Listen

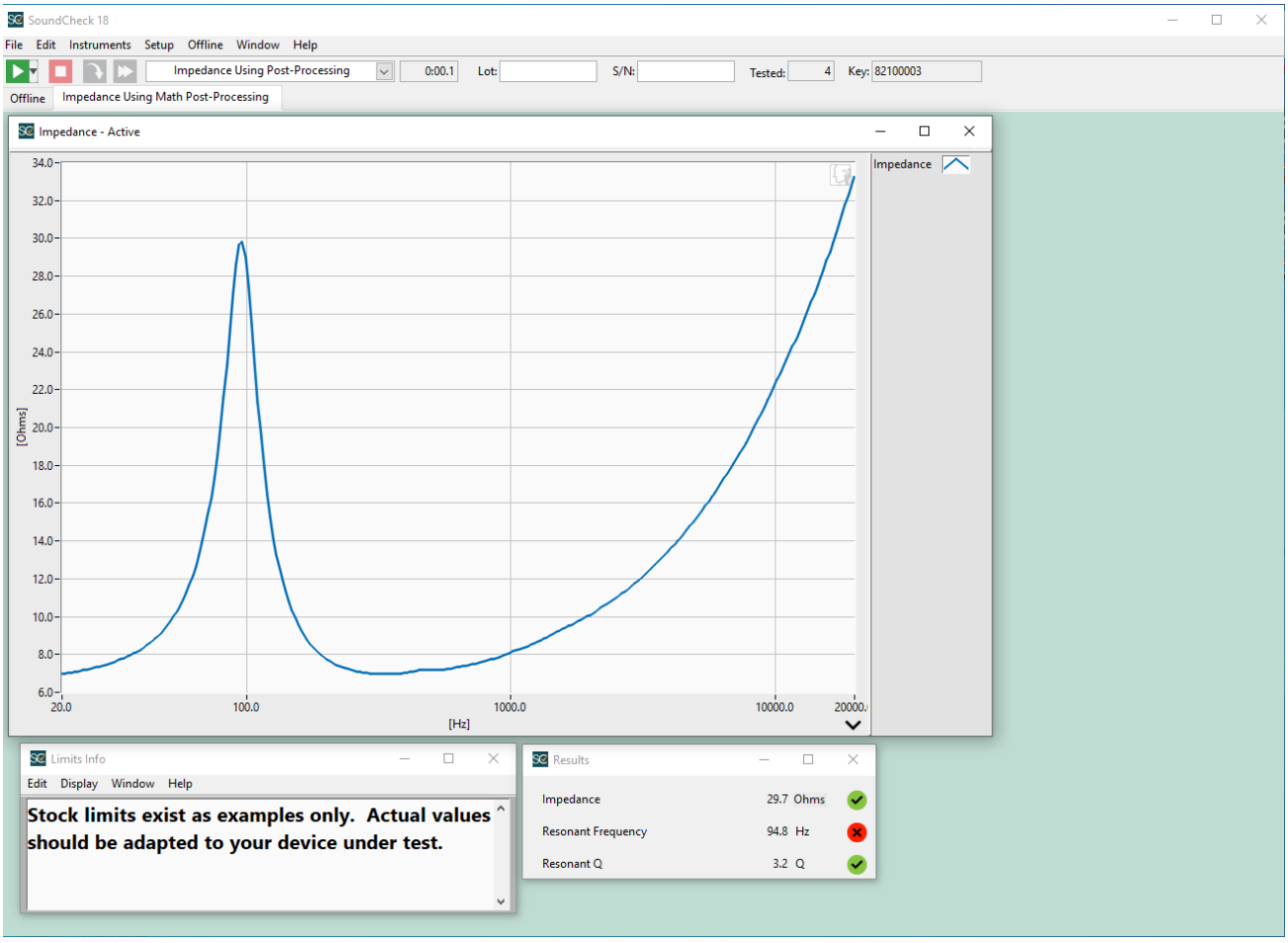
Transforming Sound into Knowledge

Sequence Note

Impedance Using Post-Processing

Introduction

This sequence demonstrates an alternative to the traditional SoundCheck single channel impedance measurement method. A stepped sine sweep from 20 Hz to 20 kHz is played through the speaker while the signal across the loudspeaker terminals is recorded by Direct In 1 and the signal across the sense resistor (impedance box) is recorded by Direct In 2. A heterodyne analysis step is then applied to calculate the fundamental response from both inputs and a math post-processing step divides Fundamental A (speaker terminal voltage) by Fundamental B (voltage across sense resistor). A post-processing step corrects for the value of the reference resistor before displaying the final impedance curve. The curve is then post-processed to calculate resonance frequency, maximum impedance and Q of the resonance peak. A set of arbitrary limits steps are also provided to generate pass/fail results.



Final Display for *Impedance* Using Math Post-Processing sequence

Software Requirements

- SoundCheck 18
- 2004 – Post Processing

Hardware Requirements

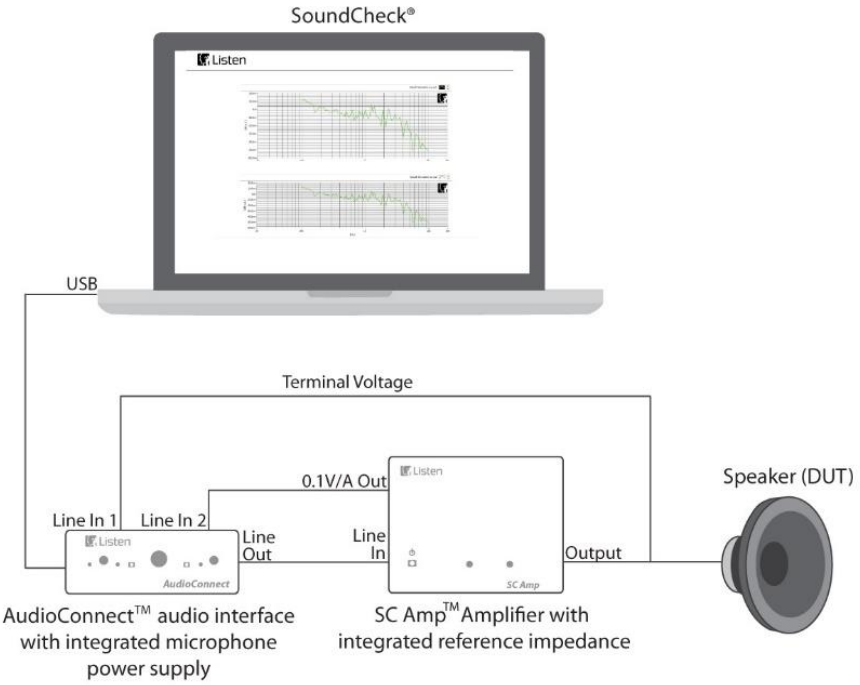
- Audio Interface – Listen AudioConnect or similar
- Power Amplifier – Listen SCAmp or similar
- Impedance Reference – Listen Impedance Box or SCAmp Impedance Reference Output

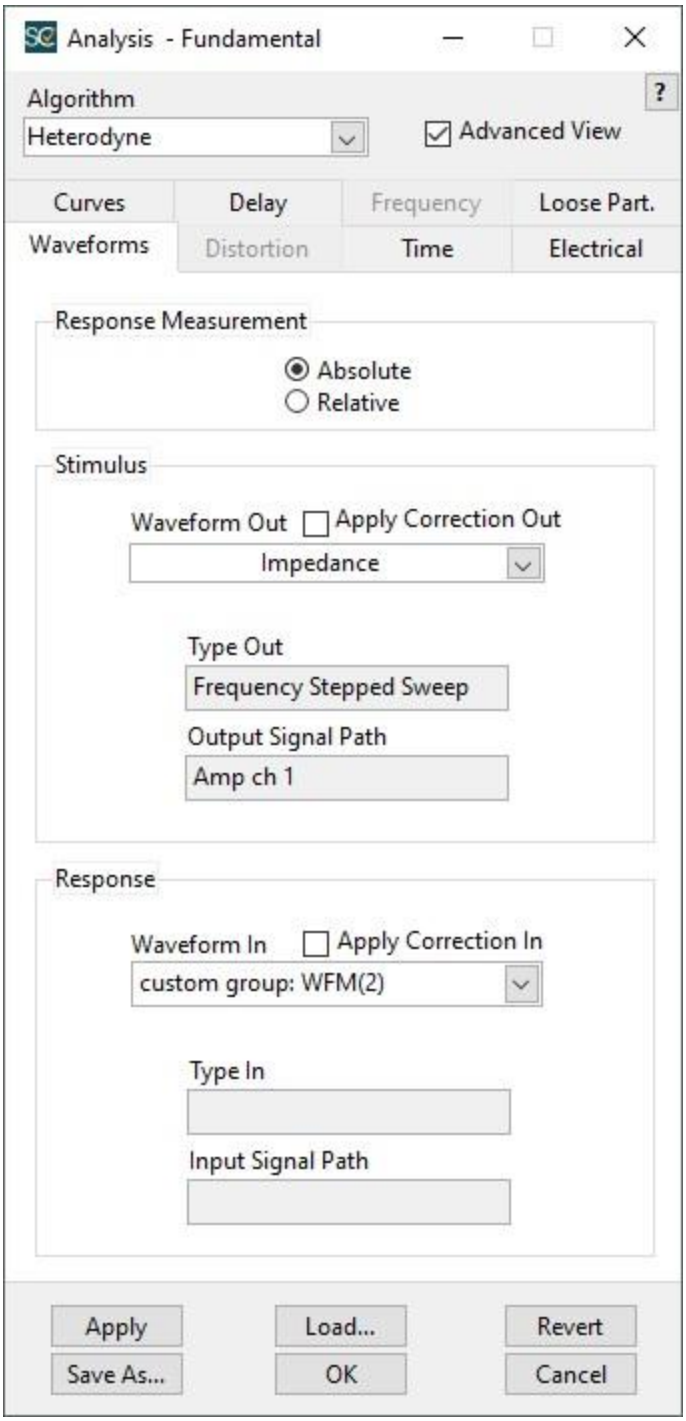
Hardware Setup & Calibration

1. Calibrate the amplifier as instructed in the SoundCheck manual.
2. Connect output 1 of your audio interface to the input of the amplifier.
3. Connect the impedance reference (connection types will vary depending on reference type).
4. Connect the amplifier output to the loudspeaker
5. Connect input 1 of the audio interface across the terminals of the amplifier. Use a balanced cable with a ¼" TRS plug or XLR at the sound card and a ¼" TS(or dual, banana, alligator clips, etc.) at the amplifier – wired for "differential" ground (shield and ground tied to each other) for this connection.
6. Connect the output of the impedance reference to input 2 of your audio interface. Use a balanced cable (1/4" TRS) for this connection.

You are ready to start the sequence.

System diagram




Analysis - Fundamental
Algorithm
Heterodyne
Advanced View
?
Curves
Delay
Frequency
Loose Part.
Waveforms
Distortion
Time
Electrical
Response Measurement
Absolute
Relative
Stimulus
Waveform Out
Apply Correction Out
Impedance
Type Out
Frequency Stepped Sweep
Output Signal Path
Amp ch 1
Response
Waveform In
Apply Correction In
custom group: WFM(2)
Type In
Input Signal Path
Apply
Load...
Revert
Save As...
OK
Cancel

Sequence Logic

Type	Step Name	#	Out	In
Sti	Impedance	1	Amp Ch 1	
Mes	Sense Resistor Value	2		// Prompts operator to input value of sense resistor
Acq	Play & Record	3	Amp Ch 1	Speaker Sense Resistor
Ana	Fundamental	4		// Batch analysis of recorded time waveform group
Lim	Test for signal	5		// Applies limits for testing the presence of an input signal
Mes	No signal	6		
Pos	Curve division	7		// Divides V across Speaker by V across sense resistor
Pos	Curve multiplied by constant	8		// Multiplies result of curve division step (step 6) by the value of the sense resistor and applies custom units (ohms)
Pos	Est Resonance	9		// Estimates the resonant frequency of the impedance curve
Lim	Impedance	10		// Applies a maximum impedance limit value
Lim	Resonant Frequency	11		// Applies an upper and lower limit to the resonant frequency value
Lim	Resonant Q	12		// Applies an upper and lower limit to the Q of the impedance curve
Dis	Impedance Using Math Post-Processing	13		// Display step

Further sequence development

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

- Add autosave steps to store your data and results
- Add a third input channel for an acoustic test
- Test for loose particles
- Incorporate the impedance test into a larger suite of tests similar to the *Complete Test* sequence