300 Series
Operation Manual

BCN-0310-8000/3

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The beacons listed in this manual are designed for use with our Easytrak USBL system. They are also compatible with other USBL systems as shown on the next page.

Introduction to the 300 Series

The 300 Series subsea beacons (combined transponders / responders / pingers) suit a variety of underwater positioning and relocation tasks. Smaller beacons (200 series), Release (500 series), Low Frequency (600 series) and higher powered Medium Frequency (900 / 1000 series) are also available.

This manual covers the 300 Series models in the range, including a version with a Remote Transducer (see Appendix B).

All the models in the range use the same mating connector - the MCBH5M and have the same channel (frequency) selection switches. These are situated internally to the transponder.

There is facility for operation with the following USBL systems: -

AAE Easytrak USBL system	8 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 17 preferred HiPAP channels.
Simrad HiPAP system	17 preferred channels.
Sonardyne USBL	Simrad Channels 1 - 9 and 11 - 55
ORE Trackpoint	17 kHz - 22.5 kHz Receive and 22 kHz - 30.5 kHz Transmit

The beacons operate as

a) Acoustically triggered transponder (requires an acoustic signal before replying).

b) Electrically triggered responder.

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

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 300 Series beacons are all switched on by the use of a shorting plug between two pins on the external connector. Channel and mode selection is performed using internal switches.

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.

Mechanical damage will occur if the beacon is deployed at depths greater than the specified depth.

All beacons are fitted with a pressure relief valve located in the connector endcap next to the connector.

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.

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 (Shorting plug not fitted)

Information (items 1-3) can be found on the beacon product labels and on the delivery paperwork**.** **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.

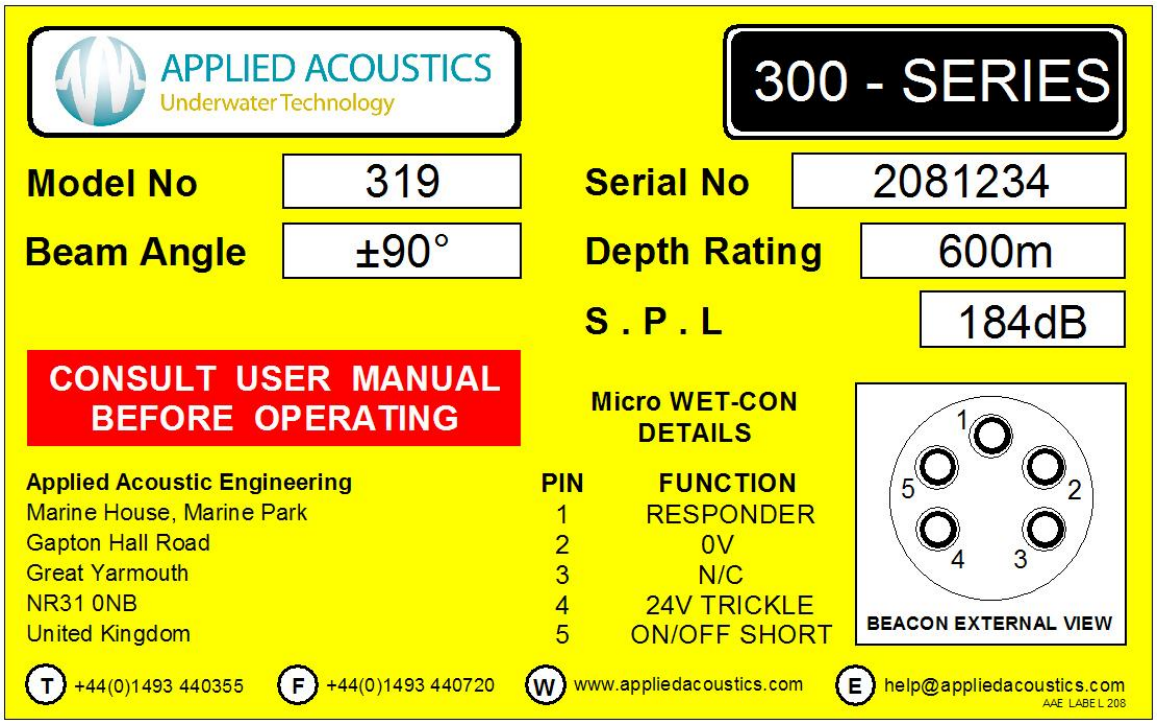

FIGURE 1
Example Label Only

Your beacon is charged at the factory before dispatch and should arrive fully charged. If the beacon requires charging prior to commissioning then please read the charging instructions in this manual. Note: if the beacon has been shipped with the shorting plug connected, 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 can 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.

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. Directional Head 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.

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.

Charging the Beacon

300 Series beacons contain a 14.4V Nickel Metal Hydride (NiMH) battery pack.

300 Series beacons are supplied with their own dedicated trickle charger, Model Number 0380. These are universal mains input chargers and will operate from 100-240VAC 50-60Hz. An appropriate mains lead will be supplied with each charger. The Applied Acoustics' 1082 Smart Switch may also be used to trickle charge the beacon. Beacons can also be trickle charged from an external 24 volt regulated power supply. This is usually done whilst the beacon is operating on the ROV.

Note 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. Ensure you have a safety margin!

WARNING: The 0380 charger is intended for inside use only. Do not use outside or in wet conditions.
Never over charge or inappropriately attempt to charge a unit as this will create internal pressure.
IF YOU SUSPECT A UNIT HAS FLOODED **NEVER** ATTEMPT TO CHARGE OR OPERATE the unit. 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.

Connecting to the Applied Acoustic Model 0380

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 prevent the battery from fully charging.

ii) Attach the connector from the 0380 charger into the bulkhead connector on the bottom of the beacon and tighten locking sleeve.

iii) Trickle charge the beacon for 18 hours (nominally) before use.

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

If the beacon has poor usable life after charging check;

a) The charging lead is undamaged and connection is electrically secure with the beacon.
b) That the pressure relief valve has vented (fluids or gas).
c) Charging has not occurred in a too warm environment.
d) Check that the beacon is not hot or warm to the touch.
e) Check that the battery pack is within its operational life. (Stated on label on lower endcap).

If charged incorrectly or if charged in too warm 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.

Connecting to the Applied Acoustic Smart Switch Model 1082

300 Series beacons may also be trickle charged from the 1082 Smart Switch. Please refer to the 1082 manual for instructions for trickle charging.

Connecting external power or an external trigger to the beacon

The beacon can be electrically connected to an external key (trigger) or to a fused 24 volt regulated DC supply using the bulkhead connector. The pin out for the connector follows; -

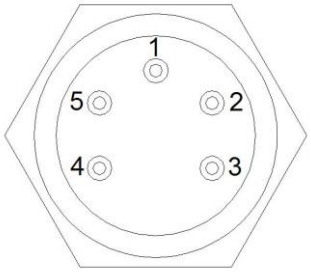

FIGURE 2

PIN 1 is for connection to an external key
PIN 2 is the electrical ground
PIN 3 is not connected
PIN 4 is for connection to an external regulated positive 24 volt DC supply for charging
PIN 5 is shorted to pin 2 to switch the beacon on

Note: Applied Acoustic Engineering cannot be held responsible for damage or injury caused by the incorrect wiring of bulkhead connectors by non AAE personnel.

The +24Vdc trickle charge input will accept +18Vdc to +30Vdc input.
Do not exceed +30Vdc otherwise damage can occur to the internal circuitry.

Always ensure that the battery is fitted into the beacon before charging, otherwise damage can occur to the internal circuitry.

Check the correct polarity of the +24V trickle charge input before connecting to the beacon as connecting incorrectly can cause damage to the internal circuitry

Note: The shorting link with locking sleeve must be used when a pigtail is not connected to the beacons connector (MCBH5M).

The 24 volt trickle connection only provides a trickle charge which will maximise the beacon's operating life whilst on the ROV. It will still be necessary to charge the beacon periodically on an Applied Acoustic Engineering charger in order to maintain the beacon's battery pack capacity.

Current drawn is as follows: -

Model	Current Drawn	Recommended Fuse (MAX)
Micro	100mA (Max)	125-150mA

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.

WARNING: When securing end caps on beacons, do not over-tighten the plastic screw fixings.

Once charged, the beacon is 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.

Operating Instructions

Prior to operation, the beacon will require setting up to operate appropriately with the user's tracking system. This is achieved by means of internal switches; two switches set up the channel the beacon will operate on, another switch allows the user to set the pulse width, turn-around-time and free running pinger mode.

Note: Each beacon is labelled up with their channel and settings at the factory prior to dispatch. If this default setting is in-appropriate for your tracking system it can be changed. See below.

Switching On

Switching on is achieved by inserting the supplied shorting plug onto the connector. This connects pin 2 and 5 together. *If default settings need to be changed, this needs to occur prior to switch-on.*

Note: If the beacon is wired to an external 24Vdc such as a ROVs power supply, pins 2 and 5 must be shorted together otherwise the beacon will fail to operate.

Channel Switches

Shown below is the Dual Frequency Synthesiser board fitted to the underside of the RX/TX/Logic board. These switches need to be set appropriately for the tracking system being used. For access to these internal circuit boards see Maintenance Section.

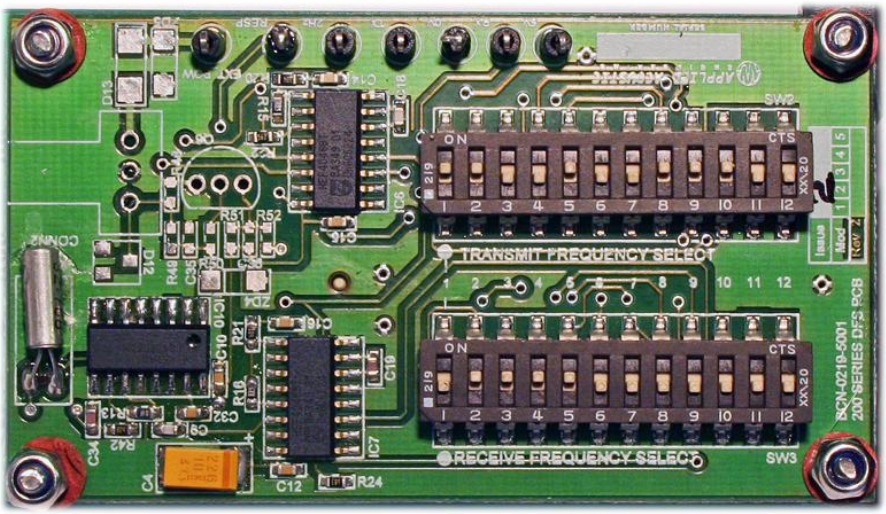

FIGURE 3

Note: In order to not cause damage to the small dual-in-line (DIL) switches, a small screwdriver or point of a ballpoint pen is required to operate the switches.

Switch SW2 selects the transmit frequency (22 kHz to 37.5 kHz) and switch SW3 selects the receive frequency (17 kHz to 26 kHz) both in 250Hz steps.

Note: No damage to the transponder can occur if these switches are set incorrectly

Other controls

Shown below is the RX/TX/Logic board with the DFS board hidden below it. Observe the location of the battery connector, CONN1 and also the location of CONN3 to which the wiring loom from the bottom end connector attaches into.

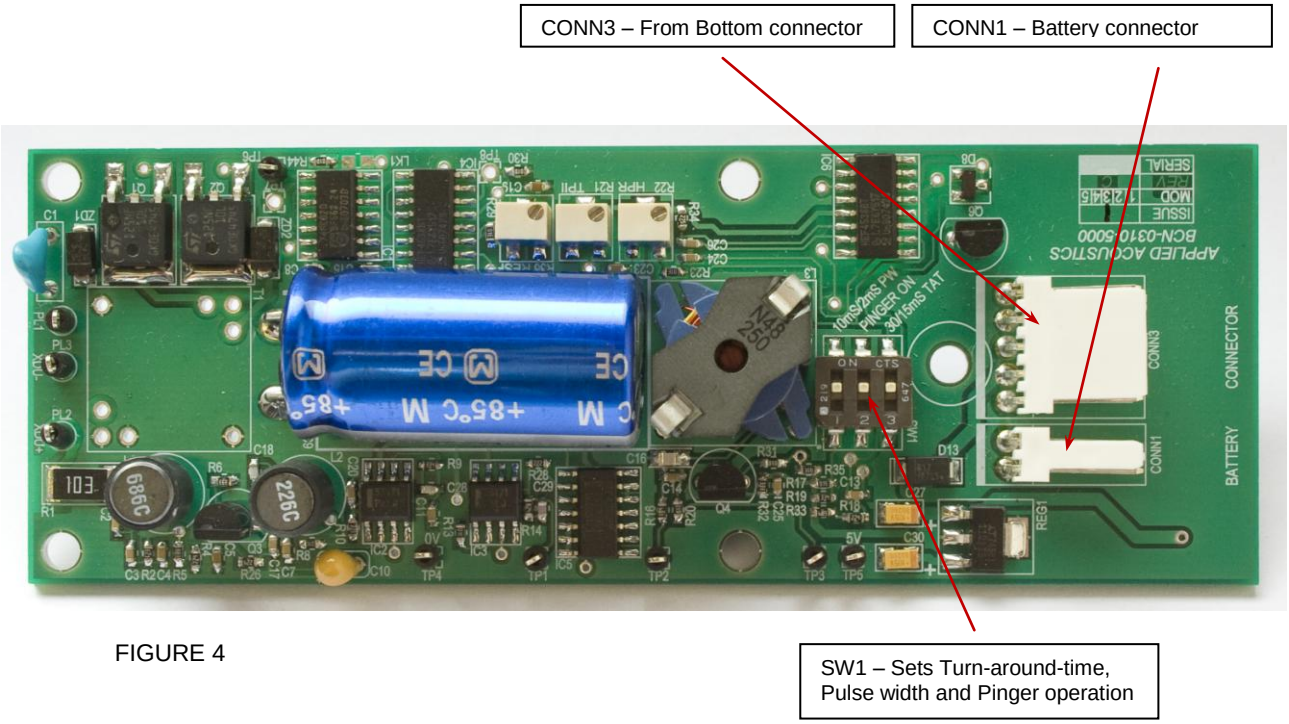

FIGURE 4

This board contains switch SW1 which operates the following: -

1) *Turn Around Time* switch. For all systems with the exception of ORE Trackpoint II/3 this is set to 30mS. If this switch is set incorrectly, a fixed range error will be recorded by the tracking system.

2) Pinger switch. When on, the beacon will operate as a free running pinger at a rate of 2Hz.

3) *PW* switch. 2mS is used for Easytrak and Trackpoint 2/3 systems and 10mS is used the other systems.

Operation with Easytrak system

Channel	Easytrak Rxf1 (Hz)	Easytrak Rxf2 (Hz)	Easytrak 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

TABLE 1

Frequencies shown above are in kHz

Out of the 20 Easytrak channels shown above, 8 are suitable for the 200 and 300 Series of beacons, the remaining (in grey) are shown for information only. Older versions of Easytrak will not have these channels listed, (Channels 10/0 to 10/3 are defaults) so the frequencies will have to be entered manually.

i. Select channel, then program receive and transmit frequencies using table 2 and 3 for reference.
ii. Set the TAT switch to 30mS on the Transmit / Receive board Switch 1, see FIGURE 5.
iii. Set the pulse width to 2mS on switch 1, see FIGURE 5.

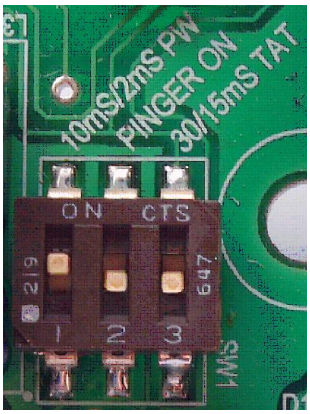

FIGURE 5
SW1 Switch Positions
for Easytrak operation

Easytrak Switch settings

Beacon Transmit Frequency kHz	Switch 2 Settings											
	1	2	3	4	5	6	7	8	9	10	11	12
25.000	On	Off	Off	On	On	On	On	On	Off	On	On	On
26.000	On	On	On	On	On	Off	Off	On	On	Off	On	Off
27.000	On	On	On	Off	On	Off	Off	On	On	Off	On	On
28.000	On	On	Off	On	On	Off	Off	On	On	On	Off	Off
29.000	On	Off	On	On	Off	Off	Off	On	On	On	Off	On
30.000	On	Off	On	Off	Off	Off	Off	On	On	On	Off	On

TABLE 2

Beacon Receive Frequency kHz	Switch 3 Settings											
	1	2	3	4	5	6	7	8	9	10	11	12
17.000	Off	On	Off	Off	Off	On	Off	On	Off	Off	Off	Off
17.500	Off	Off	On	Off	Off	On	Off	On	Off	Off	Off	Off
18.500	Off	Off	Off	On	Off	On	Off	On	Off	Off	Off	On
19.000	On	On	On	On	Off	On	Off	Off	Off	Off	On	Off
19.500	Off	Off	Off	Off	Off	On	Off	On	Off	Off	On	Off
20.500	On	On	Off	On	On	On	Off	Off	Off	Off	On	On
21.500	On	On	Off	Off	On	On	Off	Off	Off	Off	On	On
22.500	On	Off	On	Off	Off	On	Off	Off	Off	On	Off	Off

TABLE 3

Note: Use an interrogate repetition rate within the tracking system which suits the needs of your application. Consider that a faster interrogation rate will deplete the batteries of the transponder faster than a slow interrogate rate.

Operation with Simrad and Sonardyne systems

Simrad's HPR and Sonardyne's 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.

1) Select the channel you wish to operate on and adjust the switches in accordance with tables 4 and 5.

SIMRAD HRP3 COMPATIBLE SWITCH SETTINGS

CHANNEL	Beacon Transmit Frequency kHz	Switch 2 Settings (Transmit)											
		1	2	3	4	5	6	7	8	9	10	11	12
SQUARE	27.173	On	On	On	Off	Off	On	Off	On	On	On	On	Off
CIRCLE	28.409	On	Off	On	On	On	Off	Off	On	On	On	On	On
TRIANGLE	29.762	On	Off	On	Off	Off	On	Off	On	On	On	Off	On
X	31.250	Off	On	On	On	Off	On	Off	On	On	On	On	On
Y	32.468	Off	On	On	Off	Off	On	Off	On	On	Off	Off	Off
1	29.762	On	Off	On	Off	Off	On	Off	On	On	On	Off	On
2	30.488	On	Off	Off	On	On	Off	Off	On	On	On	On	Off
3	31.250	Off	On	On	On	Off	On	Off	On	On	On	On	Off
4	31.847	Off	On	On	Off	On	On	Off	On	On	On	Off	Off
5	32.468	Off	On	On	Off	Off	On	Off	On	On	Off	Off	Off
6	27.173	On	On	On	Off	Off	On	Off	On	On	On	On	Off
7	27.778	On	On	Off	On	On	On	Off	On	On	Off	On	On
8	28.409	On	Off	On	On	On	Off	Off	On	On	On	On	On
9	29.070	On	Off	On	On	Off	Off	Off	On	On	Off	On	On
EMERGENCY A	37.500	On	On	On	Off	Off	On	Off	Off	On	Off	On	On

TABLE 4

Note: Frequencies shown above are in kHz

SIMRAD HRP3 COMPATIBLE SWITCH SETTINGS													
CHANNEL	**Beacon Receive Frequency kHz**	**Switch 3 Settings (Receive)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
SQUARE	21.552	On	Off	On	On	Off	On	Off	Off	Off	Off	On	Off
CIRCLE	22.727	On	Off	On	Off	Off	Off	Off	Off	Off	On	Off	On
TRIANGLE	23.923	Off	On	On	On	On	Off	Off	Off	Off	Off	Off	Off
X	25.126	Off	On	On	Off	Off	On	Off	Off	Off	Off	On	Off
Y	26.455	Off	Off	On	On	On	Off	Off	Off	Off	Off	Off	On
1	20.492	On	On	Off	On	On	On	Off	Off	Off	Off	On	On
2	21.552	On	Off	On	On	Off	On	Off	Off	Off	Off	On	Off
3	22.124	On	On	Off	Off	Off	On	Off	Off	Off	Off	Off	Off
4	22.727	On	Off	On	Off	Off	Off	Off	Off	Off	On	Off	On
5	23.364	On	Off	Off	On	On	Off	Off	Off	Off	Off	Off	On
6	24.038	Off	On	On	On	Off	On	Off	Off	Off	On	Off	Off
7	24.510	Off	On	On	Off	On	On	Off	Off	Off	On	Off	On
8	25.000	Off	On	On	Off	Off	On	Off	Off	Off	On	On	Off
9	26.042	Off	On	Off	On	Off	On	Off	Off	Off	On	On	Off

TABLE 5

Note: Frequencies shown above are in kHz

2) Set the transmitted pulse width (PW) to 10mS using switch SW1, see FIGURE 6.
3) Set the TAT to 30mS by using switch SW1, See FIGURE 6.

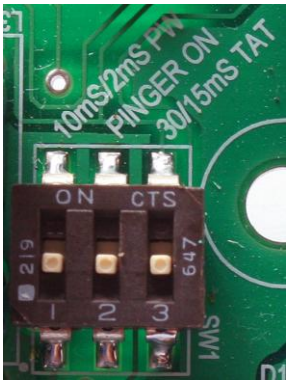

FIGURE 6
SW1 positions for HPR300 operation

Operation with Simrad HiPAP

The Simrad HPR400 / HiPAP system uses a double interrogate frequency to allow differentiation of a large number of transponders. As the 300 Series of beacons have the capability to only receive one frequency, there is a small limitation to its use because of the inability of the beacon to distinguish between all the available channels. We do not feel that this is a particular problem provided the limitation is known, as it is unlikely that many transponders will be in the water when the beacons are used.

Table 6 lists all the channels available. There are 56 channels in total. Some of them are highlighted in bold. These are our 'preferred' channels when used with the 300 series; the reason is this: If we look at channel 15, the transponder receives at 23 kHz and replies at 30.75 kHz. Remember that the transponder ignores the first interrogation of 21 kHz. The same is true of channel 35 and channel 75; the transponder will ignore the first interrogation pulses of 22 kHz and 24 kHz respectively and reply to the second interrogation pulse. The tracking system will not know if it is picking up a transponder set to channels 15, 35 or 75 so confusion will be apparent!

Therefore it is recommended that the tracking system is only set to these preferred channels when a 300 Series beacon is in the water. However, provided you are aware of the limitation, alternative channels can be utilised without a problem.

Channel	Beacon Receive 1	Beacon Receive 2	Beacon Transmit
12	21KHz	**21.5KHz**	**29.25KHz**
13	21KHz	**22KHz**	**29.75KHz**
14	21KHz	**22.5KHz**	**30.25KHz**
15	21KHz	**23KHz**	**30.75KHz**
16	21KHz	**23.5KHz**	**27.25KHz**
17	21KHz	**24KHz**	**27.75KHz**
18	21KHz	**24.5KHz**	**28.25KHz**
21	21.5KHz	**21KHz**	**28.5KHz**
23	21.5KHz	**22KHz**	**29.5KHz**
24	21.5KHz	**22.5KHz**	**30KHz**
25	21.5KHz	**23KHz**	**30.5KHz**
26	21.5KHz	**23.5KHz**	**27KHz**
27	21.5KHz	**24KHz**	**27.5KHz**
28	21.5KHz	**24.5KHz**	**28KHz**
31	22KHz	**21KHz**	**28.75KHz**
32	22KHz	21.5KHz	29.25KHz
34	22KHz	22.5KHz	30.25KHz
35	22KHz	23KHz	30.75KHz
36	22KHz	23.5KHz	27.25KHz
37	22KHz	24KHz	27.75KHz
38	22KHz	24.5KHz	28.25KHz
41	22.5KHz	21KHz	28.5KHz
42	22.5KHz	**21.5KHz**	**29KHz**
43	22.5KHz	22KHz	29.5K
45	22.5KHz	23KHz	30.5KHz
46	22.5KHz	23.5KHz	27KHz
47	22.5KHz	24KHz	27.5KHz
48	22.5KHz	24.5KHz	28KHz

TABLE 6

Channel	Beacon Receive 1	Beacon Receive 2	Beacon Transmit
51	23KHz	21KHz	28.75KHz
52	23KHz	21.5KHz	29.25KHz
53	23KHz	22KHz	29.75KHz
54	23KHz	22.5KHz	30.25KHz
56	23KHz	23.5KHz	27.25KHz
57	23KHz	24KHz	27.75KHz
58	23KHz	24.5KHz	28.25KHz
61	23.5KHz	21KHz	28.5KHz
62	23.5KHz	21.5KHz	29KHz
63	23.5KHz	22KHz	29.5KHz
64	23.5KHz	22.5KHz	30KHz
65	23.5KHz	23KHz	30.5KHz
67	23.5KHz	24KHz	27.5KHz
68	23.5KHz	24.5KHz	28KHz
71	24KHz	21KHz	28.75KHz
72	24KHz	21.5KHz	29.25KHz
73	24KHz	22KHz	29.75KHz
74	24KHz	22.5KHz	30.25KHz
75	24KHz	23KHz	30.75KHz
76	24KHz	23.5KHz	27.25KHz
78	24KHz	24.5KHz	28.25KHz
81	24.5KHz	21KHz	28.5KHz
82	24.5KHz	21.5KHz	29KHz
83	24.5KHz	22KHz	29.5KHz
84	24.5KHz	22.5KHz	30KHz
85	24.5KHz	23KHz	30.5KHz
86	24.5KHz	23.5KHz	27KHz
87	24.5KHz	24KHz	27.5KHz

TABLE 6 CONTINUED

1) Select the channel you wish to operate on and adjust the switches in accordance with tables 7 and 8.

'Preferred' channels only are shown.

HiPAP / HPR400 Compatible Switch Settings														
Channel	**Beacon Rx Freq**	**Beacon Tx Freq**	**Switch 3 Settings (Receive)**											
	kHz	**kHz**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
12	21.5	29.25	On	On	Off	Off	On	On	Off	Off	Off	Off	On	On
32														
52														
72														
13	22	29.75	On	On	Off	Off	Off	On	Off	Off	Off	On	Off	Off
53														
73														
14	22.5	30.25	On	Off	On	Off	Off	On	Off	Off	Off	On	Off	Off
34														
54														
74														
15	23	30.75	On	Off	Off	On	On	On	Off	Off	Off	On	Off	Off
35														
75														
16	23.5	27.25	Off	On	On	On	On	On	Off	Off	Off	On	Off	On
36														
56														
76														
17	24	27.75	Off	On	On	On	Off	On	Off	Off	Off	On	Off	On
37														
57														
18	24.5	28.25	On	Off	Off	Off	Off	On	Off	Off	Off	On	On	Off
38														
58														
78														
21	21	28.5	On	On	Off	On	Off	On	Off	Off	Off	Off	On	On
61														
81														
23	22	29.5	On	On	Off	Off	Off	On	Off	Off	Off	On	Off	Off
43														
63														
83														
24	22.5	30	On	Off	On	Off	Off	On	Off	Off	Off	On	Off	Off
64														
84														
25	23	30.5	On	Off	Off	On	On	On	Off	Off	Off	On	Off	Off
45														
65														
85														
26	23.5	27	Off	On	On	On	On	On	Off	Off	Off	On	Off	On
46														
86														
27	24	27.5	Off	On	On	On	Off	On	Off	Off	Off	On	Off	On
47														
67														
87														
28	24.5	28	On	Off	Off	Off	Off	On	Off	Off	Off	On	On	Off
48														
68														
31	21	28.75	On	On	Off	On	Off	On	Off	Off	Off	Off	On	On
51														
71														
41	21	28.5	On	On	Off	On	Off	On	Off	Off	Off	Off	On	On
42	21.5	29	On	On	Off	Off	On	On	Off	Off	Off	Off	On	On
62														
82														

TABLE 7

HiPAP / HPR400 Compatible Switch Settings															
Channel	**Beacon Rx Freq**	**Beacon Tx Freq**	**Switch 2 Settings (Transmit)**												
	kHz	**kHz**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
12	21.5	29.25	On	Off	On	Off	On	On	Off	On	On	On	Off	On
32														
52														
72														
13	22	29.75	Off	Off	On	Off	Off	On	On	On	Off	On	Off	On
53														
73														
14	22.5	30.25	Off	Off	Off	On	On	On	On	On	Off	On	On	Off
34														
54														
74														
15	23	30.75	Off	Off	Off	On	Off	On	On	On	Off	On	On	Off
35														
75														
16	23.5	27.25	On	On	On	Off	Off	On	Off	On	On	Off	On	On
36														
56														
76														
17	24	27.75	On	On	Off	On	On	On	Off	On	On	On	Off	Off
37														
57														
18	24.5	28.25	Off	On	Off	On	Off	On	On	On	Off	On	Off	Off
38														
58														
78														
21	21	28.5	On	Off	On	On	On	Off	Off	On	On	Off	On	On
61														
81														
23	22	29.5	On	Off	On	Off	On	Off	Off	On	On	On	Off	On
43														
63														
83														
24	22.5	30	On	Off	On	Off	Off	Off	Off	On	On	On	Off	On
64														
84														
25	23	30.5	On	Off	Off	On	On	Off	Off	On	On	On	On	Off
45														
65														
85														
26	23.5	27	On	On	On	Off	On	Off	Off	On	On	Off	On	On
46														
86														
27	24	27.5	On	On	On	Off	Off	Off	Off	On	On	Off	On	On
47														
67														
87														
28	24.5	28	On	On	Off	On	On	Off	Off	On	On	On	Off	Off
48														
68														
31	21	28.75	Off	Off	On	On	Off	On	On	On	Off	On	Off	Off
51														
71														
41	21	28.5	On	Off	On	On	On	Off	Off	On	On	Off	On	On
42	21.5	29	On	On	Off	Off	On	Off	Off	On	On	On	Off	Off
62														
82														

TABLE 8

2) Set the transmitted pulse width (PW) to 10mS using switch SW1, See Figure 7.

3) Set the TAT to 30mS by using switch SW1, See FIGURE 7.

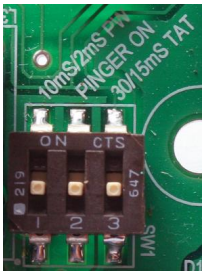

FIGURE 7
Switch positions for HPR400

Operation with ORE LXT; Trackpoint II and 3 Systems

In order for a Trackpoint system to be able to operate with the 300 Series beacons, both interrogate and reply frequencies need to be set within the Trackpoint system which corresponds to the frequencies set inside the transponder. In addition the TAT or turn-around-time and Pulse Width need to be set in the transponder.

1) Set the transponder for the frequencies required as shown tables 9 and 10.

Beacon Transmit Frequency	Switch 2 Settings (Transmit)											
KHz	1	2	3	4	5	6	7	8	9	10	11	12
22.000	On	On	On	Off	Off	On	On	On	Off	On	On	On
22.500	On	On	Off	On	On	On	On	On	Off	On	On	On
23.000	On	On	Off	On	On	Off	On	On	Off	Off	Off	Off
23.500	On	On	Off	Off	On	On	On	On	Off	On	On	On
24.000	On	On	Off	Off	On	Off	On	On	Off	Off	Off	On
24.500	On	Off	On	Off	On	Off	On	On	Off	Off	Off	On
25.000	On	Off	Off	On	On	On	On	On	Off	On	On	On
25.500	On	Off	Off	On	On	Off	On	On	Off	Off	Off	On
26.000	On	On	On	On	On	Off	Off	On	On	Off	On	Off
26.500	On	On	On	On	Off	Off	Off	On	On	Off	On	On
27.000	On	On	On	Off	On	Off	Off	On	On	Off	On	On
27.500	On	On	On	Off	Off	Off	Off	On	On	Off	On	On
28.000	On	On	Off	On	On	Off	Off	On	On	On	Off	Off
28.500	On	Off	On	On	On	Off	Off	On	On	Off	On	On
29.000	On	Off	On	On	Off	Off	Off	On	On	On	Off	On
29.500	On	Off	On	Off	On	Off	Off	On	On	On	Off	On
30.000	On	Off	On	Off	Off	Off	Off	On	On	On	Off	On
30.500	On	Off	Off	On	On	Off	Off	On	On	On	On	Off

TABLE 9

Beacon Receive Frequency	Switch 3 Settings (Receive)											
KHz	1	2	3	4	5	6	7	8	9	10	11	12
17.000	Off	On	Off	Off	Off	On	Off	On	Off	Off	Off	Off
17.500	Off	Off	On	Off	Off	On	Off	On	Off	Off	Off	Off
18.000	Off	Off	Off	On	On	On	Off	On	Off	Off	Off	On
18.500	Off	Off	Off	On	Off	On	Off	On	Off	Off	Off	On
19.000	On	On	On	On	Off	On	Off	Off	Off	Off	On	Off
19.500	Off	Off	Off	Off	Off	On	Off	On	Off	Off	On	Off
20.000	On	On	On	Off	Off	On	Off	Off	Off	Off	On	Off
20.500	On	On	Off	On	On	On	Off	Off	Off	Off	On	On
21.000	On	On	Off	On	Off	On	Off	Off	Off	Off	On	On
21.500	On	On	Off	Off	On	On	Off	Off	Off	Off	On	On
22.000	On	On	Off	Off	Off	On	Off	Off	Off	On	Off	Off
22.500	On	Off	On	Off	Off	On	Off	Off	Off	On	Off	Off

TABLE 10

2) Set the TAT to 15mS by selecting the TAT switch on the Transmit / Receive board Switch SW1, see FIGURE 8.

3) Set the (reply) pulse width to 2mS using switch SW1, see FIGURE 8.

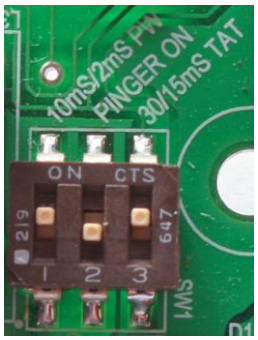

FIGURE 8
Switch SW1 positions for TP2

4) Set the Trackpoint interrogate frequency to match the RECEIVE frequency of the transponder and set the interrogate pulse width to 10mS.

5) Set the receive frequency of the Trackpoint to the TRANSMIT frequency of the transponder and enter a TAT of 15mS.

6) Use an interrogate repetition rate within the Trackpoint system which suits the needs of your application. Consider that a faster interrogation rate will deplete the batteries of the transponder faster than a slow interrogate rate. Please also note that these models can reply at 1 transmission per second whereas the ORE ‘Multibeacons’ are limited to 1 reply per 2 seconds.

Applied Acoustic Engineering 300 Series beacons can be interrogated at 1 Hz. For responder work, the 300 Series use a positive edge key pulse. Although this is not usual with Trackpoint, the system can be configured quite easily. Refer to your Trackpoint documentation.

Responder Operation

Responder mode is permanently on, but the beacon will only respond when it receives an electrically generated pulse.

The pin outs for responder operation are; -

Pin 2 – 0V / Ground
Pin 1 – Responder Input

The beacon can still be trickle charged whilst the responder is being used. This is achieved by connecting together the 0V / Ground on the responder and placing 24V on pin 4.
Ensure the 24V supply can provide 100mA (Maximum) to the beacon.

Pin 2 and Pin 5 must be shorted together for the beacon to power on.
This short must be incorporated into the cable for the responder input.

The beacon requires a 10mS positive edge pulse at 15vdc to trigger.

Once triggered the beacon has a turn-around-time of 30mS and as such if the Trackpoint 2/3 system is used, then the Responder turn-around-time setting on the tracking system will need changing to 30mS to suit the beacon, otherwise a range error will occur.

Set the beacon to the frequency required as per the previous sections of this manual.

The transmit frequency needs to be set to whichever tracking system is being used. Set the pulse width to 10mS for HPR channels and 2mS for Easytrak and Trackpoint channels.

The receive frequency can be set to any frequency.

Note, if any acoustic signals are at the same frequency as the receive frequency the beacon is set to, then the beacon may be falsely interrogated and cause false readings / positions to be shown.

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.

Pinger Operation

The 300 Series of beacons can operate as free running pingers with a fixed repetition rate of 2Hz. To enable pinger mode, slide SW1 ‘PINGER ON’ setting to the right as shown. Select the transmit pulse width you require.

If you are unsure what pulse length to use, select 10mS. (For Easytrak and Trackpoint II operation you may use 2mS which will increase battery life). TAT can be set to either position, as this is not used in pinger mode.

FIGURE 9
Switch SW1 positions for pinger operation

You can now select the transmit frequency of your choice by using the transmit frequency switches shown in previous tables.

If you require frequencies not listed, please contact Applied Acoustics for advice.

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.

Applied Acoustic Engineering cannot accept responsibility for any operator not being able to achieve these ranges in practice. Higher ranges may be achievable, but experience with the vessel, tracking system and also environmental / acoustic conditions are the governing factor.

Model number	Expected useable range
319	To 300 metres
310 with RM90V	To 300 metres

Maintenance

Safety precautions prior to beacon disassembly

A Pressure Relief Valve (PRV) is fitted to all 300 Series beacons as a safety precaution. However even with a PRV the internal pressure can build up to 6 psi before the valve will 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. Internal pressure can be vented by hand by inserting an M2 screw into the PRV and actuating manually.

FIGURE 10

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.

Disassembly and Reassembly

Note. Appropriate anti-static precautions should be taken to prevent damage when working internal to the beacon. In addition it is necessary to ensure the large TX storage capacitor is discharged when changing / working on circuit boards. This can be achieved by turning on the pinger mode and waiting until the unit stops.

To dismantle the beacon, remove the three screws securing the transducer endcap.

Withdraw the endcap away from the body, this will allow access to the internal switches for setting up the beacon for operation. You will observe two O-rings on this end-cap. Ensure that any water present is not drawn into the transponder.

To continue dismantling the beacon to allow access to the battery, remove the connectors Conn1 and Conn3 (as shown in Fig.4) from the circuit board and remove the transducer endcap away from the main body.

Remove the three screws securing the connector endcap. Withdraw the connector endcap away from the body. Assembly is the reverse of dismantling procedure.

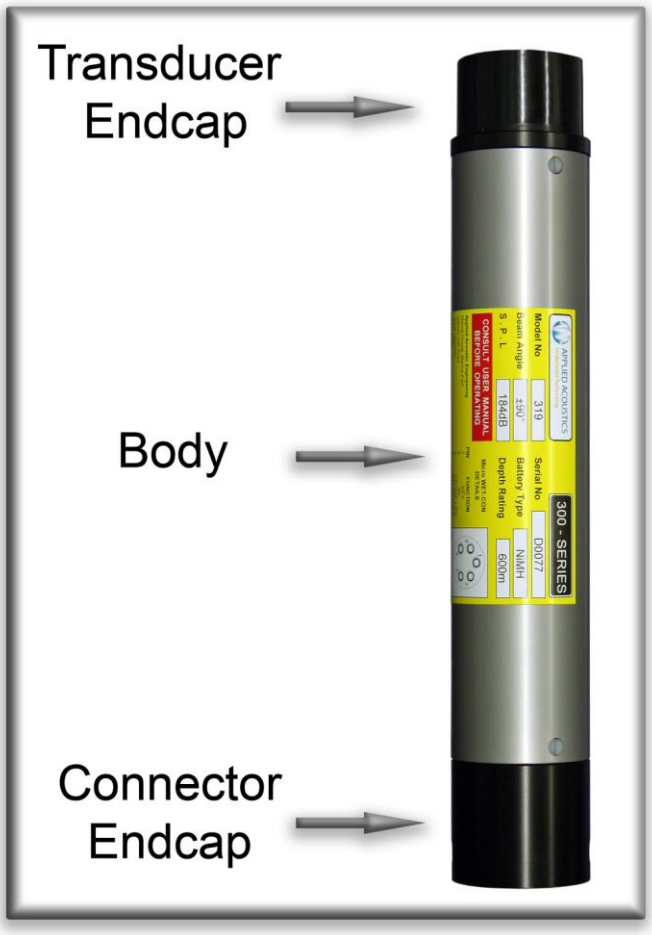

FIGURE 11

NOTE: Do check the O- rings and clean or replace them if necessary before re-assembly.
Do not over-tighten the securing screws!

Battery Replacement

300 Series beacons use battery pack part number: BCN-0310-3000. This is a 14.4V and 700mAh Capacity NiMH pack. Quoted operational and listening life is based on the standard 700mAh battery pack operating in water temperatures above 10^0C. In due course, rechargeable batteries will require replacement and this can be achieved quite simply with the 300 Series beacons. 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.

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.

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

After use the transponder should be switched off, washed in clean water, labelled and stored for future use. The beacon should also be charged ready for its next deployment.

Battery Disposal and the Environment

Please consider the environment and safety when disposing of all battery types. Applied Acoustic Engineering operates a conscientious 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 regularly for integrity and foreign matter.
O-Ring seals that are exposed to high pressure cycles should be changed annually to ensure operational reliability.

Pressure Relief Valves

The pressure relief valve used on Applied Acoustic Engineering underwater equipment is a non-serviceable item and if damaged or faulty should be replaced immediately. Applied Acoustic Engineering strongly recommends 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 flooded or pressurised transponder housings. This is especially important if the transponder is being operated in tidal areas where marine contamination is more likely.

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.

Spares / Accessories

The following spares and accessories are available;

Part Number	Description
BS130S	300 Series O-Ring set includes O-Ring lubricant
BCN-0310-3000	300 Series NimH Battery pack
MCBH5M	Bulkhead connector
BCN-0310-3003	300 Series Shorting ‘On’ Link with locking sleeve
MCIL5F	Pigtail connector lead for external power connection
MCDLSF	Locking sleeve for MCIL5F
AAE0380	0380 Model Charger for 300 series
300SS	300 Series Pressure Housing securing set

Fault Finding

It doesn't work, what can we do?

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** 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 the beacon to Applied Acoustic Engineering for repair.

DO NOT use units that have been over-charged, 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 the unit using the pinger function after charging. If the unit pings, the battery and the transmitter are functional.

Check the unit is 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 another beacon which is *exactly the same* is the performance the same? This will identify if there is just one faulty unit.
- Are you out of range? Maybe a higher powered unit is required.
- Is multipath present? Try slowing down the interrogation rate.
- 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.
- Check on a different channel (frequency) to see if performance changes.

If you can't find a solution, please contact our Technical Support team.

Specifications

Model 319

Housing Material	Anodised aluminium alloy	
Size	50 mm diameter x 290 mm long	
Weight in air / water	800g / 350g	
Depth rating	600 metres (2000 feet)	
Connector Type	Micro wet-con MCBH5M	
Mating Connector	Micro wet-con MCDC5F (NOT SUPPLIED)	
Channels / frequencies	EASYTRAK	8
	HPR300	14
	HPR400	56 (16 preferred)
	Sonardyne USBL	14
	ORE Trackpoint II	Entire MF range
	ORE LXT	Codes 1 - 5
	(Reduced source level below 24 kHz)	
Pinger capability	2 Hz pinger at any chosen transmit frequency	
Turn around delay	15 / 30mS dependent on system selected	
Pulse Width	2mS or 10mS dependent upon system selected	
Inhibit Time	700mS nominal	
Power supply	14.4V 700mAh NiMH Rechargeable Battery Pack	
Charge Current	Trickle charge @24V – 100mA (Maximum)	
Charge Time	18 hours nominally	
Operational Life	4 days (96 hours) at 1 pulse per second (2mS pulse) or 20 Days (Listening Life)	
Internal adjustments	Transmit / Receive Frequency Turn Around Time / Pulse Width / Pinger Mode	
Source level	184 dB (-3 dB) re 1µPa at 1 metre	
Beam Pattern	> Hemispherical	
Receive sensitivity	110 dB typically	
Operating temperature	-5 to 30 °C	
Storage temperature	0 to 45 °C	
Pressure relief valve	5 psi +/– 1 psi	

Although unlikely, published specifications are subject to change. Please consult the factory if a particular specification is critical. Changes to the existing design are possible - please consult the factory for information.

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

Model 310 with RM90V (Remote Transducer)

Model 310

Housing Material	Anodised aluminium alloy
Size	50 mm diameter x 275 mm long
Weight in air / water	780g / 320g
Depth rating	600 metres (2000 feet)
Connector Type	Micro wet-con MCBH5M
Mating Connector	Micro wet-con MCDC5F (NOT SUPPLIED)
Connector to RM90V	Micro Wetconn MCIL2M

All other specifications are the same as the 319 beacons

Model RM90V

Base Material	Anodised aluminium alloy
Size	50mm diameter x 72mm long
Weight in air / water	100g / 50g
Interconnection Method	600mm MCIL2M Captive Lead
Mounting Method	4 off M4 Nylon Screws - To be isolated from other metals
Source level	184 dB (-3 dB) re 1uPa at 1 metre
Beam Pattern	> Hemispherical
Operating temperature	-5 to 30 °C
Storage temperature	0 to 45 °C

Although unlikely, published specifications are subject to change. Please consult the factory if a particular specification is critical. Changes to the existing design are possible - please consult the factory for information.

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

Transportation by Air

All equipment should be switched OFF prior to air transportation. It follows that the 300 Series beacons must have their shorting link removed from the transponder prior to air flight.

NiCad and Alkaline Battery Packs

These battery packs are **not** classified as dangerous goods for transportation by air.
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 300 Series beacons, it is possible to relieve this pressure by fitting an M2 screw into the hole on the pressure relief valve and lifting the valve out from the endcap, manually releasing the PRV to equalise the pressure, post air transportation.

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

Appendix A

Packing Information

A sturdy carry case typically contains the following items;

300 Series beacon
Shorting on plug
0380 Charger
Mains lead
Spare O-Ring Set
O-Ring Lubrication pack
Operating Manual

FIGURE 12

Appendix B

Model 310 With RM90V Remote Transducer

The 310 and RM90V is essentially a 319, but with transducer on a captive cable giving the ability to place the transducer away from the electronics housing. This solution is ideal where space is limited and / or the transducer needs mounting away from any noise sources, such as ROV thrusters.

To set up, attach the connector from the transducer into the bulkhead connector on the main Electronics housing. Tighten up the locking sleeve on the captive cable onto the bulkhead connector to prevent the connectors coming apart.

Secure the RM90V remote transducer using M4 plastic screws. Isolate the aluminium base from dissimilar metals to prevent galvanic corrosion.

If M4 plastic screws are not available then A4 stainless steel screws may be used. If A4 stainless screws are used or the base has to be mounted straight onto other metals then a zinc sacrificial anode MUST BE USED.

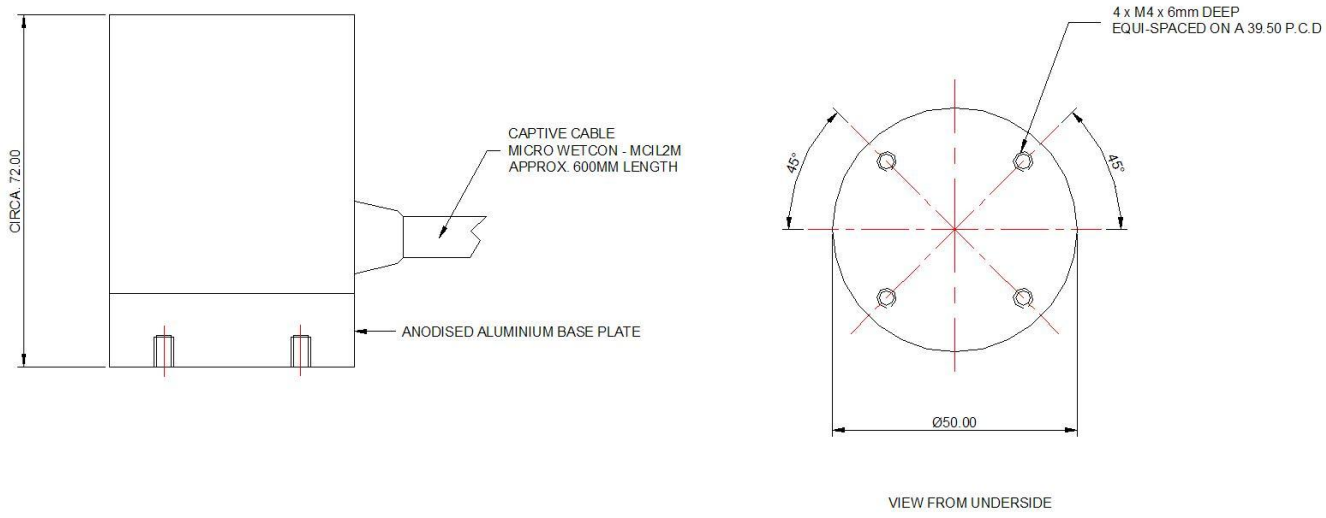

FIGURE 13
The above diagram shows the mounting details of the RM90V