

DRAFT

GEMINI

USER MANUAL

English Language – Imperial Units

Version 001

USER INFORMATION

For your information, please fill in the following information

SERIAL NUMBER OF THE TANK UNIT: _____
SERIAL NUMBER OF THE WRIST UNIT: _____
DATE OF PURCHASE: _____
PLACE OF PURCHASE: _____
ADDRESS: _____
CITY: _____
STATE: _____ ZIP CODE: _____
PHONE NUMBER: _____

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Limited Warranty

To the original purchaser ("OWNER") only, Cochran Undersea Technology, a division of Cochran Consulting, Inc. ("COCHRAN"), represents this Product to be free of defects in both materials and workmanship under normal SCUBA use for 24 months from the date of shipment from COCHRAN to the Authorized Dealer or Distributor. For purposes of establishing warranty eligibility, this date may be noted on the original product box, or can be determined by contacting COCHRAN.

Any defective Product, unless cause is specifically excluded in the "Warranty Conditions and Limitation" section below will at the sole discretion of COCHRAN, be repaired, replaced, or replaced with a new or refurbished unit of comparable or better function and/or condition. COCHRAN is not responsible for any incidental or secondary damages as a result of Product malfunction

WARRANTY LIMITATIONS AND EXCLUSIONS

Product must have been obtained from a COCHRAN Authorized Dealer. Contact COCHRAN for verification of dealer status. This Warranty is not transferable.

The warranty registration card must be sent to COCHRAN within 15 days of the purchase in order to validate Limited Warranty

Failure to provide proper care for this Product will render this Limited Warranty null and void. Damages or malfunction resulting from accidental or deliberate abuse, tampering, battery leakage, exceeding maximum intended operating depth or other parameters, extreme heat or cold, or other conditions that COCHRAN deem to be outside the intended scope of this Limited Warranty are not covered. Plastics, o-rings, batteries, battery life and flooded battery compartments are NOT covered by this Limited Warranty.

OWNER is responsible for shipping this Product to COCHRAN for service, and paying all associated costs, including shipping, insurance, and import duties. OWNER may take Product to an Authorized Dealer to arrange service under terms of this Limited Warranty. COCHRAN will return Product to OWNER or Dealer via a method and carrier of its choosing. Costs for requested expedited return shipping will be the responsibility of OWNER. Product returned for service under terms of this Limited Warranty must be accompanied by a photocopy of the original sales receipt in order for warranty repair or replacement to be performed if the Warranty Registration Card is not on file.

STATEMENT OF LIMITED LIABILITY

A mathematical model is used by this Product to calculate physiological effects of SCUBA diving related to use of compressed air or other breathing mixtures while at depth. Such effects specifically relate to nitrogen absorption into and elimination from body tissues, as well as effects of oxygen used in Enriched Air Nitrox breathing mixtures.

However, because of the number of variables and the varying degrees to which they may affect individuals engaged in SCUBA diving, COCHRAN DOES NOT GUARANTEE THAT USE OF THIS PRODUCT WILL PREVENT DECOMPRESSION SICKNESS OR ANY OTHER CONDITION OR INJURY INCURRED WHILE USING THIS PRODUCT.

These influencing variables may include, but are not limited to, dehydration, obesity, age, old injuries, or other physical conditions on the part of the diver, or environmental extremes of heat or cold, or poor training, or diving practices, any of which may promote the onset of decompression sickness or other harmful effects.

This Product is sold and intended to be used only as a guide, providing the TRAINED and CERTIFIED diver the information needed to make safe diving decisions. It is expressly understood that by buying and/or using this Product the Diver assumes ALL RISK as to its operability, reliability, quality, performance, accuracy, and suitability for his diving style. Furthermore, Diver recognizes that this Product is an electronic instrument being used in a hostile environment and is subject to failure, which may manifest itself in a number of ways. COCHRAN and its distributors and retailers will not be held liable for any personal injuries or other damages resulting from its use, even if COCHRAN has been advised of such occurrences or damages.

These products must be handled with care and properly maintained to assure the optimum performance. Users must possess the proper training for SCUBA diving activities and should be fully educated in the operation of this product. Users are encouraged to possess and utilize a redundant (backup) computer for their dive planning and execution. And divers are always encouraged to dive with a buddy at all times.

COCHRAN strongly supports and agrees with maximum depth limits of 130 feet for recreational SCUBA diving, as established by recognized training and certification agencies, and in no way encourages diving beyond these or any prudent lesser limits as may be necessitated by environmental, diver-specific, or other conditions.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, WHETHER ORAL OR WRITTEN, EXPRESSED OR IMPLIED. COCHRAN UNDERSEA TECHNOLOGY SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. No Cochran Undersea Technology dealer, agent, or

employee is authorized to make any modification, extension, or addition to this warranty.

DO NOT ALLOW THE GEMINI TO HAVE LOW OR NO BATTERIES FOR ANY EXTENDED PERIOD OF TIME! THIS WILL DISCHARGE THE INTERNAL LITHIUM BATTERY THAT KEEPS THE MEMORY ALIVE!

CAUTION!!! LOSS OF BATTERY POWER WILL CAUSE ALL PREVIOUS DIVE NITROGEN LOADING TO BE LOST. THIS MAY AFFECT NITROGEN CALCULATIONS ON NEAR-FUTURE DIVES. AFTER A BATTERY CHANGE, CONFIRM THAT NO-DECOMPRESSION TIME DATA IS REASONABLE DURING PRE-DIVE PREDICTION MODE. DIVE-OF-DAY NUMBER GOING TO ZERO IMMEDIATELY AFTER CHANGING BATTERIES IS ANOTHER INDICATION OF A LOSS OF NITROGEN LOADING.

FCC Label

FCC ID: **LYP744556-04**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Interference Statement

NOTE: This equipment has been tested and found to comply with both the limits for a Class B digital device and an intentional radiator, pursuant to Part 15, Subpart B/C of the FCC Rules. This equipment generates, uses, and radiates radio frequency energy. If not installed and used in accordance with the instructions, it may cause interference to radio communications. The limits are designed to provide reasonable protection against such interference in a residential situation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna of the affected radio or television.
- Increase the separation between the equipment and the affected receiver.
- Connect the equipment and the affected receiver to power outlets on separate circuits.
- Consult the dealer or an experienced radio/TV technician for help.

MODIFICATIONS

Changes or modifications not expressly approved by Cochran Consulting, Inc. could void the user's authority to operate the equipment.

SHIELDED CABLES

This product is designed to be used only with the Analyst[®] interface cable (RS-232) to maintain compliance with FCC Regulations.

Patent Information

Protected under one or more Foreign or US patents. Other patents may be pending.

All specifications subject to change without prior notice. **GEMINI** and Analyst are registered trademarks of Cochran Consulting, Inc. Copyright 1999 Cochran Consulting, Inc.



NORMES EMC 89/336/EEC
EMC 89/336/EEC STANDARDS
HOMOLOGADA EMC 89/336/EEC
ZERTIFIZIERUNG EMC 89/336/EEC

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GEMINI Manual
English - Imperial
Version 001i

Introduction

Your **GEMINI** Dive Computer from Cochran Undersea Technology is one of the most advanced instruments made for this application. It incorporates more user-programmable functions than any other dive computer made, yet is one of the simplest to use. Once your personal preferences and perhaps some dive site or condition-specific settings are entered, its computing power goes to work in the background. What you, the diver, see is all the critical information you need, in an informative and easy to comprehend display, with minimal distraction.

This manual is intended for use with the **GEMINI** with and without the Nitrox functions being enabled. Manual sections that apply to the Nitrox capabilities of the **GEMINI** are in *Italic Type*.

The GEMINI: Overview

USER & ENVIROMENTAL ADAPTATION

In addition to its standard time/depth-based decompression algorithm, the **GEMINI** is one of the new breed of Dive Computers that adapts its algorithm to the user's diving environment and style as originally pioneered by COCHRAN. All of COCHRAN's newer dive computers incorporate this capability. The factors used for this 'Adaptation' in the **GEMINI** are:

Altitude Acclimatization	Water Temperature
Salt/Fresh Water Compensation	Microbubble
User Conservatism	Previous Dive Profile
Workload	

However, the **GEMINI** allows the diver, via the optional Analyst[®] PC Interface, to disable the Temperature and/or Workload decompression compensation should the diver deem a particular diving situation would so warrant. *Calculation of Central Nervous System Oxygen Toxicity (CNS), Mission Oxygen Tolerance Units (OTU's), and the Partial Pressure of Oxygen (PO₂) is yet another added feature of this algorithm.* Twelve half-time compartments ranging from 5 minute to 480-minute theoretical tissue groups are used. You will find that this unit is extremely user friendly and can be customized to your individual diving conditions and practices. Factors that influence the decompression algorithm of your **GEMINI** are detailed below.

ALTITUDE ACCLIMATIZATION

Driving or flying to a dive site significantly higher in altitude requires special modifications to the "sea level" algorithm. The **GEMINI** regularly samples the ambient barometric pressure to determine these changes in altitude. Accordingly, the decompression algorithm is changed to reflect these barometric pressure changes. Note that temperature and weather systems also affect barometric pressure and hence, apparent altitude. Using the Time-To-Fly digits, the number of hours required to "adapt" to the new altitude is immediately known to the diver. If a significant altitude change occurs, a minimum of one hour should pass before diving to allow the unit to adapt to this new altitude. Rapid changes in altitude should be avoided. The dive computer may in fact, see particularly rapid changes from a higher to a lower altitude as a dive. Should this occur, removing the batteries for ten minutes will reset the computer, however, all tissue nitrogen loading will also be lost.

Should it be desired to initiate a dive PRIOR to completing the adaptation time, the **GEMINI** will treat this dive as a repetitive dive in its algorithm, taking into account the "residual" nitrogen present due to travel to altitude. There are two methods of compensating for altitude. Via the ANALYST[®] Personal Computer Interface, ZONE or SEAMLESS compensation for altitude may be selected.

In **ZONE** all altitudes less than 2,000 feet above sea level use the sea-level algorithm. At altitudes greater than this, altitude compensation is "seamless"; literally, every small fraction of gained altitude is considered in adjusting the algorithm. ZONE will reduce the occurrences of obtaining slightly different altitude readings and corresponding no-decompression (NDC) limits when diving within a given area. However, ZONE reduces the accuracy of the altitude compensation for the first 2,000 feet above sea level, since all altitudes below 2,000 feet are treated as sea level. However, the advantage in ZONE is that changes in apparent altitude due to temperature or weather changes at sea level will not affect the NDC computations.

In **SEAMLESS**, the algorithm is adjusted for extremely small changes in altitude. However, a difference in altitude may be seen from day-to-day at a given dive site due to temperature or weather systems and their effect on barometric pressures. SEAMLESS will provide the most accurate altitude compensation algorithm, but normal variations in atmospheric barometric pressure may affect the no-decompression time which is more predominantly seen in the Pre-dive Prediction forecast.

WATER TEMPERATURE

Diving in cold water can lead to a lower diver core and skin temperature, which can affect the gas exchange rate of the body's tissues. The **GEMINI** progressively makes its' nitrogen algorithms more conservative as the water temperature declines below 75 degrees F. Above this water temperature, there is no temperature compensation. If the diver is wearing an insulated dry suit and

is relatively warm even in cold water, this temperature compensation factor may be turned off at the divers discretion using the ANALYST® PC software.

MICROBUBBLE

There are several theories regarding the exact method by which a nitrogen bubble forms from a microbubble which was formed from micronuclei. One predominant theory states that more rapid ascents accelerate bubble formation. The **GEMINI** attempts to compensate, or adapt, for these higher Ascent Rates. For Ascent Rates less than 30 feet-per-minute (fpm) there is no compensation. As the Ascent Rate goes progressively higher than 30 fpm the compensation progressively increases.

USER CONSERVATISM

Current dive computers cannot tell if the diver is dehydrated, tired, smokes, overweight, or has some other physical issue that may require additional conservatism in the nitrogen algorithm. The **GEMINI** allows the diver to input an added degree of conservatism to the nitrogen algorithm from 0 to 50 percent in one-percent increments. Field programming is featured.

PREVIOUS DIVE PROFILES

Under some circumstances, recent dive activity can have an effect on nitrogen loading, particularly if the diver engages in inverted profile diving. This occurs when a deep dive is followed by an even deeper dive. This recent dive history is used to compensate the nitrogen loading for the current dive.

SEA WATER/FRESH WATER RECOGNITION

There is approximately three-percent difference in depth readings taken in fresh water versus seawater. Some dive computers are calibrated in feet of fresh water and some are calibrated in feet of salt water. Diving in a medium different from what the dive computer is calibrated will cause apparent depth errors. Only COCHRAN dive computers, including the **GEMINI**, actually determine the type of diving medium and compensate the depth reading accordingly. This accomplished by measuring the conductivity of the water during a dive. Caution must be taken in interpreting this reading since some apparent fresh water is actually high in minerals or contaminants and is correctly compensated as salt water. This commonly occurs in some caves, springs and lakes.

WORKLOAD COMPENSATION

When a diver's work rate or exertion level increases, he consumes more breathing gas (air) and his Breathing Parameter (BP)/Surface Air Consumption

(SAC) increases. The diver exchanges and retains higher levels of nitrogen in his tissues at a high work rate as compared to a low work rate. The **GEMINI** progressively makes its' nitrogen algorithms more conservative as work rate increases. The Workload Compensation starts when the diver's BP exceeds 35 psi per minute and reaches maximum compensation at 98 psi per minute. For accurate Workload Compensation the cylinder size, in liters, must be set correctly, this can be done by Field Programming or with the ANALYST[®] Personal Computer Interface. The Workload Compensation factor may be turned off at the divers discretion using the ANALYST[®] PC software.

THEORY OF OPERATION

The **GEMINI** Dive Computer consists of two component parts, the Tank Unit (TU) and the Wrist Unit (WU), the TU contains the computer's electronics and the WU displays the information to the diver.

WRIST UNIT

The Wrist Unit consists of a Liquid Crystal Display (LCD) screen that is the primary method of conveying information to the Diver. The information is presented in an easy to read and understand layout. The Wrist Unit is supplied with TACLITE[™], the night vision safe red Backlight. Two N-Cell Size Alkaline batteries power the WU. The WU will receive information from the **GEMINI's** TU from approximately 36 inches; the actual distance will vary depending on the orientation of the WU to the TU. When the WU is beyond the communications range of the TU the WU's display will flash. When the WU is back in communication with the TU the display will cease flashing.

TANK UNIT

The TU contains the High-pressure transducer assembly, the Depth/Altitude Sensor, and the computer's electronics. The TU performs all of the time-depth calculations and also stores the detailed statistics and profile information. The TU transmits all information to the WU once per second where it is displayed. Four AA-cell batteries power the TU; these batteries can be Alkaline, Lithium, Rechargeable, Tester or non-tester.

NOTE: The WU and TU contain NO USER SERVICABLE PARTS, If the lens is removed from the WU and/or the lid from the TU it will VOID the limited warranty.

Nitrox Specific Functions

ENRICHED AIR NITROX

Your **GEMINI** has the capability of providing the diver with the ability to program the percentage of oxygen in the breathing mix from 21.0% to 50.0%. This is accomplished via the Field Programming Mode or the Analyst P.C. Interface.

EQUIVALENT AIR DEPTH

Your **GEMINI** uses Equivalent Air Depth (EAD) in determining the no-decompression limits for each individual dive. A standard NOAA equation is used to determine the EAD based upon the oxygen percentage entered. This equation is:

$$\text{EAD} = \frac{(1 - \text{O}_2\%) \times (\text{D} + 33)}{.79} - 33$$

Where O_2 is entered in decimal form and D is the actual depth in feet.

For example, if you were diving with NOAA II (36% oxygen) to 70 feet, the EAD used for determining your no-decompression limit would be:

$$\begin{aligned} \text{EAD} &= \frac{(1-.36) \times (70+33)}{.79} - 33 \\ &= \frac{.64 \times 103}{.79} - 33 = 50.44 \text{ feet} \end{aligned}$$

Therefore, the no-decompression time for this example would be calculated to an EAD of 50.44 feet.

CENTRAL NERVOUS SYSTEM (CNS) OXYGEN TOXICITY

An additional consideration for the NITROX diver is Oxygen Toxicity. Your **GEMINI** will provide audible and visual warnings to alert you to this hazardous condition

Maximum exposure time for a given depth is calculated based on the Partial Pressure of oxygen (PO_2). The following standard formula is used to determine the PO_2 :

$$\text{D} \times \text{O}_2\% = \text{PO}_2 \text{ level}$$

Where O_2 is entered in decimal form and D is the actual depth in atmospheres absolute.

For example, if you were diving to 86 feet with NOAA II your PO₂ level would be:

$$(86 + 33 \div 33) \text{ or } 3.61 \times .36 = 1.298$$

which would be rounded up to PO₂ = 1.3. PO₂ levels from 0.5 to 1.6 are calculated.

Exceeding a PO₂ of 1.6 will greatly increase the probability of the immediate onset of CNS Oxygen Toxicity. While various training organizations have established maximum PO₂ limits, the maximum exposure times and their associated PO₂ levels used in this dive computer's calculations are shown on the following table:

PO ₂ LEVEL	Max Bottom Time (minutes) (Based on CNS Exposure)
.5	1304
.6	719
.7	496
.8	379
.9	257
1.1	221
1.2	194
1.3	172
1.4	149
1.5	110
1.6	44

Your dive computer calculates CNS or OTU toxicity percentages and it issues a unique, five double-beep audible alarm once per minute should you reach 50 percent of the associated maximum limit. In addition to this audible warning, the WARNING legend will appear and flash AND the TEMPerature digits will be replaced with the current calculated CNS Oxygen Toxicity percentage. This warning will continue until the calculated toxicity percentage is less than 50 percent. For example, the maximum bottom time exposure for a PO₂ level of 1.4 is 149 minutes. Once you reached 75 minutes of bottom time with a PO₂ of 1.4, this alarm would be issued since 75 minutes is 50% of 149 minutes. At a PO₂ of 1.5, this alarm would be issued at 55 minutes, etc.

NOTE: While all other audible alarms of the dive computer consist of five long beeps, the toxicity audible alarm consists of short double-beeps that sound for five seconds.

WARNING: It is possible in certain diving circumstances to reach an Oxygen Toxicity limit well before reaching a no-decompression limit. For this reason, a diver who has successfully completed a sanctioned NITROX diving course from a recognized certifying agency should only conduct NITROX diving.

NOTE: By accepted definition of CNS Toxicity. Should a PO₂ value