Tonal Noise (Receive Path) Sequence

Introduction

The purpose of this sequence is to measure single frequency interference (tonal noise) in the receive path of a communication device such as a headset or speakerphone. It is based on the Microsoft Teams Audio Test Specification, Section 6.13.

Narrow-band noise, including single frequency interference, is an impairment that can be perceived as a tone depending on its level relative to the overall noise level. This can be caused by electrical noise in soundcards, fan or hard disk drive noise on laptops or other sources. This test sequence makes sure that no tonal noise is present in the receive signal.

The sequence plays and records a test signal containing digital silence. A constant 30 Hz, Flat Top FFT with 4096 sample size is used to analyze the recorded waveform and calculate the tonal noise spectrum. A tolerance mask is then created by 1/1 octave smoothing the noise curve and applying +10 dB to the curve throughout its entire frequency range. If the unsmoothed tonal noise spectrum peak remains below the tolerance mask, the test is passed.

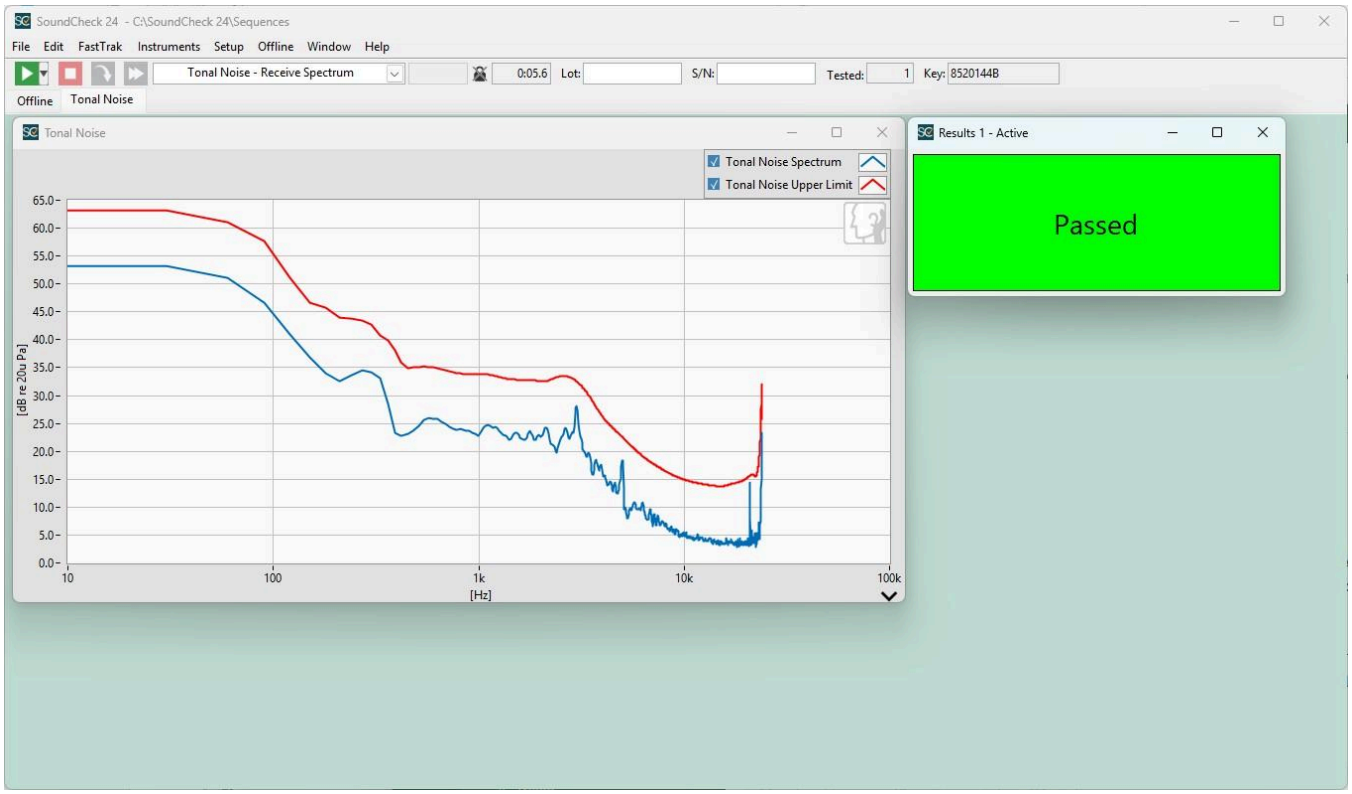


Figure 1 – Tonal Noise (Receive Path) Sequence final Display

Software Requirements

SoundCheck 24 Plus or newer

Hardware Requirements

Audio Interface – Listen AudioConnect 2 (p/n 4047) or similar

Reference microphone – Listen SCM-4 (p/n 4006T) or similar free-field microphone or HATS ear.

Hardware Setup & Calibration

Note: Reference Section 5 of the MS Teams Audio Test Specification, for detailed hardware set-up recommendations. A copy of the spec is available for download here.

1. Connect your hardware as shown in the following diagram.
2. Calibrate the microphone per instructions in the SoundCheck user manual

You are ready to start the sequence.

System diagram

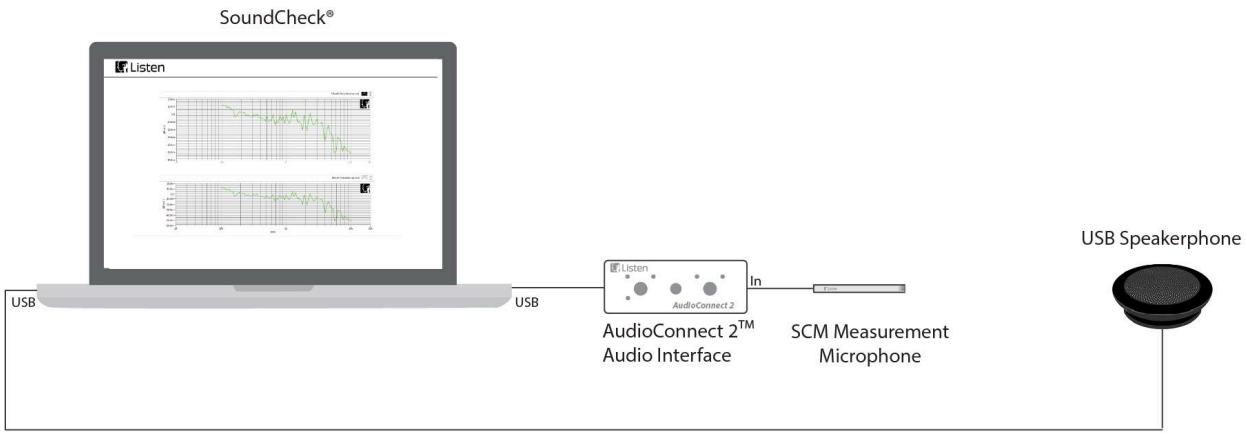


Figure 2 – Tonal Noise (Receive Path) Hardware Diagram

SoundCheck Setup (USB DUT)

If your DUT uses a USB connection, you will need to create a new output channel in the Hardware editor.

- Connect your USB DUT to the SoundCheck host computer
- Go to Setup > Hardware > Hardware Table
- Right click on the Output Channel table and select Add Channel. Name the channel when prompted.
- Select WDM/MME from the Driver dropdown list (Windows) or Core Audio (macOS)
- Select the USB DUT friendly name from the Device dropdown list
- Select Digital from the Type dropdown list

- Select the desired sample rate from the Default Sampling Rate dropdown list. The selected sample rate should reflect the sample rate shown in your operating system's audio hardware configuration settings. Typically, the highest available sample rate should be selected.
- Click the Save button to close the Hardware Table and go to Setup > Calibration > Calibration Table
- On the Signal Path named Receive (SC to DUT) select the Unity Digital Out (AES 17) file from the Calibrated Device dropdown list and select the Input Hardware Channel you just created from the HW Channel dropdown list.
- Click the Save button to close the Calibration Table.

SoundCheck Setup (Analog DUT)

If your DUT uses an analog connection, connect it directly to one of your hardware output channels and assign that channel to the Receive (SC to DUT) Signal Path in the Calibration Table. Insert a power amplifier in the signal path if needed.

Further sequence development

This sequence has been designed for simplicity and has been written for a stereo channel system, to be accessible to 100% of SoundCheck customers. Ways in which you could modify or further develop the sequence include:

- If your DUT has multiple receive paths (e.g. stereo headset), you can add them to the Acquisition step's input table, group the recorded time waveforms and batch analyze them.
- Modify the input signal path to test a Bluetooth communication device.