Listen

Transforming Sound into Knowledge

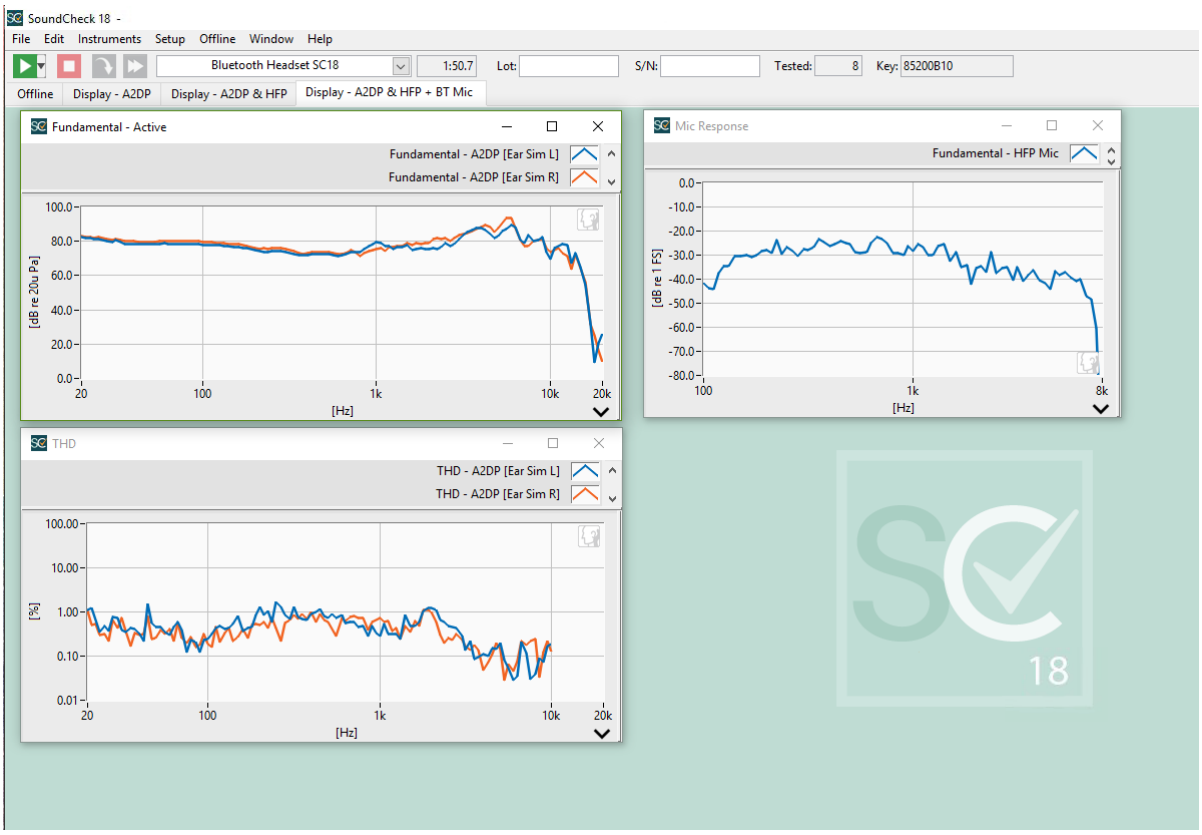
Sequence Note

Bluetooth Headset Sequence

Introduction

This sequence tests the send and receive performance of a stereo Bluetooth headset with a built-in microphone using a mixture of analog and digital channels. The left and right earphones are measured simultaneously with a stepped sweep from 20kHz to 20 Hz using two Bluetooth profiles: A2DP and HFP. The mic is measured with a stepped sweep from 8kHz to 100Hz using the HFP profile.

A short 1kHz tone is pre-pended to the test stimulus which serves as a reference tone for resampling and frequency shift operations. Post-processing resampling and frequency shift precisely synchronizes the stimulus and response waveforms prior to analysis. In this case, the HarmonicTrak algorithm is used for frequency and THD analysis. A2DP frequency response and THD curves are displayed on the first display, followed by A2DP & HFP curves superimposed on a subsequent display. Lastly, the Bluetooth headset's microphone is tested with HFP and its frequency response is shown on the final display along with the previously collected data.



Final Display for Bluetooth Headset Sequence

Hardware Requirements

- Head and Torso simulator – B&K 4128C HATS or similar
- Bluetooth transceiver – Portland Tool & Die BTC (part# 5814) or similar
- Audio Interface – Listen AudioConnect (part# 4050) or similar
- Microphone power supply – Listen SoundConnect 2 (part# 4025/4026) or similar
- Power amplifier – Listen SC Amp (part# 4060) or similar

Software Requirements

SoundCheck 18.0 or later

Hardware Setup & Calibration

SoundCheck's **Digital In 1** and **Digital Out 1** Signal Paths should be assigned a Unity Digital (AES17) sensitivity value (input sensitivity: 0.707 FS/FS, output sensitivity: 1.414 FS/FS) for device that conform to the AES17 Standard.

Receive Path

1. Connect ear output to an appropriate microphone power supply.
2. Connect the output of the amplifier to the input of the mouth simulator.
3. Connect the Output 1 of the audio interface to the amplifier.

Send Path

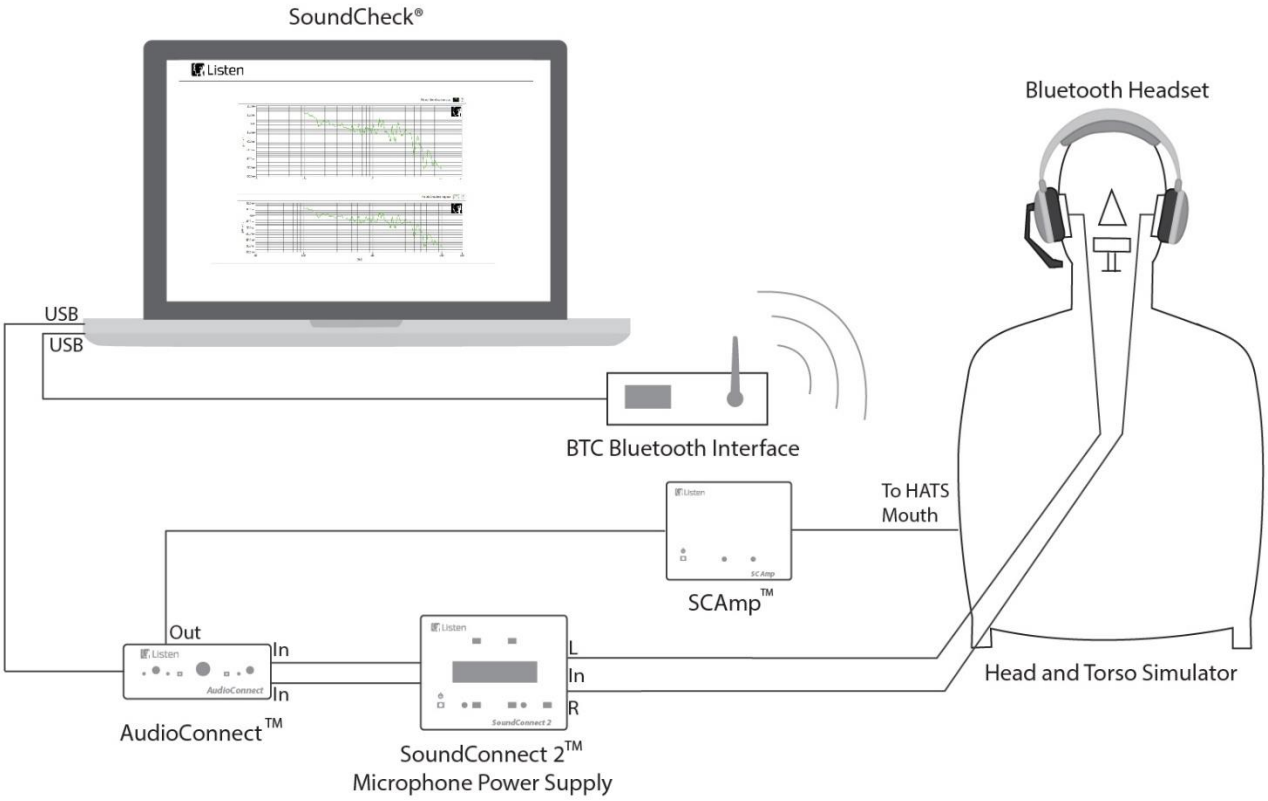
1. Calibrate the amplifier according to the instructions in the Soundcheck manual.
2. Connect the output of the amplifier to the input of the mouth simulator.
3. Connect Output 1 of the audio interface to the amplifier.

General

1. Connect and configure your Bluetooth transceiver (e.g. Portland Tool and Die BTC or BQC)
2. The Bluetooth device sampling rate is set to either 44.1 or 48kHz and the sampling rate of the PTD BTC/BQC matches that.

You are ready to start the sequence.

System Diagram



Sequence Logic

Type	Step Name	#	Out	In
Sti	Stweep - BT 20 Hz - 20 kHz	1	Digital Out 1	
Sti	Stweep - BT 100 Hz - 8 kHz	2	Digital Out 1	
Sti	Stweep - Acoustic 100 Hz - 8 kHz	3	Mouth Sim	
Mes	Operator Message	4		
Mes	BTC Get Address	5		
Mes	BTC Connect Audio	6		
Mes	Pause	7		
Acq	Play & Record	8	Digital Out 1 Digital Out 2	Ear Sim L Ear Sim R
Pos	Resampling	9		
Pos	Frequency Shift	10		
Ana	HarmonicTrak	11		
Dis	Display - A2DP	12		
Mes	BTC Change from A2DP to HFP Profile	13		
Mes	Pause	14		
Acq	Play & Record	15	Digital Out 1 Digital Out 2	Ear Sim L Ear Sim R
Pos	Resampling	16		
Pos	Frequency Shift	17		
Ana	HarmonicTrak	18		
Dis	Display - A2DP & HFP	19		
Acq	Play & Record	20	Mouth Sim	Digital In 1
Pos	Resampling	21		
Pos	Frequency Shift	22		
Ana	HarmonicTrak	23		
Dis	Display - A2DP & HFP + BT Mic	24		
Mes	BTC Disconnect	25		

Further sequence development

This sequence has been designed for simplicity and has been written for a stereo channel headset with a single microphone. To further develop the sequence, you can:

- Add a USB barcode scanner to scan in the Bluetooth device's MAC address
- Add logic to the sequence that allows you to test the microphone only or earphones only
- Add Limits steps for select values and curves
- Add Autosave steps to save selected data during sequence run