Acoustic Release

K/MT 562

KUMQUAT

Deck Unit K/MT 8011M
Deck Unit K/MT P.A.C.S

Manual

December 2022

Product no.: K/MT 562
Instrument ID:
Manual dated July 5, 2023
Delivery date:

Vendor:

User:

Introduction on:

By:

(Stamp and signature)

Contents

List of Figures

1 Acoustic Release Unit KUMQUAT

1.1 Preface

This manual serves both as introduction and reference book. It shall assist you to find solutions and answers in an easy and rapid way. Therefore we kindly ask you to first read carefully the manual when problems with the releaser KUMQUAT occur. Make use of the table of contents and read attentively the corresponding chapter(s). However, should there still be open questions please contact us directly:

- in written form to:
  K.U.M. Umwelt- und Meerestechnik Kiel GmbH
  Wischhofstraße 1-3, Geb. D5
  24148 Kiel - Germany -
- by phone: +49(0)431-7209220
  Please have the manual ready!
- by fax: +49(0)431-7209244
- by e-mail: kum@kum-kiel.de

1.2 Introduction

1.2.1 Short instrument description

The acoustic releaser KUMQUAT is used in instrument carriers like landers or OBS-systems as well as in complete moorings. It is strongly fixed to the instrument carrier while the ground weight is hung up to the release hook. After the measurement has taken an acoustic signal is sent down to the instrument and the releaser opens the hook. The release optionally can also be made by an integrated timer. Additionally the releaser is able to head for external instruments and to send replies to the deck unit.

The acoustic releaser KUMQUAT consists of the following components:

- pressure tube
- release mechanism
- transducer
- electronics
- battery pack
- manual
- optional: time releaser
- optional: programmer and cable for the timer
- optional: deck unit with transducer
- optional: frame for inline attachment (e.g. moorings)

The compact pressure tube is made of non-corroding titanium. After demounting the bottom plate the battery pack is uncovered (see chapter 1.3.2). Before each new deployment it is recommendable to put a new drying agent bag into the tube to protect the electronics from condensation.

1.2.2 Technical data

Product no.	K/MT 562
Serial no.	
Operation depth	6000m
Operation temperature	-5°C to 40°C
Storing temperature	-20°C to 60°C
Release load	250kg (depends on hook configuration)
Safe working load	500kg (depends on hook configuration)
Power supply	2 x 6 Alkaline C-cells, redundant arrangement
Battery life	14 month @ 100 releases and 3000 pings, safety 1.5
Enhanced Power supply	2 x 6 Lithium C-cells, redundant arrangement
Enhanced Battery life	24 month @ 100 releases and 3000 pings, safety 1.5
Interrogate frequency	11kHz
Reply frequencies	7.5 to 15kHz in 0.5kHz steps (12kHz standard)
Reply pulse width	8.5 or 17ms
Command encoding	FSK 16 bit, 12.000 individual codes available
Commands	release, enable, disable, 3 individual I/O commands
I/O capabilities	• connector to control up to 3 external devices • sensor input line to cause a ping from an external device
Size	Ø110mm x 570mm
weight	11.1kg in air, 6.3kg in water (incl. 12 Alkaline cells)
Material	titanium
Options	• backup timer with separate battery and external programm unit (14 /24 month with Alkaline/Lithium 9V block battery • heavy load release • transducer safety cage • in-line release

1.2.3 Encoding of the external connector

Pin	Signification	Input	Output
1	User1	-	5V TTL, 1s length
2	User2	-	5V TTL, 1s length
3	User3	-	9V@2A, 20s length
4	not connected	-	-
5	Send "Ping"	5V Puls @ 1Hz max.	-
6	Communication timer	TxD	(RxD)
7	Communication timer	(RxD)	TxD
8	GND	-	-

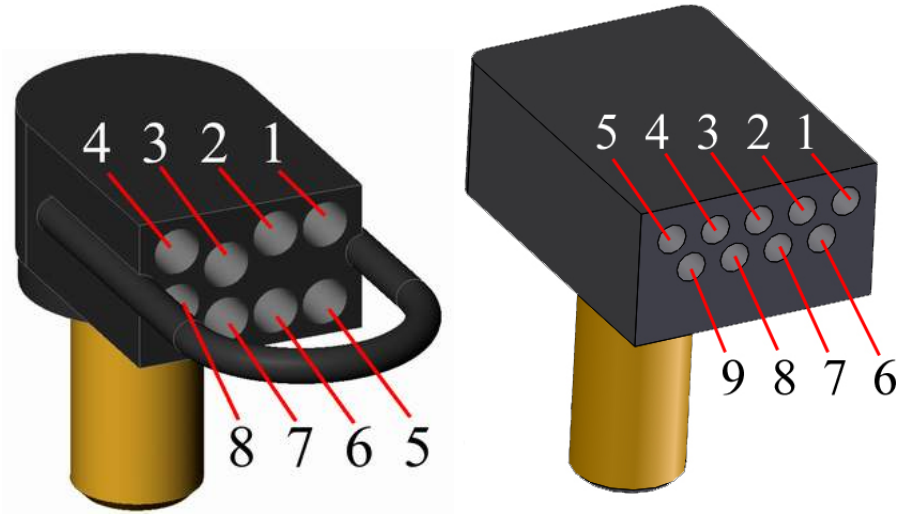


Figure 1.1: Encoding of Impulse LPMBH-FS8 or subconn MCBH9F

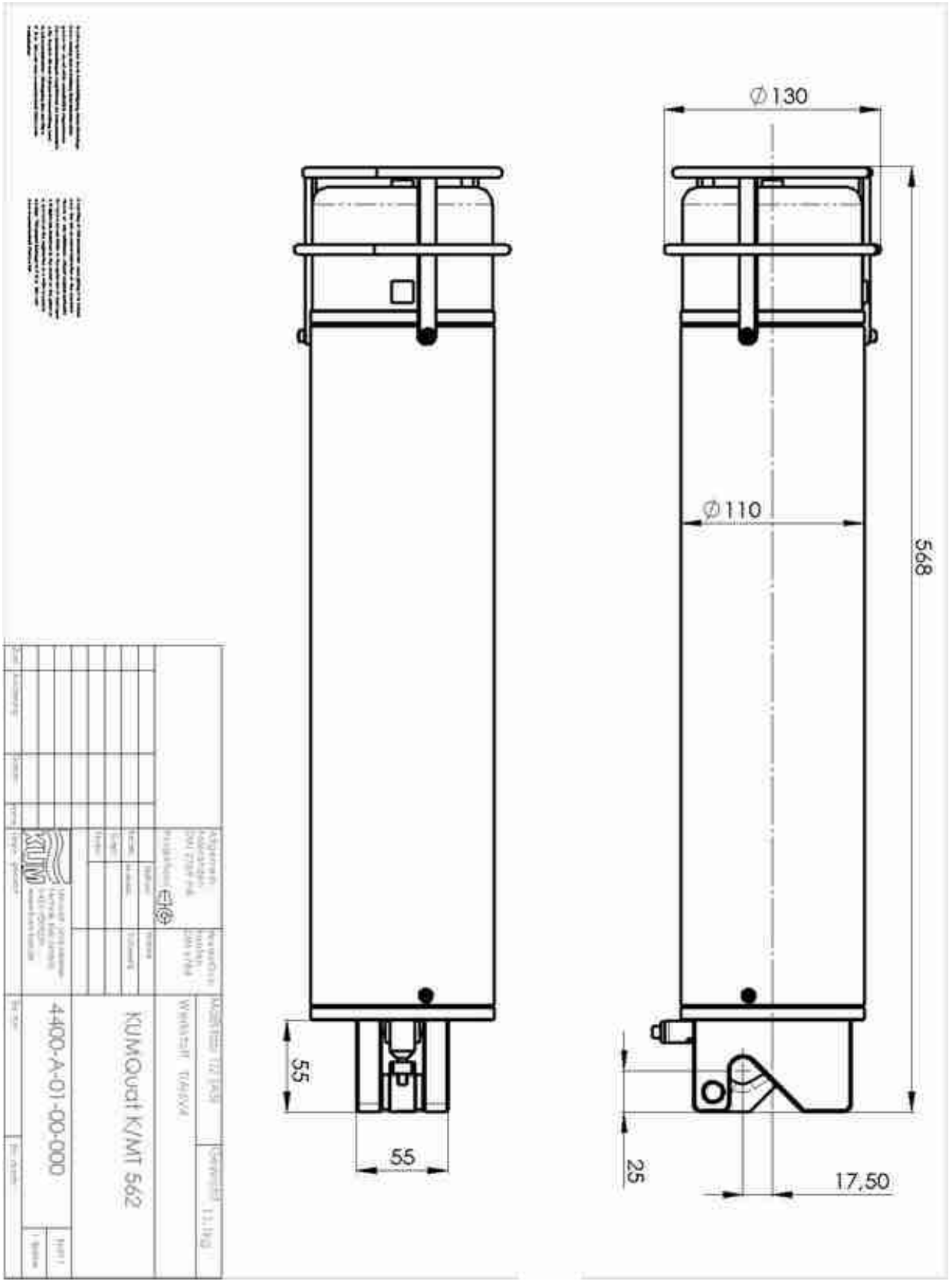


Figure 1.2: Size of the Release Unit

1.3 Handling instructions

1.3.1 General safety regulations

When changing batteries or doing maintenance and repair works use only tools in excellent condition to avoid corrosion. The assemblage, in general, has to be done with new sealing and security elements. Grease all screws, but only with the prescribed grease. All maintenance and repair work must be done by skilled personnel. **After each maintenance work the system‘s functionality must be controlled.**

Handling instruction for plug connections

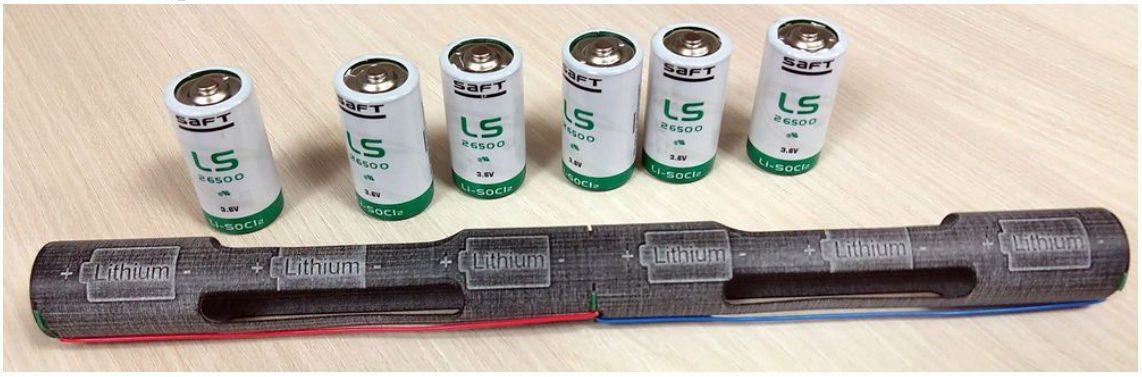
Moveable electrical devices (e. g. personal computer) must be installed with the prescribed plug connections (plug and bracket). It is forbidden to use adapters and plugs that are suitable for brackets of different voltages.

1.3.2 Start operation

Electrical connection

12 batteries C-cells supply the releaser with power, either Alkaline cells or Lithium cells. In case of Alkaline cells the batteries are arranged in two packages with 6 batteries each to ensure a redundant energy source. For changing batteries the tube‘s bottom plate plus release unit is removed.

To use Lithium batteries, a thin pipe has been designed that hosts 6 batteries as well as 3 PCB to separate each three batteries:



The PCBs ensure that every 3 batteries connected in series give 10.8 volts. Both battery strings are then fused with Schottky diodes and connected in parallel. The pipes can be filled by the customer himself, to the batteries can be shipped inside its original packing with original safety data sheet and IATA certification.

This way, the acoustic release can be powered with alkaline cells (no extra tubing) or lithium cells (extra tubing with PCB separators).

ATTENTION: Never assemble Lithium batteries without the adapter, it will destroy the elctronics due to high voltage!

First the three inner hexagonal screws that hold the tube in position are removed (see picture).

ATTENTION: use only tools tools in excellent condition when tightening or loosening the screws. Tighten the long M4 screws to take away the bottom plate.

The bottom is lifted out of the rails/threads and then completely removed. Pay utmost attention to vertical disassembling to avoid damages to the sealing. As soon as the bottom plate can be removed first disconnect the connectors from the board.

Remove the inner hexagonal screws from the battery box (see picture, red). The grey middle plate now can be withdrawn and the batteries changed. Attention: the plus terminal of both cables must be in front! (see picture next side). Each battery package of six batteries is secured by its own diode to ensure a redundant energy source.

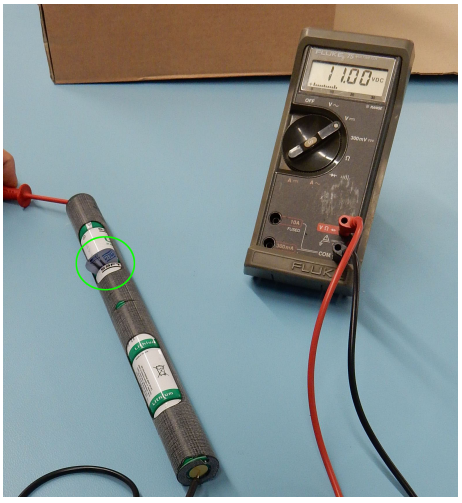
After the battery change measure the voltages of each cable. **When using Alkaline cells**, they should be higher than 9V and **must not differ more than 0.1Volts! Attention! Measure the voltage on load only! Use a 30 Ω resistor parallel to the voltmeter!**

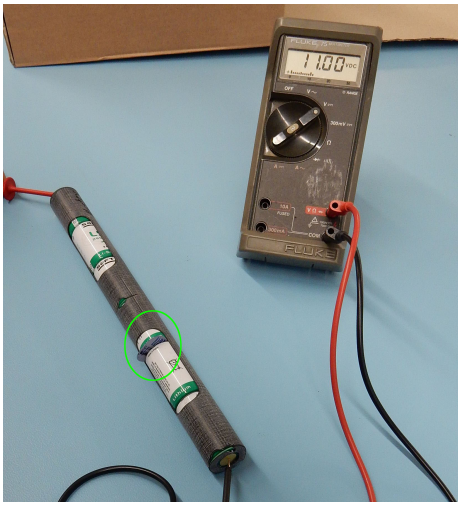
(The battery packages are divided by diodes. Even if only a single package is assembled a digital voltmeter shows a high voltage on both measuring points. Using a load resistor the voltmeter correctly shows the usable voltage.)

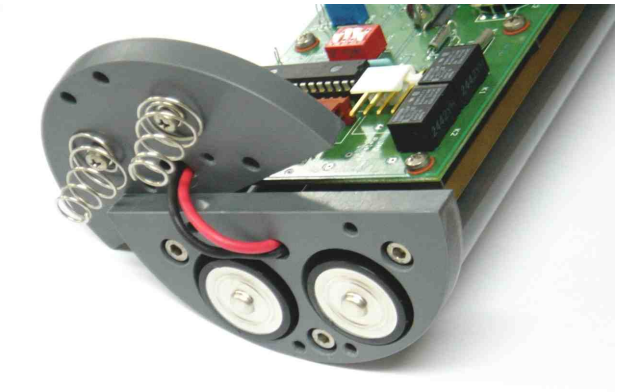
The timer board (optional) has got an independent power supply, you only have to change the 9V block.

When using Lithium cells, the use of the adapter is mandatory. Part of the delivery is a small isolator:

To control functionality of the tube and electronics, voltage has to be higher 10.8 Volts on each three of the batteries. To check this, place the isolator between two batteries on the left side to measure the voltage of the batteries on the right side, and do so the other way around (see below).







Before installing the battery pack the contacts must be entirely clean. If necessary apply a special cleaner for contacts (e.g. Kontakt 60) to remove oxidation deposits. After installing the batteries refix the middle plate correctly. Add two new drying agent bags (e.g. Minipax 1/6TME). Rub o-rings and sealing area of the pressure tube with silicone paste. Even slightly broken o-rings must be replaced. Put the cap on the pressure tube and tighten it with the inner hexagonal screws (rubbed with silicone paste). **Attention! Notice the metal pin at the face of the tube that ensures the right position of the endcap.**

1.4 Operating instructions

The releaser KUMQUAT has a pressure-proof titanium housing for being deployed in water depths up to 6000m. On the releaser‘s top you find the acoustic signal unit. This unit consists of a ceramic swinger situated in an oil-filled rubber skin. The ceramic is extremely hard but brittle, therefore the swinger must be protected against bumps. Hard bumps can destroy the unit!

1.4.1 Connection of the programming unit

The time releaser (optional) is programmed by an external unit. With the hand device one programs the present time and date as well as time and date of release. You can also save this data on a chip and read it out. After having connected the hand device to the timer data is transferred, controlled and re-transferred. The releaser is set now and will open the hook on the programmed time. The delay can be set to any value between one minute and 24 month.

If time release isn't desired choose a release time earlier than the system time (a time in past).

You are guided with a menu structure when using the hand device. Table 1.1 shows the structure of the menu.

Use the arrow-key "right" to enter the next menu or to start operation. Use "left" to enter upper menu or to cancel operation. Use the keys "up" or "down" to toggle through the menu or to change parameter.

Please note: After changing the release time you have to transmit the new data to the releaser by choosing `Save to Timer`!

Main Menu	
1 System Time	- Set Date
	- Set Time
2 Release Time	- Set Date
	- Set Time
3 Chipcard	- Save to Card
	- Get from Card
4 Save to Timer	- Save NOW!
5 Service	- Init Card
	- Get from Timer
	- Test Battery
6 About	

Table 1.1: Menu of the hand device

The menu is shown always, for example when you check the battery you do as follows:

```
Service       \5
Test Battery  |3
```

In this case `\5` indicates menu item "5" and `|3` indicates "3" of the lower menu. The value of `B I` shows the voltage of the release battery package while `B II` shows the voltage of the timer.

1.4.2 Installation into the instrument carrier

The releaser is able to release in each position in an angle radius of 90°. You've got to be aware that the side walls of the release mechanism are in a vertical position and the hook's oblique side is directed to the bottom. Furthermore pay attention to the transducer's work position that must be a semi-circle. In particular the reply´s range can become worse when the ship is situated in the releaser's shadow.

Figure 1.3: Installation into the instrument carrier

As long as there is no cage at the outside (see picture) the load must be picked up by the releaser‘s bottom. The releaser hence must put in an upright position in the instrument carrier, the attachment clamps only have the function of fixation but not for picking up load.

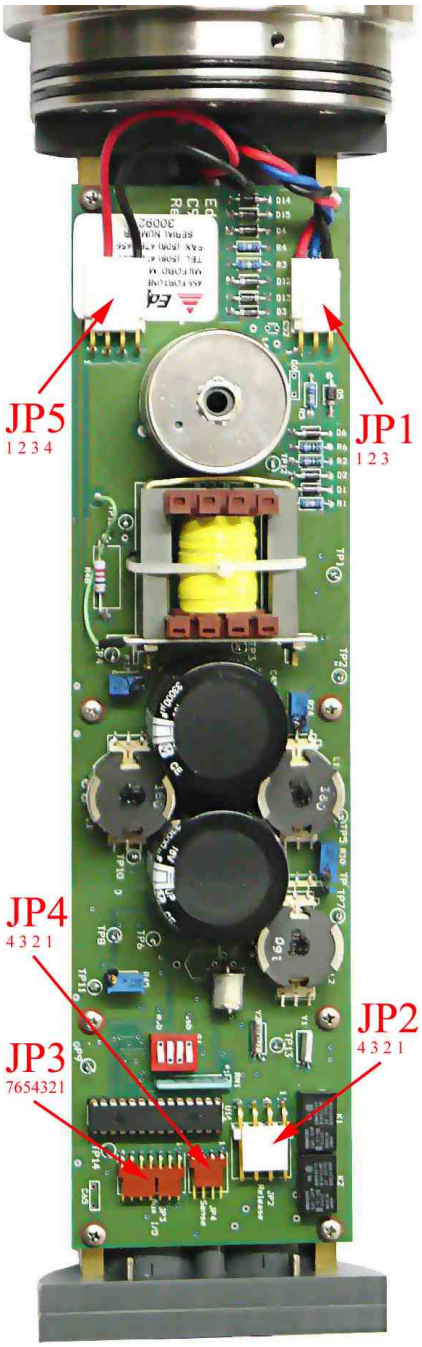
1.4.3 Deck unit

The releaser runs with the ORE Offshore/EdgeTech deck units P.A.C.S., 8011A or 8011M. The unit P.A.C.S. is the basic unit already disposing of all commands. It is equipped with a transducer at a 9m long cable. You find a detailed description in chapter 2.

The unit 8011M offers more functionality, e. g. the range function: frequencies are programmable between 7kHz and 15kHz. Equipment of other manufacturers can be contacted if the signature is known. Additionally the unit 8011B possesses a RS232 interface, by this means it can be run in the HOST-mode. This feature on the one hand permits the logging of all transferred commands, on the other hand the comfortable handling for the equipment of other manufacturers. Deck Unit 8011M is equipped with an internal battery pack plus charger for that operation is possible either by mains connection or battery supply. It can be powered either with the American 110V-net or the European 220V-net - both are automatically identified. You find a detailed description of Deck Unit 8011M in chapter 3.

1.4.4 The board

Manufactured by ORE Offshore/EdgeTech you can rely on a well proven system. In the picture the five plug connections are named JP1 to JP5. Connector JP1 is connected to the transducer, connector JP5 to the battery pack. At the bottom JP2 drives the motor, JP4 controls the micro switch of the release shaft and JP3 is responsible for the I/O capacities.



The following table gives an overview:

connector	pin	represents
JP1	1	Plus Transducer
	2	nc
	3	Minus Transducer
JP5	1	nc
	2	Battery plus
	3	nc
	4	Battery GND
JP2	1	Release output
	2	GND
	3	User3
	4	GND
JP4	1	Sense1
	2	GND
	3	Sense2
	4	GND
JP3	1	Vcc 9 Volt
	2	Vdd 5 Volt Ping source
	3	User1
	4	User2
	5	reserved
	6	Ping input
	7	GND

1.4.5 Command description

The receive sensibility of the releaser is at -80dB re 1μPa@1m. The sending efficiency is at 192dB re 1μPa@1m with a carrier frequency of 12kHz (standard). The releaser's turn-around-time is at 12.5ms. The turn-around-time (*tat*) is the length of time between arrival of the signal and reply. The deck unit calculates with *tat* and signal duration plus sound speed the distance of the releaser.

All commands are FSK16-coded (*Frequency Key Shifting*). By that 12.000 individual commands are available.

Each releaser can be contacted by 7 commands:

Release The command "Release" effects the opening of the hook. After receipt of the command the releaser heads for the internal motor and checks the position of the shaft. After semi-circle /turn the motor stops and a state report is sent to the top. Four different replies are possible:

1. hook is open, releaser is in vertical position: 15 pulses with a one second pause each
2. hook is open, release is in horizontal position: 7 pulses with a one second pause each
3. hook is blocked, releaser is in vertical position: 15 pulses with two seconds pause each
4. hook is blocked, releaser is in horizontal position: 7 pulses with two seconds pause each

When the hook is blocked the unit tries to open it for 20 seconds and breaks off indicating "hook blocked". Re-sending of the "Release" command leads to a new attempt to open the hook.

Enable After receipt of the "enable" command the releaser replies to each "interrogate-signal". A valid interrogate-signal lies in the field of 11kHz and has a length of at least 2ms. The maximum reply rate is at 1Hz. After receipt of this command a status report is sent.

Disable With the "disable" command answers to the interrogate-signal are oppressed. The releaser doesn't respond to these signals and batteries' life prolong. After receipt of this command a status report is sent.

Command1 After receipt of this command contact 1 of the releaser connector is put on 5V TTL for one second. With this command also external devices can be started, can be controlled in general or can be status modified. A single pulse is sent.

Command2 After receipt of this command contact 2 of the releaser connector is put on 5V TTL for one second. A single pulse is sent.

Command3 After receipt of this command contact 3 of the releaser connector is put on 5V for 20 second with a maximum of 2A. 7 pulses at a two second rate are sent.

Interrogate After receipt of a valid Interrogate-Signal (11kHz with at least 2ms length) the releaser answers with a single pulse. Caution! The releaser will only answer on an Interrogate-signal when activated by the "Enable"-command before!

1.5 Maintenance and care

Each time after deployment the releaser must be carefully rinsed with fresh water and cleaned from mussel and tank dirt. The maintenance of the components is confined to cleaning the housing surfaces and checking on external damages. When cleaning we recommend to take a dry, soft, not fluffing cloth. Do not use aggressive cleanser!

1.5.1 Put out of operation

When out of use for a longer period take the batteries out of the releaser and close the housing. Take new batteries, new drying agent bags and new o-rings when putting it in operation again.

1.5.2 Transport and storing

The release must be transported and stored with due care. It must be protected from harmful influences as well as from bumps, hurts and so on. For storing remove the battery set out of releaser and pay attention to the allowed temperature.

1.5.3 Change of the o-rings of the pressure tube cap

Remove the three screws from the pressure tube cap, then screw evenly and by turns M4 screws in the threads for pushing up the cap. Take away both o-rings. Clean the grooves carefully. Rub the new o-rings slightly with silicone paste P and install them. Use only original o-rings from K.U.M. to guarantee absolute water imperviousness of the releaser. The assemblage is done the other way round.

1.6 Standard equipment and accessories

Delivery of the releaser KUMQUAT comprises:

- pressure tube with releaser electronics and transducer
- manual
- timer (optional)
- programming and read-out cable, 9 pins sub D (optional)
- programming unit (optional)
- external connector (optional)
- transducer safety case (optional)

1.6.1 List of accessories

The following accessories can be purchased with K.U.M.:

- set of o-rings incl. silicone paste
- drying agent bag
- transport and storing box
- universal clamp
- set for conversion to heavy load
- transducer safety case
- battery set
- hand terminal with programming cable
- deck unit 8011A including transducer
- deck unit 8011M including transducer
- deck unit P.A.C.S. including transducer

2 Deck Unit P.A.C.S.

Figure 2.1: Deck Unit P.A.C.S.

2.1 Preface

The P.A.C.S. is a low cost, light weight, battery operated, transmit only deck unit. The P.A.C.S. is supplied with a hydrophone that includes an oil filled wide band transducer, nine (9) meters of kevlar reinforced cable and a Kelums strain relief grip. The strain relief grip is "split laced" and can be easily moved to a different position if the factory placement is not suited to your needs. The P.A.C.S. is identical with the P.A.C.S. of ORE Offshore/EdgeTech, so it supports ORE Offshore/EdgeTech's (formerly EG&G Marine Instruments) BACS (binary acoustic code system) and XS coding formats. In addition to the KUMQUAT model, these formats are employed in ORE Offshore/EdgeTech's 8202, 8242, 7500 and AM200 units. This field proven coding system provides the user with a command structure that is tolerant of multipath environments and is secure.

2.2 Specifications

General

Product Number: K/MT P.A.C.S.

Frequencies: Interrogate and receive frequencies
select 7.5 to 15kHz

Default transmit: 9.0 and 11.0kHz

Default receive: 10.0kHz and 12.0kHz

Transmit source level: 185dB re 1μPa@1m,
controllable by operator

Receive Sensitivity: -80dB re 1μPa@1m

Transmit pulse width: 10ms

Timing accuracy: 1ms

Range units: Meters (if supported)

COMMANDS

Codes: BACS (FSK16) commands

Source level: Changeable by operator, up to 185dB re 1μPa@1m

Receiver lockout: 50ms

Status: Automatic time-line display of acoustic status replies

Interface

Liquid crystal display (LCD): 2 lines of 20 characters; displays menus of input selections; operating parameters and range

Keypad: 16 keys on 1 pad, menu selections, data input, and level adjustments

Beeper: Audio confirmation of received acoustic signals

Power: 8 each type MN1604 alkaline batteries; 130 hours continuous operation and/or 3750 commands

Case: robust, sealed, portable, splash-resistant

Size: 27cm x 25cm x 19cm (10.5in x 10.0in x 7.5in)

Weight: 3.2kg (7.0 lbs)

P.A.C.S. Transducer

Acoustic frequency: 7.5 to 15kHz

Beam pattern: Omni-directional in lower hemisphere

Cable length: 9m (30 feet)

Weight in air: 3.2kg (7.0lbs) with cable

Size: Diameter 11.4cm (4.5in); height 10cm (4.0in)

2.3 Operation of the Deck Unit

Your model P.A.C.S. acoustic deck unit has been carefully tested and shipped from the factory with a set of new, industrial date coded batteries.

When the P.A.C.S. is switched on the LCD display will come up with a power on message of "`EDGETECH P.A.C.S. - FIRMWARE VER. X.X`". Confirm with `CMD`.

After turning the unit on there are two command modes that can be selected using the arrow keys, they are `BACS` or `XS`. You can select High or Low Power modus by using the arrow keys also. The low power setting is particularly useful when bench testing or operating close to an acoustic release. By reducing the transmit power level the problems associated with multipath effects are minimized.

2.3.1 Commands

To send a BACS command press the CMD button on the keypad, the display will change to: `Enter BACS Command Pwr=H Command:` The unit will now accept six (6) digit commands and transmit them when the ENT (enter) key is pressed. If a mistake is made while entering the command the CLR (clear) key may be pressed to delete the entry. The first digit in a BACS command defines the FSK tone pair to be used, the P.A.C.S. will not accept commands that do not start with a valid tone pair (1 through 6). The BACS command format does not allow any of the remaining five digits of the command to contain decimal values greater than seven (7). If either an invalid tone pair or an illegal command digit is entered the P.A.C.S. will display an error message and quit the current mode.

Using the KUMQUAT Release Unit you don't need XS commands. However, this is how it works: the `XS` command format was developed primarily to be used as an extension to `BACS` commands. To send an `XS` command press the XS button on the keypad, the display will change to: `ENTER XS TONE PAIR`

The P.A.C.S. will now accept a valid tone pair number (1 through 6), if the number entered is not valid, an error message will be displayed. The tone pair number entered sets the two `FSK` frequencies that will be used to send all subsequent `XS` commands. The

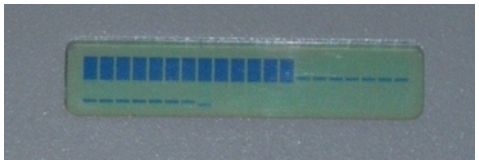
display now will change to `ENTER XS COMMAND`

The unit will now accept three (3) digit commands and transmit them when the `ENT` (enter) key is pressed. The allowable range of `XS` commands is 000 to 255, commands must be entered as three digits, leading zeros cannot be omitted.

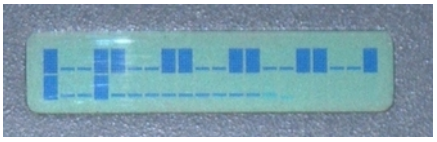
An `XS` command requires two (2) seconds to transmit, while a `BACS` command requires nine (9) seconds. While the command is being transmitted the P.A.C.S. will display the message: "`SENDING COMMAND NOW!`".

2.3.2 Reply of the Releaser

When receiving an answer, the deck unit will acknowledge this with signs on the display, each sign at half a second. Depending on signal intensity the display will show solid or half signs.



A strong signal of 7 pings will cause 14 black signs. When the pings are transmitted each in one second, there will no blanks occur in between. A screen shot is shown left.



When pings are transmitted each one in two seconds, each two blocks are divided by two blank ones as shown left. Any received signal will also cause a beep. You can control the intensity of the beeps by its clasp.

2.3.3 Ranging mode

Key `R` will start the ranging mode. First one has to determine *Interrogate frequency* (11kHz) and *Reply frequency* (12kHz). Using `<ENT>` the distance measurement is started.

Commands `Enable` and `Disable` will switch the reply of the releaser on and off. We recommend to disable the releaser to avoid pinging because of 11kHz-noise. Ships engines e.g. can cause 11kHz signals and force the releaser to send a ping.

2.4 Maintenance and Care

2.4.1 Battery Replacement

The P.A.C.S. acoustic deck unit requires eight type MN1604 9V alkaline batteries (or equivalent) to operate properly. It is recommended that if available, use only the highest quality, industrial date coded batteries in your P.A.C.S.. To replace the batteries turn the deck unit off. Unscrew the ten (10) mounting screws located on the perimeter of the front panel.

Gently lift the front panel from the case then place it upside down on mounting frame of the case. Unscrew the two wing nuts that hold the battery retaining plate in position. Gently remove the batteries from snaps by pulling on them one at a time. Carefully insert a new set of batteries in place of the old ones.

- Use new, tested batteries only
- Use 9V-Alkaline batteries only
- Pay careful attention to the polarity, failure to do so may result in damage to the instrument
- Pay attention to the alignment of the batteries
- Do not mix up batteries of different suppliers
- When removing some batteries, remove all
- Remove exhausted batteries immediately

Replace the retaining plate and screw it down with the two wing nuts provided. After reassembling send a command to verify operation of the deck unit.

2.4.2 Transport and Shipment

Use well-padded packaging to ship the unit. Strong vibration may cause a damage. Temperature of store and shipment must be between -20°C and 60°C. Use dry and clean environment for both shipment and storing. While storing remove the batteries.

To clean the unit use warm water and a soft cloth only. Do not use cleanser or thinner.

3 Deck Unit 8011M

Figure 3.1: Deck Unit 8011M

3.1 Preface

Deck Unit 8011 is a new, comfortable deck unit that offers utmost control on acoustic signals. It serves to control and operate KUMQuat releasers. The deck unit is of the same configuration as the unit 8011M from ORE Offshore / EdgeTech, hence also all releasers from the ORE Offshore series (nos. 8202, 8242, 7500 and AM200) can easily be operated. In addition acoustic signals from other instruments are already implemented (see chapter 3.3.2) and therefore you can serve acoustic instruments from other manufacturers, too. Due to legal reasons we don´t assume any guarantee but only inform you about this.

3.2 Specifications

3.2.1 Equipment

For Deck Unit 8011M the standard transducers 8012 and 8012A with 25m or 50m cable length are offered. Both RS232- and Auxiliary-cable are available.

General

Product number: K/MT 8011M

Frequencies: interrogate frequency from 7.5Hz to 15.0Hz in 500Hz increments, receive frequency from 7.5Hz to 15.25Hz in 250 increments

Standard Send: KUMQuat-Releaser

Send: KUMQuat, ORE Offshore, EdgeTech, EG&G, Benthos, Mors

Standard receive: 12.0kHz

Source level: 185dB re 1μPa@1m, adjustable at 9 levels

Receive sensitivity: -78dB re 1μPa@1m, adjustable at 9 levels

Send pulse width: 10ms

Time accuracy: $\pm$0.1ms (noise-free-field); $\pm$0.5ms (40dB S/N-ratio)

Range units: meter, seconds

Range options: : horizontal or full distance ranging, manual or automatic repetition; input of speed of sound, turn-around-time and distance window possible

Commands

Codes: BACS (FSK16), bit-encoded ("Mors"), rate-encoded ("Benthos")

Source level: adjustable, up to 185dB re 1μPa@1m

Status: automatic time line shows acoustic status reply in the display, both time intervals and signal strength are displayed

Interface

Liquid crystal display (LCD): 4 lines at 40 characters, backlighting and contrast adjustable

Menus: Command Setup, Range Setup, System-Setup

Keypad: 25 keys

Speaker: acoustic acknowledgement of received acoustic signals, adjustable

Headphones: acoustic acknowledgement of received acoustic signals, adjustable

RS232: operation in host mode possible (Laptop / PC), logging function

Aux/Diag: external trigger connection possible, synchronous output of pulses

Power: 220V@50Hz, 110V@60Hz or internal batteries

housing: robust, sealed, shock resistant, portable and splash resistant

Size: 41cm x 34cm x 18cm (16in x 13in x 6.8in)

Weight: 6.3kg (16lbs)

8012A Transducer

Product: Modell 8012A, Other transducers on request

Frequencies (acoustic): 7.0 to 16kHz

Radiation: omni-directional in bottom hemisphere

Cable length: 50m (165feet)

Weight: 7.5kg (16.5lbs) incl. Kabel

Size: diameter 11.4cm (4.5in); height 10cm (4.0in)

Keyboard

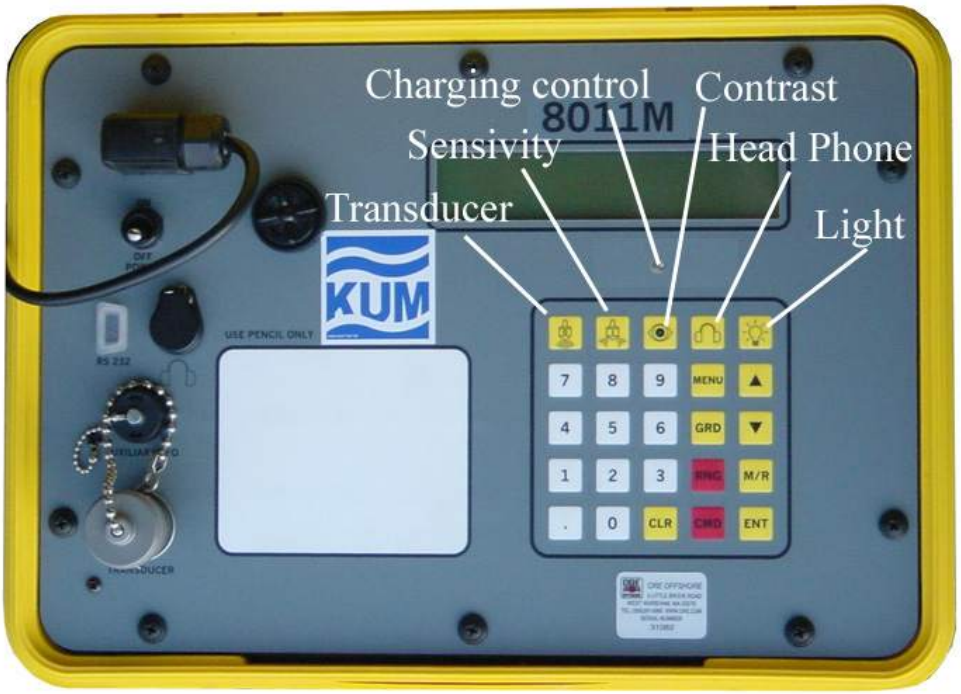


Figure 3.2: Adjustable parameters of deck unit 8011M.

After having pressed the respective key you set the parameter with the arrow keys.

Key	Name	Function
0-9	Zero to nine	figures or menu choice
CLR	Clear	clear input
△	Up	back to precedent screen
ENT	Enter	end input

·	Dot	place a decimal point in the number
△	Raise	raise the level
▽	Lower	lower the level from left to right on the keypad:
		source level
		sensitivity
		contrast
		headphones
		display lighting (on/off only)
CMD	Command	change to command mode
GRD	Guard	hold in to send a guarded command
RNG	Range	change to distance measurement
M/R	Manual/Repetitive	change between manual and automatic ranging
MENU	Menu	different menus for parameter setting

Figure 3.3: Keyboard 8011M

3.3 Operation of the Deck Unit

The use of deck unit 8011M is easy and intuitive. Nevertheless we recommend to read carefully the manual in order to prevent misuse and to get to know the unit´s whole functionality.

Instruction is divided into the paragraphs `command mode`, `range mode` as well as `setup and tuning`.

The deck unit is tested ex works. For operation open the cover first and connect the mains connector and the transducer. When switching the deck unit on it appears the following screen:

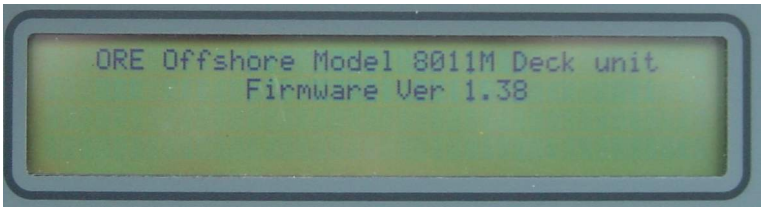


Figure 3.4: Start screen

When switching on the unit runs a self test. The memory is tested and errors are reported. If an error arises and you still want to use the device press `<ENT>`. However, the error can be so serious that no operation is possible.

Next the backup-battery for the memory is tested; similar to a PC battery this one has a longevity of many years. When the battery is exhausted saved data input is replaced by presettings - you get a message. The unit functions without any problems but modified settings are deleted when switching the unit off.

The loudspeaker is tested as well and you hear a short beep.

By pressing the keys `CMD`, `RNG` or `MENU` you change to command mode, ranging mode or menu.

3.3.1 Short instruction

- Connect mains plug and transducer, descend the transducer into the sea and switch the deck unit on.

- Press `CMD` for sending a command or `RNG` for ranging.

- **Command Send**
  - Set the source level (see fig. 3.2).
  - Set the deck unit by means of the keys `MENU`, `<1>`, `<1>-<3>`, on communication with KUMQuat or EdgeTech releaser respectively Benthos or Mors releasers.
  - Input a command.

    ORE/KUM Put the 6-digit `BACS` code in (KUMQuat releaser).

    Benthos Put frequency and 2-digit `Fx` code in.

    Mors Put the 4-digit (6xx serie) or 8-digit (8xx serie) code in.
  - Press `ENT` for sending the command. Guarded commands need simoultaneously pressing of `GRD`.
  - After having sent the command the display shows possible replies with signal strength.

- **Distance measurement/Ranging**
  - Set the source level (see fig 3.2) with the arrow keys.
  - Press `<Menu> <2) Range Setup>` and set the correct parameters.
  - Press `<RNG>` for ranging.
  - Choose with `M/R` either manual distance measurement or steady measurement. If necessary set the repetition rate.
  - Press `ENT` for starting distance measurement.

3.3.2 Detailed instruction

Command Send

Deck Unit 8011 can send either KUMQuat commands or commands for other releasers. Commands for the releasers from ORE Offshore/EdgeTech and EG&G belong to the KUMQuat commands.

If you expect a reply from the targeted instrument first press `<MENU>`, `<2) Range Setup>` and set the frequency on the carrier frequency of the reply; with KUMQuat releasers you must set 12kHz.

Press CMD in order to change in command mode. Then put the command in (see fig 3.5).

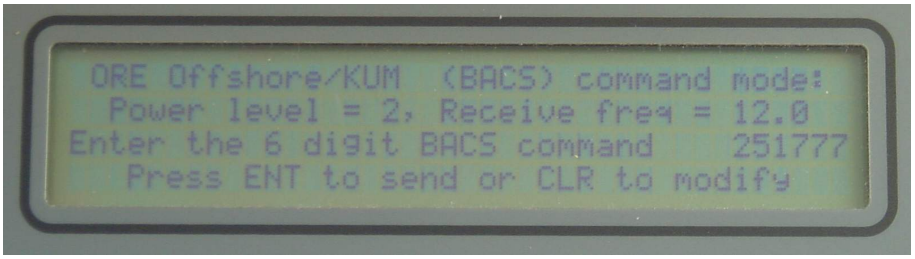


Figure 3.5: Input of a BACS command

Now the unit is ready for sending. In the first line you see the releaser´s family, to which the command belongs, in the second line you see the output power and the expected reply frequency, in the third line you see the command to be sent (see fig. 3.5).

Pressing `ENT` sends the command. If the command is "guarded" - our example - press simoultaneously the `GRD` key. In general the `RELEASE` command is a guarded one.

Other commands

With deck unit 8011M you can serve also instruments from other manufacturers. Both rate-encoded ("Benthos") and bit-encoded signals are supported ("Mors"). First enter the menu with `MENU` and choose `<1) COMMAND SETUP>` for setting the commands up. With `<1>` to `<3>` choose one of the supported signals. Press `CMD` and put the command in.

"Benthos"

The "Benthos" command is put in in two steps: first choose the <IN BAND> frequency with the arrow keys, acknowledge with ENT, then choose <repetition rate>, <ENT> sends the command.

"Mors"

Choose the needed Byte with the arrow keys and acknowledge with <ENT>. If you want to put a 861-command in (8 Bytes) separate each 4 Bytes with a dot (decimal point) (see fig. 3.6).

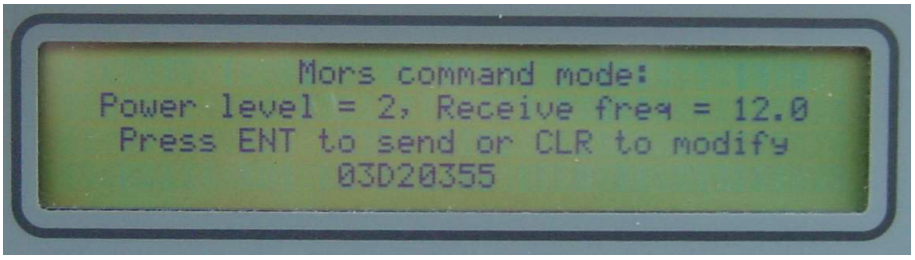


Figure 3.6: Bit-encoded signal 03D2 0355

With an additional <ENT> the unit is ready for sending. A last <ENT> sends the command. With an 8-digit command there is automatically a 4-10 sec. pause between the first and the second command half. Replies from the releaser are received and stored but not decoded.

3.3.3 Reply from the releaser

After the command has been sent and the lockout-time has passed by the unit expects a reply. With the first reply signal the recording of the arriving pings starts.

The receiver has a variable threshold. Therefore the deck unit´s sensitivity can be maximized, by setting the threshold just above background rush. In order to set the threshold switch the deck unit on and descend the transducer into the sea. With the transducer´s arrow keys set the threshold so that the detector just reacts to the background rush, the loudspeaker documents this with a beep. The optimum sensitivity is one to two steps

above this rush. Try this threshold in different environments and you will get optimised sensitivity, widest possible range and minimized "ghost signals".

Releasers from KUMQuat serie encode their replies in number and repetition rate of their pings, e.g. 7 pings in second interval show that the command execution is successfully terminated and the releaser lies horizontally (see fig. 3.7). 15 pings show a vertical position, pings every two seconds show an error.

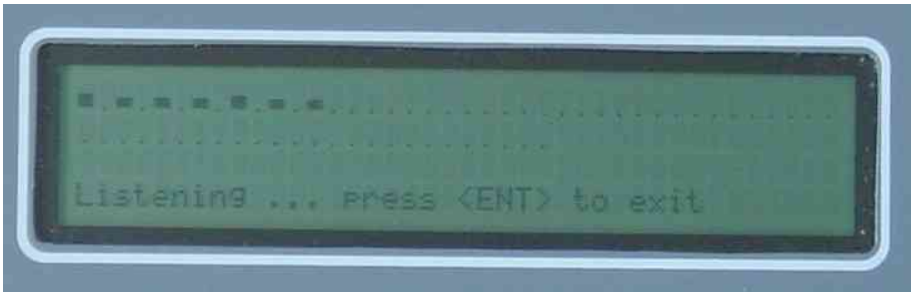


Figure 3.7: Reply from the releaser

When receiving a reply within the specified frequency the deck unit shows a bar each half second in the display, depending on reception strength either a blank or a black bar.

A reply signal that e.g. is 7 pings at one-second-intervals is displayed – provided that the reception is good – with 7 black bars and 7 dots.

If the pings are sent in two-second-intervals one black and three blank bars are displayed alternately.

Each received signal, furthermore, is reproduced acoustically over the installed loudspeaker. A turnable button at the loudspeaker´s housing regulates the loudness, that also can be set with the arrow keys on the right keyboard.

3.3.4 Range mode/Tuning

Distance measurement

In the range mode (enter with key <RNG>) one single ping is sent to the underwater unit and the time is measured until the reply arrives. Now you can determine the distance from the transducer (of the deck unit) to the transponder (of the underwater unit) with the time that has passed by and instrument and environment parameters with the following formula for the calculation of direct distance s:

$$
\begin{aligned}
s &= \frac{t - t_{tat} - t_{rt}}{2c} \\
\text{mit} \quad t &= \text{time between pulse sending and receiving} \\
t_{tat} &= \text{turn around time of the underwater unit (reaction time)} \\
t_{rt} &= \text{receive time of the deck unit} \\
c &= \text{average speed of sound}
\end{aligned}
$$

For the horizontal distance s_h between transducer and transponder is valid

$$
\begin{aligned}
s_h &= \sqrt{s^2 - s_{ttd}^2} \\
\text{with} \quad s_{ttd} &= \text{transducer-transponder-depth}
\end{aligned}
$$

In order to start a distance measurement set timing and display parameter and transmit frequency with the key <MENU> <2) Range Setup> . Choose <RNG>. Set the transmit strength with the arrow keys of the transducer and start distance measurement with <ENT>.

Tuning - setting possibilities in detail

With the keys <MENU> <2) Range Setup> you can set the following parameters (see fig 3.8):

Interrogate freq.: standard for KUMQuat releasers are 11Hz. You can change the frequency for other instruments.

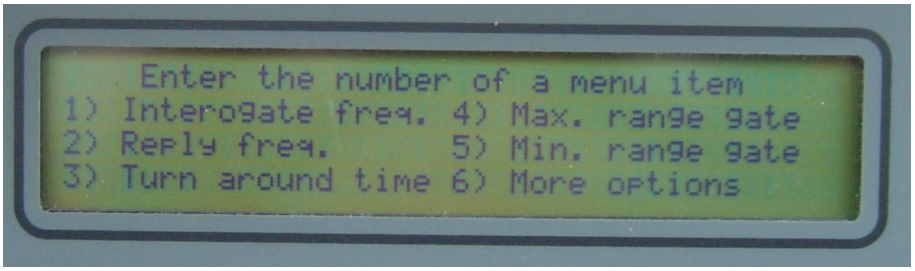


Figure 3.8: Menu for setting the acoustic parameters.

`Reply freq.:` given are 12.0kHz. Here you set the frequency at which the underwater unit sends its reply. All KUMQuat releasers send on 12.0kHz.

Turn-around-time of underwater unit t_{tat}: the called transponder needs a defined time to detect the signal, to evaluate it and to send a reply signal. The more this time is known, the more exact works distance measurement. For KUMQuat releasers this time is at 12.5ms. If for releasers from other manufacturers the values for t_{tat} and for transmit and receive frequencies are known distance measurement is also possible.

`Max. range gate:` if the distance measurement comes to higher values than the here stored ones measurement is ignored. This option shall fade out "ghost signals" (e.g. from precedent replies).

`Min. range gate:` if the distance measurement comes to higher values than the here stored ones measurement is ignored. This option shall fade out "ghost signals" (e.g. reflections and echoes).

In the next sub-menu you find three more setting possibilities:

Sound speed of water `sound speed` c**:** The exactitude of distance measurement to a high degree depends on the sound speed that is put in here. The sound speed itself depends on temperature, salinity and other factors, for utmost exact measurements we recommend to make a CTD-measurement first. Standard is $1490.0\frac{m}{s}$for cold ocean water. It is also possible to put the air sound speed in for test measurement on deck or in the laboratory although distance measurement in air is rather inexact.

`Slant/horizontal range mode:` As an alternative to the absolute distance you can also get the horizontal distance provided that transducer and transponder depths are known. With this key you change between absolute and horizontal distance.

`repetition rate:` With key `M/R` you can switch between manual ranging and repetitive ranging; the repetition rate can be set in seconds.

3.3.5 Installation and setup

Power supply

The deck unit can be connected to the American (110 V with 60Hz) net as well as to the European (230V with 50Hz), it switches automatically.

DDeck unit 8011M possesses internal batteries. It can be used either per mains connection or per batteries. If backlighting is on when the deck unit is powered by batteries, operation time reduces considerably. In order to charge the batteries the deck unit must be switched on and supplied with mains voltage. Charging is effected processor controlled end finishes automatically. Newer units are supplied with a tri-color-LED that describes charging status: green light indicates high charging current like directly after connecting to power. If batteries are fully charged, LED switches off. Blue color indicates that the unit is running on batteries, if color changes to red or blu/red, batteries are almost empty.

Since the unit is a highly sensitive receiver you must pay attention to clean energy supply and careful grounding. Mains voltage should be free of high-frequency parts, therefore you should do without generators with so-called "modified sinus form". In general the "modified sinus form" is just a step-function. That leads to a "dirty" power with utmost high frequencies in it.

An adequate voltage supply has a potential difference of less than 1 Volt as well as a resistance of a few Ohm between "neutral" and "mass". If these conditions are not given the unit cannot shield its sensitive receivers against induced interferences. In particular with generators or on ships with moderate voltage generation these problems occur. If the headphones rush excessively and if you have only bad contact to the underwater unit, please check the power supply.

Caution! Voltages of power supply are lethal! Never open connector housings or instrument housing while connected to the power line.
If a problem with energy supply occur consult a qualified electrician.

Check voltage and voltage differences / resistances between "neutral" and "ground". Ask the ship‘s electrician when you have problems with the ship´s electrics. If you have problems with a generator make an adequate connection to the mass and ground it.

3.4 Operation of the RS232 interface

The parameters of the serial interface are set on `9600 Baud, no Parity, 8 Databits, 1 Stopbit.` . The serial interface fulfils two functions: *logging* and *host mode*.

3.4.1 Pinout of RS232 interface

The serial interface of deck unit 8011M works on a simple level. Since only a few data are transferred there is no handshaking. Only three of nine pins are in use. Set the parameters of the interfaces from PC and deck unit on the same values.

Pin AMP	Pin d-sub 9	Name	Direction	Meaning
1	-	Shield	-	ground housing
2	5	`GND`	-	signal ground
7	3	`RX1`	in	receive data (to 8011M)
8	2	`TX1`	out	transmit data (from 8011M)

Table 3.2: RS232-Pinout

3.4.2 Logging

All commands that are put in the deck unit are simoultaneously given out over the interface and can be saved in a PC or laptop.

The logging function refers to commands and ranging commands.

3.4.3 Host mode

In the host mode the deck unit can be controlled from a PC or laptop. The scope of functions confines to the general jobs, no settings and programming are possible. You start the host mode with `<MENU>, <3) System setup>, <3) Enter Host mode>` or with `<CR>` (Carriage Return) on the RS232-line. The commands are made up of 2 letters, sometimes a number follows without space. Each command is closed with `<CR>`. The deck unit

answers to any command <XX><CR> either with <XX *><CR> for a valid command or with <XX #><CR> for an invalid command.

Take care to put them in capitals in!

The following table enlists all commands:

RXxx.xx	Receive frequency, puts receive frequency on "xx.xx" in kilohertz, increment 0.25kHz, range 07.50kHz to 15.25kHz.
INxx.x	Interrogate frequency, puts interrogate frequency on "xx.x" in kilohertz, increment 0.5kHz, range 07.50kHz to 15.25kHz.
IN	Interrogate, generates an interrogate pulse with set frequency and set power. An interrogate pulse serves distance measurement. If a reply is detected on the set RX-frequency, distance (in mm) is transferred to the host. If 300 seconds later no reply is detected the unit sends <IN 00000 mS> as indication for "No Reply". You can stop ranging with <CR>, the unit then answers <IN #><CR>showing abort.
RR	activates Return Ranges. Each reply from the underwater unit is sent to the host (presetting).
NR	No Ranges (Return Ranges is deactivated).). The reply from the underwater unit appears only on the deck unit's display.
GR	Get Range forwards the latest determined distance to the host.
SOx	Set Output puts the transducer power on "x"; "x" ranges between 0 and 9. Output 0 does *not* set the output to zero but to lowest level available.
SIx	Set Inputputs the transducer sensivity on "x"; "x" ranges between 0 and 9.
LGxxxxx	Lower range Gate puts the bottom threshold for ranging on "xxxxx" milliseconds, valid range is 00050 to 21844 ms.
UGxxxxx	Upper range Gate puts the upper threshold for ranging on "xxxxx" milliseconds, valid range is 00050 to 21844 ms.

`CMxxxxxx` `CoMmand`, sends command "xxxxxx". **Caution! Execution of each command is done immediately, even guarded commands!** A `<*><CR>` reply shows successful sending, a `<#><CR>` CR reply an invalid command. By means of `<CR>` a command can be aborted, guarded commands are protected. An aborted command is documented with `<*><CR>` pursued by `<#><CR>`.

Examples host mode

Input	`RX10.00 <CR>`	Puts receive frequency on 10.00kHz.
8011M	`RX10.00 * <CR>`	Execution successful.
Input	`SO6 <CR>`	Puts power on 60 percent.
8011M	`SO6 * <CR>`	Execution successful.
Input	`IN22.0 <CR>`	Puts interrogate frequency on 22.0kHz.
8011M	`IN22.0 # <CR>`	**No execution!** (Frequency higher than permitted range.)
Input	`IN11.0 <CR>`	Puts interrogate frequency on 11.0Hz.
8011M	`IN11.0 * <CR>`	Execution successful.
Input	`RR <CR>`	Activates transfer of replies from the underwater unit to the host.
8011M	`RR * <CR>`	Execution successful.
Input	`IN <CR>`	Send interrogate pulse.
8011M	`IN 02300 mS <CR>`	Pulse sent, reply receipt 2300 ms later.
Input	`CM237170 <CR>`	Send BACS command `237170`.
8011M	`CM237170 * <CR>`	Command `237170` sent.

3.5 Maintenance and care

3.5.1 Transport and storage

Please take a shock absorbing packing for transportation. Hard bumps can cause damages. Transport and storage temperature must range between -20°C to +60°C. Storing and transportation must be done in a dry and dust-free environment.

For cleaning purposes take only a wet, not fluffy cloth and no cleanser and thinner.