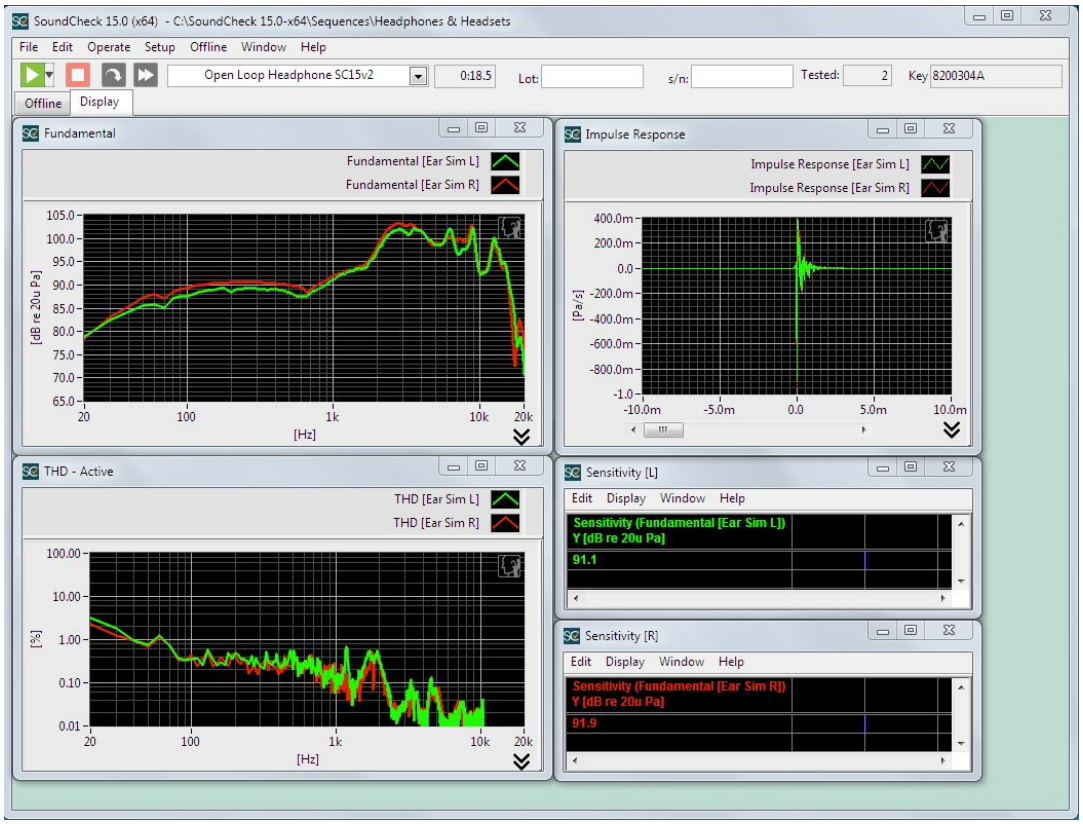
Open Loop Headphone Test Sequence

Introduction

This sequence tests a stereo headphone connected to a portable audio device such as a mobile phone or MP3 player. It is particularly useful for testing headphones with proprietary connectors such as the Lightning connector which otherwise can't be tested in a conventional "closed loop" test configuration.

The test stimulus is created in SoundCheck, saved as a WAV file and loaded on to the portable device for playback. Both left and right earphones are measured simultaneously using a continuous log sweep from 20 Hz to 20 kHz. The sequence uses a short 1 kHz tone, pre-pended to the normal test stimulus to automatically trigger the test when playback of the test signal begins; it also serves as reference tone for any frequency shift calculations. Post-processing precisely synchronizes the stimulus and response waveforms, and then calculation of the measurement parameters proceeds as with any conventional headphone. In this case, analysis is performed using the Time Selective Response (TSR) algorithm which performs THD and fundamental frequency response analysis simultaneously in addition to producing an impulse response. The fundamentals are then post processed to derive the sensitivity of the left and right channels at 1 kHz.



Final display for the *Open Loop Headphone* sequence

Hardware Requirements

- AmpConnect all-in-one audio interface Part #4042 or similar
- Ear Simulators - Ear couplers, head block or head and torso simulator

Software Requirements

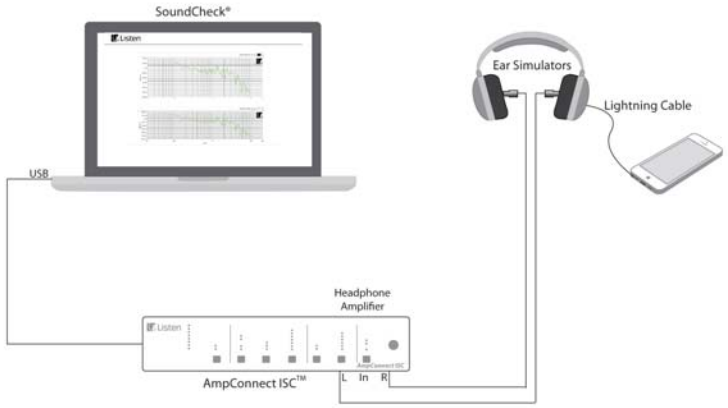
- SoundCheck 15 or later
- Time Selective Response Part # 2006

Hardware Setup & Calibration

1. Load the WAV stimulus file onto the portable device, connect the headphones, and adjust the stimulus playback volume to the desired level. **Note**: *If the default stimulus parameters in the sequence are changed, the new stimulus must be saved as a WAV file and loaded onto the portable device. The record time in the Triggered Record step may also need to be changed to reflect the new stimulus duration.*
2. Connect the left and right ear simulator outputs to the AmpConnect inputs. **Note:** *If your ear simulators require 200V polarization, an external microphone power supply such as the Listen SoundConnect 2 will need to be added to the test system.*
3. Both the left and right ear simulator needs to be calibrated before measuring the headphones. Refer to the manufacturer's manual for further instructions on calibrating your device. In the SoundCheck Microphone calibration editor, select B&K 4231 & UA 1546 ear adaptor for calibrating the B&K 4128 HATS artificial ears (similar in sensitivity to the B&K 4134 pressure mic). Insert couplers may require their own unique calibration correction value.
4. Mount the headphones on the ear simulators.

You are ready to start the sequence.

System Diagram



Sequence Logic

Type	Step Name	#	Out	In
Sti	Open Loop Log Sweep	1	Direct Out 1	
Mes	Operator Message	2		
Acq	Triggered Rec	3		Ear Sim L Ear Sim R
Pos	Frequency Shift	4		
Ana	TSR	5		
Pos	Sensitivity	6		
Dis	Display	7		

Further Sequence Development

Ways in which you could modify or further develop the sequence include:

- Enable Rub & Buzz in the Analysis step and select the appropriate high order harmonics on the Distortion tab
- Recall a correction curve (e.g. diffuse field) and apply it to the Fundamentals in a post processing step
- Add an autosave step