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See Page 1 for Quick Start Guide.

# Song Meter SMZC

BIOACOUSTICS RECORDER

## User Guide

Updated October 19, 2015 for firmware version 1.0.6

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# 1 Quick Start Recording Guide

Complete the following steps to start recording bats with the Song Meter SMZC .

- ☐ Mount the recorder in a suitable location for recording (vertical orientation and well off the ground fro best results).
- ☐ Open the hinged lid to access the internal components.
- ☐ Verify that the pre-installed alkaline batteries and 8GB SDHC card are installed.
- ☐ (Optional) Attach the available GPS accessory to set time, date and location automatically.
- ☐ Slide the power switch down to turn the recorder **ON** and close and latch the front lid.
- ☐ The device powers on and shows the status screen as the memory card is mounted.
- ☐ After scanning the memory card, the **Quick Start** menu appears.
- ☐ Choose **Record at Night** to load the built-in *Sunset to Sunrise* program or choose **Record Always** to load the *24 Hours* program for non-stop recording and press **Enter** to select.
- ☐ If this is the first time a program has been selected, you are prompted to set the date, time, and time zone. If you attached the available GPS accessory in an earlier step, the date and time are set for you automatically. You must set the time zone; it is not set by GPS.
- ☐ For the *Record at Night* program, you are also prompted to set the recorder location so as to calculate sunrise and sunset times. If you attached the available GPS accessory, the location is set for you automatically.
- ☐ Press the **PROGRAM START** button to start the active program on the recorder.
- ☐ You will see a series of screens showing the status of the recorder as it prepares to record. When recording, you will see the time of the recording session and ARMED when listening for bats and TRIGGER when actively making a recording.
- ☐ Hours, days, or weeks later, press and hold **PROGRAM STOP** for two seconds to finish recording.
- ☐ Remove the memory card and review the recordings on your computer.

# 2 Song Meter SMZC Overview

## 2.1 Introduction


The latest generation in the Song Meter series, the Song Meter SMZC , is a completely new, professional, lightweight, weatherproof, cost-effective, and reliable zero crossing recorder for the periodic, seasonal, or long-term acoustic monitoring of bats in any field conditions.

You can program the device to record when you want for as long as you need. The Song Meter SMZC has battery life and memory capacity to record for weeks. Take the portable device with you anywhere or mount it in a fixed outdoor location.

Use the available Kaleidoscope™ software, sold separately, to view and analyze your recordings and automatically identify recorded species. For more information, visit www.wildlifeacoustics.com. The Song Meter SMZC is also compatible with all popular zero crossing bat analysis software.

### 2.1.1 Features

- One-channel zero crossing recorder.
- Fully weatherproof enclosure and microphone.
- Lightweight and portable, you can take the device with you to record anywhere.
- Easy to set up and use. The new **Quick Start** menu allows you to start recording with just a couple button presses. Press the **CHECK STATUS** button to view the current health of the unit without interrupting recording. Check memory card usage, battery voltage, and more.
- All-in-one control panel features a weatherproof keypad for easy entry and feedback with a dual-color LED status lamp and a backlit LCD display.
- For advanced users, program the device on the recorder or on a PC using a powerful, flexible, and easy-to-use programming language.
- Generates its own diagnostics to assist in troubleshooting.

- Internal temperature and battery voltage logging.
- Auto-leveling feature automatically determines the optimal zero crossing threshold and recalculates levels for every recording period.
- Records to a standard SDHC or SDXC memory card (included).
- Up to 40 nights of recording time from 4 alkaline C batteries (included).
- Integrated omnidirectional, weatherproof, low noise FG microphone.
- Compatible with our SMM-U1 microphone for cabled applications using up to 100m of cable (not included). External microphone is automatically detected.
- Internal headphone port for real-time monitoring and verification of system functionality.
- Integrated top and bottom mounting flanges are designed to work with radiator clamps, screws, or bungee cords.
- GPS accessory option automatically calculates sunset/sunrise and logs recording locations and path data for transects.
- Lowest-cost zero crossing recorder on the market.

## 2.2 Zero Crossing Recording

The Song Meter SMZC record bat activity using zero crossing technology. Zero Crossing is not the same as full-spectrum recording. In full spectrum recording, the recorder samples audio signals at a specified rate. Zero crossing mode measures the transition time between positive and negative signals relative to a fixed sensitivity threshold.

The advantages of zero crossing include significantly lower power consumption and memory card utilization. However, zero crossing representations of bat calls lack information about the changing amplitude and harmonic structure of the underlying signal. It is possible to convert from full spectrum to zero crossing by removing information from the signal, but it is not possible to convert from zero crossing back to full spectrum.

During the programmed recording period, Song Meter SMZC creates zero crossing sequence files for each trigger. The recorder assesses each sequence to verify that it is a bat pass and not a non-bat trigger. You can open and analyze the resulting files directly in Wildlife Acoustics Kaleidoscope software or third-party zero crossing software.

### 2.2.1 Auto-leveling of Zero Crossing Threshold

Zero Crossing requires a sensitivity threshold that is not actually "zero", but a level slightly greater than zero, and measures signal transitions that cross this threshold. The threshold is required because a signal devoid of bat calls will still contain transitions around zero as a result of ambient and electronic noise. If the threshold is too low, many zero crossings will be detected in a quiet signal resulting in significant noise. If the threshold is too high, the echolocation calls of bats may be

distorted or undetectable. The SMZC automatically adjusts the sensitivity threshold at the start of each recording period. The display will show "Auto-leveling..." for several seconds while the level is adjusted. This allows the level to be optimized regularly as it is not unusual for ambient noise to change during a deployment.

## 2.3 Updates and Support

The Song Meter SMZC is field-upgradeable. New features, fixes, and improvements are available in firmware updates from our website. The Song Meter SMZC Configurator software notifies you when new firmware is available.

To install a firmware update file on the recorder, see 8.5 How to Update the Firmware.

## 2.4 How to Join Our Mailing List

Join our mailing list to receive important news and information about your Song Meter and related products, features, and events.

1. Navigate to www.wildlifeacoustics.com.
2. Click **Contact Us**.
3. Click **Join Our Mailing List**.
4. Complete the online form and click **Add to Mailing List**.

### 2.4.1 How to Contact Support

We have full-time support staff ready to assist you.

- Email: support2015@wildlifeacoustics.com
- In the United States (toll-free): 1-888-733-0200
- Outside the United States: +1 978-369-5225

We have partnered with Baker Consultants, Ltd. to provide free local phone support services in the U.K.

- Telephone: 0114 360 9977

# 2.5 Song Meter SMZC Visual Tour

**Song Meter SMZC Product Diagram**


| | |
|---|---|
| 1 | **Built-in Microphone:** Standard ultrasonic microphone is ready to record with no cables or additional setup required. |
| 2 | **LED Status Indicator**: Displays the recording status. |
| 3 | **External Microphone Connector:** Connect an SMM-U1 ultrasonic microphone and cable for remote mounting away from the recorder. |
| 4 | **Bottom Hinge for Lid**: Lift the hinged lid open to reveal the battery bay, memory card slot, and other internal components. |
| 5 | **Mounting Flanges (Top and Bottom)**: Rugged and ready for outdoor adventure, use these cutouts to mount the recorder in almost any land environment. |
| 6 | **Headphone Connector**: Open the hinged lid to connect the optional headphones for convenient system monitoring. |
| 7 | **LCD Screen and Keypad**: Press the buttons on this panel to navigate the menu options on the LCD screen that configure the unit and run programs. |
| 8 | **Pressure Vent**: This temperature, UV, and water-resistant vent protects the enclosure against condensation, moisture, and heat exposure. |

## LCD Display and Buttons


| | |
|---|---|
| 1 | **Check Status**: Displays the status of the device and the current program. |
| 2 | **LED Indicator**: Flashes green once per second during a recording. Flashes red once per second when waiting for a triggered recording to start. |
| 3 | **Program Start**: Closes any open menus and starts the current loaded program. Depending on the schedule, the device may begin recording immediately or go to sleep until the scheduled recording time. If a program is already running, pressing this button does nothing. |
| 4 | **LCD Screen**: Displays the menus, commands, prompts, and other details when the recorder is awake. Blank when the unit is sleeping to save power. For improved visibility in dark or low-light environments, press any button on the keypad to illuminate the LCD screen. The backlight remains lit while you continue operating the device and turns itself off after ten (10) seconds of inactivity. |
| 5 | **Main Navigation Buttons**: To control the recorder, press the directional arrow buttons on this panel while viewing the menu options on the LCD screen. Press ▲ **Up** or ▼ **Down** to navigate menus, scroll through options, or adjust values. Press ► **Right** to advance to the next submenu or multi-part entry. At the end of an entry, press ► **Right** to save your changes. Press ◄ **Left** to cancel or go back to the last menu item. Press **ENTER/MENU** to navigate menus, select options, and to confirm entries. |

| | |
|---|---|
| 6 | **Program Stop**: Stops the current running program and returns you to the *Quick Start* menu. In some modes, you may need to hold the button down for a few seconds. |

### Internal Components (Hinged Lid Open)


| | |
|---|---|
| 1 | **Backup Battery**: Maintains real-time clock and other settings when the four (4) main C batteries are not operational. |
| 2 | **GPS Connection Point**: Standard RJ-11 jack for available integrated GPS unit. Cable snaps in place when inserted. |
| 3 | **Integrated GPS**: Synchronizes recordings on multiple recorders to within ± 0.5 milliseconds. GPS coordinates are stored in the ZC recording metadata. You can view them in compatible zero crossing software. Path information is stored in the summary file once per minute. |
| 4 | **SD Memory Card**: Insert and remove memory cards from the memory slot. |
| 5 | **Power Switch**: Slide up to turn the unit **OFF**. Slide down to turn power **ON**. (Up/down directions are given with the lid open, as shown.) |
| 6 | **Battery Tray**: Holds four (4) C batteries in the proper orientation. |

# 2.6 The LCD Main Menu

Refer to the following table when navigating the Main Menu using the LCD screen and directional buttons.

**LCD Screen Menu**

| Menu Item | Description |
|---|---|
| **Quick Start[GPS:---]** | |
| Record at Night | Load the *Sunset to Sunrise* program. When you press the **PROGRAM START** button, the recorder begins recording immediately if the time is at or past sunset. If it is before sunset, the unit goes to sleep until sunset. The recorder prompts for settings, if needed. |
| Record Always | Load the *24 Hours* program. When you press the **PROGRAM START** button, the device begins recording immediately. The recorder prompts for settings, if needed. |
| Main Menu | Advance to the **Main Menu** where you can work with programs, configure settings, or run utilities |
| **Program** | |
| Select Program | Choose a ready-to-run (and customizable) built-in program. |
| Edit Program | Edit, add, or delete command lines in a program. |
| Import Program | Import a program and associated settings from an SD card. |
| Export Program | Export a program and associated settings to an SD card. |
| **Settings** | |
| Time and Date | Set the local date and time for your device. |
| Prefix | Specify a short code to identify recordings from a specific program, project, location, or recorder. The prefix is especially useful to project teams with multiple recorders. |
| Latitude | Specify the latitude of the recorder in degrees north (N) or south (S) of the equator. Latitude is used in sunrise and sunset time calculations. |
| Longitude | Specify the longitude of the recorder in degrees west (W) or east (E) of the prime meridian. Longitude is used in sunrise and sunset time calculations. |
| Timezone UTC | Set the global time zone for your device. |
| **Utilities** | |
| Export Diagnostics | Display useful status and troubleshooting information, and save it on an SD card. |
| Set Factory Default | Reset the original device settings. Restore configurations to their factory-fresh, like-new state. **NOTE**: Your settings are lost. |
| Calibrate Mics | Test the sensitivity levels of the built-in or connected microphone. |
| Format Memory Card | Erase and reformat the memory card. The original file system such as exFAT or FAT32 is preserved.**CAUTION**: All data on the memory card is permanently lost and cannot be recovered. |
| Update Firmware | Update the recorder with a new firmware file that you downloaded and saved to a memory card. |

# 3 Setup

## 3.1 Overview

The following steps summarize a typical deployment of the recorder.

1. Push the bottom hinge of the unit down and flip the lid open to access the internal components.
2. Insert four (4) size C Alkaline or NiMH batteries.
3. Insert one (1) SDHC or SDXC memory card.

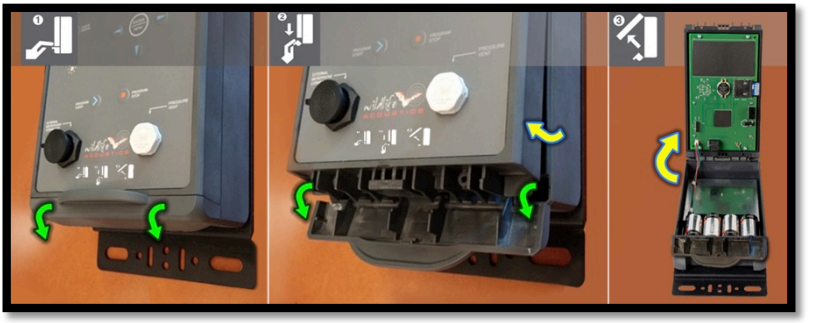
**TIP**: Use the Song Meter SMZC Configurator software to estimate memory card requirements and power consumption for the program that you plan to run.

4. Load one of the following types of programs on the recorder:
   - one of two built-in programs available on the recorder
   - a custom program that you edited on the recorder
   - a custom program that you designed using the Song Meter SMZC Configurator software and then imported on a memory card.
5. Press the **PROGRAM START** button. You can leave the recorder unattended after this step.
6. The recorder *sleeps* until the next scheduled recording time.
7. The recorder *wakes* at the scheduled recording start time, records audio as programmed, and saves recordings to the memory card.
8. After a period of time has elapsed (it might be several hours, days, or weeks as estimated in the Song Meter SMZC Configurator software calendar view), return and check on each recorder.
9. (Optional) To extend a deployment, exchange the memory card and install fresh batteries out in the field.
10. At the end of the deployment, remove the device from its mounted location, eject the memory card, and examine the recorded output.
11. Clean and prepare the recorder for its next assignment.

## 3.2 How to Open the Hinged Lid

To install batteries, insert a memory card, or access other available internal components such as the available GPS accessory, open the hinged lid.

**Steps to Open the Hinged Lid**



1. Locate the handle on the lower front side of the recorder.
2. Press down on the handle. The bottom hinge flips down. The front lid of the unit is now ajar.
3. Push the entire front lid up until you can see the internal components.

To close the lid, reverse the steps. Push the top of the lid back down and lift the bottom hinge so it snaps back into place.

## 3.3 How to Turn Power On and Off

Follow these steps to turn the power on or off.

1. Open the lid to access the power switch.
2. Slide the switch down to turn power **ON**. When you turn the power **ON** the following LCD screen appears:

```
2014-Oct-14 14:50:48
SMZC00001     R1.0.0
CARD: 2/32   Mic: IN
Bat  5.9V Temp 16.70
```

The same information appears when the unit wakes from sleep and starts itself as programmed. The startup screen shows the following information:

- The current date in YYYY-MMM-DD format.
- The current time in HH:MM:SS format.
- The model number and serial number for the recorder.
- The firmware version. For example, R1.4.3.

- The memory used as a fraction of the total capacity in GB.

3. To turn the unit off, slide the switch up.

**NOTE**: Do not turn the power **OFF** when a recording is in progress. To safely exit from recording, press **PROGRAM STOP**, allow the recorder to return to the Main Menu, and then switch the power to **OFF**.

**NOTE**: Avoid quickly switching power **OFF** and then **ON** again. The unit can interpret this sudden loss and restoration of power as an error and may start diagnostics.

## 3.4 Batteries

The Song Meter SMZC uses four (4) size C alkaline or NiMH batteries, included for your convenience. The SMZC can record up to 40 nights using Alkaline batteries and up to 25 nights using NiMH batteries. The device enters a very low power state when not recording and, therefore, uses negligible power between scheduled recordings.

Use the Song Meter SMZC Configurator software to estimate a recording schedule based on your program requirements.

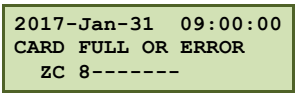
Prior to installation, we recommend that you test all batteries with a high-quality pulse load battery tester such as the ZTS MINI-MBT.

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

## 3.5 Memory Card

Insert a memory card to update the firmware, import or export a program, and save recordings. One 8 GB SDHC card is included with the recorder. You can expect a 8 GB to last for months if not years.

If the recorder is unable to write to the memory card, this error appears:




If no card is present in the memory slot, insert one. If the card no longer works, try setting its read/write switch to allow to the card. You can also try copying the data to another card or hard disk and then using a new memory card.

**NOTE**: During a recording, do not remove the memory card. Replace card only when the unit is in sleep mode or when power is **OFF**. In some cases, removing and/or

inserting a memory card while the device is recording (often called *hot-swapping*) may cause the recorder to restart.

## 3.6 How to Use the Available GPS Accessory

The available GPS accessory lets you automatically set the date, time and latitude and longitude of the recorder. If you have several SMZC recorders to deploy in the field, you can use one GPS accessory to set up all recorders.

The accessory also logs the path and location of the recorder when a recording was made, a useful feature when conducting mobile transects. The GPS coordinates are stored in the metadata of the ZC recording. You can view them in compatible zero crossing software. Path information is stored in the summary file once per minute.

The GPS accessory consumes about 90mA of additional current. This is four times the current of the recorder itself. It is, therefore, recommended for passive recording that the GPS be used to automatically set the clock and location at the beginning of the deployment but not attached for the duration of the deployment. For driving transects, where persistent logging of recording location is desired, the GPS should remain attached. Deployment time using Alkaline batteries is reduced from about 400 hours to about 80 hours with use of GPS.

**NOTE**: It can be difficult to acquire a GPS signal in thick vegetation.

1. The **Location and Time/Date Settings** are automatically set by the GPS.

**NOTE**: The **Location Settings** coordinates are read-only as long as the GPS is attached. You cannot change them.

2. The recorder automatically detects the presence of the GPS. When the recorder wakes up, the GPS is powered up. A question mark (?) blinks between the date and time to indicate that the GPS accessory is attempting to acquire global positioning satellite data.

```
2014-Oct-14?14:50:48
SMZC00001      R1.0.0
CARD: 2/32    Mic: IN
Bat  5.9V Temp 16.70
```

3. When the GPS has successfully acquired satellite transmission, the question mark changes to an exclamation point (!) and then a dollar sign ($) indicating that the clock is now synchronized.
4. The Song Meter SMZC clock automatically adjusts to GPS time.

**NOTE**: If you connect a GPS accessory and are still prompted for location, date, and time after selecting a Quick Start program, it most likely means the GPS accessory does not yet have a fix.

## 3.7 How to Set the Date and Time

If you are not using the available GPS accessory to automatically set the current date and time, you can manually set these parameters.

**NOTE**: The recorder does not automatically adjust for daylight savings time.

As you adjust the month and day, the unit calculates and displays the next sunrise and sunset times for your reference.

As you adjust the month and day, the unit calculates and displays the next sunrise and sunset times for your reference.

1. At the **Main Menu**, select **Settings**, and press **ENTER/MENU**.
2. Select **Time and Date** and press **ENTER/MENU**.
   The date and time appear on one line in the following format:
   YYYY-MMM-DD HH:MM:SS
   For example:

   ```
   2016-Oct-22
   20:17:45
   ```

3. Press **ENTER/MENU** or ► **Right**.
   The cursor flashes on the last digit of the year.
4. To adjust the year, press ▲ **Up** or ▼ **Down**.
5. Press **ENTER/MENU** or ► **Right** to set the month.
6. To adjust the month, press ▲ **Up** or ▼ **Down**.
7. Press **ENTER/MENU** or ► **Right** to set the numeric day of the month.
8. To adjust the date, press ▲ **Up** or ▼ **Down**.
9. Press **ENTER/MENU** or ► **Right** to set the hour.
10. To adjust the hour, press ▲ **Up** or ▼ **Down**.
11. Press **ENTER/MENU** or ► **Right** to set the minute.
12. To adjust the minutes, press ▲ **Up** or ▼ **Down**.
13. Press **ENTER/MENU** or ► **Right** to set the second.
14. To adjust the seconds, press ▲ **Up** or ▼ **Down**.
15. (Optional) To go back and make any changes, press ◄ **Left**.
    Press ► **Right** to return to the seconds value.
16. Press **ENTER/MENU** or ► **Right** to apply your changes. The cursor moves back to the first digit of the year and then applies your changes.
17. Press ◄ **Left** to return to the **Settings** menu.
18. Press ◄ **Left** again to return to the **Main Menu**.

**NOTE**: To accelerate the pace when adjusting the date and time values, press and continue to hold down the ▲ **Up** or ▼ **Down** arrow buttons.

## 3.8 How to Set the Location and Time Zone

If you are not using the available GPS accessory to automatically set the latitude, longitude, you can manually set these parameters. The Time Zone cannot be set automatically by the GPS and must be set manually. The selections you make for latitude, longitude, and time zone enable the recorder to make adjustments and determine a specific sunrise and sunset time for each day.

**NOTE**: When you import a program with custom coordinates, a new prefix, UTC settings, and other check box items from the **Configuration Settings** section of the Song Meter SMZC Configurator software, the new values from the program automatically replace the original settings on the recorder.

You can specify the local time zone (as used to set the clock) in hours relative to UTC (Universal Time Coordinated). Half and quarter time zones (:00, :15, :30, :45) are also supported.

**NOTE**: The recorder does not automatically adjust for daylight savings time.

1. At the **Main Menu**, select **Settings**, and press **ENTER/MENU**.
2. Select **Latitude** and press **ENTER/MENU**.
   a. To enter degrees of latitude north of the equator, press ▲ **Up**.
   b. To enter degrees of latitude south of the equator, press ▼ **Down**.
   c. Press ► **Right** to enter minutes for the degree of latitude using ▲ **Up** or ▼ **Down**.
   d. Press **ENTER/MENU**.
3. On the **Settings** menu, press ▼**Down** to select **Longitude** and press **ENTER/MENU**.
   a. To enter degrees of longitude west of the prime meridian, press ▲ **Up**.
   b. To enter degrees of longitude east of the prime meridian, press ▼ **Down**.
   c. Press ► **Right** to enter minutes for the degree of longitude using ▲ **Up** or ▼ **Down**.
   d. Press **ENTER/MENU**.
4. On the **Settings** menu, press ▼**Down** to select **Timezone** and press **ENTER/MENU**.
   a. To specify one of the time zones ahead of 0:00 UTC, press ▲ **Up**.
   b. To specify one of the time zones behind 0:00 UTC, press ▼ **Down**.

c. Press ► **Right** to specify an additional 15-minute increment adopted by certain regions between two time zones.
d. Press **ENTER/MENU**.

**NOTE**: To accelerate the pace when adjusting values, press and continue to hold down the ▲ **Up** or ▼ **Down** arrow buttons.

## 3.9 How to Change the Prefix for Recorded Files

You can specify a filename prefix of up to 12 characters. This appears in the recording file names to label every recording made by a specific program or recorder. For example, you can use the same prefix (PROJECT-A) in a program (or series of related programs) to tag all recordings from all devices running that program. Or, you can use multiple unique prefixes on each recorder to tag recordings by location and device. For example, DEVICE-A, DEVICE-B, and DEVICE-C.

The default prefix set by the hardware is the serial number of the recorder. You can edit this value on each device or override the prefix with a new one in the program file that you create using the Song Meter SMZC Configurator software.

Follow these steps to change the device-specific prefix:

1. At the **Main Menu**, select **Settings**, and press **ENTER/MENU**.
2. Select **Prefix**, and press **ENTER/MENU**.
3. Specify a 1 to 12 character prefix from left to right:
   a. At the first position, press ▲ **Up** to cycle through the alphabetic characters A to Z. Press ▼ **Down** to cycle through the numbers 9 to 0. You can also select a hyphen (it is above the digit 9).
   b. Press ► **Right** to advance to the next position in the prefix and repeat the previous step.
   c. To erase characters, select the blank character. It is higher than the hyphen and lower than the letter A. All of the characters to the right of the blank character are erased.
4. When you are finished, press ► **Right** to advance to the last position and then press **ENTER/MENU.**

**NOTE**: The prefix can only contain capital letters, numbers, and hyphens.

## 3.10 How to Mount the Recorder

Use the top and bottom mounting holes for attaching the unit with cables, screws, radiator clamps, bungee cords, or other fasteners. The enclosure is fully weatherproof and does not require additional protection.

**NOTE**: The recorder should not be deployed laying on a flat surface. This orientation will produce poor quality recordings as signals will bounce off the surface and cancel out portions of the echolocation call. This results in fragmented calls that might not fulfill the minimum duration of the scrubber and be deleted.

**Bungee Cords and Slotted Metal Clamps as Mounting Options**

**Mounting Examples - Slotted Clamp (Left) and Screws (Right)**


## 3.11 How to Connect an External Microphone

You can connect an available SMM-U1 external microphone. The SMM-U1 is a highly sensitive and low noise ultrasonic microphone designed for recording ultrasound up to 190 kHz (limited to 125 kHz when used with the SMZC). The microphone has a differential output, which significantly reduces noise from electromagnetic sources.

**SMM-U1 Ultrasonic Microphone**

The external microphone connector mates with the 3-meter cable included with the microphone. The microphone can be extended up to 100 meters with

available extension cables in 10 m and 50 m lengths with no signal attenuation or degradation. All connections are fully waterproof. The connector on the cable is keyed and the cable should be seated into the connector when oriented correctly and then locked into place by turning the locking ring on the microphone or cable ↻ clockwise firmly until it stops.

**NOTE**: Each cable is shipped with a ferrite filter to reduce electromagnetic transmission to nearby equipment. This is required to comply with FCC regulations but not installing will not adversely affect the performance of the recorder. The ferrite should be installed to the cable that attaches to the recorder. The cable is looped through and the ferrite snapped shut. A zip tie is included for further securing the filter.

The omnidirectional SMM-U1 is ideal for unattended monitoring where the precise direction of bat activity is not known in advance. For applications requiring more directionality, the microphone can be adapted for directional sensitivity with the available Horn Attachment.

The SMM-U1 microphone features a hydrophobic membrane transparent to acoustic or ultrasound signals to prevent unpressurized water from entering the microphone. In gusty windblown rain, water may pass the membrane and the included windscreen should be installed so as to protect the internal ultrasonic transducer from water damage. We also recommend positioning the microphone so that they point parallel to the ground, or even slightly downward, so as to minimize water entry.

**NOTE**: Mounting cabled microphones on ungrounded non-conductive masts especially in dry and windy conditions, could result in damage to the microphones due to electrostatic build up. Please check with a professional/licensed electrician or installer of outdoor antennas, weather instruments or the like for advice suitable to your specific situation.

See 9.5 Microphone for specifications on the SMM-U1.

### 3.11.1 How to Connect the Horn Attachment

The available Horn Attachment turns the SMM-U1 omnidirectional ultrasonic microphone into a highly directional microphone, while preserving call quality. The attachment remains weatherproof at angles up to 45-degrees.

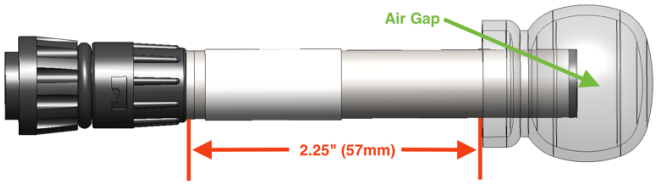
### 3.11.2 Installing Microphone Windscreens

Windscreens should be installed for long-term deployments in all areas susceptible to heavy wind driven rain. This could result in permanent damage to the microphone element due to water penetration. The risk is greater when deployed with the ultrasonic horn attachment. For short-term deployments with

predictions of less severe weather and in dry climates, you can avoid using windscreens.

The windscreens will attenuate ultrasound by only a few dB when dry. However, they will block most ultrasound when soaked with water, until they dry. Drying time can vary significantly based on temperature, humidity and wind.

Secure the windscreens for the SMM-U1 microphone with the included C-clip. Make sure there is an air gap between the windscreen and the microphone as shown below. (Do not pull the windscreen down tightly).




For the SMX-Horn directional attachment, secure the large windscreen with the included zip-tie as shown below. Exact positioning is not important.

## 3.12 Headphones

You can use the available headphone jack to monitor bats in real time.

1. With the lid open, insert the headphone cable into the headphone jack.
2. Activate monitoring.
   a. If the unit is asleep, press the **STOP** button to stop the program, then press the **CHECK STATUS** button to activate headphone output for a five-minute period. When done monitoring, press Start to resume the schedule.
   b. If the unit is currently recording, press the **CHECK STATUS** button to activate headphone output. It will remain activated for five minutes or until the end of the recording, whichever is shorter.

## 3.13 Temperature Sensor

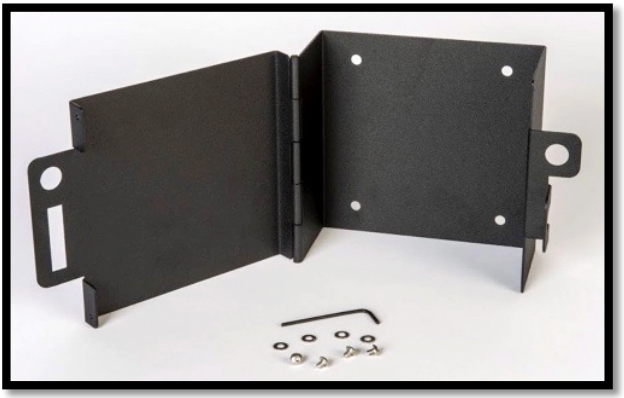
The recorder includes an integrated temperature sensor to log temperatures inside the enclosure. This is intended for diagnostics only. Heat from the circuit and/or heat from sun on the enclosure can significantly increase the temperature reading above ambient air conditions.

## 3.14 How to Install the Available Security Cover

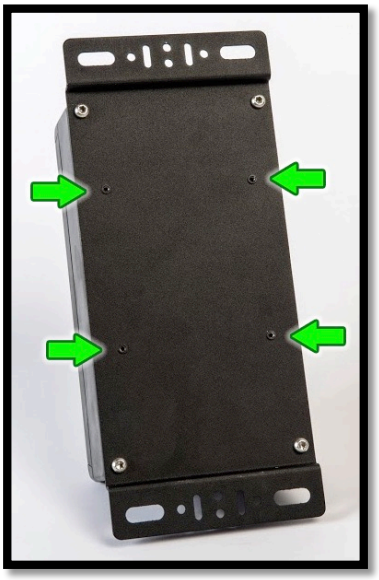
The available security cover helps protect the unit from theft or vandalism. It covers the LCD screen, buttons, and LED lights. The cover also prevents the lid from opening and exposing the inside of the device. You can attach your own padlock and/or cable lock to prevent the device from opening and deter theft.

If you order the Song Meter SMZC with the security cover it will be pre-installed. If ordered separately, follow these steps to install it:

1. Locate the security cover, four (4) 5/64-inch hex screws, four (4) washers, and L-shaped hex wrench.



2. On the back of the recorder, locate the four (4) pre-drilled threaded holes.



3. Place the security cover over the holes and align the four holes.
4. For each hole, place a washer onto a hex screw and tighten until the cover is attached to the back of the recorder.

5. Wrap the cover around the front of the device. Align the circular cut-outs and the rectangular slots.

6. Attach a heavy-duty lock and/or cable lock

# 4 Programs

## 4.1 Introduction

The Song Meter SMZC  records in zero crossing format from one microphone. Programs define the operating behavior of the device including the recording schedule, trigger settings, and other user-configurable parameters.

You can create and save multiple programs; however, you can only load, start, and optionally edit one program at a time on the recorder. You can load one of the built-in programs or import a program file on a memory card. You can use the Song Meter SMZC Configurator software on your computer to create and edit your own programs.  You can save a program on a memory card and import it on the recorder.

This section describes how to work with programs on the recorder using the LCD screen, menu options, and keypad. To develop your own custom programs using the Song Meter SMZC Configurator software, see Chapter 5: Song Meter SMZC Configurator.

## 4.2 How to Load a Built-In Program

You can load, edit, and run built-in programs directly on your recorder. The built-in programs are designed to implement the most popular recording schedules. You also have the flexibility to edit one or more lines in the built-in programs to satisfy your specific objectives.

1. At the **Main Menu**, select **Program**, and press **ENTER/MENU**.
2. Select **Select Program** and press **ENTER/MENU**.
3. At the **Select Program** prompt, press ▲ **Up** or ▼ **Down** to select one of the two built-in programs:

   ```
   Sunset to Sunrise
   24 hours
   ```

4. Press **ENTER/MENU**. The following message appears:

   ```
   Program loaded
   ```

5. The program that you selected is loaded onto the recorder. Next, you can perform any of the following actions:
   - Edit the program.
   - Export the program to a memory card.
   - Start the program.

## 4.3 How to Edit a Program

Use this procedure to edit the active, or currently loaded, program directly on the recorder using the LCD screen and buttons. To learn more about each command and available settings, see 6.1 Program Commands.

As a general rule, we recommend that you edit programs using the Song Meter SMZC Configurator software; however, if you are out in the field and need to edit a program, this method is convenient.

1. Load or import a program.
2. If you already started the program, press **PROGRAM STOP**.
3. At the **Main Menu**, select **Program**, and press **ENTER/MENU**.
4. Select **Edit Program** and press **ENTER/MENU**.
5. Press ▼ **Down** to select a line in the program.
6. To edit the line, press ► **Right** to advance to the command or value and then press ▲ **Up** or ▼ **Down** to make adjustments.
7. To undo your changes at this point, you can press ◄ **Left** to return to the start of the line.
8. When finished, press ► **Right** or **ENTER/MENU** and repeat until the end of the line has been reached and the cursor is back at the start of the line.
9. To add or insert a line:
   a. Press ▼ **Down** to select the **<Add/Insert>** entry on the last line of the program and press **ENTER/MENU**. A new line appears at the bottom of the program.
   b. Press ◄ **Left** and then press ▲ **Up** or ▼ **Down** to change the line number for the new line. Press **ENTER/MENU** to confirm the line number.
   c. To edit the new line, press ► **Right** to advance to the command or value and press ▲ **Up** or ▼ **Down** to make adjustments. When finished editing, press ► **Right** or **ENTER/MENU**.
10. To delete a line:
    a. Press ▲ **Up** or ▼ **Down** to select the line you want to delete.
    b. Press ► **Right** to advance to the command for that line.
    c. Press ▲ **Up** or ▼ **Down** until the **<Delete>** command appears.
    d. Press **ENTER/MENU**. The line is removed and all higher lines cascade down in sequence by one line.
11. When finished editing all lines, press **ENTER/MENU** and then press ◄ **Left**.
12. Program errors or warnings may appear. Repeat these steps to resolve them or press ◄ **Left** to ignore. Warnings can be fixed or ignored; however, your program will not run until it is error-free.
    a. Press ▼ **Down** to view the next problem.

b. Press ▼ **Down** after the last problem to return to the **Program** menu.

c. To return to the **Program** menu before reviewing all the problems, press ◄ **Left**.

13. When no errors exist, the following message appears:

```
Program edit OK
```

## 4.4 How to Create a Program On the Recorder

Instead of creating a new program line by line, take advantage of the two built-in programs. Use them as templates for creating your own custom programs. See 4.3 How to Edit a Program. You can also use the SMZC Configurator software to create your own custom programs.

## 4.5 How to Export a Program

You can export the current program to the memory card. After exporting it, you can share the program with others, load it on another device, or edit it using the SMZC Configurator software.

1. At the **Main Menu**, select **Program**, and press **ENTER/MENU**.
2. Press ▼**Down** to select **Export Program** and press **ENTER/MENU**. The following messages appear:

```
Exporting Program...
```

```
Program exported
```

3. Eject the memory card and examine the top-level folder contents on a computer or laptop. The exported file name is always the recorder prefix with the .PGM extension. For example:

   SMZC00155.PGM

   The default prefix is the device serial number. You can specify a new prefix on the recorder or in a custom program.

**CAUTION**: If a file with that name already exists on the memory card, it is overwritten.

## 4.6 How to Import a Program

Use this procedure to import a custom program file (for example, myProgram.PGM) from the memory card.

1. Save a custom program to the top-level directory of a memory card from another recorder or from the Song Meter SMZC Configurator software.
2. Insert the memory card in the Song Meter SMZC recorder.
3. At the **Main Menu**, select **Program**, and press **ENTER/MENU**.
4. Select **Import Program** and press **ENTER/MENU**.
5. At the **Select Program File:** prompt, press ▲ **Up** or ▼**Down** to select a program file on your memory card.
6. Press **ENTER/MENU**.
7. If no warnings or errors exist, the following message appears:

   ```
   Program imported
   ```

8. If a warning or error is detected in the program, the line number and a short notification appear as shown in the following example:

   ```
   Program error
   Line 14
   Unreachable command:
   ```

   Warnings can be fixed or ignored; however, you must fix errors in a program.

   a. Press ◄ **Left** to return to the list of available programs. (As an option, you can choose a different program.)
   b. Press ◄ **Left** again to exit and go back to the **Program** menu. Edit the program using the recorder or Song Meter SMZC Configurator software and try the import again. Select **Import Program** when the program is error-free.
9. The program that you select is imported onto the recorder and loaded as the active program. Press ◄ **Left** to return to the **Program** menu.
10. You can perform any of the following actions on the imported active program:
    - Edit the program.
    - Export the program to a memory card.
    - Start the program.

## 4.7 How to Start a Program

Follow these steps to start the active program. The active program is the most recent one you loaded or imported.

**NOTE**: If you press **PROGRAM START** and the message *Empty Program!* appears, it means you have not loaded or imported a valid error-free program.

1. Press **PROGRAM START**.
   a. Errors or warnings may appear. For example:

   ```
   Program error

   Card slot empty
   ```

   b. Press ▼ **Down** to advance to the next error or warning, if any. If you do not press any buttons for 60 seconds, the Program Checker exits.
   c. If there is at least one *error*, go back to the Main Menu. Edit the program and fix the errors.
   d. If there are only *warnings*, the program starts running. Editing the program can often be used to resolve any *warnings*.
   e. Press **PROGRAM START** again to run the revised program.
2. If the scheduled start time is immediately, as in the case of the *Record at Night* schedule, you will see a progression of preparation screens with the following status:
   a. **Auto-leveling** as the recorder automatically sets the zero crossing threshold for optimal sensitivity.
   b. **Preparing to record** as the recorder scans the memory card to assure there is sufficient space for recordings.
   c. And finally you will see the recording screen:

   ```
   2014-Oct-14 14:50:48
   Currently recording:
   14:45:39 - 15:45:35
   DIV 8 ARMED/TRIGGERED
   ```

   Where **DIV** indicating the division ratio, **ARMED** indicating that the recorder is waiting for a trigger**,** and **TRIGGERED** indicating that the recorder is actively making a triggered recording.
3. If the scheduled start time is more than one minute into the future (three minutes if using the available GPS accessory), the recorder enters sleep mode to conserve power. You will see:

   ```
   2016-Jan-31  18:05:00
   Going to sleep.
   Next Recording at:
   2016-Feb-01  03:15:00
   ```

The Song Meter SMZC wakes up 30 seconds before the scheduled recording start time and prepares itself before carrying out each line of the program.

**NOTE:** If you use an AT TIME, AT SRIS or AT SSSET command that is within a daily repeating loop, and start the program after that time of day, the recorder will assume you wish to record starting at the previously occurring sunset, sunrise or time, and begin recording immediately.

For example, if you have a program that starts with AT TIME 16:00:00 and records for 3 hours, but you start the program at 17:00:00, the recorder will not wait until 16:00:00 the next day, but instead will start recording immediately and record the remaining two hours of the days' schedule.

If you start a program with an AT TIME command that is not contained in a daily loop or the program starts with an AT DATE command, then the recorder will wait until the next specified time or date.

## 4.8 How to Check the Status of the Recorder

Use the following procedure to check the status of the recorder before during or after starting a program. The **CHECK STATUS** button will toggle between the current screen and an information screen.

**NOTE**: Always perform this procedure to check the status of the recorder and memory card before a deployment.

### 4.8.1 While the Recorder is Sleeping

1. Press and release the **CHECK STATUS** button**.**
2. If you loaded a program that is scheduled to start but has not yet started, the unit wakes from sleep and displays the following:

```
2014-Oct-14 14:50:48
Going to sleep.
Next recording at:
2014-Oct-14 18:26:00
```

   - The current date in YYYY-mmm-DD format.
   - The current time in HH:MM:SS format.
   - The time when the SMZC will wake and begin recording.
3. Press the **CHECK STATUS** button again to activate the backlight and see the information screen:

```
2014-Oct-14 14:50:48
SMZC00001     R1.0.0
CARD:  2/32  Mic: IN
Bat  5.9V Temp 16.70
```

- The current date in YYYY-mmm-DD format.
- The current time in HH:MM:SS format.
- The model number and serial number for the recorder.
- The firmware version. For example, R1.0.1.
- The memory used as a fraction of the total capacity in GB.
- The microphone type: IN for the Built-In microphone or U1 for SMM-U1 external microphone.
- The battery voltage.
- The temperature in degrees Celsius.

**NOTE**: New alkaline batteries should report 6.0 or more volts. The internal temperature of the recorder is intended for diagnostics and not an accurate measure of outside air temperature.

4. Pressing the **CHECK STATUS** button again will toggle though these two screens. The recorder will timeout after 10 seconds of no button presses and will go back to sleep until the next scheduled recording.

### 4.8.2 While the Recorder is Actively recording

1. If the SMZC is currently recording, the following screen is already displayed:

```
2014-Oct-14 14:50:48
Currently recording:
14:45:39 - 15:45:35
DIV 8 ARMED/TRIGGERED
```

- The current date in YYYY-mmm-DD format.
- The current time in HH:MM:SS format.
- The start and end time of the current recording period.
- The Division ratio.
- The state of the trigger, **ARMED** indicating that the recorder is waiting for a trigger**,** and **TRIGGERED** indicating that the recorder is actively making a triggered recording.

**NOTE:** The recording period is only the period based on the length of recording time selected in the program. It does not indicate the entire recording session. In other words, if the **Record Nightly** program is selected, the displayed time period only indicates the current 30-minute recording period, as that is the default. At the end of the 30-minute period a new 30-minute period will be started and this will continue until sunrise.

2. Press the **CHECK STATUS** button again to activate the backlight and see the information screen, as described in the previous section.
3. Pressing the **CHECK STATUS** button again will toggle though these two screens. The recorder will timeout after 10 seconds of no button presses

and will go back to the recording status screen. The backlight will timeout after 10 seconds.

## 4.9 How to Stop a Program

Press and hold the **PROGRAM STOP** button for several seconds while a program is running or scheduled to run to stop it from continuing. When you stop a running program, the recorded output up until recording was stopped is saved to the memory card.

When you press **PROGRAM STOP** you are only stopping the current instance of that program. The program will start itself and resume recordings as programmed. To stop all recording, you can power the unit off.

# 5 Song Meter SMZC Configurator

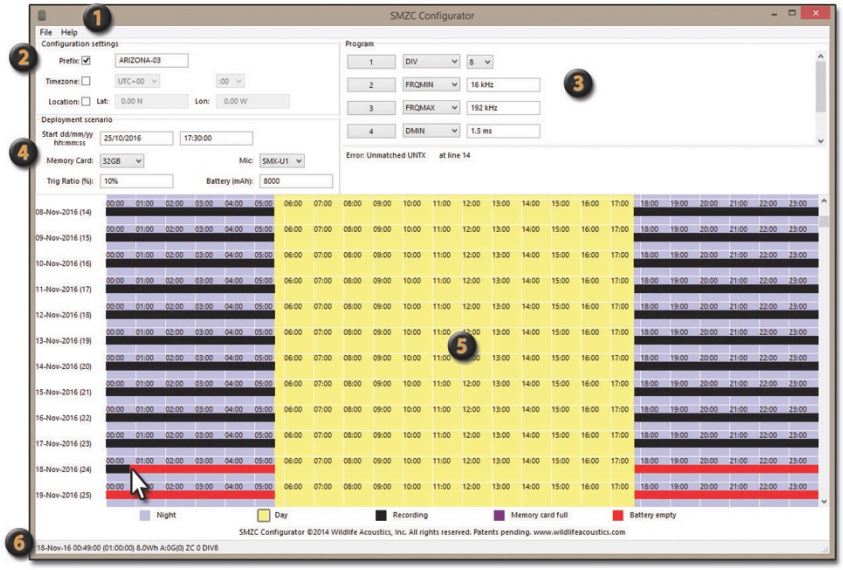
## 5.1 Introduction

Use the Song Meter SMZC Configurator software to create and edit recording programs for the recorder. You can also use this application to perform the following tasks:

- Estimate battery life and memory capacity for recording deployments.
- Open a recording to view the commands and settings used in the original program that captured it.
- Edit and save your own versions of a program and use them on future deployments to one or more SMZC recorders.

The software is available for Microsoft Windows, Apple Mac OSX, and Red Hat Linux and can be downloaded for free at: http://www.wildlifeacoustics.com/support/download-software.

## 5.2 Song Meter SMZC Configurator User Interface



**Song Meter SMZC Configurator Software**

| | |
|---|---|
| 1 | **File and Help Menus**: Click the **File** menu to load a sample program, open one of your own programs, save a program, or exit. Click the **Help** menu and choose **About** to view the currently installed version number of the utility. |
| 2 | **Configuration Settings**: Adjust the settings in this section to override the settings on the recorder when you import the program. |
| 3 | **Program**: Enter your choice of commands and adjust their parameter values to create, edit, and save your own custom programs. Any warnings or errors appear below the program. |
| 4 | **Deployment Scenario**: Estimate the timeline of your deployment settings including Start date, battery power, and memory capacity. |
| 5 | **Scrolling Calendar View**: Use this section to explore the estimated recording schedule, battery life, and memory card requirements of your program. Black bars represent successful recordings; purple bars require more memory; and red bars represent insufficient power. Blue and yellow shading indicates night and day based on program settings. |
| 6 | **Status Bar**: When you drag your mouse pointer in the schedule, the status bar displays details about that point in the program. From left to right, it shows the recording date, approximate time, estimated recording duration for that particular segment of the program, cumulative power consumption, memory card utilization (by segment and in total), recording file type (ZC), channels (0), and division ratio (DIV 4, 8, or 16). |

## 5.3 How to Create a Program in the Configurator

Although you can create a new program starting at line one, as a time-saving best practice use this procedure to create a new program from one of the sample programs provided as a template.

**TIP**: Start by loading one of the sample programs and then make adjustments to create your own custom programs.

1. Open the **Song Meter SMZC Configurator** software application.
2. Click the **File** menu and choose one of the sample programs:
   - Sunset to Sunrise
   - 24 hours
3. In the **Program** section, examine each line of the program. Use the drop-down value lists to edit fields. You can use the mouse or press the **Tab** key to advance to the next field. Press **Shift+Tab** to go back to the previous field. Press the arrow keys on your keyboard to cycle through value lists.
4. To change a command in any line, select another command from the list.

5. The last line in a program is empty and shows **<Choose>** in its command field ready for you to specify a command. To insert a new line, click a line number.
6. To remove a line, select **<Delete>** in the command field.
7. (Optional) Adjust the **Configuration Settings** section to override the settings in the recorder.
8. (Optional) Adjust the **Deployment Scenario** section to estimate a recording schedule.
9. Resolve any errors that appear below the **Program** section.
10. Click the **File** menu and choose **Save**.
    a. Save the program to your computer to continue editing it or to use it as a template for future programs. You can open your saved program, edit it, and save over the old name or give it a new name.
    b. Save the program to a memory card to import it onto one or more recorders in the field.

## 5.4 How to Adjust Configuration Settings

Select any of the check boxes in the **Configuration Settings** section to override any values already set on an individual Song Meter SMZC unit when you import your program. For example, select the **Prefix** check box and enter a new prefix for a location or project name.

All of the settings in this section are documented elsewhere in this guide.

## 5.5 How to Adjust Deployment Scenario Settings

Use the fields in the **Deployment Scenario** section to estimate the recording schedule for the program in the calendar view.

1. Load a sample program or a custom program.
2. In the **Start** fields enter the date and time in the following format:
   `DD/MM/YYYY HH:MM:SS`
3. In the **Memory Card** field, select the capacity of the memory card.
4. In the **Mic** field, select the type of microphone you plan to use: the built-in internal microphone or the SMM-U1 external microphone.
5. In the **Trig Ratio (%)** field, indicate the percentage of time during recording periods that a given microphone will be triggered. The default value of 10% is a good estimate for bat recordings. Adjust as needed based on past experience with your specific recording conditions.

6. In the **Power (mAh)** field, enter your batteries capacity in milliamp hours. This is the capacity from just one battery. Do not add up four capacities for four batteries as the capacity is given for only that cell's voltage.
7. Examine the recording calendar and make any adjustments to fit your timeline.
8. Click the **File** menu and choose **Save**. Save the resulting .PGM file to a memory card.
9. Import the program onto the recorder. See 4.6 How to Import a Program on page 26.

## 5.6 How to Use the Scrolling Calendar

The scrolling calendar in the lower portion of the application window shows the recording schedule for over a year (400 days to be precise) from the **Start** date in the **Deployment Scenario** section. Successful recording periods are shown with black bars. Blue shaded areas represent nighttime and yellow shaded areas represent daytime based on sunrise/sunset calculations determined by the time zone (hours relative to UTC), latitude, and longitude specified in the **Configuration Settings** section.

The scrolling calendar also illustrates when the Song Meter is likely to stop recording after running out of memory storage (purple bars) or battery power (red bars). These are estimates based on the memory card and battery capacity specified in the **Deployment Scenario** section. Actual performance is subject to variations in memory card and battery manufacturers and numerous other factors such as temperature or battery charging method.

To estimate memory requirements for triggered recordings, set the **Trig Ratio (%)** field in the **Deployment Scenario** section. The application estimates memory consumption based on how often the unit is likely to be triggered and truly recording as opposed to waiting for a trigger to start recording. The default value of 10% is good for bat recording. You can adjust this ratio based on personal experience with your specific recording conditions.

# 6 Developing Custom Programs

## 6.1 Program Commands

Use the following commands to create programs for your specific recording needs. Or use the following as a guide to modify an existing program to better suit your needs. A program can contain up to 99 command lines.

**TIP**: Start by loading one of the sample programs and then make adjustments to create your own custom programs.

### DIV {4,8,16}

Use this command to specify the data division ratio for zero crossing recordings. The choices are 4, 8 or 16.

We recommend a value of eight (8). This is the value used in Kaleidoscope software's Auto-Identification algorithms and is optimal for most applications.

A division of 16 will provide less detail and use less memory card space, but zero crossing is already such a compact format there is no longer a compelling reason for that compromise.

A division of 4 will show more detail, but the additional "dots" tend to lack accuracy as they are not averaged as much over time. This division could be useful for bats with very short duration echolocation calls or calls with very low frequency.

### TRGWIN [0.1-9.9]

Use this command to set the recording duration after a triggering signal. The recording continues for this amount of time after the last signal that satisfies the trigger. If the only such signal is the signal that causes the trigger, then the duration of the recorded file matches the length of this setting. Otherwise, the length of the recording is longer than the last trigger signal by this amount. The recording is truncated when it reaches the maximum recording duration set by **TRGMAX** (see below).

The available range is 0.1 to 9.9 seconds in 0.1 second increments. Set this value long enough to avoid a recording that ends after one echolocation call. If a bat's echolocation calls occur every 0.5 seconds and this was set to 0.1 seconds, you would get a new trigger with every single echolocation call. Three (3.0) seconds is a good default value.

**NOTE:** Some standards describe a specific recording trigger window as a *bat pass*.

### TRGMAX [OFF,00.1-99.9]

Use this command to set a maximum recording duration.

The available range is from 0.1 to 15.0 seconds in 0.1 second increments.

### FRQMIN [OFF,1K-192K]

Use this command to set the lower bound for the frequencies of interest to the scrubber and the triggering mechanism. The available range is from 1 to 192 kHz in 1-kHz increments, or **OFF**

Echolocation calls or other signals occurring below this frequency will not cause a trigger and will be considered noise to the scrubber mechanism. A setting of 16 kHz works well for most bat applications but it may be necessary to set lower if lower frequency species will be recorded.

See **DMIN** for more information on how the scrubber uses this value.

### FRQMAX [OFF,1K-192K]

Use this command to set the upper bound for the frequencies of interest to the scrubber and the triggering mechanism. The available range is from 1 to192 kHz in 1-kHz increments, or **OFF**.

Echolocation calls or other signals occurring above this frequency do not cause a trigger and are considered noise to the scrubber mechanism. A value of 192 kHz is recommended for recording bats.

See **DMIN** for more information on how the scrubber uses this value.

### DMIN [OFF, 000.1-800.0]

Use this command to set the minimum duration for a signal in the specified frequency range to be a valid signal to satisfy the scrubber. The available range is from 0.1 to 800.0 milliseconds in 0.1-millisecond increments, or **OFF**.

The scrubber automatically deletes files where no suitable bat echolocation call is detected. The scrubber looks for at least two narrow band signals of at least this **DMIN** duration and shorter than **DMAX** and within the frequency range specified by **FRQMIN** and **FRQMAX**. If two such signals exist, the file is saved, if they are not, the file is not saved.

A value of 1.5 ms is recommended for recording bats.

Setting this command to **OFF** will not scrub files based on a minimum signal duration.

The files are scrubbed based on this field and **DMAX**. If you do not want to scrub files, set this command and **DMAX** to **OFF.**

### DMAX [OFF, 000.1-800.0]

Use this command to set the maximum duration for a signal in the specified frequency range to be a valid signal to satisfy the scrubber. The available range is from 0.1 to 800.0 milliseconds in 0.1- millisecond increments, or **OFF**.

A value of 200 ms is recommended for recording bats.

Setting this command to **OFF** will not scrub files based on a maximum signal duration.

See **DMIN** for more information on how the scrubber uses this value.

### RECORD hh:mm:ss

Starts a triggered recording period of the specified duration. Individual zero crossing files are saved directly to the memory card. If the **RECORD** command is inside a repeat/until loop, the recording period may end early to match the outer loop ending time.

Auto-leveling of the zero crossing threshold is performed at the beginning of each recording session for optimum sensitivity.

### PAUSE hh:mm:ss

Pauses the program for the specified amount of time. If you set the duration of the **PAUSE** command to greater than 1 minute, the Song Meter SMZC enters low-power sleep mode and wakes up at the next scheduled recording.

### AT DATE DDMMMYY

Causes the program to wait until the specified date. YY are the last two digits of the year in the current century beginning with the year 2000.

**NOTE:** Technically this command acts as an "at or After" command. If you start the program after the specified **AT DATE**, the command is ignored and the program continues.

### AT TIME hh:mm:ss

Causes the program to wait until the specified date time.

**NOTE:** If you use an AT TIME, AT SRIS or AT SSSET command that is within a daily repeating loop, and start the program after that time of day, the recorder will assume you wish to record starting at the previously occurring sunset, sunrise or time, and begin recording immediately.

For example, if you have a program that starts with AT TIME 16:00:00 and records for 3 hours, but you start the program at 17:00:00, the recorder will not wait until 16:00:00 the next day, but instead will start recording immediately and record the remaining two hours of the days' schedule.

If you start a program with an AT TIME command that is not contained in a daily loop or the program starts with an AT DATE command, then the recorder will wait until the next specified time or date.

### AT SRIS±hh:mm:ss

Causes the program to wait until sunrise, plus or minus the specified time.

### AT SSET±hh:mm:ss

Causes the program to wait until sunset, plus or minus the specified time.

### REPEAT

Indicates the beginning of a *repeat until* loop and must be ended by an **UNT** command. See next section for details on loops and how they work.

### UNTDATE DDMMMYY

Ends a loop when the specified termination date is reached. Any **RECORD** commands in progress in this loop are forced to stop recording.

### UNTTIME hh:mm:ss

Ends a loop when the specified termination time is reached. Any **RECORD** commands in progress in this loop are forced to stop recording.

### UNTSRIS±hh:mm:ss

Ends a loop at sunrise, plus or minus the specified time. Any **RECORD** commands in progress in this loop are forced to stop recording.

### UNTSSET±hh:mm:ss

Ends a loop at sunset, plus or minus the specified time. Any **RECORD** commands in progress in this loop are forced to stop recording.

### UNTCOUNT [INF,01-99]

Ends a loop after <count> iterations. **INF** specifies an infinite count.

### FEATURE <feature number> {OFF,ON}

This is for advanced use only and is not a required command by the program checker. The first parameter is a number from 1 to 16 and the second parameter is OFF or ON. By default, all features are OFF.

- FEATURE #01: If ON, disables the LED blinking during recording. Insert into the top of a program "01 FEATURE 01 ON" to disable the LEDs.

This command may be used to add additional features in the future.

## 6.2 Loops

An essential logical structure in any computer program, a *loop* repeats a task until an ending condition is met. For example, you need a program that waits, and continues to wait until sunset; and then you want it to record, and repeat that action, recording over and over (we call that a *loop*) until 15 minutes before sunrise.

Loops are programmed by using a pair of **REPEAT** and **UNT** commands. Loops can be nested such that a pair of **REPEAT** and **UNT** commands can contain pairs of **REPEAT** and **UNT** commands within. Loops have an explicit ending condition, such as a date for an **UNTDATE** command or a count for an **UNTCOUNT** command. In addition, loops have an implicit ending time, inherited from any enclosing loops. The implicit ending time is the earliest of all the enclosing loop ending times. In other words, the ending condition of a loop is either its own ending condition or the implicit ending time, whichever occurs first.

**RECORD** commands likewise inherit an implicit ending time from any enclosing loops, perhaps causing a **RECORD** command to finish earlier than indicated by its own duration parameter.

**UNTCOUNT** loops do not have an ending time of their own, although they do adhere to any implicit ending time that they inherit. If a program contains just one loop, a **REPEAT**/**UNTCOUNT** loop, with a **RECORD** command inside that loop, then the **RECORD** command will always run for its full duration, and the loop will end after the specified count of iterations.

## 6.3 How to Work With the Program Checker

The Program Checker runs automatically to verify the configuration of the hardware and software, and to check your program for errors or warning conditions. If it detects contradictory commands, the Program Checker reports the latter of the two as the error source. Use the Program Checker output to correct your program, save it, and then attempt to import or run it again.

1. The Program Checker runs at all of the following times:
   - After you finish loading or importing a program.
   - After you finish editing a program and press the main buttons on the device to exit the editor as viewed through the LCD screen.
   - Before you run a program by pressing the PROGRAM START button.

2. The Program Checker performs several tests on the current program. For example, it checks for the following items:
   - Balanced REPEAT/UNTX loops
   - At least one RECORD command that is reachable; in other words at least one RECORD precedes, or is inside of, an infinite loop.
   - All required parameters set prior to a RECORD command.
   - Parameters that are consistent with the present hardware.
3. It shows *errors* (if any), followed by *warnings* (if any). It shows the matching line number in your program for the error or warning.
4. To view the next error or warning, press the ▼ **Down** button.
5. To exit the Program Checker, press the ◄ **Left** button. You can also exit by pressing ▼ **Down** after the last error or warning.
6. If no buttons are pressed for 60 seconds while a problem is displayed, the Program Checker times out and exits.
7. When the Program Checker exits:
   - If you were loading or editing a program, you return to the Main Menu.
   - If you were running a program and there are no errors (only warnings or no problems at all), your program starts.

## 6.4 How to Resolve Program Checker Errors

When a program contains *warnings*, you can address them or even choose to ignore them and continue. However, when a program contains one or more *errors*, it will not run. To resolve an error, edit the program and adjust a parameter or add, move, or delete a command line. Refer to the following list of the most common program warnings and errors.

**Song Meter SMZC Common Program Warnings and Errors**

| Message | Warning/Error | Explanation |
|---|---|---|
| **Unmatched REPEAT:** | error | A REPEAT command for which no corresponding subsequent UNT_X command can be found. |
| **Unmatched UNTX:** | error | An UNT_X command for which no corresponding preceding REPEAT command can be found. |
| **Inf lp bfr REC:** | error | The program has an infinite loop before reaching any RECORD command. |
| **Unreachable command:** | warning | The program contains an infinite loop. |
| **No RECORD:** | error | The program contains no RECORD command. |
| **No DIV cmd:** | error | A RECORD command has been reached with no preceding DIV command. |
| **No FREQMIN cmd:** | error | A RECORD command has been reached with no preceding FREQMIN command. |

| Message | Warning/Error | Explanation |
|---|---|---|
| **No FREQMAX cmd:** | error | A RECORD command has been reached with no preceding FREQMAX command. |
| **No DURMIN cmd:** | error | A RECORD command has been reached with no preceding DURMIN command |
| **No DURMAX cmd:** | error | A RECORD command has been reached with no preceding DURMAX command. |
| **No DTRGWINDOW cmd:** | error | A RECORD command has been reached with no preceding DTRGWINDOW command |
| **No DTRGMAXLEN cmd:** | error | A RECORD command has been reached with no preceding DTRGMAXLEN command. |
| **FREQMAX <= FREQMIN:** | error | A RECORD command has been reached, and the preceding FREQMAX value is less than or equal to its preceding FREQMIN value. |
| **DURMAX <= DURMIN:** | error | A RECORD command has been reached, and the preceding DURMAX value is less than or equal to its preceding DURMIN value. |
| **Extern mic not ultra:** | run-time warning | A RECORD command has been reached and the external microphone is not a ultrasonic. |
| **Card slot empty** | error | No memory card is installed. |
| **Card is read-only** | error | The memory card has the read-only switch on. |

# 7 ZC Recording Details

## 7.1 Filenames for Recordings

Audio recording files are saved in a **Data** folder on each memory card and use the following naming conventions:

```
PREFIX_0_YYYYMMDD_HHMMSS.00#
```

**PREFIX**

The prefix is set in the **SETTINGS** menu or in the Song Meter SMZC Configurator.

**_0_**

Indicates a mono recording to maintain consistent format in order to assure compatibility with Kaleidoscope and other software.

**YYYYMMDD_HHMMSS**

The full timestamp including the year, month, day, hour, minute, and second when the recording started.

**.00#**

The filename suffix for zero crossing recordings.

## 7.2 Recording Metadata

In addition to the information available in the filename, values for the attributes listed below are stored as metadata in your ZC recording files. This information is visible in the available Kaleidoscope software as well as third party zero crossing analysis software.

**NOTE:** Kaleidoscope software supports additional metadata relating to analysis of the recording and allows you to change some of the metadata fields.

**Timestamp**

This is the full timestamp including the year, month, day, hour, minute, second and, microseconds when the recording started. This is stored in the following format:

```
Timestamp: YYYY-MM-DD HH:MM:SS.mmm
```

**Latitude and Longitude**

The location of the recorder at the start of the recording. This is stored in the following format:

```
GPS: XX.XXXXX N [or S] XX.XXXXX W [or E]
```

**NOTE:** This only stored if the available GPS sensor is attached and has a fix during the recording. Manually entered latitude and longitude are not stored.

### Device Model and Serial Number

This is stored in the Notes field in following format:

```
TAPE: SMZ00001
```

### Auto-Level Value

This is a measure of the zero crossing threshold level. This voltage setting is relative to full scale at the microphone inputs. It is stored in the notes field in the following format:

```
SPEC: Level: - 84.1dBV
```

## 7.3 Summary Text File

Once per minute during a recording period, the recorder appends a line of text to the summary text (.txt) file. The summary file logs basic parameter values separated by commas for easy viewing later in Excel or a text editor. The file begins with a header line which identifies the fields that appear in each line of summary data in the rest of the file:

```
DATE,TIME,LAT,,LON,,POWER(V),TEMP(C),#FILES,#SCRUBBED,MICTYPE
```

As examples, three lines from a sample summary file appear below:

```
2016-Jan-22,17:15:24,42.00000,N,71.00000,W,5.9,12.00,2,1,IN
2016-Jan-22,17:16:38,42.20000,N,71.10000,W,5.9,11.75,3,4,IN
2016-Jan-22,17:17:47,42.35000,N,71.18200,W,5.5,11.75,1,2,IN
```

### Date and Time

The date of each entry in the file is stored in the format YYYY-MMM-DD. The time of each entry appears in a 24-hour format HH:MM:SS that includes minutes and seconds.

### Latitude and Longitude

The latitude and longitude are stored with single characters to designate direction (N, S, E, or W). These coordinates are set by the user manually or dynamically calculated by the available GPS accessory. The GPS location of each recording is stored in the recording metadata only if the available GPS sensor is attached and has an accurate satellite reading during the recording.

**Power**

The power supply voltage for the batteries are logged. In the example, the voltage is 5.9 volts.

**Temperature**

The file stores the temperature in degrees Celsius. In our example, the internal temperature has fallen from 12.0 to 11.75 degrees.

**Number of ZC Files Saved**

This is the number of ZC files recorded and written to the memory card since the last entry. In the example 2, 3, and 1 files were recorded during each respective one-minute period.

**Number of Scrubbed Files**

This is the number of ZC files that were scrubbed based on the program settings. These files were not written to the memory card since the last entry. In the example 1, 4, and 2 files were scrubbed during each respective one-minute period.

**Microphone Type**

The file stores the microphone type: IN for the Built-In microphone or U1 for SMM-U1 external microphone.

## 7.4 Kaleidoscope Software

The free version of the Kaleidoscope post-processing software from Wildlife Acoustics can convert .wac, .wav, and zero crossing formats while filtering out unwanted signals. Upgrade to Kaleidoscope Viewer to view spectrograms of your bat recordings. Upgrade to Kaleidoscope Pro to add automatic classification of bats (includes Kaleidoscope Viewer).

1. Navigate to http://www.wildlifeacoustics.com/support/download-software.
2. Find the file appropriate for your operating system.
3. On Windows, open file and follow installation instructions. On Mac copy the file to the **Applications** folder.

# 8 Utilities

## 8.1 How to Run Diagnostics

Use this procedure to generate diagnostic information about the current state of the recorder and the current program. Use the diagnostic information to troubleshoot any problems you may be experiencing. When contacting customer support, a representative may ask you to provide this information to help diagnose the problem.

1. Insert a memory card into the recorder.
2. At the **Main Menu**, select **Utilities**, and press **ENTER/MENU**.
3. Select **Export Diagnostics** and then press **ENTER/MENU**.
4. The unit performs internal diagnostic tests and then exports the following information in a log file to the memory card:
   - current settings and configurations
   - current program
   - other diagnostic information

**Note**: You can also press and hold **▼Down** while powering the unit **ON** to activate the diagnostics utility.

5. Remove the memory card and identify the diagnostic file by the following format:
   `PREFIX_YYYYMMDD_hhmmss.smzcdump`

A support professional can use the file to help you troubleshoot issues. You can open the file in the SMZC Configurator software to view the original program.

## 8.2 How to Reset Factory Default Settings

This short procedure restores the original device settings set as default values at the factory when your recorder was first assembled and tested.

1. At the **Main Menu**, select **Utilities**, and press **ENTER/MENU**.
2. Select **Set factory default** and then press **ENTER/MENU**.
3. At the **Confirm: Set dflt?** prompt:
   a. Select **No** to cancel this entire procedure and continue operating the Song Meter SMZC with its current settings.

b. Select **Yes** and press **ENTER/MENU** to restore the device to its original factory default settings.

**CAUTION**: All custom settings, including, location, and prefix, are erased.

## 8.3 How to Test Microphones

Use the available Ultrasonic Calibrator to calibrate the built-in microphone or an attached SMM-U1 microphone. Since ultrasound is beyond the range of human hearing, verifying proper system and microphone performance can be a challenge. The Ultrasonic Calibrator helps you test both the microphone and the full recorder system.

The Calibrator requires a 9V alkaline battery (1.5V cell) and one is included with the unit. The battery is located behind the hinged door at the top of the unit. The LED will no longer illuminate when the battery is depleted and can no longer provide a calibrated tone. While the unit may still emit sound at this point, it cannot be used as an accurate calibrator if the LED is not illuminated.

The calibrator has two modes of operation:

- **CAL**: Calibration mode is used to test the microphone at close range.
- **CHIRP**: Chirp mode is used to test the entire system at a greater distance.

### 8.3.1 Entering Calibration Mode

To test a microphone, the calibrator generates a calibrated 40 kHz tone.

1. At the **Main Menu**, select **Utilities**, and press **ENTER/MENU**.
2. Select **Calibrate Mics** and then press **ENTER/MENU**. Wait a moment for the following screen to appear:

```
MICROPHONE CALIBRATE

@40KHZ = ------dBv
```

3. Turn the calibrator **ON** and set the mode switch to **CAL**.

You are now ready to test the built-in microphone or an attached SMM-U1 Ultrasonic microphone.

### 8.3.2 Testing the Built-in Microphone

1. Remove the clear calibrator microphone adapter by sliding it of the calibrator from the bottom (the end with the Wildlife Acoustics logo).

2. Place the calibrator flush with the top of the SMZC housing such that the ultrasonic transducer is pointing downwards towards the built –in microphone. Make sure it is flush with the angled bevel such that it is pointed slight downward.

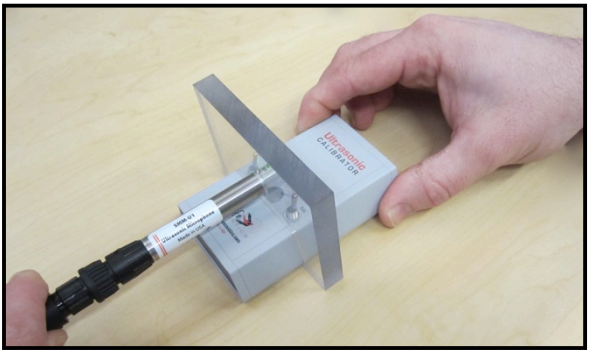

3. Set the toggle switch to **CAL**.
4. Look at the dBv level shown on the SMZC screen. If the value is higher (less negative) than **-45 dB** your microphone is within specification and ready to use. If the value is lower (more negative) than your microphone has lost some or all of its sensitivity and should be repaired.
5. Press the ◄ **Left** button when finished to leave calibrate mode.

### 8.3.3 Testing an Attached SMM-U1 Ultrasonic Microphone

1. Install the clear calibrator microphone adapter by sliding it onto the calibrator from the bottom (the end with the Wildlife Acoustics logo) until it is touching the toggle switches.
2. Set the toggle switch to **CAL**.


3. Place the microphone in the calibrator microphone adapter. Make sure that the side with the smaller hole diameter is near the toggle switches.

Insert the microphone until it rests against the smaller opening of the adapter hole.





4. While looking at the dBv level shown on the SMZC screen, slowly rotate the microphone 360 degrees. Note the largest (least negative) number.
5. If the value is higher (less negative) than **-38 dB** your microphone is within specification and ready to use. If the value is lower (more negative) than your microphone has lost some or all of its sensitivity and should be replaced.
6. Press the ◄ **Left** button when finished to leave calibrate mode.

### 8.3.4 Testing the System Using Chirp Mode

To test the system, the Ultrasonic Calibrator can emit loud ultrasonic signals to the recorder while it is recording from some distance. Analyze these recordings to verify that the recorder settings are appropriate and the system is functioning as expected.

1. Remove the microphone adapter from the calibrator.


2. Set the toggle switch to **CHIRP**.
3. The unit will emit a 100ms 40khz (+/- 10Hz) tone every 500ms. The amplitude of the tone is 104dB SPL (+/- 3dB) at 10cm. The signal can be picked up by the SMZC at distances up to 20 meters. Begin recording and view recordings or monitor with headphones to verify that the signal is being picked up.

**WARNING**: Do not place the Ultrasonic Calibrator near your ears! In **CHIRP** mode, the calibrator emits a 40 kHz signal at over 100 dB SPL. Prolonged exposure to high intensity ultrasonic signals may cause permanent hearing loss at audible frequencies.

## 8.4 How to Erase and Format a Memory Card

This procedure erases and formats the installed memory card. Use this procedure prior to all deployments for optimal performance.

**WARNING**: This procedure erases all data files on the memory card. Verify that you have imported, saved, or copied any important programs and backed up any important recordings stored on the memory card before running this utility.

1. Open the hinged front lid and insert a memory card. Verify batteries are installed and the power switch is **ON** (down).
2. At the **Main Menu**, select **Utilities**, and press **ENTER/MENU**.
3. Select **Format Memory Card** and press **ENTER/MENU**.
4. At the **Confirm: Format now?** prompt, choose one of the options:
   - Press ► **Right** to select **No** and cancel this entire procedure. Any existing data files remain on the memory card.
   - Press ▼ **Down** to select **Yes** and press **ENTER/MENU** to format the memory card.

5. If you select **Yes**, the progress appears and then the screen resets to the last selected submenu.
6. With a clean and formatted memory card, you now have the maximum available space on the card and are ready to start a program and save recordings.

## 8.5 How to Update the Firmware

When a new firmware update is available, download and install it to update your recorder.

1. Navigate to http://www.wildlifeacoustics.com/support/download-software.
2. Click **Support** and then click **Downloads**.
3. Complete the online form and click **Request Downloads**.
4. Select the latest Song Meter SMZC firmware update file to download it.
5. (Optional) You can also access the following downloads:
   - Song Meter SMZC Configurator software
   - Kaleidoscope software for sound file conversions
6. Save or copy the firmware file to the top level of a memory card and insert into the recorder.
7. At the **Main Menu**, press ▲ **Up** or ▼**Down** to select **Utilities** and then press **ENTER/MENU**.
8. Press ▲ **Up** or ▼**Down** to select **Update Firmware** and then press **ENTER/MENU**. The recorder scans the memory card for .smzc files.

**TIP**: You can also press and hold ▲ **Up** while powering the unit **ON** to activate the firmware update menu.

9. At the **Select upgrade file** prompt, select the firmware update file that you want to apply and press **ENTER/MENU**. The following message appears:

```
Upgrading.........
UPGRADE COMPLETE!

Rebooting
```

The system applies the new firmware and restarts.

**NOTE:** There is no way to exit the Update Firmware screen other than updating with a file or powering the SMZC off and back on again (leaving it off for five seconds).

# 9 Specifications

## 9.1 Physical

| | |
|---|---|
| **Length/Height:** | 11.5 inches (290 mm) |
| **Width:** | 5.0 inches (125 mm) |
| **Depth:** | 2.8 inches (71 mm) |
| **Weight:** | 2.2 pounds (1.0 kg) |
| **Weight with 4 Batteries:** | 2.8 pounds (1.3 kg) |
| **Operating Temperature:** | -4°F to 122°F (-20°C to 50°C) |
| **Enclosure:** | Fully weatherproof. A pressure vent and a self-regenerating humidity control prevent condensation. |

## 9.2 Power

**Battery Specifications**: The recorder uses four (4) standard C size disposable alkaline batteries or rechargeable NiMH batteries. Battery life can vary widely depending on the battery type, brand, charger, temperature, and other factors. The following battery longevity is typical and assumes 10-hour nights:

- Alkaline batteries (8,000 milliamp hours at 1.5V each): 40 nights
- NiMH batteries (5,000 milliamp hours at 1.2V each): 25 nights

**Power Consumption**: 0.5 mW sleeping and 100 mW recording

**Clock Backup Battery Type**: CR2032 (approximately 3-year life)

**Internal Clock Accuracy**: Temperature-Compensated Crystal with 3.5ppm drift from -40°C to 0°C and 2.0ppm from 0°C to 40°C

## 9.3 Memory Card

**Memory**: Up to 32 gigabytes (SDHC) or up to 256 gigabytes (SDXC). This is the maximum currently available; higher capacities may be available in the future.

**Formats**: FAT32 for SDHC or exFAT for SDXC

## 9.4 Ultrasonic Audio

**Channels**: 1

**Recording format**: zero crossing

**Amplifier Gain**: 60 dB

**Anti-alias filter:** 2-pole at 156 kHz

**Maximum Recordable Frequency:** 125 kHz

## 9.5 Microphones

### 9.5.1 Built-In

**Element**: Knowles FG

**Built in high pass filter:** 4-pole at 8 kHz

**Frequency response:** As SMM-U1 shown below.

**Directionality:** As SMM-U1 shown below but attenuated from behind the enclosure.

### 9.5.2 SMM-U1 Ultrasonic

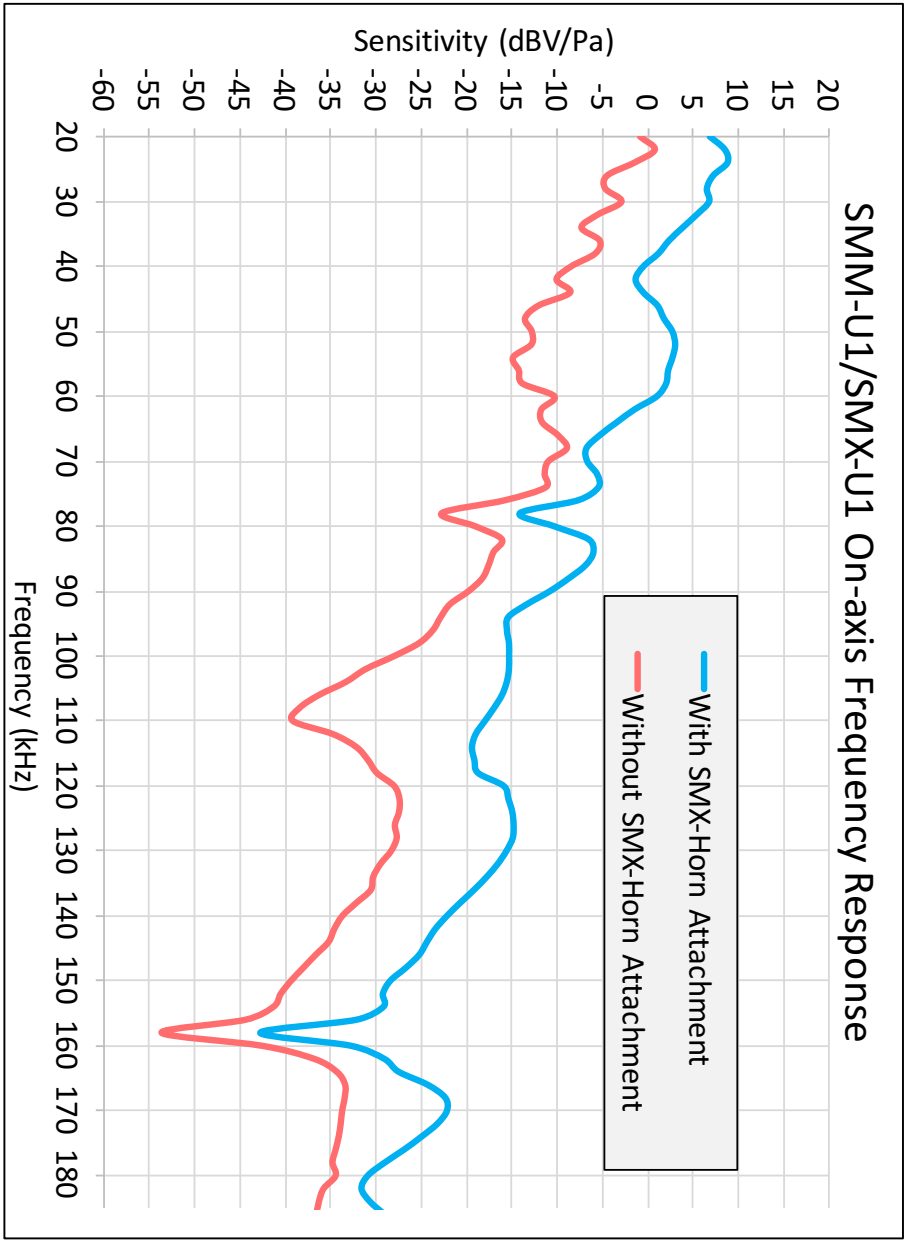
**Enclosure**: Weatherproof stainless steel

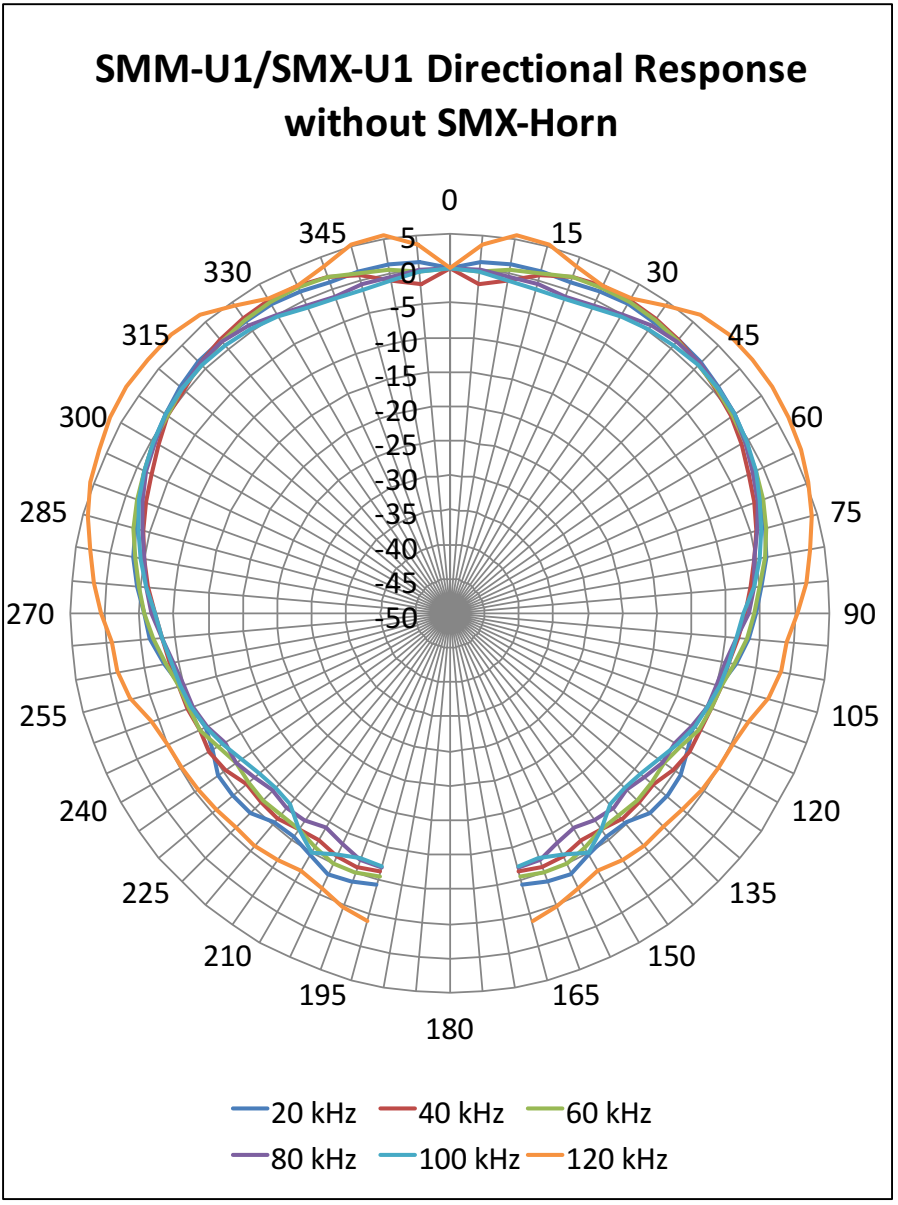
**Directionality**: Omnidirectional

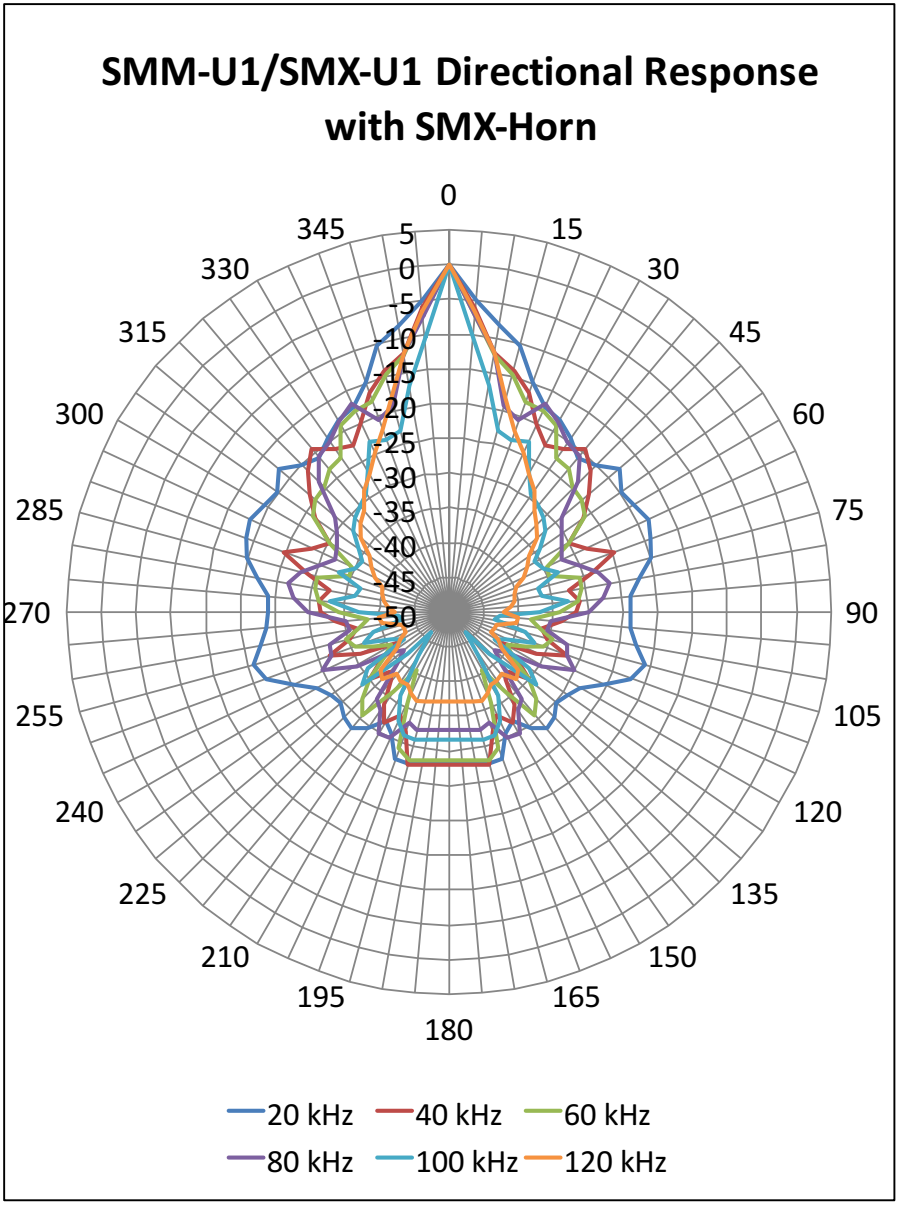
**Element**: Knowles FG

**Output:** Differential

**Built in high pass filter:** 4-pole at 8 kHz


SMM-U1/SMX-U1 On-axis Frequency Response
Sensitivity (dBV/Pa)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
Frequency (kHz)
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
With SMX-Horn Attachment
Without SMX-Horn Attachment


SMM-U1/SMX-U1 Directional Response without SMX-Horn
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
225
240
255
270
285
300
315
330
345
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
20 kHz
40 kHz
60 kHz
80 kHz
100 kHz
120 kHz


SMM-U1/SMX-U1 Directional Response with SMX-Horn
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
225
240
255
270
285
300
315
330
345
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
20 kHz
40 kHz
60 kHz
80 kHz
100 kHz
120 kHz

# 10 Firmware Release Notes

**1.0.1** (Initial release)

**1.0.3** (March, 2015)

- Fixes a freeze that could occur when exiting the Check Status screen with a program running.
- Fixes the log file buffer size for correct diagnostic dumps.

**1.0.6** (June, 2015)

- Improved the interpretation of programs containing non-infinite loops.
- Further improvements to compatibility with certain SD cards.
- Reduced gain on headphone output and reduced time-out period to save power. Output will now automatically turn off at the end of a recording period or after 5 minutes, whichever comes first.
- Lengthened the check status display timeout to 10 seconds.
- Fixed redundant summary file entries.

# 11 Warranty and Disclosures

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

## 11.1 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 following table for the applicable warranty period from the original date of purchase.

**Hardware Limited Warranty**

| Product | Components | Hardware Warranty Period |
|---|---|---|
| Song Meter SMZC Recorder | All components including microphone and accessories | 1 Year |

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 program 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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**Disclaimer**: Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages so the above limitations and exclusions may be limited in their application to you. When implied 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, U.S.A., 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.

Wildlife Acoustics, Inc.
3 Clock Tower Place, Suite 210
Maynard, MA 01754-2549 United States of America
www.wildlifeacoustics.com

August 14, 2014

## 11.2 Declaration of Conformity (EN 45014)

Manufacturer: Wildlife Acoustics, Inc.
3 Clock Tower Place, Suite 210
Maynard, MA 01754
United States of America

Declares that the following product:

Product Name: Song Meter
Product Model Number: Song Meter SMZC
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 B

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

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

ICES-003, 2004, Industry Canada, Interference-Causing Equipment Standard, Digital Apparatus, Class B

EN61326, 2006 Electrical Equipment for Measurement, Control and Laboratory use EMC Requirements (EMC Directive 2004/108/EC)

EN61000-4-2 Electrostatic Discharge

EN61000-4-3 Radiated Electromagnetic Fields

This product was tested in a typical configuration.

Ian Agranat, President
Wildlife Acoustics, Inc.
August 14, 2014

## 11.3 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.

# Song Meter SMZC

BIOACOUSTICS RECORDER

## User Guide

**Wildlife Acoustics, Inc.**
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