Listen

Transforming Sound into Knowledge

Sequence Note

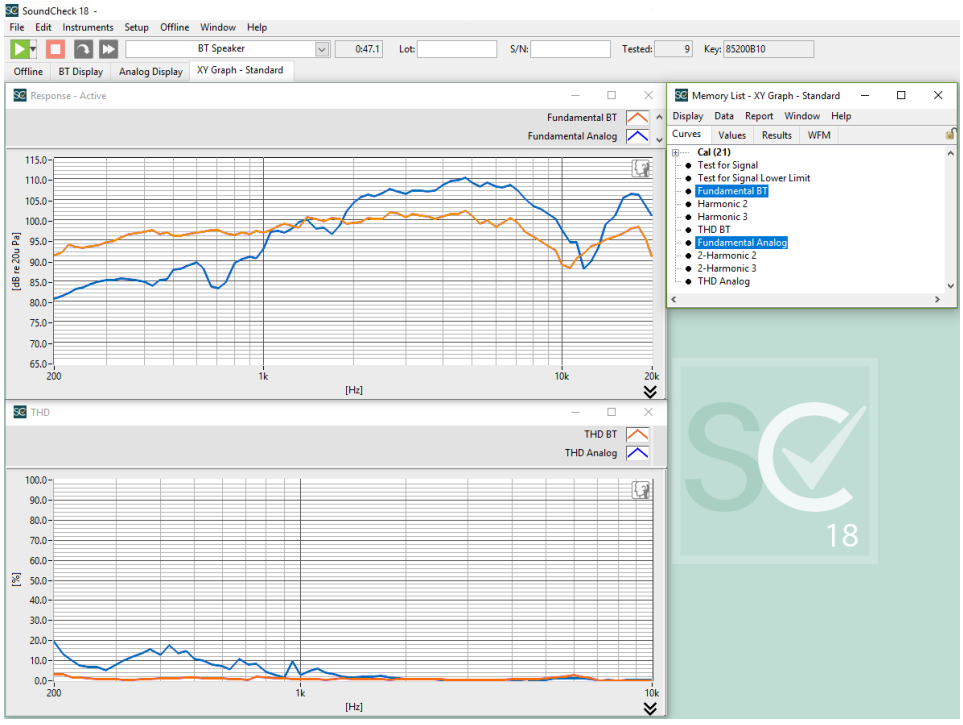
Comparison of Wired and Wireless (Bluetooth) Speaker Response

Introduction

This test sequence performs frequency response and distortion measurements of a Bluetooth speaker using both a wireless Bluetooth and wired stimuli; then compares the results. This sequence is configured for use with a Portland Tool & Die BTC-4149/4148 or BQC-4149/4148 Bluetooth interface.

Initially, the sequence prompts the operator to turn on the Bluetooth device under test and set it to pairing mode. BTC message steps will connect the Bluetooth device (operator selects the device from a list of detected Bluetooth devices) and connects Bluetooth audio. A 1 kHz test tone is transmitted, and if detected, the test sequence proceeds. A stepped sine sweep from 20 kHz to 100 Hz is played wirelessly to the Bluetooth speaker and measured via a calibrated reference mic.

Two post-processing steps convert the sampling rate and alignment of the response, then an analysis step calculates the frequency response and THD. The Bluetooth is disconnected, and the Bluetooth frequency response and THD curves are displayed on graphs. The operator is then prompted to connect the wired analog input into the Bluetooth speaker, and the same measurements are performed using the analog connection. Analog frequency response and THD curves are temporarily displayed on graphs, followed by graphs containing both Bluetooth and analog curves for comparison.



Final Display for *Comparison of Wired and Wireless Speaker Response*

Requirements:

Software

- SoundCheck 18 Basic or higher

Hardware

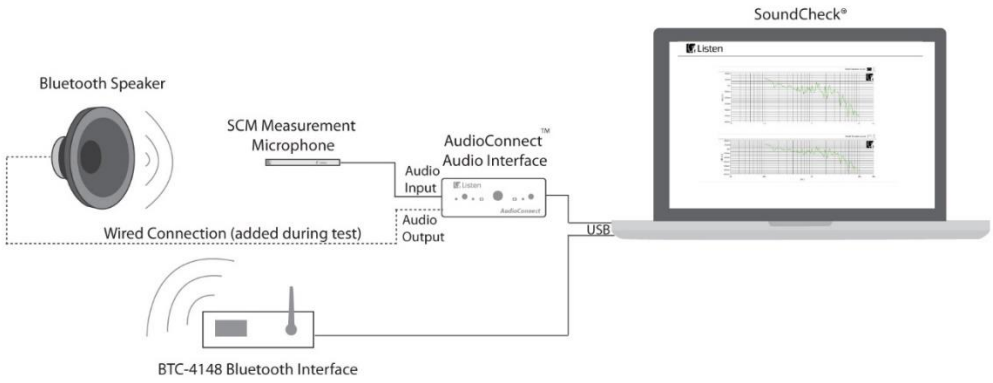
- Reference Microphone – Listen SCM-3 or similar
- Audio Interface – Listen AudioConnect or similar (**note:** AudioConnect provides bias voltage for the SCM-3 microphone. If you use a different microphone or interface, you will likely need to add a microphone power supply such as the Listen SoundConnect to your hardware setup.)
- BTC-4148 Bluetooth Interface or BQC-4149

Hardware Setup & Calibration

1. Install a USB connected Portland Tool & Die BTC-4149 or BQC-4149 as instructed by the User's Guide
2. Calibrate the reference microphone as instructed in the SoundCheck manual.
3. Position your reference microphone at the desired test distance from the loudspeaker, and connect it to the microphone power supply
4. (if applicable) Connect the output of the microphone power supply to the input 1 of your audio interface.
5. Connect channel 1 output of your audio interface to the audio input of your Bluetooth speaker when prompted by the test sequence.

You are ready to start the sequence.

System diagram



Sequence Logic

Type	Step Name	#	Out	In	
Sti	1 kHz	1	Digital Out 1		// 1K Test Tone
Sti	20k - 100Hz (R40)	2	Digital Out 1		// Test Sweep
Mes	Operator Message	3			// Put Bluetooth DUT in pairing mode
Mes	BTC connect	4			// BTC connect
Mes	BTC connect audio	5			
Acq	Play & Record	6	Digital Out 1	Reference Mic	// 1K Test Tone Loop
Pos	Resample	7			
Pos	Frequency Shift	8			
Ana	Heterodyne	9			
Lim	Test for Signal	10			// Test Tone Loop pass/fail
Acq	Play & Record	11	Digital Out 1	Reference Mic	// Bluetooth Test
Pos	Resample	12			
Pos	Frequency Shift	13			
Ana	THD	14			
Mes	BTC disconnect	15			
Dis	BT Display	16			
Mes	Operator Message	17			// Connect the analog cable
Sti	20k - 100Hz (R40)	18	Direct Out 1		// Analog Test
Acq	Play & Record	19	Direct Out 1	Reference Mic	
Ana	THD	20			
Dis	Analog Display	21			
Dis	XY Graph - Standard	22			