



# Automotive Audio Testing

## Any Car Audio System, Any Measurement



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SoundCheck offers simple, fast and accurate testing of vehicle audio quality, from individual speaker components to complete in-vehicle infotainment and telematics systems. With interfaces to connect via Bluetooth, Lightning, USB and with individual MEMS devices, as well as analog connections, SoundCheck can handle the complexity and demands of testing in today's vehicles.



## Measurements include:

- Speaker/system response
- Speaker/panel buzz, squeak and rattle
- Bluetooth audio performance
- Head unit and amplifier response & THD+N
- Microphone/microphone array response
- Active noise cancellation effectiveness
- Spatial reproduction accuracy

## The System

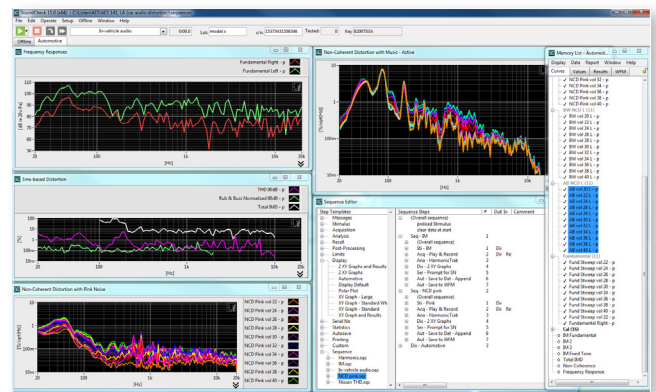
SoundCheck's modular combination of hardware and software is cost-effective, flexible and expandable.

At the heart of the system is the SoundCheck software. Powerful, fast and accurate, its scalable design allows it to perform in the R&D laboratory as well as the end of the production line. Complete flexibility in stimulus choice enables any test signal (even music) to be used as stimuli. Virtual instruments offer the functionality of stand-alone hardware on your laptop. Advanced

algorithms and powerful post processing options allow a wide choice of analyses and mathematical operations.

For example, using a common 6 measurement microphone array, it is possible to measure sound power, time delays, spatial envelopment and both tonal and stereo balance. Alternatively, the response of a telematics microphone array to a person in the driver's seat both with and without background noise can be evaluated. Documentation options range from comprehensive Microsoft Word or Excel reports to simple pass/fail outputs or automatic database writing.

Repeatable, automated tests are quickly and easily created, modified and saved using the simple point-and-click interface. Complex sequences can be developed to meet specific automotive test requirements, for example performance of active road noise cancellation, microphone directivity and spatial reproduction.



**Automotive test result in SoundCheck showing frequency response and distortion based on sine wave, music and pink noise.**

In addition to interfacing with the audio measurement hardware (audio interface, HATS, microphone, coupler etc.) the software can also control the vehicles head unit to adjust L/R and fader balance (e.g. using an A2B car interface).

## Listen's automotive audio test hardware includes:

### AudioConnect™

A compact USB audio interface with built in headphone amplifier and a power supply for up to 2 SCM™ microphones. This is a very cost-effective approach for basic headphone testing.



### AudioConnect 4x4™

A high-precision audio interface suitable for measuring amplifier THD+N. The AudioConnect 4x4 offers 4 digital and 4 analog channels in and out, high signal to noise ratio, wide frequency response, and a user-defined sampling rate up to 200kHz.



### SoundConnect 2™

A 2-channel microphone or accelerometer power supply (SCM, IEPE, 200V polarization) ideal for vibration measurements or applications where polarization is required.



### BTC-4148 and BQC-4148 Bluetooth Interfaces

Designed for R&D and production respectively, these interface any Bluetooth device to SoundCheck, offering full control over all Bluetooth protocol settings and explicit control over the CODEC choice and transmitter power. The BQC-4148 is USB powered for easy on-road testing.



Also available: test microphones, MEMS interfaces, amplifiers, speakers, current monitors, 3rd party hardware including Head and Torso Simulators (HATS) and more.

## R&D Automotive Testing

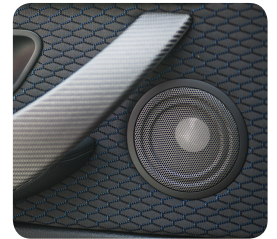
In the R&D lab, SoundCheck is used for voicing the audio system



Photo courtesy of Brüel and Kjær

to the car. This might include speaker positioning and equalization of the system for correct tonal and spatial balance including L/R and front/back balancing. It is also used for microphone positioning and directivity measurements, and noise cancellation performance with simulated and actual road noise.

## End-of-Line Automotive Testing



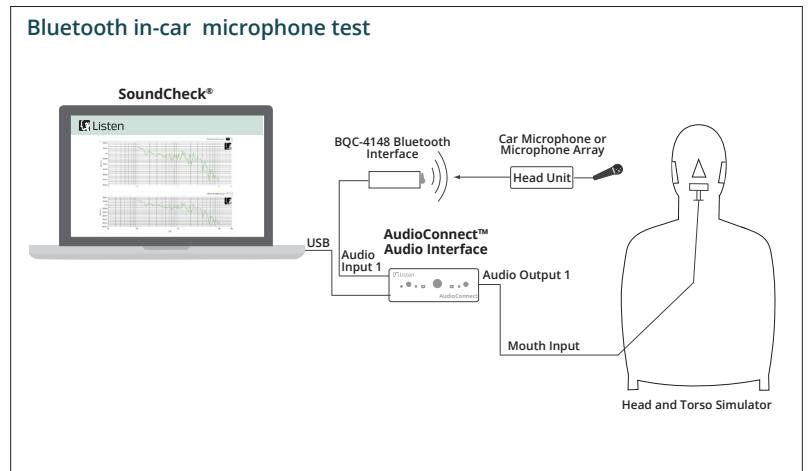
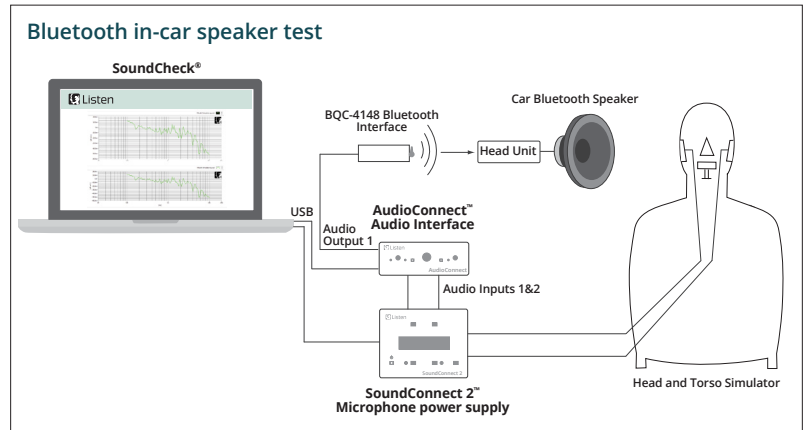
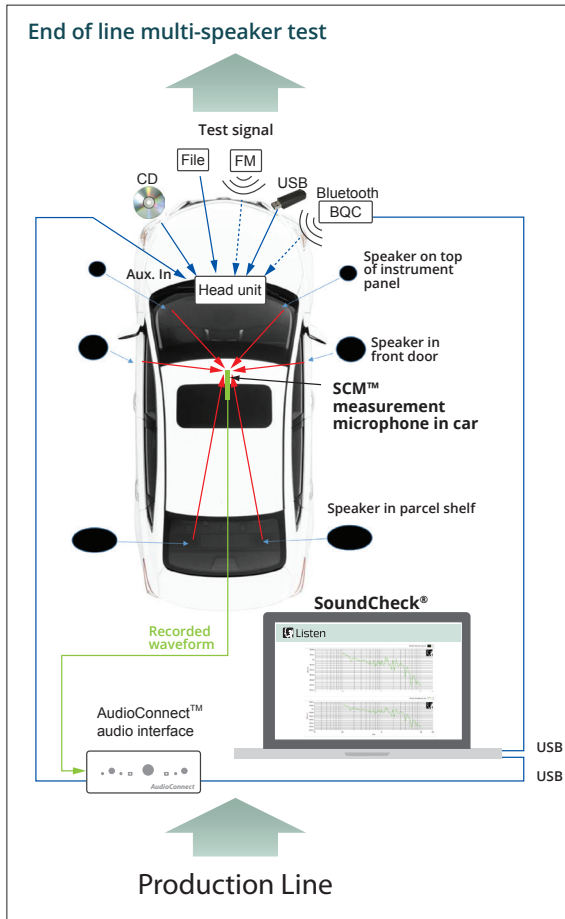
At the end of the production line, SoundCheck offers a final audio QC check on the car. Initially a single measurement of frequency response and Rub & Buzz can be used to ensure that the audio profile measured in the car meets specifications. If there are discrepancies, each speaker can then be measured independently (including additional measurements such as polarity) to help identify the causes.

The microphone(s) can be tested to verify directional response by performing simple directivity measurements using the car's own speakers.

SoundCheck is also ideal for R&D and production line testing of drivers for automotive applications. Please see our loudspeakers brochure for more information.

## TEST CONFIGURATIONS

There are many possible in-vehicle test configurations. These are just a few options for testing Automotive audio.



Listen, Inc.  
580 Harrison Ave Ste, 3W  
Boston, MA 02118

Tel: 617-556-4104  
Fax: 617-556-4145  
Email: sales@listeninc.com  
www.listeninc.com

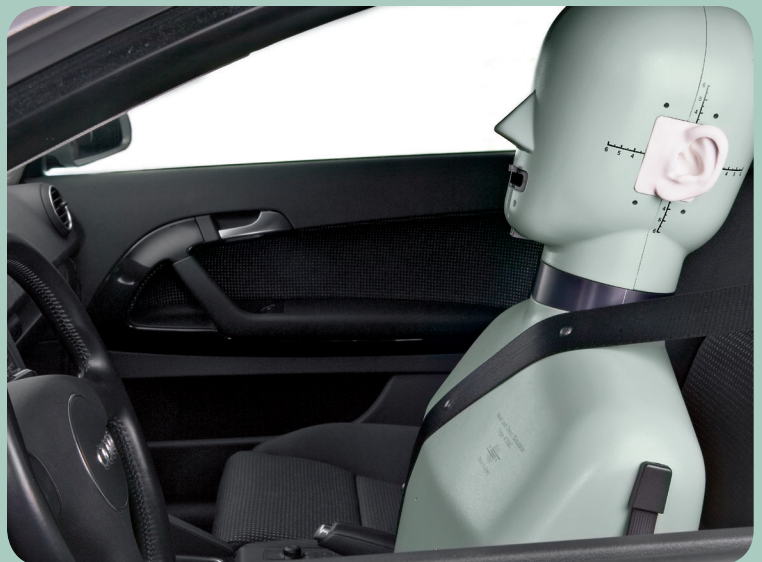


Photo courtesy of Brüel and Kjær