uRec384k

programmable
underwater
acoustic
recorder

version 2.c
quick reference manual and operation guide
released on March 2021

manufactured by

NAUTA scientific - www.nauta-rcs.it
&
DODOTRONIC - www.dodotronic.com

General overview

The uRec384k is a stand-alone programmable underwater audio and ultrasound recorder.

It records autonomously, according to a pre-programmed schedule and a maximum sampling rate set at 384k samples per second. Limits on frequency response other than sampling rate may apply.

The electronic board inside the unit can be programmed using a bluetooth link via a dedicated software (to be installed manually) running over recent Android devices.

Updated programming details and procedures are available at our web-page.
https://bit.ly/UREC384

The unit can be delivered using different acoustic sensors (hydrophones), each with different characteristics, frequency response, depth range and self-noise.
In its standard configuration the unit features a single hydrophone, a Sensor Technology SQ26-05 ceramic, giving a declared 50kHz bandwidth (all the units we tested have a much larger bandwidth than the factory specified 50kHz).
Standard sensitivity of the SQ26-05 sensor is -175dB re 1V/µPa.
According to our tests the SQ26-05 survived a -500m long period (5 months) operation.
Calibrated sensors, with known frequency response curve, can also be delivered with custom made preamplifiers.

uRec384k unit with H2c hydrophone installed (on the left) and AS-1 (right)

The URec384k canister is a clear acrylic 8cm overall diameter cylinder, 35cm tall, 1cm wall. Two screw-on DELRIN caps, with two O-Rings at each end and 1.5cm wall and 10cm diameter.

Operational depth of the canister, with safe margin, is at least -500m, while other limiting factors may apply (hydrophone survival depth for instance).
AS-1 sensors (most calibrated units feature this model) can survive at 350m, with a standard operational depth of 200m.

Standard units are delivered with a **256GB mSD** card. Battery capacity goes from about 70hrs of recording time up to over 250hrs, depending on the battery units provided or installed and the sampling rate of the files.
A simple spreadsheet to **estimate battery duration and memory occupancy** if available at https://bit.ly/UREC-estimator

Power supply & Battery life

According to version models, the power supply of the unit is conditioned to deliver a 5V output starting from the battery set in the unit.
Some custom models feature a step-up/step-down micro-inverter, delivering a 5VDC from voltages from 1,5V up to 11,8V supplied, while **standard units feature a step-up micro-inverter, delivering a well regulated supply of 5VDC starting from 1V up to 5.5VDC**.

Battery life depends on the programmed duty cycle of the unit. As stated before a simple spreadsheet to **estimate battery duration and memory occupancy** if available at **https://bit.ly/UREC-estimator**

A **magnetic switch**, directly connected to the batteries, can be operated using a magnet from outside the canister.
The unit can be pre-programmed and closed days before actual deployment.

The unit is turned on when the magnet (shown in the picture) is removed.
This procedure (turning OFF and then ON again) can also be used to load a new configuration via bluetooth, without the need to open/close the canister while on the field.
Data present on the mSD memory can NOT be downloaded using the bluetooth connection.

Actual turning-on of the unit can be checked via the three status LEDs of the board.

Batteries must be inserted carefully according to the battery holder installed.
Please double check correct polarity.
Standard battery format is size D x 3 cells.

The board

The URec384k unit is based on the DODOTRONIC Ultramic384K BLE.

To program the unit, as a first choice method, the user has to use an android device with bluetooth connection.
The bluetooth connection on the Ultramic is turned on at the start-up only of the unit, and is turned off if no link is established within a few seconds.

The most reliable procedure to link to the board from you phone is this:

1.(first install the .apk software from the file and grant the necessary priviledges. The file is NOT on the official PLAY store, so it must be downloaded from the Dodotronic website, saved on the android device, and the run from the internal memory. A security warning might appear when downloading the .apk package, please confirm and proceed)

2. lauch the application on the smartphone UM384BLE; select CONNECT TO MIC; select SCAN AND CONNECT

3. remove the magnet on the unit to start it, or place the magnet in position, wait 10 seconds and then remove to restart. If yor unit is open and out of the canister, you can simply first remove and then set the batteries back in position.

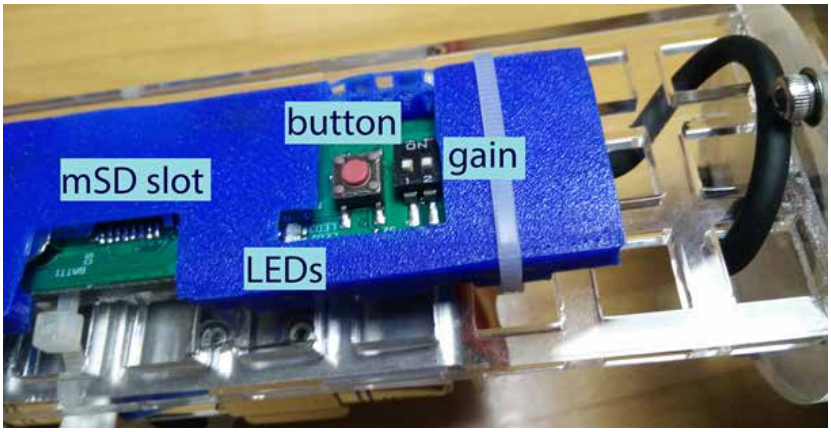
An **RTC - real-time clock** is powered by a separate coin-battery, and retains the correct time and date even when the unit is left with no batteries over long periods.
Correct date and time are programmed via bluetooth while sending the configuration from the Android device used for programming.

Sampling rates and recording schedule can be programmed via bluetooth using the dedicated software **or using a setup file saved on the mSD installed**.(please check the board manual for details).

Several sampling rates are possible on the unit, up to 384ks/s, single channel, 16bit.

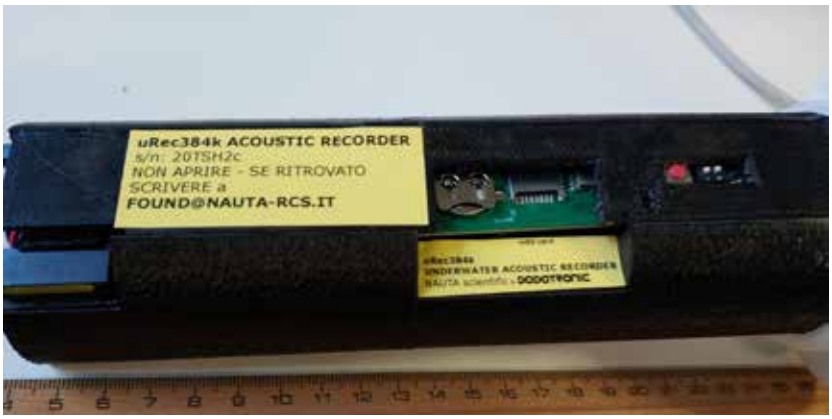
Firmware and software can be downloaded from **DODOTRONIC** website and are updated when new features are made available.
https://www.dodotronic.com/ultramic384k/ultramic384k-ble

The board has a standard gain (amplification) of 30dB on the input. Additional input gain can be set using the dip-switches on the board, according to manual. Additional gains can be of 20 or 40 dB. When delivered the unit will have a 0 - zero additional gain set, unless specified.



The board is protected using a plastic shell, with variable shapes according to instrument series, leaving button, dip-switches and mSD access operable.

A shell also protects the voltage regulator (micro-inverter), near the magnetic switch.



The canister

Extra care must be paid to the canister, especially when closing it, in order not to damage the thread and to guarantee water tightness.
In general ONLY the cap with the hydrophone must be opened, while the closed end should be left tightened.

Two O-Rings (made of black NBR Nitrile-butadiene rubber) are set at each end and they must be carefully checked before closing the unit. One O-R is set on the cap, while the other is set on the canister itself. They are different in measure and must not be mismatched.
Please use some lubricant (special lubricant is provided with the unit) on the thread and O-R and be sure no dust, salt, dirt is sticked on it when closing. If you need to but some extra lubricant, please be sure it is suitable for O-R, as many standard aggressive lubricants could damage the NBR O-R making them too soft or larger.

The caps are made of a non-sticking DELRIN resin which is softer than the cylinder. This is made so that the two parts will not get seized up even if left in the water for long periods.
Fouling will be minimal.

Please be sure the faces of the cylinder and of the cap are perfectly parallel when closing.
Extra caps are available for servicing on request.

Please follow these steps when closing:

Starting from an open unit…

- Carefully check and clean the thread and the O-R. Put a small dose of lubricant on your clean finger and spread evenly on the O-R and thread.

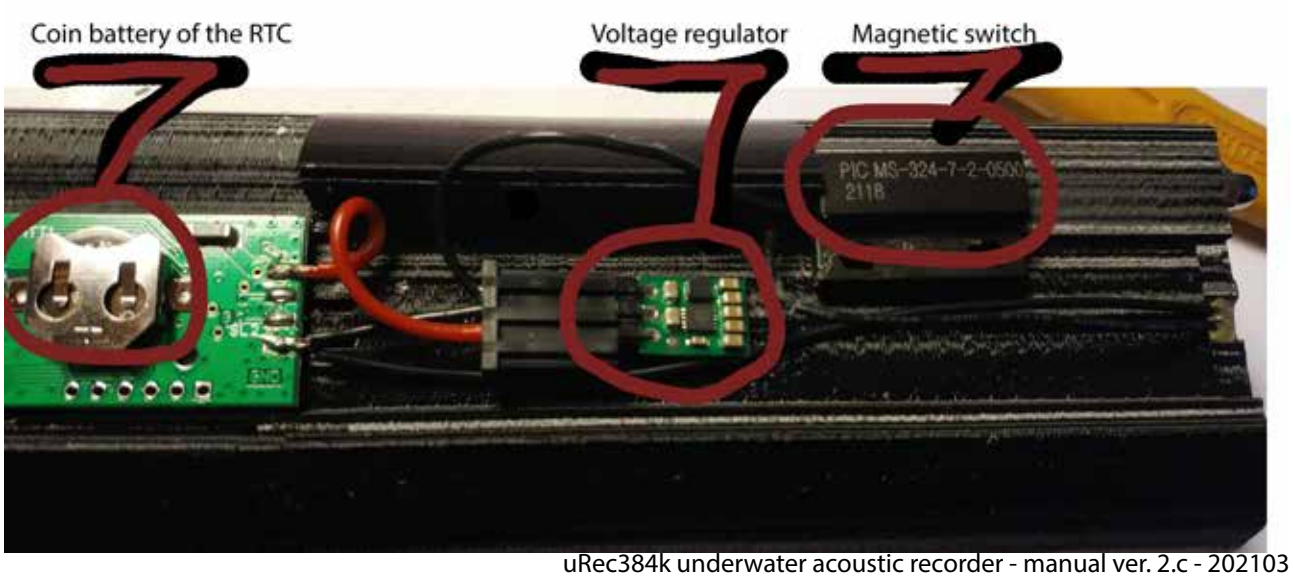
- Gently position the cap with the hydrophone and instruments into the canister, and UNSCREW until you are sure they are perfectly aligned.

- SCREW the unit into the canister until it is fully in locked position.

- The can with hydrophone mounted must be twisted to lock it until the reference tape on the acrilic is almost in contact with the white cap.
This operation must be done by hand.
(You can use some duct tape and/or wear gloves to improve the grip of your hands while locking and unlocking).

- The closed end (bottom of the unit) has a shorter thread on its cap and more free threads are visible when locked.

- The O-R on the cap will be fully visible and in contact through the transparent wall of the canister



Parts

According to the Ultramic384k manual, several parts are easy to be identified.

mSD SLOT: supports several brands of mSD cards, tested up to 400GB.

LEDs: status leds show the current operation or status of the device.

GAIN: sets the gain at the input (0, 10x, 100x) and must be used to tune the device according to the sensor and to the expected signal levels.

BUTTON: switches different functions. Please check the manual.

VOLTAGE REGULATOR: accepts input from batteries and delivers 5VDC.

MAGNETIC SWITCH: directly connected to the batteries, this switch disconnects the power supply when a strong magnet is near. Can be used from outside the canister to restart the unit (connecting the bluetooth), or to put the unit in stand-by before the deployment (keeping a magnet in proximity of the switch).

Magnetic switch is black and is highlighted with a yellow mark on it. Provided magnets can operate the switch through the wall of the recorder.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