

MATRIX MANUAL

Safety Considerations

You must carefully read this entire manual before using your Matrix.



WARNING: Diving has many inherent risks. Decompression sickness is among the most serious of those risks. Even if you follow the instructions in this manual carefully, it is possible that you may be seriously injured or die from decompression sickness, or some other inherent risk of SCUBA diving. Unless you are fully aware of these risks and are willing to personally accept and assume responsibility for those risks, do not use the Matrix!

The Matrix is a sophisticated decompression tool to assist a trained and certified SCUBA diver in making decisions concerning dive planning and execution. As with any tool, the Matrix may be misused if the following safety and operational precautions are not strictly followed. If they are followed, careful use of the Matrix can increase your diving enjoyment and reduce the risk of decompression sickness; if they are not followed, you will be placing yourself at serious risk for decompression sickness.

The Matrix is a technically advanced tool based on a biophysical model of decompression theory. However, neither it nor any other diving computer (or table) can actually monitor the physical changes that occur in your body as you dive. Each diver varies in his or her susceptibility to decompression sickness, and that susceptibility may vary from day to day. Decompression modeling is an inexact science; it is based, at least partly, on certain unproven assumptions. Therefore, you must dive responsibly and to carefully follow all standard safe diving practices as well as the warnings and cautions contained in this manual.

Guidelines for Using the Matrix

The following guidelines for using the Matrix are derived from the latest medical research and the recommendations of the American Academy of Underwater Sciences for diving with dive computers. Following these guidelines will greatly increase your safety while diving, but cannot guarantee that decompression sickness will not occur.

1. In accordance with the recommended maximum diving limit of all instructional agencies, do not dive deeper than 130 feet (40 meters).
2. Do not use the Matrix for planned decompression diving. The decompression algorithm contained in the Matrix should be used only for emergency or unintended decompression.
3. On all no-decompression dives with the Matrix, make a safety stop for three to five minutes between 10 and 30 feet (3 and 12 m) before surfacing.
4. Never use the Matrix for repetitive, "square" dives deeper than 60 feet (18 meters). A square dive is a dive that is performed for its duration at a uniform depth.
5. Always make the deepest dive of the day first when repetitive dives are planned, and for each successive dive make sure that the deepest portion of that dive is done at the beginning of the dive.
6. The Matrix is designed for dives made with compressed air only. Do not use the Matrix for dives made with nitrox or other mixed gases.
7. All divers using dive computers to plan dives and indicate or determine no-decompression/decompression status must use their own computer.
8. If the Matrix fails at any time during the dive, the dive must be terminated and appropriate procedures (including a slow ascent and a 3 to 5 minute safety stop) should be initiated immediately (see page 38).
9. On any given dive, all divers in a buddy group must follow the most conservative dive computer for that particular dive.
10. Do not dive for 24 hours before using the Matrix for the first time.
11. You **MUST** follow the ascent rates as indicated by the Matrix. If the computer fails, ascend to surface no faster than 60 ft/min (18 m/min).



Pay special attention to warnings and cautions, which are denoted by this symbol

WARNINGS are used before a procedure or situation that may result in serious injury or death.

CAUTIONS are used before any situation or technique that will result in damage to the product.

12. You MUST be familiar with all signs and symptoms of decompression sickness before using the Matrix! Seek IMMEDIATE treatment for decompression sickness should any of these signs or symptoms occur after a dive! There is a direct correlation between effective treatment and the delay between the onset of symptoms and the treatment for decompression sickness.
13. Always observe the optical alarm signals of the Matrix. Avoid situations of increased risk for decompression sickness which are marked with a warning sign in this manual.
14. Never dive the Matrix to its limits, as well as other dive computers and tables. Give yourself a margin of safety by always leaving a few minutes of no-stop time before making an ascent.
15. Avoid repeated ascent and descents (yo-yo diving) while using the Matrix.
16. DO NOT perform repetitive decompression dives. Doing so greatly increases the risk of decompression sickness.
17. Carefully inspect your Matrix computer for any signs of damage or malfunction before every dive.

Introduction

Congratulations on the purchase of your Matrix dive computer. Our designers have condensed all the crucial dive information into a user-friendly dive instrument. By combining a color-coded system with bold alphanumerics, we have created an easy-to-use computer that provides dive data at a glance.

As with all life support diving equipment, it is crucial to understand the features and functions of the Matrix. Before using the Matrix, it is essential to read this manual in its entirety. Contained within this easy to read manual are illustrations to aid you in the complete understanding of the computer.

This manual covers both the imperial and metric versions of the Matrix. Where applicable, two illustrations are used - an imperial version and metric version.

Chapter 1 covers all the operating instructions, including attaching the computer to the regulator. Chapter 2 is dedicated to diving conditions that U.S. Divers considers extreme, or are past the operational limits of the Matrix. Chapter 3 offers advise on care and maintenance, and instructions on changing the battery. Lastly, the reference section contains the technical specifications and glossary.

WHAT IS A “DIVE COMPUTER”

Definition of Compartments

A dive computer is an instrument that mathematically simulates the absorption and release of nitrogen by hypothetical tissue types in the human body. These hypothetical tissues are commonly referred to as “compartments.” Each compartment absorbs and releases nitrogen at different rates. The Matrix tracks these compartments constantly, providing you with up-to-the-minute decompression information.

Multi-Level Diving

If you use, or have used, dive tables you know the total amount of time you can stay under water is based on the maximum depth reached during the dive. Dive tables, such as the U.S. Navy dive tables, assume that you immediately descend to a single depth, stay at that depth for the duration of the dive, then immediately surface from that depth. This type of dive profile is referred to as a rectangular dive profile (figure 1). In reality, however, most recreational divers go to the deepest depth first and make a gradual ascent to the surface. This type of dive profile is referred to as a multi-level dive profile (figure 2).

Multi-level diving is where the Matrix excels. By continuously calculating the nitrogen absorption/release of all the compartments, the computer updates the amount of no-decompression time (NDT) you have left. As you ascend to shallower depths, the computer credits you with more allowable NDT; if you go deeper, it reduces the NDT available.

Diving Responsibly

Years of research and thousands of dives have gone into the mathematical formulas used by the Matrix. However, the computer does not have special sensors attached to your body; it doesn't know if you are tired, dehydrated, overweight, or out of shape. For this reason, U.S. Divers recommends that you never push the no-decompression limits of the computer. Always leave a comfortable safety margin in respect to no-decompression time and ascent speed. Let the computer assist you in making a safe dive. Do not let it control your dive.



WARNING: Using the Matrix will not prevent the possibility of decompression sickness, but using it sensibly reduces this risk. Any sport diver, however, must accept that there is no device or procedure which will totally prevent the possibility of a decompression accident.

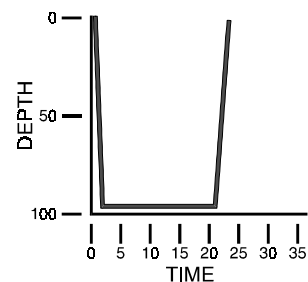


Figure 1
Rectangular Profile

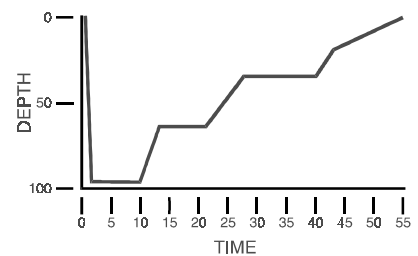


Figure 2
Multi-Level Profile

Operating the Matrix

ATTACHING THE MATRIX TO YOUR REGULATOR

If you have purchased the Matrix in the Pivot® console, have your Authorized U.S. Divers Dealer attach the console to your first-stage regulator. If this is not possible, follow the steps below to do it yourself:

1. Remove the high pressure (HP) port plug from your first-stage regulator using the appropriate wrench. The HP port on all U.S. Divers first-stage regulators is clearly marked with the letters "HP."

Note: The end fitting of the HP hose has $\frac{7}{16}$ " threads. On some early model first-stages, the HP port is only $\frac{3}{8}$ ". If this is the case with your regulator, you need to purchase a $\frac{7}{16}$ " female to $\frac{3}{8}$ " male adapter (U.S. Divers part number 1017-85) from your U.S. Divers dealer.


2. Thread the end of the HP hose into the HP port of the first-stage until finger tight. Using a $\frac{5}{8}$ " open-end wrench, tighten the hose fitting until snug. DO NOT overtighten.
3. Attach the first-stage to a charged SCUBA cylinder. Slowly turn the valve handwheel counterclockwise until the valve is fully open. Submerge the first-stage in water and check for any leaks. If you detect leaks, take your regulator and computer to your U.S. Divers dealer and have the O-ring inspected and/or replaced. Then have the U.S. Divers dealer attach the Matrix to your regulator.

STARTUP/DIAGNOSTIC MODE

Starting the Matrix


To activate the Matrix, simply press and release the neon-yellow button (figure 3,a). After pressing the button, the Matrix displays all "8"s followed by dashes, followed by all the digits counting down from 9 to 0. During this countdown, the Matrix goes through a self-diagnostic test to check all its functions, battery power and barometric pressure (altitude).


After the Matrix completes its diagnostics, it goes into Surface Mode and is ready to make a dive. If you do not make a dive within two hours after turning on the Matrix, the computer will turn off automatically. Always be sure to check to see if the unit is activated before entering the water.

 **WARNING: Never activate the Matrix while underwater. This may result in inaccurate depth and no-decompression time displays. Activation is not possible deeper than ten feet.**

Low Battery Warning

If the Matrix detects low battery power, the battery warning icon appears (see figure 4,a). If the battery icon remains flashing on the screen after startup, you have enough power to complete one day of diving. If you intend to do multi-day diving, replace the battery immediately.

 **WARNING: If the low battery icon appears, U.S. Divers strongly recommends that you DO NOT dive until you change the battery. Although there may be enough power to finish a full day of diving, sudden changes in temperature can cause the battery voltage to drop below the operational level, causing the computer to shut off.**

 **WARNING: DO NOT change the battery between dives, or between days of diving. Once the battery is removed, all residual nitrogen information is erased. When the Matrix is activated after new batteries have been installed, the computer assumes you are on the first dive of the first day of a multi-day trip. This means the computer may allow you more no-decompression time than you really have, resulting in a greater chance of decompression sickness.**

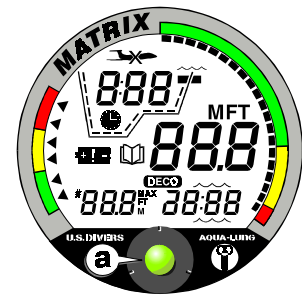


Figure 3
Startup/Diagnostic Mode

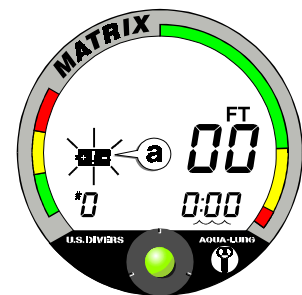


Figure 4
Low Battery Display

Altitude Diving

The mathematical model in the Matrix accounts for the reduced no-decompression time available at higher elevations based on the National Oceanic and Atmospheric Administration (NOAA) guidelines. When diving in high altitude lakes or rivers (from 3,000 to 14,000 ft; 915 to 4267 m), the Matrix automatically adjusts to these conditions providing correct depth and reduced no-decompression times. At altitudes over 3,000 ft (915 m), depth calibration automatically changes to read in feet/meters of freshwater (FFW, MFW) instead of feet/meters of seawater (FSW, MSW).



WARNING: Until it has shut itself off, you must not use the Matrix at an altitude other than the altitude where it was originally activated. Doing so will result in an error equal to the difference in barometric pressure, and possibly a false dive mode.

SURFACE MODE

The Matrix enters Surface Mode when (1) the computer completes the startup/diagnostic procedures, or (2) ten minutes after completing a dive deeper than 5 feet, or 1.5 meters. While in Surface Mode, the Matrix alternates between the following three informational displays:

1. Standard surface information
2. Pre-dive planning sequence
3. Wait-to-fly time

Standard Surface Information

The first display to appear in Surface Mode is standard surface information (figure 5). This display gives the following information:

- a. **Surface Time.** Notice how the wave icon is below the time display, meaning that it is "time above the water." The time is displayed in HH:MM
- b. **Dive number.** The computer displays the number of the dive just completed. After startup, this number will be 0. The Matrix counts up to 10 dives. After dive 10, it cycles back to 1.
- c. **Depth.** Depth always shows 00 ft., or 0.0 m during Surface Mode.
- d. **Compartment Loading Bar Graph (CLBG).** The CLBG is only displayed after making a dive. During the surface interval, the CLBG starts to recede, indicating that you are off-gassing nitrogen. When you first turn on the Matrix, you will not see the CLBG.

Wait-to-fly Time

The second display to appear during Surface Mode is wait-to-fly time (figure 6). It appears about twenty seconds after the standard surface information, and only appears after a dive. Only two elements appear: (a) the no-fly icon (airplane icon) and (b) the wait-to-fly time.

Wait-to-fly time starts to count down from 23:50 (24 hours less the first 10 minutes of surface interval). At the 12:00 mark, the Matrix shuts down internally, but continues to display the countdown from 11:59 to zero. Therefore, if you want to make a dive while wait-to-fly time is 12 hours or less, you must first reactivate the computer by pressing the neon-yellow button.

■ Wait-to-fly guidelines

In 1990, the Undersea and Hyperbaric Medical Society (UHMS) published a set of guidelines for lowering the chance of decompression sickness due to flying too soon after diving. The UHMS suggests divers using standard air tanks and exhibiting no symptoms of decompression sickness wait 24 hours after the last dive to fly in an aircraft with an internal cabin pressure of 8,000 feet (2438 m) or less. The only two exceptions to this recommendation are:

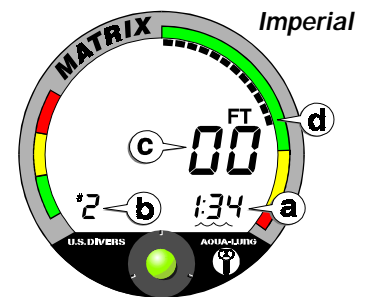


Figure 5
Standard Surface mode

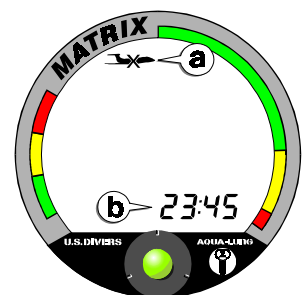


Figure 6
Wait-to-fly Time

1. If a diver had less than two hours total accumulated dive time in the last 48 hours, then a 12 hour surface interval before flying is recommended.
2. Following any dive that requires a decompression stop, flying should be delayed for at least 24 hours, and if possible, for 48 hours.

Since the introduction of the 1990 UHMS guidelines, the Divers Alert Network (DAN) has introduced data that resulted in DAN's position that:

"A minimum surface interval of 12 hours would be required in order to be reasonably assured a diver will remain symptom free upon ascent to altitude in a commercial jetliner (altitude up to 8,000 feet). Divers who plan to make daily, multiple dives for several days, or make dives that require decompression stops, should take special precautions and wait for an extended surface interval beyond 12 hours before flight."

Both the UHMS and DAN agree that:

"There can never be a flying after diving rule that is guaranteed to prevent decompression sickness completely. Rather, there can be a guideline that represents the best estimate for a conservative surface interval for the vast majority of divers. There will always be an occasional diver whose physiological makeup or special diving circumstances will result in the bends"

Pre-Dive Planning Sequence

The last display shown during Surface Mode is the Pre-Dive Planning Sequence (PDPS). See figure 7. The Pre-Dive Planning Sequence allows you to plan your next dive by giving you the maximum no-decompression time for various depths. Since the computer is always monitoring the off-gassing of nitrogen, the longer you stay on the surface, the more NDT you get. In the PDPS, the Matrix displays the following information:

- Dashed no-decompression time icon.** The no-decompression time icon is dashed during the pre-dive planning sequence, as opposed to the solid line displayed while diving.
- Depth Scrolling.** The PDPS scrolls from 30 ft. to 160 ft. in 10-foot increments. The metric version scrolls from 9m to 48m in 3-meter increments.
- Adjusted no-decompression times.** For each depth, the Matrix shows the maximum allowable no-decompression time. This time increases the longer you stay on the surface.
- Dive number.** Dive number is the number of the dive just completed. Before the first dive of the day, this number is 0.

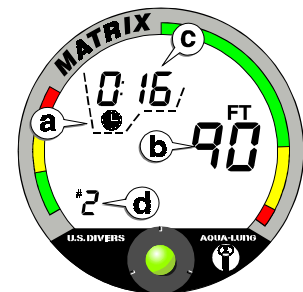


Figure 7
Pre-Dive Planning
Sequence

NO-DECOMPRESSION DIVE MODE

When the Matrix goes deeper than five feet, it switches from Surface Mode to No-Decompression Dive Mode (figure 8). In No-Decompression Dive Mode, the computer displays the following information:

- Current Depth.** Current depth is displayed to 250 feet (76 m). At depths deeper than 250 feet (76 m), the depth display is replaced with three dashes. (See Chapter 3, "Extreme Situations")
- No-decompression Time (NDT).** NDT is the amount of time you can stay at the current depth before entering decompression mode. If you stayed at a constant depth, the NDT would countdown to zero. As you ascend to shallower depths, the computer credits you with more NDT.
- Maximum Depth.** Maximum depth is the deepest depth reached during the dive. It only appears when you ascend 3 feet (1 m) shallower than the deepest depth reached during the dive. For example, if you made a dive to 100 feet (30 m), the max depth display would not appear until you ascended to 97 feet (29 m).
- Bottom Time.** Bottom time is the total amount of time spent underwater. The bottom timer begins when you descend below five feet and stops when you ascend above 3 feet.

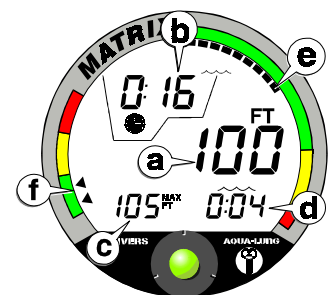
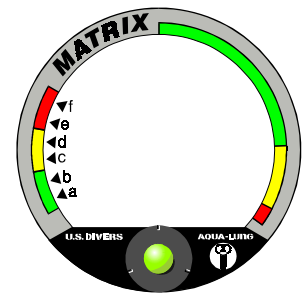


Figure 8
No-decompression Dive
Mode

e. **Compartment Loading Bar Graph (CLBG).** As you dive, the Matrix monitors the nitrogen absorption of 12 tissue groups simultaneously and displays the controlling tissue group via the CLBG. The CLBG has three sections: The green zone means you are within the no-decompression limits; the yellow zone means you are approaching decompression and should start your ascent; the red zone means you've exceeded the no-decompression stop limits and must perform a decompression stop. When the bar graph reaches the red zone, the Matrix will switch to decompression dive mode and give you all the necessary decompression stop information.



f. **Ascent Rate Indicator.** The ascent rate indicator consists of six triangles that appear, from bottom to top, as your ascent rate increases. Figure 9 shows each triangle with its corresponding ascent rate. While making your ascent to the surface, always try to keep the ascent rate indicator in the green zone. If it enters the yellow caution zone, slow down or stop until the triangles recede into the green zone. If the ascent rate indicator enters the red zone, you are making an unsafe ascent and risk the possibility of decompression sickness. While in the red zone, the ascent rate indicator flashes. Always make an ascent such that the ascent rate indicator never enters the red zone.

	Ft./Min	M/Min.
a=	21 - 30	6 - 9
b=	31 - 40	9.1 - 12
c=	41 - 50	12.1 - 15
d=	51 - 60	15.1 - 18
e=	61 - 70	18.1 - 21
f=	71 +	21.1 +

Figure 9
Ascent Rate Values

DECOMPRESSION DIVE MODE



WARNING: U.S. Divers does not recommend decompression diving or diving deeper than 130 feet. Doing so increases the risk of decompression sickness.

When you exceed the no-decompression time limits, the Matrix enters Decompression Dive Mode (figure 10). There are three visual cues that alert you that you are in decompression:

1. The last segment of the compartment loading bar graph (a) has entered the red zone.
2. The "DECO" label (b) appears.
3. The ceiling indicator (c) flashes.

As soon as the Matrix enters Decompression Dive Mode, the maximum depth is replaced with the depth of the first decompression stop (d), and the bottom time is replaced with the decompression stop time (e). Also, no-stop time is replaced with total ascent time (f). Total ascent time is the sum of all your decompression stop times plus the ascent time to the first stop at a rate of 60 ft/min. The example shown in figure 10 shows that the diver must make a 20-foot (6 m) stop for 3 minutes, with a total ascent time of 14 minutes.

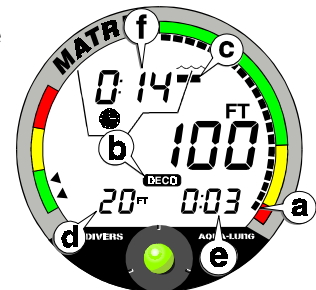


Figure 10
Decompression Dive Mode

After entering decompression, it is imperative that you begin your ascent immediately. Ascend to a depth slightly deeper than or equal to 10 feet. The amount of decompression credit time depends on the depth, with slightly less credit given the deeper you are.

You must never ascend shallower than the prescribed decompression stop depth (ceiling). Doing so will put the Matrix into a Conditional Violation Mode (see page 32) and greatly increase your risk of decompression sickness. If there is heavy surge or large swells, it is difficult to stay at a chosen depth. To ensure that you do not enter a violation mode, stay slightly deeper than the required decompression stop depth until the next shallower stop depth appears. For example, if you are required to make a 20-foot (6 m) decompression stop, perform the stop at 23 or 24 feet (7 or 7.5 m) until the computer tells you to ascend the 10-foot (3 m) stop. Then perform the 10-foot (3 m) stop at 13 or 14 feet (4 or 4.5 m) until you clear the decompression requirement.

Once you complete all the necessary decompression stops, the Matrix returns to normal Dive Mode, allowing you additional time underwater. To add a greater margin of safety, U.S. Divers strongly recommends that you wait until the segments of the CLBG are well within the green zone before surfacing, unless a low air situation dictates that you surface.

At the end of all decompression dives, spend as much time as possible at your safety stop and on the surface to reduce your compartment loading before the next dive.

VIOLATION MODES

The Matrix enters one of three different Violation Modes when you dive the computer beyond its normal operating limits, because continued exposure is outside the mathematical model used to calculate decompression status. These modes are explained in detail in the next chapter, "Extreme Situations."

GAUGE MODE

If the Matrix enters a Permanent Violation Mode, it will only operate in Gauge Mode on subsequent dives. The Matrix removes all displays that relate to decompression. No dives must be made for 24 hours for the Matrix to reset itself. Gauge Mode is explained in detail in the next chapter, "Extreme Situations."

DIVE LOG MODE

Accessing the Dive Log Mode

Ten minutes after surfacing from a dive, you can access the Dive Log Mode by pressing the neon-yellow button at any time. After entering the Dive Log, the Matrix scrolls through all dives in memory, beginning with the most recent dive. The Matrix displays each dive for 4 seconds. However, if you need to pause the dive log scrolling to write down the information in a logbook, press and hold the neon-yellow button anytime during the scroll to freeze the display. When you release the button, the scrolling continues.

Note: If you hold the button down to enter Dive Log Mode, and do not release the button for eight seconds, the Matrix enters External Access Mode. In External Access, the Matrix displays the letters "EA" and counts down from 6 to 0. This mode is for factory use only.

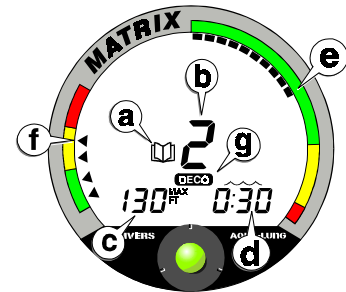


Figure 11
Dive Log Mode

Memory Capacity

The Matrix retains the information for the last 10 dives indefinitely, even if you remove the batteries. After exceeding the 10 dive limit, the newest dive is added to memory while the oldest dive is deleted.

Dive Log Display

When you enter Dive Log Mode (figure 11), the Matrix displays the logbook icon (a) with the dive number (b) immediately to the right. Maximum depth (c) and total bottom time (d) are located at the bottom of the screen. The Compartment Loading Bar Graph (e) shows the nitrogen loading level at the end of the dive. The ascent rate indicator (f) shows the fastest ascent rate during the dive. Lastly, if a decompression stop was required during the dive, the "DECO" label (g) is displayed.

Extreme Situations

EXCEEDING THE MAXIMUM DEPTH

The Matrix displays the current depth down to 250 feet (76 m). If you exceed 250 ft. (76 m), the current depth and maximum depth will display three dashes (figure 12), indicating that the Matrix is beyond its depth range. After ascending shallower than 250 ft. (76 m), the current depth display returns to normal, while the maximum depth continues to show three dashes.

Note: If you exceed the 250 foot (76 m) limit, three dashes will be displayed as the maximum depth when you view the dive in Dive Log Mode.

Although the Matrix withstands the pressure at 250 ft. (76 m), the depth at which you can use all its features can be much shallower. Before going further, read the following warning:



WARNING: The maximum recommended sport diving limit is 130 feet (40 m). Diving any deeper than 130 feet (40m) should be avoided. Special equipment and training are necessary for this type of diving. U.S. Divers strongly recommends against diving to depths below 130 ft. (40 m) or decompression diving.

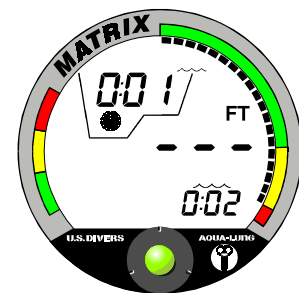


Figure 12
Exceeding the Maximum
Depth

EMERGENCY DECOMPRESSION

After entering decompression, the prescribed decompression stop depths may move quickly through the 10, 20, 30 and 40 foot (3, 6, 9, 12 m) displays. Once you enter decompression, it is imperative that you ascend toward the required stop depth immediately. If you continue the dive at a greater depth, you increase decompression risk and may also exceed the operating limits of the computer to such an extent that the computer will cease to provide ascent information.



WARNING: If the Matrix display indicates you have entered decompression mode, do not descend further or remain at the same depth. The decompression stop obligation can increase quickly and once the exposure requires a greater than 40-foot (12 m) stop, the Matrix will enter Immediate Violation Mode, and no longer provide ascent information. This situation increases the risk of decompression sickness and must be avoided.

Decompression diving requires special training and equipment. For these reasons, sport divers should not attempt decompression diving. Making a dive that requires decompression stops should be avoided because you cannot ascend directly to the surface without risking personal harm. If equipment problems delayed your ascent, your risk of decompression sickness would increase. Your buddy would be unable to lend assistance without also risking decompression sickness.

VIOLATION MODES

If you exceed certain limits, the Matrix will not be able to tell you how to get back to the surface. These situations will make the Matrix enter Violation Mode and must be avoided at all costs. They push decompression theory to the limits and can result in loss of some Matrix functions for 24 hours after the last dive of the day in which a violation occurred.

There are three different Violation Modes, which vary in seriousness. They are termed "Conditional Violation," "Delayed Violation Mode," and "Immediate Violation Mode." It is important to understand how each of these modes function and how to carry out decompression procedures in the event you encounter one.

Conditional Violation Mode

Before a situation causes the loss of nitrogen monitoring functions, the Matrix enters Condition Violation Mode. If properly handled, the Conditional Violation Mode will not only assist you in getting back to the surface, but will also allow continued use of the computer. There is only one situation that forces the Matrix to enter a Conditional Violation Mode: Ascending above the required decompression stop.

■ **Ascending Shallower than the Required Decompression Stop**

The Matrix will enter a Conditional Violation Mode if you ascend shallower than the indicated stop depth for less than five minutes. Figure 13 shows an example of a diver at a depth of 15 feet (4.6 m) when his decompression stop is 20 feet (6.0 m). This can easily happen if you temporarily lose control of your buoyancy, or get caught in a surge or swell. Immediately after breaching the decompression stop depth, the total ascent time (figure 12,a) starts to flash..

While in the Conditional Violation Mode, the Matrix stops calculating decompression information. In fact, the computer penalizes you with 1.5 minutes of additional decompression time for each minute spent above the decompression ceiling. For example, if you have 10 minutes of decompression time and ascend shallower than the decompression stop depth for 4 minutes, you will now have 16 minutes of decompression time

$$(10 + (4 \times 1.5) = 16).$$

If you descend to, or slightly below, the decompression ceiling within five minutes, the Matrix will resume normal operation and allow you to complete the decompression stop(s) successfully and allow you to keep diving for the rest of the day. If you stay above the decompression ceiling for more than five minutes, the Matrix will enter Delayed Violation Mode.



Figure 13
Conditional Violation

Delayed Violation Mode

■ Spending more than five minutes above the decompression stop depth.

If you stay shallower than the required decompression stop depth for more than five minutes, the Matrix enters Delayed Violation Mode (figure 14). Immediately after entering Delayed Violation Mode, the Compartment Loading Bar Graph starts to flash and the total ascent time continues to flash (continued from Conditional Violation Mode). If you descend below the decompression ceiling after 5 minutes, the Matrix can still assist you in getting back to the surface. Stay at, or slightly below, the decompression ceiling until you complete the decompression requirement. Once you clear decompression, remain underwater until the CLBG recedes to well within the green zone. After five minutes of surface time, the Matrix enters Immediate Violation Mode and will operate only in Gauge Mode (see page 36).

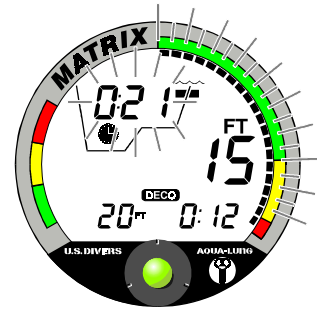


Figure 14
Delayed Violation Mode

■ Decompression stop greater than 40 feet

The maximum decompression stop depth for the Matrix is 40 feet (12 m). As soon as the computer calculates a decompression stop depth slightly greater than 40 ft. (12 m), the Matrix goes into Delayed Violation Mode. Once the Matrix enters Delayed Violation, the CLBG will continuously flash.

To get back to the surface safely, you must immediately ascend to, or slightly deeper than, 40 feet (12 m) until the CLBG stops flashing. Continue to make your decompression stops as indicated by the computer. After you clear decompression and the CLBG recedes into the yellow zone, continue decompressing until the leading segment is near, or into the green zone. After five minutes of surface time, the Matrix will enter Immediate Violation Mode for 24 hours.

If you do not make an immediate ascent to the 40-foot (12 m) decompression stop after entering Delayed Violation Mode, the calculation limits will be exceeded and the computer will enter Immediate Violation and operate only in Gauge Mode (see page 36) for 24 hours.

Immediate Violation Mode

The Matrix enters Immediate Violation Mode when a dive profile represents gross excursions into decompression that are beyond the boundaries of the Matrix's computer model. If you intend to make these types of decompression dives, you should not be using the Matrix.

Two situations cause the Matrix to enter Immediate Violation Mode:

1. Five minutes after surfacing from a dive in which you entered Delayed Violation.
2. A calculated decompression stop much greater than 40 feet (12 m).

While in Immediate Violation Mode, the Matrix makes the following function changes:

1. The Matrix only operates in Gauge Mode (explained in the next section)
2. Pre-Dive Planning Sequence is disabled
3. Wait-to-fly display (from 24 to 12 hours) is disabled

Gauge Mode

After the Matrix has experienced an Immediate Violation, the computer only operates in Gauge Mode. In Gauge Mode the computer no longer calculates decompression information. In essence, the computer becomes a depth gauge and bottom timer.

■ Underwater

When in Gauge Mode underwater (figure 15), the Matrix flashes the CLBG and only displays current depth, maximum depth, bottom time, and ascent rate.

■ On the surface (24 - 12 hrs.)

During the first 12 hours on the surface while in Gauge Mode (figure 16), the Matrix gives you the dive number, depth, and surface time. The Wait-to-fly display and Pre-Dive Planning Sequence are disabled. The Dive Log Recall Mode is not affected and can be accessed as described in the previous chapter.

■ On the surface (12 - 0 hrs.)

During the second 12 hours on the surface (figure 17), the Matrix contin-

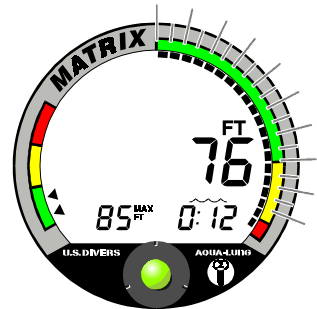


Figure 15
Gauge Mode - Underwater

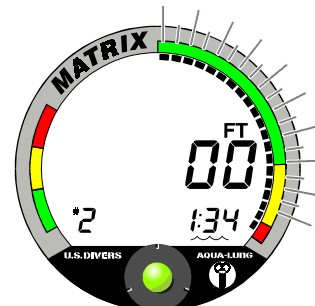


Figure 16
Gauge Mode - Surface (24 to 12 hrs)

ues to count down from 12 - 0 hrs. It also displays a single dash (a) which denotes that the computer has been violated and, if turned on, will only work in Gauge Mode.

Caution Zone

The yellow caution zone offers you a convenient way to monitor how close you are to the no-decompression limit. U.S. Divers strongly recommends that you leave the water with CLBG well inside the green zone.



WARNING: Never exit the water with the Compartment Loading Bar Graph in the red decompression zone. Doing so greatly increases the risk of decompression sickness, and may result in injury or death.

A diver's metabolism varies from person to person, and even from day to day. If you are feeling less than 100%, or you are in less than perfect shape, use the yellow caution zone as a visual reference to place a wider margin of protection between you and the no-decompression limit.

What to do if your computer quits working

Because a dive computer is an electronic, battery powered instrument, the possibility that it may quit working unexpectedly is very real, even with new, high quality batteries. While no-decompression diving, if you find that any major piece of equipment is not working, you must abort the dive immediately and surface slowly in a controlled manner. If your dive computer quits for any reason, it is important that you have anticipated this possibility and are prepared for it. This is an important reason not to push your dive profiles to the limit. U.S. Divers advises you to bring additional backup instruments with you on your dives, and to log each dive profile during every surface interval.

Dive computers make diving easier and provide a planning tool to enable you to increase dive time for more enjoyment underwater. Yet, as with any high tech instrument in a harsh environment, unforeseen things may happen. If you do not prepare for the unexpected, you may be unprepared to respond adequately. If you dive in situations where your trip would be ruined, or your safety jeopardized by losing the use of a dive computer, an analog or digital backup system is highly recommended.

Night Diving with the Matrix

The Matrix uses a high contrast liquid crystal display with large numerals for easy readability in low light conditions. However, the display is not internally illuminated for night diving because of the excess power consumption that would be required. Therefore, on night dives, cave dives, or any low-light situation, you must use your dive light to illuminate the display. If your dive light were to fail, you would be unable to read your critical dive information. U.S. Divers recommends that you carry a backup light in case of primary light failure.

Sharing the Matrix

The Matrix provides information based upon your personal dive profile and, therefore, must not be shared between divers. You should never, under any circumstances, swap your computer with another unit between dives, or share your computer with another diver underwater.



WARNING: Never participate in sharing or swapping of a dive computer. Doing so may result in injury or death.

A Final Word of Caution

Although the Matrix represents the latest in user-friendly dive computer technology, it cannot force you to understand how to use it. Before diving with the Matrix, be sure you thoroughly understand its functions and displays. If you have any questions, call your local Aqua Lung dealer. Remember, technology is not a substitute for training, experience, and common sense.

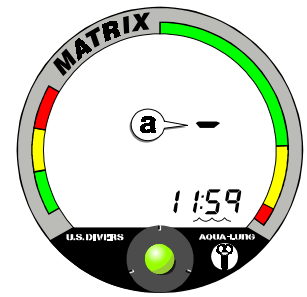


Figure 17
Gauge Mode - Surface (12 to 0 hrs)

CARE & MAINTENANCE

The Matrix is a robust instrument designed to withstand the rigors of SCUBA diving. However, you still need to protect it from shock, extreme heat, chemical attack, and tampering.

Even though the Matrix's material is tough and durable, it is susceptible to chemical attack and scratches. Chemical attack can be in the form of spray propellants, gasoline fumes in your garage or boat, and alcohol. U.S. Divers can replace scratched gauge faces. However, small scratches naturally disappear underwater.



CAUTION: Never use aerosol sprays, including silicone sprays, on or near the Matrix. The propellants may chemically attack the plastic, causing the plastic case to crack.

Before the Dive

The Matrix's plastic housing is made of a shock resistant resin. This housing, combined with the rubber console boot, protects the Matrix from the normal bumps that occur when diving. However, the computer cannot withstand the impact of heavy objects, such as weight belts or SCUBA cylinders. Impact from heavy objects is the most common cause of computer damage. When you set up your dive gear on a boat or the beach, tuck the Matrix into your BC pocket, or between the BC and cummerbund. Never leave the computer exposed where someone could accidentally step on it or drop something on it.

During the Dive

The most common damage inflicted on a computer while underwater is scratches to the computer face. Scratches occur when a dangling computer gets dragged over coral or rocks. Most BCs have gauge hose retainers that keep the computer close to your body for easy access and reduce the possibility of scratching the computer face.

Note: Dangling gauges are a major cause of damage to delicate marine life, such as corals. Always keep secondary hoses, such as your octopus and gauge, retained close to your body.

After the Dive



CAUTION: If the Matrix is not attached to a first-stage regulator while soaking (explained below), make sure that water is not allowed to enter the high pressure hose. Water entering the submersible pressure gauge (SPG) via the high pressure hose may cause damage to the internal components.

After each day of diving, soak the Matrix in a warm, fresh water bath to dissolve salt crystals. To dissolve heavy salt buildup, use a slightly acidic vinegar/water bath. After removing the computer from the bath, rinse thoroughly with fresh water. Towel dry the computer before final storage. Place the Matrix in a cool, dry and protective case to transport.



CAUTION: Never, under any circumstances, poke any object through any slots or holes on the rear of the Matrix. Doing so may damage the depth sensor resulting in erroneous depth and/or dive time remaining displays.

ANNUAL DEALER INSPECTIONS & FACTORY SERVICE

The Matrix should be inspected annually by an Authorized U.S. Divers Dealer. The dealer will perform a depth accuracy test, function check, and routine inspection for damage or wear. To keep the two-year limited warranty in effect, this annual inspection must be done one year from the purchase date, plus or minus 30 days. U.S. Divers recommends that you continue to have yearly inspections to ensure the Matrix is working properly, even after the warranty period expires. An annual inspection record is provided in the rear of this manual, which should be signed by the technician after each inspection. The cost of this service is not covered under the two-year limited warranty. Also, be sure to record any factory services that are performed.

If you ever doubt the accuracy of the Matrix's depth readings, DO NOT dive with it until you have it inspected by a U.S. Divers dealer. Some dive stores who provide this service do not have test gauges on their pressure chambers as accurate as the depth sensor on the Matrix. Therefore, if you request a depth check, verify that the test chamber gauge accuracy is better than ± 2 feet.

It is possible to damage the Matrix's depth sensor if it is not pressure tested properly. Please heed the following caution:



CAUTION: Always fully submerge the Matrix in water when performing a pressure test. Pressure testing the Matrix in an air environment may damage the depth sensor, resulting in erroneous depth and time readings.

OPERATING TEMPERATURE

The Matrix operates normally between 32°F to 140°F (0°C to 60°C). You may notice the liquid crystal display (LCD) becoming sluggish at extremely low temperatures. This is normal and will not affect the computer's accuracy.

It is possible to damage the electronics if left exposed to direct sunlight or in a hot, confined space (like a car trunk). After the dive, cover the computer and keep it out of the sun. If inadvertently left in direct view of the sun, the LCD may become totally black. If this occurs, immediately immerse the Matrix in water. The display should recover its normal appearance after a few minutes. Damage from extreme heat or cold is not covered under the two-year limited warranty.

REPLACING THE BATTERY

By continuously flashing, the battery icon (figure 17, a) alerts you to that the batteries are low and must be changed as soon as possible. If there is not enough battery power to complete a full day of diving, the Matrix immediately shuts down after activation. Since changes in temperature can suddenly shorten battery life, U.S. Divers advises that you do not dive when the battery icon is displayed. Furthermore, U.S. Divers recommends that you install fresh batteries before any extended, multi-day dive trip.



CAUTION: Damage from improper battery replacement is not covered under the two-year limited warranty. It is advisable to have your Authorized U.S. Divers Dealer perform the battery replacement. At the same time, the dealer can perform an inspection to make sure the computer functions properly.



WARNING: All memory of tissue loading is erased when the batteries are removed. If you change batteries between dives, you must wait 24 hours before diving again. Otherwise, you may increase the risk of decompression sickness.

If you need to change the batteries yourself, follow these simple procedures:

Removing the Matrix from the Console Boot

1. To avoid damage to the gauge, make sure to work over a soft, cushioned surface. Using two hands, push in on the back of the console boot with your thumbs, while, at the same time, peeling the upper lip of the console boot over the top of the Matrix module. Take special care not to let the module fall out onto the floor.
2. Beneath the Matrix module is a spacer. Remove and clean the spacer. At this time, you may want to clean the interior of the console boot with warm fresh water to remove any salt crystals. Towel dry and insert the spacer back into the console boot.

Battery Removal and Installation

Note: Perform battery removal and installation in a dry, clean environment, taking extreme care to prevent the entrance of moisture or dust.

1. Using a nickel or quarter (never use a screwdriver), turn the battery hatch (figure 18, a) counterclockwise and remove it from the case back.
2. Using your fingers, remove the O-ring from the battery hatch and discard. Do not use tools to remove the O-ring.
3. Examine the threads of the battery hatch and case back for signs of damage which may impair proper threading. If damage is found, return the Matrix to an Authorized U.S. Divers Dealer. Do not attempt to use until the unit has received service.



WARNING: DO NOT attempt to remove the outer case back ring (figure 18, b). Doing so may cause the Matrix to malfunction, resulting in injury or death; it also voids the warranty.

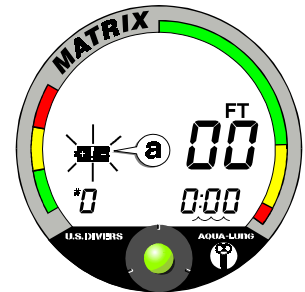


Figure 17
Low Battery Display

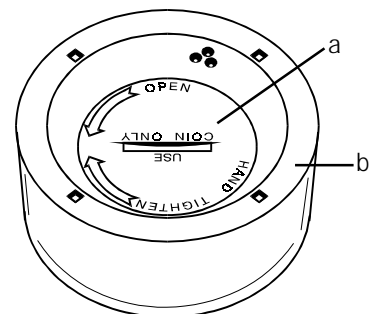


Figure 18
Battery hatch

4. Run your finger around the outer edge of the top battery in a circular motion until one edge of the battery pops up. Remove the top battery. Turn the unit over so the bottom battery drops out into your hand. Discard the used batteries, regardless of age or amount of use. Closely examine the metal contacts inside the battery compartment; check for signs of bending, breakage or corrosion, which indicates the entrance of moisture into the battery compartment. If you see any signs of damage, return the Matrix to an Authorized U.S. Divers Dealer and do not attempt to use it until after it receives service. If everything looks good, proceed to the next step.
5. Install two new 3-volt lithium batteries (Duracell® DL 2032, Radio Shack® 23-162, Maxell® CR 2032, or Panasonic® CR 2032) into the battery compartment directly on top of each other with the positive (+) side of both batteries facing upward. Note: Avoid touching the metal contacts, or the flat sides of the batteries, as skin oil impairs correct contact.
6. Lightly lubricate a new O-ring using a food grade silicone grease, such as Dow Corning 111. This grease is available at most dive shops. Do not over lubricate. Install the new O-ring onto the battery hatch, making sure to gently stretch it over the threads; do not roll it down the threads. Only use the proper U.S. Divers O-ring. Use of the incorrect O-ring may void the warranty.
7. Carefully thread the battery hatch into the case back in a clockwise direction until snug. Using a quarter or nickel, tighten the battery hatch until it is flush with the case back.

Check for Proper Function

1. To ensure that the battery installation was successful, activate the unit and watch it go through its diagnostic mode and battery check as described on pages 15 & 16. If the battery icon is still displayed, return the unit to an Authorized U.S. Divers Dealer for service.
2. Observe the LCD to ensure it is consistently clear and sharp in contrast throughout the screen. If any segments appear dim or are missing, return the unit to your Authorized U.S. Divers Dealer for service. If everything is working properly, proceed to the next step.

Installing the Matrix Module Back Into the Boot

1. Make sure the spacer is in the boot.
2. Place the Matrix module over top of the hole in the boot, making sure it is properly aligned. Dip the top edge of the module into the hole and press the bottom edge with your palm until the bottom edge just enters the hole.
3. If necessary, correct the alignment of the module. Press the module completely into the boot until it “snaps” into place.