

# RASP

## Programmable underwater acoustic recorder

Introduction  
and  
Protocol for use

Ver.1.1us



## **Overview**

The RASP recorders are self-contained programmable acoustic recorders designed to perform short-to-mid term underwater monitoring in the audio and ultrasonic audio range.

Currently based on modified *MicroTrack 24/96* digital pocket recorders and on customized Sensor Technology SQ26 series hydrophones, they are inexpensive and effective equipment for underwater acoustic and bio-acoustic monitoring tasks.

In their current configuration the systems are packed together with an original timer control board, offering full programmability, an aluminium canister and a set of NiMH rechargeable batteries, delivering up to weeks of independent life (depending on battery capacity and system configuration).

Every RASP order is delivered with accessories and spare parts. One cable to connect the timer to the PC is normally delivered with each order; extra cables are available on request.

One or more electronic automatic fast battery chargers are normally delivered with each order.

RASPs can go down 500 meters and successfully record the signals you are interested in.

## Describing the unit

Units are assembled with (starting from the hydrophone side):

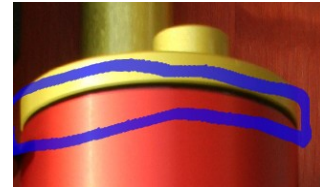
- one ST SQ26 hydrophone, set in an aluminium cup, and retained there by two o-rings;
- the aluminium cup, screwed into the top of the canister, and retained there using an o-ring and a chemical compound;



- a second smaller aluminium plug, screwed into the top, used to offer optional connections, to compensate pressure difference between the environment and the inside of the canister. **This plug is LOOSE when delivered, and must be firmly tightened by hand before use;**



- the aluminium top, with two holes and an o-ring;
- the aluminium canister;



- a PVC plug, inside, that fits the top, and hosts the needed conditioning electronics and connections between the recorder and the hydrophone;
- the recorder;



- the programmable timer, normally set on the back of the recorder;
- the battery, snapped between two stainless steel bars, used to accommodate a variety of battery sets;



- the bottom, with a zinc and a stainless steel ring, to firmly attach the RASP to its host.



## Preparing the units

Units are normally delivered already assembled, but with loose screwing among some of the canister parts (**except** the hydrophone cup connection, which is tightly fixed and must never be loosened / removed by the final user).

Loose screws on the canister must be tightened before going into the water.

Batteries are delivered discharged and disconnected; this is also required by current air transport regulations. Batteries must be charged before use.

## Charging the batteries

NiMH batteries are delicate and must not fall.

They can easily and **without external signs of damage** break if submitted to strong mechanical stress.

Nominal current of the RASP battery packs is 4.8VDC, and they reach 5.3VDC when fully charged. This value must NOT be exceeded, even if connecting to a third party power source.

Battery packs provided in the MT150US units have a nominal 9.000 mA capacity. Standard slow charging must be at 1/10 of the nominal capacity for about 16 hrs (about 1A for 16hrs). Faster charges are accepted provided the battery temperature is monitored, especially for currents higher than 2x the slow rate.

Please use the provided cable and battery charger to fully charge batteries before use, and carefully follow the instructions delivered with the charger to properly charge the packs. At the beginning rechargeable batteries will reach their best performance after several charge/discharge cycles.

Battery chargers usually have a status led that reports about the charging status.

Please consider that, to avoid additional power consumption, the system does not offer a discharge limiting circuit. This means that the batteries will be completely discharged if they are not removed / disconnected from the system. To recover from this status (fully discharged) and depending on the life cycle of the battery pack and the charger used, the pack could require several recharging cycles. Chargers usually have a DISCHARGE feature, or the user could simply complete the first cycle, leave the pack disconnected for half an hour, and then repeat the recharging cycle.

Charge status can be independently checked using a voltage meter, and should be around 5.3V when fully charged.

NiMH batteries have a huge discharge current, and could burn or explode if short circuited. This is the reason why all operations with open canisters must be done in a dry environment, with **freshwater rinsed and then dried canisters**.

## Setting the timer

You will need the provided cable, connected to the pin-out at the bottom of the timer board, to program the timer board.

Please consider that you have 10 seconds, after connecting the battery, to establish a software connection to the unit. After this period, if no connection is detected, the timer turns the serial interface off (to save power), and no connection is possible until you disconnect and reconnect the power.

Therefore, the correct procedure is the following:

- leave the battery disconnected,
- connect the serial cable to the board (that must be connected to the computer at the other end... it goes without saying),
- launch the programming software on the computer and open the configuration tool,
- connect the battery,
- press CONNECT

It is up to the researcher to decide the sampling scheme. Three sampling methods are currently available from the programming panel on the PC:

### Equal interval

It is used to define equal recording and stand-by periods. Values are in “minutes”.

It is cyclically repeated.

Example: setting “10” in this mode, will result in 10 minute recordings with 10 minute pause in between.

In general, due to the recorder’s delays, it is not advisable to set schedules with equal intervals shorter than 3 minutes. If shorter periods are needed, please test the schedule before deploying.

### Hourly interval

It is used to set up to 24 recording periods in a day. Scheduling is cyclically repeated.

### Duty cycle

It is used to preset a recording length over each hour. It is expressed in minutes over the hour. Scheduling is cyclically repeated.

The sampling scheme can be saved, for future use, on the local computer.

Once the program is set it must be uploaded to the board using the SEND TO TIMER button. You can check if it has been correctly received using the GET FROM TIMER function.

A delay can be set (up to 600 minutes) to start the program after a quiescent period. A delay period will also give you the time to manually turn the recorder ON and set your recording preferences. (see after).

Close the communication and disconnect the cable.  
Correct disconnection is needed to set the correct time on the timer clock. Consider that the timer clock is set accordingly to the computer clock. So be sure your computer's clock is correctly set if you want to follow a precise schedule.

From this moment batteries should not be disconnected until the end of the mission, especially if the "**hourly interval**" settings are used. While settings will be retained even with disconnected power source, the timer uses a software clock that resets if batteries are disconnected. It will restart from 00:00 AM when batteries will be reconnected.

Timing examples:

<b>format</b>	<b>sampling</b>	<b>Bit</b>	<b>channels</b>	<b>4GB capacity card</b>	<b>Sampling scheme</b>
WAV	44.1k	16	mono	12:40	<b>5 minutes / hour, 152.6 hrs to fill memory</b>
	48k			11:45	
	88.2k			6:24	
	96k			5:50	<b>5 minutes / hour, 70 hrs to fill memory</b>
MP3	48 o 44.1	96kb	stereo	92:17	<b>15 minutes / hour give 1100 hours to fill memory</b>
		128kb		69:13	
		160kb		55:20	
		192kb		46:08	
		320kb		27:40	<b>5 minutes / hour give 330 hours to fill memory</b>

## Setting the recorder

Please refer to the M-Audio manual to correctly set the recorder according to your requirements.

Please consider that the hydrophone is connected to the 1/8" plug (**use this as INPUT**).

Batteries must be connected to be able to turn the recorder on.

You can turn the recorder ON by pressing the standard I/O button (10 seconds after the circuit has been powered, if the timer is connected). You can access all standard menus using the standard buttons, including the recording levels.

Please remember:

Set the recording level (mono recording is recommended if WAV recording, and left channel is used, as standard, for mono recordings).

Set the level using the virtual sliders (front panel of the recorder – up...down buttons), and set the MIC SENSITIVITY switch on the side.

**MID sensitivities on both settings can be a good starting point.**

KEEP THE PHANTOM POWER OFF

KEEP THE KEY LOCKING SWITCH OFF

SET THE RECORDER'S TIME (while recording settings are kept when batteries are disconnected, the internal clock is reset when batteries are disconnected, and must be set at each use). While setting the time is not crucial for the recorder, having the time correctly set will let you have each file individually time-stamped (in the *file properties*).

## Updating the recorder's Firmware

M-Audio is constantly updating the software that drives your recorder. This could sound as a good thing, adding new options and fixing some bugs.

On the other hand we observed that current firmware latest release (ver.1.4.5) returns an unpredictable behaviour when used together with our timer boards.

**This means that you should NOT update your firmware unless advised to do so by our technical team.**

## Memory cards

Memory cards must be protected as they are sensitive devices.

Cards stick to the CF or Compact Flash standard. Currently available formats are up to 8GB on solid state cards. *MicroTrack* recorders do currently support formats up to 4GB. This due to firmware restrictions that should be corrected in future releases. Some 8GB cards have been successfully tested with the installed firmware, but in general 4GB cards are more compatible.

We hope to find a solution, and adopt 8GB cards as standard, in the near future.

## Nominal capacity of memory cards

File format	Sampling rate	bit	Channels	Nominal capacity on a 4GB CF	Time to fill memory with an "equal interval" configuration
WAV	44.1k	16	Mono	12.43.38	25h – 1 day
	48k			11.46.45	23h – 1 day
	88.2k			6.23.56	12h – ½ day
	96k			5.53.17	12h – ½ day
MP3	48 or 44.1	96kb	Stereo	92.17.24	184h – 7 ½ days. Requires a supersized battery.
		128kb		69.13.00	138h – nearly 6 days. Requires a supersized battery.
		160kb		55.22.22	110h – 4 ½ days. Requires a supersized battery.
		192kb		46.08.37	92h – nearly 4 days. Requires a supersized battery.
		320kb		27.41.06	54h – two days

So we can go from about 6 hours to a max of 184 hours on a 4GB card.

## GOOD CARE OF THE SYSTEM

The aluminium parts are anodized for protection, and canisters have a zinc at the bottom that will limit system corrosion. The metal cup that keeps the sensor is also protected with a plastic sleeve.

Even if processed and protected, the metal canister may gradually, in a period of months/years depending on use, lose part of its resistance. Please periodically and carefully check the canister and its caps, and refer about corrosion status.

This system can be used, without distinction, at sea and in freshwaters.

Spare o-rings are provided and must be replaced every now and then according to the system use (a month or two, for example). O-rings must be carefully inspected at each use, and a **lubricant** must be used both on the o-ring themselves AND the parts being screwed.

Silicon and non-silicon lubricants, both in the persistent spray and the paste form, have been successfully used.

Aluminium screws, in general, can easily lock if they are not lubricated, and this is also true with RASPs caps. It is important to repeat the lubricant application at each use.