

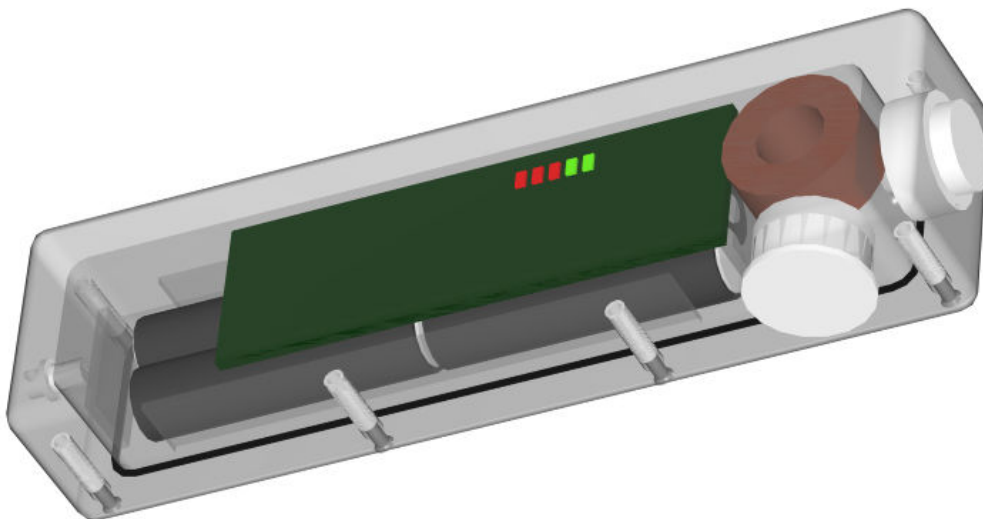
# Your Buddy Locator

## A Navigation Aid for Recreational SCUBA Divers

Thank you for purchasing a Buddy Locator. I trust that you will find it to be a useful navigational aid and that, through prudent diving practice, you will never have cause to rely on it.

To start using your Buddy Locator immediately (without even getting wet) go straight to the 'Battery Replacement, Operation and Training' sections of this manual on page 3. To get full utility from your Buddy Locator you are encouraged to read these instructions in their entirety.

Figure 1. Your Buddy Locator



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Table 1. Technical Data Summary

Characteristic	Measurement
Effective Range:	Greater than 100 m (330') submerged subject to alignment & conditions.
Weight:	120 g (4.2 oz), approximately neutrally buoyant in fresh water with batteries fitted.
Dimensions:	135 mm x 35 mm x 25 mm (5.3" x 1.4" x 1").
Batteries:	Four AAA Lithium cells.
Battery Life:	Approximately 50 hours (based on a 10:1 transmit receive ratio).
Depth:	Pressure tested to 50 m (164').
Temperature Range:	0 to 40°C (32 to 104°F).
Environment:	Salt or fresh water and air.
Transmit Frequency:	40 kHz.
Transducer Life:	50,000 hours (MTBF).
Display:	8 segment LED bar graph.



## 1. Warning

Your Buddy Locator is an underwater navigational aid. It is not a life-safety device. Always dive with a buddy and maintain contact in accordance with current recreational SCUBA diving recommendations.

## 2. Warranty

Your Buddy Locator has been pressure-tested to a depth of 50 m (164'), optimally tuned and thoroughly operationally tested before dispatch. Your Buddy Locator is warranted for hardware or software malfunction for a period of one year from the date of purchase. The extent of this warranty is limited to replacement or return-to-base repair at the discretion of the manufacturer.

Ensure that your warranty card has been completed by your retailer and returned to the manufacturer to validate warranty claims.

Due to the adventurous nature of SCUBA diving this warranty does not extend to case or seal damage, or water ingress. Warranty claims specifically exclude battery leakage, physical damage, or unauthorised modifications or servicing.

Use of the Buddy Locator waives any claim for consequential damages including loss of, or damage to, equipment or other property, personal injury or death.

### 3. Inventory

Your Buddy Locator package is provided with inventory listed in Table 2.

Table 2. Inventory

Quantity	Description
1	Instruction Manual (this manual)
1	Warranty Card
1	Carry Case
2	Buddy Locator (unit)
2	Spare Case O Ring
2	Retractor Clip
1	Jeweller's Screwdriver



### 4. Environmental Issues

The low power transmissions from your Buddy Locator are comparable to many naturally occurring underwater ultrasonic sound sources and are significantly less than many boat mounted sonar and fish-finders. Your Buddy Locator has no known adverse effects on marine flora or fauna.

Your Buddy Locator has been tested to identify if its transmissions present any specific attraction to apex predators (sharks). The tests indicated no specific reaction. However you are encouraged to treat all marine life with respect. In the event of any unusual threatening behaviour be prepared to descend (within dive limits) and move cautiously away from the threat.

Your Buddy Locator is made from RoHS compliant components to minimise environmental impact. However batteries, the case and other components are not readily biodegradable. Recycling or disposal at the end of service life should be in accordance with sound environmental practice and any legal requirements that might apply in your jurisdiction.

All of your dive equipment is a potential source of contamination when moving between dive sites. Ensure that your equipment, including your Buddy Locator, is thoroughly cleaned between dives at different geographical locations.

### 5. Buddy Locator Care

Thoroughly rinse your Buddy Locator with fresh water after each dive-day.

Avoid leaving the Buddy Locator in direct sunlight or exposed to other sources of excessive heat for extended periods.

Do not apply solvents or lubricants to the case or O ring seal.

If your Buddy Locator is not going to be used for an extended period of time batteries should be removed to prevent potential damage from battery leakage. Refer to the Battery Replacement instructions on page 3.



## 6. Transportation

The transportation of Lithium batteries are subject to specific IATA regulations. The Buddy Locator has been tested to ensure that under dead-short circuit conditions the lithium battery pack will not result in ignition at standard temperature and pressure. However it is the user's responsibility to comply with any regulations concerning the transportation of Lithium batteries. If there is any doubt about compliance then the batteries should be removed prior to transportation.

## 7. Battery Replacement

Your Buddy Locator is shipped without batteries to ensure both compliance with transportation regulations and indefinite shelf life. Fitting or replacing batteries is straight-forward but if you are uncomfortable with the prospect of opening your Buddy Locator enquire at your retailer or a reputable dive shop and provide these instructions. Note that a fee may be incurred for batteries, fitting and any subsequent pressure testing.

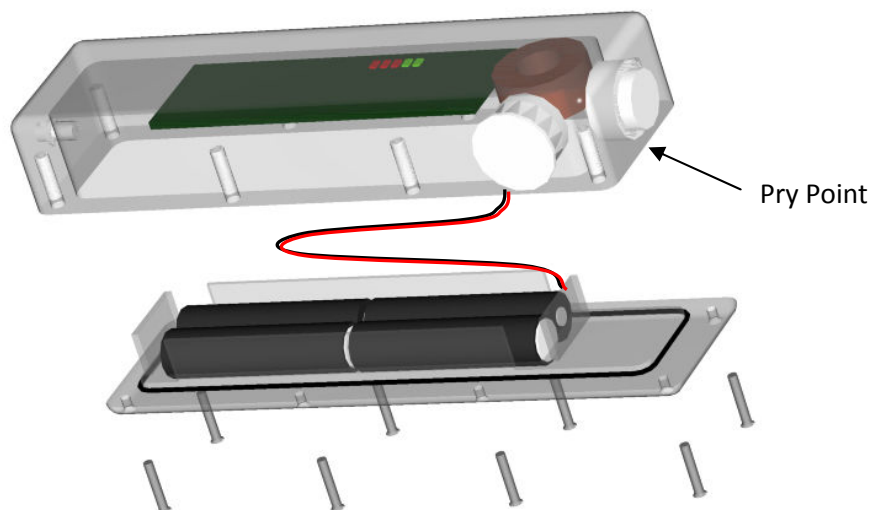
To fit, replace or remove the batteries first remove the eight cover screws (turning counter-clockwise) on the base of your Buddy Locator using the jeweller's screwdriver provided. Remove the bottom cover, if necessary prying gently with the screwdriver in the notch provided for this purpose above the aluminium transducer (see Figure 2). Avoid pulling on the battery pack wires when removing the bottom cover.

Remove depleted batteries, wait for 5 minutes and then fit four new AAA Lithium batteries (Eveready Type L92 or similar) observing the indicated battery polarity. Note that the unit is protected from reversed polarity battery insertion.

When the new batteries are inserted your Buddy Locator should display an alternate flashing green and red LED reset display for ten seconds before shutting down with a Cylon LED display. At the end of this sequence press the control button once to proceed to a normal start-up, lamp test and battery status display as described on page 4. Confirm that the battery status shows two green LEDs (see Table 3 on page 5). If your Buddy Locator does not show the reset display sequence on battery replacement or two green LEDs for battery condition after the initial restart then check the battery polarity and

ensure that you have fitted four new AAA Lithium batteries within their shelf-life expiry date. Otherwise refer to Maintenance on page 11.

Figure 2 . Battery Replacement



Confirm that the O ring case seal is sitting in its groove and is free from twists, kinks, cuts or debris (such as sand or lint). Place the cover in position with the battery pack wires folded against the circuit board and screw holes aligned. Reinsert and tighten the eight cover screws until the first feel of resistance. Proceed to further tighten the case screws working clockwise around the case a quarter turn at a time until the cover is flat with the case. Do not over-tighten the screws.

Turn your Buddy Locator off by pressing the control button 3 times at approximately 1 second intervals (just like typing the same letter three times when text-messaging on a cellular telephone).

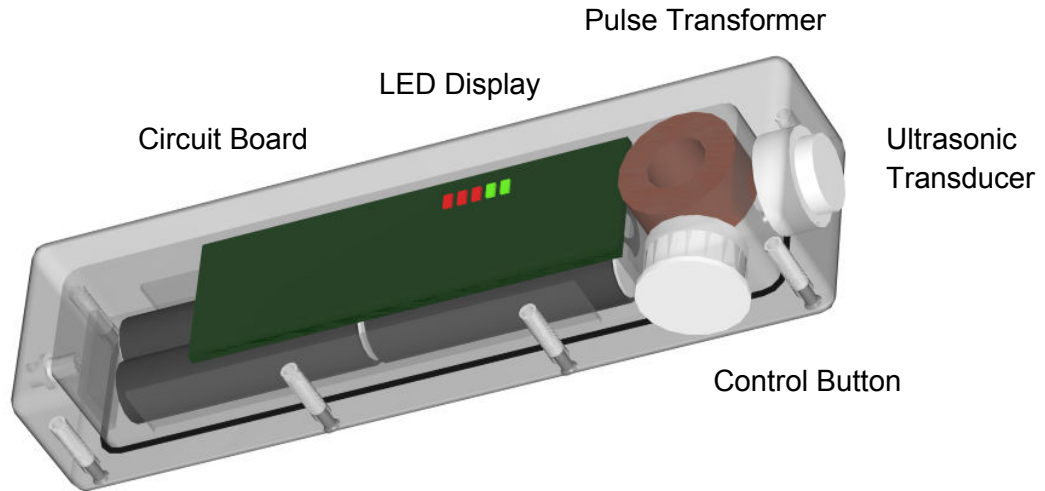
## 8. Operation

Your Buddy Locator (unit) is designed to work in transmit/receive pairs. A minimum of two units are required for effective operation. Work through the following instructions (in air) to become familiar with your Buddy Locator. Refer to Figure 3 to identify key features.

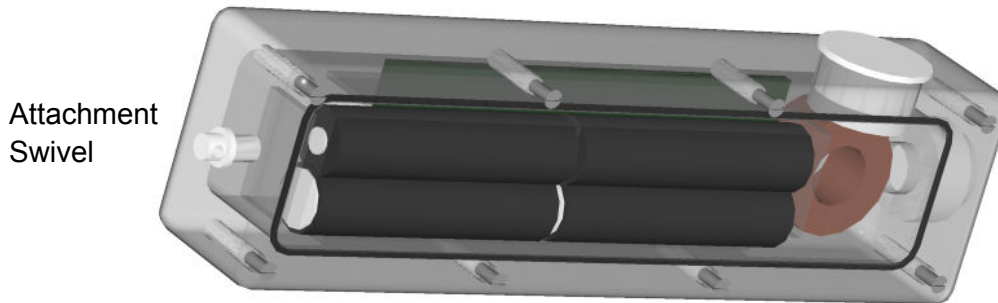
Each Buddy Locator has a single control button for power control and changing modes. The standard control button is designed for right-handed use. A left-handed control button is available. Please contact your preferred retailer for the left handed option.

With batteries fitted press the control button once to turn your Buddy Locator on. All eight LEDs will light for a one second lamp test followed by a battery condition display (see Table 3).

Figure 3. Key Features



Viewed from Base



Case Screws, O Ring Seal and AAA Lithium Batteries

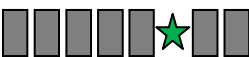
LED Display	Condition
	Lamp test (maintained for 1 second on power-on) followed by battery condition display.
	Battery condition is good.
	Battery condition marginal. Replace batteries at the earliest opportunity.
	Batteries are depleted. Range and functionality are adversely affected. The unit will turn off after 30 seconds.

Table 3. Lamp Test and Battery Condition Display

If the batteries are depleted (after approximately 50 hours of use) your Buddy Locator will indicate a depleted battery condition by displaying two red LEDs and turn off after thirty seconds. This feature has been incorporated to ensure that your Buddy Locator will have sufficient power to operate reliably throughout your dive. Depleted batteries can be avoided by replacing batteries at the earliest opportunity when a marginal battery condition is indicated.








Press the control button once more to activate transmit mode. If transmit mode is not activated by pressing the control button within 30 seconds your Buddy Locator will automatically shut down. In transmit mode the upper green LED will flash approximately every second as shown in Table 4. A unit will stay in transmit mode until receive mode is activated, it is turned off, or it automatically turns off after 90 minutes of inactivity.

Table 4. Transmit Mode Display

LED Display	Condition
	Buddy Locator is in transmit mode.

Press the control button once to activate receive mode. The LED display will indicate received signal strength as shown in Table 5. More LEDs lit equates to increasing received signal strength. The signal strength is indicative of both direction and range, subject to the orientation of the transmitter/receiver pair and the dive environment.

Table 5. Receive Mode Signal Strength Display

LED Display	Received Signal
	No, or very weak signal (flashing red LED at 2 second intervals).
	Weak signal.
	Low signal.
	Moderate signal.
	Good signal.
	Strong signal.
	Maximum signal.

Note that if there is no transmitter in range or the received signal is very weak the lower red LED will flash at approximately two second intervals.

Each unit will remain in receive mode for 5 minutes before it automatically switches back to transmit mode. This safety feature ensures that each unit will change to transmit mode if it has been inadvertently placed in receive or should a diver be unable to operate it. If you are actively searching in receive mode this 5 minute timeout is a useful reminder to check your remaining air, depth and decompression limit. Press the control button to return to receive mode.

Press the control button once to swap between transmit and receive modes at any time.

Turn your Buddy Locator off by pressing the control button 3 times at approximately 1 second intervals (just like typing the same letter three times when text messaging on a cellular telephone). The LEDs will go through a Cylon display sequence indicating that your unit is shutting down.

Each unit will turn off after approximately 90 minutes of inactivity. This feature is designed to preserve battery life if a unit is inadvertently left on after a dive. The 90 minute timeout restarts on any mode change. This gives adequate time for a recreational dive with sufficient margin for a lost diver search.

## 9. Training

You can use your Buddy Locators in air with no risk of damage although range will be significantly reduced when compared with operation underwater.

Place one unit in transmit and the other in receive. Have someone hide the transmitter within about 20 m. Slowly complete a 360° turn (*360 search*) and then move in the direction of strongest received signal to find the transmitter. Alternatively move in the opposite direction to the weakest received signal. While searching observe the effect of intervening objects and reflections from walls, the ceiling and the floor on the displayed signal strength. Note that placing your body between the transmitter and receiver will significantly attenuate the displayed received signal strength. These attributes of the Buddy Locator will also be prevalent under water. Understanding them in air will assist in locating your dive buddy underwater.

## 10. Dive Application

Attach your Buddy Locator to your BCD in an accessible position using the retractor clip provided. Each unit is approximately neutrally buoyant and streamlined to minimise drag. On a submerged horizontally swimming diver the Buddy Locator should ideally angle slightly downward pointing generally towards the diver's fins.

This position gives optimal transmitter/receiver alignment if your buddy is swimming away from you and can provide desirable transmission signal scatter from the seafloor or thermoclines. It is highly recommended that you do not place your Buddy Locator in a BCD pocket, weight belt pouch or catch bag. This may reduce transmission range and you might end up separated from your Buddy Locator when you need it most.

During your pre-dive buddy-check turn both Buddy Locators on, check the battery condition and place both units in transmit mode. Put one unit in receive mode by pressing its control button and confirm signal reception from the other unit (in air). Return it to transmit by pressing the control button and complete the same transmit/receive test with the other unit.

If both units are in transmit or receive mode at the same time then buddy location will clearly not be possible. It is recommended that one diver in a buddy pair should be designated as the *Beacon Buddy*. Their role is to limit the use of receive mode to about 1 minute (enough time for two *360 searches*) in any 5 minute period. The other diver may switch between receive and transmit mode at will.

Commence to dive your dive plan.

If, for any reason, you are unable to move during your dive then firstly try and remain calm. If you are able then briefly change your Buddy Locator to receive to reset the 90 minute timeout and return it to transmit. If you know the direction of your buddy then point your unit in that direction. In other circumstances leave your unit alone. It will always revert to transmit mode.

At any time during the dive press the control button on your Buddy Locator to change to receive mode. With your body positioned vertically in the water, complete a slow *360 search* to find the direction of maximum received signal strength. Then tilt your Buddy Locator up and down, again looking for maximum received signal strength. If no signal is found then slowly ascend a few metres and repeat the *360 search*. If no signal is found it is possible that your buddy is also in receive mode looking for you. The designated *Beacon Buddy* should revert to transmit mode at this time.



If you have not been able to locate your buddy's signal after approximately 1 minute then follow recommended dive practice and commence a controlled SAFE<sup>1</sup> ascent while continuing to search for your buddy's signal.

At recreational dive depths ultrasonic sound waves can be expected to travel in straight lines like light from a lamp. If there is an object between a transmitter and receiver then the signal will be reduced. By ascending slowly during a search you remove potential obstructions from the signal path while also placing yourself closer to the surface.

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<sup>1</sup> SAFE - Slowly Ascend From Every Dive

Ultrasonic sound can reflect from the seafloor, solid objects and the surface. It can also bend at changes in water temperature (refraction at thermoclines). Under some conditions this may cause multiple signal peaks from apparently different directions. If this occurs then use your Buddy Locator to identify the direction of minimum signal strength and move in the opposite direction. Alternatively follow either of the signal peaks to the source - you should eventually end up with your buddy. Reflected signals may also cause localised signal fade. Move or ascend a few metres and try receiving the transmitted signal again.

In very low visibility or on a night dive the Buddy Locator may indicate maximum signal strength before you have made visual contact with your buddy. In this case complete a slow *360 search* to locate the direction of minimum signal strength and head in the opposite direction. Expect to find your buddy within approximately 10 m (about five kick-cycles).

Your Buddy Locator has been specifically designed to minimise the effects of marine animal, wave action and man-made underwater noise by continuously measuring background noise conditions and automatically compensating for variations. During field trials the Buddy Locator has been subject to operational validation in known high marine noise environments. However, under some circumstances extraneous signals may result in a significant impairment to signal reception. If you become isolated from your buddy on any dive and you receive strong signals from every direction (including up and down) then it is possible that boat sonar, fish finders, wave action or extreme marine animal noise are masking the received signal.



If you have not been able to locate your buddy's signal after approximately 1 minute then follow recommended dive practice and commence a controlled SAFE<sup>2</sup> ascent while continuing to search for your buddy's signal.

At the completion of your dive turn your Buddy Locator off by pressing the control button 3 times at approximately 1 second intervals. Look for the Cylon display to confirm that your unit has been turned off.

## 10.1 Multiple Buddy Pairs

Your Buddy Locator cannot differentiate between transmission signals of other units. If there are a number of diver-pairs using the Buddy Locator on your dive and you become separated from your buddy then head for the strongest (and probably closest) received signal. This will put you in contact with other divers and enhance the group's transmitted signal for your missing buddy to follow.

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<sup>2</sup> SAFE - Slowly Ascend From Every Dive

## 10.2 Home Navigation

If a Buddy Locator is suspended below a boat or float this can act as a homing signal. Place your unit in receive mode and complete a *360 search* to identify the direction and approximate range of home.

## 10.3 Missing Diver Procedures



A Buddy Locator may assist in the location of a missing diver however it is an adjunct to, not a replacement for, the missing diver procedures advocated by your professional dive organisation. The best place to start searching for a missing diver search is the last known location of the diver.

Ensure that all other Buddy Locators are turned off. Place one Buddy Locator into receive mode. Hold it under the surface (on the leeward side of a boat on a boat-dive to provide shelter from surface wave action) and slowly complete a *360 search* looking for a received signal. Attempt to validate any received signal by looking for surface bubbles in the direction of maximum received signal strength. If a signal is received then a qualified diver search team may use a Buddy Locator in receive mode to find the missing diver directly.

If no signal is received then continue to implement your missing diver procedures. Remember that a Buddy Locator placed in receive mode will revert to transmit after five minutes. Try a *360 search* again after a few minutes.

## 10.4 Mark for Return or Recover

A Buddy Locator can be used to mark an underwater object for subsequent retrieval, or a location to assist with return navigation later in a dive. To avoid the loss of a unit it is recommended that it is used in conjunction with a surface float and line. Attach a Buddy Locator to the line at least several metres off the object/bottom to optimise signal transmission. Cycle through receive and transmit modes to reinitiate the 90 minute timeout. While continuing your dive confirm that the transmitter is in range from time-to-time and validate the return direction. Ensure you return with a sufficient air for retrieval of the line, float and Buddy Locator, and assent with a recommended safety margin of at least 30 Bar (435 psi) at the surface.



## 10.5 Confined or Overhead Spaces

Your Buddy Locator can be used in confined or overhead spaces such as wrecks or caves although in these environments a transmitted signal can be significantly influenced by reflections, channelling and attenuation. Your Buddy Locator is not a replacement for the special procedures and training recommended by your professional dive organisation for diving in confined spaces or overhead environments.

## 10.6 Night Diving

Night diving provides an exciting opportunity to observe many marine animals that are dormant during daylight. It can also present significant challenges to underwater navigation and maintaining group contact. Your Buddy Locator can be a useful adjunct to the lighting requirements and procedures recommended by your professional dive organisation. Your Buddy Locator's LED display visibility can be enhanced by avoiding direct lighting. Complete any *360 search* slowly to avoid disorientation.

## 10.7 Hand Signals

For best utility it may be necessary to coordinate whether the Buddy Locators on a dive are turned on or off, or are placed in transmit or receive mode. The following hand signals are suggested.

- Get diver's attention.
- Point to unit.
- Arms crossed in front of chest: Turn off.
- Point to mouth: Turn on and go to transmit mode.
- Point to ear: Turn on and go to receive mode.
- Validate with the universal OK signal.

## 11. Maintenance

Other than replacement of batteries and the case O ring seal there are no user-serviceable parts in your Buddy Locator. Should your Buddy Locator cease to function then it may be reset by removing the batteries for a period of not less than five minutes. When the batteries are replaced the unit should complete a flashing red and green LED reset display for 10 seconds and then shut down with a Cylon display. Pressing the control button should then initiate a standard lamp test and battery display start-up. If your Buddy Locator fails to reset after battery removal reset then it requires servicing. Please contact your retailer.

Although the case has been designed to resist impact damage it may be scratched by contact with hard materials. Light scratches can be removed by

polishing with a non-solvent based metal polish or toothpaste and a soft cloth. Do not apply solvents to your Buddy Locator.

## 12. About Your Buddy Locator

The four year development of your Buddy Locator is described at <http://www.turtlesarehere.com>.

Each unit comprises a compact low-power ultrasonic (VLF) transceiver using a highly selective direct conversion receiver with Digital Signal Processing (DSP) capable of discriminating between extended range transmission signals below noise thresholds in high marine noise environments. Operation, timing and DSP are controlled by an 8 bit microprocessor running optimised proprietary software. The Buddy Locator has been subjected to extensive field trials and testing to ensure reliable and effective operation.

Each Buddy Locator contains an individual serial number in the micro-code and records details such as operating time in non-volatile memory. These measurements are intended to aid with servicing and the establishment of warranty claims.

Your Buddy Locator contains proprietary hardware and software which is subject to copyright and has patents pending.

I would like to know if you have found your Buddy Locator useful. How can I make the Buddy Locator better for you? Do you consider that it has been good value for money? Have you found a better way to use your Buddy Locator?

Please contact me via the email link at <http://www.turtlesarehere.com> with any comments, suggestions or criticisms that you might care to share. I shall endeavour to respond to all correspondence.

Sincerely yours,

Tim O'Brien  
Aquacoustics Limited