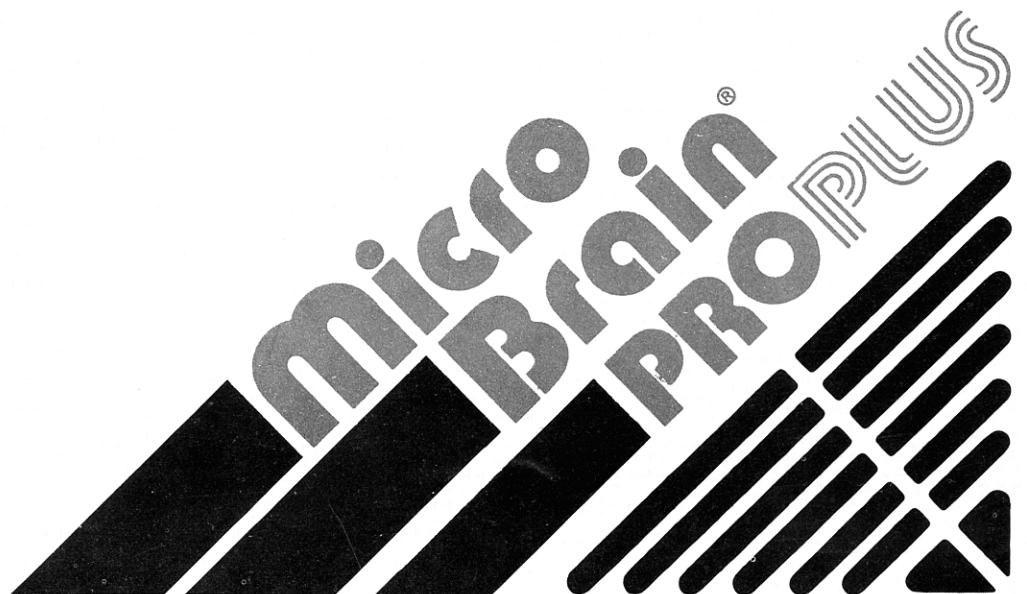


DACOR MICRO-BRAIN[®] PRO PLUS DIVECOMPUTER MANUAL



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DACOR MICRO BRAIN® PRO PLUS

The Micro Brain® Pro Plus has been developed especially for easy understanding and readability. Its display is designed with the express intention of keeping the risk of accidents as low as possible. The Micro Brain® Pro Plus is an innovative breakthrough which sets new standards in diver convenience and safety.

The Micro Brain® Pro Plus is to be used only by certified divers who are fully trained in decompression diving and are aware of the potential hazards of such decompression diving.

**DO NOT ATTEMPT TO USE THE MICRO BRAIN® PRO PLUS WITHOUT READING THIS ENTIRE INSTRUCTIONAL MANUAL.
LEARN TO MASTER THE UNIT WITH THE DIVE PLANNER.**

Eight years ago, the world's first decompression computer, the Deco Brain, was put on the market by Divetronic. This was an epoch-making innovation in the development of diving equipment.

Recently, the Dacor Micro Brain® has proven to be an excellent no-decompression computer. The next step was only logical: to provide even more safety in diving, Dacor became the first manufacturer to offer a miniaturized successor model to the legendary Hans Hass Deco Brain.

The new P4 Program utilized in the Micro Brain® Pro Plus provides reliable data for diving to greater depths whether in a mountain lake, on a repetitive dive, or to depths beyond normal sport diving.

CAUTION: The Dacor Micro Brain® Pro Plus is a precision instrument for estimating residual nitrogen time, manufactured to the most exacting standards in the industry. Each unit has been carefully inspected and tested before it left the factory. However, you, as a diver using this equipment must be aware that no decompression table or dive computer can totally eliminate the risk of decompression sickness. The algorithm used for the Dacor Micro Brain® Pro Plus is more conservative than that used by the U.S. Navy. Even so, individual variation from day to day, factors such as lack of sleep, dehydration, temporary illness, or environmental extremes may increase an individual's susceptibility to decompression sickness even while observing safe decompression limits. Multiple level/repetitive diving over multiple days (i.e., a week long dive trip) requires careful planning and strict adherence to no-decompression limits. When participating in such diving, always remain well within the allowed no-decompression limits by ascending during the remaining two to four minutes. The Dacor Micro Brain® Pro Plus, when used with common sense and care can be an aid in improving your diving pleasure and safety.

Dacor's Micro Brain® Pro Plus offers the latest advanced diving technology and is the world's first decompression computer with:

- Integrated dive planner and decompression computer (for prognosis calculations).
- Recorder and memory for total hours, total dives, and maximum depth ever attained.
- EEPROM ("Electrical Erasable Programmable Read Only Memory")- This provides an energy independent, "locked-in" memory.
- Interactive calculator and memory access.

Dacor Micro Brain® Pro Plus means:

Feeling secure at depth because of reliable information on hand with easy understanding and readability.

Table of Contents:

Page

I.	The 36 functions of the Micro Brain® Pro Plus	2
II.	Micro Brain® Pro Plus provides:	2
III.	Brief description of the functions	4
IV.	Description of the display	7
V.	Instructions for use	9
	A. Turning on	9
	B. Turning off	9
	C. Operation modes	9
	D. Diving in groups	10
	E. Mountain lake diving and diving in the dark	11
	F. Use in pressure chambers	11
	G. Special features, fastening	11
VI.	Characteristics	16
	A. Hardware, Service Life	16
	B. Battery Life	16
	C. Care and Maintenance	16
	D. Battery Charger, Recharging the Battery	17
	E. Authorized Recharging	19
	F. Depth Gauge	19
	G. Ascent Rate/Indicator	19
	H. Dive Timer	19
	I. Desaturation Time, Do-Not-Fly Warning	19
	J. Logbook Memory	19
	K. Dive Recorder	20
	L. Dive Planner	20
	M. No-decompression Computer	21
	N. Decompression computer	22
	O. Software	23
VII.	Appendix	23
	A. Cautions and Warnings	23
	B. Production range and accessories	24
	C. Definitions	26
	D. Questions & Answers	26
	E. Troubleshooting	27
	F. Warranty	28

I. The 36 Functions of Micro Brain® Pro Plus

20 Basic Functions from the standard Micro Brain®:

- Elapsed dive time
- Depth
- Maximum depth
- Remaining no-stop time volume (triangle display)
- Actual no-stop time
- Warning signal before no-stop time expiration
- Warning for ascent speed exceeding 33-40 ft. (10-12m)/min.
- Warning for decompression stop required
- Warning for ascent to deco-stop
- Actual deco-stop required (10, 20, 30...78 ft) (3, 6, 9...24 m)
- Minimum ascent depth (SAD or ceiling)
- Descent required indicator (omitted deco-stop)
- Emergency warning mode switches on when the unit is Out of Range
- Out of Range emergency mode displays the omitted decompression stop ceiling
- Do-not-fly indicator
- Logbook data memory for last 6 dives (maximum depth, dive time)
- No-decompression dive profiles of 51-130 ft. (15-39m), scrolling
- Functional test display with error detection
- No-decompression computer for repetitive dives
- No-decompression computer for dives up to 6560 ft. (2000 m) above sea level

16 Additional Functions for Micro Brain® Pro Plus:

- Decompression prognosis (triangle flashing)
- Ascent time (all stops and ascents are calculated at a speed of 33 ft. (10 m)/min.)
- Out of range mode with decompression plan scrolling of depth and times
- Time until next flight permitted
- Time until complete desaturation
- Surface intervals with six dive logbook entries
- Dive counter and memory for 9999 dives *
- Dive hours counter and memory for 9999 hours *
- Recorder and memory for the maximum depth ever achieved
- No-decompression dive profiles of 41-149 ft. (12m - 45m) scrolling
- Dive planner for calculating any profile wanted
- Interactive calculator, recorder and logbook recall activated by moistened fingertips
- Decompression computing for planning of repetitive dives
- Decompression computer for dives up to 6560 ft. (2000m) above sea level
- Decompression prognosis computer for dive planning
- Logbook data memory for last 3 dives in the EEPROM memory after complete desaturation.

* See Specifications

II. Micro Brain® Pro Plus provides:

A. Four unique features:

1. Dive planner and decompression prognosis computer. Now you can calculate in advance any dive profile, even repetitive dives, based on your present state of desaturation.
2. Recorder for counting and storing number of all dives and total dive hours. Micro Brain® Pro Plus adds and stores number of all dives executed and all dive hours up to a number of 9999. In addition it also stores the maximum depth ever achieved.
3. Electrical Erasable Programmable Read Only Memory (EEPROM). Your logbook data and other entries remain stored forever as no electrical power is necessary for storing. No battery is needed to maintain memory.
4. Interactive calculator and memory access. The operation of the dive planner, the recalling of logbook data and other entries is an interactive communicating between diver and computer by means of "on sensors" and indications.

II. Micro Brain® Pro Plus provides:

B. Functions and Technological Advantages

1. The Micro Brain® Pro Plus can be cleared manually with the accessory magnet. In resort and rental use, this makes it possible for many divers to use the same unit over a period of time. When unit is magnetized, it returns to "0" saturation level.
2. The battery life can be extended approximately six (6) years with proper recharging.
3. Battery capacity (assuming no recharging) for dives of one hour plus 12 hours of desaturation after each dive:

1500 Dives in 1 to 2 years
1000 Dives in 5 to 7 years
500 Dives in 10 to 12 years

4. Water sensor activation (manual switching not required)

C. Specifications

DEPTH GAUGE

Range: 0-270 FSW (0-82 MSW) WARNING: Descents below 270 ft. (82m) may damage unit

Operating Range: 0-14, 764 ft. (0-4500m) above sea level

Temperature Range: 14° F to 122° F (-10° C to 50° C)

Accuracy: ± 1 ft. (0.3m) between 0-270 ft. (0-82m) at temperatures between 14° F to 122° F (-10° C to 50° C)

DISPLAY

Current depth

Maximum depth (after each dive)

Stop depths: to 78 ft. (24m) maximum deco-stop

Ceiling depth

DIVE TIMER

Range: 0-199 minutes

Display: Total elapsed time
No decompression time
No stop time remaining
Time to fly

Time of total ascent for
decompression dive
Desaturation time
Total decompression time

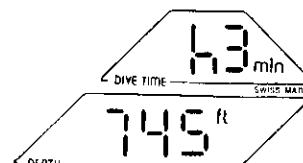
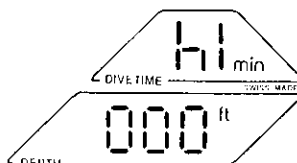
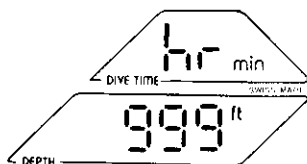
LOG TIMER

Dive hours: Recorder computes dive hours up to 9,999. 3-digit readout provides this information as follows:

For example:
999 Hours

1,000 Hours

3,745 Hours



Dive Counter: Recorder computes number of dives up to 9,999

ASCENT RATE INDICATOR

If the diver exceeds the 33-40 ft. (10-12m)/min. ascent rate, the flashing "ASCEND" warning arrow appears.

POWER

Type: (2) Lithium cell batteries (rechargeable)

Duration: Battery shelf life 8-10 years

SWITCH

On/Off - Automatic water activated "On Sensors"

Internal - Magnetic reed for manual clearing of data

DISPLAY

LCD Low power consumption - Easy to read, two digital fields and one triangle

II. Micro Brain® Pro Plus provides:

C. Specifications

ELECTRONICS

- (2) High capacity Silicon chips (including Senso Brain custom chip for automatic air pressure control, calibration and readjustment of pressure sensor)
- (1) Piezo-Resistive pressure transducer
- (1) 8 Bit CMOS single chip microprocessor
- (1) Printed circuit board with SMD/COB

CASE

Glass reinforced polyamid plastic
Hermetically sealed silicone gel
No "O" rings or gaskets (leakproof)

OPERATING TEMPERATURE

(For Maximum Accuracy)

Range: 14° F to 122° F (-10° C and +50° C)

WEIGHT

3.5 oz. (100 grams)

DIMENSIONS OF MODULE (Less protective cover)

2 1/4" x 2 3/8" x 7/8" (56mm x 60mm x 18 mm)

DECOMPRESSION MODEL

Algorithm-Buhlmann/Hahn P-4
(Modified P-3 model)
Up to date level of decompression research (1988)
Tested in over 200,000 dives
Tissue compartments: Six
Tissue half time range: 6 minutes to 600 minutes

III. Brief Description of the Functions

Main Function

1. If the diver descends, the Micro Brain® Pro Plus turns on automatically and its display shows a large black triangle as its most important display. The size of the triangle indicates the no-decompression no-stop time/volume available.
2. The deeper and the longer the diver descends and approaches the no-decompression limit the smaller the triangle becomes.
3. If the diver reaches the no-decompression limit, the triangle is reduced to a small segment and flashes every second as a warning signal.
4. If the diver ascends within this time, the flashing stops and the triangle increases in size. Additional no-decompression credit is given during ascent for shallower depths. As long as there remains no-decompression time in the triangle, the diver can return to the surface at any time without a deco-stop.
5. Should the diver descend deeper beyond the no-decompression limit, in spite of the warning signal, the triangle continues to flash and enlarge. At a glance and without reading any figures the diver understands that decompression is required. The size of the flashing triangle indicates the estimated ascent time to surface. The triangle continues to flash every (1) second.
6. A decompression profile is computed from the diver's current status. Upgraded information is displayed every seven seconds and remains on for three seconds. Alternating between the displays of current depth and total elapsed time are the deco-stop depth and the total ascent time required to surface. These appear in the depth and time windows respectively. No times are shown for individual deco stops.
NOTE: Total ascent time is the sum of all deco-stops plus the travel time calculated at an ascent rate of 33 ft. (10m)/min.

Should the diver exceed the indicated deco-stop depth, a flashing arrow appears. This warning directs the diver to descend to the safe ceiling required for decompression. Once the ceiling is reached the descend arrow disappears.

III. Brief Description of the Functions

Main Function

7. In the case of omitted decompression, the Micro Brain® Pro Plus switches to the out-of-range mode for 8 hours. This occurs if the diver has been out of the water for 3 1/2 minutes or more. If the diver enters the water before 3 1/2 minutes has elapsed the Micro Brain® Pro Plus will continue in dive mode. The out-of-range symbol will appear on the display. (See operation modes Ch. V sec. C.4). The last required deco-stop depths and deco-stop times of the diver's decompression plan will scroll on the display. If he continues to dive, the Micro Brain® Pro Plus continues to provide dive time and depth. However, the calculation of tissue desaturation stops. Even without evidence of any ill-effects, the omitted decompression must be made up in some manner to avert later difficulty. If no chamber is available on deck, the U.S. Navy recommends the following as an emergency measure: Repeat any stops deeper than 40 feet. If there were none, go back down to 40 feet and remain at the 40 foot stop for one-fourth of the 10 foot stop time. At 30 feet, remain for one-third of the 10 foot stop time. At 20 feet, remain for one-half of the 10 foot stop time. At 10 feet, remain for one and one-half times the scheduled 10 foot stop time. Obviously, when you re-descend, you must carry with you sufficient air to allow the required emergency decompression.

Additional Functions

8. During the dive the diver can keep informed any time about the current depth and the elapsed dive time. This is indicated in large figures in the two display fields above the triangle.
9. Should the diver ascend faster than 40 ft. (12m)/min., he is warned by a flashing ascend arrow. The arrow disappears when the diver resumes the proper ascent speed.
10. Immediately after surfacing, the total dive timer stops, and the depth display indicates the maximum depth every five seconds for a one second interval. If the diver does not dive again within 4 minutes, the dive data is entered in the logbook memory.
11. If no further dive follows within 4 minutes, the Micro Brain® Pro Plus switches to surface mode and scrolls during the entire desaturation time the respective no-decompression times for depths from 41-149 ft. (12-45m) in 10 ft. (3m) increments. Moreover, the Do-Not-Fly warning appears on the display while flying is not permitted, and the Micro Brain® Pro Plus starts recording the surface interval in its logbook memory.
12. For repetitive dives, the Micro Brain® Pro Plus considers automatically the increased residual saturation of tissues, and the no-decompression limits are continually upgraded for surface interval credit. This information is displayed (scrolled) for repetitive dive planning. **Always make your deepest dive first! Whenever possible, avoid returning to the same depth as your previous dive.**

Logbook - Dive Recorder

13. In the surface mode, while the Micro Brain® Pro Plus is scrolling the no-decompression times, the logbook data can be recalled. If the Micro Brain® Pro Plus is in the sleep mode (no display), you can activate it by immersion in water or by placing moistened fingertips on the two gold plated on-sensor pins. Both pins must be touched simultaneously.
14. For recalling the dive data you must touch the on-sensors with moistened fingertips for about one second. Each contact shifts the memory and the indication one step further. If the on-sensors are bridged for more than two seconds, the Micro Brain® Pro Plus returns to surface mode and starts scrolling the no-decompression times.
15. If the on-sensors are bridged for more than five seconds, the Micro Brain® Pro Plus turns into dive mode. If, however, no real dive is executed, the depth gauge and the dive time remain 0, and the triangle remains at full size for four minutes, until the Micro Brain® Pro Plus returns to surface mode automatically.
16. Summary of the above - Data Recall
 - A) Moistened finger contact for (1) second shifts the memory and indication one step further.
 - B) Moistened finger contact for more than (2) seconds stops the recalling of dive data and returns the Micro Brain® Pro Plus to surface mode scrolling.
 - C) Moistened finger contact for more than (5) seconds activates the dive mode.
17. The recalling of dive data appears in a fixed order. The triangle is erased and the recall data is indicated in the respective fields above the triangle.

III. Brief Description of the functions-Logbook - Dive Recorder

Memory Table:

Step	Display Code	Displayed Data	
1	SAt	Total desaturation time (Saturation)	} TISSUE DESATURATION INFORMATION
2	FLt	Time until flight permitted (Flight)	
3	LOG1 INt1	Logbook entry 1, max. depth, dive time Surface interval 1, (last dive)	} LOGBOOK DATA & SURFACE INTERVAL
4	LOG2 INt2	Logbook entry 2, max. depth, dive time Surface interval 2	
5	LOG3 INt3	Logbook entry 3, max. depth, dive time Surface interval 3	
6	LOG4 INt4	Logbook entry 4, max. depth, dive time Surface interval 4	
7	LOG5 INt5	Logbook entry 5, max. depth, dive time Surface interval 5	
8	LOG6 INt6	Logbook entry 6, max. depth, dive time Surface interval 6	
9	rcd d-	Maximum depth of all dives	} DIVE RECORD DATA
10	rcd no	Number of dives	
11	rcd hr	Sum of all dives in hours	
12	do PLn	Activating of dive planner	} PROGNOSIS COMPUTER

Dive Planner (Prognosis computer)

18. In order to avoid any unintentional activation of the dive planner, it can only be turned on when the recalling of the dive data is finished. Only after step 11 of the above table is completed, can the diver activate the dive planning mode (do PLn).
19. When activating the dive planner (step 12), the code "do PLn" appears in a flashing mode. It is a symbol for "Do Plan". Now the Micro Brain® Pro Plus is ready to simulate and indicate any dive profile based on real diving conditions. The Micro Brain® Pro Plus activates the simulation tissues of the prognosis computer and compares them to the actual tissue saturation. For the first time the diver is able to use a computer for the calculation of repetitive dives, based on the current state of residual saturation.
20. After another short moistened finger contact of the on-sensors, the Micro Brain® Pro Plus switches to a depth of 7 ft. (2m) and starts to count the dive time. The Micro Brain® Pro Plus is now simulating in the dive mode. By further contacts of the two sensors, you can enter the desired dive profile.
21. If the on-sensors are contacted for 2 seconds, the Micro Brain® Pro Plus starts to descend and the depth indication increases by 1.6 ft. (.5m)/sec. This is equivalent to a descent speed of 98 ft. (30m)/min. for purposes of simulation. If you wish to stop the descent and begin diving horizontally, contact the on-sensors for one second. The Micro Brain® Pro Plus stops the descent and continues to count the dive time.

For a further descent the on-sensors must be contacted again for 2 seconds.

To ascend, you contact the on-sensors for 3 seconds, the Micro Brain® Pro Plus starts ascending, and the depth is reduced by 1.6 ft. (.5m) every other second. This is equivalent to an accelerated speed ascent of 49 ft. (15m)/min., for purposes of simulation. The calculation of your planned dive profile is not affected by the accelerated ascent rate during simulation.

If the on-sensors are contacted for more than 4 seconds, the Micro Brain® Pro Plus turns off the dive planner and returns to the surface mode. If the on-sensors are contacted for more than 8 seconds, the Micro Brain® Pro Plus switches into actual dive mode, directly from dive planner mode.

22. With these three commands: Stop, Descend and Ascend, you can enter any dive profile you choose. The sensors must be contacted for either 1, 2 or 3 seconds as indicated with moistened fingertips.

Summary of the above commands and contact times:

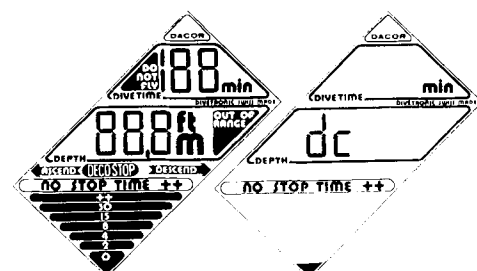
Command:	Time of Contact of On-sensors:
Stop (horizontal diving)	Contact 1 second
Descent at 98 ft. (30m)/min.	Contact 2 seconds
Ascent at 49 ft. (15m)/min.	Contact 3 seconds
Terminate	Contact 4 seconds
Activate actual dive mode	Contact 8 seconds

Note: It is very important that proper contact of "on-sensor" pins is performed to control the "Do PLn" function. Contact must be made to the exact second as specified above (no more-no less).

Suggestion: To simplify counting of seconds, use the verbalized countdown method, saying out loud, "twenty-one" for each second of contact. Salt water wetting of fingertips may facilitate more efficient contact when doing dive planning programs.

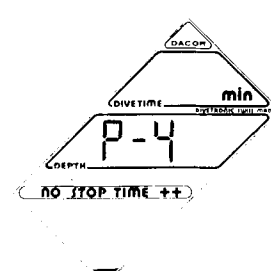
IV. Description of the display

When the computer is activated:



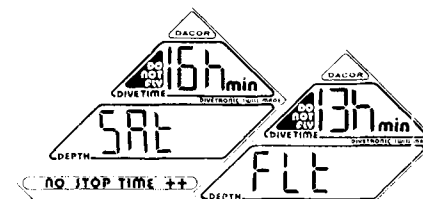
Functional test, full display blinks 3 times

Program code dc (decompression computer)



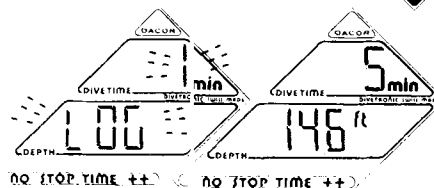
Micro-Brain © Pro Plus program P-4

Recalling of data from logbook memory or dive recorder:

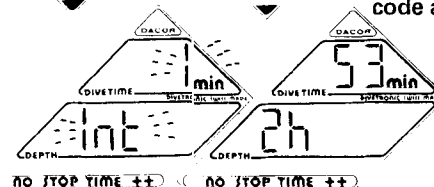


The desaturation time in hours

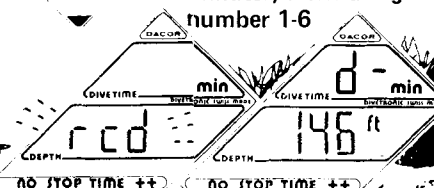
Time until flight permitted in hours



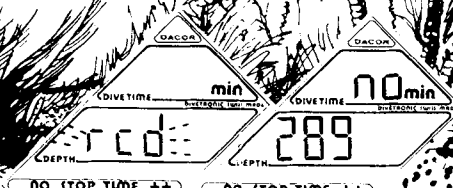
Logbook data maximum depth and dive time, alternating with code and number 1-6



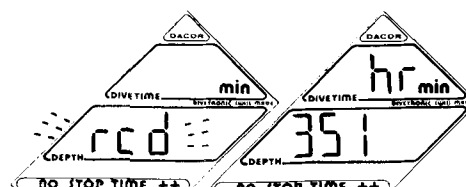
The surface interval in hours and minutes, alternating with code and number 1-6



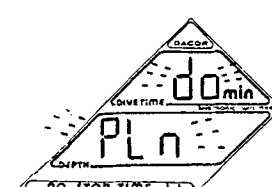
The maximum depth ever achieved, (record data)



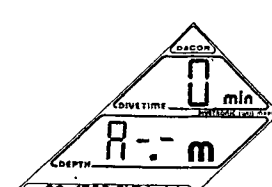
The number of all dives executed, (record data)



The number of all hours spent under water, (record data)

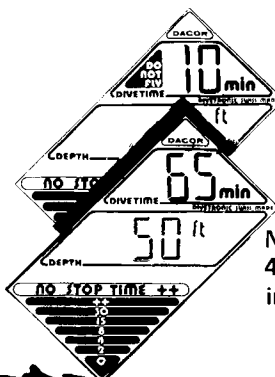


The code of the activated dive planner (Do PLn)



Adjust mode

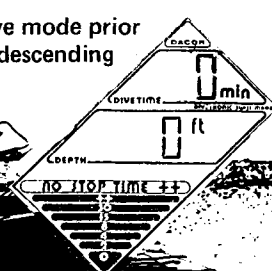
Before diving or after a dive:



Do-Not-Fly warning, as long as flying is not permitted

No-decompression times for 41 to 149 ft. (12 to 45 m) in scrolling mode

Dive mode prior to descending



Under water:

The elapsed dive time in minutes

The depth. Precise to + 1 ft. (0.3m)

A warning when exceeding the ascent speed of 40 ft. (12 m) min.

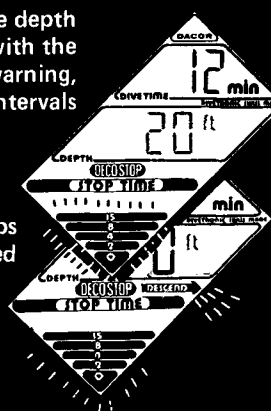
The no-stop time remaining for the given depth

A warning signal before no-stop time expires

After no-stop time has expired, the depth of the next deco-stop, together with the ascent time and the deco-stop warning, displayed 3 seconds at 7-second intervals

The ascent time as flashing triangle (sum of all deco-stops and travel time) to indicate decompression required

A descent warning if the diver has gone beyond the deco-stop



In emergency mode:

An out-of-range indicator, if a deco-stop deeper than 78 ft. (24 m) is required or if the ascent time exceeds 90 min., or if the deco-stop has been missed despite the warnings. The calculation of tissue desaturation is stopped.

The depth and elapsed dive time alternating with the latest decompression plan applicable.

All deco-stops and decompression times scrolling for 3 seconds at 7-second intervals.

V. Instructions for Use

A. Turning on:

The Micro Brain® Pro Plus is activated by touching the on-sensors with moistened fingertips or by immersion in water.

After a delay of approximately .5 seconds, all indications of the display blink 3 times in a 1 second interval as a functional test, and the display is cleared except for the code "dc", or, decompression computer. Then the Micro Brain® Pro Plus shows the program code P-4 for one second and continues in the surface mode. If the on-sensors remain contacted, the Micro Brain® Pro Plus switches directly to dive mode, showing "O" time, "O" depth and full no-stop time triangle. The on-sensors are two gold plated pins which are located on the lower left and right side of the front of the case, just below the viewing window.

B. Turning off:

The Micro Brain® Pro Plus turns off automatically. There are three different possibilities:

1. If no dive follows after switching on, i.e., if the Micro Brain® Pro Plus is still in surface mode and the on-sensors have not been activated for 4 minutes and 15 seconds.
2. After completed desaturation of all tissues to the surrounding pressure.
3. If the microprocessor detects a software or hardware failure during the functional test. However, this is most unlikely, but would prevent the use of a defective instrument.

C. Operation modes:

The Micro Brain® Pro Plus has 4 operation modes:

1. The surface mode:

In the surface mode the Micro Brain® Pro Plus scrolls the actual no-decompression times for depths between 41 ft. and 149 ft. (12 and 45m) in 10 ft. (3m) increments, the indications changing every 5 seconds.

The Do-Not-Fly warning is based upon time until safe flight and is calculated as long as the standard solution pressure of 12.7 P.S.I. (.877 bar) is required to desaturate all tissues. Flight is allowed at aircraft pressures equivalent to altitudes of 8000 ft. (2438m.) (the lowest normal allowable aircraft pressure used on commercial flights).

When activating the on-sensors for 4-5 seconds (moistened fingertips or water contact), the Micro Brain® Pro Plus turns to dive mode.

When activating the on-sensors for 1-2 seconds, the Micro Brain® Pro Plus turns to communication mode.

2. The communication mode:

In the communication mode, all data from the memory and the dive planner can be recalled. The operation is very easy. After a short contact of the on-sensors, the display shows the next logbook entry with the respective code. You can recall the desaturation time, the time until flight permitted, the last 6 logbook entries (maximum depth, dive time and surface interval) as well as 3 values from the dive recorder (the maximum depth ever achieved, number of all dives, number of all dive hours).

The recalling of dive data runs in a fixed order. When the recalling of dive data is finished (see memory table after step 11), the Micro Brain® Pro Plus activates the dive planner (see ch. III, sec. 18)

3. The dive mode:

In the dive mode, the Micro Brain® Pro Plus indicates the current dive information, i.e., depth, dive time, no-decompression time, etc.

The dive mode turns off as soon as the on-sensors have not been activated for 4 min., 15 secs. Of course this can only happen outside the water. The Micro Brain® Pro Plus then turns to surface mode.

YOU MUST HAVE THE MICRO BRAIN® PRO PLUS IN POWER UP AND DIVE MODE PRIOR TO DESCENDING. DO NOT ASSUME BECAUSE THE UNIT POWERED UP THAT IT WILL GO AUTOMATICALLY INTO DIVE MODE.

V. Instructions for Use

The Micro Brain® Pro Plus registers the air pressure immediately when contacting the water. As soon as you descend, the Micro Brain® Pro Plus is automatically sensing depth. It is recommended that you activate the unit before entering the water by moistening the on-sensors to ensure proper dive mode function and display.

Reason:

A turned-off Micro Brain® Pro Plus (display cleared) has a turn-on delay of 1.5 seconds. When a diver jumps into the water and descends immediately, this can result in a slight deviation in the maximum depth gauge reading. Deviation caused by such operating error is equivalent to the depth, which the diver reaches within the turn-on delay of 1.5 seconds. Normally, it is less than 3 ft. (1m).

If the depth gauge indicates 0, even though the diver is already 3 to 6 ft. (1-2m) below the surface, the diver should ascend a little, and the depth gauge will readjust to actual 0 ft. (0m). The Micro Brain® Pro Plus always assumes the lowest pressure measured as air pressure.

4. Emergency mode or out-of-range mode:

The out-of-range mode turns on if the required decompression is missed. If the descent warning (descend arrow) flashes, the diver is at a dangerously low surrounding pressure and should descend at once until the descend arrow disappears. The higher the diver exceeds the required ascent level, the shorter is the latent period. Finally, the descent warning turns into out-of-range warning and signals the risk of decompression sickness.

The Micro Brain® Pro Plus calculates all dive times and depths up to 270 ft. (82m) but turns into out-of-range mode if a deco-stop depth of more than 78 ft. (24m) is required, or if the decompression time is more than 90 minutes.

In the emergency mode the term "out-of-range" appears on the display. Meanwhile the Micro Brain® Pro Plus continues to provide dive time, depth and logbook information. However, the calculation of tissue desaturation is stopped, and the last mentioned decompression plan is shown scrolling. The Micro Brain® Pro Plus scrolls all deco-stops in 7-second intervals, and the respective deco-stops and decompression times are indicated for 3 seconds each, combined with the deco-stop warning. This information can be of vital importance to the diver or his buddy and can be used for a possible pressure chamber treatment in case of an accident.

The out-of-range mode keeps operating and is displayed for 8 hours. After this time the Micro Brain® Pro Plus reduces all tissues to surrounding pressure and continues in the surface mode. In the out-of-range mode only the logbook data (maximum depth, dive time and surface interval) are stored. If someone else wishes to use your Micro Brain® Pro Plus before 8 hours have passed, you can clear the out-of-range mode by means of the accessory magnet (See Ch. V, sec. G). Once the out-of-range mode is cleared with the magnet, you yourself may not use it to compute your dives until at least 24 hours have elapsed since your last diving exposure.

5. Very Deep or Decompression Diving:

If you plan to do very deep diving, or decompression diving, you must be very sure that you are carrying enough air for the necessary decompression stops. Only very experienced and trained decompression divers should even attempt decompression diving, for they will have the knowledge and expertise to compute their own air consumption rates at various depths and under various water conditions. Their air consumption rates under different activities using specific equipment should be well understood. The Micro Brain® Pro Plus does not display the stop times for all the stops as the diver begins to ascend. It displays the sum of all the stops only. Therefore, should the diver stay long enough to require an unexpected deep stop or even a very long 10 foot stop, his air consumption may be unexpectedly high and his air supply insufficient to carry out the necessary decompression. It is important to remember that air consumption at a 30 foot stop will be nearly double what it is on the surface. Also, frequent or excessive charging of the BC will seriously deplete reserve air.

For this reason, if you are planning a very deep or decompression dive, you should first use the Micro Brain® Pro Plus in dive planning mode to run through the planned dive on the surface before attempting it in the water. This should be done several times, including lengthening the bottom time and depth slightly so that you will be aware of additional decompression stops and times if you should deviate from your plan for any reason. Air supply can be calculated accordingly with an appropriate reserve. There should be an additional reserve for the BC if one is used.

D. Diving in groups:

When diving in a group with only one Micro Brain® Pro Plus in use, all divers must stay at the same depth or above the diver with the Micro Brain® Pro Plus. As soon as the unit displays only 2-4 minutes of no-decompression time remaining, it is recommended to ascend to a shallower depth, until the no-decompression time increases again.

Planned decompression dives under these circumstances are particularly dangerous, as it cannot be guaranteed that all members of the group have followed the dive leader's depth profile. Therefore, we recommend that planned decompression dives never be done using one Micro Brain® Pro Plus for more than one diver.

V. Instructions for Use

E. Mountain lake diving and diving in the dark;

CAUTION: Altitude diving poses greater potential hazards than diving at sea level.

The Micro Brain® Pro Plus model of tissue calculation and its safety margins allow altitude diving up to 4920 ft. (1500m) above sea level. If the diver has already stayed in the respective altitude 24 hours before the dive, the Micro Brain® Pro Plus is safe and reliable up to 6560 ft. (2000m) above sea level.

For dives at altitudes greater than 4920 ft. (1500m) up to 6560 ft. (2000m), the following times are required for body tissue adjustment. This is the time you must wait to dive with the Micro Brain® Pro Plus at altitudes above 4920 ft. (1500m).

<u>Beginning Altitude</u>	<u>Travel Range</u>	<u>Body Tissue Adjustment Time</u>
0 ft. (0m) to	4920 ft. (1500m)	0 Hrs.
0 ft. (0m) to	4920 ft. (1500m) -6560 ft. (2000m)	24 Hrs.
1000 ft. (305m) to	4920 ft. (1500m) -6560 ft. (2000m)	18 Hrs.
2000 ft. (610m) to	4920 ft. (1500m) -6560 ft. (2000m)	12 Hrs.
3000 ft. (915m) to	4920 ft. (1500m) -6560 ft. (2000m)	6 Hrs.
4000 ft. (1220m) to	4920 ft. (1500m) -6560 ft. (2000m)	0 Hrs.

NOTE: Travel from high altitude to lower ranges is not restricted.

For altitude diving it is recommended to observe the no-decompression limits carefully and not to plan decompression dives. In the event that deco-stops are indicated, stops should be made at the depths indicated; **NEVER LESS!** This accelerates decompression and helps to get out of the cold water as soon as possible (see Ch. VI, sec., N.5).

For altitudes up to 14,764 ft. (4500m) above sea level, the Micro Brain® Pro Plus can be used as a precision depth gauge with automatic altitude adjustment. The dive timer and logbook functions continue at these altitudes.

CAUTION: No-decompression limits and deco-stops are given, but are no longer reliable values and must not be used.

In bad visibility and in the dark the diver can use the Micro Brain® Pro Plus. As long as no dive light is needed for diving, the Micro Brain® Pro Plus can be read easily. If a dive light is required it can be used to read the display.

F. Use in pressure chambers:

The Micro Brain® Pro Plus is not to be pressurized in either air or gas. It must be immersed in water, or hyperbaric pressure will destroy the silicone gel by diffusion. Please ensure that the unit is submerged under water so that possibility of damage by air or gas diffusion is eliminated.

For testing depth gauge accuracy, the Micro Brain® Pro Plus must be held to a maximum of 1" (2.5cm) water depth. Additional water column above the instrument will cause an indication of greater depth than chamber measurement.

The Micro Brain® Pro Plus is not to be exposed to pressure of more than 270 FSW (82MSW), 134 p.s.i. (absolute). This can destroy the instrument.

G. Special Features:

The Micro Brain® Pro Plus is equipped with a Magnetic REED-switch:

You can reset or clear the Micro Brain® Pro Plus by placing the accessory magnet to the right side of the case marked "MAGNET" for three seconds. This will clear the memory of the logbook data from the last dive and the surface interval. It will clear the tissue memory to surrounding pressure also. It does not clear however, the memory of maximum depth, total number of dives and total number of diving hours obtained from previous dives. This data will remain stored despite all manipulation of the Micro Brain® Pro Plus.

Therefore, it is not a problem lending the Micro Brain® Pro Plus to other certified divers. It is helpful when used in instructional programs and facilitates test dives in pressure chambers. After a dive you do not have to wait for hours until the calculation of tissue desaturation is completed and you can decide which logbook data you wish to record in the logbook memory.

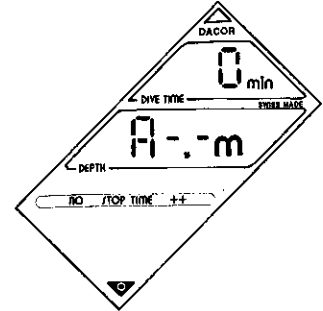
Moreover, you can turn off the Micro Brain® Pro Plus if you do not intend further dives. This will conserve battery power, which is especially useful in diving schools. **DO NOT CLEAR THE MEMORY IF YOU PERSONALLY PLAN REPETITIVE DIVES.**

V. Instructions for Use

H. Micro Brain® Pro Plus performs a functional test when turned on:

If the Micro Brain® Pro Plus flashes the symbol "A" every 5 seconds for 1 second in the depth field and the symbol "O" in the dive time field, this means that the pressure measuring system must be readjusted. "A" stands for "Adjust".

ADJUST MODE DISPLAY:



You can readjust your Micro Brain® pro Plus by yourself, if you proceed as follows:

- Step 1: Clear your Micro Brain® Pro Plus by means of the magnet, as described before. Important: The Micro Brain® Pro Plus must not be in the water and the on-sensors must not be contacted.
- Step 2: Turn on your Micro Brain® Pro Plus again.
- Step 3: If the Micro Brain® Pro Plus shows the normal display, (see Ch. V, sec. A) and not the "A", this means that the readjustment was successful.
- Step 4: If the Micro Brain® Pro Plus still indicates "A", although you have repeated Steps 1 to 3 several times, the Micro Brain® Pro Plus has to be returned to Dacor for recalibration.

Important: As long as the Micro Brain® Pro Plus demands readjustment by indicating "A", the computer functions will not work. You cannot use the computer for diving.

I. Micro Brain® Pro Plus has a modular design

Converting the wrist instrument to a console is quite simple. Conversely, the basic module, the computer, can be converted to a wrist instrument simply by snapping on the respective wristband. The Micro Brain® Pro Plus can be mounted to the new Dacor Micro Brain® console by snapping in a rotating holder. Also, the module can be put in a rubber case which slips onto a normal Dacor console.

No screws, clips or other special fasteners are needed. Simply snap in and slip on. See our accessories and production range in Chapter VII, sec. B.

J. The Wrist Design Micro Brain® Pro Plus has a built in cover.

Simply by pushing back the instrument into its wrist cover and rolling up the self adhesive velcro straps, the Micro Brain® Pro Plus is well protected against scratches and shock, and is secured in very little space.

K. Micro Brain® Pro Plus is easy to put on and fits perfectly.

- 1) Take your Micro Brain® Pro Plus; turn it over and separate the Velcro straps. (see fig. 1).

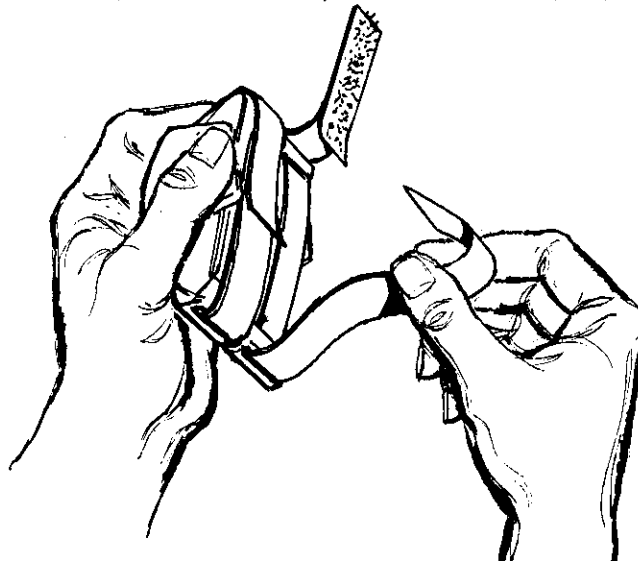


Fig. 1

V. Instructions for Use

K. Micro Brain® Pro Plus is easy to put on and fits perfectly.

2) Open the protective cover to expose the Micro Brain® Pro Plus unit. (see fig. 2).

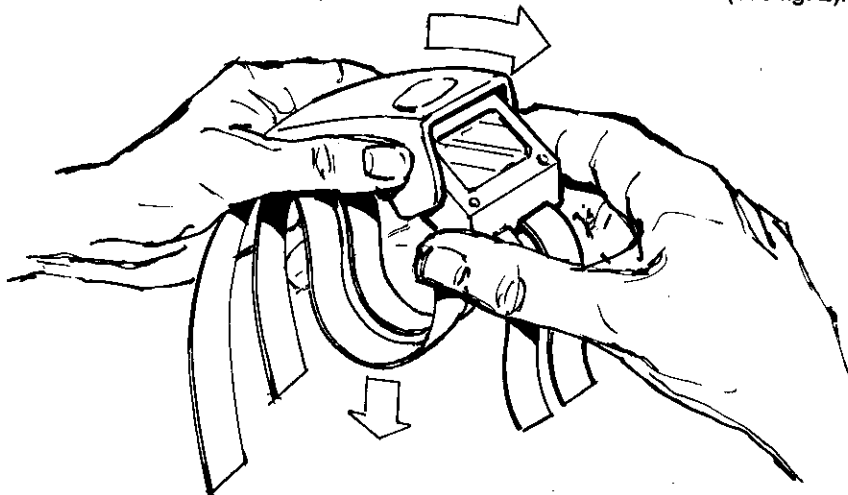


Fig. 2

3) Take both Velcro straps in the middle and draw them up until they form loops. (see fig. 3).

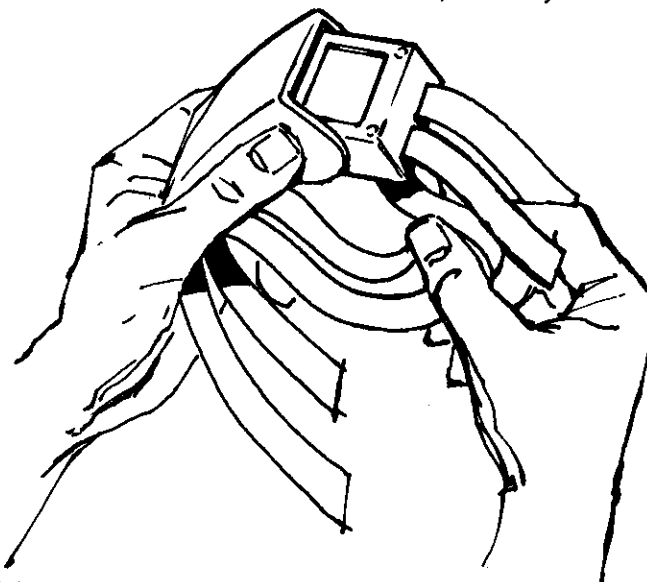


Fig. 3

4) Slip your hand through the loops and place the Micro Brain® Pro Plus on your wrist. (see fig. 4).

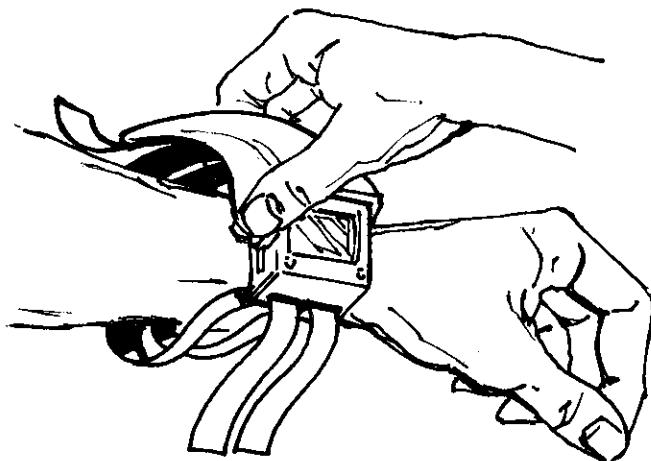


Fig. 4

V. Instructions for Use

K. Micro Brain® Pro Plus is easy to put on and fits perfectly.

5) Place your Micro Brain® Pro Plus on your arm as shown in Figure 5.

NOTE: You should be able to read the display without turning your arm.

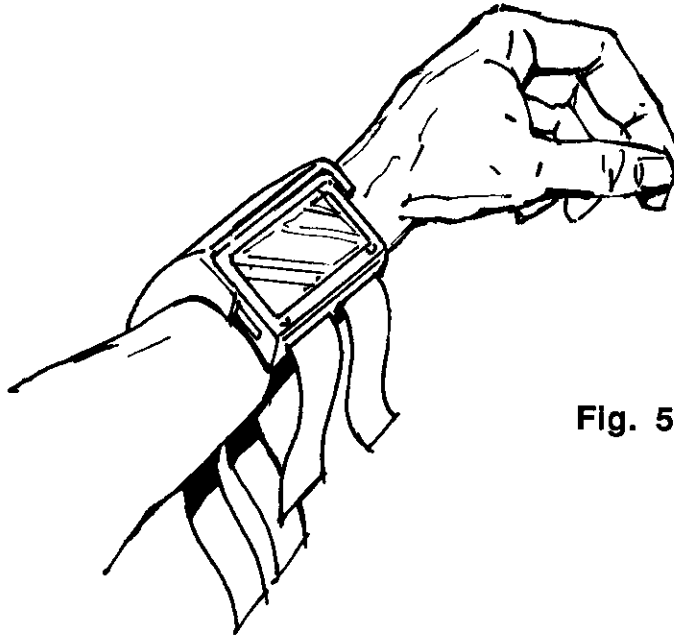


Fig. 5

6) Press the Micro Brain® Pro Plus against your body and draw up the Velcro straps.

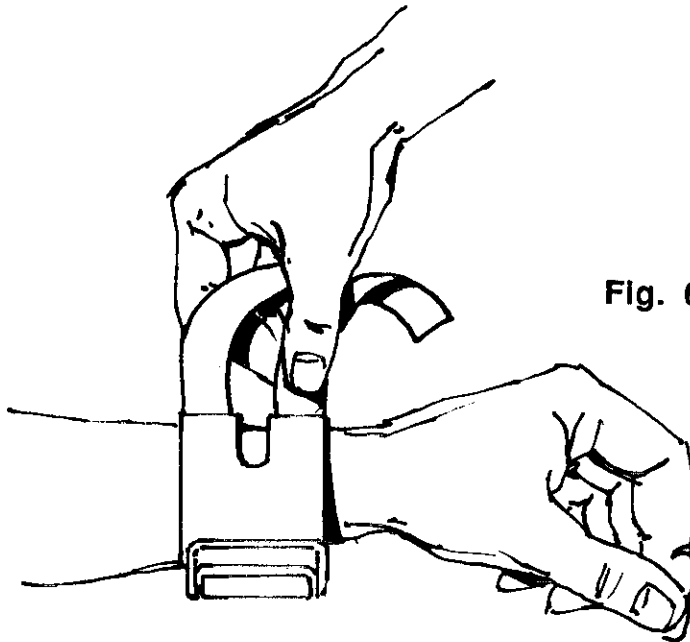


Fig. 6

V. Instructions for Use

K. Micro Brain® Pro Plus is easy to put on and fits perfectly.

7) Grasp and fold the Velcro straps.

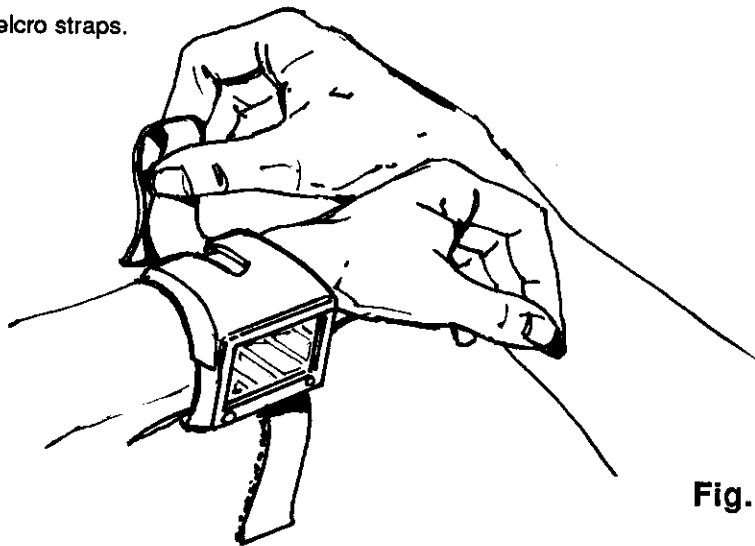


Fig. 7

8) Attach them to the mating Velcro hooks on the other end of the straps. (see fig. 8).

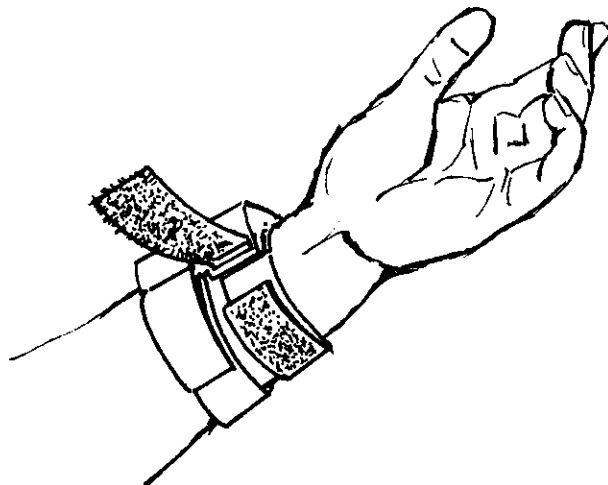
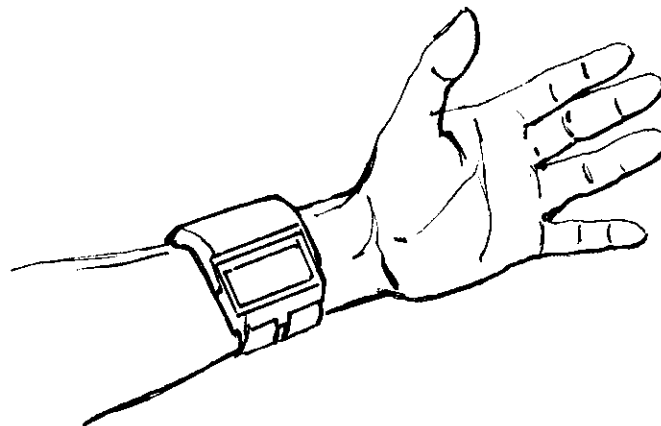


Fig. 8

Important: It is not absolutely necessary to draw up both straps to form loops. You can draw up the outer strap as far as possible. After having fixed the unit with this outer strap, you can now secure your unit with a strap of double length. (See fig. 7) This is especially suited for dry suits or for divers with extremely large wrists and forearms. Moreover, there are XL size straps available as an accessory, which are 3 3/4" (7cm) longer than the standard straps.



VI. Characteristics

A. Hardware Service Life

The Micro Brain® Pro Plus incorporates three chips, one custom LCD, one Piezo-resistive pressure sensor and two lithium batteries. These are built onto both sides of the printed circuit board using SMD (Surface Mounted Device) and COB (Chip On Board) techniques. The gold plated pins activate the unit upon moisture contact.

The heart of the Micro Brain® Pro Plus is the 8 k-Bit CMOS single chip microprocessor with an integrated 6 k-Byte program as MASK-ROM.

The Custom-IC is also responsible for the extremely low power consumption. Micro Brain® Pro Plus only needs one set of Li-batteries in its life.

The low power consumption allows the Micro Brain® Pro Plus to be encased in hermetically sealed silicone gel and provides a leak-proof instrument.

The case is molded of glass fiber reinforced polyamid 12. It has a high impact resistance to shock impact, to ultraviolet light, heat and cold. Reasonable handling is naturally suggested and advised since the Micro Brain® Pro Plus is an instrument.

B. Battery Life

The battery life is practically unlimited, if the battery is recharged regularly as indicated (see Ch. VI, sec. D).

- For a diver who does not dive more than 50 times per year, the Micro Brain® Pro Plus battery life is unlimited. The battery's self discharge is insignificant (5% within 10 years).
- For a diver with 100 to 150 dives per year, the battery life will be 5 to 7 years. This is equivalent to approximately 1000 dives of one hour each.
- For a diving instructor with 6 to 10 dives per day for 220 days per year, the battery life will be 1 to 2 years. This is equivalent to approximately 1500 dives of one hour.

The Micro Brain® Pro Plus can be recharged by means of an attachable charger module, which is available as an accessory. You can also have your Micro Brain® Pro Plus recharged in an authorized dive store for a nominal fee. (See Chapter VI, Sec. D).

A sudden breakdown due to a low battery is not likely. As long as the indications can be read, the Micro Brain® Pro Plus is reliable. Therefore, it does not need a battery warning.

A battery change is necessary, if the contrast of the LCD display is so weak that it cannot be read at +14° F (-10° C).

C. Care and Maintenance

The Dacor Micro Brain® Pro Plus is a precision electronic instrument. Avoid excessive shocks, rough usage, storage in direct sunlight or temperatures exceeding 122° F. (50° C). Do not leave inside automobiles or enclosed spaces on a boat where temperatures can exceed this range.

Rinse thoroughly with fresh water following each dive. Allow to dry (store the wrist Micro Brain® Pro Plus unit in its protective pouch). Keep magnet away from Reset Reed switch side when storing in pouch.

Modules and consoles are made of rubber. Avoid contact with suntan lotions. Some ingredients may deteriorate rubber products. Paint and fuel fumes will also affect rubber. Avoid storage in areas where electric motors and generators are running. These produce ozone which can attack rubber.

CAUTION: Do not use silicone sprays containing chlorinated solvents on any rubber or plastic parts. Contact could damage plastic.

The Micro Brain® Pro Plus can be exposed to temperatures from 14° F to +122° F (-10° C to 50° C) without suffering damage; beyond these extreme temperatures, the Micro Brain® Pro Plus function is not guaranteed. The LCD-contrast may get weaker and deviating depth gauge accuracy is possible. The Micro Brain® Pro Plus is recommended for use in a temperature range limited to between 14° F and 122° F (-10° C and +50° C).

The above characteristics give the diver the following advantages:

- Battery change is rarely necessary (only if diver fails to have unit charged within each fifty hours of use as prescribed).
- Service is rarely necessary except for periodic charging or for battery change if owner fails to charge within time limits specified.
- Design avoids leaks associated with "O" ring seals. Gel filling provides water tight integrity.
- Rarely requires repairs.

In case of a defect, the Micro Brain® Pro Plus will be replaced, with the exception of an out-of-warranty battery. For this purpose, the Micro Brain® Pro Plus must be returned to Dacor Corporation or one of its overseas distributors.

VI. Characteristics

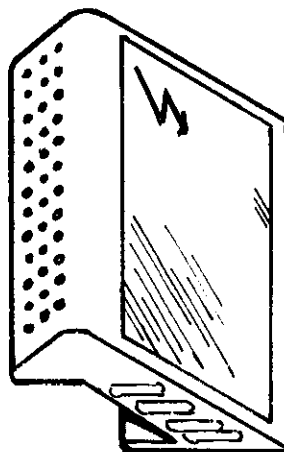
D. Battery Charger/Recharging The Battery:

1. Micro Brain® Pro Plus Charger Module

a. Individual charger:

The accessory Micro Brain® Pro Plus charger module attaches to the Micro Brain® Pro Plus and recharges the internal Lithium battery via the on-sensors. The attachable charger module requires no outside power source. It is completely autonomous as it is run by its own battery and has enough recharging capacity to provide sufficient energy for 300 dive hours.

INDIVIDUAL CHARGER:



With the charger module you can recharge the Micro Brain® Pro Plus 6 times based on 50 dives of 1 hour, plus additional desaturation time. After 6 recharges, the charger module can be taken to any authorized Dacor dealer for charger module battery replacement.

Important:

- The recharging time can be verified on the dive hour recorder of the Micro Brain® Pro Plus (see Ch. VI, sec. K).
- Since the diver cannot determine the power level of the battery and recharging is only possible in the range of the emergency peak, it is recommended to recharge periodically.
- To recharge the consumed energy of 50 dive hours and the associated desaturation time for a dive, the charger should be connected for 5 days. This means that 10 dive hours can be recharged in 24 hours, 20 dive hours in 48 hours, etc. (see chart below).

10	Recorded dive hours charge for 24 Hours	(1 Day),	Total # charges	30
20	Recorded dive hours charge for 48 Hours	(2 Days)	Total # charges	15
30	Recorded dive hours charge for 72 Hours	(3 Days)	Total # charges	10
40	Recorded dive hours charge for 96 Hours	(4 Days)	Total # charges	7.5
50	Recorded dive hours charge for 120 Hours	(5 Days)	Total # charges	6

(50 Dive Hours is maximum time between charges)

- The charger module can recharge up to 300 recorded dive hours before a replacement of the charger module battery is required. Keep an accurate record of the charging and recorded dive hours to ensure proper charging power. EXAMPLE: 20 Recorded dive hours x 15 recharges = 300. New battery for the charger module must be installed by an authorized Dacor Dealer.
 - Should the Micro Brain® Pro Plus be in use for more than 60 dive hours without being charged, the Micro Brain® Pro Plus can no longer be recharged. Timely and periodic charging is therefore of the utmost importance to keep the recharge capability of the Micro Brain® Pro Plus intact.
- b. Multiple Charger:
- On the multiple-unit charger, that can charge 5 Micro Brain® Pro Plus' at a time, a red control lamp lights up for each connected Micro Brain® Pro Plus. The control light turns off as soon as the respective Micro Brain® Pro Plus is charged and can be disconnected.

This procedure makes the charging of the Micro Brain® Pro Plus user friendly for rental and teaching operations, since the Micro Brain® Pro Plus can be recharged at any time and the charging time is not determined by the diver but is monitored by the charger itself.

VI. Characteristics

D. Battery Charger/Recharging The Battery:

1. Micro Brain® Pro Plus Charger Module

b. Multiple charger:

Since the battery operated charger is not provided with a control light it is recommended to recharge regularly according to a fixed schedule. The experienced sport diver who competes 100 to 150 dives a year, can recharge the Micro Brain® Pro Plus at readings of 50, 100, 150, 200 etc. for five days each time.

The dive instructor who completes 8 to 10 dive hours a week should recharge the Micro Brain® Pro Plus over the weekend for 24 hours. This would eliminate any inconvenience that occurs when the Micro Brain® Pro Plus is out of service for several days for recharging.

Any other charging cycle is permissible, of course. It is important, however, that the Micro Brain® Pro Plus is properly charged and no other chargers than those made by DACOR are used. If you follow these instructions carefully you will maximize the service life of your Micro Brain® Pro Plus battery.

2. Additional Remarks:

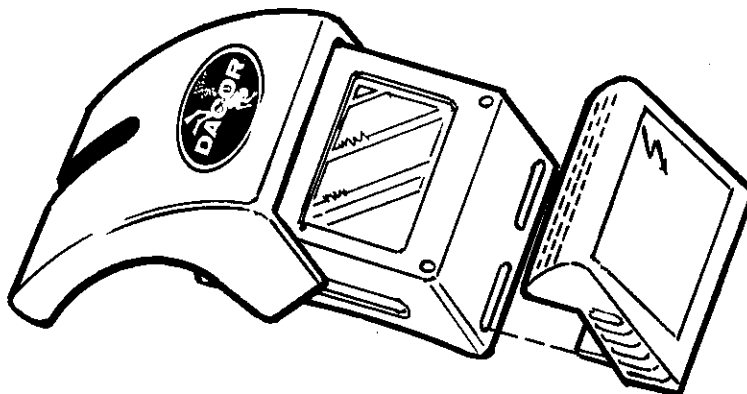
The recharging requires close to full energy. If the recharging battery has run down, a recharge is no longer possible. In this case, a recharge can destroy the battery in the Micro Brain® Pro Plus.

By proper recharging, you can prolong the battery life of your Micro Brain® Pro Plus for about 6 years, independent of the number of dives.

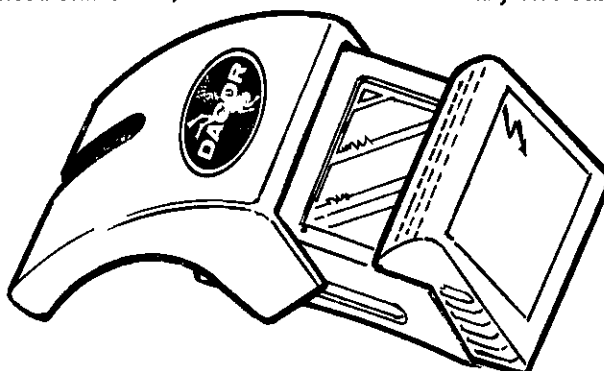
Battery life without recharging for dives of 1 hour plus an average of 12 hours of desaturation is approximately:

1500 dives in 1-2 years
1000 dives in 5-7 years
500 dives in 10-12 years

3. Operating hints for the use of the charger module:



- a. Ensure that the display of the Micro Brain® Pro Plus is off before charging. Turn off the Micro Brain® Pro Plus with the magnet if unit is "on", but be careful not to erase any dive data during desaturation. (See Ch. VI, Sec. J).



- b. Attach the Micro Brain® Pro Plus charger module as shown in the illustration.

VI. Characteristics

E. Battery recharge by authorized Dacor Sales & Service Centers

You can take your Micro Brain® Pro Plus for regular recharging to most authorized Dacor dealers. Your Micro Brain® Pro Plus will be recharged by special chargers connected to AC current supply capable of charging 5 units simultaneously.

REMARKS:

If the Micro Brain® Pro Plus is used less than 50 hours per year, it is recommended not to recharge the battery, because every unnecessary recharge contributes to the aging of these little used batteries.

F. Depth Gauge

When the on-sensors are activated with moistened fingertips for 5 seconds or after immersion in water, the Micro Brain® Pro Plus depth gauge turns on automatically, stores immediately the measured pressure as atmospheric (automatic atmospheric pressure compensation for mountain lake diving), and indicates 0 ft (0m). During the dive, the Micro Brain® Pro Plus indicates the actual depth to 1 ft (0.3m) exactly (see sec. V, Chapter 5.E, mountain lake diving).

In depths between 0-270 ft. (0-82 m), the measuring can deviate to a maximum of ± 1 ft (± 0.3 m). The depth gauge functions up to a depth of 270 ft (82m), and in altitudes from 0 to 14,764 ft (0-4500 m) above sea level.

The pressure measuring system of the depth gauge is compensated for temperatures between 14 ° F (-10° C) and 122° F (+ 50° C). The zero point long time drift, on which every Piezo-resistive pressure sensor depends, is also being adjusted automatically. Even after years of use and in extreme temperatures, the Micro Brain® Pro Plus indications are absolutely precise. For a pressure increase of 14.5 psi (1 bar), the depth gauge indicates 33 ft (10 m) more. That means, a water density of 1.02 kg/l is assumed. Therefore, the geometrically measured depth (by means of a plumb) for the most dense sea water (East Mediterranean, 12 ° C, 1.03 kg/l) is 1% less; for fresh water (1.0 kg/l, it is 2% more. These differences are insignificant for divers.

G. Ascent Speed Indicator

The Micro Brain® Pro Plus measures the depth every one second and calculates the ascent speed from the difference between the previous measured depth and the latest measured depth.

Divers are recommended not to ascend faster than 33 ft. (10m)/min. If the diver ascends faster than 33-40 ft. (12-15m)/min., he is warned by a flashing ascend arrow. Ascend arrow remains flashing until the diver resumes the recommended ascent speed.

During a correct ascent, the ascend arrow will not flash!

H. Dive Timer

The Dive Timer registers the elapsed dive time below the depth of 5 ft. (1.5 m) and indicates it in the upper display window. Micro Brain® Pro Plus indicates dive times up to 199 min. If this time is exceeded, the clock resets and continues at 0 min.

I. Desaturation Time & Do-Not-Fly Warning

1. In the surface mode the Micro Brain® Pro Plus calculates the time until all tissues have desaturated to the same inertial gas solution pressure as at the beginning of the day's first dive when the unit is powered up.
2. At the same time, the Micro Brain® Pro Plus calculates the time during which flying is not permitted. This is the time until all tissues have adjusted enough to allow exposure to a surrounding pressure of 0.58 bar (the lowest normal allowable aircraft pressure).

Both times are rounded up to full hours and can be recalled by a short contacting of the on-sensors (See Chapter III, 17., memory table).

J. Logbook Memory

1. Immediately after surfacing, the depth display indicates 0 ft. (0 m) and displays the maximum depth every 5 seconds for a 1-second interval. The upper display field shows the total elapsed dive time.
2. If the diver descends again before 4 minutes and 15 seconds have elapsed, then the elapsed times are combined as one single dive and the current depth is displayed. If the diver does not dive again within 4 min., 15 sec., then the maximum depth, the total dive time and the surface interval are entered in the logbook memory. The Micro Brain® Pro Plus sets the dive timer, the depth gauge and the surface interval timer to 0.

VI. Characteristics

J. Logbook Memory

Important:

3. The logbook data are only stored if:

- a) The dive time is more than 10 min.
- b) The dive time is more than 5 min. and the maximum depth is more than 17 ft. (5 m.)

4. When the logbook data are stored, the Micro Brain® Pro Plus returns to surface mode and starts scrolling the actual no-decompression times. It also starts counting the hours and minutes of the surface interval until the next dive. The Micro Brain® Pro Plus stores logbook data - total dive time, maximum depth and surface interval - from the last 6 dives. If more than 6 dives are made, the first entry will be erased, leaving the 6 most recent in memory.
5. 6 Dives remain in the logbook until complete desaturation, at which time the last 3 dives are placed into the permanent EEPROM memory. As soon as all tissues have desaturated to surrounding pressure, the Micro Brain® Pro Plus turns off automatically. After activating the Micro Brain® Pro Plus even after years, the logbook data from the last 3 dives can be recalled. They remain stored until they are replaced by new entries.
6. By a short contacting of the on-sensors, the individual logbook data can be recalled any time (See Ch. III, Sec. 17). The recalling of the logbook data is made most recent first, i.e., the most recent logbook entry with the code LOG 1 and INT 1 is indicated first, then the next to last with the code LOG 2 and INT 2, etc. After a short flashing of the code LOG, with the respective number, the maximum depth and the dive time are indicated for 4 seconds. Then the code INT with the same number appears shortly and the surface interval in hours and minutes is indicated for 4 seconds. As long as the on-sensors are not contacted again, these two pairs of indications alternate every 5 seconds.

K. Dive Recorder

1. Besides the logbook entries - maximum depth, dive time and surface interval - the Micro Brain® Pro Plus counts and stores the number of all dives executed. Moreover, it counts the total amount of time spent under water and stores it in hours and minutes. The dive counter and dive hours counter reach a maximum of 9999 (See Ch. II, Sec. C Log Timer for how to read 4-digit numbers on 3-digit display). Moreover, the Micro Brain® Pro Plus indicates automatically after each dive the maximum depth ever achieved in all previous dives.
2. These three entries from the dive recorder can be recalled any time while in surface mode only and remain stored in the Micro Brain® Pro Plus.

By a short contacting of the on-sensors, the individual dive recorder entries are indicated (See Ch. III, Sec. 17). When recalling the dive recorder entries, the Micro Brain® Pro Plus shows in 5-second intervals the code "rcd" (record) for one second, and indicates together with the maximum depth a "d-" for depth, a "no" for the number of dives and an "hr" for the number of dive hours.

L. Dive Planner

1. This function offers completely new possibilities for dive planning.

On the spot, the diver is able to simulate his planned dive per the computer and to have his optimum dive profile calculated. This also applies to repetitive dives. For the planning and simulating of dives, the Micro Brain® Pro Plus always considers the current state of tissue saturation. It is now possible for the first time to use a computer for the calculation of repetitive dives, based on the diver's residual tissue saturation.

The planning can be repeated as often as desired. You can simulate any dive profile: Depths up to 270 ft. (82m), dive times up to 120 min., decompression times up to 90 min., and deco-stops up to 78 ft. (24m).

2. This cannot be compared with the customary dive planning by means of decompression tables. Such tables only calculate rectangular dive profiles, and the respective calculation of repetitive dives results in extreme decompression times. Even the latest "multi-level tables" and other "improvising methods" cannot compare to the Micro Brain® Pro Plus.
3. The operation of the dive planner is easy and is certainly one of the finest functions a diving computer can offer (see Ch. III, Sec. 17-22). After having activated the dive planner, you can enter your desired dive profile by shortly contacting the on-sensors. The dive time is counted in one minute increments and the depth results from the commands: Descend, Ascend, or Stop (horizontal diving). This way, you can simulate any dive profile desired. If you wish to see your simulated decompression plan scrolling, you must ascend until the Micro Brain® Pro Plus turns to out-of-range mode, which means a violation of the decompression rules. But, keep in mind: this is only simulation and does not at all influence any data from previous real dives (see Ch. V, sec. C.4). If you turn off the dive planner, or if the Micro Brain® Pro Plus turns to surface or dive mode, the simulated dive is completely cleared. This is the work of two computers in one.

Disadvantages of dive planning by means of decompression tables are commented on in Ch. VI, Sec. M, no-decompression computers.

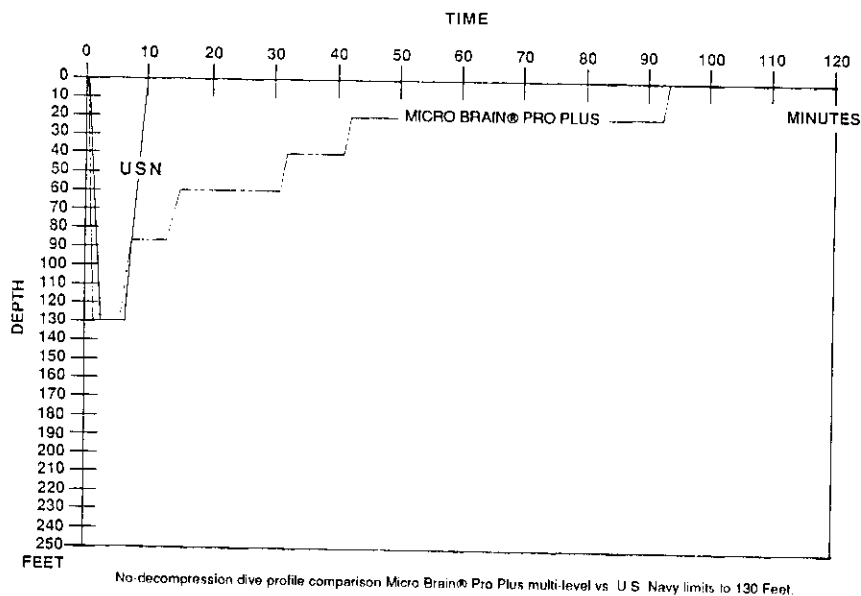
VI. Characteristics

M. No-decompression Computer

1. The triangle which indicates the actual no-decompression time/volume (size of the triangle), takes one third of the total display. The diver can check his no-decompression time at a glance without interpreting any figures. If the diver ascends, the triangle increases again. If the diver descends or remains on the same level, the triangle decreases in size as dive time increases. The numbers inside each bar indicate corresponding time values in minutes.

If the no-decompression time is less than one minute, the last segment of the triangle (Segment 0) starts flashing. If the diver wants to stay within no-decompression limits, he/she must begin ascending before the triangle disappears completely. It is recommended to begin ascent when the triangle reduces to the last two or three segments, i.e., when there are 2-4 minutes remaining. Then the diver can be sure that he can surface at any time without deco-stop even after a long and deep dive.

2. If the diver follows this rule, he can approach depths of 130 to 164 ft. (40 to 50m) without requiring decompression. The total dive time can be extended to one hour and more. Such an optimum situation of the no-decompression volume would be impossible without a diving computer.
3. Although deep sea diving is not encouraged, it should be pointed out that the computer-calculated no-decompression times cannot be compared with customary decompression tables. Instead of establishing reference dive tables, the following diagram illustrates how a dive can be performed within the no-decompression limit.
4. For taking the maximum advantage of the no-decompression time/volume, the diver remains at depth until the flashing segment signals no-decompression limit. At this moment, he ascends until the warning stops. He remains on this level until the next warning is given, and then continues to ascend (referred to as "diving along the no-decompression limit").
5. The following dive profile diagram shows a sample multi-level dive "along the no-decompression limit", made possible by using the Micro Brain® Pro Plus.



If the dive profile is varied, the surrounded area changes to different shapes and sizes. The totality of all possible dive profiles describes a volume, the so-called no-decompression volume, which the Micro Brain® Pro Plus indicates in the form of the triangle.

The customary decompression tables, however, prescribe fixed no-decompression values, which are based on the assumption that the maximum depth is maintained during the whole dive time. Such tables do not consider slow ascending stops in shallower depths or multi-level diving.

6. Customary decompression tables are only based on rectangular dive profiles. For depths of more than 82 ft. (25m), this must obviously result in extremely short no-decompression times, as few divers spend their total dive time at maximum depth.

Table diving has often tempted divers to improvise variations in dive time and depth and to create estimated deco-stops which violate standard safe practices.

The invention of the Micro Brain® and Micro Brain® Pro Plus has put an end to such practices. The Micro Brain® Pro Plus sets new standards in diver safety and security.

VI. Characteristics

N. Decompression Computer

1. The Micro Brain® Pro Plus was developed as a decompression dive computer. Therefore, it calculates a reliable decompression plan and indicates the next deco-stop level required and the ascent time. This time is the sum of all deco-stops, plus ascent time, based on a speed of 33 ft. (10m)/min.

The Micro Brain® Pro Plus was developed to guide you even in planned decompression dives and does not react with failure mode or flashing error sign, as other dive computers do.

2. On the contrary, after exceeding the no-decompression limit, the Micro Brain® Pro Plus indicates the ascent time in the form of a flashing triangle and flashes the actual deco-stop in 10 ft. (3m) increments, and the ascent time together with the symbol "deco-stop" every 7 seconds for 3 seconds in the depth field and in the dive time field.
3. The experience gained in 6 years of diving with the Deco Brain has proved that a diver who requires decompression follows primarily the indication of total ascent time. The indication of the individual deco-stop times, as indicated by Deco Brain is interesting but not necessary. This is why the display was designed for the Micro Brain® Pro Plus, for easy understanding and readability, with only two figures and one triangle. No times are shown for individual deco-stops, except the last stop and during out-of-range mode.
4. This graphic indication is the outstanding characteristic of the Micro Brain® Pro Plus in comparison with other diving computers. The diver has only to watch the triangle. For no-decompression diving the triangle must not disappear.

If the diver nears decompression, the triangle segment starts flashing as a warning signal. The ascent time is now indicated. Should the diver extend his/her no-decompression diving despite the warning signal, the flashing triangle starts to increase in size. At a glance and without interpreting any figures, the diver can check his/her ascent time. Moreover, the Micro Brain® Pro Plus indicates every 7 seconds the ascent time and the next deco-stop level in the two display fields above the guiding triangle. This is all the information a diver needs during a decompression dive. More information would only lead to confusion. Decompression times are, therefore, indicated (per stop-depth) only in the out-of-range mode for emergency situations (See Ch. V, Sec. C.4).

5. During decompression, the diver must observe not to exceed the deco-stop depth. If he ascends past that level, he is warned by the flashing descend arrow. As long as the descend arrow keeps flashing, the stop-depth is replaced by the shallowest depth to which the diver can ascend (ceiling). By steadily approaching the ceiling, the diver can accelerate his/her decompression, but this is only recommended in emergency situations, i.e., short air supply, extreme cold or injury.

Decompression stops in 10 ft. (3m) increments are recognized by divers as a standard practice. These increments keep the diver away from dangerously low surrounding pressures. Moreover, it is easier to follow the customary increments of 10, 20, 30, 40, 50...ft. (3, 6, 9, 12, 15...m) (especially when diving in groups) than to approach a constantly reducing ceiling.

With the Micro Brain® Pro Plus, it is not absolutely necessary to ascend to the given deco-stop level. This is true only if your ascent profile earns you a reduction in nitrogen to the extent that the previously indicated stop is no longer necessary, which often occurs. When diving with the Micro Brain® Pro Plus, you can often avoid decompression stops by ascending slowly. In rough seas, or in strong current, and in undiveable depths, i.e., heavy coral formations, this method of computer-decompression is extremely valuable.

VI. Characteristics

O. Software

1. The Micro Brain® Pro Plus calculates the diver's nitrogen absorption and elimination for 6 different tissues (compartments) with half-times ranging from 6 to 600 minutes. The nitrogen inert gas pressure calculation in each tissue is solved by the differential equation:

$$I) \quad dP_{ig}/dt = k(P_1 - P_{ig})$$

for inert gas solution pressures P_{ig} , with 6 time-constants

$$k = \ln 2 / t_{1/2}$$

and the inspiratory inert gas proposal p_1

The solution is determined every 5 seconds. For each compartment, the respective lowest surrounding pressures permitted P_{amb} , t_{ol} are determined as a linear function of the inert gas solution pressures P_{ig} according to system ZHL-12 by Prof. Dr. A.A. Buhlmann, Zurich, Switzerland, from the formula:

$$II) \quad P_{amb, tol} = b(P_{ig} - a)$$

2. From the respective lowest surrounding pressure permitted, the ascent levels, ascent times, no-decompression times, desaturation times and the time until flight are calculated for an N_2 gas solution pressure of 0.643 bar for the range of 0-3937 ft. (0-1200 m), sea level to altitude.

When turning on the Micro Brain® Pro Plus, all compartments refer to a standard gas solution pressure of 0.643 bar. This initial pressure combined with the integrated safety margins with the coefficients a and b permit diving up to altitudes of 4920 ft. (1500m) above sea level.

3. The do-not-fly warning is erased, when all compartments have desaturated to a partial pressure allowing you to be exposed to 0.58 BAR which is the lowest normal allowable aircraft pressure.
4. The reduction of the 16 compartments (tissues) of the Deco Brain program P 2-3, System ZHL-12 to an equivalent tissue model with only 6 compartments was developed by Prof. Dr. A.A. Buhlmann and Dr. M. Hahn in 1986 and was updated to the latest research standards by Dr. M. Hahn in 1987. The coefficient pairs a and b in Formula II had been determined to fit the decompression profiles of the P 2-3 program. Latest tests and evaluations of research results from pressure chamber tests by D.K.L.Z. (Zurich), B.L.F.S. (Berlin), and Navy Experimental Diving Unit (Panama City, FL, USA), motivated Dr. M. Hahn in 1988 to revise the coefficient pairs a and b once again. This was necessary, because the new program P-4 was intended and compiled for the decompression computer of the Micro Brain® Pro Plus.

VII. Appendix

A. Cautions and Warnings

Diving can be a dangerous sport. The Micro Brain® Pro Plus is to be used only by certified divers who are fully trained in decompression diving and are aware of the potential hazards of such decompression diving. If you are not trained, you must seek instruction prior to using the Micro Brain® Pro Plus.

DO NOT ATTEMPT TO USE THE MICRO BRAIN®PRO PLUS WITHOUT READING THIS ENTIRE INSTRUCTIONAL MANUAL. The Micro Brain® Pro Plus is designed to assist fully trained certified divers in planning safe, no-decompression diving, and can assist in performing decompression diving. We recommend full training in decompression and no-decompression theory and practice as offered in advanced open water training certification courses. The Micro Brain® Pro Plus is not intended as a substitute for proper instruction and understanding of these principles. We recommend full training in decompression theory, practice, and dive planning, prior to the first use of the Micro Brain® Pro Plus. Divers should learn to master their Micro Brain® Pro Plus by using the dive planner function.

Multiple level/repetitive diving over multiple days (i.e., a week long dive trip) requires careful planning and strict adherence to no-decompression limits. When participating in such diving, always remain well within the allowed no-decompression limits by ascending during the remaining two to four minutes.

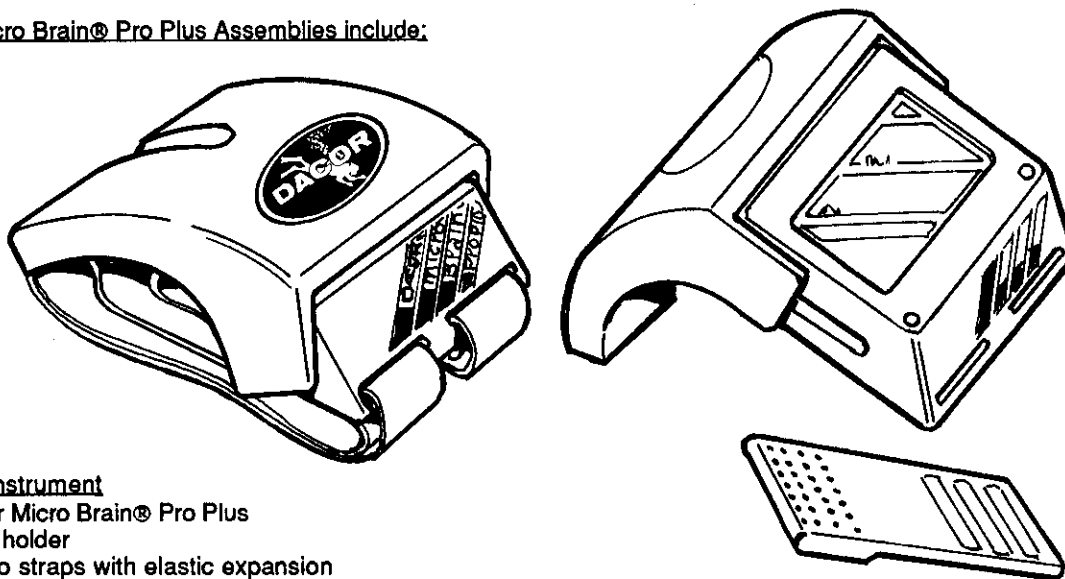
The Micro Brain® Pro Plus CANNOT PREVENT BENDS. Even if used exactly as instructed, it cannot be relied upon as your sole means of protection from decompression sickness. Any diver with or without a Micro Brain® Pro Plus can be susceptible to the bends. The Micro Brain® Pro Plus is only intended for use as an additional measure in helping the diver to reduce the risk of decompression sickness.

VII. Appendix

B. Production range and accessories

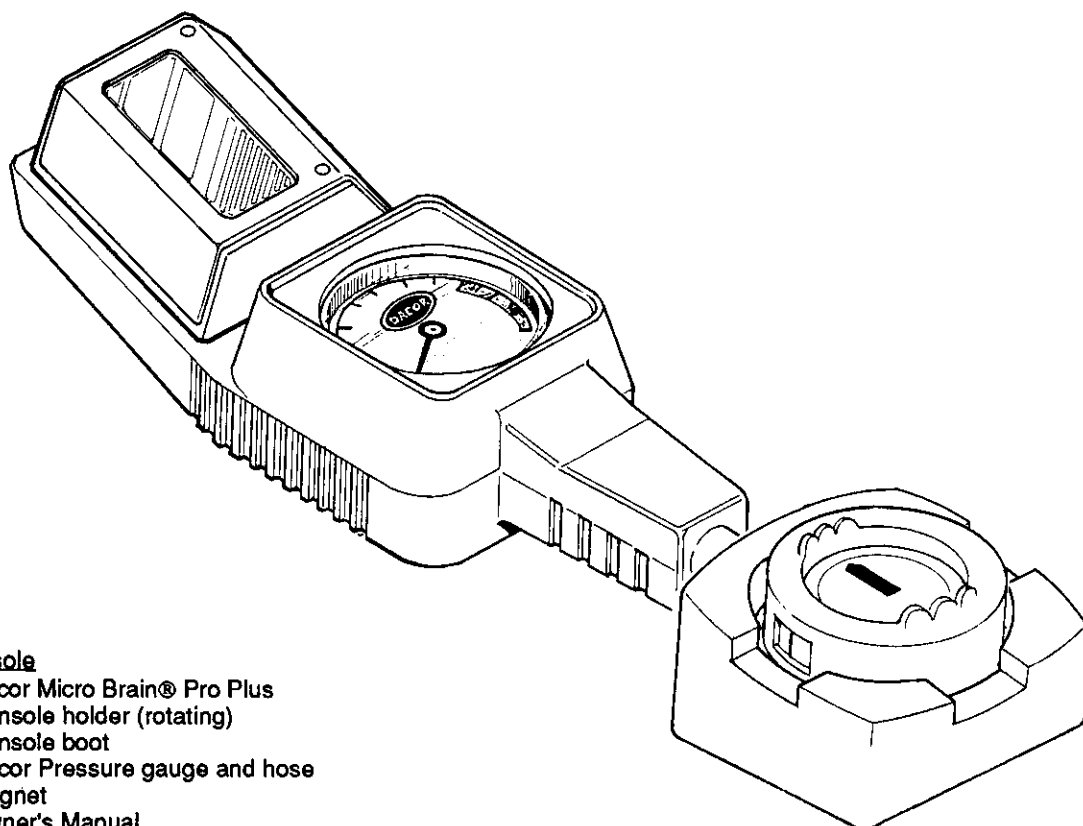
The Micro Brain® Pro Plus is available as a wrist instrument, as a console with various additional instruments, and as a slip-on module for other consoles.

The Micro Brain® Pro Plus Assemblies include:



Wrist Instrument

- 1 Dacor Micro Brain® Pro Plus
- 1 Wrist holder
- 1 Velcro straps with elastic expansion
- 1 Magnet
- 1 Storage pouch
- 1 Owner's Manual



Console

- 1 Dacor Micro Brain® Pro Plus
- 1 Console holder (rotating)
- 1 Console boot
- 1 Dacor Pressure gauge and hose
- 1 Magnet
- 1 Owner's Manual

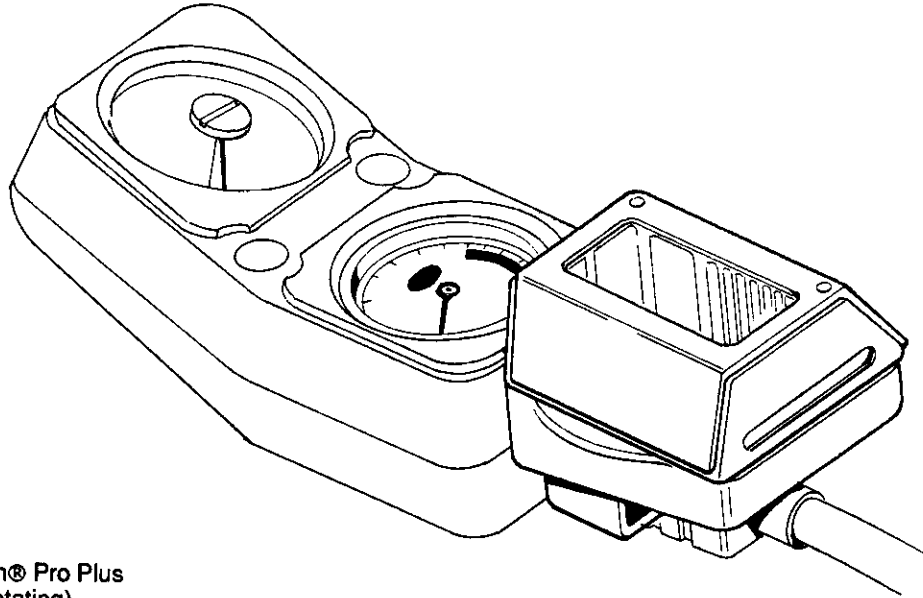
-Dacor Compass, mountable as accessory module

VII. Appendix

B. Production range and accessories

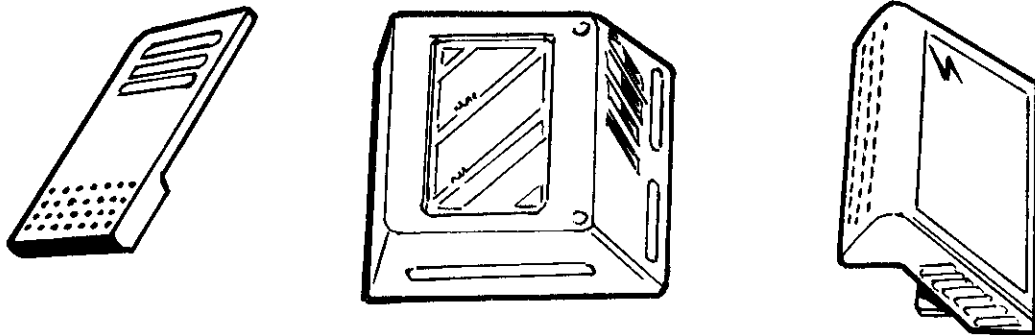
The Micro Brain® Pro Plus is available as a wrist instrument, as a console with various additional instruments, and as a slip-on module for other consoles.

The Micro Brain® Pro Plus Assemblies include:



Slip-On Module

- 1 Dacor Micro Brain® Pro Plus
- 1 Module holder (rotating)
- 1 Slip-on boot
- 1 Magnet
- 1 Owner's Manual



Available as accessories or as single parts:

- Micro Brain® Pro Plus Electronic Module Only
- Boot for slip-on attachment of Micro Brain® Pro Plus to existing Dacor consoles (fits some consoles of other brands)
- Colored wrist holder
- Magnet
- Colored boots
- Micro Brain® Pro Plus Charger Module
- Storage Pouch
- Velcro straps X-long (1 1/2" (7 cm) longer than standard size)
- Dacor Compass, mountable as accessory module
- Owner's manual
- Instructor's manual for Diving Computers

VII. Appendix

C. Definitions

Ceiling:	The shallowest depth to which the diver can safely ascend without omitting decompression.
CMOS:	Microprocessor-Complimentary Metal Oxide Semi-Conductor. A manufacturing process to achieve low power operation, high noise immunity and wide temperature range
COB:	Chip On Board
Custom IC:	Integrated Circuit specifically designed for the functions performed
Elapsed time:	Measurements by the Micro Brain® Pro Plus dive time clock of dive time, surface time, no-decompression time, decompression time, etc.
EEPROM:	Electrical Erasable Programmable Read Only Memory
Latent Period:	The time between when a diver exceeds the required ascent level and when the warning comes on.
LCD:	Liquid Crystal Display, the type of display system of very low power consumption used in the Micro Brain® Pro Plus
Li-battery:	Lithium battery. Battery of very low self-discharge (less than 0.5% per year) and storage life of more than 10 years.
Mask ROM:	A mask programmable ROM
ROM:	Read Only Memory
SAD:	Safe Ascent Depth (Ceiling)
Scroll:	A replay of stored information.
SMD:	Surface Mounted Device
Tissue Half-Times:	The theoretical amount of time that it takes for a tissue to become half saturated with nitrogen. Conversely it also refers to the amount of time that it takes for the concentration of nitrogen in a tissue to decrease by one half.

D. QUESTIONS & ANSWERS

1. What table is the Dacor Micro Brain® Pro Plus based on?

The Dacor Micro Brain® Pro Plus calculates the diver's nitrogen absorption and elimination for 6 different tissues or compartments with half-times ranging for 6-600 minutes. The basis of this selection is a modification of the 16 tissue model ZHL-12 developed by Dr. A.A. Buhlmann, Medical Director of the Deep Diving Laboratory, University of Switzerland Hospital, Zurich, Switzerland.

The 6 tissue model was compiled and tested by Dr. A.A. Buhlmann and Dr. Hahn in 1986 and updated in 1988.

Dr. Hahn, a physicist, empirically derived the required coefficient modifications based upon several hundred thousand dives of the Divetronic Deco-Brain™ P2-3 program (ZHL-12). The result is a tissue model constructed to cover multi-level repetitive diving.

2. How conservative is the tissue model?

The Buhlmann-Hahn research is the most conservative to date. The advantage is shorter surface intervals for safe repetitive dive profiles with similar bottom times as single no-decompression dives.

3. What is the recommended ascent rate?

Thirty-three to forty feet per minute is the rate which is monitored by the computer. The rate is spread due to tissue behavior under pressure.

4. Does the computer adjust for altitude?

YES. Altitude is automatic throughout the entire operating range. Some travel ranges require body tissue adjustment time. Refer to manual for complete discussion.

VII. Appendix

D. QUESTIONS & ANSWERS

5. **Does the computer go "Out of Range" if a depth of 130 feet is exceeded?**
NO. It is operational throughout the entire 270 foot range.
6. **Does the computer go "Out of Range" following decompression?**
NO. As long as decompression is not omitted, repetitive dives will be calculated on previous exposure.
7. **Does the computer provide decompression information?**
YES. Should decompression be required, the Micro Brain® Pro Plus directs you to the stop depth through a series of warning displays. Total ascent time is displayed.
8. **What type of batteries are used? Are they replaceable?**
Two high quality 3 volt Lithium rechargeable cells are solder mounted to the printed circuit board. The batteries are factory replaceable.
9. **Is there a low battery indicator?**
NO. Batteries in low state will show a dim display similar to an LCD calculator. This occurs over a period of a few weeks and does not affect the performance during a dive trip.
10. **Is the Micro Brain® affected by X-rays, radar, or radio transmitters?**
Not normally. Some airport security stations are not regulated. Request a hand inspection if in doubt. Properly installed radio and radar equipment pose no threat to the Micro Brain® Pro Plus' electronics.

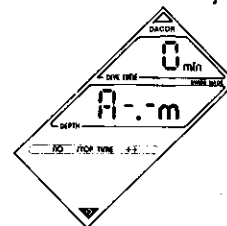
E. TROUBLESHOOTING YOUR MICRO BRAIN® PRO PLUS

As with any electronic or mechanical instrument, care should be taken to avoid mishandling and exposure to extreme conditions. If you are having operational problems with your Micro Brain® Pro Plus, please check the following before returning your instrument for servicing:

1. **Micro Brain® Pro Plus does not "Power Up"**
 - Clear unit with magnet for 3 seconds.
 - Ensure that the "On Sensor" pins are clean and free of oil contamination or corrosion. Use a cloth or pencil eraser to polish contact surface clean.
2. **Micro Brain® Pro Plus "Powers Up" but does not go into "Dive Mode".**
 - Ensure that the "On Sensor" pins are clean and free of oil contamination or corrosion. Use a cloth or pencil eraser to polish contact surface clean.
3. **Micro Brain® Pro Plus does not read accurately at depth.**
 - Make sure unit is in "Dive Mode" prior to descending.
4. **Micro Brain® Pro Plus does not log dives in memory.**
 - Observe gauge at proper time following scrolling sequence.
 - Ensure time of dive was at least 6 minutes.
 - Make sure unit has not been cleared with magnet.
 - Unit must be checked within 48 hours of dive.
 - Ensure that logged dives are recalled within a 48 hour period.
5. **Micro Brain® Pro Plus display alternates between two displays, one of which is shown below.**
This A-M mode is a built in test system.

If the Micro Brain® Pro Plus flashes the symbol "A" every 5 seconds for 1 second in the depth field and the symbol "O" in the dive time field, this means that the pressure measuring system must be readjusted. "A" stands for "Adjust".

ADJUST MODE DISPLAY:



You can readjust your Micro Brain® Pro Plus by yourself, if you follow the steps outlined in Chapter V, sec. H.

Important: As long as the Micro Brain® Pro Plus demands readjustment by indicating "A", the computer functions will not work. You cannot use the computer for diving.

If any other unusual functioning occurs, please return unit to an authorized Dacor Dealer or to Dacor Corp. for servicing. Please include a description of the malfunction and the conditions under which it occurred.

VII. Appendix

F. WARRANTY:

Micro Brain® Pro Plus Limited Warranty:

Dacor Corporation warrants to the original owner only that its Micro Brain® Pro Plus decompression computer will be free of defects in material and workmanship and deficiencies due to identifiable manufacturing errors under normal sport skin and scuba diving use and with proper maintenance for a period of two years following date of purchase by consumer. This warranty is non-transferable and is limited to repair or replacement of defective part or parts at Dacor's option. This warranty does not extend to the breaking or scratching of the lens or to the attaching straps and fasteners, nor does the warranty extend to fragile internal parts such as crystals and reed-switches damaged by shock or other abuse. Also excluded from coverage are defects resulting from chemical or electro-chemical influence or resulting from tampering or repair by non-authorized service personnel. The battery is excluded from the normal warranty (see below). Cost of labor to repair within the warranty period is included. Equipment in question must be returned prepaid to Dacor Corporation along with the owner's dated proof-of-purchase. This warranty gives you specific legal rights, and may also have other rights which vary from state to state.

Micro Brain® Pro Plus Limited Extended Warranty on Batteries:

Dacor warrants the battery used in the Micro Brain® Pro Plus for a period of one year from date of first use unless improper charging methods have been utilized or user has failed to charge the unit frequently enough to maintain a proper level of amperage. Dacor will replace damaged batteries during and after the warranty period for a reasonable replacement charge. Dacor will replace defective batteries during the warranty period on the basis of no/charge for the battery, but a labor charge for replacement will be assessed. It shall be solely Dacor's determination as to whether a battery has been improperly charged, not charged adequately or is otherwise defective.

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Final Remarks by Prof. Dr. Hans Hass

Prof. Dr. Hans Hass considers the Micro-Brain® Pro Plus a momentous development in the progress of diving equipment:

«The brain's functions have been transferred to an electronic instrument: The Micro-Brain® Pro Plus has become the diver's most important and most reliable companion. It is certainly worth its money.»

«Micro-Brain® Pro Plus is a decompression computer that offers anything that even experienced divers can desire.»

Hans Hass
