900 Series
Operation Manual

BCN-0910-8000/9

Table of Contents

Thank you for choosing Applied Acoustic Engineering as one of your subsea equipment suppliers. We hope you experience many years of reliable operational use from our products.

If you do encounter any technical issues with any of our products then please don't hesitate to contact our Technical Team via the following methods.

Tel: +44 (0)1493 440355
Fax: +44 (0)1493 440720

Email: techsupport@appliedacoustics.com

Applied Acoustic Engineering Ltd has made every effort to ensure that the information contained in this manual is correct at time of print. However our policy of continual product improvement means that we cannot assume liability for any errors which may occur.

These written instructions must be followed fully for reliable and safe operation of the equipment that this manual refers to. Applied Acoustic Engineering Ltd cannot be held responsible for any issues arising from the improper use or maintenance of equipment referred to in this manual or failure of the operator to adhere to the instructions laid out in this manual. The user must be familiar with the contents of this manual before use or operation.

Use with EASYTRAK: The beacons listed in this manual are all compatible with EASYTRAK, our small, portable and easy to use USBL tracking system. Please refer to the EASYTRAK documentation for more information.

1. Introduction to the 900 series

Thank you for choosing Applied Acoustic Engineering as one of your sub sea equipment suppliers. We hope you will enjoy many years of reliable operational use from our products.

The AAE 900 Series subsea transponders consists of a large range of beacons (combined transponders / responders / pingers) to suit a variety of underwater positioning and relocation tasks. Note smaller (200 series); Release (500 series) and Low Frequency (600 series) models are also available.

This manual covers all standard models in the range.

All the models in the range use the same mating connector - the VMG-4-FS and have the same channel (frequency) selection switches. These are situated on the lower end-cap.

There is facility for operation with the following systems: -

AAE EASYTRAK USBL system	- All 144 channels
Simrad HPR 300 series	- Channels 1 - 9 and 11 - 55 (14 in total)
Simrad HPR 400 Series	- Channels 1 - 9 and 11 - 55, plus the 56 ‘HiPAP’ channels
Simrad HiPAP system	- All 56 channels
Sonardyne USBL	- Simrad Channels 1 - 9 and 11 - 55.
Sonardyne LBL	- 19 options of CIF and CRF.
ORE Trackpoint II	- 25 Channels as listed, plus pingers.

These beacons have the capability to operate on 144 different transmit and receive frequency combinations referred to as ‘channels.’

The beacons operate as

a) Acoustically triggered transponder (requires one or two acoustic signals before replying).

b) Electrically triggered responder.

c) As a free running pinger (no interrogations are required).

Note:- We, and most suppliers, use the term ’Beacon’ to describe either of the above three types of transmitting device. Some manufacturers refer to a Beacon as a free running pinger. Well it isn’t!
Note: - When powered from a 24 volt supply, the unit will work as either responder or transponder. The transponder circuitry is not switched off when a responder is connected or used.

The following models are available as standard: -

Mini

Model 915	+/-45 degrees	194dB
Model 919	+/-90 degrees	188dB
Model 915H	+/-30 degrees	196dB

Applications: - General-purpose mini's where range is not too great. The directional unit is usually preferred for tow fish tracking and ROV work beyond 200 - 300 metres water depth.

Midi

Model 933	+/-30 degrees	203dB
Model 935	+/-45 degrees	200dB
Model 939	+/-90 degrees	190dB
Model 943	+/-30 degrees	203dB
Model 945	+/-45 degrees	200dB
Model 949	+/-90 degrees	190dB

Applications: - These units have higher output than mini's and are particularly useful in noisy environments or at longer ranges than mini's; generally used for tow fish tracking and deeper ROV work.

Fat Boy

Model 965	+/-45 degrees	203dB
Model 962	+/-15 degrees	209dB

Applications: - Even higher output than our midi's, the 96x units offer more power and battery life, but are probably too large to be fitted onto a tow cable. More powerful 'Fat Boys' are available!

Note: 972 model is available with 212 dB source level, details in appendix.

Seabed

Model 955	+/-45 degrees	194dB
Model 959	+/-90 degrees	188dB
Model 955H	+/-45 degrees	200dB

Applications: - Intended as seabed markers, the cages at each end allow these units to be moored off with weights and buoys. They also take our flotation collars. These have also been fixed onto large ROV's and ploughs. The 955H is a higher-powered version of the 955.

Remote Transducers

There are also versions of all the above beacons without a transducer fitted, instead a 1 or 2 metre lead connects to a remote transducer. The following remote transducers are currently available:-

Model RM15 *(Replaces 7920A)*	+/-15 degrees
Model RM30	+/-30 degrees
Model RM45	+/-45 degrees
Model RM90	+/-90 degrees

Check with the factory or your area representative for further details.

Applications: - For dedicated tow fish / ROV's where the electronics can be fitted inside and away from potentially damaging, or difficult locations.

Please refer to specifications for Technical Details.

A note on depth ratings: -

A published depth rating does not necessarily imply that a particular product will acoustically operate at that depth at all times. Some units are depth limited to 1000 metres and are not intended for use at a depth beyond 1000 metres. Mechanical damage will occur.

All new beacons are supplied fitted with a pressure relief valve. Older models may not be fitted with a pressure relief valve. To identify if your transponder has been supplied or fitted with a relief valve use the following information;

Mini Beacons

Pressure relief valves doubles as the centre fixing screw in the bulkhead end cap and is identified by its extended body length of 20mm beyond the Perspex cover plate. The standard centre fixing screw is flush with the Perspex cover plate and has no pressure relief valve functionality. See Appendix for visual guide.

Midi Beacons

Pressure relief valve doubles as the main ON/OFF switch and is identified by its extended body length of 20mm beyond the Perspex cover plate, the main body is knurled to aid grip when rotating (operation is by hand only). The standard ON/OFF switch is flush with the Perspex cover plate, has no pressure relief valve functionality and is operated using a flat screwdriver.

Seabed & Fatboy Beacons

Pressure relief valve doubles as the main ON/OFF switch and is identified by its extended body length of 20mm beyond the Perspex cover plate, the main body is knurled to aid grip when rotating (operation is by hand only). The standard ON/OFF switch is flush with the Perspex cover plate, has no pressure relief valve functionality and is operated using a flat screwdriver.

Note: The pressure relief valve is a non-serviceable item, if it is faulty or mechanically damaged then the beacon should be returned to the factory or service centre for replacement.

2. Getting Started

On delivery of your beacon please check the following:

1. Model number
2. Depth rating
3. Battery type
4. That the beacon is switched off

This information can be found on the beacon product label and on the delivery note**.**
Please ensure that this information is correct and suits your requirements.
Please check the beacon for any transit damage, if any is found, do not use the equipment and return it to your supplier.

Example Label Only

Your beacon is charged at the factory before dispatch and should arrive fully charged. If you require charging prior to commissioning then please read the charging instructions in section 3. Note: if the beacon has been shipped with the main on/off switch in the on position, you may need to charge the unit before deployment.

Handling

Although these units are resistant to mechanical vibration and shock, every effort should be made to avoid careless handling. Dropping the unit will quite possibly damage the transducer which contains brittle piezo ceramic material and is sensitive to mechanical shock. Care should be taken not to damage the pressure relief valve body located inside the bulkhead connector end cap, damage to this item could cause the beacon to flood internally.

Beacon support and mounting

Beacons must be held securely by means of a mechanical clamp or clamps. The clamping pressure must not overstress the beacon's main tube and the clamp must not contact the beacon electrically if it is metallic. The fixing method must be electrically isolated using rubber or plastic and preferably the clamping fixture should be plastic.

WARNING: Damage to the beacon's anodising must be avoided at all cost, as this will reduce the operational life of the beacon.

When mounting a beacon, its position should be considered to maximise its operational performance. Beacons need to be mounted so that there is a clear and unobstructed sound path between the transducer and the ship's tracking system. Head Directional transducers must be 'aimed' at the vessel – in a similar way that one would point a torch at an object, so that the vessel is 'illuminated' with signal from the beacon. When using highly directional transducers, the towing angle and cable catenary can have a significant effect on the position of the acoustic beam and comprehensive experimentation with positioning is recommended. Also ensure that ROV thruster noise is taken into account when positioning the beacon. We advise that the tracking system is set to low power when tracking at short distances. This is to reduce any multipath that may occur in some environments.

WARNING: High internal temperatures may occur if the beacon is left out in direct, strong sun light. This may lead to reduced battery operational life span and reduced charge capacity during charging. A 72 deg C thermal fuse is included in the battery pack(s) which will render the beacon inoperative should this temperature be exceeded.

If the beacon is going to be deployed in an area where there is a high risk of contamination with mud or sand, we recommend that the pressure relief valve holes be temporarily covered with electrical tape to avoid being blocked.

3. Charging the Beacon

Your beacon comes with one of the following battery types:

a. Nickel Cadmium (NiCad).
b. Nickel Metal Hydride (NiMH).
c. Alkaline or Lithium (NOT REACHARGEABLE).

Beacons fitted with battery types a) and b) can be charged with Applied Acoustic charger models 982 and PAM 2520. Beacons can also be trickle charged from an external 24 volt regulated power supply. This is usually done whilst operating on the ROV. (Only applies to the 24 volt input)

WARNING concerning all battery types: Battery life is quoted in the 'Specification' section at the rear of this manual. Battery life is based on good, recently charged cells. Battery life is quoted as x number of days listening or y number of replies (operational). Therefore when half the listening life has been used, the number of possible replies has also reduced by half. It is advisable to ensure that operational parameters do not result in the battery pack(s) being discharged before the job is finished! Make sure you have a safety margin!

Charging Instructions

Again, the beacon is factory charged before shipping and should arrive fully charged. However, if charging is required, please refer to the instructions below.

Note the exact **Model Number** of the Applied Acoustic Engineering beacon you wish to charge and also read and refer to the appropriate Applied Acoustic Engineering charger operating manual for the charger you are using. The recommended chargers being the Applied Acoustic Engineering 982 or PAM 2520 type.

i) The charging operation must take place in a dry environment at normal room temperature (recommended temperature range is between 14 – 23 deg C). If the ambient temperature is too high, the temperature sensor in the battery pack will activate before the end of the charge cycle and produce an 'open circuit' error message to be displayed on the chargers front panel.
ii) Ensure Beacon is switched off.
iii) Fit charging lead to beacon connector.
iv) Remove the beacon end cap from the main beacon body (just enough to allow internal venting). Note: Removal of the end cap on beacon models fitted with a pressure relief valve is not necessary (this applies to all AAE models and some other non AAE beacon types). If battery gassing should accidentally occur during the charging of any rechargeable battery packs, venting of this gas to atmosphere must be allowed to take place. The pressure relief valve facilitates this operation automatically without the need for the end cap removal.

WARNING: Do not attempt to charge beacon if the pressure relief valve is covered with tape or if valve vent holes are covered with marine growth.

WARNING: When securing end caps on beacons, do not over-tighten the plastic screw fixings. Screw in the main screw on Mini beacons just enough to take up any slack between the end caps and the main tube body (this main screw will be the relief valve if fitted).

v) Use the correct menu option for the beacon being charged and commence charging the beacon. Latest Applied Acoustic Engineering chargers will display the time left to charge during this operation.

vi) If the pressure relief valve starts to vent water vapour or gas during charging, stop charging immediately and decommission beacon.

vii) If the Charger flashes "open circuit" during or after the complete charge cycle the following may have occurred:-

a) Check the charger's beacon menu selection used is correct for the beacon type being charged.
b) That the charging lead is undamaged and connection is electrically secure with the beacon.
c) That the pressure relief valve has vented (fluids or gas).
d) Charging has not occurred in a too warm environment.
e) Check that the beacon is not hot or warm to the touch.
f) Check that the battery pack is within it operational life. (Stated on the case of the beacon).

- If charged incorrectly, or if charged in too warn an environment, the beacon may be re-used after an internal inspection by a competent engineer.
- If the connector or connections are dirty or corroded, replacement is necessary.
- If water ingress is suspected, the beacon should be de-commissioned and returned to shore for evaluation.

- The unit must not be recharged if any doubt exists to the beacon's integrity.

Note: Incorrect charger settings will NOT decrease charge time but may damage battery packs thus reducing their effective life in use. Applied Acoustic Engineering cannot be held responsible for incorrect charger settings. Moreover, repeatedly incorrect use could prove potentially hazardous.

The beacon is now ready to use in service. Making a note of the date of each charge may be helpful in the field to avoid unnecessary future overcharging of the battery pack.

If the beacon is going to be deployed in an area where there is high risk of contamination with mud or sand, we recommend that the pressure relief valve holes be temporarily covered with electrical tape to avoid being blocked. The tape should be removed when the beacon is used out of water to allow the valve to vent.

The beacon can be connected to a 24 volt DC (nominal) supply and should be fused as described on the following pages. This is usually done via connection to an ROV (remotely operated vehicle). The 24 volt connection only provides a trickle charge which will maximise the beacon's operating life whilst on the ROV. It will still be necessary to remove and charge the beacon monthly on an Applied Acoustic Engineering charger in order to maintain the beacon's battery pack(s).

Connected to the Applied Acoustic Engineering 981 Charger

Most of the 900 series of mini and midi beacons are backwards compatible with the 981 cycle charger, thus the 'dump' switch needs to be pressed to initiate the charge cycle. Refer to the 981 charger manual for information.

Connected to the Applied Acoustic Engineering tester charger PAM Model 2520

Refer to the manual.

Connecting to Simrad's 5382 Charger

We would not recommend using the 5382 charger as the sensing circuitry in the SIMRAD 5382 charger will not operate when connected to Applied Acoustic Engineering beacons. When used with AAE beacons the Simrad 5382 charger will be limited to trickle charge only at around 20mA. This will extend charge times to 3 days for Mini's and for other models, even longer.

After Charging

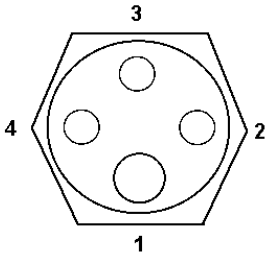
Note that a dummy connector (Blanking plug) must be used when a pigtail is not connected. Mating connector type is VMG-4-FS. A locking sleeve can be used with all models except mini's.

Charging Fat Boy 962/972 beacons fitted with NiMH Batteries

Early models of the 982 'Smart Charger' or PAM 2520, were not designed to charge these models.
For the 962, the 94x setting can be used followed by 12 hours of trickle charge.
For the 972, charge as the 962 and wait as long as you can with the charger on trickle charge.

4. Connecting external power or an external trigger to the Beacon

The beacon can be electrically connected to an external key (trigger) or to a 24 volt regulated DC supply using the bulkhead connector. Remove the dummy connector cover and you will see four electrical pins. As below.



BEACON EXTERNAL VIEW

PIN 1 is for connection to an external key
PIN 2 is the electrical ground
PIN 3 **(Only for use with the Applied Acoustic Engineering chargers)**
PIN 4 is for connection to an external regulated positive 24 volt DC supply. **Do NOT use PIN 3**

Note: Applied Acoustic Engineering cannot be held responsible for damage or injury caused by the incorrect wiring of bulkhead connectors by non AAE personnel. Pin 3 must not be connected to any other equipment other than Applied Acoustic Engineering chargers.

When connected to a 24 volt supply (pin 4), the internal batteries are trickle charged by a constant current regulator within each unit. This is ideal for permanent applications as the batteries are always fully charged whilst in this configuration. Voltage range is 24-32 volts with an inline fuse as below;

Current drawn is as follows: -

Model	Current Drawn	Recommended Fuse (MAX)
Mini's	80 mA	100-200 mA
Midi's	120 mA	150-200 mA
Fat Boy	120/150 mA	150-250 mA
Seabed	120/150 mA	150-250 mA

Note: If a fuse blows, the beacon system should be examined by a competent engineer to establish the reason why the fuse has failed. Alternatively, the beacon should be de-commissioned and returned to Applied Acoustic Engineering for examination/repair.

Applied Acoustic Engineering cannot be held responsible for injury or damage caused by incorrect use of fuse ratings higher than those recommended above.

Note that a dummy connector (Blanking plug) must be used when a pigtail is not connected to the beacons connector (VMG-4-FS). A locking sleeve can be used with all models except Mini's.

5. Operation

The three switches fitted to the bottom end of the beacons are all stainless steel so they will not be damaged by screwdrivers. However, the operator should note that the ON / OFF switch cannot be freely rotated, but only turned back and forth between the two marked positions. Damage will result if the switch is forced beyond the marked limits. The channel selection switches can be rotated freely to the desired position. However, because the O rings reduce the 'feel' of the switch, it is suggested that each switch is rotated just past (a few degrees) the desired position and then turned back to ensure that the switch has fully engaged into its new position. The use of Applied Acoustic Charger Testers will also assist in confirming and identifying selected channels. Note that switch 1 is the left hand switch and switch 2, the right.

Switching On

Switching on is achieved by rotating the switch located on the connector end-cap marked ON & OFF. Please also refer to the preceding paragraph.

Channel Switches

These two switches select the receive and transmit frequencies.

Note: During operation, there will be a delay of approximately 60 seconds before a newly selected channel becomes fully processed and operational.

Operation with Easytrak System

Please note that the switch position 10/0 as shown below can be more precisely defined as: Left hand beacon channel selector switch, position 10. Right hand switch, position 0.

Switch Position	Rxf1 (Hz)	Rxf2 (Hz)	Txf1 (Hz)	Txf2 (Hz)	Mode	TAT (ms)	P W
10 / 0	30000	0	17500	0	AAE	30	2mS
10 / 1	28000	0	18500	0	AAE	30	2mS
10 / 2	26000	0	19500	0	AAE	30	2mS
10 / 3	29000	0	20500	0	AAE	30	2mS
10 / 4	27000	0	21500	0	AAE	30	2mS
10 / 5	30000	0	22500	0	AAE	30	2mS
10 / 6	27000	26000	18000	20000	AAE	60	2mS
10 / 7	28000	27000	18000	21000	AAE	60	2mS
10 / 8	30000	29000	18000	22000	AAE	60	2mS
10 / 9	29000	28000	18000	23000	AAE	60	2mS
11 / 0	30000	29000	20000	18000	AAE	60	2mS
11 / 1	29000	28000	20000	21000	AAE	60	2mS
11 / 2	28000	27000	20000	22000	AAE	60	2mS
11 / 3	27000	26000	21000	18000	AAE	60	2mS
11 / 4	26000	25000	21000	20000	AAE	60	2mS
11 / 5	28000	27000	21000	22000	AAE	60	2mS
11 / 6	30000	29000	21000	23000	AAE	60	2mS
11 / 7	26000	25000	22000	18000	AAE	60	2mS
11 / 8	25000	0	17000	0	AAE	30	2mS
11 / 9	25000	0	19000	0	AAE	30	2mS

Frequencies shown above are in kHz.

900 series beacons will operate as transponders if acoustically interrogated, or as responders if electrically triggered. If the beacons are used with the Easytrak system. See the accompanying diagram elsewhere in this manual for wiring information.

Operation with Simrad Systems

Simrad's HPR systems use 14 channels listed as 1, 2, 3, 4, 5, 6, 7, 8, 9 11, 22, 33, 44, and 55. These are catered for as listed in the table below.

Please note that the switch position 01 as shown below can be more precisely defined as: Left hand beacon channel selector switch, position 0. Right hand switch, position 1.

Operation with Simrad 300 series, 400 series (not HiPAP)

Switch position	Channel	Interrogate frequency	Reply frequency
01	1	20.492	29.762
02	2	21.552	30.488
03	3	22.124	31.250
04	4	22.727	31.847
05	5	23.364	32.468
06	6	24.038	27.173
07	7	24.510	27.777
08	8	25.000	28.409
09	9	26.042	29.070
1/1	11 Square	21.552	27.173
2/2	22 Circle	22.727	28.409
3/3	33 Delta	23.923	29.762
4/4	44 X	25.126	31.250
5/5	55 Y	26.455	32.468

Frequencies shown above are in kHz.

900 series beacons will operate as transponders if acoustically interrogated, or as responders if electrically triggered. If the beacons are used with the SIMRAD 410 system, the channels listed above and the 56 listed for 'HiPAP' apply and are referred to as the 'B' channels.

Please note 1) SIMRAD'S HiPAP systems cannot track the above channels. We would also advise that when using the HPR400 series, the operator should use either the above channels or the 56 HiPAP type channels and NOT a mixture of the two as some frequencies are common and can cause interference. Note 2) Switch positions shown as 1/1 etc denote LH switch on position 1 and RH switch on position 1 etc.

Operation with Simrad HiPAP

Simrad's HiPAP system transmits a double interrogation pulse, with 56 channels listed as over the page: -

900 series beacons will operate as transponders if acoustically interrogated, or as responders if electrically triggered. These beacons comply with 'B' Channels as shown on the monitor screen e.g. "B24" for our switch setting 2 4. Please note that the HiPAP system is not able to operate with the 'old' HPR channels 11/22/33/44/55 and 1 – 9. See the accompanying diagram elsewhere in this manual for wiring information relating to responder operation.

See table over leaf.

Switch 1	Switch 2	Description	RX 1	RX 2	Reply
1	2	HiPAP	21KHz	21.5KHz	29.25KHz
1	3	HiPAP	21KHz	22KHz	29.75KHz
1	4	HiPAP	21KHz	22.5KHz	30.25KHz
1	5	HiPAP	21KHz	23KHz	30.75KHz
1	6	HiPAP	21KHz	23.5KHz	27.25KHz
1	7	HiPAP	21KHz	24KHz	27.75KHz
1	8	HiPAP	21KHz	24.5KHz	28.25KHz
2	1	HiPAP	21.5KHz	21KHz	28.5KHz
2	3	HiPAP	21.5KHz	22KHz	29.5KHz
2	4	HiPAP	21.5KHz	22.5KHz	30KHz
2	5	HiPAP	21.5KHz	23KHz	30.5KHz
2	6	HiPAP	21.5KHz	23.5KHz	27KHz
2	7	HiPAP	21.5KHz	24KHz	27.5KHz
2	8	HiPAP	21.5KHz	24.5KHz	28KHz
3	1	HiPAP	22KHz	21KHz	28.75KHz
3	2	HiPAP	22KHz	21.5KHz	29.25KHz
3	4	HiPAP	22KHz	22.5KHz	30.25KHz
3	5	HiPAP	22KHz	23KHz	30.75KHz
3	6	HiPAP	22KHz	23.5KHz	27.25KHz
3	7	HiPAP	22KHz	24KHz	27.75KHz
3	8	HiPAP	22KHz	24.5KHz	28.25KHz
4	1	HiPAP	22.5KHz	21KHz	28.5KHz
4	2	HiPAP	22.5KHz	21.5KHz	29KHz
4	3	HiPAP	22.5KHz	22KHz	29.5KHz
4	5	HiPAP	22.5KHz	23KHz	30.5KHz
4	6	HiPAP	22.5KHz	23.5KHz	27KHz
4	7	HiPAP	22.5KHz	24KHz	27.5KHz
4	8	HiPAP	22.5KHz	24.5KHz	28KHz
5	1	HiPAP	23KHz	21KHz	28.75KHz
5	2	HiPAP	23KHz	21.5KHz	29.25KHz
5	3	HiPAP	23KHz	22KHz	29.75KHz
5	4	HiPAP	23KHz	22.5KHz	30.25KHz
5	6	HiPAP	23KHz	23.5KHz	27.25KHz
5	7	HiPAP	23KHz	24KHz	27.75KHz
5	8	HiPAP	23KHz	24.5KHz	28.25KHz
6	1	HiPAP	23.5KHz	21KHz	28.5KHz
6	2	HiPAP	23.5KHz	21.5KHz	29KHz
6	3	HiPAP	23.5KHz	22KHz	29.5KHz
6	4	HiPAP	23.5KHz	22.5KHz	30KHz
6	5	HiPAP	23.5KHz	23KHz	30.5KHz
6	7	HiPAP	23.5KHz	24KHz	27.5KHz
6	8	HiPAP	23.5KHz	24.5KHz	28KHz
7	1	HiPAP	24KHz	21KHz	28.75KHz
7	2	HiPAP	24KHz	21.5KHz	29.25KHz
7	3	HiPAP	24KHz	22KHz	29.75KHz
7	4	HiPAP	24KHz	22.5KHz	30.25KHz
7	5	HiPAP	24KHz	23KHz	30.75KHz
7	6	HiPAP	24KHz	23.5KHz	27.25KHz
7	8	HiPAP	24KHz	24.5KHz	28.25KHz
8	1	HiPAP	24.5KHz	21KHz	28.5KHz
8	2	HiPAP	24.5KHz	21.5KHz	29KHz
8	3	HiPAP	24.5KHz	22KHz	29.5KHz
8	4	HiPAP	24.5KHz	22.5KHz	30KHz
8	5	HiPAP	24.5KHz	23KHz	30.5KHz
8	6	HiPAP	24.5KHz	23.5KHz	27KHz
8	7	HiPAP	24.5KHz	24KHz	27.5KHz

Operation with Sonardyne USBL Systems

The Sonardyne USBL system can use many frequencies including those used by Simrad HPR: -

Switch position	Channel	Interrogate frequency	Reply frequency
0/1	1	20.492	29.762
0/2	2	21.552	30.488
0/3	3	22.124	31.250
0/4	4	22.727	31.847
0/5	5	23.364	32.468
0/6	6	24.038	27.173
0/7	7	24.510	27.777
0/8	8	25.000	28.409
0/9	9	26.042	29.070
1/1	11 Square	21.552	27.173
2/2	22 Circle	22.727	28.409
3/3	33 Delta	23.923	29.762
4/4	44 X	25.126	31.250
5/5	55 Y	26.455	32.468

Frequencies shown above are in kHz.

Applied Acoustic 900 series beacon will operate as transponders if acoustically interrogated or as responders if electrically triggered. See the accompanying diagram elsewhere in this manual for wiring information.

Operation with Sonardyne PAN / Compatts

Applied Acoustic 900 series beacon will operate as transponders if acoustically interrogated within a LBL array. Note that TAT accuracy is not as precise as Compatts.

Switch Position	Switch Position	Channel	Interrogate Frequency		Reply Frequency
9	1	Ch 1 CRF	19.230 kHz	TAT = 125.8 mS	26.042 kHz
9	2				
9	3	Ch 3 CRF	20.491 kHz	TAT = 125.8 mS	26.042 kHz
9	4	Ch 4 CRF	21.186 kHz	TAT = 125.8 mS	26.042 kHz
9	5	Ch 5 CRF	21.929 kHz	TAT = 125.8 mS	26.042 kHz
9	6	Ch 6 CRF	22.522 kHz	TAT = 125.8 mS	26.042 kHz
9	7	Ch 7 CRF	23.148 kHz	TAT = 125.8 mS	26.042 kHz
9	8	Ch 8 CRF	23.810 kHz	TAT = 125.8 mS	26.042 kHz
9	9				
9	10	Ch 10 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	28.733 kHz
9	11	Ch 11 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	29.411 kHz
10	0	Ch 12 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	30.120 kHz
10	1	Ch 13 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	30.864 kHz
10	2	Ch 2 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	19.841 kHz
10	3	Ch 3 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	20.491 kHz
10	4	Ch 4 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	21.185 kHz
10	5	Ch 5 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	21.929 kHz
10	6	Ch 6 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	22.522 kHz
10	7	Ch 7 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	23.148 kHz
10	8	Ch 8 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	23.810 kHz
10	9	Ch 9 CIF	24.752 kHz	TAT =125.8 mS Inh 1.3 s	27.472 kHz

Operation with ORE LXT; Trackpoint II and II+ Systems

ORE's Trackpoint II and LXT systems operate in the MF band with interrogate frequencies between 16 and 21 kHz and reply frequencies between 22 and 30 kHz. It is increasingly common for beacons to be supplied which operate on LXT's pre-defined channels 1 - 5. Applied Acoustic Engineering 900 series beacons operate on three 'codes' as listed below: -

Switch Positions	Channel	Interrogate Frequency (kHz)	Reply Frequency (kHz)
0/10		18	24 *
0/11		17	24 *
1 / 0	LXT Code 1	17	23 *
1 / 9		18	25
1/10		16	25
1/11		21.5	26
2/0	LXT Code 2	19	25
2/9		18	26
2/10		17.5	28.5
2/11		18.5	26.5
3/0	LXT Code 3	17	27
4/0	LXT Code 4	19	29
5/0	LXT Code 5	17	30
6/0		18	28
6/9		16	23 *
6/10		18	23 *
6/11		20.5	23 *
7/0		18	30
7/9		17	24
7/10		19	24
7/11		17	25
8/9		17	26
8/10		21	33
8/11		18	31

Note: frequencies marked (*) are for special low frequency (transducer) versions only.

TAT (Turn Around Time) is 15 mS for operation as transponder and responder. Select a 10 mS transmitted pulse width within the Trackpoint II / II+ system.

Applied Acoustic Engineering 919 and 916 beacons can be interrogated at 1 PPS (faster than the standard 'Multibeacon'). For responder work, the 900 series use a +ve key pulse. Although this is not usual with Trackpoint, the system can be configured quite easily. Refer to your Trackpoint documentation.

Special Features

Applied Acoustic Engineering 900 series units have the following features: -

Test Positions

There are also test positions on the 900 series beacons (as shown below), for Simrad HPR, Sonardyne USBL, Simrad HiPAP and ORE Trackpoint II systems. Experience has shown that during installations of systems, workshop testing of beacons or tracking systems, a false range can be of assistance:-

PLEASE NOTE THAT THESE TEST POSITIONS SHOULD ONLY BE USED WHILST THE BEACONS ARE OPERATING IN TRANSPONDER MODE. THE TEST POSITIONS SHOULD NEVER BE USED WHILST THE BEACONS ARE OPERATING IN RESPONDER MODE.

Simrad HPR / Sonardyne USBL

Channel 66 emulates a transponder operating on Channel 33 (Delta), with a 330 mS turnaround time (as opposed to the standard 30mS). This increased time allows a false range (~200 metres) for testing during mobilisations and workshop testing of the system RS-232 string etc.

Simrad HiPAP

Channel 88 emulates a transponder operating on channel 24, with a 330 mS turnaround time as opposed to the standard 60 mS. This increased time should ‘fool’ the system into giving a false range of around 200 metres and may be used during mobilisations and testing.

ORE Trackpoint II / II+

Channel 77 emulates a transponder receiving at 19 kHz and transmitting at 29 kHz, with a 330 mS turnaround time. This will result in a false range being displayed and can be useful during mobilisations and during workshop testing of the system.

Switch positions 00 and 11 / 11 are used for factory tests only and should not be used by non Applied Acoustic operators.

Pinger Operation

The 900 series can also be set to operate as pingers, as the following table shows. Note that 4 / 10 and 5 / 11 are common emergency frequencies.

Switch position	Repetition rate	Pulse length	Transmit frequency
4 / 9	1000 mS	5 mS	26 kHz
4 / 10	995 mS	5 mS	27 kHz
4 / 11	990 mS	5 mS	28 kHz
5 / 9	985 mS	5 mS	29 kHz
5 / 10	980 mS	5 mS	30 kHz
5 / 11	1000 mS	10 mS	37.5 kHz

Expandability

There are a number of switch positions which have not been defined. If your company has the need for additional channels for any reason, please contact us and we may be able to help.

If the beacon is going to be deployed in an area where there is a high risk of contamination with mud or sand, we recommend that the pressure relief valve holes be temporarily covered with electrical tape to avoid being blocked. The tape should be removed when the beacon is used out of water to allow the valve to vent.

6. Operational Range

This is the most commonly asked question and there is no direct answer. Acoustic conditions, tracking system type and quality of installation all have an effect upon range.

In terms of increasing tracking capability, we would expect something like the following table to apply:-
(i.e. the top system will obtain greater ranges than the bottom system. This is a VERY ROUGH guide and some manufacturers might complain about it! All installations are different and sea conditions vary, so there is no hard and fast rule)!

- Sonardyne Big Head USBL
- Simrad HiPAP
- Simrad HPR tracking head
- Sonardyne USBL
- Simrad HPR fixed head
- ORE Trackpoint II / LXT
- Simrad portable

The following table is a general guide to assist selection of beacons. Applied Acoustic Engineering cannot accept responsibility for any operator not being able to achieve these ranges in practice. Experience with the vessel and system in question is the governing factor here. Naturally, it is better to err on the side of using increased power if unsure. Even if a lower powered beacon appears to work successfully with a system at a particular range, higher source levels (power) will still tend to increase tracking stability.

Model Number	Expected Useable Range	Known Achieved Ranges
919	To 400 metres	800 metres
939 / 949	To 600 metres	950 metres
935 / 945	To 1500 metres	4000 metres (with HiPAP)
959	To 600 metres	Usually used for battery life, not range.
955H	To 1500 metres	Usually used for battery life, not range.
965	To 2000 metres	2200 metres
962	To 3200 metres	3000 metres
972	To 4000 metres	4000 metres
Midi with 7920A	To 2800 metres	3000 metres (Deep plough apps)
Fat Boy HP with 7920A	To 4500 metres	No field reports
933/943	To 2200 metres	3000m+ reported

7. Maintenance

Assembly / Disassembly

When working on any pressure housing the operator should never point either upper or lower end caps at themselves or anyone else. It should be presumed that there is pressure internally. Working with this caution in mind will prevent accidents!

NEVER OVER CHARGE OR INAPPROPRIATELY ATTEMPT TO CHARGE A UNIT AS THIS WILL CREATE INTERNAL PRESSURE.

A pressure relief valve is fitted to all rechargeable units manufactured after 2002 as a safety precaution. Older 900 series units can be upgraded. However even with a PRV they can still accumulate up to 10 P.S.I. (depending on model) before they vent, and although this is a relatively low pressure, when related back to the volume of internal air, and end cap weight, it still poses a very real hazard.

91x PRV

93x / 94x / 95x / 96x / 97x PRV

91x Fitted With PRV

93x / 94x Fitted With PRV

IF YOU SUSPECT A UNIT HAS FLOODED **NEVER** ATTEMPT TO CHARGE OR OPERATE any of the switches. The unit must be carefully examined before it can resume service. Even the smallest amount of contamination can seriously destabilize the battery cells, not only reducing operational longevity, but also almost certainly ensuring a pressure build up.

How to Dismantle (ensure the previous safety notes have been read)

IMPORTANT NOTE FOR ALL UNITS

In the case of all the AAE manufactured transponders and release transponders they use semiconductor devices. Appropriate anti-static precautions should be taken to prevent damage. In addition to this when working internally it is necessary to ensure the large TX storage capacitor/s are discharged preventing potentially costly damage when the boards are separated or the processor board is unplugged. At the AAE workshops we simply use a high wattage 100 ohm resistor across the capacitor terminals to do this.

Mini 91X

Using the AAE opening tool carefully undo the centre securing screw from the lower end cap (this securing screw is also the PRV). The securing screws are designed to allow the double o'rings clear on one end cap before releasing fully. As the unit unscrews ensure the tube allows the bottom o'rings to expose. Once free simply extract the lower end cap straight back from the unit, ensuring it does not drag on the sealing face of the tube, and unplug the ribbon cable. Now pull the top / transducer end cap straight out of the tube, again ensuring no damage is done to the sealing faces. Re-assemble the unit in reverse ensuring all seals and sealing faces are undamaged and contamination free, with a light covering of o'lube.

Midi 93X, 94X, Fatboy 96X, 97X

Begin by removing the transducer / top end caps 4 securing screws. It is good practice to hold the top down firmly while removing the screws in case of internal pressure. Carefully pull the end cap out of the tube until the PCB assembly is clear. Now unplug the ribbon cable and free the top end assembly. Remove the screws from around the lower end cap and extract from tube taking extreme care of the sealing surface as the battery assembly passes. Follow the above instructions in reverse ensuring all seals and sealing faces are undamaged and contamination free, with a light covering of o'lube for re-assembly.

In due course, rechargeable batteries will require replacement and this can be achieved quite simply with the 900 series. We recommend a maximum 3 year life for re-chargeable packs.

Ensure that replacement battery packs are the same as the original type and complete the battery pack information label. Refer to the label on the old pack.

Re-assembly is the reverse of the above procedure. Do check the O rings and clean or replace them if necessary before re-assembly. Do not over-tighten the securing screws!

Spares and assistance can be obtained from the factory or our sales agents worldwide.

Mini Beacon Warning when securing end caps do not over tighten the main screw fixing as this will stress the internal chassis. Screw in the main screw just enough to take up any slack between the end cap and the main tube body.

Note: The pressure relief valve is a non-serviceable item, if it is faulty or mechanically damaged then the beacon should be returned to the factory or service centre for replacement.

Battery Replacement

Ensure that replacement battery packs are the same as the original type and complete the battery pack information label. Refer to the label on the old pack.

Nominal battery voltages are as follows: -

91x Mini	NiMH	15 cells at 1.2 volts / cell = 18 volts.
91x Mini	Alkaline	12 cells at 1.5 volts / cell = 18 volts.
93x Midi	NiMH	14 cells per pack at 1.2 volts / cell =16.2 volts.
		Long midi's have two packs.
96x Fat Boy	NiMH	14 cells at 1.2 volts / cell = 16.8 volts (2 packs for 97x).
96X Fat Boy	Alkaline	14 cells at 1.5 volts / cell = 21 volts (2 packs for 97x)
95X Seabed	NiMH	14 cells per pack at 1.2 volts / cell = 16.8 volts. 3 Packs used.
95X Seabed	Alkaline	14 cells per pack at 1.5 volts / cell = 21 volts. 3 packs used.
95X Seabed	Lithium	6 cells per pack at 3.6 volts / cell = 21.6 volts. 6 packs used.

Midi / Fat Boy / Seabed beacons

Gain access to the battery pack(s) / electronics as described above. The battery pack(s) are attached to the lower end-cap. Remove the hex nuts from the battery clamping plate, remove this plate and remove the batteries. Dispose of the old batteries safely.

Ensure that replacement battery packs are the same as the original type and complete the battery pack information label. Refer to the label on the old pack.

Checking Alkaline Batteries in Seabed units

Estimating the remaining life of an alkaline battery pack is not precise and the following advise should only be regarded as a guide.

Nominal voltage is 1.5 volts per cell. The Seabed units have three packs of 14 cells per pack (21 volts nominally).

The best method is to measure each battery pack voltage with a small load. We recommend 680 ohms 1 watt (approx. 50 mA). Connect the load to the pack and wait for 30 seconds. Measure the voltage. A new pack will measure 21 volts on load (maybe slightly more). We would consider a pack to require replacement if it measures 17 volts or less. Using a flat (straight line) discharge curve between 21v and 17v would indicate that at 19 volts, the battery's energy has depleted by 50%. We would not recommend that the battery is used below 17 volts as the battery packs' ability to deliver power is reduced. The electronics themselves will operate down to 6 volts but at this low voltage level, the source level from the transducer will be extremely low.

Note: Do not use alkaline or Lithium packs in equipment designed to operate with rechargeable batteries as this could lead to an explosion and injury. Applied Acoustic Engineering cannot be held responsible for damage or injury caused by incorrect battery replacement or fitment by non Applied Acoustic Engineering personnel.

Note: Alkaline or Lithium batteries should never be recharged or exposed to water. Do not mix battery types or mix batteries of differing dates within packs, always replace batteries as complete packs or sets.

Please consider the environment and safety when disposing of all battery types. Applied Acoustic Engineering operates a green policy regarding battery disposal and the environment. All used battery packs which are returned to Applied Acoustic Engineering are recycled.

O-Rings

It is recommended that the O-Rings are inspected annually for integrity and foreign matter.

O-Ring seals that are exposed to high pressure cycles (working depths in excess of 1500M) should be changed annually to ensure operational reliability.

See Appendix for reference.

Pressure Relief Valves (PRV)

It is recommended that the PRV is serviced annually to ensure operational safety.

8. Product Recycling / Disposal

Within the EU all electronic components and batteries must be taken for separate collection at the end of their working life under EU WEEE directives. Applied Acoustics as a manufacturer within the EU will responsibly dispose of any returned end of life Applied Acoustics components / batteries through a registered WEEE scheme. In order to prevent uncontrolled waste disposal and promote re-cycling please return any end of life Applied Acoustic components postage paid by sender to our UK head office. Please contact Tech Support for a RMA number prior to shipping.

9. Spares

The following beacon spares are available from stock. A part number is not necessary to order. The description below is acceptable to us. Please let us know the model number and serial number of the units you require spares for.

'O' Rings

91X Mini Body Kit	
93X Midi Body Kit Inc PTFE Backup Ring	**Refer to Appendix for details**
96X Fat Boy Body Kit Inc PTFE Backup Ring	**Refer to Appendix for details**
95X Seabed Body Kit Inc PTFE Backup Ring	**Refer to Appendix for details**

(all kits include 'O' ring lubricant)

Connector Parts

Blanking plug for connector up to 3000 metres
High pressure connector blanking plug (Above 3000 metres)
91X Bulkhead connector Mini
93X Bulkhead connector Midi / Fat Boy / Seabed
Pigtail Connector 0.5 metre lead
Pigtail 3 metre lead

Battery Packs

91X Mini NiMH	- Part Number BCN-0910-3000
91X Mini Alkaline	- Part Number BCN-0910-3011
93X Midi NiMH (2 for 94x units)	- Part Number BCN-0930-3004
93X Midi Alkaline (2 for 94x units)	- Part Number BCN-0930-3012
96X Fat Boy (1 or 2 required) NiMH	- Part Number BCN-0950-3000
96X Fat Boy (1 or 2 required) Alkaline	- Part Number BCN-0950-3001
95X Seabed (3 required) NiMH	- Part Number BCN-0950-3000
95X Seabed (3 required) Alkaline	- Part Number BCN-0950-3001

Pressure relief valves

The pressure relief valve used on Applied Acoustic Engineering under water equipment is a non-serviceable item and if damaged or faulty should be replaced immediately. Applied Acoustic Engineering strongly recommend that all pressure relief valves are annually tested for safe reliable operation, this is done on a service-repair or exchange scheme at the factory. Relief valves which are not serviced may become contaminated with marine growth or debris, leading to a flooded or pressurised transponder housing. This is specially important if the transponder is being operated in tidal areas where marine contamination is more likely.

If the beacon is going to be deployed in an area where there is a high risk of contamination with mud or sand, we recommend that the pressure relief valve holes be temporarily covered with electrical tape to avoid being blocked. The tape should be removed when the beacon is used out of water to allow the valve to vent.

Note: The pressure relief valve is a non-serviceable item, if it is faulty or mechanically damaged then the beacon should be returned to the factory or service centre for replacement.

10. Fault Finding

It doesn't work, what can we do ?

There are two primary questions here which will help to identify the nature of the problem. Most instances of failure are due to mechanical damage or 'finger trouble' but the possibility of component failure is always there.

Did it ever work?

If the answer is yes, either the battery is not charged up or the unit is faulty. Look for mechanical damage and also check to see if the charging connector has damaged contacts.

If there are any signs of mechanical damage which may have lead to water ingress at some stage, **DO NOT CHARGE THE BEACON** but return it to Applied Acoustic Engineering for repair.

If the pressure relief valve has vented water or vapour during charging, stop charging and decommission beacon, return beacon to Applied Acoustic Engineering for repair.

If the unit has been over-charged, then do not use it, replace the battery pack or return the beacon to Applied Acoustic Engineering.

If there are no signs of mechanical damage, try charging the unit.

Check unit using the responder test function on our 982 charger after charging, if the unit responds, the battery and the transmitter are functional.

Is the unit set to the correct channel?

If these tests do not help or resolve the problem, contact Applied Acoustic Engineering immediately for technical assistance.

Is performance poor?

- If the answer is yes, then please consider the following:-
- If you have a similar model, is the performance the same? This will identify if there is just one faulty unit.
- Are you out of range? Again check with a similar model. Maybe a higher powered unit is required.
- Is multipath present? Try slowing down the interrogation rate.
- Are you within the beam pattern of the transducer? If the signal from the beacon is not illuminating the vessel, then it cannot be tracked. Even with our +/-45 degree transducers, cable catenary has been known to cause problems occasionally with tow fish tracking (the signal may transmit at the wrong angle and will miss the ship).
- If you are tow fish tracking and there is a large water temperature change between the surface of the water and the beacon position, you may be experiencing severe ray bending.
- If results are different to another model? You may be comparing different models and different specifications.
- Check on a different channel (frequency) to see if performance changes.

If you can't find a solution, please contact us. Call, fax, write or e-mail and we will try to help wherever we can. Contact details are at the back of this manual. Address your communication to Technical Support.

11. Specifications

An integrated range of beacons for a multitude of positioning tasks.

General specifications:-

Housing Material	Anodised Aluminium Alloy		
Turn around delay	15 / 30 / 60 mS dependent on system selected.		
Channels / Frequencies	AAE Easytrak	20	
	HPR400	56	
	Sonardyne USBL	14	
	Sonardyne LBL	19	
	ORE Trackpoint II	25	Transponder/ Responder
		5	Pinger
	Emergency Pinger	1	(37.5 kHz)
	Test channels	3	
Spare channels	Yes		
Power supply	Rechargeable batteries		
	Alkaline / Lithium batteries can be supplied		
	External supply 22 – 35 volts dc. (fuse as recommended for model).		
Responder operation	By external connection		
	+ve logic pulse. 0.2 – 2 mS duration 5 – 25 volts.		
Internal adjustments	None		
Receiver step size	32 Hz / 32 Hz		
Transmitter step size	32 Hz / 250 Hz		
Operating temperature	-5 to 30 C		
Storage temperature	0 to 45 C		

Battery pack maximum storage temperature is 55 deg C, temperatures above 70 deg C will render the battery pack unserviceable.

Pressure relief valves	8 PSI + or – 2 PSI This is non-serviceable in the field (factory exchange unit only), service interval is 1 year.

Mini

Size:	70 mm diameter x 360 mm long	
Model 915:	+/-45 degrees	194dB
Model 919:	+/-90 degrees	188dB
Model 915H:	+/-30 degrees	196dB
Depth Rating:	1000 / 1500 metres	
Weight in air / water:	2.5 / 1.5 kg	
Batter pack:	NiMH – Part Number BCN-0910-3000	
Battery Life:	30 days listening or 28 hrs at 1 reply / second 96 hrs at 1 reply / 4 seconds	

Note: 915H has a 2000 metre depth rating and battery life is reduced to 18 Hrs at 1 reply / second.

Midi 93x

Size:	95 mm diameter x 470 mm long.	
Model 933:	+/-30 degrees	203dB
Model 935:	+/-45 degrees	200dB
Model 939:	+/-90 degrees	190dB
Depth Rating:	1000 - 3000 metres	
Weight in air / water:	5 / 2.5kg	
Batter pack:	NiMH – Part Number BCN-0930-3004	
Battery Life:	45 days listening or 26 hrs at 1 reply / 2 seconds (935/933) 50 hrs at 1 reply / 2 seconds (939)	

Midi 94x

Size:	95 mm diameter x 580 mm long.	
Model 943:	+/-30 degrees	203dB
Model 945:	+/-45 degrees	200dB
Model 949:	+/-90 degrees	190dB
Depth Rating:	1000 - 3000 metres	
Weight in air / water:	6.5 / 3kg	
Batter pack:	NiMH – Part Number BCN-0930-3004 (2 packs required per unit)	
Battery Life:	75 days listening or: 50 hrs at 1 reply / 2 seconds (945/943) 100 hrs at 1 reply / 2 seconds (949)	

'H' versions of the directional midi's are available for some models which provide an additional 3dB source level and a 50% reduction in battery life.

Fatboy 96x

Size:	125 mm diameter x 700 mm long.	
Model 965:	+/-45 degrees	203dB
Model 962:	+/-15 degrees	209dB
Depth Rating:	1000 - 3000 metres	
Weight in air / water:	15 / 8kg	
Batter pack:	NiMH – Part Number BCN-0950-3000	
Battery Life:	120 days or: 75 hrs at 1 reply / 2 seconds	

Fatboy 97x (High Power)

Size:	125-mm diameter x 910mm long	
Model 97x:	+/- 15 degrees	212dB
Depth Rating:	4000 metres	
Weight in air / water:	19 / 8kg	
Battery pack:	2 off Alkaline – **Do <u>NOT</u> charge or expose to water or heat** Part Number BCN-0950-3000	
OR	2 off NiMH Part Number BCN-0950-3001	
Battery Life:	32000 Replies 35.5 hours at 1 reply / 4 seconds with Alkaline Packs	
Minimum Interrogate Rate:	Limited to 1 reply every 4 seconds	

NOTE: The 972 has been designed as a very high power beacon with a source level of 212dB. It is intended for long range work with a maximum repetition rate of 1 reply per four seconds. If interrogated faster than this, the source level will drop significantly. It will operate as transponder, responder or pinger.

Seabed

Size:	125 mm diameter x 1000 mm long, plus 178 mm flange for cages.	
Model 955:	+/-45 degrees	194dB
Model 959:	+/-90 degrees	188dB
Model 955H:	+/-45 degrees	200dB
Depth Rating:	1000 - 3000 metres.	
Weight in air / water:	20 / 10 kg	
Batter pack:	NiMH – Part Number BCN-0950-3000	
Battery Life:	150 days or: 500 hrs at 1 reply / second except 955H (150 hrs).	

Remote Transducers

There are also versions of all the above beacons *without a transducer fitted*, instead a 1.5 metre lead connects to a remote transducer. The following transducers are currently available:-

Model 7920A +/-15 degrees (Not for new ROV designs)
Size 175 x 175 mm square, 80 mm deep.
Weight in air / water 8.5 / 7 kg
206dB with Midi (930 and 940)
208dB with Fat Boy (Model 960)
212dB with HP FAT BOY (Model 960H)

Model RM15 +/-15 degrees
Size 125mm diameter
206dB with Midi 930 + 940
208dB with Fatboy 960
212dB with Fatboy plus 970
Replaces 7920A

Model RM30 +/- 30 degrees
Frequency 27 – 33 kHz
Size 95 mm diameter
203dB with Midi 930 and 940

Model RM45 +/-45 degrees
Size 75 mm diameter x 160 mm long.
200dB with Midi (930 and 940)
203dB with Fat Boy (Model 960)

Model RM90 +/-90 degrees
Size 75 mm diameter x 160 mm long
187dB with Mini beacons
190dB with Midi (Model 930 and 940)

Check with the factory or your area representative for further details.

CE These units conform to the European directive 89/336/EEC for electromagnetic compatibility when used in the proper manner.

12. Transportation by Air

NiCad and Alkaline Battery Packs

These battery packs are **not** classified as dangerous goods for transportation by air. It is advised that any paperwork accompanying beacons that use these battery types should state this clearly.

Lithium Battery Packs

These battery packs are considered as **Dangerous Goods** for transportation by air.

Note: Only authorised or trained personnel holding a current IATA dangerous goods certification should pack and complete the necessary paperwork. Consult the latest IATA dangerous goods regulations for packing instructions and operator restrictions. This advice is freely available from Applied Acoustic Engineering technical support.

UN No. 3091 - Lithium battery contained in equipment
UN No. 3090 - Lithium batteries (shipped separately from equipment)
Class 9 Miscellaneous.

Pressure Relief Valve

Whilst being air freighted it is advised by Applied Acoustic Engineering to cover the venting holes on the pressure relief valves of beacons with electrical tape to prevent the pressure inside the beacons dropping below normal atmospheric pressure. This instruction is optional and is not a safety concern. The effects of not carrying out this advice will only make beacon dismantling more difficult during servicing as the end cap will resist being withdrawn from the main tube body. On the larger beacon models, it is possible to relieve this pressure by removing the green Perspex cover plate and momentarily removing the M3 tapped rotary switches using an M3 screw as a tool.

WARNING: Do not attempt to charge beacon if the pressure relief valve is covered with tape

If a 2008 Midi Piston type PRV is fitted a M2 screw can be used as an actuator to manually release the PRV to equalise the pressure post air transportation.

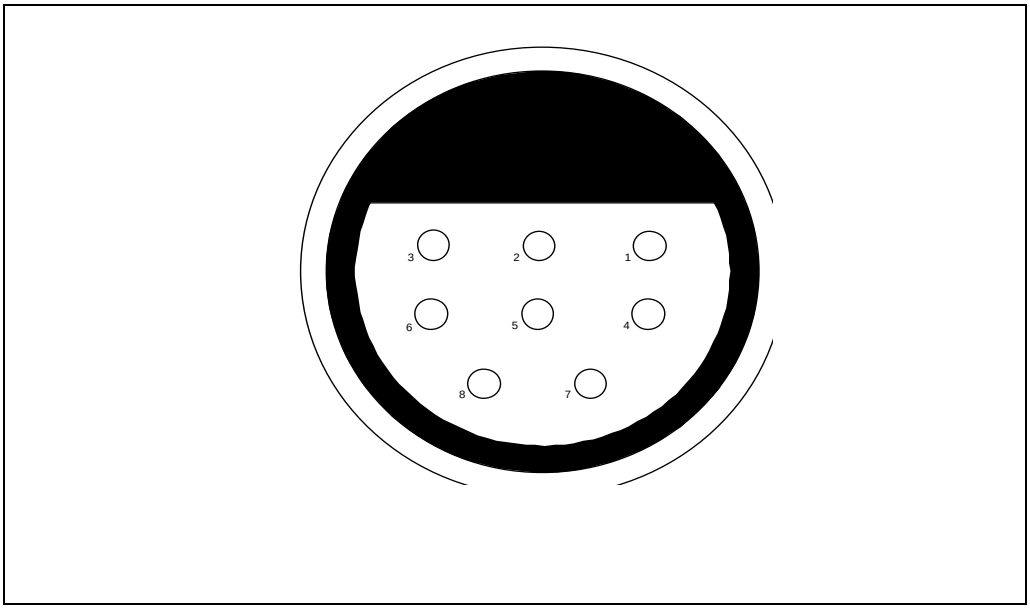
13. Appendix

Special Models:- Connection details.

For B suffix models (ie 940B) fitted with a Burton bulkhead connector, part no. 5507-2008-0004 the connection details are as follows:

Pin Number	Function
1	Power Return
2	+ 24 Volts **(FUSED 250 mA MAX)**
3	Power Shield
4	N/C
5	N/C
6	Ext Trigger Shield
7	External Trigger
8	Charge **(FOR USE WITH AAE CHARGER ONLY)**

Face view of Bulkhead Connector



Note: If beacon is being used with no pigtail connector fitted then please use a suitable bulkhead blanking plug, part no. 5501-2008-0000.

Use with Remote Transducers

Some beacons can be fitted with remote transducers. This can make installation easier in some instances. The three transducers all connect to the electronics with the same cable:-

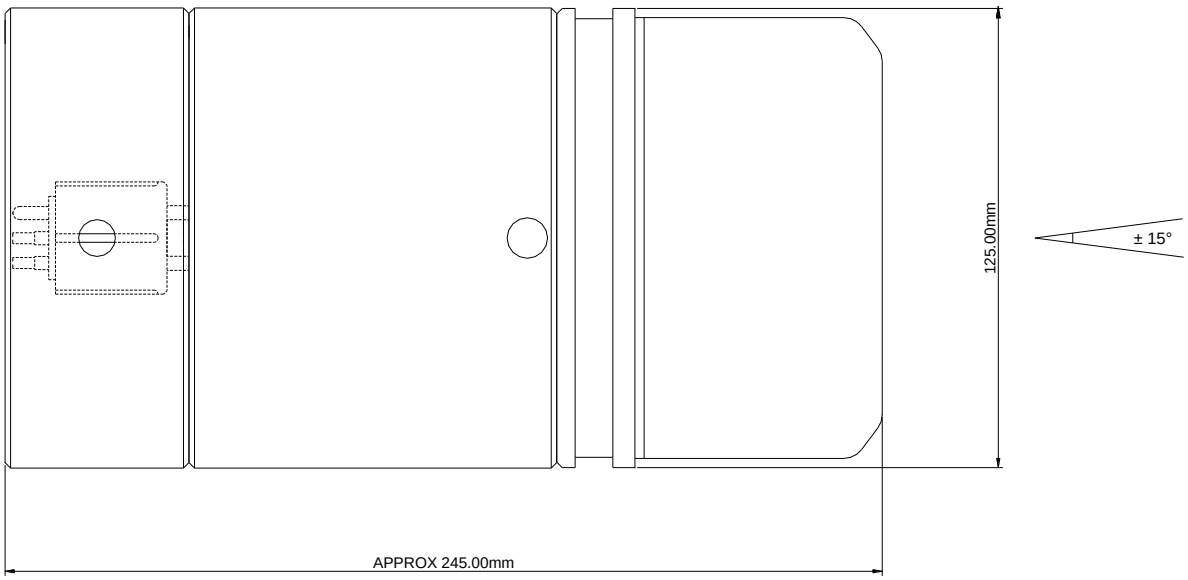
Cable Type: 4-4 I/C Lead
Connectors: IL-4-FS and IL-4-MP
Connections:

Free Plug	Free Socket
Pin 1	Pin 1
Pin 2	Pin 2
Pin 3	Pin 3
Pin 4	Pin 4

The cable length is a standard 1.5 metres minimum (typically 1.8 metres). We would not usually recommend that this length be increased to any great extent. As the cable is not screened, it is advisable to ensure that it is not secured close to any electric motors or electrical equipment. We can supply shorter cable lengths to order.

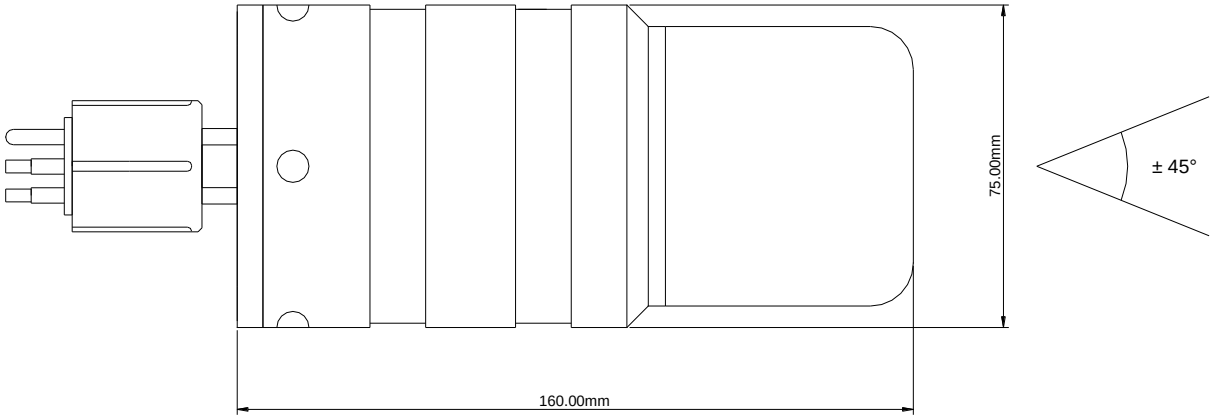
RM15

This has a highly directional transducer beam pattern of +/- 15 degrees and is used for deep water work (ROV's Ploughs etc.). The black potted face is the radiating surface which must be positioned on the vehicle to point directly towards the tracking system. Because of the directional nature of this product, it is unlikely that it will be used for tow fish / ROTV tracking.



RM45

This is the same transducer element as used with the 935 beacon. When mounted in the RM45 housing it has a directional beam pattern of +/- 45 degrees and a depth rating of 3000 metres. The same precautions about mounting apply to this model as the 7920A.

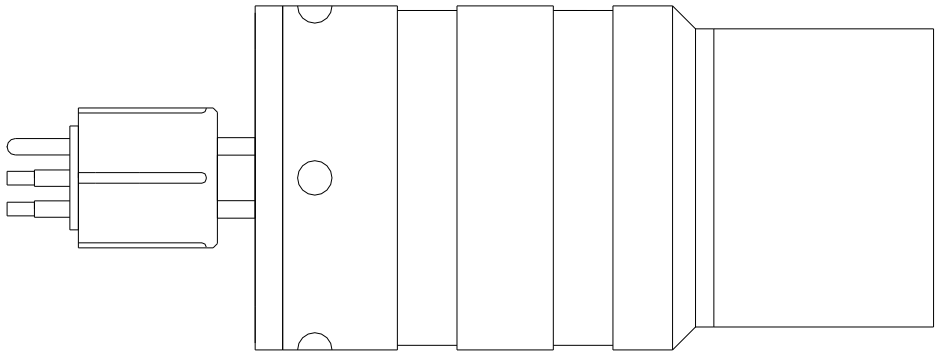


RM30

With a 95mm body diameter and a beam pattern of +/- 30 degrees, the RM30 can give source levels of up to 206dB RMS.

RM90

This transducer has a hemispherical beam pattern (omni directional) and has a depth rating of 1500 metres. Being non directional, the source level from the transducer is less than the other models listed above. We would not recommend this unit for long range work.



Note that the RM45 and the RM90 have been drawn without a protector ring for the electrical connector. This is usually supplied but can also be removed easily (4 screws). Electrical connectors should be clean and grease free. Rubber mating parts should be O-lubed (see elsewhere in the manual). Contact pins should be clean.

Depth telemetry transponders

This appendix applies to Model 9xx**D** versions of the 900 series beacons.

The 9xx**D** versions are very similar to the existing 900 series models except that they are fitted with pressure (Depth) transducers and thus are able to reply back to the tracking system with a secondary pulse.

Depth telemetry transponders of this type use a time delay between the first pulse and second pulse to convey the depth of the transponder.

For Trackpoint II operation, an initial delay of 100 mS is used to convey 0 metres depth and a maximum delay of 900 mS is used to convey maximum depth. This depth is written on the case of the beacon. It follows that the maximum interrogate rate should be limited to 2 seconds in most instances. The frequency of the second reply is 1 kHz below the navigation reply for Trackpoint II compatibility unless shown in the following table.

For Simrad HPR / HiPAP operation the zero depth delay is 125 mS. The depth reply delay is 0.5 millisecond per metre for HPR300 and 1 millisecond per metre for HPR400 / HiPAP compatibility.

The beacons can be supplied with the following depth transducers as standard:
300 metres, 1000 metres, 2000 metres 4000 metres. Others can be supplied as an option, as can other depth spans. Please consult the factory for further information.

Specifications

Specifications are generally the same as the equivalent models listed in the main part of the manual with the following exceptions:-

Model 919D
Length : 332 mm long (~13.1”)

Model 915D
Length :365 mm long (~14.4”)

Both Models:-

Depth Span : As written on the pressure case label
Depth Rating : Twice depth span or 1500 metres, whichever is less.

Closure system : M4 Nylon screws around circumference.
Number of replies : As non-depth model when depth transmission is disabled.
48% of the above when depth transmission is enabled.
A-D Converter : 10–bit

Frequencies available

The following frequencies are available for Trackpoint II operation. As well as responder and transponder operation, these beacons can be used as free running pingers. Note that the standard design frequency of the transducers fitted to these models is 27 – 32 kHz, so some loss of performance will result if the transmit frequency is set outside this range.

Switch 1	Switch 2	Description	RX 1	RX 2	Reply
0	10	Trackpoint	18 kHz		24 kHz
0	11	Trackpoint	17 kHz		24 kHz
1	0	Trackpoint LXT Code 1	17KHz		23KHz
1	9	Trackpoint	18 kHz		25 kHz
1	10	Trackpoint	16 kHz		25 kHz
1	11	Trackpoint	21.5 kHz		26 kHz
2	0	Trackpoint LXT Code 2	19KHz		25KHz
2	9	Trackpoint	18 kHz		26 kHz
2	10	Trackpoint	17.5 kHz		28.5 kHz
2	11	Trackpoint	18.5 kHz		26.5 kHz
3	0	Trackpoint LXT Code 3	17KHz		27KHz

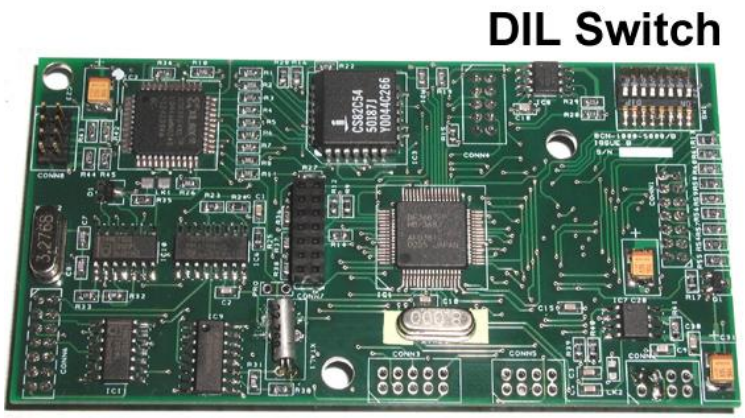
Switch 1	Switch 2	Description	RX1	RX2	Reply
4	0	Trackpoint LXT Code 4	19KHz		29KHz
4	9	Pinger	1000mS	5mS	26KHZ
4	10	Pinger	995mS	5mS	27KHZ
4	11	Pinger	990mS	5mS	28KHZ
5	0	Trackpoint LXT Code 5	17KHz		30KHz
5	9	Pinger	985mS	5mS	29KHZ
5	10	Pinger	980mS	5mS	30KHZ
5	11	Pinger		1pps / 10mS	37.5KHZ
6	0	Trackpoint	18KHz		28KHz 29 kHz Telemetry
6	9	Trackpoint	16kHZ		23KHZ
6	10	Trackpoint	18kHZ		23KHZ
6	11	Trackpoint	20.5KHZ		23KHZ
7	0	Trackpoint	18KHz		30KHz
7	7	Trackpoint II Test	19KHZ	TAT=315mS	29KHZ
7	9	Trackpoint	17KHZ		24KHZ
7	10	Trackpoint	19KHZ		24KHZ
7	11	Trackpoint	17KHZ		25KHZ

Switch 1	Switch 2	Description	RX1	RX2	Reply
8	0	Trackpoint	21KHz		29KHz
8	9	Trackpoint	17 kHz		26 kHz
8	10	Trackpoint	21 kHz		33 kHz
8	11	Trackpoint	18 kHz		31 kHz

Note that Switch 1 is the left-hand switch and switch 2 is the right-hand switch.

Disabling pressure transmission

For either ORE Trackpoint II or Simrad HPR / HiPAP systems, the second (depth) transmission can be disabled if required which will preserve battery life. This is achieved by gaining access to the printed circuit board assembly which is attached to the transducer end-cap. The Microprocessor board is the smallest of the board set and is shown in the photograph. On this board is an 8 way DIL switch.



At the time of writing this manual some switch positions have yet to be decided upon. For depth transponder operation switch 1-7 on. For operation as a navigation transponder, all switches OFF.

Please consult factory if required.

For Mini-beacons, in order to gain entry to the Beacon, first remove the 4 nylon screws which hold the connector / switch end-cap to the pressure cylinder. Slowly remove the end-cap and disconnect the cables. The transducer end-cap can now be withdrawn from the cylinder. Re-assembly is the reverse of this procedure. For other models, please gain entry as described in the main part of the manual.

O-Ring Configuration

Please note for the models listed below, there is a specific o-ring configuration which must be noted when servicing/replacing o-rings. The configuration is shown in the diagram as below and for demonstration purposes we are using a 0930 unit.

093x/4x Models(Including Depth Variants)
095x Models
096x/7x Models