FIOMARINE INDUSTRIES PTY LIMITED

ACN 074 357 869
ABN 91 442 031 533

Acoustic Model Fiobuoy®
and Deck Interface Unit

- USER MANUAL -

(Revision Dec 2005)

Defence Recognised Supplier
Australian Defence Industry

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If you only ever read

one part of this manual,

read

Section 24-

‘ AVOIDING PROBLEMS - A LAST WORD ’

Contents

1. Fiobuoy® Concept - Overview

The Fiobuoy is a submersible marine marker buoy which is designed to release itself from its underwater mooring, either at a predetermined time and date*, or via Acoustic Command, and ascend to the surface to fulfil its marking function.

The product was developed for the principal purpose of removing from the marine environment, unnecessary surface protrusions which, particularly under night conditions and in other circumstances where there is poor visibility, become hazardous to marine navigation. In addition to its marking function, the device provides access to submerged objects more easily by permitting those objects to be retrieved via its connecting tether, rather than deploying special diving personnel.

The process of ascent occurs as a result of positive buoyancy. The Release Mechanism built into the Fiobuoy is an electro-mechanical device which is computer controlled. The mechanism is programmed by a hand-held controller prior to each complete operation or deployment. The communication link between the Fiobuoy or the Deck Interface Unit, and controller is via a special direct-contact infra-red signal and is security coded.

The hand-held controller (or terminal) is a portable computer specifically supplied by Fiomarine Industries for programming the Fiobuoy or operating the Deck Interface Unit (DIU). The programming function can also be undertaken by either a standard desktop or laptop computer (ie. a PC).

* Time/Date setting is ‘absolute’ ie. you enter a specific time & date (as opposed to ‘relative’ where you would indicate a time period ‘ x ’ days/hours from now)

Pre-deployment setup

The deployed Fiobuoy

Fiobuoy actuates via Acoustic Command or Time/Date trigger

Fiobuoy fulfils its surface-marker role

2. COMMUNICATIONS CONCEPT - Overview

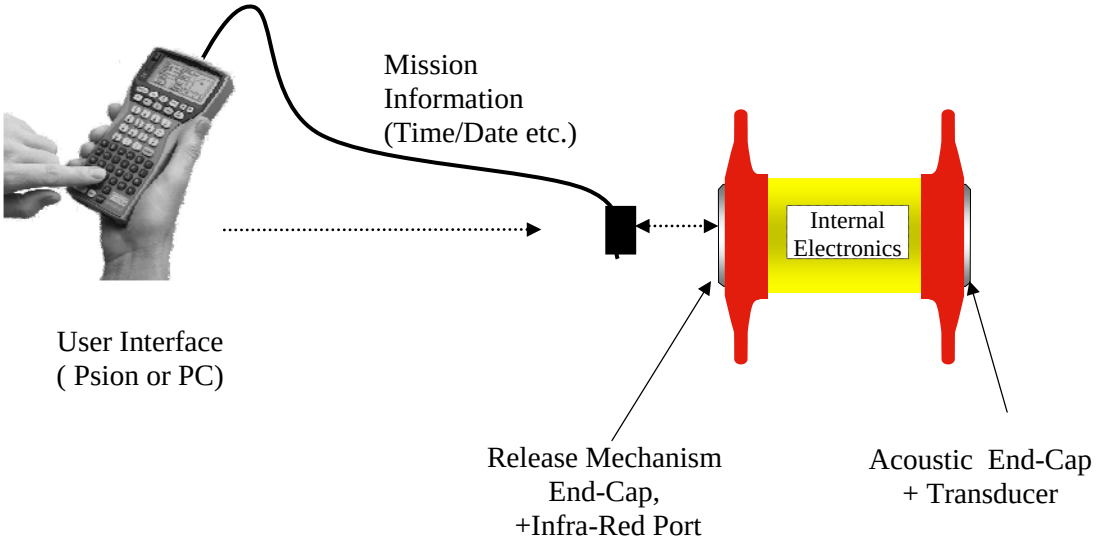
There are two phases of communication with the Fiobuoy® System.

The first phase is where mission information is placed into the Fiobuoy itself before deployment.

This is done via a special direct-contact Infra-Red Communications Cable, using either a PC/Laptop, or the Psion WorkAbout hand held PC (as supplied) for the User Interface.

Once the information is programmed into the Fiobuoy, assuming all appropriate tether line and mooring attachments have been carried out, it is then ready for deployment.

Pre-Deployment Programming and Setup of the Fiobuoy®



The second phase, is communication with a deployed Fiobuoy via acoustics.

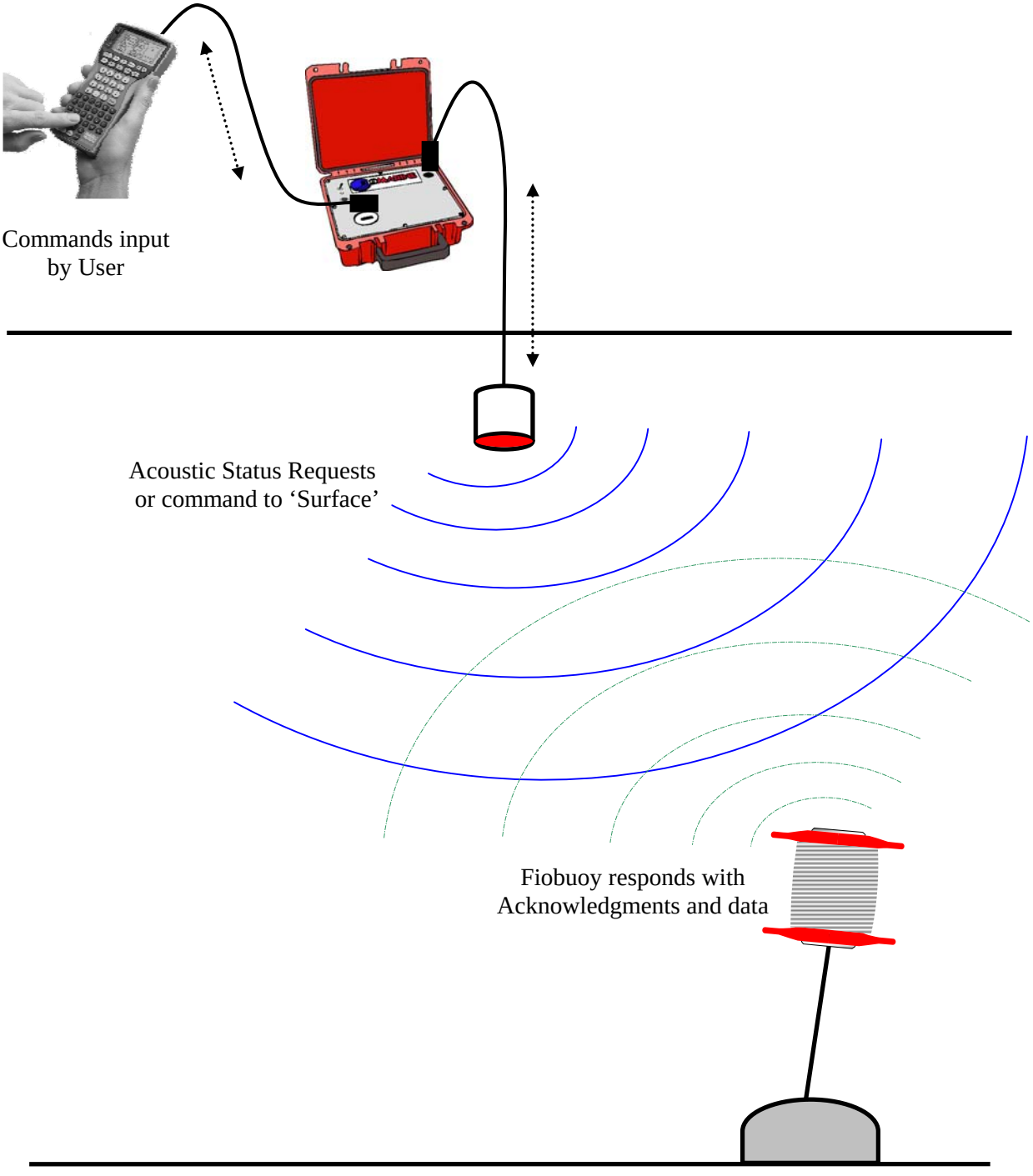
The same PC/Laptop/Psion User Interface is used, however the Infra-Red Communications Cable is now connected to the Deck Interface Unit (DIU).

Commands input by the User are processed and converted into acoustic signals, which in turn are transmitted through the water by means of a special Acoustic Dunking Transducer.

The acoustic signals are then received, acknowledged, and acted upon by the submerged Fiobuoy. The transmitted data will include such things as requests for deployed status information, or commands to 'Surface'.

Fiomarine Deck Interface Unit (DIU)
and Acoustic Dunking Transducer

Communication Flow with a deployed Fiobuoy.



On a technical point, the Fiobuoy is constructed with a 'zero leaks' philosophy, and so pre-deployment communication between the terminal and the internal electronics is accomplished via infra-red light actually transmitted through the casing. This method was chosen because conventional plugs and sockets not only leak, but also corrode in a harsh marine environment. Similarly, the integral Acoustic Transducer is housed within the Fiobuoy body, so as not to cause any protrudence or need for extra water-tight seals.

For the same reasons, there is no ON/OFF switch on the Fiobuoy. Instead, the Fiobuoy spends most of it's serviceable life in a **'Standby'** mode. When in this mode, very little power is consumed, and this allows for longer battery life.

The Fiobuoy is 'woken' from its standby mode, in one of five ways:

1. By the User, via the Direct-Contact Infra-Red Comms port (to program mission parameters etc.)
2. By the User sending an Acoustic Command via the DIU
3. When an actual pre-programmed (timed) Release Event is about to take place.;
4. During its automated, daily diagnosis of battery condition etc.
5. When a 'leak' is detected inside the chamber.

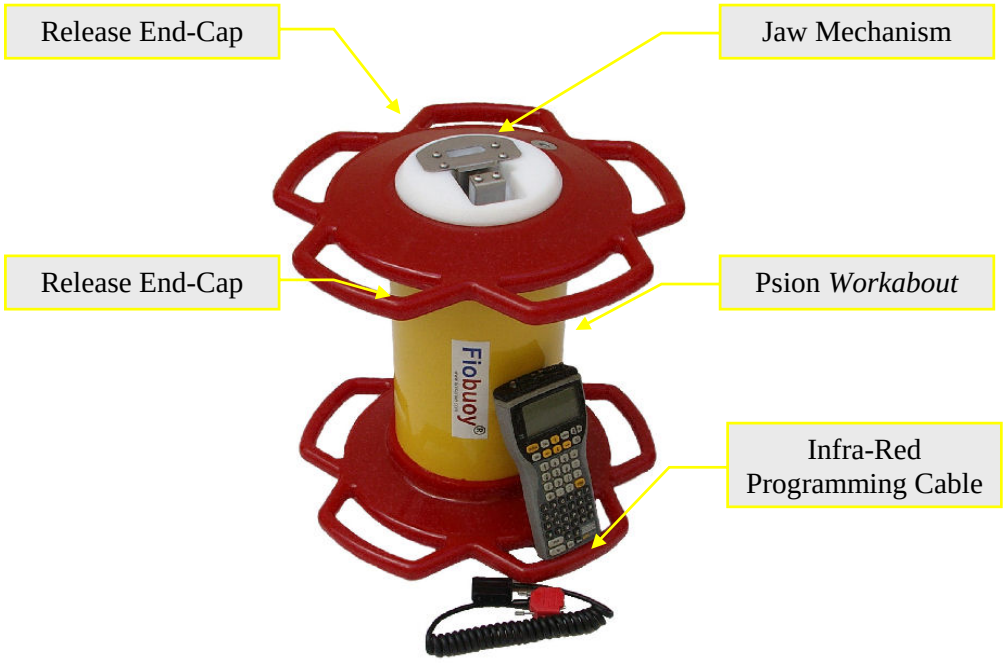
After any 'awakening', 'standby' mode is re-entered automatically following a predetermined period of inaction.

The Acoustic Fiobuoy®

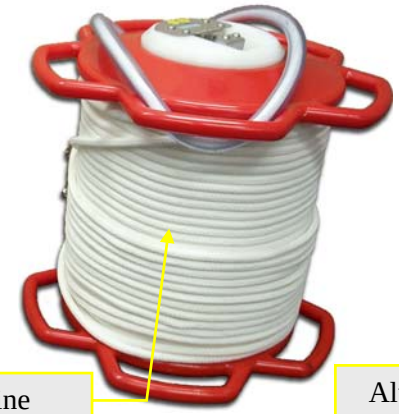
3. DESCRIPTION OF PRINCIPAL COMPONENTS

Illustrations of the principal components of the Fiobuoy® System are presented in the following:

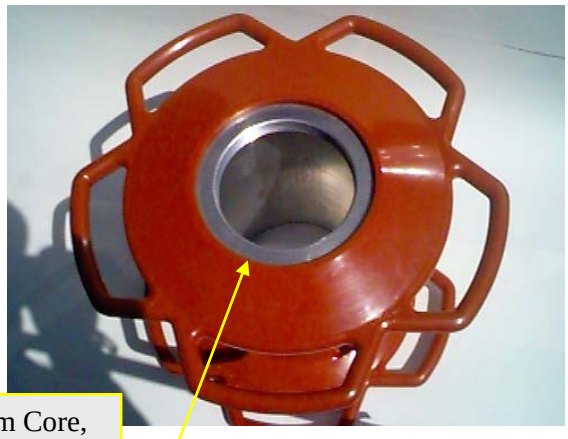
FIOBUOY® (without rope) assembled, with Release Mechanism showing.



Fiobuoy, assembled with rope



Fiobuoy, unassembled



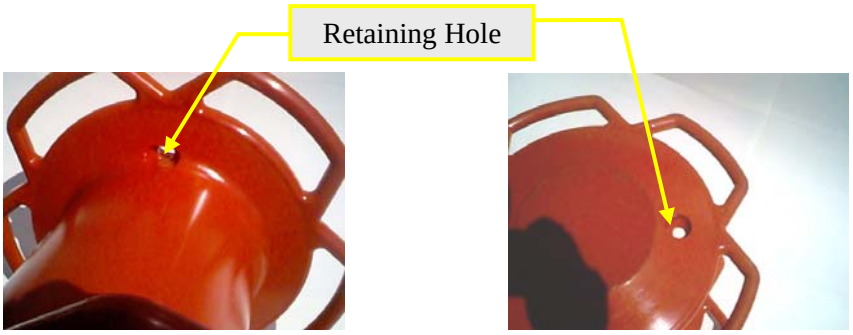
4. ATTACHMENT OF FITTINGS

The instructions in this section are intended to address the needs of those users who elected to supply or replace the tether-line rope themselves. We strongly encourage those users to seek advice from Fiomarine Industries Pty Ltd on the correct selection of rope since this is critical to the proper performance of the Fiobuoy.

Where the Fiobuoy is already supplied with ropes and attachments installed, proceed directly to the next Section "**COMMUNICATING WITH THE FIOBUOY**".

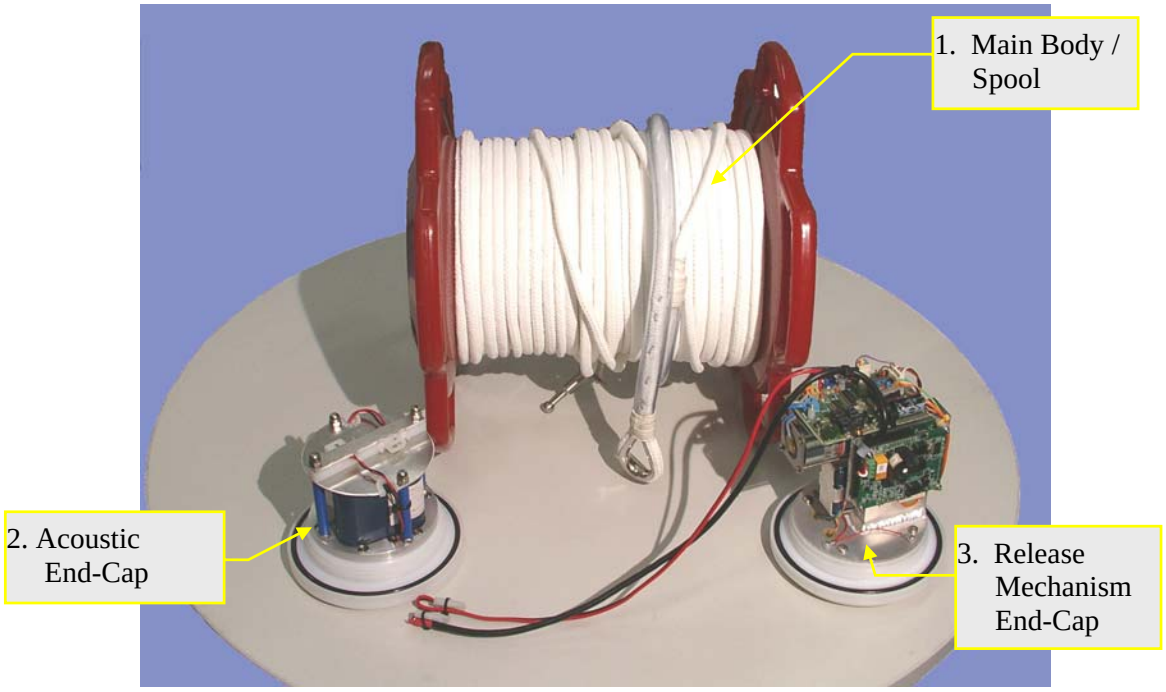
To install the rope and fittings, please observe the following steps:

1. In the flange of the body, locate the retaining hole shown in the following illustrations:

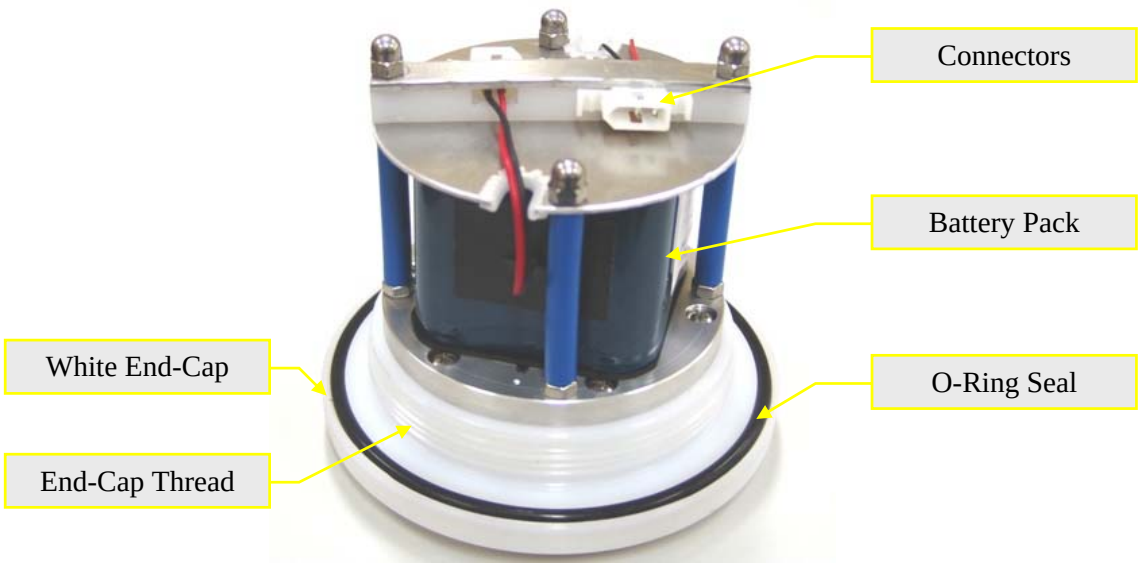


2. Pass one end of the rope from the inside of the flange through the hole; approximately 10cm to 15cm of length should be sufficient.
3. Then tie a knot firmly with this length and pull the rope back to the inside, making sure that the knot rests securely in (and is properly restrained by) the retaining hole.
4. Cut off any excess length of rope (past the knot) on the outside of the flange to avoid possible entanglement during operation.
5. Stitch the knot for further security.

INTERNAL COMPONENTS
The Acoustic Model Fiobuoy comprises 3 main parts:

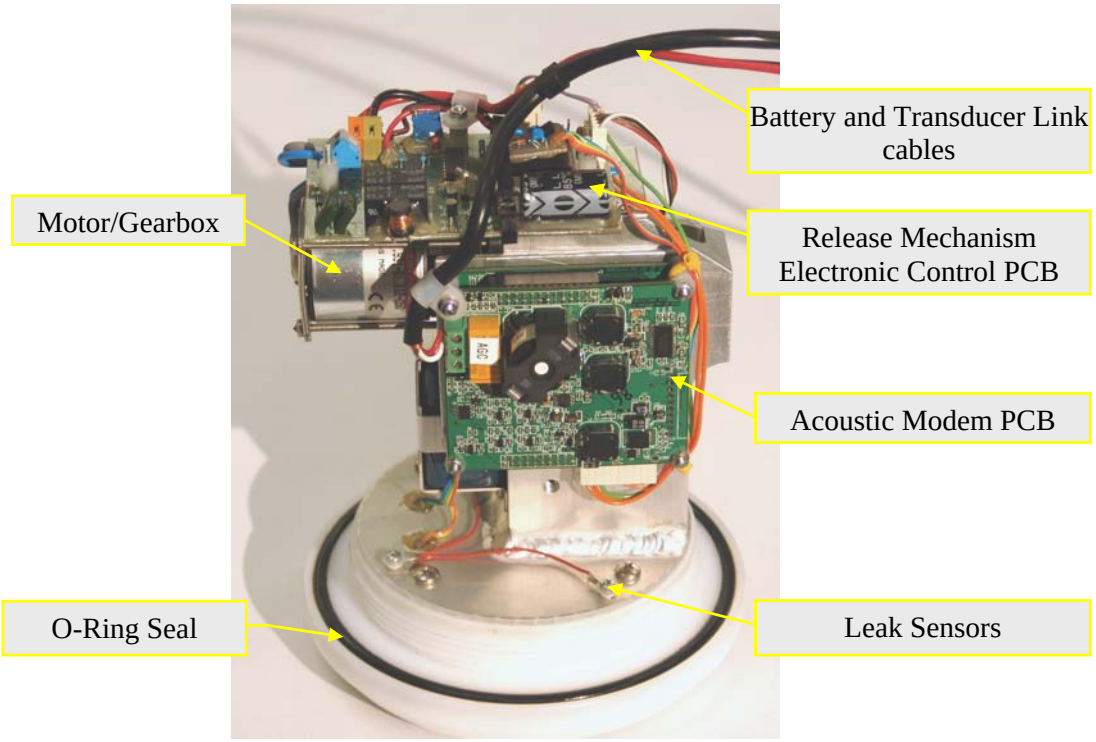


Acoustic End-Cap Assembly



The Acoustic End-Cap and Battery Pack are located at the opposite end to the Release Mechanism Endcap. The 2 sections are linked internally by 2 cables.

Release Mechanism End-Cap Assembly



IMPORTANT NOTE

During battery replacement it is not necessary to remove the Release Mechanism End-Cap. For other maintenance where the Release Mechanism End-Cap does have to be removed, it is important to remove the Acoustic End-Cap first !

✗ Removing the Release Mechanism End-Cap first, may cause the internal cables to tangle during the unscrewing process and damage the unit.

✓ REMOVE THE ACOUSTIC END-CAP FIRST !

5. COMMUNICATION WITH THE FIOBUOY or DIU

- Using the Psion Hand Held Terminal

We have selected the well known PSION ***work****about* hand held terminal as the preferred unit for the User Interface when communicating with Fiobuoy components As supplied by Fiomarine, it is set to start up and automatically boot to its communications mode at switch on, with a screen format of 29 characters by 12 lines.

Generally, for normal operation you will use the following keys:

- the number keys [1] to [0]
- the [ENTER] key
- the [Y] & [N] keys (for Yes and No responses)
- the [BS] (backspace) Key

We have also included the PSION ***work****about* User Guide. We recommend you read the initial chapters about its general use, and advanced features of this very versatile device. Please refer to the Psion's User Guide should any non-routine events arise.

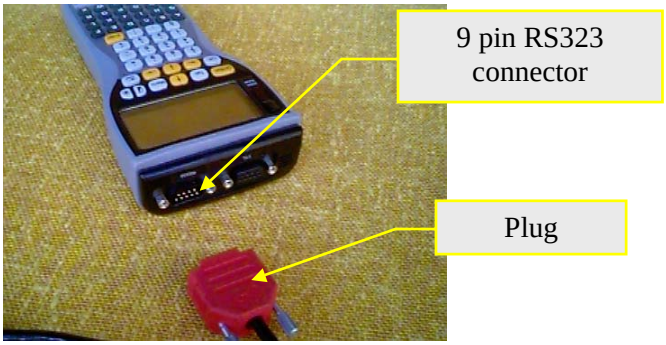
Psion Battery Replacement and reset.

On occasions, after replacing the Lithium Battery, or via inadvertent action by the User, the Psion may loose some factory settings. The following is a quick guide to resetting these parameters. From a fully powered down state –

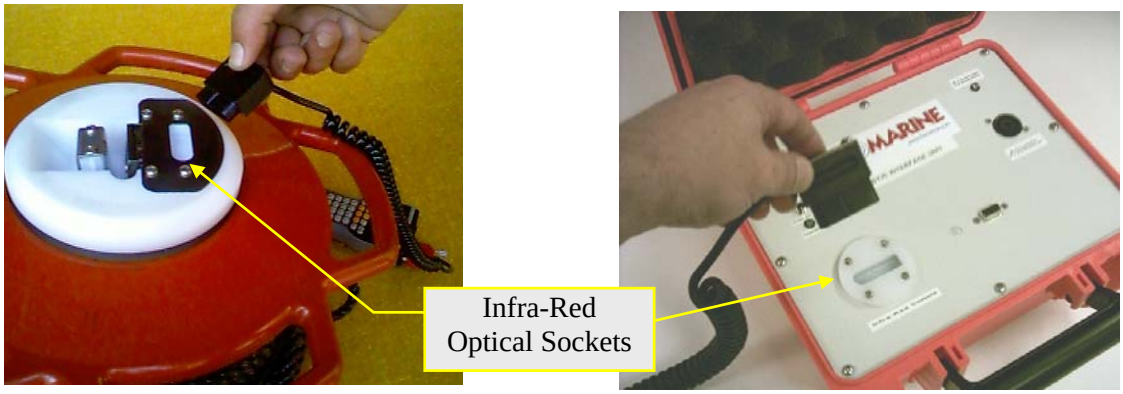
- Insert Main and Lithium batteries and press [On/Esc]
- Wait for the Psion banner to appear, the press [Menu]
- Select 'System screen' (using the arrow keys), press [Enter]
- From the screen showing icons labelled- 'Data', 'Calc' and 'Sheet', arrow right until 'Comms' is selected, press [Enter].
- Set comms parameters by holding down the special Psion key **U** and pressing [J], adjust the 'Baud rate' parameter to '1200', and the 'Port' to 'A'. Press [Enter] to accept changes and exit.
- Hold down the Psion key **U** again, and press [K]. Alter the 4 parameters if necessary so they are sequentially: On, Off, Off, Off in that order. Press [Enter] to exit.

The Psion is now set for Infra-Red comms to the Fiobuoy® or DIU.

PLUGGING IN
Connect the spiral cable (supplied) to the 9 pin connector marked RS232, at the top of the ***work****about*.



The opposite end of the cable plugs into a special 'D' shaped optical socket which, the Fiobuoy is located on the 'Jaw End-Cap', and for the DIU, is located on the front panel. These sockets should be kept clean to allow reliable communications.

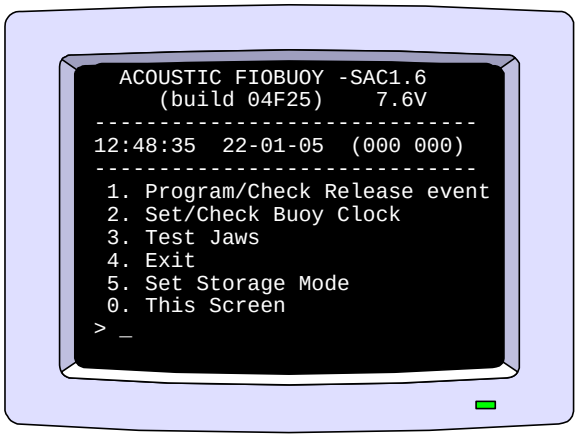


Press the yellow [On/Esc] button, and the ***work****about* will power up ready for you to establish communications.

Communicating with Your PC or Laptop

If you are using a PC or Laptop as the User Interface, connect the spiral cable (supplied) to your spare 'Comms' port**.

The other end of the cable plugs into either the socket located at the 'Jaws' end of the Fiobuoy or the similar socket on the DIU front panel. These sockets should be kept clean to allow reliable communications.



Turn you PC on, and run any general purpose Terminal program (ask your Fiobuoy supplier if you need help with that). Set the comms setting to 1200 baud, 8 bits, no parity, 1 stop bit (with plain TTY type protocol). Ensure the Comm Port parameter (ie Comm1) is the one you have plugged the cable into !

Generally, for normal operation you will use:

- the number keys [1] to [0]
- the [ENTER] key
- the [Y] & [N] keys (for Yes and No responses)
- the [BS] (backspace) Key

Connection is the same as described on the previous page.

** For laptops which do not have RS232 Comm Ports, converters for USB ports are available from electronics outlets.

6. Pre-Deployment set-up of the Fiobuoy

Connect the Psion or PC as per instructions in the previous section, then bring the Fiobuoy out of Standby mode by simply pressing the 'Enter' key twice (not pausing longer than ½ sec between).

The Password
The unit's Serial Number will the be displayed, and you will be prompted to enter its password (supplied). This is a preset password and is not alterable. It is a 'security tool ', intended as a safeguard against the possible misuse of your Fiobuoy . It needs to be protected in order to prevent any unauthorised use.

```
Wake
 Buoy Serial No. 05H0036
 Enter Password: _
```

(When keying in your password, 'Backspaces' are allowed, and the [Enter] key is necessary to finish. If no password is received within 12 seconds, Standby mode is re-entered automatically.)

The Banner
Next, on the top half of your screen, you will see a Banner showing the Model and Version Number of your Fiobuoy.

```
  ACOUSTIC FIOBUOY –SAC1.6
     (build 04F25     7.6V
------------------------------
12:48:35  22-01-05  (000 000)
------------------------------
```

Other information given here is:

- An indication of the current Battery Voltage (nominally 7.5V)
- the Time and Date of the Fiobuoy's own ***internal*** clock/calendar
- 2 counters (in brackets).

The two counters keep track of (successful) jaw mechanism actuations ('Openings' and 'Closings' respectively). They are provided for your information and may be retained, or reset to zero at any time.

The MENU
Appearing directly below is a numbered Options Menu:

```
 1. Program/Check Release event
 2. Set/Check Buoy Clock
 3. Test Jaws
 4. Exit
 5. Set Storage Mode
 0. This Screen
> _
```

followed by the **>** command prompt. (_ indicates the screen cursor)
The [Enter] key is not needed to select these menu options

In the case where new batteries just have been installed, the internal Clock/Calendar will need to be set, and a warning appears at the command prompt until that is done:

```
 WARNING: Buoy Clock not set
> _
```

Now let's look at each of the Menu Options and the programming required for deployment -

MENU OPTION 1 – Program Release Event

Consistent with the overall philosophy of the Fiobuoy® System, this time and date can be used as a backup to the Acoustic activation method, should there be a failure.

This step is required to close the Jaw so that it will accept the Release Pin for deployment. In this way, it will not allow the User to deploy the Fiobuoy without a pre-programmed back-up Timed Release Event.

Note 1: There is no automatic return to sleep mode '**during'** any of these programming stages

.

Note 2: none of the **time or date** information is held or saved inside the Psion ***work****about* unit (or your PC/Laptop). It is **retained <u>inside</u> the Fiobuoy only**

.

STAGE 1: Setting the Release Event 'Date'

User: 1
Buoy:
```
Release Date: (DD-MM-YY)
   [16-08-06]  _
```

The date in (round) brackets is a guide for the format and sequence of input:

DD means day of the month (01 to 31),
MM means the number of the month (01 - 12),
YY is the last 2 digits of the year (00-99).

Note that two digits are expected for each, so, for instance the 8th should be entered as 08. Backspace is not supported here. If a mistake is made during entry, continue (ie. complete the entry), then start again. Before and after each 'month', hyphens are automatically inserted ***so there is no need to type them in.***

The date in [square] brackets is the date previously programmed into the Fiobuoy. **By pressing [ENTER] you can leave it unchanged** ! Or you can enter a new date for your future Release Event in the format expected.

The following example is for 28th August 2006:

User:
Buoy:
User:

```
        280806
Confirm: _
        280806
```

As a precaution against errors, you are asked to re-enter the date as confirmation.
Note: This "confirmation" feature is user configurable. It can be disabled so that date and time need only be entered once each (see Hidden Menu Options). It does not apply to setting the Fiobuoy's own internal clock.

STAGE 2: Setting the Release Event 'Time'

Buoy:

```
Release Time: (hh:mm)
   [09:00:00]: _
```

You are now asked for the time of day for the future **Release Event** (in 24 hour format). Only hours and minutes are needed (seconds are set to 00 automatically). A 'colon' is automatically printed between hours and minutes for clarity. Again, ***don't type it in.*** As with the date format, single digit times should have a leading zero (eg. for 9:15am, enter 0915).

User:
Buoy:
User:
Buoy:
User:
Buoy:

```
        0915
 Confirm:_
        0915
Enable Strobe? [y/n]:
                    n
Set for 13:00:00 on 28-08-06
Strobe off
OK to close ? _
```

← NOTE. Strobe prompt is only given for units with Strobe Light Option installed

STAGE 3: Closing the Jaws

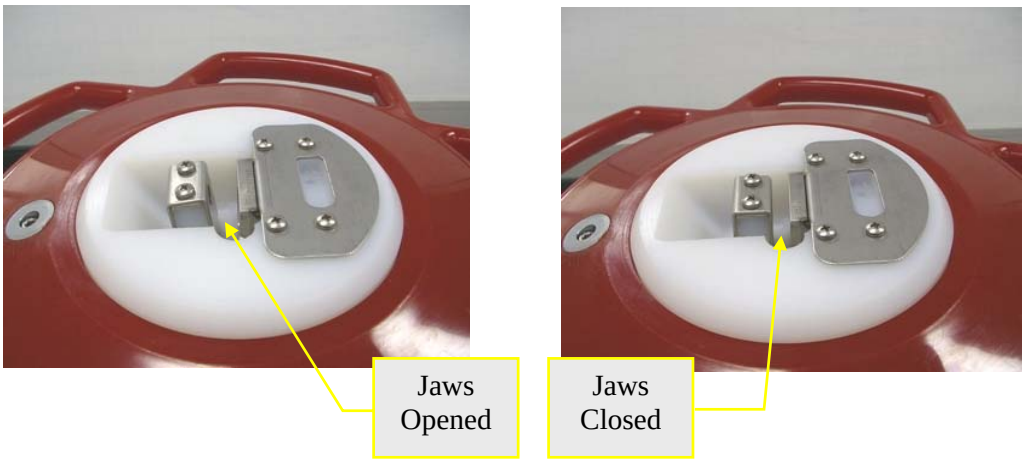
The Mechanical Jaws are about to be closed !. While slow moving, they are quite powerful, so you are strongly advised to avoid touching the jaws during closure in order to prevent personal injury. You are prompted for an OK to proceed. Entering a 'Y' (or 'y') will be taken as a Yes/OK. **ANY OTHER RESPONSE** will be interpreted in the negative.
Closing the jaw mechanism may take up to 30 seconds:

User: Y
Buoy:
```
Closing Jaws... Closed !
 7.5 before, 7.0 during
> _
```

The two battery readings displayed on the screen are intended to inform the user on the condition of the battery pack. The "before" reading represents the condition under no load while "during" represents the condition under load (ie. during the closing process). If the control circuitry deems the battery to be too low, the closure is aborted and the jaws return to the open position.

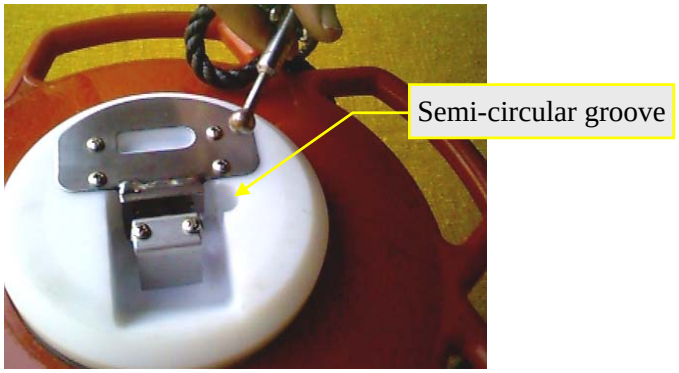
NOTE: When fully open, the jaws are approximately 15 mm apart; when fully closed, they continue to remain apart but at a distance of approximately 10mm. Therefore, jaw closure represents a movement of only some 5 mm, which is sufficient to secure the spherical end of the release pin within the plate cavities of the jaws.

***CAUTION SHOULD BE EXERCISED DURING JAW CLOSURE TO PREVENT PERSONAL INJURY.**

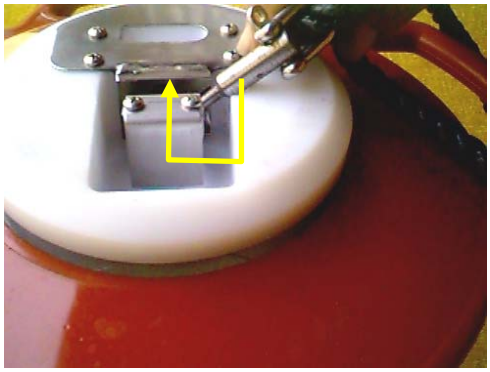


STAGE 4: Inserting the release pin
You should now fit the **Release Pin** into the Jaw Mechanism. Ensure it is located properly and the tether line is made fast in accordance with the following 3 steps:

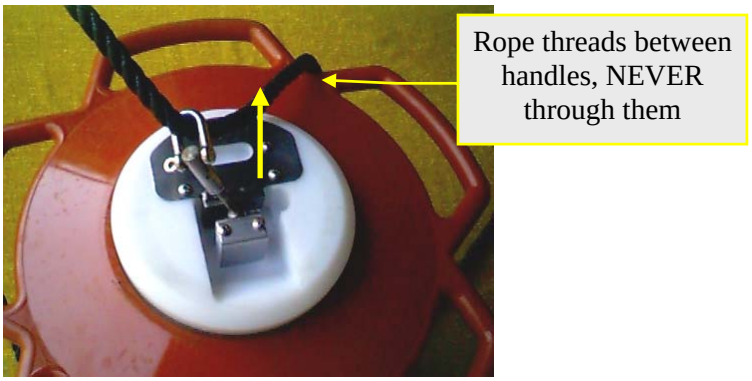
Step 1.
Locate the semi-circular groove within the white End-Cap and insert the spherical end of the Release Pin down the groove as far as possible:



Step 2.
Move the ball of the Pin toward the center of the jaw, then finally upward again through the channel in the Jaw Plates:



Step 3.
Hold the pin upright, and give a firm tug upward so there is an obvious 'click' when the spherical end of pin engages into the plate cavities of the jaws, and is held fast:



NOTE. The tether line must NEVER be threaded through the handles, but simply rests between two.

MENU OPTION 2 – Set Buoy Clock

This procedure is strongly recommended for each deployment (along with Option 1, Pgm/Chk Release Event) as a back up or alternative to the Acoustic Command mode, or for adjusting time and date of the Fiobuoy's own ***internal*** clock/calendar (ie. for changes between standard and daylight savings times). The steps are almost identical to Menu Option 1.

> Note again, that none of this **time or date** information is held or saved inside the Psion ***work****about* unit (or your PC). It is **retained inside the Fiobuoy only**

STAGE 1: Setting the Buoy 'Date'

User:
Buoy:

```
2
Buoy Date:  (DD-MM-YY)
 [16-08-05]: _
```

The date in (round) brackets is a guide for the format and sequence of input:

- DD means day of the month (01 to 31),
- MM means the number of the month (01 - 12),
- YY is the last 2 digits of the year (00-99).

Note that two digits are expected for each. For example, the 8th should be entered as 08. Backspace is not supported here. If a mistake is made during entry, continue (ie. complete the entry), then start again. Before and after each 'month', hyphens are automatically inserted ***so there is no need to type them in.***

The date in [square] brackets is the date previously programmed into the Fiobuoy. **By pressing [ENTER] you can leave it unchanged** ! Or you can enter a new current date in the format prescribed.

Note: Leap years are supported automatically.

The following example is for 28th August 2005.

User:
Buoy:

```
          280805
Buoy Time:  (hh:m)
 [09:00:00]: _
```

STAGE 2: Setting Buoy 'Time'

You are now asked for the current time of day (in 24 hour format). 'Colons' are automatically printed between hours, minutes and seconds ***so you don't need to type them in.*** As with the date format, single digit times should have a leading zero (eg. for 9:15am, enter 0915).

User:
Buoy:

```
        0915
Set for 09:15:00 on 28-08-05
> _
```

MENU OPTION 3 – Test Jaws

Intended as a utility only, this procedure closes the jaws, then re-opens them, once. *There is no automatic return to sleep mode during this menu option.*

User :
Buoy:
User:
Buoy:

```
 3
Proceed ? (y/n) _
                y
Closing Jaws...  Closed !
 7.5V before, 7.1V during.
Opening Jaws...  Opened !
 7.5V before, 7.0V during.
> _
```

As in Menu Option 1, should the battery voltage be too low, the procedure is aborted with the Jaws returning to the open position (if at all possible).

MENU OPTION 4 – Exit

After all pre-deployment setup has been completed, it is necessary to exit this programming session and place the Fiobuoy's internal electronics into low power mode (Standby Mode). Selecting menu option 4 'exits' this programming session, into Standby Mode in which the Acoustic system is made active between the hours of 7am-7pm (default values). The Fiobuoy itself automatically Exits this programming session and re-enters Standby Mode after a period of 60 seconds of inaction from the User.

User:
Buoy:

```
 4
Acoustic Active 07:00 – 19:00
```

To bring the Fiobuoy out of Standby Mode and enter the programming mode again, simply press the 'Enter' key twice (not pausing longer than ½ sec between), and you will be prompted once again for the password.

POWER CONSERVATION MODES
Standby mode is designed to extend battery life. This is achieved in 2 ways:

When in Standby Mode, the Fiobuoy electronics, including the acoustic signal detecting sections are shut down for 9 out of every 10 seconds to reduce power consumption.

Further, as most recovery operations will occur during daylight hours, the Fiobuoy acoustics electronics are by default, shut down completely between 7pm and 7am, disabling any reception of acoustic communications/commands.

***Note** 1*. Pre-programmed Time/Date triggering and Leak Detection still function 24 hours per day. Infra-red programming is also still available.

***Note** 2*. The default 12 hour 'listening band' (7am to 7pm) can be altered by the User as required, to increase the length of the listening band, or reduce it further to conserve battery life. see 'Adjusting Fiobuoy Acoustic Listening Band'

See the Technical Note at the end of this document for more detail on predicting remaining serviceable battery life.

MENU OPTION 5 – Set Storage Mode

This is intended as an additional strategy for battery conservation complimenting Menu Option 4 for when the Fiobuoy is to be placed into storage for several months. This mode disables all acoustic command reception, as well as the automated daily diagnostic checks.

User:
Buoy:
User:

```
 5
Storage Mode? (y/n):
                     Y
> _
```

The User is prompted for a Y or y to confirm Storage Mode. Once set, Storage Mode is entered instead of Standby Mode when the User selects Menu Option 4 (Exit), or upon session timeout by the system automatically:

User:
Buoy:

```
 4
Storage Mode
```

A Fiobuoy should NEVER be *deployed* while in Storage mode, as no acoustic commands can be received, and no Time/Date activation is possible, therefore the Fiobuoy and equipment would be lost.

Two fail-safes have been incorporated to reduce the likelihood of accidental deployment while in Storage mode:

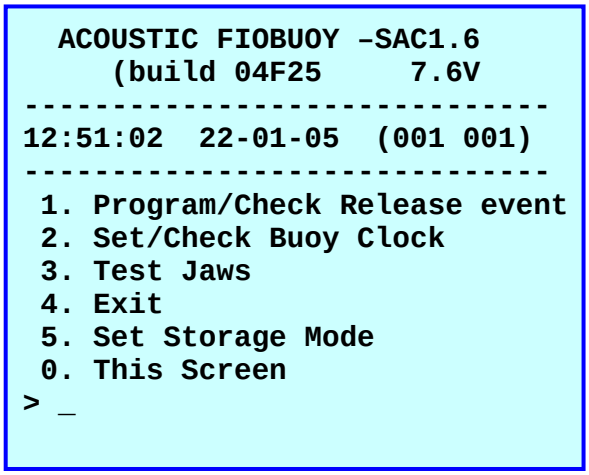
- If Storage Mode is 'set' by a User whilst the Jaw is closed, the Jaw is automatically opened, making it impossible to lock the 'Pin' into the Jaw.

- If a Time/Date for activation is programmed in by a User *after* Storage Mode has been set, then Storage Mode is automatically cancelled, and the normal operational mode is applied.

Note. for occasions where the Fiobuoy is to be stored for extended periods, it is recommended that the unit be opened, and all battery packs be disconnected and removed.

MENU OPTION 0 – This Screen

Reprints the Banner and Menu to the Screen.



7. DEPLOYMENT

Successful deployment will require careful preparation and planning before you take to the water. The steps required for immediate deployment are as follows:

- Ensure that the internal clock/calendar of the Fiobuoy is set to the current local time and date in accordance with instructions provided in this manual.
- Ensure that the Release Event time and date have been programmed and that the jaws are in the closed position.
- Fasten the remaining portion of the tether line to the anchor and/or equipment which is to be submerged. The fastening process may involve a simple tie or a shackle arrangement.
- Check all rope connections and ensure the release pin is properly engaged by the jaw mechanism.
- Check to ensure that all settings have been properly recorded and logged, such as time and date of scheduled release and the exact co-ordinates of the position at which the unit is being submerged.
- It is advisable to perform an 'in-air' check of the Acoustic system before deployment.

Commence the submerging process. First lower the Fiobuoy into the water so that it is floating. Then lower the mooring-weight/equipment into the water, and gently release the line. *Never **throw** the devices overboard*.

Both the mooring/equipment and the Fiobuoy will then commence their descent to the sea bed where the Fiobuoy will adopt a vertical attitude and maintain a tension force on its tether-line equal to that of its own buoyancy.

8. RETRIEVAL

Deployment ceases when the Fiobuoy successfully 'releases' (either in response to an Acoustic Command or a pre-programmed Time/Date trigger) and ascends to the surface to fulfil its marking function.

When retrieving the Fiobuoy by hand, you may secure it by grabbing the handles. If you intend using a grappling hook or similar device, secure the Fiobuoy by its handles (not by the tether line) until you are in a position to bring it on board the vessel by hand.

It is advisable that the Fiobuoy is immediately made-ready for its next deployment by re-winding the tether line back onto the spool/body. A custom Winder mechanism specifically designed to make this task easier and faster, is available from Fiomarine or your Supply Agent.

9. BENCH TESTING A 'TIMED' RELEASE EVENT

The object of the following bench test is to enable users to become familiar with the functioning of the Fiobuoy and the processes which occur after it is programmed for a 'Timed' Release Event.

The Fiobuoy actually brings itself out of Standby mode each day, **at the time** programmed during Menu Option 1, ie. at the Release Event **time**. It continues to do so at the same time each day (followed by a resumption of its sleep mode) until the day on which the Release Event is scheduled to occur.

The tests illustrated here depict how the Fiobuoy should respond to an automatic wake up prompt by its internal clock/calendar:

- during a day other than the Release Event date; and
- on the day of a programmed Release Event.

Ensure that prior to conducting the following tests, the Fiobuoy's internal clock/calendar has been correctly set with current time and date in accordance with Menu Option 2. With the Psion Workabout (or PC) plugged in to monitor proceedings, each of the following tests should yield the corresponding screen outputs:

(a) Wake up during a day other than the Release Event date

Test Steps:

1. Set the Release Event in accordance with Menu Option 1 for a **date** and **time** 5 minutes in the future.
2. Close the jaws in accordance with Menu Option 1
3. Exit the programming session, into Standby Mode.

As soon as the 5 minute period has elapsed, the corresponding screen display will show -

Buoy:

```
Wake by Clock
Acoustic Active 07:00 - 19:00
```

The Fiobuoy has checked its systems, and returned to Standby Mode making its Acoustic system active between 7am-7pm without opening the Jaw.

(b) Wake up on the day of a programmed Release Event

Test Steps:

1. Set a new Release Event in accordance with Menu Option 1 for a **date** and **time** 5 minutes in the future.
2. Close the jaws in accordance with Menu Option 1
3. Exit the programming session, into Standby Mode.

As soon as the 5 minute period has elapsed, the corresponding screen display will show -

Buoy:

```
 Wake by Clock
Opening Jaws...  Opened !
7.5V before, 7.1 during
Acoustic Active 07:00 – 19:00
```

If your test procedures resemble the outputs depicted above, you can be assured that the Time/Date system is operating correctly. The values of the voltages show above may vary depending on their condition.

10. ERROR CODES

Error codes appear with the Command Prompt and indicate the presence of a fault within the Fiobuoy's operating system.

eg.

```
Error 01
> _
```

Errors remain in force until specifically reset by an operator after the faults have been rectified. **A jaw closure is not possible if there is an un-cleared error in force.** This is designed to prevent accidental deployments which could otherwise have compromised equipment safety.

There are five types of error code and each is displayed in the following table, together with their corresponding interpretations and prescribed courses of action.

ERROR	CAUSE	YOU SHOULD
01	The system detected that the battery power was too low, during a daily wake-up / battery diagnostic check. It then proceeded to carry out an emergency Release Event (*with obvious success!*)	If the unit is subject to warranty, return it to a dealer or factory for inspection and service including replacement of battery pack. If warranty has expired, proceed to change battery pack and service as per this manual.
02	The system attempted to close the Jaws, but after an amount of time (40 sec.) no closure was detected. The operation was then aborted	Submit the unit to a dealer or factory for inspection and repair.
03	The leak detectors suggest that water may have entered the chamber. The system then proceeded to carry out an emergency Release Event.	Submit the unit to a dealer or factory for inspection and repair.
10	An internal problem occurred with the Acoustic Modem during reset or battery change.	try resetting the error (see below), or checking the internal interlink cable. Otherwise return for repair to your dealer.
20	An internal problem occurred with the Acoustic Modem.	as for error 10
30	An internal problem occurred with the Acoustic Modem.	as for error 10

Resetting Error Codes

Error codes may be *cleared* for normal operation if each of the causes has been properly identified and the appropriate repairs/servicing completed by qualified persons.

The resetting mode is accessible via hidden Menu Option “93”. The resetting procedure is as follows:

Go to the numbered Options menu.
At the command prompt, enter “93”.
The Fiobuoy will respond with the current error code eg. “01”.
Enter “00” (zero zero) and nothing else.

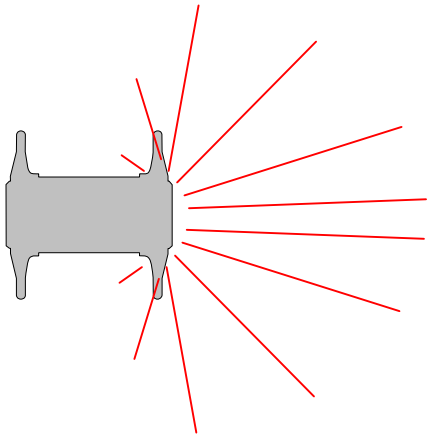
The corresponding screen display should look like this-

User:
Buoy:
User:
Buoy:

If, upon entering Menu Option 93, it is decided that the error code should be left intact (and not reset), simply press “Enter” to leave the value unchanged. **We emphasise that error codes should not be reset without a prior inspection of the equipment by qualified personnel.**

11. Strobe Light Option

In night conditions, even the Fiobuoy's bright colouring can be difficult to see Therefore, a strobe light option is available for users who require additional visibility during night time or low light conditions. Please specify such an option when placing your orders for Fiobuoy units:



General

- To maintain the Fiobuoy's existing geometry, the Strobe is mounted internally, the light transmitted through the End-Cap (*the Jaws end*).
- When the Fiobuoy prepares to surface (releases the pin from the Jaw) the Strobe automatically activates, allowing retrieval in night conditions.
- The power supply for the Strobe is completely separate from the Fiobuoy's own Power, and is a pack of 4 x AA Alkaline Cells connected as 3VDC (+ 2 pin connector).
- Visibility is from 200m to 1000m depending on conditions.
- The Strobe is configured so that, as batteries drain, the flash intensity level does not diminish, however the time between flashes lengthens from it's initial value of approx 1 second (up to approx 10 seconds after 8 hours).

Operating Commands

Fiobuoys fitted with the Strobe option have 2 additional instructions:

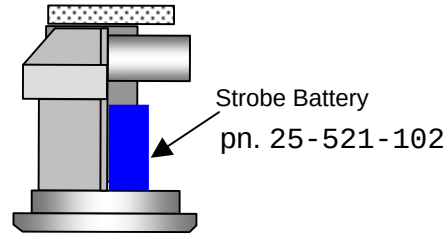
1. During a programming session to set a Release Event (closing the Jaws), an extra response is now required:
   Enable Strobe ? [y/n]:

   Only responding with a '**Y**' or '**y**' will 'enable' the strobe to activate when it surfaces. *(note: the Strobe won't actually turn on at this stage)*

2. Once the Fiobuoy is retrieved and back on deck, the Strobe is turned off by:
   a) plugging in the Infra-Red Comm Lead (and Hand Controller/PC)
   b) Pressing and hold the 'Enter' key, until the prompt for Password appears.

Strobe Battery Replacement

1. Remove the Release Mechanism End-Cap in accordance with instructions contained in this manual (remember to remove the Acoustic End-Cap first !)
2. The Strobe Battery Pack is located under the Motor and held in place with a metal backet.
3. Unplug the existing pack, and remove it from the mounting.
4. Install the new pack into the mounting and plug it in to the connector.
5. Re-assemble the Fiobuoy per instructions.



WARNING! DO NOT OPEN THE STROBE ELECTRONICS BOX !
IT STORES HIGH VOLTAGES FOR LONG PERIODS, EVEN WITHOUT BATTERIES.

OTHER

- An extra 'Hidden Menu Option' is included for maintenance. Type **95** at the command prompt to perform an immediate test of the strobe. Pressing 'Enter' terminates the test.
- The Fiobuoy's usual battery indications are not related to the Strobe's separate battery pack. One method of determining their state is to time the frequency of flash.
- When a Fiobuoy has been activated by means of the Acoustic method, the strobe can not be switched off until a period of 3 minutes has elapsed from receiving the acoustic command.

12. Battery Life

The anticipated battery life specification is, by necessity, only a best estimate based upon **anticipated average use**. It should be pointed out though, that a number of factors will affect battery life:

- The total number of Jaw Actuations per year,
- The 'frequency' of Jaw Actuations,
- The total number of Acoustic signals sent
- Amount of time spent in Storage Mode
- Temperature (low temperatures reduces the battery)

Additionally, although the Fiobuoy does have built-in defaults to prevent deployment with a low battery, these too are based on average use. Not everyone will fall into this 'average use' category. As an illustration, consider this extreme scenario:

Suppose when programming the Release Event time/date (and loading the Pin etc ready for deployment) that the battery is just above the 'too low' level, and as well, the ambient room temperature at the time is a warm 25ºC.

Now, if a particularly long deployment time is planned (say 12 months), and the water temperature is expected to be quite low, a successful release cannot be absolutely assured.

As the User has absolute discretion over how and where the Fiobuoy will be used, a certain amount of responsibility must be accepted in planning deployments. As an aid, Battery Voltage is printed with the Menu Banner. Also, voltages are taken and reported with all Jaw Actuations. The (average / generalised) point at which the Battery is considered 'too low' is when it falls below 5.5 volts under stable load (ie. 1 second after the jaws begin to move).

It should be noted too, that a **second threshold** exists - Daily Low Battery Threshold: When the Fiobuoy awakens each day (at the programmed time of day), it checks battery voltage (with no 'load') also. Should this voltage be below a critical level, an attempt is immediately made to open the Jaws, as a final effort to bring equipment to the surface with what ever power is left.

This Daily Low Battery Threshold can be altered. See Section 'Hidden Menu Options'.
It is highly appropriate to replace existing power supplies with fresh batteries if extended deployments are contemplated, or if there is any doubt about the remaining life of the existing batteries.

Adjusting Fiobuoy Acoustic Listening Band'

By default, Acoustic Model Fiobuoys are programmed to be acoustically 'active' for only 12 hours per day, (from 07:00 to 19:00). This is to conserve battery power.

This daily acoustic 'listening band' can be altered by the User if required.
Only personnel with sufficient technical knowledge should attempt this procedure.
The times may be adjusted in whole-hour values only, not minutes.

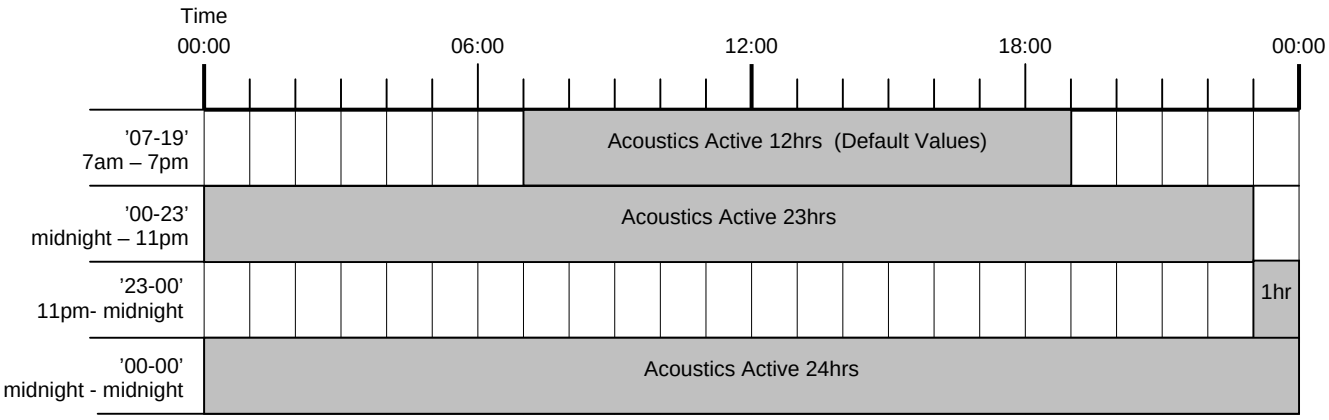
Procedure:

1. Establish Infra-Red communications with the Fiobuoy in the usual way.
2 . At the command prompt, enter 9L (must be capital 'L')
3. The current values of 7am & 7pm are displayed [07-19] :
4. Enter 4 digits to depict the 2 new hour values
   ie. 0915 for 9am to 3pm (you do not need to type the hyphen)

IMPORTANT NOTES:

A. For single digit hours, enter a leading zero ie. "07"
B. Enter numbers ONLY (no letters or Backspace etc)
C. It is invalid for the 1st value to be numerically less or equal to the 2nd value.
D. Hour values greater than 23 are invalid.
E. Listening Bands which cross midnight are not allowed.

Practical Examples of settings for Listening Band -



Predicting Servicable Battery Life

Acoustic Fiobuoys have several modes of operation, each with differing levels of power consumption. These modes include: Storage, Standby, Run, and Transmit/Jaw-Open. Additionally, by default, Acoustic Fiobuoys are acoustically active for only 12 hours per day (Listening-Band) from 7am to 7pm, however this can be altered by the user.

The tables below are calculated by taking an average usage scenario, as would be expected by a User of the Acoustic Fiobuoy. This table should not be taken as definitive, but used as a general guide only. The Battery Pack reading is that seen with the Main Menu of the Fiobuoy itself.

Based on 12hr Listening-Band (default)

BattPak (V)	Battery Life Remaining (days)	(Weeks)	(Mnths)
7.8	166	23.8	5.5
7.5	165	23.5	5.5
7.3	160	22.9	5.3
7.0	154	21.9	5.1
6.8	141	20.1	4.7
6.5	120	17.1	4.0
6.3	90	12.8	3.0
6.0	54	7.8	1.8
5.8	32	4.6	1.1
5.5	19	2.7	0.6
5.3	10	1.4	0.3
5.0	0	0.0	0.0

Based on Storage Mode

BattPak (V)	Battery Life Remaining (days)	(Weeks)	(Mnths)
7.8	541	77.3	18.0
7.5	536	76.5	17.9
7.3	520	74.3	17.3
7.0	499	71.3	16.6
6.8	458	65.4	15.3
6.5	390	55.7	13.0
6.3	291	41.6	9.7
6.0	177	25.3	5.9
5.8	104	14.9	3.5
5.5	62	8.9	2.1
5.3	31	4.5	1.0
5.0	0	0.0	0.0

Based on 24hr Listen-Band

BattPak (V)	Battery Life Remaining (days)	(Weeks)	(Mnths)
7.8	114	16.3	3.8
7.5	113	16.2	3.8
7.3	110	15.7	3.7
7.0	106	15.1	3.5
6.8	97	13.8	3.2
6.5	83	11.8	2.8
6.3	62	8.8	2.1
6.0	37	5.3	1.2
5.8	22	3.1	0.7
5.5	13	1.9	0.4
5.3	7	0.9	0.2
5.0	0	0.0	0.0

13. MAINTENANCE

This Section relates solely to the Fiobuoy and not the PSION ***Workabou***t. Maintenance for the latter is covered separately in the manual which accompanies that product.

General
The Fiobuoy has been constructed with a minimum of moving parts and therefore, requires minimum maintenance where moderate deployments are envisaged.

However, at times, the product will be used within extremely harsh environments where a combination of elements such as salt water, pressure (at significant depths), marine growth, temperature extremes etc. are likely to affect its operation and therefore, its service life.

With average use under moderate conditions, we recommend that servicing/maintenance be undertaken every 6-9 months. With a higher frequency of use under more extreme conditions, servicing and maintenance should be undertaken every 6-9 months if possible.

The product comprises three major components -

- The body (or casing) of the Fiobuoy
- The Release Mechanism End-Cap assembly which fits into the cavity of the body via an aperture at one end of the body.
- The Acoustic Communications End-Cap module

A condition of warranty offered by Fiomarine Industries Pty Ltd expressly prohibits the user from removing the Release Mechanism in order to conduct **internal maintenance**. Accordingly, we suggest that any internal maintenance be performed either by an authorised dealer or, by Fiomarine Industries Pty Ltd for at least the duration of the warranty. **External maintenance** by the user on the other hand, is encouraged and we recommend that users practice the following routine as part of a regular maintenance program.

In summary, we suggest that external maintenance should be performed by the user whereas any internal maintenance should, while the product is subject to warranty, be performed by authorised personnel only.

External Maintenance Procedures

A.1 Immediately prior to and following each deployment, inspect the white End-Cap for signs of any cracking around the clamping mechanism. Contact either your local dealer or Fiomarine Industries Pty Ltd for further instructions should you detect any such wear or damage.

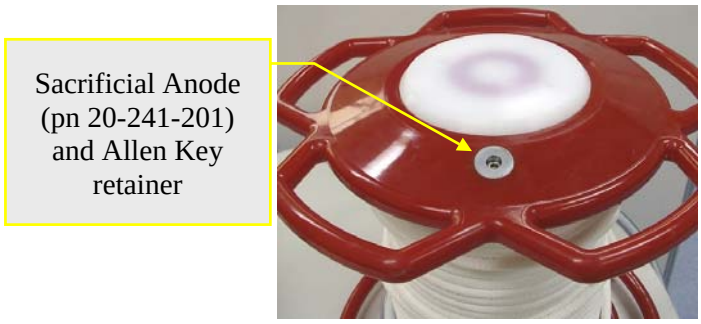
A.2 Inspect for any marine growth and debris, particularly around the clamping mechanism and communications socket. Remove any obstruction with a stiff brush.

A.3 Immediately following each deployment and during the process of rewinding the rope on to the Fiobuoy, inspect the rope for any appreciable wear and replace if necessary. Also inspect the shackles and other rope attachments to ensure they are properly secure.

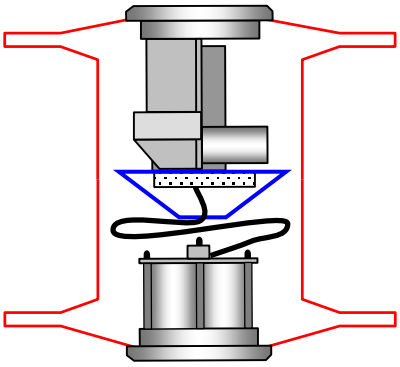
A.4 In the event the Fiobuoy is to be either placed into storage or, not used for an extended period following its last deployment, rinse the Fiobuoy and its rope and attachments with fresh water before stowing away.

A5 Anode. Inspect the Sacrificial Anode for excessive corrosion, and replace as required.

ANODE
Some Fiobuoy models employ a Sacrificial Anode within the body moulding to reduce the effects of electrolytic corrosion. This anode needs to be inspected regularly and replaced when it has become depleated. For replacement a 4mm Allen Key is required.



Internal Maintenance Procedures



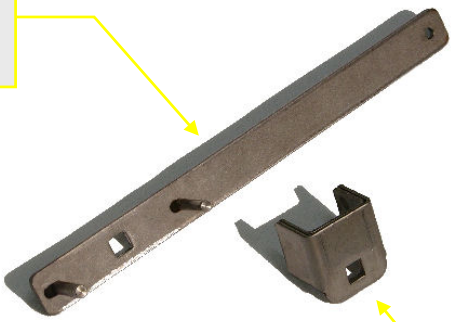
The frequency of internal maintenance is dependent entirely upon the extent of use and the environmental conditions in which the Fiobuoy operates. For example, operating in extremely hot conditions for extended periods is likely to shorten battery life, thereby creating a need for more frequent maintenance involving battery and seal replacement.

The following is a summary of recommended internal maintenance and inspection procedures for those users who wish to conduct their own maintenance program following the expiration of the warranty period. We recommend that all maintenance activities be undertaken in a proper workshop environment and not on board a marine craft whilst at sea, unless in a suitably protected area.

The following tools are required to open the two End-Caps to access the internal mechanisms and electronics for maintenance purposes . These tools have a square hole intended for use with a 1/2 " Torque Wrench driver for the re-assembly phase.

Maintenance Tool 'Kit'

Maintenance Tool for Acoustic End-Cap pn. 25-510-102



Maintenance Tool for Release Mech End-Cap pn. 25-510-101

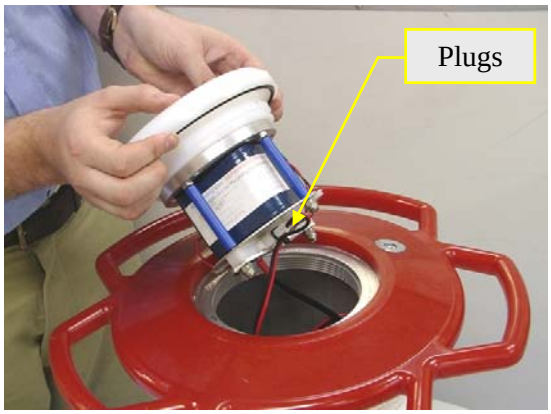
(later models do not require this tool)

Remove the Acoustic End-Cap First

During this operation, the body of the Fiobuoy must be held securely either by another person or, by placing it in a position which will prevent it from turning while the white End-Cap is being removed.

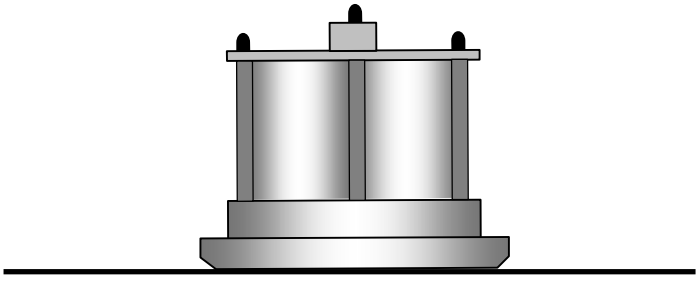
Position the Fiobuoy so that the Acoustic End-Cap is uppermost, and insert the 2 pins of the Maintenance tool into the 2 mating holds in the Acoustic End-Cap.

Using the leverage of the Maintenance Tool, unscrew the End-Cap and carefully withdraw it from the body of the Fiobuoy. Treat all components of this assembly with great care. Avoid physical shock, foreign particles and moisture.



Disconnect the 2 cables. When un-plugging the connectors, take care not to put stress the cable wires themselves. Instead, hold the white connector housing of the plugs when unplugging.

Place the Acoustic End-Cap carefully in a clean area.

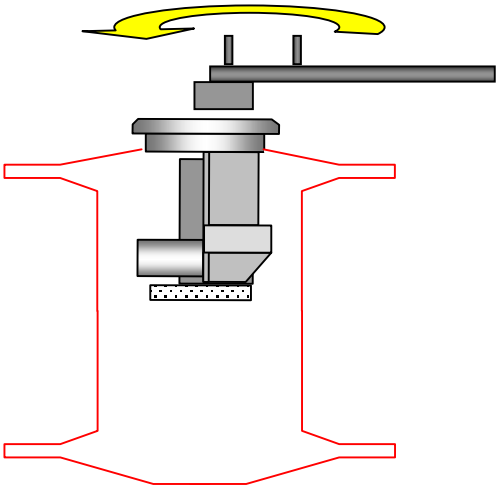


Remove the Release Mechanism Assembly Second

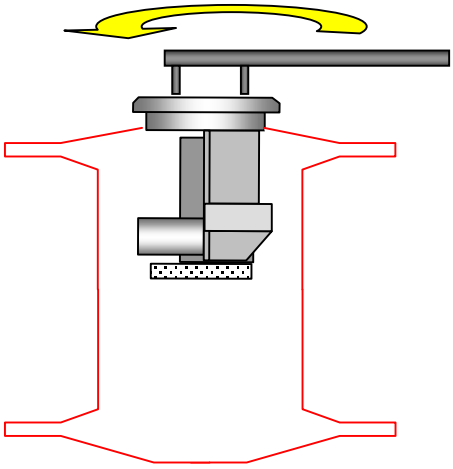
Combine the two End-Cap Maintenance Tools via the square drive stud and hole and insert the tool into the jaw cavity as below –

Unscrew the Release Mechanism End-Cap anti-clockwise. (The End-Cap is permanently fastened to the frame of the release assembly and so by turning the End-Cap, the assembly also turns). After several revolutions, the End-Cap can then be further loosened by hand until the thread completely disengages from the neck of the Fiobuoy.

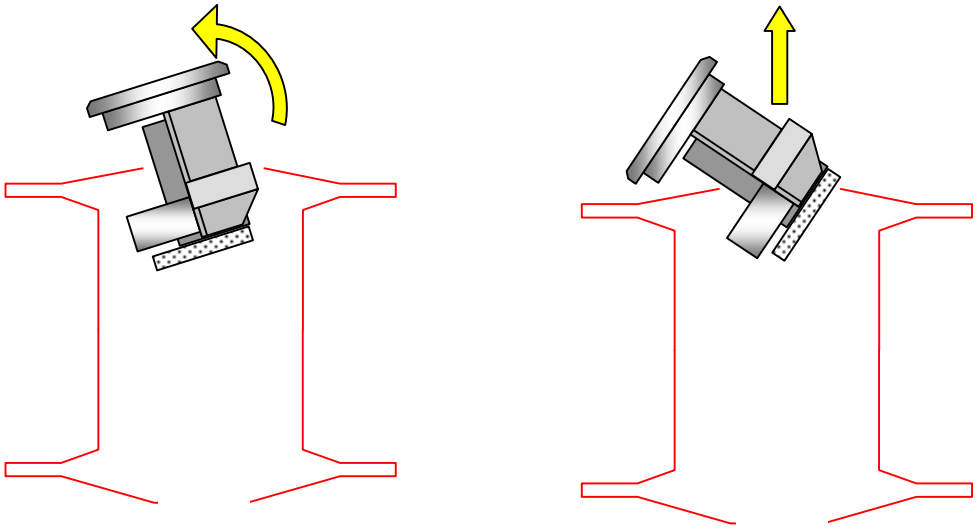
Earlier versions use both maintenance tools joined together to unscrew the Release End-Cap



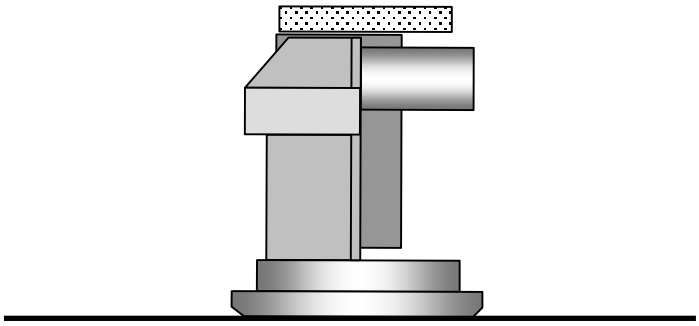
Later versions have 2 holes (similar to the Acoustic End-Cap) so the Acoustic-Maintenance-Tool can be used to unscrew the Release Mechanism End-Cap



Gently remove (ie. pull out) the entire assembly from the body of the Fiobuoy, tilting as shown below, taking care to avoid contact between the mechanicals/ electronics of the assembly and the opening, and also take care of the link cable which will still be attached.



Upon completely removing the Release Mechanism assembly, stand it upright on a flat surface with the white End-Cap at the base in a clean area.



Inspection and service

- Remove and discard O-ring seals.

- Carefully examine both the chamber of the Fiobuoy body, the Acoustic End-Cap Assembly and the Mechanism Assembly for evidence of any moisture. (Where moisture is detected, contact Fiomarine Industries Pty Ltd for further assistance on a suitable course of action. Care should be taken to observe and note the precise amount of moisture, the location/s at which it was detected and whether the Fiobuoy was recovered as a consequence of an unscheduled Release Event. It is possible that the unit will have to be returned to the factory for repair or refurbishment).

- Where moisture is not detected, proceed to remove and discard the battery per the instructions 'Battery Pack Replacement'.

- The Jaw Mechanism has only three moving parts and therefore, requires only minimal lubrication. Lubrication may need to be applied only to the following components:

- The **motor and gearbox assembly** are factory lubricated for life and therefore, should not require any further attention.

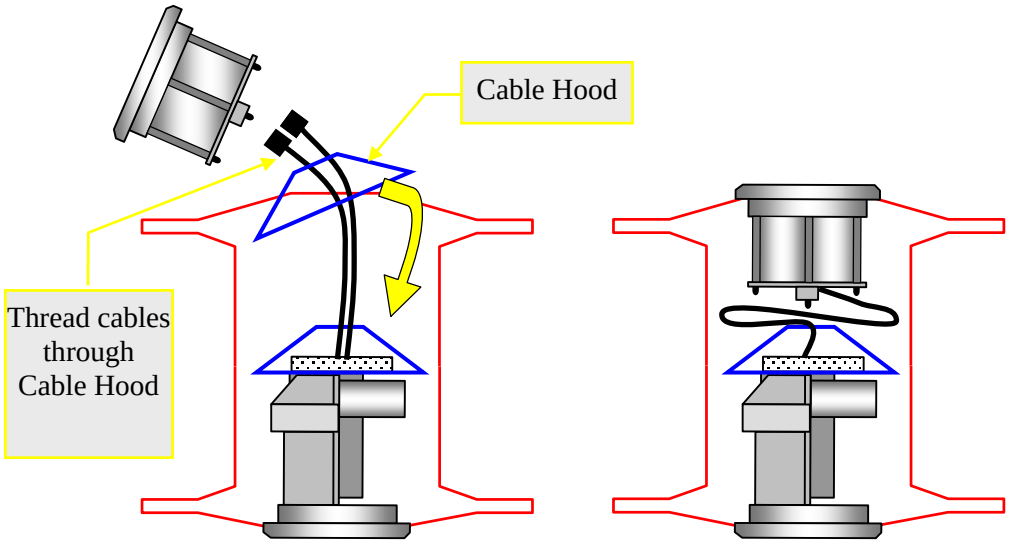
- **Lead screw and clevis nut** - apply Castrol LM grease (or equivalent) sparingly to the lead screw every 12 months.
- The thread of the **white End-Cap** should be lubricated with a silicon based grease each time the unit is serviced.

- A new **O-ring seal** should be installed with each service. It should also be lubricated with a silicon based grease and then inserted into the grooved cavity of the white End-Cap.

- Examine the surface of the external, aluminium rim of the Fiobuoy (which interfaces with the O-ring seal and white End-Cap) to detect any residue from the previous seal. Wipe surface clean to ensure smooth contact and proper seal with facing O-ring and End-Cap.

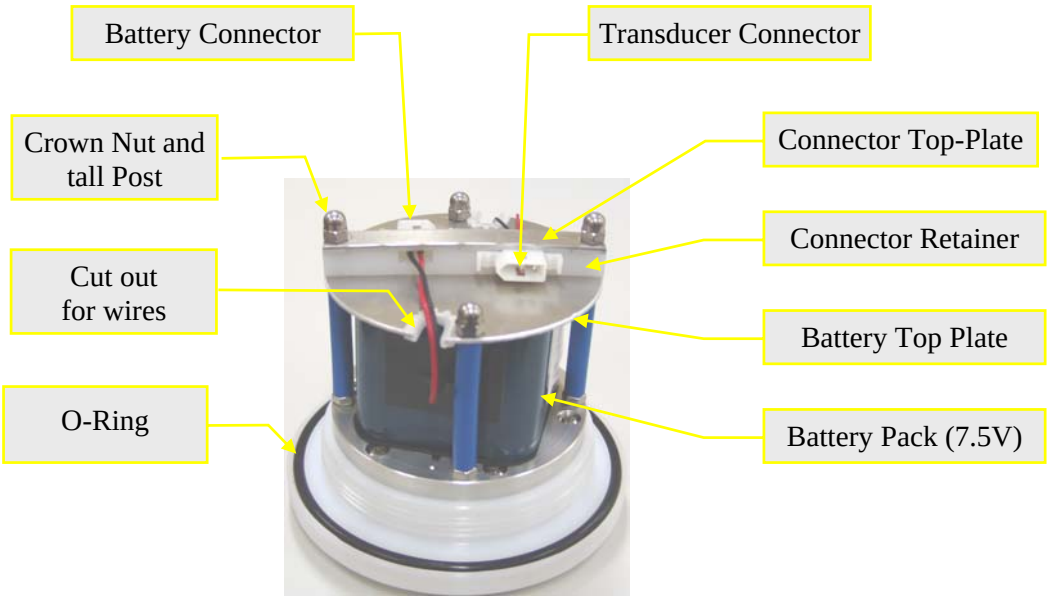
Assemble and test

- Insert the Release Mechanism End-Cap into the body of the Fiobuoy, using the technique outlined in the section '*Remove the Release Mechanism*' but in reverse order.
- Take care in engaging the nylon thread of the End-Cap with the corresponding thread of the body. Commence by giving the End-Cap reverse turns so as to find the thread start point. Hand tighten initially, taking care not to cross thread. Torque the End-Cap to 60 Nm. (+/- 10Nm) using the appropriate tools.
- Locate the 2 Cables from the Release Mechanism, and thread the cables through the centre of the Cable Hood as per the diagram below, and sit the Hood over the Release Mechanism as per the diagram below.



- Plug the cables into their associated sockets on the Acoustic End-Cap.
- Gently insert the Acoustic End-Cap into the Fiobuoy body.
- Take care in engaging the nylon thread of the End-Cap with the corresponding thread of the body. Commence by giving the End-Cap 2 – 3 reverse turns so as to reduce net coiling of the cable, as well as finding the thread start point. Hand tighten initially, taking care not to cross thread. Torque the End-Cap to 60 Nm. (+/- 10Nm) using the appropriate tools.
- Check proper operation by communicating via the Infra-Red cable, and also check Acoustic Communications via the DIU.

14. Fiobuoy Battery-Pack Replacement



Battery Pack / Acoustic End-Cap Sub-Assembly (7.5V)

DISASSEMBLY-

1. Remove Fiobuoy Acoustic End-Cap (only) in accordance with the section 'Internal Maintenance Procedures'.
2. Disconnect the Battery Cable and the Transducer Cable from their respective Connectors (shown above) - be sure not to pull on the cables but on the tabs located each side of the Connectors. The End-Cap Sub-Assembly should now be free of the Fiobuoy.
3. Remove the O-ring.
4. Using a 10mm Spanner/Socket, remove the 4 Crown nuts and withdraw the Connector Top Plate. Free the 2 Sockets from the Connector Retainer, then continue by removing the Connector Retainer and the Battery Top Plate.
5. Remove the Battery Pack and install the new unit, making sure that the wires of the battery pack are opposite to the Transducer wires.

REASSEMBLY-

6. Replace the Battery Top Plate and the Connecter Retainer orienting them to the 2 taller Posts as shown above.
7. Fit the 2 Connectors into the Connector Retainer, making sure their wires run through the cutouts as shown above.
8. Fit the Connector Top Plate as show, and the 4 Crown Nuts, taking care that they are secure, but not over tightened.
9. Apply a film of silicone grease to the new O-ring and fit into place.

10. Reconnect the Transducer Cable (3 pins) then the Battery Cable (2 pins)
11. Re-install the End-Cap Sub-Assembly into the Fiobuoy as per the section 'Internal Maintenance Procedures'.
12. The display screen may show some error. For this reason, it is usual to re-initialise as follows:

```
At the command Prompt, press 93 then 00  (zero, zero)
At the command Prompt, press 9I then 00 00 00 (6 zeros)
```

13. Test Acoustic Communications, and reset the internal clock / calendar as required.

Note: Should the Fiobuoy for any reason fail to respond to communications after the battery change, a hard Reset may be necessary:

- Locate the Jumper on the Mechanism PCB, labeled "RST".
- A shorting link will be sitting on just one of its two pins.
- Pull it off, and place it on both pins for 2 seconds.
- Return it to its original position.

15. HIDDEN MENU OPTIONS

Access to special functions not listed in the menu is available via the following options. Eeach option, eg.”91” etc. is entered at the command prompt of the Fiobuoy itself.

Reset actuation counters - Menu Option ‘91’

This option sets/resets the two counters which record the number of jaw actuations (ie. openings and closings). They appear in brackets within the Banner Menu. These counters have a maximum value of 255, and automatically default to “000” to begin the counting again.

The following example shows the two counters which have progressively recorded 5 openings and 5 closings:

```
User:    91
Buoy:  005 005: _
User:           000000
Buoy:  > _
```

To reset each of the counters back to 000 as in the above example, two sets of “000” (ie. six zeros) must be entered.

The full 3 digit numbers are expected for each counter, so you must enter 6 digits in total. Pressing [Enter] leaves the values unchanged. Back Space is not supported; if you make a mistake, continue to the end then start again.

Daily battery threshold - Menu Option ‘92’

During automated daily diagnostic checks, the battery condition is evaluated. If the voltage is considered too low (5V), the Fiobuoy is programmed by default, to automatically actuate the Release Mechanism, allowing it to ascend to the surface for retrieval.

To disable this unscheduled-emergency Release Event, enter a value of 000 (zero, zero, zero) -***see Note 1*****.** Alternatively, to change the trigger point, scale this (3 digit) internal constant into real voltage values, use the formula:

$$\text{Value} = \frac{\text{Voltage}}{0.031}$$

Where: Voltage is the desired Battery voltage threshold, in volts.
Value is the 3 digit (integer only) number input by the user
eg. the factory default of 5.0VDC has a value of 162.

User: 92
Buoy: 162: _
User: 000
Buoy: > _

Note 1.
Such a setting will, in addition, disable the leak detector and thereby prevent the occurrence of any emergency Release Event as a consequence of a leak.

Resetting the Error Flag – Menu Option '93'
To clear the error flag (see section 'Error Codes – Faults') type 93 at the command prompt, then type 00 (zero zero)

User: 93
Buoy: 01: _
User: 00
Buoy: > _

Set time/date confirmation option - Menu Option '94'
Determines whether a second (ie. a confirmation) Date and Time are required when entering Release Event information. It does not apply to Setting Fiobuoy Clock.
'00' (zero, zero) = confirmation not required.
'01' (zero, one) = [default value] confirmation is required.

Test Strobe Light Option - Menu Option '95'
To test the Strobe Light Option if it is installed, press 95 at the command prompt.
The strobe will start flashing. It may be that random characters are printed to your screen with each flash. This is not a fault, but a consequence of the strobe interfering with the Infra-Red comms link.
To terminate the Strobe Light test, simply hold down the Enter key until the usual command prompt appears.

Set Listening-Band Option – Menu Option '9L'
See section: 'Adjusting Fiobuoy Acoustic Listening-Band'

16. PRODUCT SPECIFICATIONS (Fiobuoy®)

(subject to change without notice)

ELECTRONICS -

Power Supply .....Battery Pack – 7.5, 10AH
Battery Pack Life:
average use scenario .....6 months
Storage Temperature .....-20 to 50°C
Operating Temperature .....3 to 50°C
Clock Accuracy.....+/- 10 min/year @ 25°C

Infra-Red Comms Port: .....1200 baud, 8 data bits, 1 stop bit.

Auto Return to Standby Mode
at Wake .....after 1 Second
at Password.....after 12 Seconds
at Main Menu.....after 30 Seconds
at Acoustic Wake.....after 3 minutes
Direct Contact IR Communications
Medium.....Infra-Red LED Tx/Rx
Protocol .....Ascii, Full Duplex, DCE,
1200 baud, 8 data bits, 1 stop bit.
Acoustic Communications:
Depth 200m
Distance (line of sight).....500m
Protocol .....2 way, Broad Band Spread Spectrum
100bps, Confirmed Packet.
Transducer Beam Pattern .....Omni-directional
Data Rate 100bps
Error Rate .....10^{-6}
Unique Address Assignment.....1,000,000 (move available if required)
Doppler Tolerance.....+/- $5ms^{-1}$
Transmit Technique.....Spread Spectrum (DSP)

OPERATING -	100m Model	200m Model
Maximum recommended deployment depth……	100m	200m
Tether line/rope length (10mm marine cord)	up to 120m	up to 250m
Buoyancy lift	3.5 kg	8 kg
Weight in air without rope	13 kg	15 kg

DIMENSIONS -

Overall Diameter	410mm	410mm
Overall Length	350mm	650mm
Access Hole to Cavity	120mm	120mm
Internal Free Space Dia	170mm	170mm [i]
Internal Free Space Length (without Modem)	120mm	350mm
Internal Free Space Length (with Modem)	60mm	290mm

[1] The 200m Fiobuoy cylinder has 2 internal Reinforcing Rings (180mm apart) which have internal Diameters of 120mm

CONSTRUCTION -

Aluminium Cylinder encased in moulded polyurethane polymer
Endcaps: HDPE. Internal mechanisms: Aluminium & Stainless Steel.

The Deck Interface Unit
(DIU)

17. OPERATING PROCEDURES

Overview:

The primary function of the DIU is to act as an interface between the terminal (Psion/Laptop etc) and a deployed Fiobuoy. It accepts commands input at the terminal via the direct contact Infra-Red lead, creates an appropriate acoustic signal and transmits that via the Dunking Transducer through the water to the deployed Fiobuoy.

Additionally, the DIU unit waits for acoustic 'acknowledgments' or data from the deployed Fiobuoy, decodes their meaning and context, and reports them to the terminal screen via the Infra-Red lead for the User.

Proceedure
Assuming your Fiobuoy is active and appropriately deployed:

- Connect the Acoustic Dunking Transducer to the DIU in the appropriate socket.

Note, this is a bayonet style plug/socket. To plug in, align the keyway slots and insert, then turn cw 90º. To remove, pull the chrome catch back toward you with your thumb, then turn ccw 90º, and withdraw the plug from the socket.

- Connect the terminal (Psion WorkAbout or PC/Laptop etc) to the DIU via the Direct-Contact Infra-Red Comms Cable, and switch the Psion ON.

A system Banner and menu will be sent to the terminal screen:

DIU:

```
DIU Serial No.03A0002
------------------------------
 FIOMARINE ACOUSTIC INTERFACE
 Model FAI-1 [v1.3]   +
------------------------------
DIU Password: _
```

The Password
You will then be shown the unit's Serial Number and prompted to enter the password. This password is preset at the factory and is not User changeable. It is a 'security tool ', intended to guard against misuse of your Fiobuoy. It needs to be protected in a manner appropriate to your organization and application.

(When keying in your password, 'Backspaces' are allowed, and the [Enter] key is necessary to finish)

The Banner
After entering the Password (shown below as “xxxxxx”), some internal system initialisation and diagnostics are processed, after which, a Banner containing model and revision information is displayed. Also included is a reading of the internal re-chargable battery. Nominally this is 6V, and re-charging should be undertaken if this value is less than 5.6V

User:
DIU

```
              xxxxxx
Modem Init:  0000 Ok
k-k
Setting (local)...-k
------------------------------
 FIOMARINE ACOUSTIC INTERFACE
 Model SAI [v1.3]   +6.1V
------------------------------
```

The MENU
Appearing directly below the Banner is a numbered Options Menu

DIU:

```
----------MAIN MENU----------
 1. Select a Fiobuoy
 2. Wake a Fiobuoy
 3. Chk Fiobuoy Battery
 4. Activate Release Now
 0. This Screen
> _
```

followed by the **>** command prompt. (_ indicates the screen cursor)

NOTE: The [Enter] key is not needed to select these menu options

Next, let’s look at each of the Menu Options necessary for communication and acoustic command of a deployed Fiobuoy.

MENU OPTION 1 – Select a Fiobuoy.

Each DIU can at any time, be set to communicate with, or actuate, any Fiobuoy.

Selecting Menu Option 1, you are prompted to enter the 6 digit security code (shown as 'xxxxxx' below) of the particular Fiobuoy you intend to actuate. This is the same code used to access the pre-deployment programming mode of your Fiobuoy (see Section 1, Pre-Deployment set-up of the Fiobuoy- The Password).

User: **1**
DIU: **Fiobuoy's Password:**
User: **xxxxxx**
DIU: **Setting (local)...-k**
> _

MENU OPTION 2 – Wake the Fiobuoy

As discussed in the Operating Instructions for the Fiobuoy - Menu Option 4 'Exit', a deployed Fiobuoy typically sets itself to a low power mode (Standby Mode) in which it actively 'listens' for acoustic commands for only 1 second in 10. It is necessary to bring it out of this mode with a special signal before acoustic commands (i.e. Surface, status requests etc) can be received and acted upon by the deployed Fiobuoy. To do this, the DIU sends a 10 second acoustic signal (termed 'Ping') to bring the deployed Fiobuoy out of Standby Mode and to secure its attention for a pre-determined period.

User: **2**
DIU: **Sending...Ping-**
Waiting...
RemoteMdm Ack
> _

After sending the Ping sequence, the DIU waits for an Acknowledgement from the submerged Fiobuoy, and reports positively with "**RemoteMdm Ack**". If for some reason no reply is received "**No RemoteMdm Ack**" is reported on the screen.

It is worth noting that in the later case, there is the possibility that the Fiobuoy did in fact receive the Ping command, but that the DIU did not 'hear' the reply at the surface. In this case, it is possible to send another Ping command until a response is received. Should prevailing surface conditions be particularly unsuitable so that no Acknowledgement is received, sending a command to Surface, may succeed in actuating the Fiobuoy regardless.

Once active in Acoustic Mode (not in Standby Mode) the Fiobuoy can receive any number of acoustic commands or enquiries, but can not be communicated with via the Direct-Contact Infra-Red Comms Cable (ie. bench testing etc.). If no acoustic signal is received by the Fiobuoy for a period of 3 minutes, it automatically returns to 'Standby Mode'. Each time an acoustic signal is received the 3 minute timer is restarted.

MENU OPTION 3 – Check Fiobuoy Battery.

Sends a request to the submerged Fiobuoy, to report back with battery status information.

The DIU sends the status request command, and waits for an acknowledge of receipt. Then waits further for the data:

User:
DUI:

```
  3
Sending...-
Waiting...
RemoteMdm Ack
Waiting...
7.2V 7.5V
> _
```

The data are two readings of the Fiobuoy's battery Pack. The first is an 'under load' reading, and the second is with no load. If either read below 5.5V, a successful actuation of the Release Mechanism Jaw, or further acoustic replies cannot be assured. See the technical note at the end of this document, on predicting serviceable battery life.

Note, for Fiobuoys with the Strobe Light Option installed: the indicated battery voltages do not refer in any way to the separate Strobe Battery Pack.

MENU OPTION 4 – Activate Release Now.

Sends a command to initiate activation of the Jaw Release Mechanism to allow the Fiobuoy to surface.

The DIU sends the 'Release' command, and waits to receive an acknowledgement of receipt of this command. "**RemoteMdm Ack**" is reported for a positive response, "**No RemoteMdm Ack**" is reported for no reply.

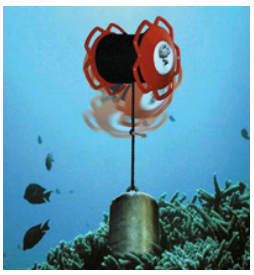
The DIU then begins a define waiting period for the Fiobuoy's Jaw-Opening process to complete. It reports " **Waiting... for Jaw to Open**".

It is worth noting, that the Acknowledgement might not be detected by the DIU at the surface, but the Fiobuoy may well have proceeded normally with its own processes for an actuation sequence.

User:
DIU:

```
  4
Sending...-
Waiting...
RemoteMdm Ack
Waiting...
for Jaw to Open…
Jaw Opened
> _
```

← NOTE. Jaw Opening can take up to 30 seconds, so there may be a delay here.



After a successful Actuation of the Jaw Mechanism, the Fiobuoy transmits to the DIU, which reports "**Jaw Opened**". The Fiobuoy is designed to rise to then surface, unwinding line from its spool. Depending on depth of deployment, this ascent to the surface could take some time. Although not quite linear, a general rule of thumb is approx 2 seconds per metre of depth.

It may occur that the Fiobuoy has already starting its unwinding ascent while it tries to report successful Jaw Opening. In this case, turbulents created by this motion may prevent the report to reach the DIU. In this case, the DUI screen will report "**No Reply**" instead of 'Jaw Opened.

If the Strobe Light Option is installed, and was 'enabled' during pre-deployment set-up, it will start flashing at this time as well. It can be de-activated by connecting to the Fiobuoy via the Direct-Contact Infra-Red Comms Cable, and holding the Enter key.

(note, technically, the Strobe can not be de-activatedl after a time period of 3 minutes from the point the acoustic actuation command was sent.)

18. Maintenance

1. The internal re-chargable battery should be replaced every 2 years.
    - Remove the 8 front panel screws, and remove the front panel.
    - Remove the 2 bolts of the Battery Bracket, and remove the battery, unclipping the 2 leads.
    - Install an appropriate 6V 4AH equivalent (Fiomarine PN. 50-228-101) noting the polarity (Red-positive, Black-Negative)
    - Re-secure the battery bracket, and replace the front panel and screws.

2. The Infra-Red optical connector should be kept clean and free from dirt etc.

3. The O-Ring seal in the lid should be inspected yearly.

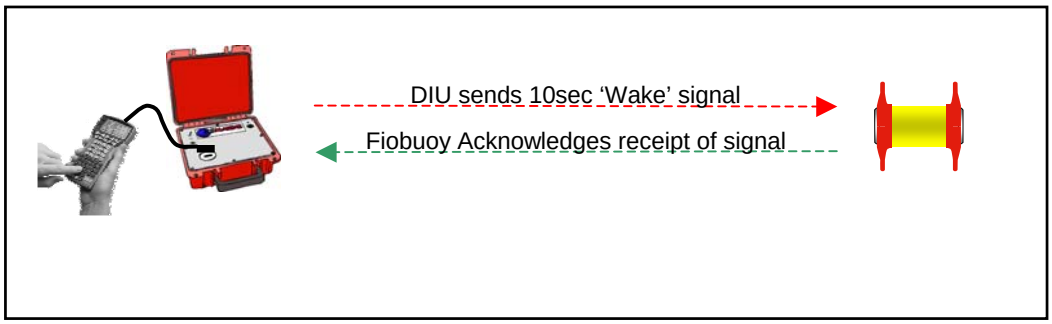
19. Bench Testing – Acoustic Communications.

The object of the following bench test is to enable Users to become familiar with, or allow testing of the functioning of the Acoustic Communications link between the DIU and a Fiobuoy.

As a conceptual outline, a basic in-air test would consist of

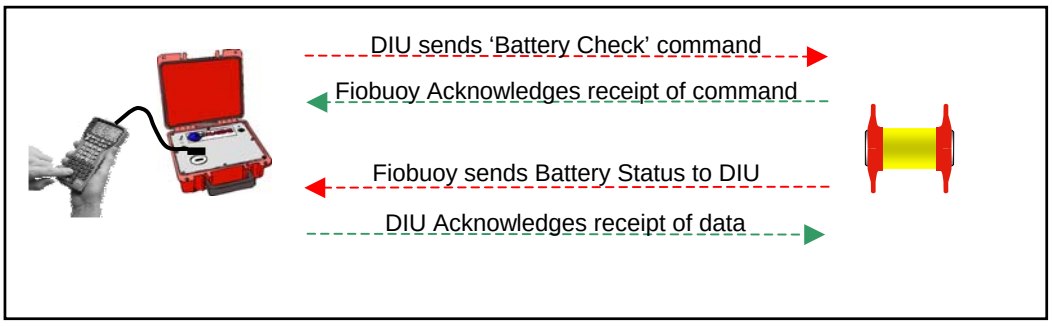
- firstly bringing a Fiobuoy out of Standby Mode via acoustics using DIU Wake Command (Menu Option 2) and receiving an acknowledgment of that command.

  TWO acoustic tones will be heard –



- Once the link is established, you can then send a command from the DIU to the Fiobuoy, (such as the 'Check Battery' command), receive an acknowledgement of that command, after which the Fiobuoy will send some real information (ie. battery status) back to the DIU (to the User) with an associated acknowledgment being returned by the DIU.

  FOUR acoustic tones will be heard -



Initial set-up –

- The Fiobuoy must first have been placed into Standby Mode (see Fiobuoy Operating Instructions).
- Place the DIU's Dunking Transducer approximately 2m from the Acoustic End-Cap of the Fiobuoy. (*Some experimenting of positioning may have to be done if ambient conditions cause interference.)*
- It may also be of interest to plug a second Psion (or PC/Laptop) into the Fiobuoy via an Infra-Red cable (if available) to monitor the transactions as received by the Fiobuoy.

Procedure:

From the DIU and referring to the Operating Instructions within this manual-

1. Enter the Fiobuoy's unique access code with Menu Option 1,
2. Wake the Fiobuoy from Standby Mode with Menu Option 2
3. Wait for Acknowledgment.
4. Send the 'Check Fiobuoy Battery' command with Menu Option 3,
5. Wait for Acknowledgment
6. Wait for the battery voltage information transmitted from the Fiobuoy.
7. Finally, the DIU will acknowledge receipt of this data back to the Fiobuoy.

20. About Through-Water Acoustic Communications

Factors effecting reliable acoustic communications.

While the Fiobuoy's Acoustic Communications system employs advanced technology to overcome impediments to the acoustic signal path, it is important understand that acoustic waves by their nature, are readily influenced by various factors present in the environment in which the Fiobuoy is intended to operate.

Some of these include;

- layers of differing water temperature
- layers of differing salinity or freshwater channels
- rough surface conditions or surf
- Marine animals and plants containing air cavities
- Marine animal noise
- collapsing air bubbles
- boat engine or other man-made equipment noise
- seabed topography

Should you encounter difficulty in establishing acoustic communications with a deployed Fiobuoy, there are several strategies available to improve reliability:

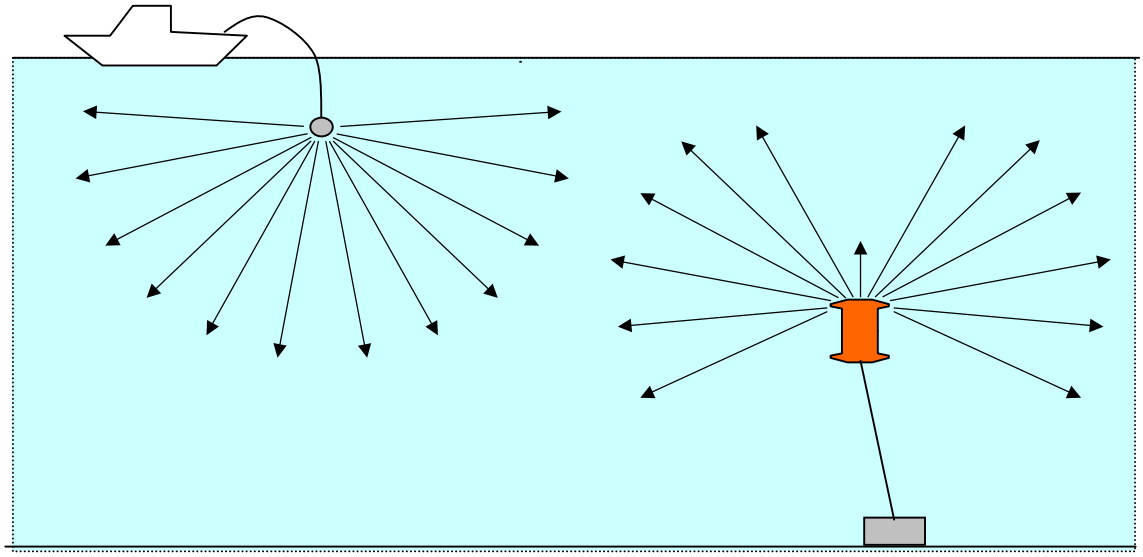
Try -

- positioning the surface dunking transducer at different depths
- or moving it away from the boat's engines or sonar transducer.
- moving away, toward or on a different bearing to the deployed Fiobuoy.
- moving the dunking transducer, so that it is stationary within its local body of moving water.
- The dunking transducer should not stream out from the vessel, but sit vertically in the water for best results.

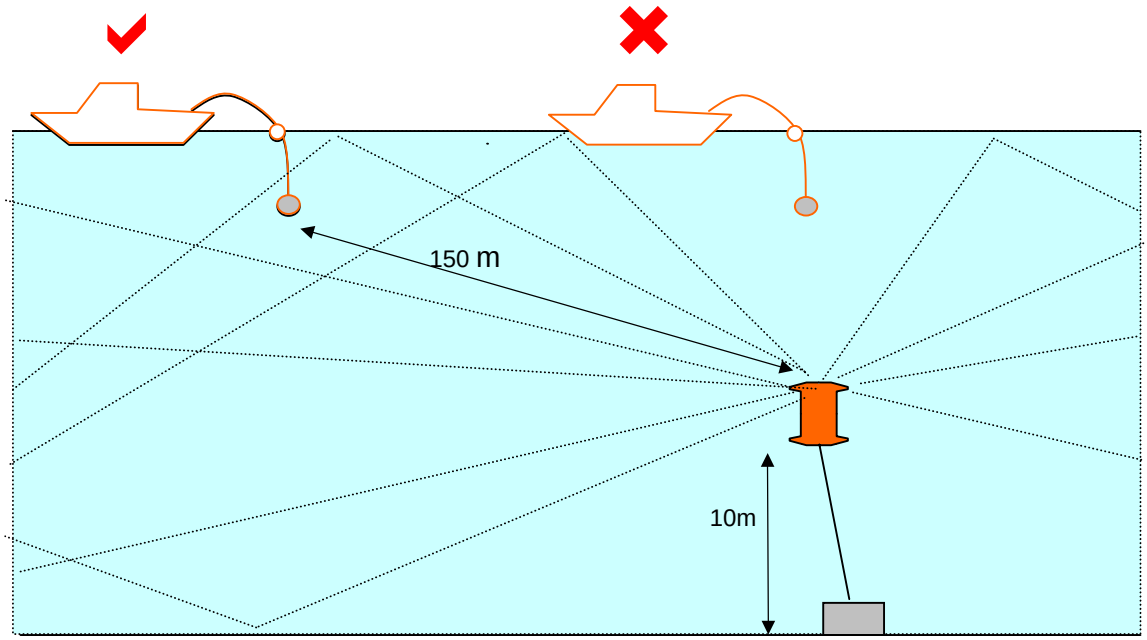
Beam Pattern

The beam pattern of the Acoustic Transducers for both the Acoustic Fiobuoy and the Deck Interface Unit are generally omnidirectional in the horizontal plane.

In the vertical plane, the same is generally true. However for the Fiobuoy, the profile of the beam patten diminishes correspondingly as the angle approaches true vertical. This leads to a decrease in capacity of the Fiobuoy to both transmit and receive signals when the vessel is directly above.



However, in real deployment conditions, other factors have an effect, and so with natural attenuations and reflections, the effective beam pattern is more complex. Therefore, as a general observation, we note that in true vertical positions, communications may not be as reliable, although the extent of such reliability will vary according to depth.



21. Product Specifications (Deck Interface Unit)

Power Supply.....Lead Acid 6VDC, 4AH sealed

Battery Life between charges:
assume average 10 Transmits.....10 Hrs

Acoustic Communications:
Depth.....100m
Distance (line of sight).....500m
Protocol .....2 way, Broad Band Spread Spectrum
.....100bps, Confirmed Packet.
Transducer Beam Pattern .....Omni-directional

Programming:
Medium.....PC/Laptop/Psion via Custom Infra-Red Lead
Protocol .....Ascii, Full Duplex, DCE, 1200 baud, 8 data bits, 1 stop bit.

Storage Temperature .....-20 to 50°C

Operating Temperature .....3 to 50°C

Weight 3.5kg

Dimensions .....24cm x 28cm x 12cm

Transducer Cable 10m

Enclosure .....Plastic. Mil-Spec 810F / IP 67

General

22. Parts List

Part Number	Description
25-240-101	Direct-Contact Infra-red Communication Cable
25-522-103	Maintenance Kit (incl O-rings and Battery Pack [excl Strobe])
25-521-102	Battery Pack, 3V for Strobe Option Fiobuoys
40-211-001	**Rope** - Aquatec® 10mm Dia. 1,300kg, /m (without splice/fittings)
40-210-001	**Rope** Dyneema® PP 10mm Dia, 5000kg, /m (without splice/fittings)
40-550-101	Stainless steel thimble and splice Dyneema rope
40-550-102	Rope Splicing/Stainless Steel fittings Aquatec rope
25-510-103	Tool 'kit', Maintenance - Acoustic Fiobuoy (for both EndCaps)
70-230-111	User Manual, Fiobuoy® Acoustic, Colour
25-310-203	**Deck Interface Unit** - **Acoustic** Model SAC 1.3- with Transducer
25-310-101	Deck Interface Unit, Model 1.4 (w/o Transducer)
25-350-101	Transducer, DIU, 10m cable, 60mm Cylinder
25-210-101	Psion Workabout controller option
25-210-102	Winder, Deck Model (for 100/200m Model Fiobuoy®)
25-110-103	Winder, Deck Model (for 100m Model Fiobuoy® only)
52-210-103	Winder, Mini (for 100/200m Model Fiobuoy®)
25-521-106	Battery Pack, 5 Cell, for Acoustic Fiobuoy®
50-113-102	O-ring, for all model Fiobuoys
20-241-201	Sacrificial Anode, 28mm
20-420-101	Cable Hood, for Mech Assembly cables
25-510-101	Tool, Maintenance - Std 'Release' End only
25-510-102	Tool, Maintenance - Acoustic End Only
25-520-102	Release Pin, S'Steel 12mm with Shackle
20-210-121	Fiobuoy Shell Moulded, 100m, Red
20-210-221	Fiobuoy Shell Moulded, 200m, Red
20-310-105	Fiobuoy Release Mech Assy, Complete, Acoustic, 160mm incl Batt
20-240-301	Fiobuoy Acoustic End-Cap Complete, 160mm
60-110-102	Service - Acoustic Fiobuoy (system check, replace batt/o-ring)
20-410-110	PCB, Fiobuoy Ac Model (500m/100bps) complete
20-410-104	PCB, Acoustic Modem, 500m, 100bps
50-227-101	Motor/Gearbox for Fiobuoy 100/200m
20-110-Z000 -MI-C-W1	**Fiobuoy® Acoustic** Model, 120m rope capacity, Defence rated **100m** depth capacity, - Without rope
20-120-Z000 -MI-C-W1	**Fiobuoy® Acoustic** Model, 220m rope capacity, Defence rated **200m** depth capacity, - Without rope
20-110-Z000 -MI-C	**Fiobuoy® Time/Date** Model, 120m rope capacity, Defence rated **100m** depth capacity, - Without rope
20-120-Z000 -MI-C	**Fiobuoy® Time/Date** Model, 220m rope capacity, Defence rated **200m** depth capacity, - Without rope

23. WARRANTY

The Fiobuoy product and its accessories are covered by separate warranties as indicated below:

(a) Hand Controller - Psion brand “Workabout” model

This item is warranted in accordance with the conditions prescribed on the relevant warranty sheet from Psion Computer Plc of the UK. Any matters relating to warranty should in the first instance, be referred to the National Service Centre of an authorised Australian distributor;

Bar Code Data Systems
Lakes Business Park, Level 2 Building 8
Lord Street
Botany NSW 2019 Australia
fax: + 61 2 8336 6300
Phone 02 83366338

(b) Fiobuoy

- This product is warranted by Fiomarine Industries Pty Ltd to be free from defects in workmanship and materials for a period of twelve months from the date of purchase subject to the following conditions:
- The product must be returned to us, freight and insurance pre-paid, together with purchase invoice/receipt as proof of purchase.
- The product must not have had its serial number removed, defaced, or changed, its casing opened, its cabling or cord altered, nor have been tampered with in any other way.
- Failure of the product must not be due to misuse such as failure to observe proper operating instructions and product limitations, improper installation or connection, other abuse, neglect, accidental damage or other circumstances beyond our reasonable control.
- Responsibility is not accepted for damage or loss caused during transit or damage caused by other third parties.
- Apart from warranties necessarily implied by law, all other warranties, express or implied, and whether arising by virtue of statute or otherwise, are hereby excluded.
- All repair costs for any products which are found to be faulty due to abuse, misuse, neglect, accidental damage, improper installation or improper operation, shall be charged to the purchaser in accordance with our current schedule of fees.
- All batteries are specifically excluded from warranty.

24. Avoiding Problems - A Last Word

General Safety and Compliance Obligations

- **Release Event** Time/Date. Take care to note **and record** the Release Event date and time you program into the Fiobuoy . Then have someone verify them ! **This cannot be stressed too strongly !** Similarly, ensure the internal clock/calender is accurately set with the correct time and date.

- Equally important is the need to record the precise location at which deployment has occurred. Access to a GPS device and log book should be sufficient to record the relevant details.

- Always check to ensure that the deployment depth is significantly less than the length of rope attached to the Fiobuoy, otherwise a fully extended tether line will not permit the Fiobuoy to reach the surface. Consideration should also be given to tidal conditions which again, may affect the depth of deployment.

- Do **not** deploy the Fiobuoy to depths beyond its rated capacity without first securing written advice from Fiomarine Industries Pty Ltd in relation to possible breaches of warranty.

- Ensure that the mooring-weight/payload attached to the Fiobuoy is of sufficient mass (weight in water) to properly submerge the Fiobuoy and to hold it steady in the same location for the desired deployment period, despite the existence of any prevailing currents.

- None of the **time and date** information is held or saved inside the Psion ***work****about* unit (or your PC). It is **retained inside the Fiobuoy only**.

- All Fiobuoy deployments must be undertaken in a manner which complies with the laws of the States and Territories of the Commonwealth of Australia. International users are encouraged to seek advice from their respective, local authorities.

- Users must take special precautions to ensure that deployments do not endanger surface craft or any other users of marine resources.

- The Fiobuoy is equipped with safety devices to assist with its recovery from deployments in the events of **(a)** a diminution in battery power supply (below a prescribed threshold) and **(b)** the occurrence of leaks. In either case, the Fiobuoy will attempt to perform an unscheduled Release Event ie. it will attempt to release itself from its underwater mooring and float to the surface for eventual recovery. In such circumstances, the Fiobuoy may remain on the surface for a considerable period until fed by the user/owner. During the time it remains unattended, it may constitute a hazard to surface craft.

- The safety devices can be disabled by a simple process following further consultation with an authorised dealer or with Fiomarine Industries Pty Ltd. This course of action would remove the incidence of unscheduled releases but, would also remove the safety features which were designed to assist in recovering the device and its attached assets during the events described above. However, the safety devices can also be “switched” (ie. reprogrammed) back on to accommodate changing circumstances and

consequently, users are provided with a reasonable degree of operating flexibility when planning their deployments. We emphasise that successful and safe deployments will therefore, require careful and thorough planning.

- The Fiobuoy contains sensitive electronic equipment; avoid dropping the unit on to hard surfaces to prevent possible damage. This applies especially to the End-Caps.

- Frequent deployment in a severe environment could necessitate more frequent servicing/maintenance checks at say, 6 - 9 month intervals instead of the regular 9-12 month intervals. Conduct external maintenance on a routine basis.

- Be aware of the implications of programming a Release Event to occur during a different time zone eg. when programming a Release Event (during Standard Time) to occur during Day Light Savings/ Summer time etc. Adjust times accordingly.

- Take care with the Optical Communications Sockets (at the Jaws end of the Fiobuoy and on the DIU). Dirt and other material (and of course marine growth) may damage the Infra-Red communications light path during cleaning.

- Very strong sunlight can disrupt Infra-Red communications. If this occurs, try placing the Optical 'connection' in the shade.

- If communications stop when using the PSION ***work****about* , it is possible its batteries do not contain sufficient residual energy for this purpose (even though the device correctly performs all other functions). Replace the batteries accordingly.

- The PSION ***work****about* has a dust/splash proof rating of only IP54, so keep it protected appropriately (IP54 = limited protections against dust, and fine water spray).

- When placing the Fiobuoy in storage for any period of time, be aware that an already programmed Release Event during that storage period ***will*** occur even though the Fiobuoy is not submerged. This could cause personal injury or damage to equipment. Placing the unit in Storage Mode is advised to prevent this.

- During a test routine, any communication with the Fiobuoy (via Infra-Red or Acoustics) at the time a programmed Release Event is scheduled to occur, will automatically cancel that Release Event.

- The **Leak Detector**. As standard feature, this sensor is intended for use in sea water only. Should you wish to deploy in fresh water, a different sensor should be installed. Please consult with Fiomarine Industries Pty Ltd in this instance.

25. Contacting Us

If you require any further assistance with matters concerning the above warranties, please contact either your local dealer or, Fiomarine Industries Pty Ltd at the following address:

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