



WILDLIFE
ACOUSTICS



Song Meter SM4M

BIOACOUSTICS RECORDER

User Guide Supplement

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1 Overview

1.1 Use of this Guide

The SM4M is built upon the Song Meter SM4/SM4BAT platform. The Acoustic Model features the SM4 recorder and the Ultrasonic Model features the SM4BAT recorder. This document is a supplement to the SM4/SM4BAT User Guides. It is not intended as a stand-alone document and describes only information specifically related to the SM4M Marine Recorders. The SM4 or SM4BAT User Guide should be read first to fully understand the device's features and capabilities.

Revised and Translated User Guides

Wildlife Acoustics' User Guides are regularly updated and improved. New versions can be downloaded from <http://www.wildlifeacoustics.com/support/documentation>. The SM4/SM4BAT User Guides are also available from the same webpage in Spanish, French, German, Chinese and Japanese translations.

Tutorial Videos

Visit <http://www.wildlifeacoustics.com/support/tutorial-videos> to view tutorial videos for the SM4 and SM4BAT.

Contacting Support

For issues or questions not addressed in this guide, contact the Wildlife Acoustics Support Team:

- Email: support2021@wildlifeacoustics.com
- North America (toll-free): 1-888-733-0200
- Outside North America: US+1 978-369-5225 (Toll charges may apply.).

1.2 Introduction to the SM4M

The Song Meter SM4M is a submersible bioacoustics recorder designed for short or long term deployments in fresh or salt water. It is a cost-effective and reliable solution for the underwater monitoring of dolphins, whales, and other marine wildlife as well as ocean noise or anthropogenic sounds.

Like the SM4 and SM4BAT recorders, the SM4M features flexible scheduling, low power consumption and 16-bit digital recording. The SM4M can be deployed for days, week or months in any marine environment.

1.3 Submersible and Deep Water Models

The SM4M is available in two housings: **Submersible** or **Deep Water**.

The **Submersible** is rated to 500 feet (150 meters). The depth rating degrades with time, the 500 feet rating assumes a ten-year deployment life. The housing will accept 32 D-sized batteries.

The **Deep Water** is for deployments requiring greater depth or longer battery life. It is rated to 2,625 feet (800 meters) and will accept 64 D-sized batteries. The recording electronics are identical.



1.4 Acoustic and Ultrasonic Models

The SM4M is available in two versions: **Acoustic** or **Ultrasonic**.



The **Acoustic version** is designed to be used with the **Acoustic Hydrophone** option for monitoring non-ultrasonic marine mammals and quantifying ocean noise. It can record sounds up to 48 kHz. It is a two-channel recorder so it can additionally be fitted with a **High-SPL Hydrophone** to simultaneously record very loud sounds such as pile drivers. Alternatively, it can be ordered with only a **High-SPL Hydrophone**.

The **Ultrasonic version** is designed to be used with the **Ultrasonic Hydrophone** option for monitoring echolocation calls of marine mammals. It can record sounds up to 200 kHz. The hydrophone and electronics can also record low frequency sounds but with slightly more recording noise than the **Acoustic** version with the **Acoustic Hydrophone**.

1.5 Hydrophone Options

Three hydrophone options are available for the SM4M: Acoustic, Ultrasonic, and High-SPL.

The **Acoustic Hydrophone** is used to record whale songs, dolphin whistles, and/or ambient noise levels, from infrasonic into ultrasonic frequencies.

The **Ultrasonic Hydrophone** increases the recording bandwidth of the system to allow recordings not only from ultrasonic dolphin and porpoise echolocation calls, but also ultrasonic anthropogenic sounds as well.

NOTE: For low noise applications, choose the Acoustic Model. The Ultrasonic has a higher noise floor which can mask quieter noises. See the Specifications section for more information.

The **High-SPL Hydrophone** is specifically tailored to recording and quantifying high sound pressure levels such as those produced by pile drivers and air guns. When combined with any of the other hydrophones in a dual hydrophone configuration, the unit can record quiet or distant sounds from any source including marine life with one hydrophone, and at the same time accurately record and quantify very loud sounds from anthropogenic sources with the High-SPL.

The sensitivity of each hydrophone is calibrated to a 0.1 dB resolution by the hydrophone manufacturer. This value appears on a tag attached to the hydrophone cable and is reported as the average value over the band from 200 Hz to 1 kHz in increments of 100 Hz.

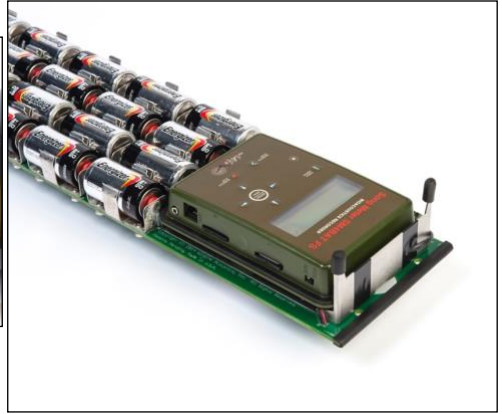
Hydrophone Recording Bandwidth and Dynamic Range

Hydrophones	± 5 dB Recording Bandwidth (Hz)	Dynamic Range (dB SPL)
Standard Acoustic	2 – 48,000	78 – 165
Ultrasonic	2 – 192,000	81 – 165
High-SPL	2 – 48,000	150 – 240

1.6 SM4M Visual Tour

The housing contains a large board with electronics and batteries that slides free of the enclosure for servicing. The **Deep Water** model also contains a second board that is attached to the first to hold additional batteries.

WARNING: Do not allow water, moisture, dirt, or debris of any kind to come in contact with the internal parts of your recorder.



At the top of the board are the SM4 or SM4BAT module which contains the LCD display, user interface buttons, SD card slots, power switch and GPS accessory port.

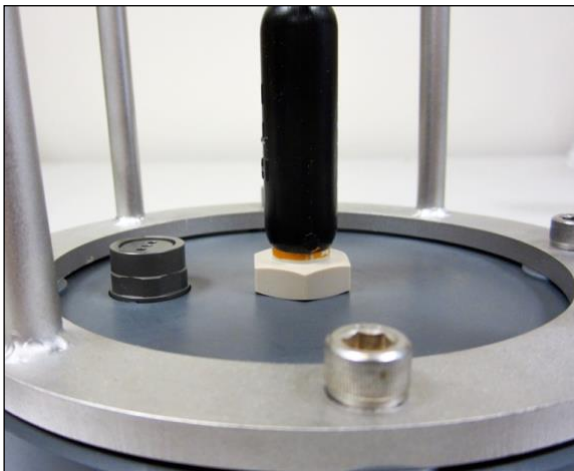


- 1 Storage Case:** Rugged storage case protects the equipment and offers convenient handles and wheels for reliable transport.

- 2 Desiccant:** Your unit ships with 5 packs of desiccant. Apply a desiccant pack inside the unit before each deployment.
- 3 Silicon Lubricant:** Apply to the O-Rings and flat surface points inside the top cap.
- 4 O-Rings:** O-Rings protect seals against water.
- 5 Spanner Wrenches:** Set of two identical wrenches allow installation and removal of the threaded top cap.

1.7 Pressure Release Valve

A pressure release valve is installed on the top cap next to the hydrophone. The pressure release valve prevents dangerous pressure build up greater than 10 PSI within the enclosure by releasing air through the valve. No maintenance is required to the valve and it should not be removed. It should be verified that it is hand tight before deployment.



2 Setup

2.1 Storage and Transport

The SM4M ships in a rugged case suitable for storage and shipment.



The case has wheels on one end for ease of travel and two latches which can accept locks for security. The spanner wrenches, O-rings, lubricant, desiccant, and other needed supplies can also be stored inside.



2.2 Installing Batteries

You can use standard D sized alkaline or NiMH batteries. Always use a minimum of 8 batteries. Though the SM4M will power with only 4 batteries installed, battery life will be shorter because of the voltage drop from the diodes that protect each group of 4 batteries.

Prior to installation, we recommend that you test all batteries with a high-quality pulse load battery tester such as the ZTS MINI-MBT.

NOTE: Do not mix batteries of different types. Do not mix old and new batteries.

1. Remove the top cap.
2. Pull the battery board from the housing using the large finger hole at the top of the board.
3. Press **STOP** to stop the current recording schedule. This step may be unnecessary if the batteries are depleted or the memory cards are full.
4. Remove the old batteries.
5. For SM4M Submersible models, insert at least 8 and at most 32 new size D batteries of the same type. For SM4M Deep Water models, insert at least 8 and at most 64 new size D batteries of the same type.



Batteries must be inserted in the proper groupings which are labeled A through H on the battery board. All four battery holders corresponding to a letter must be populated. Letters C and F have two on the back and two on the front. If not

filling all available battery positions, it is best to populate the letters closest to the bottom as that will help the SM4M float vertically.

2.3 Turning Power ON and OFF

Set the power switch to **INT** to turn the unit on. When not in use, set the switch to **EXT** to turn the unit off and conserve battery power.

2.4 Inserting and Removing SD Memory Cards

NOTE: Use memory card slot A when you want to update the firmware or import or export a Schedule.

1. In a dry environment, remove the top cap.
2. Pull the battery board from the tube.
3. Press **STOP** to stop the current schedule.
4. Insert one or two memory cards by lightly pushing in until each card is secure. Use memory card slot A when you want to update the firmware or import or export a Schedule.



TIP: Insert multiple SD memory cards to take advantage of failover capabilities. If an error occurs on one card, the SM4M can continue writing data on the other card.

5. To remove a card, press **STOP** to stop the current schedule. Lightly push it in and then feel it release from the slot and pull it out.

NOTE: Do not remove memory cards during a recording.

2.5 Estimating Battery Life

The following table shows approximate recording longevity in days recording continuously 24 hours a day. Since the recorder uses very little power while sleeping, longevity for lower duty cycles can be estimated by multiplying the shown values (50% duty cycle would double the shown values for example).

This assumes 20-degree Celsius water. Battery life varies and this should be taken as a maximum figure.

Maximum Deployment Time in Days			
Version	Sampling Rate (Hz)	SM4M Submersible	SM4M Deep
Acoustic (100% Duty-cycle)	8,000	133	266
	12,000	133	266
	16,000	133	266
	22,050	133	262
	24,000	133	241
	32,000	133	181
	44,100	131	131
	48,000	121	121
Ultrasonic (10% Triggered)	96,000	60	60
	192,000	153	301
	256,000	153	226
Ultrasonic (non-triggered)	384,000	151	151
	192,000	30	30
	256,000	23	23
	384,000	15	15
Limited by Battery Capacity			
Limited by Storage Capacity			

Download our free **SM4 Configurator** software application to see detailed visual forecasts for remaining battery life and memory card utilization given your specific recording schedule and configuration.

2.6 Estimating Memory Requirements

Ultrasonic Recording

Generally, ultrasonic recordings will be made utilizing the trigger function so that the recorder is not constantly recording and quickly using up card space. How long any given card (s) will last is dependent on ultrasonic activity, so some

experimentation will be required. A good starting point is to assume 1GB of memory per 24 hours of recording.

Acoustic Recording

In most applications, there is no reason to use sampling rates faster (greater) than twice the frequencies of interest.

The following tables estimate the recording time in hours for .wav file output and different combinations of memory capacity, sample rates, and channels:

Estimated Recording Time in Hours (1-channel Mono WAV)

	96,000	48,000	44,100	32,000	24,000	22,050	16,000	8,000	4,000
8 GB	12	23	25	35	46	50	69	139	278
16 GB	23	46	50	69	93	101	139	278	556
32 GB	46	93	101	139	185	202	278	556	1111
64 GB	93	185	202	278	370	403	556	1111	2222
128 GB	185	370	403	555	741	806	1111	2222	4444
256 GB	370	741	806	1110	1482	1613	2222	4445	8889
512 GB	741	1481	1613	2221	2963	3226	4444	8889	17778

Estimated Recording Time in Hours (2-channel Stereo WAV)

	96,000	48,000	44,100	32,000	24,000	22,050	16,000	8,000	4,000
8 GB	6	12	13	17	23	25	35	69	139
16 GB	12	23	25	35	46	50	69	139	278
32 GB	23	46	50	69	93	101	139	278	556
64 GB	46	93	101	139	185	202	278	556	1111
128 GB	93	185	202	278	370	403	556	1111	2222
256 GB	185	370	403	555	741	806	1111	2222	4444
512 GB	370	741	806	1110	1482	1613	2222	4445	8889

The above numbers can be doubled without significant loss of recording quality using Wildlife Acoustics' proprietary W4V compression format, which can be activated via the Audio Settings menu. Even greater compression rates are available with small degradation in signal quality.

Mixed Acoustic and Ultrasonic Recording

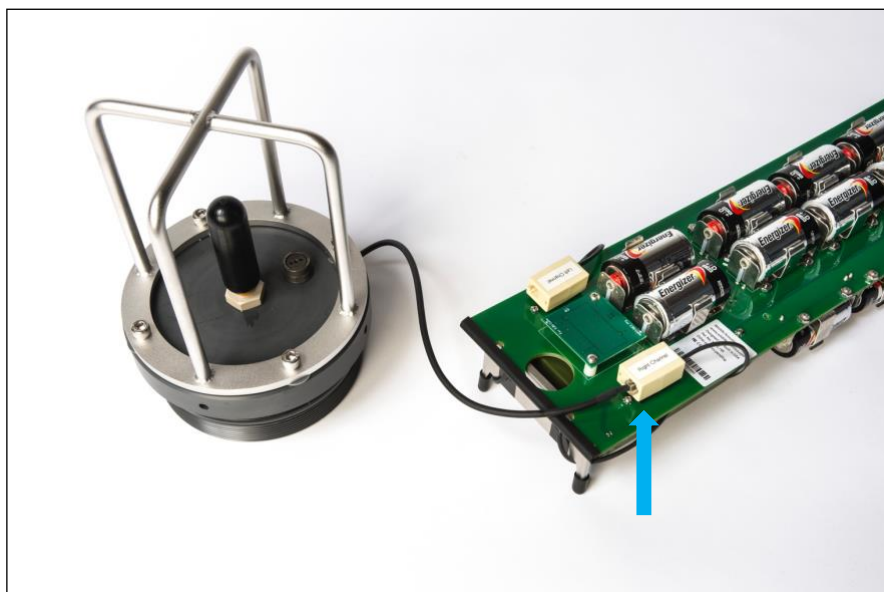
The **Ultrasonic version** is capable of sampling at both ultrasonic and acoustic sample rates. Estimating mixed recording schedules can be very difficult. Use the **SM4 Configurator** to determine battery longevity. The software understands the power used in both recording modes and can easily generate a calendar showing you a good estimate.

2.7 Deploying the Recorder

Install the Battery Board

Before installing the top cap and sealing the unit, perform these steps to secure the battery board.

1. Verify that the neoprene edging is in place on the top and bottom of the board to provide a small layer of insulation and cushioning. When the top cap is tightened, this holds the board in place and prevents movement during deployment.
2. Slide the battery board down into the recorder cylinder.
3. Plug the cable into either channel connector, or both if using two hydrophones. The **Ultrasonic Version** will have only one connector.



Perform a Pre-Deployment Test

At this point it is prudent to run a final system test.

1. Verify that you installed at least one memory card in slot A.
2. Power **ON** the unit.
3. Load the built-in 24 Hour schedule and press **START**.
4. Make loud sounds or use your voice.
5. Press **STOP**.

6. Eject the memory card and insert it into a computer.
7. Verify the sounds or vocalizations that you just recorded in the audio files on the memory card.

Start you schedule.

1. Load your chosen schedule as per the SM4 or SM4BAT User Guide.
2. Press the **START** button and watch for an announcement of scheduled recording time, if in the future, or **preparing to record** if the recording schedule starts in the next few minutes. The LED light on the Song Meter blinks once a second during a recording and once per minute when awaiting a scheduled recording.
3. Drop a desiccant pack into the bottom of the housing before re-installing the top cap.
4. Store remaining desiccant packs in air-tight resealable storage bags to prevent them from absorbing moisture.

Prepare the Top Cap

It is extremely important that the O-rings are clean, free of defects, and properly lubricated. The housing is sealed using two O-rings on the top cap. This is a redundant system. Only one O-ring is necessary to seal, but two are used to ensure a seal if one should become compromised.

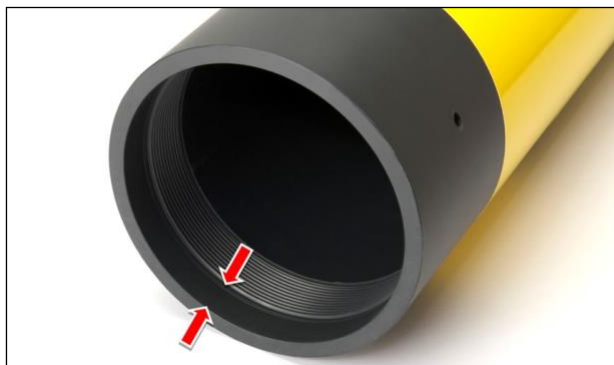
Note: The SM4M ships with no O-rings installed. Follow the steps in this guide to install the O-rings. Without O-rings, the unit will not seal and is unsuitable for deployment at any depth.

1. Apply a small amount of the included lubricant to the entire O-ring, feeling for defects with your fingers as you apply.
2. Insert the two (2) O-rings on the cap as shown.



3. Apply a thin layer of lubricant all the way around the smooth inner circumference of the housing where the O-rings will mate as shown in the

area between the two arrows below. This area and the O-rings should be free of dust, hair, and other debris.



NOTE: The SM4M package includes 4 O-rings, 5 packs of desiccant, and a tube of O-ring lubricant. Additional deployment supplies can be purchased from McMaster Carr (www.mcmaster.com). O-rings are part number 9557K334 and desiccant 5-pack is part number 2189K18. O-ring lubricant is part number 9463K33.

Install the Top Cap

Follow these steps to install the top cap. Install the cap with the tube standing in an upright position.

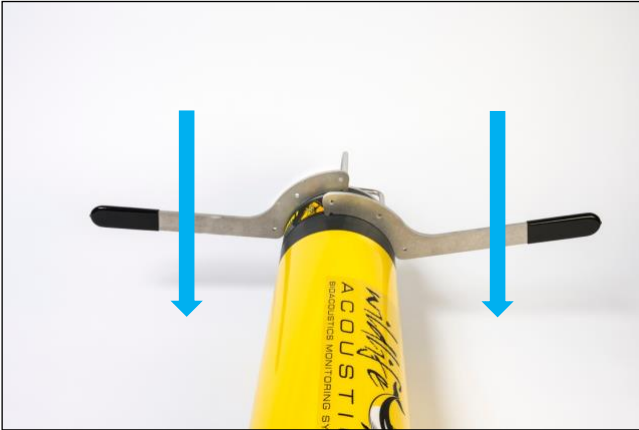
1. Before inserting the cap, rotate the cap in the reverse direction of tightening four times. It takes eight turns to seal the cap. Loosen the cap with four turns to allow a maximum of four turns on the hydrophone cable.
2. Insert the cap. Gently place the cap into the tube opening. Verify that the cap is level.
3. In a single counterclockwise rotation, you should feel the cap fall into place with a click. At this point, the beginning of the threads are mated properly and the cap can then be installed by slowly rotating clockwise to tighten the cap onto the tube.
4. Rotate by hand to tighten the cap a couple turns to get it started. When the first O-ring engages, rotation becomes more difficult and requires the spanner wrenches.

NOTE: With the O-rings in place, the top cap can make one full rotation before the first O-ring is engaged by the tube. Further rotation requires more torque as the O-ring is compressed between the cap and the inside wall of the tube. With proper lubrication, it still does not require a tremendous amount of force even after the O-rings are engaged. If rotation feels like it is too difficult or binding, stop and start over. It is critically important that the top cap be screwed on carefully to prevent cross threading and permanent damage to the watertight seal.

5. Insert the included spanner wrenches into the interfacing holes. One wrench interfaces with the two holes in the housing and the other interfaces with the 4 holes in the top cap. It is easiest to do the procedure while sitting atop the pipe (as though riding it). You can hold the housing wrench stationary and rotate the top cap, moving to a new hole as it is tightened.

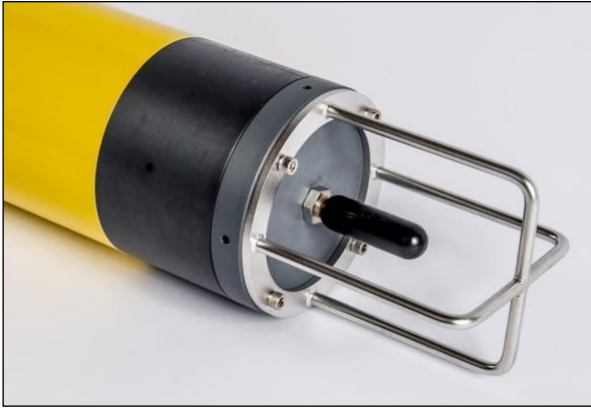
NOTE: The wrenches are identical. They rotate in opposing directions to create a seal inside the threaded enclosure. Be careful to orient the wrenches as shown. Operating them backwards can easily break the small tabs.

6. Apply symmetric downward force as shown below to tighten.

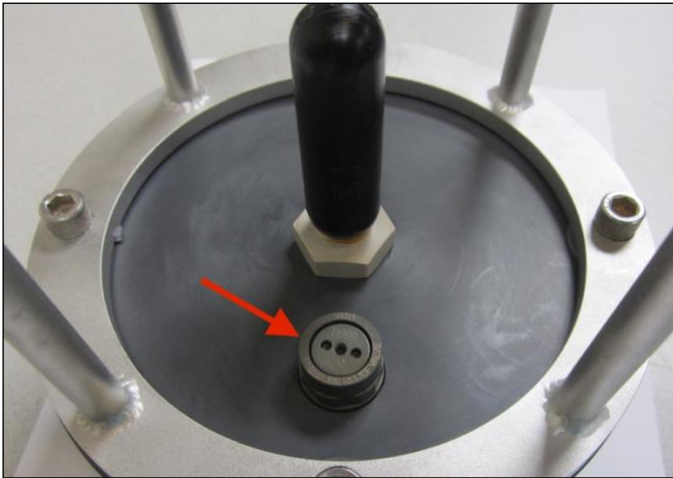


7. Make six (6) more rotations. Turns are more difficult as the second O-ring engages.
8. Continue tightening until there is no gap between the top cap and the cylinder as shown below.



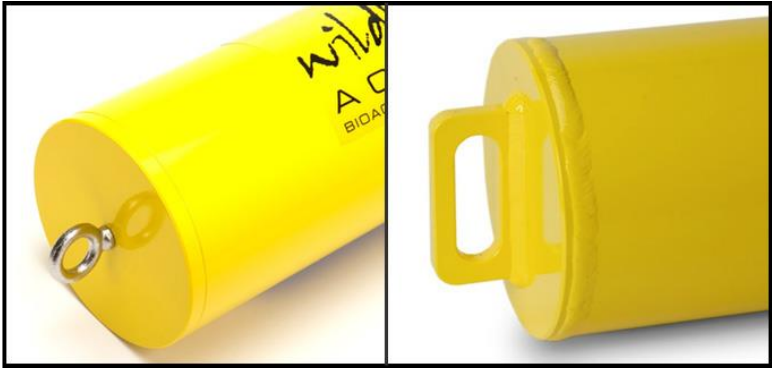


9. Make sure the Pressure release valve is hand tight.



2.8 Anchoring Solutions

The SM4M Submersible model (shown at left below) can be anchored from the stainless-steel eyebolt on the bottom of the housing. For the Deep Water Model (shown at right below) there is a mounting bracket welded on the bottom.



The eyebolt was tested with a 150lb (68 kg) load. A heavier maximum load such as an anchor could be used underwater; however, do not exceed this limit as a best practice.

The unit can be tethered directly to an anchor for diver release, or tethered to a surface structure. Acoustic releases are commercially available which allow the unit to be released from the ocean floor by playing an acoustic signal from the surface. In this case, it is necessary to use a subsea float to increase the visibility of the housing when it surfaces.



The Deep Water unit is not positively buoyant with any batteries installed and will need additional flotation to return to the surface on its own.

NOTE: All metal hardware used on the SM4M is 316 stainless steel. If dissimilar metal is used for deployment that is near or contacting any of the hardware, a zinc or aluminum sacrificial anode should be used to prevent galvanic corrosion.

2.9 Retrieving and Servicing the Recorder

Retrieving the Recorder

Regardless of method of retrieval, take care in getting the unit shipside so as not to damage the hydrophone. If planning on using hooks to snare the housing, it might be best to deploy with a ring of floating nylon line attached to the bottom eyebolt to give a hooking point. You can also attach rigging to the unit using large stainless steel band clamps around the length of the cylinder.

Removing the Top Cap

Follow these steps to remove the top cap and perform maintenance activities to extend or end a deployment:

1. Clean the top of the cylinder to access the holes for the spanner wrenches. After a long underwater deployment, especially in shallow water, the unit may have accumulated significant biofouling.
2. Insert the spanner wrenches in the top cap side holes.

NOTE: When sealing and removing the top cap, downward force is applied; however, the spanner wrenches are reversed. When unsealing the cap, the top wrench extends to the right and the lower wrench extends away from the cylinder to the left as shown. Be careful to orient the wrenches as shown. Operating them backwards can easily break the small tabs.

3. To remove the top cap, apply downward force to the spanner wrenches.



DANGER: Battery failures or water intrusion during deployment could cause the tube to become pressurized. Use extreme caution while unscrewing the cap. Orient the enclosure horizontally on a surface and aim in a safe direction before unscrewing the top cap. Wear safety goggles in case of the presence of corrosive chemicals from the batteries.

Maintaining the Recorder

Whether you decide to redeploy the recorder or place it in dry storage, follow these maintenance steps.

1. Remove and clean the O-rings. If a tool is required, use only plastic tools to avoid damaging the smooth surface of the top cap where the O-ring sits.
2. Inspect the O-rings for signs of wear; replace worn or damaged O-rings.
3. Clean the top cap exterior, especially the O-ring area.
4. Clean the inside of the cylindrical housing especially where the O-rings make contact.
5. Discard the desiccant pack. It is not reusable and must be replaced before every deployment.
6. Inspect the entire unit for damage to the housing, attachment points, or hydrophone.
7. Verify that the hydrophone is still tightly secured to the top cap. The bottom of the hydrophone connector should make contact with the surface of the top cap.

WARNING: The hydrophone is a delicate instrument. Do not attempt to remove the hydrophone from the top cap. Do not drop, shake, or apply force or pressure to the hydrophone. Never use it as a handle or pick up the recorder or top cap by the hydrophone. Removing or mishandling the hydrophone will void your warranty.

3 SM4M Specific User Guide Notes

This chapter contains specific notes relating specifically to settings or functions that differ from those as described in the SM4 or SM4BAT User Guides.

3.1 Setting Gain

Acoustic Gain (in Audio Settings section of SM4 User Guide)

The SM4 module has a gain range for the Left and Right channels of 0 dB to 59.5 dB in 0.5 dB steps. 12 dB is a good starting point for recording marine mammals or quantifying lower noise levels with the **Acoustic Hydrophone**. If the unit is near louder animals or anthropogenic noise sources, 0dB might be more suitable to avoid clipping. Test recordings are encouraged to select the optimal gain.

For the High-SPL Hydrophone Option when combined with the standard hydrophone, 0dB gain on both channels will assure that sounds can be recorded from about 78dB SPL all the way up to 240dB SPL. There is no reason to use additional gain as both hydrophones are fully covering the available dynamic range. Further gain will not allow recording quieter sounds due to the self-noise of the standard hydrophone.

Preamplifier Gain (in Audio Settings section of SM4 User Guide)

This gain only affects the built-in microphones of the SM4 unit and it will have no effect on the SM4M.

Ultrasonic Gain (in Audio Settings section of SM4 User Guide)

The SM4BAT module has two gain settings only, 0 dB or 12 dB. A good starting point for the Ultrasonic hydrophone is 12 dB. This will be optimal for recording distant marine mammal echolocations. If the unit is very near the marine mammals, the lower gain setting might be better. Test recordings are encouraged to select the optimal gain.

3.2 Deactivating Scrubber on Ultrasonic Models

The SM4M includes a file scrubber, carried over from the SM4BAT terrestrial bat recorder, which tries to determine if a triggered recording contains bat echolocations and deletes the file automatically if it does not. Since this is not well tested on dolphin echolocations, you should turn the scrubber off if you are

using the triggers. To disable the scrubber, set **Min Duration** and **Max Duration** under **Audio Settings**. to *none*.

3.3 Recording Behavior

Three and a half minutes before the device starts a recording, the SM4M wakes up from sleep mode to allow the hydrophone noise to settle before recording. When processing consecutive recordings in a series, the first recording finishes on time; however, the system needs several seconds before it will be able to start the next recording. This results in the next recording starting a few seconds late. To compensate, the SM4M automatically extends the duration of the recording so it will finish on time to keep to the schedule. In this scenario, it is normal to see a delayed start time and a shorter recording.

3.4 Measuring Hydrophone Sensitivity

We include this section because all SM4 models support this functionality; however, this procedure is not intended for use with hydrophones, though it could be utilized with a pistonphone to check hydrophone sensitivity.

1. At the **Song Meter Main Menu**, select **Utilities**, and press **SELECT**. Select **Calibrate Mics** and then press **SELECT**. The values under @1 represent dB (re full scale) levels at 1 kHz, a good measure of acoustic sensitivity. The values under @40 are for testing the SM4BAT recorder.

MICROPHONE		
CALIBRATE		
	@1	@40
kHz		
Ch 0:	-62.4	-
73.8 dB		
Ch 1:	-62.5	-
73.6 dB		

2. Press **SELECT** when finished.

4 Specifications

4.1 Physical Specifications

SM4M Submersible

Length/Height:	35.8 +/-0.3 inches (90.9 +/- 0.8cm) includes eyebolt and hydrophone cage
Diameter:	6.6 inches (16.8 cm)
Eyebolt Anchor:	1.0 in (2.5 cm) inner diameter 1.7 in (4.3 cm) outer diameter 2.0 in (5.1 cm) height off housing
Weight (Dry):	21.0 lb (9.5 kg) without batteries 31.0 lb (13.5 kg) with 32 batteries
Buoyancy (salt water):	12.0 lb (5.5kg) without batteries 3.0 lb (1.5 kg) with 32 batteries
Rated Depth:	500ft (150 m)
Operating Temperature:	-4°F to 122°F (-20°C to 50°C)

SM4M Deep Water

Length/Height:	58.3 in (148 cm) includes bottom bracket and hydrophone cage
Diameter:	6.5 in (16.5 cm)
Mounting Bracket Slots:	1.5 in (3.8 cm) high 3.0 in (7.6 cm) wide
Weight (air):	53.8 lb (24.4 kg) without batteries 71 lb (32.2 kg) with 64 batteries
Buoyancy (salt water):	2.2 lb (1 kg) without batteries -15.0 lb (-6.8 kg) with 64 batteries note negative buoyancy with batteries
Rated Depth:	3,280 ft (800 m)

4.2 Power Specifications

Main Batteries: Standard D size disposable alkaline batteries (1.5V) or rechargeable NiMH batteries (1.2V). The SM4M Submersible accepts up to 32 D-size batteries and the Deep Water accepts up to 64 batteries. A minimum of 4 batteries is necessary for the recorders to function.

Clock Backup Battery Type: 3.0-volt lithium CR2032 (approximate 3-year life)

Acoustic Power Consumption: Recording: 135 – 185 mW Sleeping: 1.8 mW

Ultrasonic Power Consumption: Recording: 230 – 270 mW Sleeping: 1.8 mW

4.3 Memory Card Specifications

Type: Class 4 or faster SDHC and all SDXC (reformatting not required)

Capacity: Two card slots each support up to 32 GB SDHC to 512 GB SDXC.



4.4 Audio Specifications

Acoustic Model

Channels: 2

Recording Format: 16-bit PCM .wav

Analog to Digital Converter Full-scale: 0.707V rms (2v p-p)

Supported Sample Rates (Hz): 8000, 12000, 16000, 22050, 24000, 32000, 44100, 48000, and 96000

Amplifier Gain: 0.0 – 59.5 dB in 0.5-dB steps

Channel Crosstalk: -65dB

High Pass Filter: Selectable 2-pole at 220 Hz or 1 kHz

Anti-Alias Filter Performance:

Fraction of Sample Rate:	Anti-Alias Filter Gain (dB):
0 to 0.39	±0.1
0.4125	-0.25
0.45	-3.0
0.5	-17.5
0.55	-75.0

Ultrasonic Model

Channels: 1

Recording Format: 16-bit PCM WAV

Analog to Digital Converter Full-scale: 0.884V RMS (2.5v p-p)

Supported Sample Rates (kHz): 192, 256, 384, and 500

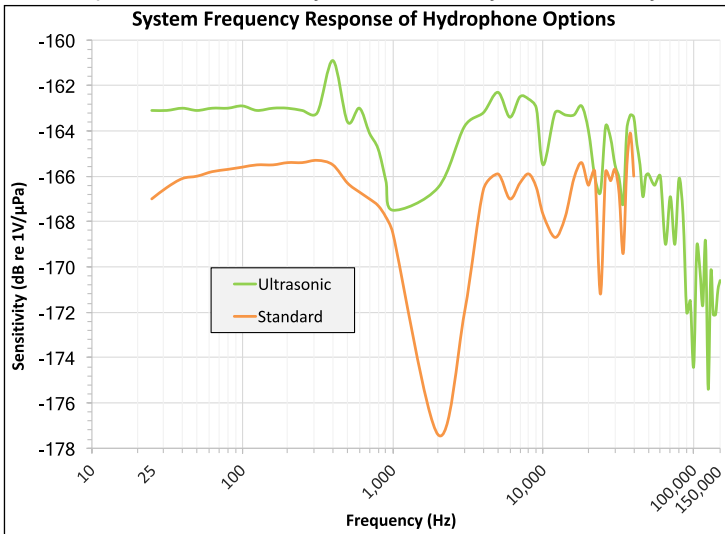
Amplifier Gain: 0 or 12 dB

High Pass Filter: Selectable 2-pole at 16 kHz

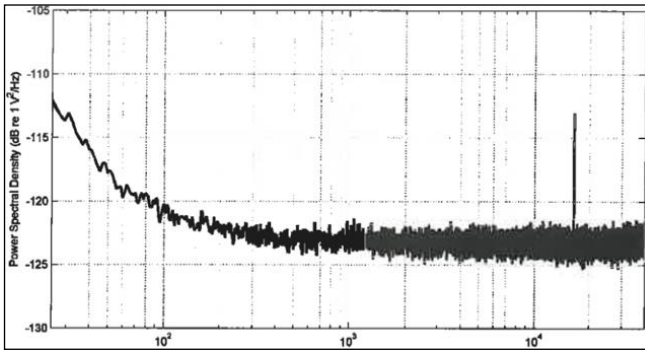
Anti-alias Filter: 2-pole at 156 kHz

4.5 Hydrophone Response and Noise Charts

Testing was completed and certified by the National Physical Laboratory in the UK.

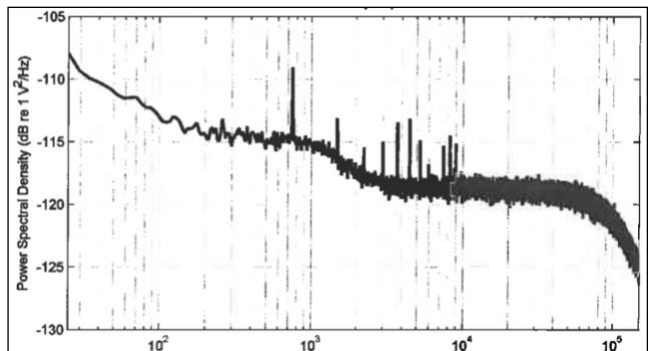


NOTE: The dip in response at 2 kHz is caused by resonance in the housing and can be avoided with a cabled hydrophone available for special order.



Noise Power Spectral Density for Acoustic Model.

Noise Power Spectral Density for Ultrasonic Model.



5 Warranty and Disclosures

Except as specifically provided herein, Wildlife Acoustics makes no warranty of any kind, express or implied, with respect to this product.

Hardware Limited Warranty

Product	Components	Hardware Warranty Period
Song Meter SM4M	all components (excluding hydrophones, batteries and accessories)	1 Year
	hydrophones, batteries, and accessories	1 Year
	Accessories	1 Year

Wildlife Acoustics, Inc. Limited Warranty

HARDWARE: Wildlife Acoustics, Inc. (“WAI”) warrants to the original end user (“Customer”) that new WAI branded products will be free from defects in workmanship and materials, under normal use. Refer to the Hardware Limited Warranty table at the top of this page for the applicable warranty period from the original date of purchase.

WAI warrants refurbished WAI products, marked and sold as such, for ninety (90) days from the original purchase date.

SOFTWARE: WAI warrants to Customer that any WAI branded software will perform in substantial conformance to their schedule specifications for a period of ninety (90) days from the date of original purchase. WAI warrants the media containing software against failure during the warranty period. WAI makes no warranty or representation that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected.

EXCLUSIONS: This warranty excludes (1) physical damage to the surface of the product, including cracks or scratches on the outside casing; (2) damage caused by misuse, neglect, improper installation or testing, unauthorized attempts to open, repair, or modify the product, or any other cause beyond the range of the intended use; (3) damage caused by accident, fire, power changes, other hazards, or acts of God; or (4) use of the product with any non-WAI device or service if such device or service causes the problem.

Any third party products, including software, included with WAI products are not covered by this WAI warranty and WAI makes no representations or warranties on behalf of such third parties. Any warranty on such products is from the supplier or licensor of the product.

No warranty is provided by WAI unless the product was purchased from an authorized distributor or authorized reseller.

EXCLUSIVE REMEDIES: Should a covered defect occur during the warranty period and you notify WAI, your sole and exclusive remedy shall be, at WAI’s sole option and expense, to repair or replace the product or software. If WAI cannot reasonably repair nor replace then WAI may, in its sole discretion, refund the purchase price paid for the product. Replacement products or parts may be new or reconditioned or comparable versions of the defective item. WAI warrants any replaced or repaired product, part, or software for a period of ninety (90) days from shipment, or through the end of the original warranty, whichever is longer.

OBTAINING WARRANTY SERVICE: Customer should refer to the WAI website at www.wildlifeacoustics.com/support/contact-support for information on obtaining warranty service authorization. Methods for obtaining warranty service may vary depending on whether purchases were made from an authorized provider of WAI products or from WAI directly. All requests for warranty service authorization must be made within the applicable warranty period. Dated proof of original purchase will be required. Products or parts shipped by Customer to WAI must be sent postage-paid and packaged appropriately for safe shipment. WAI is not responsible for Customer products received without a warranty service authorization and may be rejected. Repaired or replacement products will be shipped to Customer at WAI expense. All products or parts that are replaced become the property of WAI. WAI shall not be responsible for Customer software, firmware, information, or memory data contained in, stored on, or integrated with any products returned to WAI for repair, whether under warranty or not. The repair and replacement process for products or parts in locations outside of the United States will vary depending on Customer’s location.

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warranties may not be excluded in their entirety, they will be limited to the duration of the applicable written warranty. This warranty gives you specific legal rights; you may have other rights that may vary depending on local law. Your statutory rights are not affected.

GOVERNING LAW: This Limited Warranty shall be governed by the laws of the Commonwealth of Massachusetts, and by the laws of the United States, excluding their conflicts of laws principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

DECLARATION OF CONFORMITY (EN 45014)

Manufacturer:

Wildlife Acoustics, Inc.
3 Mill and Main Place,
Maynard, MA 01754
United States of America



Suite 210

Declares that the following product:

Product Name: Song Meter

Product Model Number: SM4M

Product Type: Bioacoustics Recorder

Conforms to the appropriate country standards and governing regulations listed below and/or on the following page. As the manufacturer, we are fully responsible for the design and production of the above-mentioned equipment.

Federal Communications Commission Rules Part 15, Class A

AS/NZS CISPR 11, 2011, Industrial, scientific and medical (ISM) radio-frequency equipment – electromagnetic disturbance characteristics – limits and methods of measurement, Class A

EN 55011, 2009/A1, 2010, Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement, Class A

ICES-003, 2012, Industry Canada, Interference-Causing Equipment Standard, Digital Apparatus, Class A

EN61326, 2013 Electrical Equipment for Measurement, Control and Laboratory use EMC Requirements

EN61000-4-2 Electrostatic Discharge

EN61000-4-3 Radiated Electromagnetic Fields

Tested at operating temperatures of -20C to +55C. Testing included 24-hour soaks at both extremes plus 6 cycles for one hour each.

Tested at operating humidity of 95% relative humidity at +40C. Testing included 24-hour soak.

Tested for vibration as per the MIL-STD-810G Method 514.6, category 4 standard.

This product was tested in a typical configuration.

Ian Agranat, President
Wildlife Acoustics, Inc.
May 10, 2017

ELECTROMAGNETIC INTERFERENCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Wildlife Acoustics, Inc. could void the user's authority to operate the equipment.

Note: Use of ferrite clamped cables are required to comply with the Class B limits in part 15 of the FCC rules. A Fair-Rite 0431164181 ferrite clamp (or equivalent) must be placed on each cable near the recorder with the ferrite residing within one loop of the cable. This clamp is provided with all cables sold by Wildlife Acoustics.

PROHIBITION AGAINST EAVESDROPPING

United States law (Federal Communications Commission Part 15 Section 15.9) states "Except for the operations of law enforcement officers conducted under lawful authority, no person shall use, either directly or indirectly, a device operated pursuant to the provisions of this Part for the purpose of overhearing or recording the private conversations of others unless such use is authorized by all of the parties engaging in the conversation."

You are responsible for complying with all applicable laws within your jurisdiction

PRODUCT DOCUMENTATION

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Song Meter SM4M

BIOACOUSTICS RECORDER

User Guide

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The Song Meter is patented (U.S. Pat. No. 7,782,195).

Additional U.S. and international patents and trademarks are pending.

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