



Soil Acoustic Meter (SAM) – User Guide

Copyright of Soil Acoustics Limited





Table of Contents

1	Introduction.....	3
1.1	Testing protocols.....	3
2	Device Overview	4
2.1	Key Features	5
3	Getting Started	5
3.1	In the Box.....	5
3.2	Setup Steps.....	5
3.3	Recording Tips.....	6
4.	How to Use the SAM.....	6
5	Data Upload & Analysis.....	7
5.1	Getting started.....	7
5.2	Location & sample labelling	7
5.3	Analysis.....	9
5.4	Comparing recordings.....	10
6	Maintenance & Battery Replacement.....	10
7	Troubleshooting	11
8	Safety and Care.....	11
9	Technical Specifications.....	11
10	Support & Contact Information	12



1 Introduction

Welcome to your **Soil Acoustic Meter (SAM)**, developed by Soil Acoustics Limited.

The Soil Acoustic Meter (SAM) records the sounds made by invertebrates and small mammals beneath the soil. By measuring the amount and diversity of the sounds made by worms, beetles, ants and other invertebrates, you can measure and track the level of biological activity within the soil.

The SAM is easy to use. It is a hand-held data recorder with a wave guide that is pushed into the soil allowing recordings to be taken quickly (3 minutes per sample site). When you have finished the sampling session, simply plug the unit into a computer (using the USB-C to USB-A cable provided) log into our Data Portal and then upload the recordings. The report will be available almost immediately, quickly giving insights into the biological activity in your soil. All data will be available to listen to and used for future comparisons, reporting and downloading, for as long as your user account is active.

1.1 Testing protocols

1. It is recommended to take a minimum of ten samples per setting/field, using a W-sampling pattern, in line with AHDB Soil Health Scorecard methodology.
2. Where there are large variations in habitat or ground conditions in one setting, more dense sampling may be useful.
3. Alternatively, design your own sampling protocol and monitoring regime, based on what you want to learn about your soil.



Figure 2:
Recommended sampling
protocol



2 Device Overview

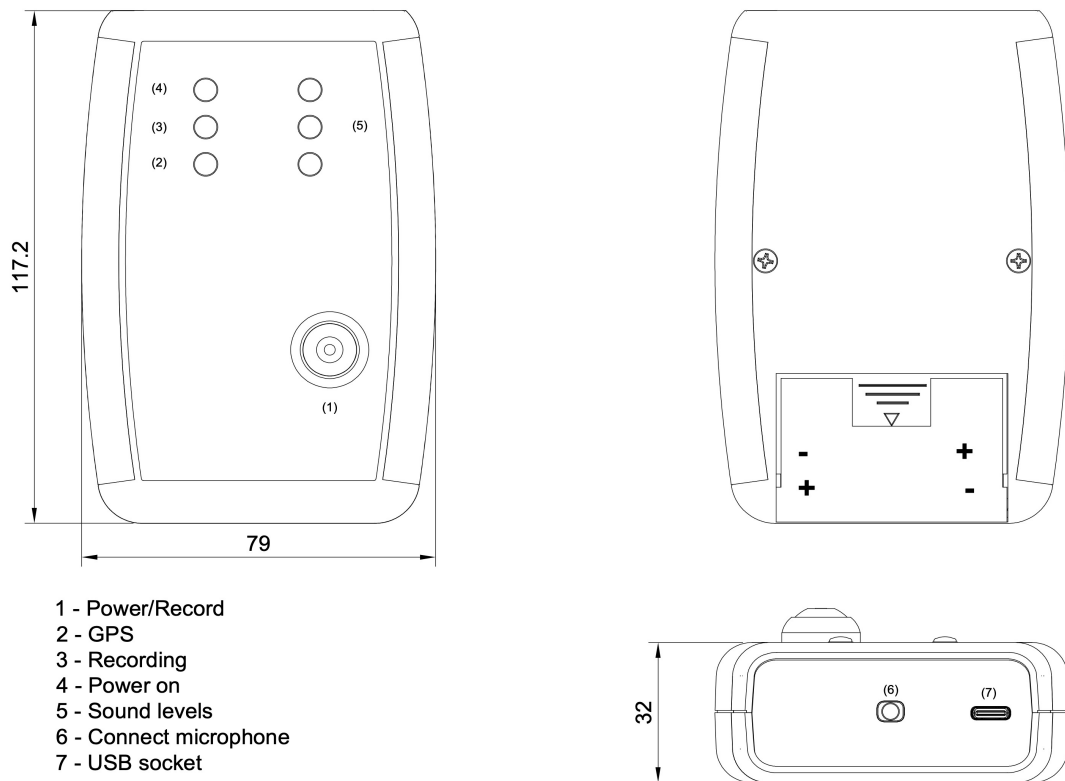


Figure 1: Soil Acoustics Meter (SAM) technical drawing



Figure 3: Replaceable probe



2.1 Key Features

- **Main SAM Unit:** Robust housing for all the electronic, control components and batteries.
- **Probe:** A replaceable item, (Fig 3) containing a high-sensitivity contact-microphone, which is inserted into the soil and is connected to the SAM using port (6)
- **Multi-function Control Button:**
 - Press for 1 second and release to turn the unit on
 - Press again for 3 seconds and release to start a recording
 - Press and hold for 5 seconds and release to turn off. Note that the unit will switch off automatically, if the button is not pressed for 5-minutes.
- **USB Port:** Port (7) requires a USB-C to USB-A cable (supplied) to connect the SAM to your computer, which will then enable you to upload your recordings to the Data Portal (portal.soilacoustics.com).
- **Indicator lights:**
 - **Power** (1) constant red when power is on. Flashing red when batteries need replacing.
 - **GPS** (2) flashes red while searching for a fix. Continuous red when GPS lock is achieved.
 - **Recording** (3) flashes red when preparing to record. Continuous red while making a recording.
 - **Sound levels** (4) Continuous red on lower light when recording shows whether a signal is being received. Higher levels indicate louder signals.

3 Getting Started

3.1 In the Box

- Soil Acoustic Meter (SAM)
- Replaceable probe
- USB-C to USB-A data cable
- Quick start guide with QR code for WhatsApp support chat

3.2 Setup Steps

1. Insert standard 2xAA batteries into the battery compartment with opposing polarities. Be sure to place the ribbon under the batteries to make removal easier.
2. Plug in the probe to the 3.5 mm round jack socket (No. 6 on Figure 1).



3.3 Recording Tips

- Remember to stand a minimum of 2m away when recording
- Stand still & quiet during the recording and do not move your feet to prevent noise pollution impacting the score
- Do not collect recordings in the rain or when overnight temperatures fall below 10 degrees Celsius
- Sampling is best done when wind speeds are <10mph / 16kph
- Do not sample close to roads, under power-lines or machinery that is idling.
- Do not have the probe or contact-microphone (the orange bit) in contact with any vegetation
- Avoid laying the probe cable over vegetation wherever possible

4. How to Use the SAM

1. Plan your sample sites across the field you wish to test using a W path as shown in Figure 2 above.
2. **Select a location** where you want to test the soil.
3. **Press the control button once** to power on the device. The GPS LED will blink whilst searching for a fix – and then show continuously red when a GPS lock has been acquired.
4. **Insert the probe gently** into the soil, to a depth of 10-12 cm. Do not force the probe into the soil; if you hit a stone remove the probe and try again.
5. **Place the unit on the ground and press and hold the control button for 3 seconds** to start a recording. A short tone will be heard to indicate that the unit is preparing to record and the Recording LED will flash. The LED will turn solid red once it is ready to start recording.
6. **Move a minimum of 2 metres back from the probe site to avoid noise interference.** Another tone will sound to indicate the start of the recording. Note there is a short delay between pressing the record button and the recording starting.
7. The device will **record for 3 minutes**, stopping automatically, as indicated by the third tone and the record light (3) turning off.
8. **Remove the probe from the soil** and move to another location, repeating steps 1-6 at least ten times in each field/setting.
9. When you have finished taking your recordings, login to the data portal **portal.soilacoustics.com** and upload the files for analysis. (see section 5 below).



5 Data Upload & Analysis

This section describes the steps to upload your data to the Data Portal for processing.

Connect the SAM to your computer using the data cable supplied. Your SAM will appear as an external hard-drive. If your organisation places restrictions on the use of external drives you may need to gain permission from your IT support team to connect your SAM unit to your computer.

Data processing is done using the Data Portal (portal.soilacoustics.com). The portal allows you to select the data you wish to upload, once uploaded the data is processed and information about the recordings you have taken will appear on your portal. Note that each recording is c.18 MB in size, so this may take a few minutes, depending on your PC and the speed of your internet connection.

5.1 Logging in

- Each device is paired with a user account for the online Data Analysis Portal
- Once you have confirmed your user account details with us, you will receive a welcome email from noreply@soilacoustics.com inviting you to login.
- Open the email on your PC (*not a smartphone*) to trigger the access key
- Click “GO TO SOIL ACOUSTICS” to access the portal
- If desired, you can change your password by clicking on the link when you login
- You are now ready to begin uploading your soil sound recordings!

5.2 Location & sample labelling

There are two ways in which your recordings should be named:

- Location name – to be set by you, e.g. the name of the farm, the parcel number of a specific field/plot/setting or postcode
- A Batch Name – which you use to describe what, or why you were testing a batch in that location on that date. E.g. “August readings” or “Post-herbicide”

All the recordings are automatically GPS-tagged, date & time stamped (yyyymmdd_hhmmss). For re-sampling on another occasion, check locations on the portal.

(year/month/day_hour/month/second)



You will then typically need to apply two levels of classifier label to each Batch, to confirm the setting in which they were recorded:

1. Land Use; and
2. Land Cover

Each sample appears as a GPS located dot on a zoomable map (with aerial photograph view option as well as a block map). Before uploading (whilst the dots are showing blue) you can move the dots if they are not showing the correct sampling location and then select the correct uploads to be grouped into a batch(es) from the same land-use and cover type.

Selecting Recording for a Batch:

Upload a batch of recordings

Batch name: June-2025 Recordings

Recordings List: Choose files for upload by selecting them in the list or on the map

☐	Filename	Date	Time	
☐	0001_20250528_181149.WAV	28/05/2025	18:13	🔍
☐	0001_20250528_181938.WAV	28/05/2025	18:22	🔍
☐	0001_20250528_184235.WAV	28/05/2025	18:42	🔍
☐	0005_20250528_181048.WAV	28/05/2025	18:10	🔍
☐	0005_20250528_181936.WAV	28/05/2025	18:22	🔍
☐	0005_20250528_184222.WAV	28/05/2025	18:42	🔍

Recordings locations: Click to select. Hold shift and drag to select multiple.

CHANGE DEVICE LOCATION ADD FILES ☐ Delete recordings from device after upload NEXT



Land Use Options:

The screenshot shows a web interface titled "Data Portal" with a "SUPPORT" link. A modal window titled "Upload a batch of recordings" is open, displaying a "9 RECORDINGS SELECTED" status. Inside the modal, there is a section titled "Select a land use type" with a grid of 12 buttons. The buttons are arranged in four rows and three columns. The first row contains: "Pasture - standard", "Pasture - regen", "Pasture - organic", and "Permanent crops - organic". The second row contains: "Arable crops - standard", "Arable crops - regen", "Arable crops - organic", and "Forestry". The third row contains: "Nature conservation", "Garden/allotment", "Other", and "Permanent crops - regen". The fourth row contains: "Permanent crops - standard", "Amenity/leisure", and "Commercial". Below the grid, there are two small circles, the first of which is filled. At the bottom of the modal, there are two buttons: "BACK TO RECORDINGS" on the left and "ADD TO UPLOAD" on the right.

Land Cover Options:

The screenshot shows the same "Data Portal" interface with the "Upload a batch of recordings" modal open. The "9 RECORDINGS SELECTED" status is still present. The modal now displays a section titled "Select a land cover" with a grid of 12 buttons arranged in four rows and three columns. The first row contains: "Woodland/scrub - deciduous", "Woodland/scrub - mixed", "Woodland - coniferous", and "Arable". The second row contains: "Vineyard", "Orchard", "Grassland - improved", and "Grassland - neutral". The third row contains: "Grassland - calcareous", "Grassland - acid", "Heath", and "Wetland - fen/bog". The fourth row contains: "Saltmarsh", "Dunes", "Urban/suburban", and "Bare ground". Below the grid, there are two small circles, the second of which is filled. At the bottom of the modal, there are two buttons: "BACK TO RECORDINGS" on the left and "ADD TO UPLOAD" on the right.

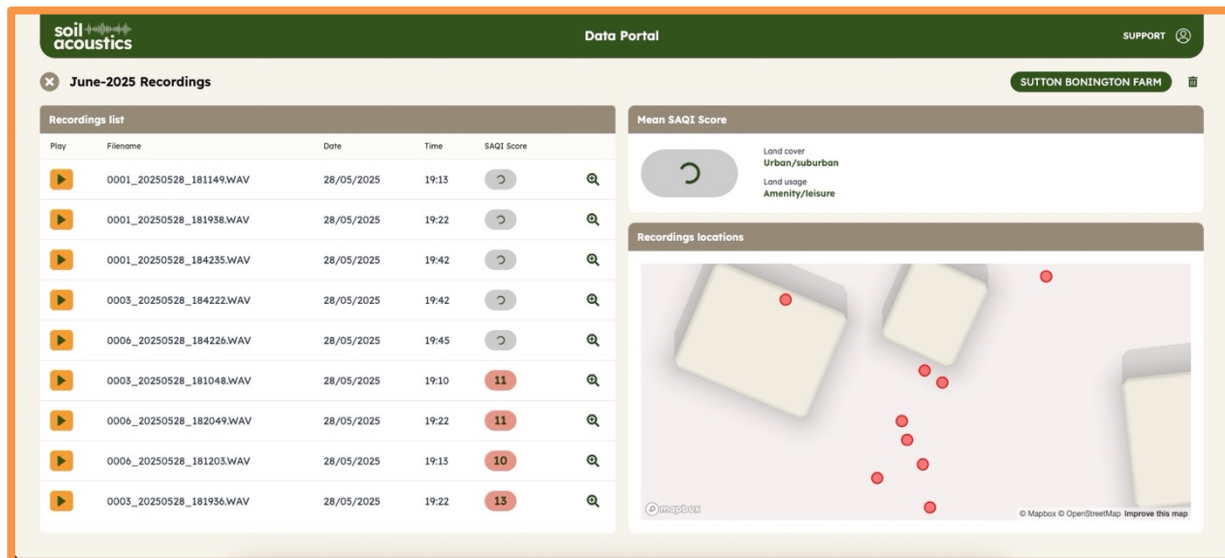
5.3 Analysis

Once all of the batches you wish to analyse have been created and classified, click on **upload all** and the files will be transferred from the device to the portal over the internet. The upload process may take a few minutes, depending on your PC and internet speed, so **do not close the browser window** during this time – waiting for the progress bar to complete.

Your soil sound files are then automatically analysed and a Soil Acoustic Quality Index (SAQI) score is generated for each individual recording – and also an average score for each batch.



Data being processed (half-completed & half in process)



5.4 Comparing recordings

To compare batches from the full analysed list simply select the batches you want to compare and click 'compare selected'. A report will be generated that you can download as a PDF file. Comparisons can be made multiple times and each report downloaded as often as required.

6 Maintenance & Battery Replacement

- Ensure two AA LR6 1.5v alkaline batteries are installed correctly (with opposing polarity). The flat end of the battery goes against the flat metal plate.
- Please replace the AA batteries as needed – i.e. when the SAM Unit will no longer turn on or if all the lights or the power light flashes continuously.
- Do not insert anything into the battery compartment apart from compatible batteries as this may cause overheating which could damage the unit.
- If dirty, wipe the device with a **dry or slightly damp cloth**
- Do **not** submerge the device in water
- Store in a **dry, cool location**, away from direct sunlight
- Remove batteries when unit is not in use (or stored for more than 8 weeks).



7 Troubleshooting

Problem	Solution
Device won't turn on	Replace batteries
GPS light flashes continuously	Restart the device. (GPS location can be edited at upload if necessary).
No sound recorded	Check the probe is properly inserted into port (6)
No GPS Lock	Re-test in a different location, with a clear view of the sky
Power light flashes continuously	Replace batteries
Yellow (flashing) and/or red indicator lights solid on when unit plugged into PC	Remove all recordings from the device to free up space on SD card
Power and recording lights flash alternately	Treat as separate issues and proceed as above

8 Safety and Care

- Do **not** force the probe into hard or stoney soil as this might break the contact-microphone (the orange disk) or snap the probe
- Keep the device dry
- Avoid exposing the device to **temperatures below 5 degrees Celsius and above 30 degrees Celsius and rain**
- Do not disassemble the device – this will void your warranty

9 Technical Specifications

Feature	Specification
Power	x2 AA batteries
Recording length	3 minutes per sample (after a 15-s delay at the start)
Data Storage	MicroSD card
Length	117.2 mm
Width	79 mm
Height	32 mm



10 Support & Contact Information

Users will be invited to join a WhatsApp community for sharing ideas and asking questions. This can be accessed via a QR code on the Quick Start Guide in the box.

For any other help or more information, please contact:

- **Email:** support@soilacoustics.com
- **Website:** www.soilacoustics.com
- **Registered address:** Cromford Station, Cromford, Matlock, DE4 5JJ

END