APPLIED ACOUSTICS
Underwater Technology
An AAE Technologies Group Company

500 Series Release Operation Manual

REL-529P-8000/5

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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.

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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.

1. Introduction

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

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

The beacons operate as: -

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

b) As an acoustically triggered release using a disposable plastic block system.

A variety of release transponder models are offered. This manual covers only the 529P and 539P models. They are identical with the exception that the 539P is longer and incorporates a larger receiver battery pack.

There is facility for operation (navigation) with the following systems: -

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
ORE Trackpoint II	9 Channels.
Sonardyne Compatt	IIF Channels MF 1 – MF 8

For range and release the PAM 2520 Digital Deck unit is compatible (Rev 4.0 and later). For range/bearing and also release the EASYTRAK USBL system is compatible. Please note that PAM units with software below Rev 4.0 are not compatible on all channels. Check operation on deck first before deployment!

2. Getting Started

On delivery of your beacon please check the following:

1. Model number
2. Safe working load SWL
3. Depth rating
4. Battery type and release operations available on the particular model
5. Manufacturers / suppliers safety certificate

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 your beacon over for transit damage and if damaged, do not use it but contact your supplier or agent for advice.

Your release transponder is shipped to you in a fully functional state. However the batteries may or may not be connected due to shipping restrictions or preference stated at the time of order. The unit is permanently in the ON (listening) state when the batteries are connected as there is no external ON or OFF switch. If the unit is not required for immediate use and is going to be stored, it is recommended that the receiver battery pack be disconnected (see service repair section).

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.

The Fitment of External Devices to Release Body

Objects attached to the transponder 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.

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

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 capacity. A 72 deg C thermal fuse is included in the battery pack(s) that will render the beacon inoperative should this temperature be exceeded.

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.

3. Safety Considerations

The release transponder is designed to lift loads up to 250 kg or the maximum as stated on the label. Each unit has been proof tested to twice this load before shipment (Machinery directive 89/392/EEC as amended by directives 91/368/EEC, 93/368/EEC). Care should be taken to avoid mechanical damage to the release unit, as this will reduce operational safety when loaded and could lead to personnel injury or loss of life if the unit failed when being operated in a damaged state.

Before operating check for mechanical damage to the release units mechanical parts, critical parts are the;

1. Main tube
2. Clamping rings
3. Transducer cage
4. Main fixing bolts and nuts
5. Release jaw components
6. Sacrificial anodes (without these corrosion may take place).

Before lifting loads, always check the following

1. The steel external screw shaft is not damaged or corroded
2. That the Plastic release block is in good condition.
3. Ensure the release block is screwed home onto the release shaft; a small gap is permissible to allow closing of the locking blocks (side cheeks) either side.

All lifting shackles or straps used with the release must be of sound construction and have current safety test certificates. Shackles fitted to this release must conform to the shackle specification shown in the specification section of this manual, this is to ensure reliable release operation with this unit. Note for calculating load requirements on board ships operating in heavy swell conditions: - It is advisable to add an extra safety margin regarding load calculations to allow for the addition of these dynamic forces on the static working load (effectively reducing the rated SWL).

Do not place fingers or objects near the release mechanism when the unit is primed (when re-setting) or releasing. Do not stand directly below the unit when supporting a weight and handle unit with gloves when supporting loads.

When dismantling the release for servicing, do not place operators' face in front of the end caps in case the transponder is internally pressurised. Internal pressurisation can happen if the transponder has flooded with water during use - the main cause of flooding is damaged 'O' rings: care during assembly will avoid this happening.

All battery packs are short circuit protected with the exception of the motor battery pack, which is not current limited due to the high current demands from the motor when operating in high biofoul conditions. Battery packs should never be shorted or contaminated with water. Battery packs should be disposed of with consideration to the environment or returned to Applied Acoustic Engineering for recycling.

Safety Considerations Cont

Do not subject the transponder to high ambient temperatures or leave the unit standing in direct strong sunlight for long periods (Tropical climates) as this will lead to an increase in internal temperatures and a reduction in battery life. If the transponder gets too hot due to an external heat source, the thermal fuses inside the receiver and transmitter battery packs will blow; this is to prevent thermally damaged battery packs from being operated. Thermally damaged battery packs can vent gases and their operational life span is reduced.

The release transponder is used in a harsh environment and should be thoroughly inspected by a competent person at regular intervals to ensure it and its components are safe to use. Refer to your country or operator's health & safety regulations / procedures for safe use of lifting equipment and thorough inspections for more details. Should a problem or defect be found, the unit must be taken out of service until correctly addressed.

THE UNIT MUST HAVE A CURRENT SAFETY WORKING CERTIFICATE TRACEABLE TO AN APPROPRIATE SAFETY STANDARD.

4. Channel and ID Changing

Channel (Frequency) Selection and Release Identity (ID) Selection

The 500 Series release transponders have been designed to be flexible by offering compatibility with various (USBL) tracking systems for navigation purposes, as well as offering a secure command/release structure.

Channel Selection

Channel (frequency) selection is achieved by adjusting two rotary switches that are located on the main circuit board.
These switches are marked SW1 and SW2 and are 16-way labelled 0 - 9, A – F. To access these, please refer to section 6 of this manual.

Channel selection can be achieved whilst the unit is on or off and it takes up to 60 seconds for the transponder to begin to operate on the new channel. Please refer to the appropriate tables later in this section of the manual to determine the switch positions suitable for your needs.

Release ID Selection

For every navigation channel available, there are 16 different release identities associated with it (0 – 15). For example if we are operating on Channel 33 (compatible with Simrad HPR and Sonardyne's USBL system), the transponder will be able to be operated as a standard navigation transponder with those systems, but release and status functions will only be available to a PAM 2520 unit or EASYTRAK when set to the correct ID. The DIL switch SW1, located on the DFS/Processor board 1000-5000, is used to set the ID number, as described below: -

ID NUMBER	SW1-8	SW1-7	SW1-6	SW1-5
0	Off	Off	Off	Off
1	On	Off	Off	Off
2	Off	On	Off	Off
3	On	On	Off	Off
4	Off	Off	On	Off
5	On	Off	On	Off
6	Off	On	On	Off
7	On	On	On	Off
8	Off	Off	Off	On
9	On	Off	Off	On
10	Off	On	Off	On
11	On	On	Off	On
12	Off	Off	On	On
13	On	Off	On	On
14	Off	On	On	On
15	On	On	On	On

Additional relating information continues over page.

Release ID Selection Cont

The remaining switch positions **MUST** remain in the following position:

SW1 – 1 = Off (OFF=RS-232 off; ON= RS232 ON)
SW1 – 2 = On (ON= Release Mode; Off= Beacon Mode)
SW1 – 3 = On (OFF=Metal [claw] release; On= Plastic [BERT] Release)
SW1 – 4 = Off (Off= Standard Telemetry protocol; On= not used at present).

The settings associated with the 8-way DIL switch on the processor board are only read on power-up or when a channel selection switch is rotated. After any changes have been made it is advisable to rotate either channel selection switch one 'click' forward and then one 'click' back to ensure that all the switches have been read correctly. Unless a voltmeter has been used to ensure that there is no voltage present on the processor board, it is not reliable to assume that the processor is at 0 volts due to the possibility of the circuitry retaining stored energy for a considerable time even when the batteries are disconnected. Note that the processor takes up to 1 minute to read the switches.

Operation with Simrad HPR 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 shown in the table below.

Please note, switch position 0/1 as shown below can be more precisely defined as: set the rotary switch SW1 switch to 0 and the rotary switch SW2 to 1 on the main board.

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

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.

Please note SIMRAD'S HiPAP system 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 mutual interference.

Operation with HiPAP

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

500 Series 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.

Please note, switch position 0/1 as shown below can be more precisely defined as: set the rotary switch SW1 switch to 0 and the rotary switch SW2 to 1 on the main board.

Operation with Simrad HiPAP

Simrad's HiPAP systems use 56 channels listed below and transmit a double interrogation pulse.

Channel	RXF1 (Hz)	RXF2 (Hz)	TXF1 (Hz)	TXF2 (Hz)*	Transponder TAT (ms)	Responder TAT (ms)	Pulse Width (ms)
12	21000	21500	29250	29750	60	30	10
13	21000	22000	29750	30250	60	30	10
14	21000	22500	30250	28750	60	30	10
15	21000	23000	30750	27250	60	30	10
16	21000	23500	27250	27750	60	30	10
17	21000	24000	27750	28250	60	30	10
18	21000	24500	28250	30750	60	30	10
21	21500	21000	28500	29000	60	30	10
23	21500	22000	29500	30000	60	30	10
24	21500	22500	30000	28500	60	30	10
25	21500	23000	30500	27000	60	30	10
26	21500	23500	27000	27500	60	30	10
27	21500	24000	27500	28000	60	30	10
28	21500	24500	28000	30500	60	30	10
31	22000	21000	28750	29250	60	30	10
32	22000	21500	29250	29750	60	30	10
34	22000	22500	30250	28750	60	30	10
35	22000	23000	30750	27250	60	30	10
36	22000	23500	27250	27750	60	30	10
37	22000	24000	27750	28250	60	30	10
38	22000	24500	28250	30750	60	30	10
41	22500	21000	28500	29000	60	30	10
42	22500	21500	29000	29500	60	30	10
43	22500	22000	29500	30000	60	30	10
45	22500	23000	30500	27000	60	30	10
46	22500	23500	27000	27500	60	30	10
47	22500	24000	27500	28000	60	30	10
48	22500	24500	28000	30500	60	30	10
51	23000	21000	28750	29250	60	30	10
52	23000	21500	29250	29750	60	30	10
53	23000	22000	29750	30250	60	30	10
54	23000	22500	30250	28750	60	30	10
56	23000	23500	27250	27750	60	30	10
57	23000	24000	27750	28250	60	30	10
58	23000	24500	28250	30750	60	30	10
61	23500	21000	28500	29000	60	30	10
62	23500	21500	29000	29500	60	30	10
63	23500	22000	29500	30000	60	30	10
64	23500	22500	30000	28500	60	30	10
65	23500	23000	30500	27000	60	30	10
67	23500	24000	27500	28000	60	30	10
68	23500	24500	28000	30500	60	30	10

Operation with Simrad HiPAP cont.

Channel	RXF1 (Hz)	RXF2 (Hz)	TXF1 (Hz)	TXF2 (Hz)*	Transponder TAT (ms)	Responder TAT (ms)	Pulse Width (ms)
71	24000	21000	28750	29250	60	30	10
72	24000	21500	29250	29750	60	30	10
73	24000	22000	29750	30250	60	30	10
74	24000	22500	30250	28750	60	30	10
75	24000	23000	30750	27250	60	30	10
76	24000	23500	27250	27750	60	30	10
78	24000	24500	28250	30750	60	30	10
81	24500	21000	28500	29000	60	30	10
82	24500	21500	29000	29500	60	30	10
83	24500	22000	29500	30000	60	30	10
84	24500	22500	30000	28500	60	30	10
85	24500	23000	30500	27000	60	30	10
86	24500	23500	27000	27500	60	30	10
87	24500	24000	27500	28000	60	30	10

Operation with Sonardyne USBL Systems

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

Please note, switch position 0/1 as shown below can be more precisely defined as: set the rotary switch SW1 switch to 0 and the rotary switch SW2 to 1 on the main board.

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.

Operation with ORE Trackpoint II and II+ Systems

Medium frequency Trackpoint systems can be set to operate with the following frequencies. It is only necessary to set Trackpoint for interrogate frequency with a pulse width of 10mS and reply frequency (Note that the TAT is 30mS). The telemetry transmit and reply frequencies are shown for information only and are used for the PAM/Release commands.

SWITCH POSITION SW1/SW2	INTERROGATE FREQUENCY (Nav Tx)	TELEMETRY Tx	NAVIGATION FREQUENCY (Reply)	TELEMETRY REPLY
1/0	23 Khz	25.25 Khz	27 Khz	29 Khz
2/0	22 Khz	24.75 Khz	28 Khz	30 Khz
3/0	21 Khz	24.25 Khz	27 Khz	29 Khz
4/0	22 Khz	25.25 Khz	29 Khz	31 Khz
5/0	21 Khz	23.75 Khz	30 Khz	27.5 Khz
6/0	22 Khz	24.25 Khz	28 Khz	30 Khz
6/9	20.5 Khz	23.75 Khz	27.5 Khz	29.5 Khz
6/A	21.5 Khz	24.75 Khz	28.5 Khz	30 Khz
6/B	22.5 Khz	24.75 Khz	29.5 Khz	31.5 Khz

Pinger Operation

The 500 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. During pinger operation, the release functions are not available.

SWITCH POSITION	REPETITION RATE	PULSE LENGTH	TRANSMIT FREQUENCY
4 / 9	1000 mS	5 mS	26 kHz
4 / A	995 mS	5 mS	27 kHz
4 / B	900 mS	5 mS	28 kHz
5 / 9	985 mS	5 mS	29 kHz
5 / A	980 mS	5 mS	30 kHz
5 / B	1000 mS	10 mS	37.5 kHz

Sonardyne Compatt Functions Compatibility

The AAE 500 Series offers limited Compatt functionality only:

- Interrogation on Sonardyne Individual Interrogation Frequency (I.I.F.) Channels MF 1 to MF 8 inclusive, with a TAT of 125ms.
- Address range 1 to 15 inclusive.
- Responds to Compatt release command only.

Channel Selection

Note: Compatt protocol dictates an interrogation on an I.I.F. is replied to with Common Reply Frequency (C.R.F.).

Switch settings for I.I.F. channels MF 1 to MF 8 are listed below:

SWITCH POSITION MSD / LSD	I.I.F. CHANNEL	I.I.F. FREQUENCY	C.R.F. FREQUENCY
B / 1	MF 1	19.230	26.042
B / 2	MF 2	19.841	26.042
B / 3	MF 3	20.491	26.042
B / 4	MF 4	21.186	26.042
B / 5	MF 5	21.929	26.042
B / 6	MF 6	22.522	26.042
B / 7	MF 7	23.148	26.042
B / 8	MF 8	23.810	26.042

Frequencies shown above are in kHz.

Address Selection

Addresses are selected using DIL switch SW1 located on the DFS/Processor board 1000–410 (1000-5000 for newer models), as for Release ID Selection (refer page 10) .

Addresses are limited to 1 to 15 inclusive. Note an address 0 (zero) is adjusted in software to address 1.

N.B. Sonardyne Compatt mode, DIL switch settings read only on power-up. Please ensure that the transponder battery pack is dis-connected and the dc supply on the boards is at zero before re-connecting the receiver battery pack.

Release Function

The 500 Series respond only to a Compatt release command. No other commands are supported.

A total of 4 release commands are required in direct succession within 1 minute of each other to activate the release.

As an example of above, if require a Compatt address of ‘0905’ for the release transponder, DIL switch SW1 would be set for an ID of 9, and channel select switches set to B/5.

Expandability

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

5. Arm and Release Operations

If the unit is going to be stored for some time prior to use then it is advisable to leave the batteries disconnected until the unit is required for use and record the date at which the unit is decommissioned. If the unit has been stored or decommissioned for some length of time, then it is vitally important to know the condition and state of the batteries inside the release unit. If there is any doubt regarding the condition of any battery packs, then it is strongly recommended that all battery packs be replaced. It is false economy to use old or used battery packs which have an unknown capacity or shelf life, battery types other than the ones supplied by Applied Acoustic Engineering should not be used in this unit.

The receiver battery voltage is a nominal 9 volts for the 529P and 10.5 volts for the 539P when new and will fall to 6 volts at which point the transponder will become inoperative.

When measuring voltages from batteries, especially at the end of the batteries life the voltage will tend to increase slightly when off load or when on a small load, and will droop when on a higher load so that the voltage measured whist the transponder is in a quiescent state will be slightly higher than when delivering current to the microprocessor when it is awake and consuming energy.

Transmitter Life

The transmitter battery consists of alkaline cells welded in a pack. The pack is separate from the receiver and motor, so that the transponder will receive and release even if the transmitter pack is exhausted and no replies can be obtained from the transponder. When the transponder is not transmitting, the current drawn by the circuitry is very tiny (capacitor leakage current only) and can to all intents and purposes can be ignored. However we do suggest replacing the transmitter battery pack annually in any case. When transmitting a large energy pulse (several amps) passes through the transmitting circuit to the transducer. This energy is stored in an electrolytic capacitor which is in turn supplied by the transmitter battery pack. Although varying with transducer impedance (hence frequency) we can calculate the amount of energy used for each transmission and thus gain a realistic battery life.

As with the receiver battery, operating temperature will affect the operation of the transmitter battery.

Release Battery Life

The release battery is separate from the receiver and transmitter, and is located around the motor itself. It is rated at 70 releases at full load at 0 centigrade or 140 releases in air as tests. Although the voltage measured after 70 releases may indicate sufficient energy remaining, we do not recommend continued use of the battery as its ability to deliver current will be reduced when used beyond the specified lifetime.

CAUTION

Do not extend these recommended operational life spans, as the reliability of the unit will be severely compromised and the unit could possibly fail to release when commanded. The transponder release units will deliver reliable release operations using the above recommended life spans when using a set of new batteries, the full set comprising of a motor, transmitter and receiver battery packs.

The release transponder is controlled using the Applied Acoustic Engineering PAM deck unit or EASYTRAK system, these communicates with the release transponder using acoustic tone bursts. These tone bursts correspond to the command being executed and are typically very short in duration (less than one second) and will be heard by the operator as a series of small clicks. The release transponder jaws can be operated out of water using a short acoustic air path between the release and the PAM unit dunker transducer, this distance should typically be 30 centimetres with a PAM and PT02 test transducer.

Please refer to the operating manual that was supplied with your EASYTRAK or PAM deck unit for the operational instructions required to control the release transponder, if your EASYTRAK / PAM operating manual does not have the relevant information than please contact Applied Acoustic Engineering for an up to date manual. Familiarise yourself with the operating command instructions before attempting to use the release transponder subsea.

Please note that release operations carried out on deck (out of water) to check / test or familiarise oneself with the release operation will use up the internal battery capacity and the number of available release operations will be reduced. Therefore please log all release operations carried out whether subsea or on deck to ensure that the maximum number of release operations is not exceeded. (Note unloaded atmospheric release operations for test purposes are equivalent to 50% of the normal operating battery power consumption; therefore treat 2 test release operations as a single fully loaded release operation regarding the log sheet).

It is important that the channel number and ID are known. This is necessary to be able to communicate with the transponder.

The following features are available when used with PAM 2520 with software versions Rev 3.0 and later: -

TEST OPTIONS

From the beacon test function within PAM, the operator may check basic transponder operation.

RANGE

Ranging to the transponder can be achieved by using the ranging function (not available with all transponder channels) to determine the 'slant range' between the dunking transducer and the transponder. The transponder is also compatible with various USBL (tracking) systems, depending on the settings inside the transponder. USBL tracking systems have the capability to locate the transponder by calculating range and bearing to the target transponder.

STATUS

Checks the operational status of the transponder. This includes monitoring of the tilt sensors, fault flags and release status as described in the following page.

TILT

Checks the four tilt switches. These are four non-mercury switches, which switch at approximately 15 degrees from the vertical, two for the X-axis and two for the Y-axis. These transponder may be supplied with tilt sensors to measure the transponder horizontally rather than vertically.

FAULT

Checks for fault conditions are monitored by the micro controller inside the transponder. The fault conditions are: Motor battery status, motor fault, release jam, release shaft broken. Within PAM, Zero indicates no fault found. One indicates a fault condition.

SLEEP

Allows the transponder to be put to sleep, which ensures that the device remains 'silent' until commanded to wake up. This conserves transmitter battery power and also ensures that the transponder cannot interfere with other systems operating in the same frequency band.

RELEASE

PAM displays 0 for a release which is ready to deploy release. After the release command has been used, PAM displays a 1 and the unit will require resetting.

ARM

1 indicates that the unit is armed an ready for a release command. 0 indicates that the transponder is awaiting the ARM command before the unit can be released. If the release flag is at 1 then it is not possible to ARM the release until a RESET has been performed.

Note: In common with other '500 series' release transponders, a release is only achieved after both an ARM and a RELEASE command. This ensures security of release. Once a release operation has occurred, the release will need to be re-set by re-installing a release block and using the RESET command.

JAM

The JAM command is not operational for the plastic (PERT) models. However with the Stainless Steel models it facilitates a shunting of the release motor back and forward in order to break and marine growth and thus ensures release.

Release Motor Torque Limitation

During release operations there is no fusing or torque limiting applied so that there is maximum chance of obtaining a full release, even under high biofoul conditions. It is felt that there is no need to attempt to protect the release motor from burning out whilst in a stalled condition if the release transponder doesn't achieve its task.

Better to know that every effort has been made to release!

Re-setting the Plastic End Release Transponder

The transponder will be supplied from the factory with a plastic block installed on the endcap as shown in the attached picture.

Once the release motor has turned and the plastic block has unscrewed from the threaded shaft, the shaft will be visible between the two side-cheeks. These side cheeks act as anti-rotation pieces to ensure that the block unscrews correctly. By pressing the spring retainer, these two side cheeks can be spread apart as shown in Picture 1. Note that the release motor rotates for a specific time rather than a specific number of turns. When operating in air, the plastic block will fall off some time before the motor stops. This is usual because with high load conditions and low temperatures, the motor will slow down as the battery voltage droops. The transponder is designed to release under low temperature and high load conditions!

The following photograph shows a new block being screwed onto the threaded shaft. It should be positioned so that the two side cheeks can now be rotated and snapped into place (Picture 3) the mechanism is now ready for re-use.

Picture 1

Picture 2

Picture 3

Before the unit is ready to be redeployed, a RESET command must be sent. This command is to be found within the ARM menu of PAM. The status display must read ARM = 0 and Release = 0.

If the unit is jammed or has intermittent operation, consult the troubleshooting guide in this manual. If problems persist, then please return the unit to Applied Acoustic Engineering for repair and servicing. Do not try to use the unit in a damaged or intermittent operating condition as it may well fail to release under water, this could lead to costly underwater recovery.

6. Disassembly

The release transponder should first be cleaned and dried and removed to a clean bench or work area.

Disassembly for replacing of the battery packs requires both ends of the transponder to be removed. For channel (frequency) changing, only the transducer end need be removed.

Procedure

Loosen the nuts that hold the transducer cage in place and check that there is not undue pressure build-up inside the transponder housing which might cause the end-cap to be propelled from the transponder body. Then remove the nuts holding the cage in position to allow the cage to be removed. Carefully hold the transducer and put it away from the body of the transponder, exposing the printed circuit boards that are attached to it. Withdraw the assembly until the end has been reached and then remove single black 6-way plug, which attach this assembly to the motor assembly.

If necessary, the release mechanism end-cap can be removed in a similar way, thus exposing the motor / gearbox and batteries attached to the end-cap.

Stored electrical energy may be in the battery packs and the printed circuit boards, so care must be exercised to ensure that damage or a short circuit cannot occur.

NOTE: If the transponder is cold and disassembly is difficult, allow it to warm to room temperature and end-cap removal will be easier.

Release Mechanism End-Cap

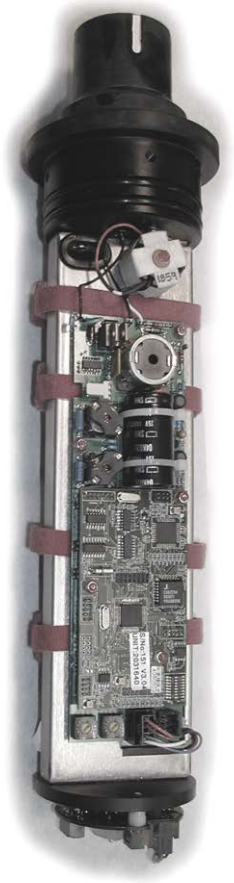
This ‘lower’ end-cap assembly consists of the motor and gearbox, which is surrounded by its independent battery pack.
This assembly connects to the top-end electronics by a cable and plug assembly. Hidden from view inside the end-cap are the thrust bearings that ensure that the gearbox does not receive undue axial pressure from operating in deep water.

Model 529P & 539P Transducer End-Cap

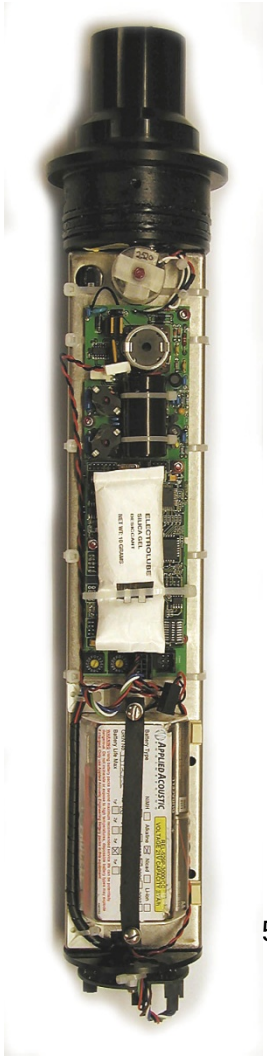
Mounted on the transducer end-cap is attached a chassis on which is mounted the main printed circuit boards and the receiver and transmitter battery packs.

The printed circuit board set consist of the following: -

1000-510	Rx/ Tx Board
1000-410 or 1000-5000	DFS or 'Processor' Board
529P-5000	Motor Control board



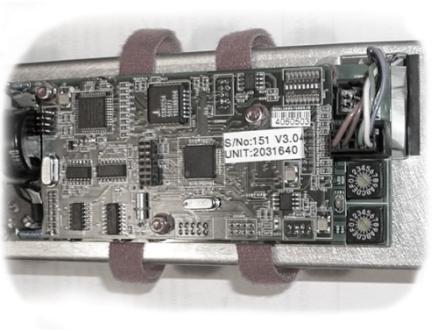
529P
Electronics



539P Electronics and
Transmitter Battery

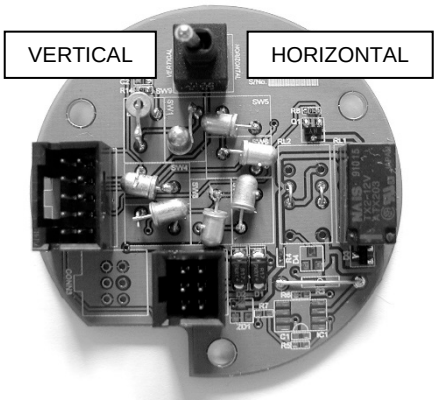
Circuit Board Identification

All models use a combined transmit / receive board on which a smaller circuit board known as the DFS board is fitted.



Model 529P & 539P

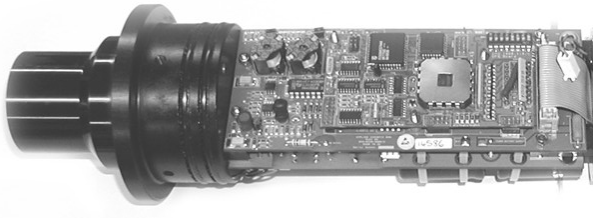
The DFS (or 'processor) board is fitted with an 8-way DIL switch. This sets several user parameters and is piggy backed onto a larger board.



The motor control board, shown, has tilt sensors fitted and on some variants has a switch to allow sensing of transponder tilt in the vertical or horizontal positions. The switch for adjustment (if fitted) is located on the board as shown.

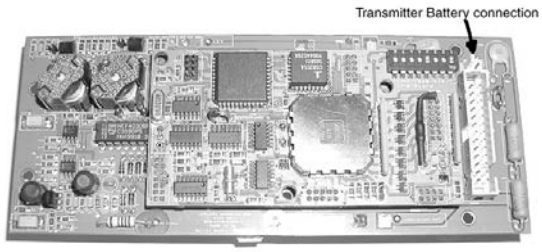
Horizontal tilt alignment indicator

Model 55X Transducer Endcap

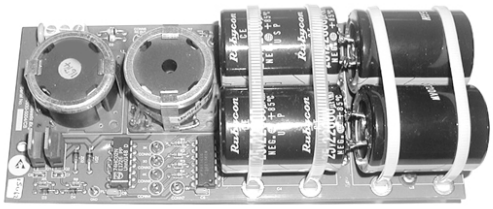


Displayed Electronics without Seabed Adaptor Fitted

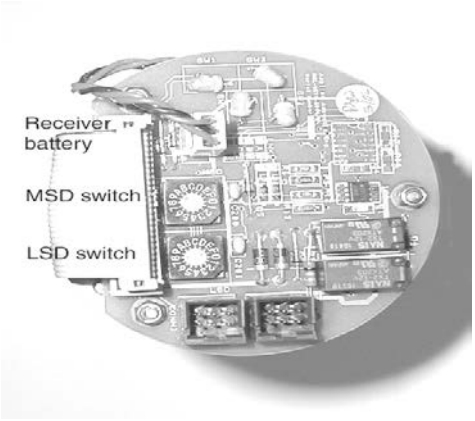
Circuit Board Identification



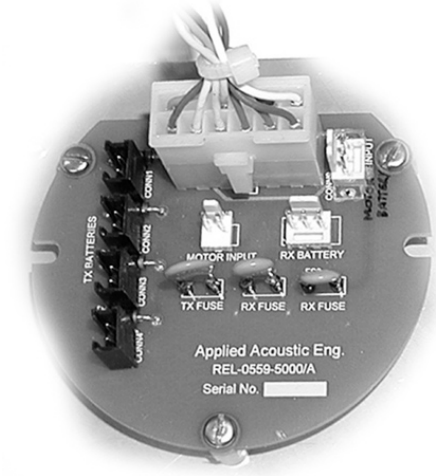
53x and 55x models have a receiver board contains the connector for the transmitter battery pack labelled CONN 8 TX BATTERY'



53x and 55x models: The transmitter board contains four storage capacitors and the transmitter circuitry itself. It also contains a 3-way screw connector to allow easy removal from the transducer wires.



The REL/Switch board is a round board fitted to the end of the assembly. Located on the board are 4 tilt sensors; relays to control the motor drive; connection for the receiver battery, CONN4, and two small rotary switches which control compatibility with various (USBL) tracking systems; these switches are connected to the processor board by a 26-way ribbon cable.



The battery board is fitted to Seabed (55X) releases only and allows multiple battery packs to be used.

7. Batteries

The 529P standard battery types are as follows: -

Motor Battery: Part Number REL-0539-3002

Tx Battery: Part Number REL-529P-3000 *(transmitter)*

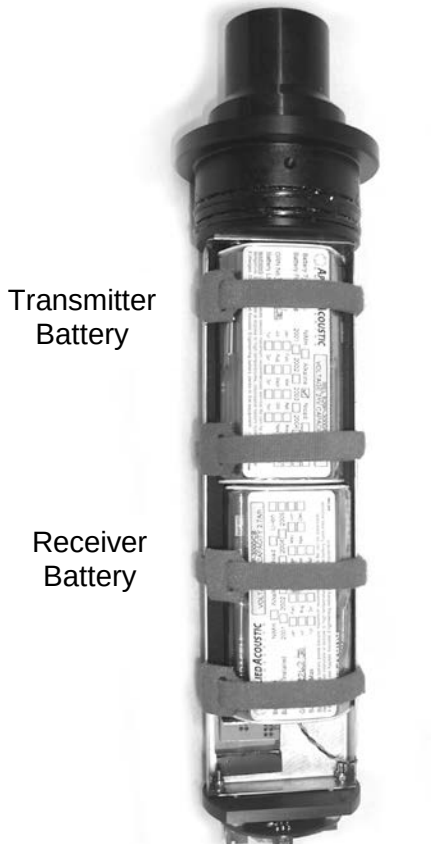
Rx Battery: Part Number REL-529P-3001 *(receiver)*

The 539P has a larger receiver battery:-

Rx Battery: Part Number REL-539P-3000 *(receiver)*

Note that the revision suffix may vary.

Lithium packs are available for extended listening life.



529P Battery Packs - Alkaline

539P Receiver Battery

It is recommended that: -

All 3 battery packs are replaced as a set, and replacement is simply a reversal of the removal procedure. In order to avoid power being applied when the transponder is apart, it is suggested that the batteries are only connected just before transponder re-assembly.

Receiver and transmitter battery pack replacement is as follows: -

The batteries for the transmitter and receiver are located on the main chassis behind the printed circuit board assembly. (Please see picture this page). The battery packs are held in place by Velcro type fasteners. Simply remove the fasteners and replace the batteries. Ensure that the battery pack wires are not caught when removing or replacing them.

Model 529P & 539P Motor Battery Replacement

The motor battery is located on the lower endcap as shown in the photographs below.

1) Remove the inter-connect wire from the battery and motor. Fig.1.
2) Next unfasten the rubber battery holder rings from the clips on the battery clamp. Fig. 2.
3) Lift off the battery clamp and lift off the battery from the motor. Fig. 3.
4) Replace the battery and reassemble.

Fig. 1

Fig. 2

Fig. 3

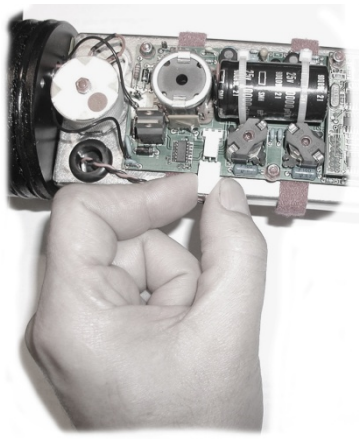
Model 529P & 539P Receiver and Transmitter Battery Replacement

Batteries should be replaced in the following order:-

1) Connect the motor battery and insert the motor end-cap into the pressure housing, first checking the o-rings are clean and lightly greased.

2) Connect the receiver battery to CONN 4 on the main board.

3) Connect the transmitter battery as shown in the photograph.



NOTE: It is advisable to tick the appropriate ‘date’ boxes on the battery labels so that installation date is known.

Re-assembly

Re-assembly is the reverse of the disassembly procedure. Ensure that o-rings are clean and lightly greased, and that the o-ring faces on the pressure housing have not been damaged.

Model 55xP Battery Replacement

The battery packs are located on the lower / release mechanism end-cap as shown.

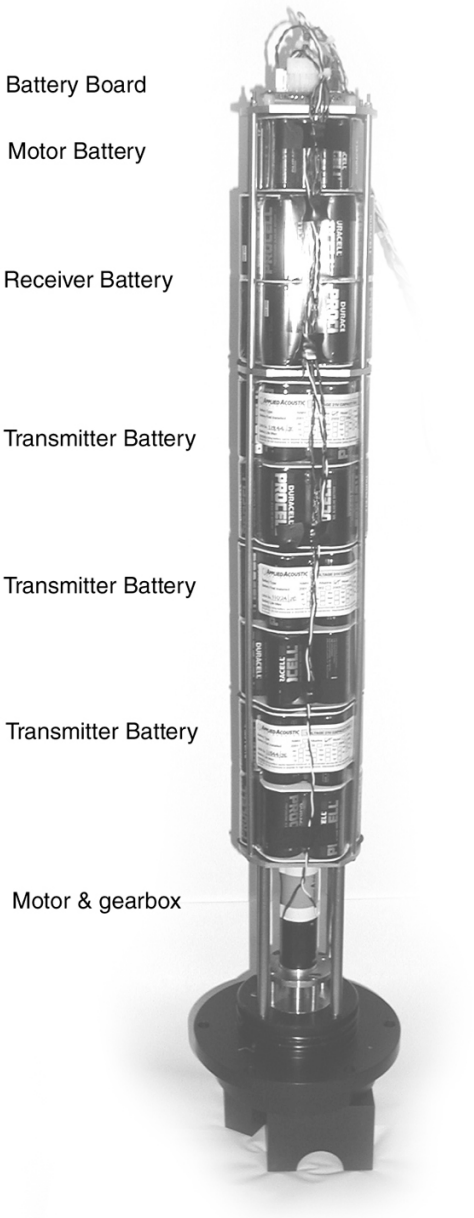
It is advisable to replace all battery packs as a set unless there are specific reasons otherwise! In order to replace the batteries, the top plate is first removed to allow access to the motor battery and receiver battery. Once these have been un-plugged for the battery board and removed, the 5 stainless steel tie-rods can be un-screwed to allow removal of the three transmitter battery packs.

Seabed Battery types are as follows: -

Motor Battery: Part Number REL-559P-3001

Rx Battery: Part Number REL-559P-3000 *(receiver)*

Tx Battery: Part Number REL-559P-3002 *(transmitter, 3 packs are required)*



Re-assembly

Re-assembly is the reverse of the disassembly procedure. Ensure that o-rings are clean and lightly greased and that the o-ring faces on the pressure housing have not been damaged.

NOTE: It is advisable to tick the appropriate ‘date’ boxes on the battery labels so that installation date is known.

8. Deployment

Before deploying the release subsea check the battery packs are not older than 12 months in age and the motor battery pack has sufficient release operations available. If the unit is going to be used for a long-term deployment, it is recommended that new batteries be installed in the release transponder. It is recommended that a log is set up for all release operations carried out on the motor battery pack from new, this log should record the date at which each release operation occurred and will eliminate the scenario of the release unit failing to release subsea. (Log record label is attached to the release body, which may be used).

Check that the sacrificial anodes are attached and have a reasonable amount of material left on them, if in doubt replace anodes as these components protect the body of the release transponder when underwater. If the release transponder unit is used without sufficient sacrificial anode protection, it will suffer irreparable damage that could compromise the safe working of the unit.

Examine the release transponder carefully for damaged or broken components. If any faulty or damaged components are found replace with new parts before attempting to use the release. All replacement parts should be sourced from Applied Acoustic Engineering to guarantee correct operational use and safety margins.

Attach only tested stainless steel shackles and lifting rings to the release body. The recommended stainless steel shackles will provide safe trouble-free release operations and resist corrosion during long deployment in seawater; they should also be supplied with a safety certificate from your supplier.

The release can now be used to support a static weight of 250 kg, on board ship this weight is influenced by the ships motion in the water and heavy swells will add dynamic loading to this load case. The release has designed-in safety capacity which will allow for intermittent overloading during heavy sea swell conditions, although if the conditions are too rough it is recommended that no attempt is made to use the release unit. Avoid catching the dead weight suspended from the release or the release transponder body on any part of the ships superstructure during the lifting operation, if this occurs it will stress the release transponders body momentarily, possibly beyond its maximum rated load capacity and the unit may fail or become dangerous to use.

If the release unit has been stressed by lifting over it's rated capacity or damaged during use it must be mechanically inspected and re-certified to ensure safe operating conditions.

When you are familiar with the release command instructions on the PAM unit and you are confident that the release transponder unit is fully functional (i.e. it has available release operations left in the battery pack) and that the correct lifting shackles are used, then you are ready to use the unit underwater.

Drag line

It is good practice to attach a drag line to the release transponder to assist in the recovery in the advent of mechanical failure or discharged battery packs. The drag line should be connected to the weight that is used to sink the release unit in the water and care should be taken to make sure it does not interfere with the release mechanism operation. The line should be no less than 20m long with a reasonable weight on the end say 8.0 kg+. If deployed North to South for example, it can be dragged for East-West, and the chance of recovery are greatly increased.

9. Recovery

On release from the seabed, please ensure that the release transponder is not damaged during the hoisting operation to bring the unit onboard ship. Mechanical damage will reduce the operating life of the beacon, possibly making it unsafe for immediate use. Wash the unit down with clean water on recovery and examine the release for corrosion damage on all external parts.

Record the release operation and date on a log sheet for future available release operations remaining in the motor battery pack being used in the release transponder.

10. Servicing & Spares

To ensure reliable operation in use, Applied Acoustic Engineering recommends the following service intervals: -

The release transponder unit should be inspected following each and every release operation for mechanical damage and wear to rotating/moving parts.

Anodes should be checked and replaced if necessary. This will depend on the expected work duration, water temperature and past experience at the site. If in doubt, use new ones!

Depending on local laws or company specific guidelines regarding lifting equipment, the release may require a 6 monthly or annual SWL test.

It is recommended that annually the unit should be serviced by the manufacturer to ensure reliable and safe operation at which time a pull test can be carried out.

Spares

The following field service spares are available. Please consult the factory if further information is desired

PART DESCRIPTION	PART NUMBER
Anode	BCN-0950-2011/n
Release Block	REL-529P-2002/n
Model 529P/539P Cage	REL-529P-2100/n
Model 55xP Cage	BCN-0950-2001/n
Battery Packs:-	
Model 529P	
Receiver Battery Pack Alkaline 9v (529P)	REL-529P-3001/n
Transmitter Battery Pack Alkaline	REL-529P-3000/n
(The above two items are to be used as a pair)	
Motor Battery Pack Alkaline	REL-0539-3002/n
Model 539P	
Receiver Battery Pack Alkaline 10.5v (539P)	REL-539P-3000/n
Transmitter Battery Pack Alkaline	REL-529P-3000/n
(The above two items are to be used as a pair)	
Motor Battery Pack Alkaline	REL-0539-3002/n
Model 529P	
Receiver Battery Pack Lithium	REL-529P-3002/n
Transmitter battery pack Alkaline	REL-529P-3003/n
(Note the above two items are to used as a pair)	
Model 55xP	
Receiver Battery Pack Alkaline	REL-559P-3000/n
Transmitter Battery Pack Alkaline	REL-559P-3002/n
Motor Battery Pack Alkaline	REL-559P-3001/n

(In the above, /n denotes the most recent revision letter)

11. 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.

12. Specifications

General

Housing Material	:	Anodised Aluminium Alloy
Release mechanism	:	Acetyl Plastic & Nylon
All Fixings	:	Stainless Steel 316
Corrosion Protection	:	Sacrificial Anodes
Operating Temperature Range	:	0 to 30 deg C
Storage Temperature	:	- 5 to 45 C
Depth Rating	:	1000m Models 529P / 539P
	:	1500m Models 555P / 559P / 553P

NOTE: A published depth rating does not necessarily imply that a particular product will acoustically operate at that depth at all times.

SWL (Safe Working Load)	:	250kg
Proof Load Tested to	:	500kg
Release Operations available on a New Battery Pack	:	70 in Total Max
Time Taken for Release Operation	:	45+ Seconds

Tilt sensing to +/- 15 degrees measured from the vertical. Optional horizontal sensors can be fitted. The tilt sensors are not calibrated.

Frequency Band	:	Medium Frequency Band 20 to 32 KHz
Turn around delay	:	15 / 30 / 60 mS dependent on system selected
Channels / frequencies	:	HPR300 Sonardyne USBL 14
	:	HPR400 56
	:	ORE Trackpoint II 9
	:	Sonardyne Compatt IIF Channels MF 1 – MF 8

Model 529P and 539P

Weight	:	529P 11 kg / 539P 13 kg
Weight in Water	:	529P 6 kg / 539P 7 kg
Size	:	785 / 940 mm long x 100 mm tube diameter
Transmitter Power	:	186-8 dB +/- 90 degrees (>Hemispherical)
Motor Battery Pack	:	18.5 V 5400mA / hr capacity Alkaline
Transmitter Battery Pack	:	21.5V - 2700mA / hr capacity Alkaline with thermal fusing
Receiver Battery Pack 529P	:	9.0V - 8100mA / hr capacity Alkaline with thermal Fusing. 4 month listening life
Receiver battery pack 539P	:	10.5V – 23.25 A / hr capacity Alkaline with thermal Fusing. 12 month listening life
Motor Battery Pack Life	:	1 year and 70 Release Operations.

Motor current (no load in air) is approximately 150-200 mA @ 12Volts

Transmitter battery life	:	1 year or 200,000 TX replies. (A telemetry reply counts as 5 transmissions)

NOTE: All Battery packs are of the non-rechargeable type.

Model 559P, 555P and 553P

Weight	:	25 Kg
Weight in Water	:	10 Kg
Size	:	1270 x 178mm diameter Tube diameter 125mm
Transmitter Power	:	559P 186-8 dB +/- 90 degrees 555P 191dB +/- 45 degrees 553P 197dB +/-30 degrees
Motor Battery Pack	:	18.5 V 5400mAhr capacity Alkaline
Transmitter Battery Pack	:	21.5V - 5400mA / hr capacity Alkaline with thermal fusing
Receiver Battery Pack	:	10.5V - 3600mA / hr capacity Alkaline with thermal fusing.
Motor Battery Pack Life	:	1 year and 70 release operations.

Motor current (no load in air) is approximately 150-200 mA @ 12Volts

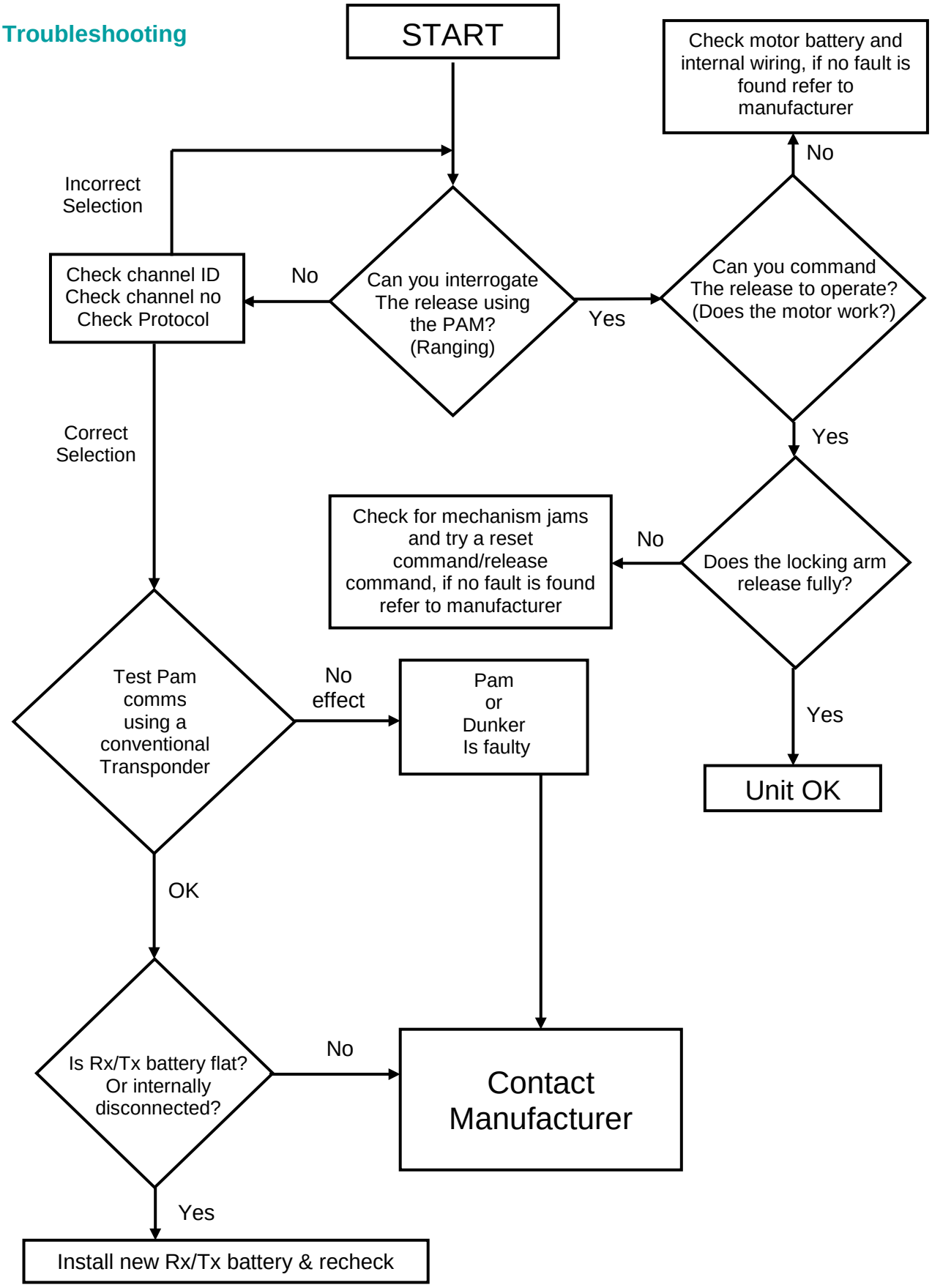
Transmitter Battery Life	:	1.5 year or 2,500,000 TX replies. (A telemetry reply counts as 5 transmissions)
Receiver Battery Life	:	1.5 year

NOTE: All Battery packs are of the non-rechargeable type.

Shackle Fixing Details

The aperture in the release block for the lower-end fixing shackle is 15 mm diameter and the block is 28 mm thick.

13. Troubleshooting



Is Performance Poor?

- If the answer is yes, then please consider the following: -
- If you have a similar model, is performance the same? This will identify with a control if there is a fault.
- 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 results are different to another model? You may be comparing different models and different specifications. Only use like for like comparisons.
- Check on a different channel (frequency) to see if performance changes.
- Is the release mechanism failing to operate when tested prior to being used subsea, if so please check for fouling around jaw mechanism.
- Is the release very slow at performing a release when tested prior to being used subsea, if so please check for fouling or corrosion and also check battery state (check the number of release operations left on the battery pack being used).

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

Applied Acoustic Engineering is a leading company in the design and manufacture of a wide range of subsea navigation and positioning products, and marine seismic survey equipment.

The extensive product range includes the innovative USBL tracking system, Easytrak, a variety of positioning and release beacons and seismic devices for offshore geotechnical and seabed analysis known as sub-bottom profiling.

All products use acoustics, underwater sound waves, in location, positioning, navigation and data acquisition applications.system, Easytrak, a variety of positioning and release beacons and seismic devices for offshore geotechnical and seabed analysis known as sub-bottom profiling.

European Quality Assurance

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