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UNDERSEA DETECTION EQUIPMENT

# AQUAPULSE 1B

## UNDERWATER

## METAL DETECTOR

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# Operating Instructions

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## INTRODUCTION

The AQUAPULSE name has been established for more than two decades and conveys the message of underwater detection excellence using the Pulse Induction (PI) principle. Unlike some of the land based detection solutions that perform dismally underwater the PI system provides a very powerful means of detection for every form of ferrous or non-ferrous metallic item. The AQUAPULSE is a modular system with a range of interchangeable detection heads that allows for a flexible approach to detection under various underwater conditions.

A standard AQUAPULSE 1B (AQ1B) kit consists of the following items:

1. Sealed electronic unit
2. Bone conductor earphone (or Land headphones) with cable and plug.
3. Search Loop and shaft or Search probe with cable and plug.
4. Mains Battery charger (100-250v) with AC charging lead.
5. Harness and belt with quick release buckle.
6. Operating instructions.



The **Aquapulse 1B** underwater metal detector is a precision built instrument using the latest pulse induction techniques, and has been designed for both ease and simplicity of use in the underwater environment, featuring good detection performance with both ferrous and non-ferrous metals.

The unit is ruggedly built to withstand normal diving usage, but to get the best trouble-free operation and long life, certain simple operation and maintenance procedures must be followed. Read the instructions carefully before diving with your detector.

## INITIAL TESTING OF YOUR AQ1B DETECTOR:

### 1. Charging the batteries: -

The detector is supplied only partially charged and will require a full 14 hours charging duration to bring the unit to a fully charged status. Plug the output lead from the charger into the AUDIO & CHARGE socket on the control bulkhead. Please note that this can only be inserted one way round due to the locating (polarising) pin.

***N.B. DO NOT ON ANY ACCOUNT PLUG THE CHARGER INTO THE LOOP SOCKET AS DAMAGE MAY BE DONE TO THE ELECTRONICS***

Plug the charger into the mains supply (100 – 250vAC). After running for an hour or so the charger may get slightly warm to the touch. This is quite normal.

The batteries will not be damaged by being left on charge for a longer period than necessary due to the controlled charge current (14hr rate). For maximum life it is recommended not to give 'top-up' charges and to generally charge for no longer than 14 hours from the discharged state. If the batteries become fully discharged - due to natural usage for the maximum operating period or through the unit accidentally being left in the on state – the unit should be fully recharged as soon as possible to avoid irreparable damage to the battery cells.

***N.B. DO NOT USE ANY OTHER BATTERY CHARGER THAN THE ONE SUPPLIED AS DAMAGE TO THE BATTERY PACK MAY RESULT.***

When the charge period has elapsed, disconnect the AC supply to the charger and unplug the connector from the socket on the detector.

Plug in the connector on the search loop into the LOOP socket and screw down the retaining collar. This should be good finger tightness only.

***Note: This plug can only be inserted one way round due to the polarising pin.***

4. Plug the connector on the Bonephone (or headphone) lead into the PHONE & CHARGE socket and screw down the collar as above. NB. For testing on land the headphones – if available - are much easier to work with.
5. Hold the search loop well away from any metal and switch the unit on by rotating the REJECT control to the MIN position. If a continuous sound is heard immediately, the SET AUDIO control should be rotated anticlockwise until the audio threshold is reached, this is indicated by a low frequency ticking sound in the Bonephone. Alternatively, if the unit is initially silent, the control should be turned clockwise to reach the audio threshold. The audio can be set so that a normal slow ticking sound is heard, or alternatively set slightly below the threshold so that operation is initially silent.

6. Test the operation of the detector by scanning the loop over metal objects e.g. a coin, keys or any convenient metallic object. The audio note will rise rapidly reaching a maximum pitch when the object is centred on the loop axis.
7. An additional check can be made on a piece of buried metal. Scan the loop from side to side and locate the position of maximum tone. Repeat in a forward and backward direction. The point where the audio is at a maximum on both scans is where the object lies.
8. Check the detector on various sizes and shapes of both ferrous and non ferrous metals to get 'feel' as to how it responds on different targets.
9. The 'REJECT' control when set at its lowest setting will give maximum sensitivity to small rings and thin section foils; as the setting is increased the detector will 'reject' signals from silver paper, ring pulls and other unwanted non ferrous objects.
10. Having performed the above checks, switch off. The **Aquapulse** is now ready for use on land or underwater.

### UNDERWATER OPERATION

1. The control unit of the detector can be worn or carried in a number of ways, the choice will be influenced by which of the sense head variants is being utilised. The most obvious choice is worn on the waist secured by the quick release buckle, however if the 38cm (15") loop is being used the control unit can be fitted to the lower cup of the "armsaver" section. Other options include strapping to the upper arm, clipping to any suitable position on the diver or attached to a container that may be used for collecting detected items. When the armsaver is being used one of the small straps should retain the control unit, whilst the other should act as a brace for the forearm in the upper cup.



*The above image shows the control module attached to the armsaver*



*Diver prepared for EOD survey using AQ1B/20cm - Harness mounted*

2. The Bonephone should be placed under the hood, if no hood is worn it can be placed under the strap of the facemask or under a suitable neoprene headband. Position the Bonephone so that it is on a bony part of the head close to the ear.

***N.B. NEVER PLACE THE PHONE DIRECTLY OVER THE EAR AS THIS COULD INTERFERE WITH PRESSURE EQUALISATION ON THE EARDRUM.***

3. Dive to the search area to be searched.
4. Switch the unit on and rotate the SET AUDIO control to achieve the audio threshold point keeping the search loop at arms length and up from the seabed, this avoids detecting any metallic part of the personal diving equipment or any buried items.
5. Search by scanning the loop from side to side close to the seabed in a fanning action, Avoiding passing the loop close to regulator, air tanks or weightbelt as these or any other metal object on the diver, will give false responses.
6. If too much signal is obtained from the seawater such that the 'SET AUDIO' control will not achieve the desired threshold, turn the 'REJECT' control clockwise until the 'SET AUDIO' control comes back into range.

***Note: Different water depths will make a small difference to the threshold setting which can be readjusted by the control knob. This effect does not occur in fresh water.***

## USING ARM SAVER KIT WITH 38CM LOOP

1. Place 38cm Loop on a flat level surface.
2. Remove the Nut, Bolt and Washer from the Lower Shaft and place the Washer in the recess on the Swivel Connector at the centre of the Loop as shown below.



*Washer in connector recess*

*Nut, Bolt & Washer*

3. Next slide the end of the Lower Shaft over the Washer and the Connector as shown below.



4. Secure the Lower Shaft in place using the Nut & Bolt you removed from the Lower Shaft in step 2.



5. Now slide the opposite end of the Lower Shaft inside the Arm Saver as shown below and secure with the Nut and Bolt from the Arm Saver.

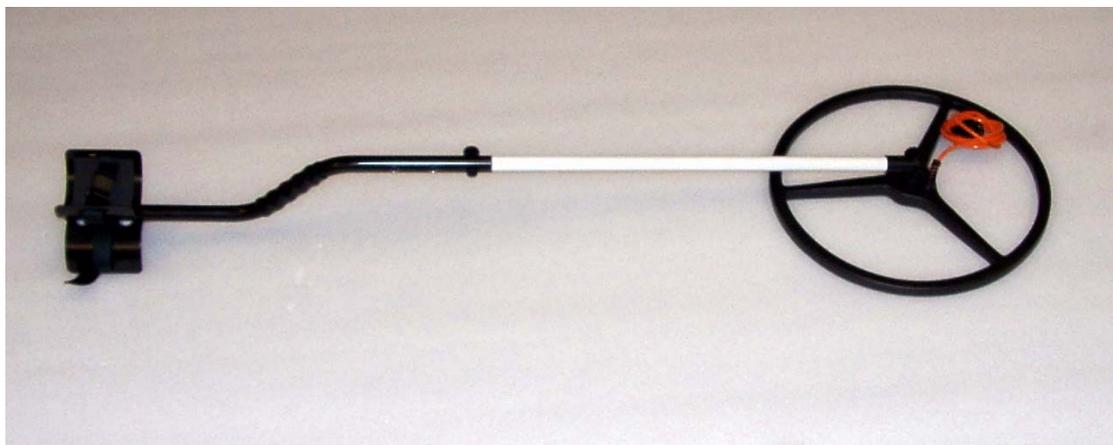
*Note: There are three possible securing positions on the Arm Saver so that you can select the one which is more comfortable for you and most suitable for the job you are carrying out.*



6. The top of the Arm Saver is designed to secure both your arm and an AQ1B Module in the cups as shown below.



7. When fully assembled the Arm Saver Kit when connected to a 38cm Loop should look like the image below.



## CARE AND MAINTENANCE

Proper care of your **Aquapulse** will be repaid by a long and trouble free life and attention should be given to the following points: -

1. After use, and before removing plugs, make sure that the unit is switched off, wash down with clean fresh water.
2. Dry the detector paying particular attention to the area around the plugs. Clear any excess water by blowing.
3. Recharge the batteries if the total hours used is approaching 10.
4. **Never** leave your **Aquapulse** lying in the hot sun, as this could raise the internal temperature to the point where it may distort the case and harm the electronics.
5. The electronic unit is sealed and pressure tested in the factory, no attempt should be made to access the electronics. If any servicing is required, contact your supplier who will advise you where to send the unit.

## BATTERY CARE & CHECKING BATTERY PERFORMANCE/STATUS

The AQ1B internal battery pack is a 7-cell series pack giving a capacity of approximately 2500mA/Hrs. This capacity relates to an operational period of between 10 and 12 hours from full charge. Note: self-discharge occurs naturally in a rechargeable battery. During inactivity this self-discharge causes the battery to slowly discharge itself over a period of months. Nicad batteries can develop a “memory” effect through partial charge/discharge cycles; this effect will reduce the effective capacity available. To maintain maximum performance it is important to regularly discharge the battery completely followed immediately by a full re-charge. Periodically, to ensure adequate operational battery duration, or to confirm the status of your battery, the following checks and procedure should be carried out.

### Checking Battery Pack Voltage

To test whether or not your battery pack is charged, you may use the following test, which requires a DC voltmeter. A digital voltmeter is preferred since these voltages are low and measurement needs to be made in the tenths of a volt resolution.

1. With nothing connected to the detector, turn the detector ON.
2. With the detector placed so the printing on the top label is in normal orientation, place the positive lead of the voltmeter on the TOP pin of the Loop connector (See diagram).
3. Place the negative lead of the voltmeter on the TOP pin of the Phone/Charge connector (See diagram).
4. You should now be able to read the voltage of your battery pack.

5. A fully charged new battery pack should read approximately 9.8 volts. This might decrease slightly as the pack gets older. As the detector is used, the voltage will drop gradually, but performance is not affected until the voltage drops below 8.4 volts. Once the voltage drops below 8.4 volts, it will drop at an accelerated rate. The detector will not function correctly if it gets down around 7 volts or lower. If you measure the voltage and it is near or below 8.4 volts, it's time to re-charge the battery pack.



*Battery Test Points*

## **Checking Battery Pack Performance**

**Note:** *For routine maintenance this should be carried out every three months.*

The recommended procedure is as follows: -

- 1.0 Connect an AQ1B Loop or Probe to your AQ1B module.
- 1.1 Power on your AQ1B and leave it on overnight to fully discharge the battery.
- 1.2 Disconnect the loop and power the AQ1B off.
- 1.3 Charge the AQ1B for at least 14 hours using the provided AQ1B charger.
- 1.4 Once the AQ1B is fully charged, disconnect the charger.
- 1.5 Connect an AQ1B sensing loop and Bonephone/Headphone to the unit and switch it on. Place the loop away from any metal and adjust the SET AUDIO control to get a steady slow clicking sound.
- 1.6 Make a note of the detection range on a suitable test object.

- 1.7 Confirm the functionality and detection range of the unit every 30 minutes - re-adjusting the tick-over as necessary.
- 1.8 When it becomes impossible to set the threshold, or the detection distance has dropped dramatically, this can be considered to be the end of charge status for the battery.
- 1.9 If the performance becomes unacceptable after less than what you (the operator) determine to be an acceptable minimal operational period, then the AQ1B Battery Pack needs to be replaced.

*Note: If your battery needs to be replaced please contact our technical support dept to arrange for an installation of a replacement battery, or in the case of an approved service agent please refer to the servicing data provided.*

*Please consider Nicad batteries as hazardous material and dispose of your old battery pack in line with local guidelines.*

## TROUBLESHOOTING GUIDE

**Symptom:** No Response from AQ1B Module

Check the following:-

1. Check that the battery has been charged -
  - If not, place AQ1B on charge and then re-test.
2. Check that both Sensing Loop and Bonephone are correctly connected
  - Try using an alternative Bonephone/AQ1B Headphones.
  - Try using an alternative Loop or a known good AQ1B Probe.
3. Check that both the Sensing Loop and Bonephone are in good condition. Check by substitution if possible or by monitoring the nominal resistance of both items. Connecting a good quality multi-meter across the pins of the plug can check the resistance. NB. It is good policy to firstly check the multi-meter's reading with the leads shorted together - this provides a measure of what residual reading to take into account.
  - See AQ1B Resistance Chart below: -

Item	Resistance (ohms)
20cm Loop	1.4
25cm Loop	1.6
38cm Loop	1.8
12" Probe	5.8
36" Probe	5.8
Bonephone	5.4
Headphones	15.0 (Minimum Volume)

**Symptom:** Erratic Performance from AQ1B Module

1. First check as above.
2. Check that the stainless contacts of the bulkhead connectors are clean.
3. Check that the stainless connectors of the Sense loop and bonephone are clean. If necessary reduce the contact resistance by slightly prising the gap in the male contacts, this will increase the firmness of the connector on insertion.
4. Check that the cable to the Sense Loop has not been damaged causing water ingress.
5. Check that the male connector seals are in place and clean.

## AQUAPULSE 1B SYSTEM PARTS & ACCESSORIES



### AQ.4.061

AQ1B Bonephone – Fully waterproof headphone, utilises Ikelite underwater connector to connect to the AQ1B Control Module. Normally placed against the skull at the back of, or below the ear whilst underwater, enabling the diver to clearly hear the change in the Detector tone when metal is sensed

### AQ.4.062

AQ1B Bonephone with Extending Flexible Cable– Fully waterproof headphone, utilises Ikelite underwater connector to connect to the AQ1B Control Module. Normally placed against the skull at the back of, or below the ear whilst underwater, enabling the diver to clearly hear the change in the Detector tone when metal is sensed. Comes with extendable flexible cable which allows more freedom of movement with the Bonephone whilst underwater.



### AQ.4.030

AQ1B Land Headphones – Rugged headphones for use above water enabling The AQ1B to be utilised as a powerful land detector. The Headphones feature an adjustable volume control and a comfortable fit for the user.

### AQ.4.031

AQ1B Underwater Headphones – Rugged headphones for use underwater giving an alternative to the Bonephone. These are particularly useful in warm waters where a diving hood is not normally worn, They also provide a more powerful sound level that can enhance the ability to sense even the most subtle changes in the audible output.





## AQ.4.000 part 1

Arm Saver – Used in conjunction with a 38cm Loop and Lower Shaft. Set of straps enables user to use forearm to comfortably support 38cm Loop for long periods of time. AQ1B Control Module can also be secured to lower cup of the Arm Saver.

## AQ.4.000 part 2

Lower Shaft – Used in conjunction with Arm Saver and 38cm Loop. Extends the sensing loop to a distance that eliminates background detection of metallic items on the diver. Allows the sense head to be swung over a wide arc for good search coverage. Locks into one of three Arm Saver positions to optimise the overall length



## AQ.4.080

20cm (8'') Loop with Stem – Fully Waterproof compact search loop uses Ikelite underwater connector that enables the Loop to be easily connected and disconnected.

## AQ.3.001

20cm (8'') Loop – Same loop as AQ.4.080 but comes without Stem & Handle. This can be used with the Extending Handle (AQ.04.001) and the Arm Saver kit (AQ.4.000)

## AQ.3.002

25cm (10'') Loop – Fully Waterproof robust, mid-sized search loop uses Ikelite underwater connector that enables Loops to be inter-changed. Normally supplied with the extending handle to give a flexible usage.





### AQ.3.003

38cm (15") Loop – Fully Waterproof large search loop complete with Ikelite underwater connector. This loop gives the largest sensing range and supplied with the Arm-saver kit to give good sweep range underwater and a good balanced unit for land use.

### AQ.3.004

38cm (15") Loop supplied with a 20 metre (65ft) length of re-enforced cable and standard Ikelite connector for direct compatibility with a standard AQ1B detector.

The extended length of cable allows the sensing loop to be slowly towed behind a boat or simply lowered down for drift searching. This system of operation allows metallic contact areas to be located prior to deploying a diver.

This item is indispensable for extended shallow water searches in low visibility conditions.



### AQ.3.040

30cm (12") Ferrite Probe – Fully waterproof probe used for searching for metal in small crevices and for digging amongst silt and sand.



### AQ.3.041

90cm (36") Ferrite Probe – Fully waterproof probe used for searching for metal in bigger crevices and for digging amongst silt and sand. Fully extendable between 44cm & 85.5 cm.

# AQ1B Underwater Metal Detector User Manual



## AQ.04.001

Extending Handle – Used in conjunction with 25cm Loop, fully extendable between 45cm & 87cm.



## AQ.2.010

AQ1B Control Module – The main item of the AQ1B detector kit. A fully sealed electronic control module with a diver depth rating of 100m (tested and proven by divers beyond this depth). The control unit features a multi-turn adjustment for audio (detection) threshold.

The primary control is the rotary on-off power control which also provides an element of rejection as it is rotated clockwise, this is primarily intended for the rejection of “ring pulls” during beach searching applications. In addition to the electronics, the control unit houses the Nicad rechargeable battery pack.

## AQ.4.010

Battery Charger – Switched mode unit with 100v to 250v AC 50/60HZ input voltage range. Used to recharge the AQ1B Module internal battery pack. Can be supplied with option of US, UK or European type Power Connector.





## **Manufacturer Contact Information**

If you should need to contact Aquascan International Limited for advice on your purchase, to order further equipment or to arrange a repair, please use the following contact information: -

Mailing Address:

Aquascan International Limited  
Aquascan House  
Hill Street  
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Website: [www.aquascan.co.uk](http://www.aquascan.co.uk)



## **Aquascan International Ltd. EC Declaration of Conformity**

We hereby declare that the following equipment complies with the essential requirements at the Electronic Compatibility Directive (89/336, 91/26 3 and 92/31).

This equipment should not be modified, without our approval, as this declaration will lose it's authority.

**Equipment description:- Marine Metal Detector.**

**Model:- Aquapulse 1B.**

**Manufacturer:- Aquascan International Ltd.  
Aquascan House  
Hill Street  
Newport,  
NP20 1LZ  
S. Wales.**

Tel: +44 (0) 1633 841117/255645

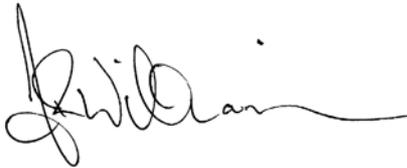
Fax: +44 (0) 1633 254829

**Email:** [info@aquascan.co.uk](mailto:info@aquascan.co.uk)

**Applicable directives:- EN 55011 General Emission Standard Class A,  
Group 1.**

**EN 50082 Generic Immunity Standard Part 2.**

A technical construction file for this equipment is retained at the manufacturing base.

**Signed :**  **Date :-** ..... **1st January 1996**

**J. R. WILLIAMS**

**Managing Director**

**Name :-** ..... **Position :-** .....