *H*. If the Phoenix needs to display a time longer than 19 hours (*19H*), it will be displayed as *HH*. For a time longer than 42 hours, the display window will be blank. The only situation in which you are likely to see either *HH* or a blank will be as a **REMAINING ND TIME** Limit when you are near the surface. At a depth of 12 feet or less, **REMAINING ND TIME** Limit will always be blank (indicating infinity).

### AIR LIMIT CALCULATIONS

The method used to predict the length of time that your tank will last provides a reasonable estimate of your remaining air time. Weighted time averaging is used to desensitize the **AIR LIMIT** number to brief uses of air other than breathing (like filling your BC), yet still adjust adequately for increases or decreases in your exertion level. The **AIR LIMIT** number is less accurate at the beginning of your dive than it is in the middle or towards the end. The longer you dive, and the more consistent your exertion level, the more accurate the **AIR LIMIT** estimate will become.

## **SWIMMING ON THE SURFACE**

If you make a surface swim with your air off, make certain that when you turn the air back on, the Phoenix is out of the water. The Phoenix needs 10 seconds out of the water after turn-on to establish its surface reference pressure.

### **Wearing the Phoenix**

The Phoenix comes in a protective boot. There are two 1/8" holes in the end of the boot, which you can pass a line through to attach to a clip or snap. You can then snap the Phoenix to your BC to avoid dragging it over rocks or coral.

## **MAINTENANCE AND CARE**

1. Never leave the Phoenix out in direct sunlight or in a potentially high temperature environment. This will cause the display to fade and possibly damage the electronic components inside the unit.
2. Rinse the Phoenix in clean, fresh water and dry it after each use. Washing the exterior of the unit with mild soap and rinsing thoroughly is good for removing salt and stains.
3. Avoid excessive shock to the unit such as dropping it. A protective pouch is available to protect the LCD and unit in your dive bag.
4. Do not probe into the back of the Phoenix. This will disrupt the integrity of the seal and render the unit unwarrantable. Do not attempt to remove the case back.
5. The battery should be removed from the unit during long periods of inactive service. Inspect compartment for moisture and clean out if necessary.
6. Periodically inspect and grease the battery compartment door O-ring with silicone grease. Make sure the O-ring seal area inside the battery compartment is clean and free of scratches. This will insure a proper seal and ease of operation.
7. In the event that sea water enters the battery compartment, remove the battery and flush out the compartment with fresh water or alcohol. If the battery clips are in good condition, there has probably been no harm done (the electronic compartment is separately sealed). Simply

replace the battery and ensure that your O-ring is not nicked and that it is clean and lightly greased with silicone grease.

8. Do not expose the Phoenix to solvents, petrochemicals, or strong cleaners. Do not use any grease on the O-ring other than silicone grease.

9. If a battery wire breaks or comes loose, send the unit to the Orca Service Center for repair

## **BACKGROUND AND THEORY**

Calculating safe dive times is made complicated because when the human body is under pressure, it does not absorb nitrogen uniformly. In a dive, some tissues such as blood in the lung capillaries and the lung tissues themselves are directly exposed to the pressurized nitrogen and absorb it very quickly. Other tissues such as bone tissues are far removed from the pressurized gas and therefore absorb it very slowly. "Fast" tissues such as the lungs will reach equilibrium (saturation) in a matter of a few minutes, while "slow" tissues may take hours. When the pressure is removed, of course, just the opposite occurs. Fast tissues degas quickly, slow tissues take hours.

In reality, there are not just two tissue speeds, but a continuous range of intermediate tissues between fast and slow.

Here is a somewhat simplified version of what happens during repetitive dives (the numbers are chosen to make the math easier): The first dive is relatively straight forward. The Orca model would allow you to stay 19 minutes on a no-decompression dive to 100 feet. For the purpose of this example, let's say you dive to 100 feet, stay 15 minutes and return to the surface at the proper ascent rate. On the surface before you started your dive, your tissues were equilibrated with air (mostly nitrogen) at 1 atmosphere (an "atmosphere" is the normal pressure at sea level = 14.7 psi or about the same as 33 fsw). At 100 feet, the gas pressure in your lungs was 4 atmospheres and your tissues tried to absorb enough new nitrogen to become equilibrated at this new pressure. Your fast tissues picked up the gas pretty quickly, but because you were at pressure only 15 minutes, your intermediate and slower tissues picked up less—perhaps only 20% as much

as the fast tissues. During the time that it took you to ascend to the surface, your fast tissues out-gassed quickly, causing no problem. Your slower tissues, however, lost very little of their newly absorbed nitrogen. In this example, some of your slower tissues (actually your intermediate tissues) picked up and held enough extra nitrogen to be significantly charged when you reached the surface. In fact, even after you have been on the surface for 30 minutes, your intermediate tissues will have lost only a small percentage of their new nitrogen<sup>1</sup>.

Now as you prepare for your next dive, your intermediate tissues contain residual nitrogen from the first dive. Let us assume you wish to make your second dive a no-decompression dive. If you start your second dive 30 minutes after finishing the first, your intermediate tissues are still close to having the maximum permitted nitrogen level. Obviously, on another dive to 100 feet, your allowed RNDT time will be significantly shorter. (In actual practice, don't use such a short surface interval between dives this deep.)

If you make several more dives—even no-decompression dives—more and more of your slower tissues will become charged to their permitted limit, and longer and longer surface intervals will be required to allow even a short bottom stay.

Here is where conventional tables become hopelessly complex and errors compound themselves. The situation becomes even more tangled if, instead of the simple dives described in our example, the dives are multilevel dives. Because the Phoenix uses calculations instead of tables, complicated dive profiles are not a problem.

The Phoenix mathematically models 12 different tissue speeds<sup>2</sup> and tracks the amount of nitrogen in each. By using the Orca Decompression Model<sup>3</sup> to compare the tracked levels with the known limits, the Phoenix is able to calculate how much margin actually remains in your most saturated tissues and, if they are over the limit, how shallow it is safe to ascend.

<sup>1</sup>Gas transmission and absorption is directly proportional to differential pressure (delta P). The delta P between slow tissues at surface equilibration and 100 fsw starts out at 3 atmospheres and diminishes with gas take-up. Back on the surface, the delta P between tissues loaded with maximum permitted nitrogen level and ambient is substantially less than 1/2 atmosphere. Therefore, the in-gassing of your slower tissues that takes place when you first reach 100 feet is 5 to 10 times faster than the out-gassing that takes place when you reach the surface.

## QUESTIONS AND ANSWERS

Q. Can I get the bends while using the Phoenix?

A. Yes. No dive computer can guarantee against getting the bends. The only guarantee against getting the bends is not diving. Even aquarium divers who never go below 30 feet occasionally get the bends. You can manage your risk most effectively by using Safety Margins. Be sure to read the accompanying safety booklet.

Q. If I exceed my ascent rate or depth limitation, the Phoenix continues to display ND limits, etc. Isn't that dangerous?

A. Yes. But the alternative is worse. Computers that freeze up or shut down leave the diver "flying blind." We think it is better to continue giving the diver the Limit numbers so that, from his training, he can determine what action should be taken. But remember, the numbers are the numbers that you would have gotten had you NOT violated your Limit.

Q. I have just finished a dive and plan to dive later in the day. Can I turn my air off?

A. Yes, definitely. Your computer will keep recalculating even with the air off, but it will use much less power. Always turn your air off after a dive and bleed your regulator to relieve pressure.

<sup>2</sup>Tissue speeds are designated by their "half-time." Half-time is the time it takes for a tissue to go 50% of the way from the old pressure to the new pressure. The Orca Model uses tissue half-times beginning with 5 minutes (10, 20, 40 eg.) up to 480 minutes (8 hours).

<sup>3</sup>With the development of ultrasonic Doppler detectors, it became possible to detect the formation of small bubbles in the bloodstream. The Orca Model is based on low-bubble limits as determined and verified by Doppler evaluation of venous gas emboli following multilevel dive profiles. Orca has conducted extensive studies to examine the effect of multilevel dives on human subjects. The results have shown that the profiles tested were safe to all divers exposed. See also Doppler Evaluation of Multilevel Dive Profiles by Karl E. Huggins, Proceedings of the Fourteenth International Conference on Underwater Education, Chicago Ill., November 3-6 1983.

**Q. Is the Phoenix affected by radio transmitters or radar?**

**A. Not normally. The Phoenix is rugged both physically and electronically. However, you should keep both you and your Phoenix out of the "line of fire" of a boat's radar antenna, and at least 10 feet from a transmitting radio antenna. These requirements are not normally a problem with proper antenna installations.**

**Q. If I forget and get into the water without turning my air (and the Phoenix) on, can I turn it on underwater?**

**A. No! If you forget to turn your air on before you get in the water, hold the Phoenix above the surface and turn the air on. Wait until the Phoenix has gone through its check routine and begins showing the Scrolling Dive Tables (a wait of about 10 seconds). Then you may submerge and begin your dive.**

**Q. I am a weekend diver. How many dives can I expect from a single fresh battery?**

**A. Making three dives each day of every weekend, the battery should last for about 8 weekends, or 45 dives. (Using a Lithium battery.)**

**Q. I am on an extended diving vacation, making several dives each day. I have four days left and my Phoenix has started to show "Lo." Do I have to change the battery?**

**A. To be on the safe side, change the battery. With Phoenix, you can swap batteries without loss of dive data. Water temperature could further reduce voltage during a dive, resulting in loss of power.**

**Q. Can the Phoenix be ON in an airplane?**

**A. Yes, the Phoenix emits no EMR that would interfere with aircraft avionics. Also, air travel and security checks will do no harm to the Phoenix.**

**Q. If I snorkel during a dive trip, how can I use the Phoenix?**

**A. Because the Phoenix needs high pressure air to turn on, it cannot be used for snorkeling. If your snorkeling consists of surface swimming with infrequent short shallow dives, the computer is probably not necessary. Intensive free-diving, as opposed to snorkeling, could add significantly to tissue nitrogen levels. In this case, a non-console computer, like the MARATHON, could be used as a back-up device for scuba and a primary computer for free-diving. If significant differences develop between the MARATHON and the Phoenix, it is because of the free-diving activity, and the MARATHON results should be used.**

## TECHNICAL SPECIFICATIONS

Phoenix is available reading in either Metric or English Units.

### Decompression Model:

- \*Algorithm..... Modified Haldanean
- \*Number of Tissue Groups.....Twelve Tissue
- \*Half-Time Range..... 5 minutes to 480 minutes
- \*Tissue M Values.....Derived from No-Decompression Limits that were determined by Doppler studies, more conservative than U.S. Navy M Values
- \*Decompression Functions.....No-Decompression Times, Decompression Indicator and Ceiling, Repetitive No-Decompression Time, Analog Tissue Bar, Controlling Tissue Number, Ascent Time

### Tank Pressure Gauge:

- \*Transducer.....0-5000 psi absolute transducer, temperature compensated
- \*Accuracy..... +/-50 psi at 5000 psi
- \*Pressure Display Range.....0-5000 psi - English  
0-400 bar - Metric
- \*Analog Tank Bar.....0-2000 psi - English  
0-200 bar - Metric
- \*Pressure Resolution.....10 psi - English  
1 bar - Metric
- \*Air Functions.....Tank Pressure, Analog Tank Bar,Air Limit

### Depth Gauge:

- \*Transducer..... 0-165 psi absolute transducer, temperature compensated
- \*Accuracy..... +/-0.45 msw (+/- 1.5 fsw)

### Depth Gauge (cont.)

- \*Depth Display Range.....0-299fsw—English  
0-99msw—Metric
- \*Depth Display Resolution.....1 fsw English  
0.1 msw - Metric
- \*Depth Functions..... Present Depth,  
Maximum Depth Recorder,  
Maximum Depth Display @ Surface

### Dive Timer:

- \*Accuracy..... +/-4.32 seconds per 24 hours
- \*Range..... 0-199 minutes
- \*Activation Depth..... 6 fsw (1.8 msw)
- \*Deactivation Depth..... 5 fsw (1.2 msw)
- \*Dive Timer Functions..... Present Dive Time
- \*Dive Time Recorder.... Dive Time reset to 0 if a new dive is started after surface interval is greater than 10 minutes

### Surface Interval Timer:

- \*Accuracy..... +/-4.32 seconds per 24 hours
- \*Range.....0 mins to 99 hrs, over 19 hrs displayed as HH

### Flying After Diving:

- \*Range.....0.mins to 99 hrs, over 19 hrs displayed as HH

### Power:

- \*Battery..... Ultralife® 9 volt Lithium Cell
- \*Duration.....300+ continuous hours  
at temperature 25°C prior to "Lo" indication
- \*Shelf Life Powered..... After one year with battery installed, but not operating, operating hours are reduced to 150 hours

## Power (cont.)

- \*Shelf Life, Unpowered.....With 5-year-old batteries, properly stored, operating hours are reduced to 250 hours
- \*Low Power Indicators....."Lo" after 1 month continuous operation  
"Lo Lo" 3 days after "Lo"  
"Lo Lo Lo" 12 hours after "Lo Lo"
- \*Battery Replacement.....Electronically maintains memory if battery change is completed within 15 seconds
- \*Battery Door.....Screw-in, with O-ring seal

## Case:

- \*Construction.....High Impact Reinforced Polycarbonate
- \*Battery Compartment Seal..... O-ring
- \*Dimensions..... 6.5"L X 2.75"W X 1.7"H
- \*View Window...Scratch Resistant Coated Polycarbonate
- \*Weight.....8 ounces submerged

## Display:

- \*Configuration.....1.8" X 3.6" Multiplexed LCD Display

## Warranty:

Limited One-Year Warranty on Defective Materials and Labor

## Service:

Service and Repairs made by Orca Service Center only. Please contact the ORCA Service Center at (215) 444-9080 before sending.

(fsw = feet of sea water; msw = meters of sea water;  
°C = degrees Celsius; °F = degrees Fahrenheit)

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## CHAPTER 6/LIMITED WARRANTY:

The Phoenix is warranted to the original purchaser against defects in workmanship and materials for a period of one (1) year after the date of purchase. Failures due to abuse and neglect are specifically excepted from this warranty. This warranty is subject to and in accordance with the terms and conditions set forth below.

THIS WARRANTY IS EFFECTIVE ONLY IF THE WARRANTY CARD HAS BEEN COMPLETED AND RETURNED WITHIN 60 DAYS OF THE PURCHASE DATE. In the event of difficulty, consult your ORCA Dealer or (if you do not have access to a local dealer) return the instrument to the Orca Service Center. Remove the air hose, pack the instrument to protect it and ship it prepaid. Be sure to enclose a written statement explaining the nature of the problem and the circumstances under which it occurred.

Abuse and neglect includes, but is not limited to, broken LCDs and cross-threaded battery doors. Items subject to normal wear including the swivel spud, high-pressure hose, battery and rubber boot are not covered by this warranty. Instruments judged defective in workmanship or materials will be repaired or replaced at Orca's option and returned to sender, freight prepaid. This Limited Warranty shall apply only to the original Buyer of the instrument, and shall not be effective with respect to instruments which have been used in rental, sharing, or similar multi-user arrangements. Seller's and Manufacturer's responsibility and liability is limited to replacement or repair. Replacement or repair shall include both the cost of materials and labor.

### **WARNING**

THE PHOENIX IS INTENDED ONLY TO PROVIDE A GUIDE TO DIVERS AND SHOULD NOT BE RELIED UPON AS THE SOLE MEANS OF PROTECTION. THE PHOENIX CANNOT ELIMINATE ALL RISK OF GETTING THE BENDS, EVEN WHEN USED PRECISELY ACCORDING TO MANUFACTURER'S INSTRUCTIONS. ANY DIVING OR FLYING AFTER DIVING INVOLVES SOME RISK OF GETTING SOME FORM OF DECOMPRESSION SICKNESS. YOU MUST BE WILLING TO ACCEPT THIS RISK WHEN YOU DIVE.