

1. Overview



Figure 1: Soundskrit Earbuds Demo Kit (Cicada)

The Soundskrit Earbuds Demo Kit (Cicada) is a tool to evaluate an earbud design with a Soundskrit directional microphone integrated. It demonstrates user voice capture and noise rejection performance under a range of algorithms, with a particular focus on robustness against interfering speech. The kit includes the Soundskrit Cicada earbud, which is a PCB with one SKR0710 dipole microphone and one omnidirectional microphone mounted on the stem PCB board, integrating with a shell shaped like a real earbud. In Cicada, a 4 pin to 8 pin Molex cable links the microphone PCB to the Soundskrit PARDI board, which is a convenient interface to connect MEMS microphones over USB. The PARDI board provides the two raw audio channels to the Soundskrit Demo Kit Interface for processing.

There are several audio processing algorithms for the Cicada kit. These algorithms include Omni, Dipole and Nonlinear, as well as AI-based denoising models, all of which can be configured and evaluated using the Soundskrit Demo Kit Interface software. Through this, Cicada can demonstrate how a dipole and omni microphone pair, combined with beamforming and AI denoising, can be used to enhance the wearer's voice and reject background noise and interfering speech in different environments.

What's In the Box	
Cicada Earbud	A right-side earbud with a SKR0710 and one omnidirectional microphone integrated into the stem
Soundskrit PARDI audio interface	Multichannel audio interface to connect microphones over USB
Molex cable	Cable preconnected, linking the Cicada with the PARDI board
USB-A to USB-C Cable	A cable to connect the PARDI board to your PC.
Ear Tip	A spare soft ear tip, in addition to the one fitted on the Cicada, for a comfortable fit in the ear canal

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2. Hardware Introduction

2.1 Cicada Earbud

Cicada is built around a PCB with one dipole microphone (SKR0710) and one omnidirectional microphone. Both microphones are integrated into the stem-like PCB on a shell that reproduces the size of a real earbud. A soft ear tip is fitted so that the kit can be worn comfortably in the ear canal during evaluation. See the [SKR0710](#) product page on Soundskrit website for detailed specifications.

The Cicada placement and microphone configuration are shown as below:



Figure 2: Cicada Microphone Locations and Directions

2.2 PARDI Board Interface

The PARDI audio interface has a USB-C connector to connect it to a PC and a Molex connector to connect the Cicada earbud. The cable comes pre-connected and only needs to be reattached if it becomes disconnected.

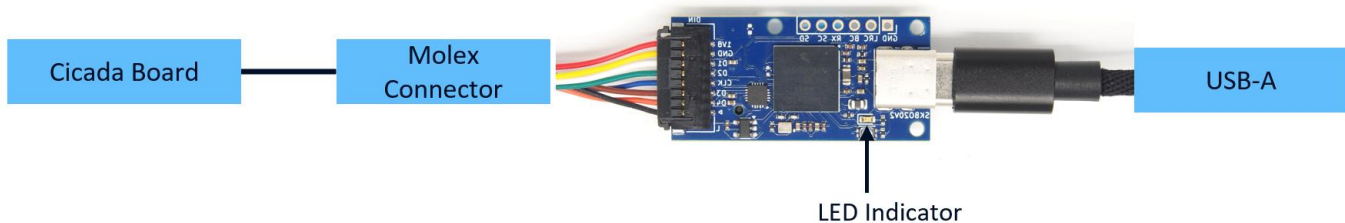


Figure 3: Cicada PARDI Board Interface

3. Software Introduction

The Soundskrit Demo Kit Interface is a platform used for evaluating performance of the Cicada demo kit. It enables users to quickly test the different algorithms provided by Soundskrit.



Figure 4: Soundskrit Demo Kit Interface

The software allows users to capture a recording via Live Recording mode and process the raw signals through various algorithms. This mode lets users compare algorithm performance side by side through playback.

The Demo Kit Interface also provides relevant computational metrics across all algorithms, including CPU usage and RAM usage for various processor cores to help customers understand the algorithm requirements in embedded implementation.

For more detailed introduction of Soundskrit Demo Kit Interface, please refer to [Downloads](#) → **Soundskrit Demo Kit Interface User Manual**.

4. Cicada Algorithm Introduction

To help customers understand the performance differences between algorithms and identify the most suitable solution for processing audio signals in their earbuds projects, Soundskrit provides three algorithms that run on the dipole and omni microphone pair in the Cicada. These algorithms are optimized for isolating the wearer's voice pickup and suppressing background noise.

Note: All three algorithms operate on the same dipole and omni microphone pair integrated in the earbud stem, so their performance can be compared directly on the same recording. The Cicada

focuses on user voice capture and noise rejection, and in particular on robustness against interfering speech. Below is a detailed overview of these algorithms.

4.1. Algorithms

Soundskrit provides three algorithms for users to compare performance in terms of voice capture and noise suppression and further understand how a dipole and omni microphone pair beamforming could be used to enhance user voice isolation and noise rejection. The table below shows the algorithms that can be evaluated with the Cicada.

Algorithms	Algorithm Descriptions*
Omni	Outputs the equalized omnidirectional microphone signal, used as a reference for performance comparison.
Dipole	Outputs the equalized dipole microphone signal, showcasing the pure hardware directionality.
Nonlinear	An enhanced beamformer, providing stronger background noise suppression.

** Please refer to the computational requirement shown in the GUI*

4.2. AI Denoising

The GUI comes equipped with AI denoising models that are divided into three categories: Small, Medium, and Large. These models can be cascaded on top of a chosen algorithm. The table below shows the detailed description for each AI model.

AI Denoiser Description*	
Small	Small AI model for noticeable background noise suppression, with some distortion and artifacts.
Medium	Medium AI model for enhanced background noise suppression, with less distortion and artifacts
Large	Large AI model for premium background noise suppression, with minimal distortion and artifacts

** Please refer to the computational requirement shown in the GUI.*

5. Setup Guide

5.1 Installation

Download and launch the Soundskrit Demo Kit Interface installer file from [Downloads](#) on Soundskrit's website and follow the installation steps. A prompt may appear requiring approval for an unknown publisher.

Connect the Cicada to your PC using the included USB-A to USB-C cable.

To start the software, search from the Windows start menu for 'Soundskrit Demo Kit Interface' or use the desktop shortcut generated by the installer.

Make sure the Cicada is correctly connected to the PC and that the PARDI board is in **raw mode**. If the PARDI board is not in raw mode, a window will appear, prompting you to change the PARDI board to raw mode.

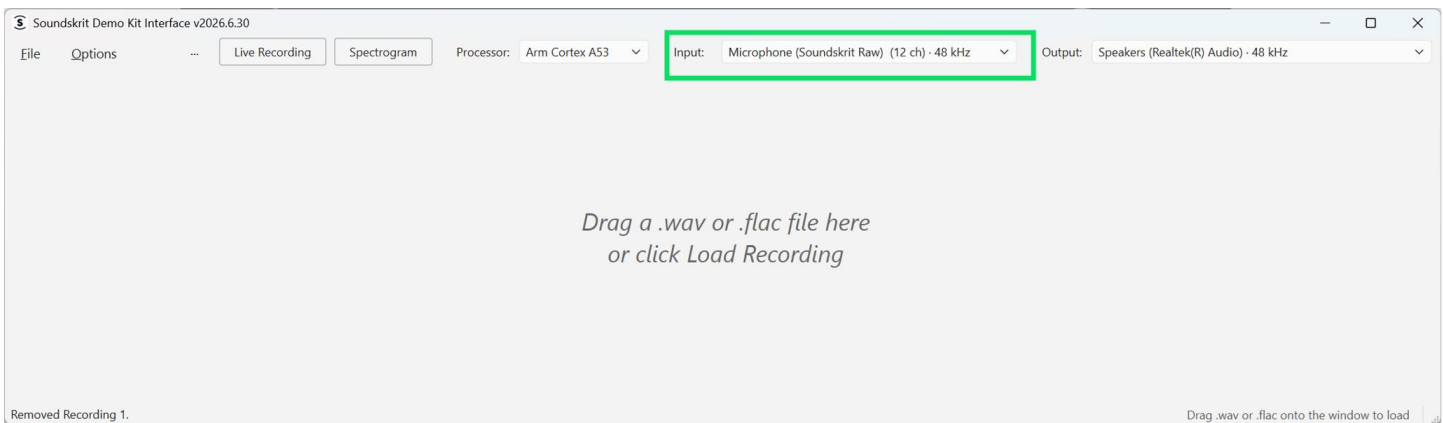


Figure 5: Raw Mode Detected

5.2 Audio Performance Evaluation

5.2.1 Option 1: Load built-in audio samples

Users can find pre-recorded audio samples and load them in the Soundskrit Demo Kit Interface for quick performance comparison without the Cicada kit connected. To find the audio samples, click **File** in the top-left corner, and choose **Samples**. In the new window displayed, you can choose the samples from the **Section** drop-down menu.

3QUEST samples assess speech quality and noise suppression in typical noise. In a 3QUEST test, a talker speaks a set of standard sentences while realistic background noise is played around the device. The standard version of 3QUEST is provided with signal-to-noise ratios for speech level to background noise: 26dB SNR. The SNR is computed at the HATS mouth reference point (25mm in front of the mouth).

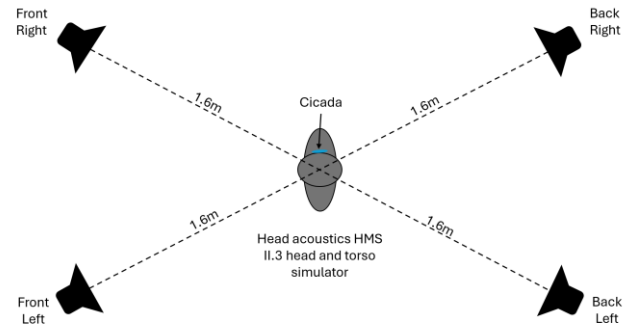


Figure 6: 3Quest Testing Setup

5.2.2 Option 2: Load an External .wav File

Users can load external .wav file for audio processing. The .wav file must be a raw signal recording captured from the Cicada demo kit.

Please note, if the external audio file is not recorded by Cicada demo kit, the audio file will only be marked as '**External**', and no demo kit can be chosen for it. Under this circumstance, external audio file could be set as benchmark reference to compare the audio performance between Soundskrit Cicada Kit and other audio solutions.

5.2.3 Option 3: Record Live with the Cicada

Use Live Recording (see image below) to capture audio with the Cicada and listen to the performance in playback after processing.

1. Click **Live Recording** to open the recording window. Set the **Demo Kit** as "Earbuds Demo Kit (Cicada)". By default, three tracks corresponding to the Omni, Dipole and Nonlinear modes are configured to compare performance across the algorithms in parallel.
2. Click **Record** to start and **Stop** to end. The audio is distributed across the tracks with preset algorithms applied. All audio tracks are normalized to facilitate easy comparisons. Recording again replaces the previous take. You can also add additional tracks by **Add Track** to compare multiple algorithms (with AI denoiser) in parallel.
3. In the **Mode** drop-down menu, select the algorithm that you want to evaluate.
4. To compare the performance with AI algorithm combined, set the AI options in **Settings** for corresponding track.
5. Click **Export Raw Audio** to keep both raw channels (re-loadable later for processing), or **Export .wav** to save a single processed track.

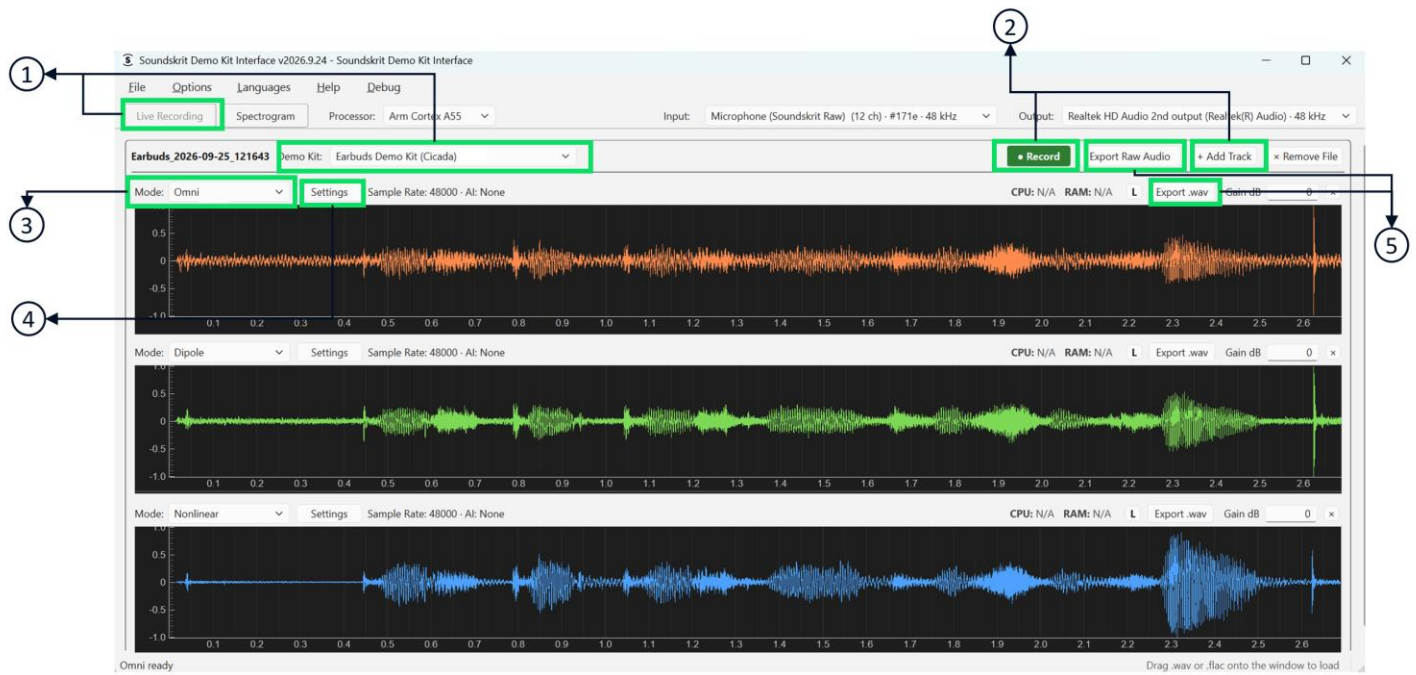


Figure 7: Operation Steps for Live Recording in the GUI

6. Troubleshooting

This section provides solutions to common issues encountered during installation and operation of the demo kit.

Problem	Possible Cause	Solution
Soundskrit Demo Kit Interface doesn't show Microphone (Soundskrit Raw) in the Input	Cicada is not correctly connected to PC	Verify the connection between PARDI board and Cicada, as well as between PARDI board and PC. A green LED indicator on PARDI board should be flashing if the connection is correct.
Earbuds Demo Kit (Cicada) doesn't appear in the drop-down menu	The software version is too old. Earbuds Demo Kit is available starting with version v2026.9.25 or later.	Go to Help and then click Check for Update for latest version.

7. Additional Support

For further information on Soundskrit's products, visit our website at <http://www.soundskrit.ca> where you can find more application notes, datasheets, and purchasing information. If you have any questions or need technical support, please reach out to applications@soundskrit.ca.

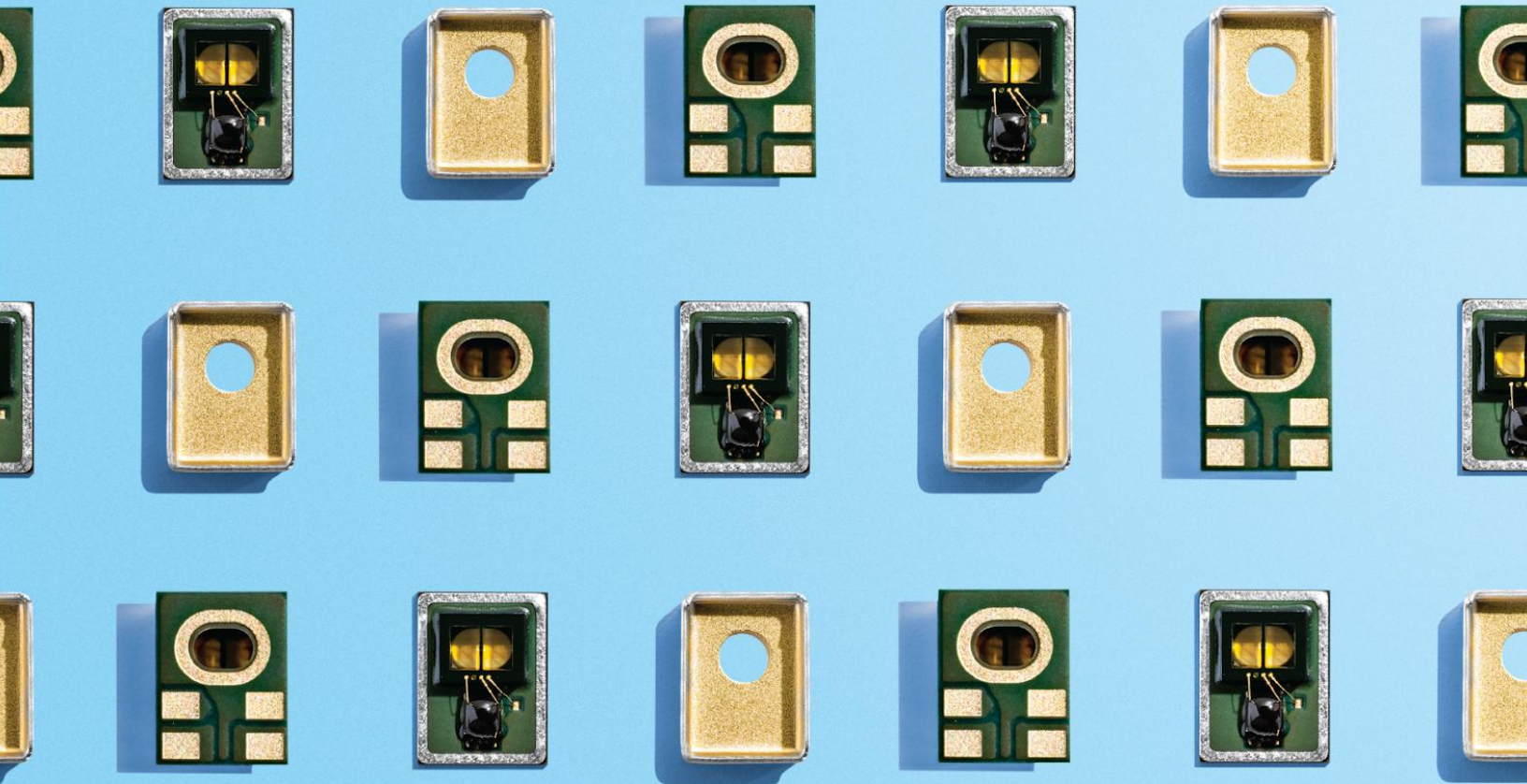
8. Revision History

Revision Label	Revision Date	Sections Revised
-	Sep 2026	Initial release



Soundskrit developed the first high-performance directional MEMS microphone on the market, leveraging years of research in bio-inspired MEMS based on how spiders and other insects in nature hear. In combination with Soundskrit's in-house audio processing algorithms, directional microphones can be used to capture and isolate any sound in an environment with a fraction of the size, power, and computation of traditional omnidirectional-based microphone arrays.

Soundskrit was founded in 2019 and is headquartered in Montreal, Quebec with an R&D facility in Ann Arbor, Michigan.



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