

# Voice Controlled Audio Device Testing

Any Smart Device, Any Measurement



• Speakers  
• Watches

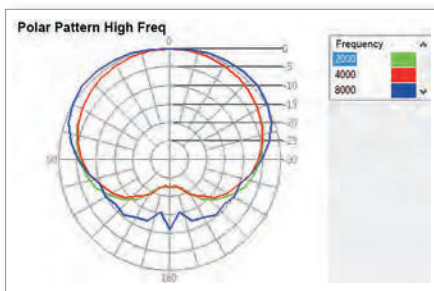
• Thermostats  
• Robots

• Appliances  
• Remote Controls

• Hearables  
• Automotive

# Any Smart Device, Any Measurement

SoundCheck offers simple, fast and accurate 'open loop' testing of any smart device – no matter what the form factor, functionality, connector, or additional features. It measures a full range of characteristics such as driver performance, microphone array performance, speech recognition and voice quality metrics via wired,



Directionality of smart speaker microphone

wireless/Bluetooth, cloud, USB, or debug port connections.

SoundCheck's long history as a multipurpose electroacoustic test

system means that Listen, Inc. has unrivalled expertise in the various tests used in voice-activated audio devices - e.g. microphone array testing and beamforming, driver testing, speakerphone testing to TIA standards, active noise cancellation, voice quality measurements and speech recognition metrics. Furthermore, Listen, Inc. has been making 'open loop' measurements – measurements on devices with no direct access to the microphone or speaker for longer than any other test equipment supplier. This has resulted in extremely sophisticated algorithms for optimizing the speed and accuracy of open loop tests, as well as the expertise to guide you through the process.

## Measurements include:

- Traditional measurements such as frequency response, directionality, distortion
- Telephony tests to TIA standards
- In-situ measurements such as voice recognition in noisy environments
- Signal to noise with background noise simulation

# The System

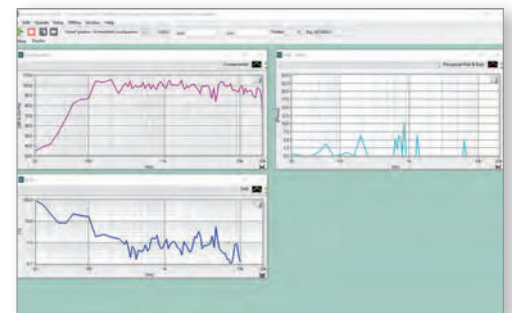
SoundCheck's modular combination of hardware and software is cost-effective, flexible and expandable.

At the heart of the system is the SoundCheck software. Powerful, fast and accurate, it measures every audio parameter from the R&D laboratory to the production line. With smart triggering and sophisticated post-processing algorithms to allow asynchronous measurement (commonly known as 'open loop testing'), SoundCheck offers incredible flexibility for testing using virtually any interface including Bluetooth, cloud-based systems, A<sup>2</sup>B<sup>®</sup> bus automotive interfaces and more. Complete flexibility in stimulus choice enables the use of real and complex test signals such as multitone, speech, and even music, to test devices.

Repeatable, automated tests are quickly and easily created, modified and saved using the simple point-and-click interface. Several easy to modify sample sequences for measuring voice-activated devices are provided. These include sequences for open loop microphone and speaker test, as well as more complex sequences for specific test standards such as TIA 910 and background noise simulation to the ETSI ES 202 396-1 standard.

The software also controls the audio measurement hardware –

an audio interface, measurement microphone, power supplies, and amplifiers and speakers for background noise generation.



Smart Speaker test results showing frequency response and distortion

### **Listen's smart device test hardware includes: AmpConnect™**

Listen's all-in-one hardware includes an audio interface, amplifier, power and gain for up to 2 SCM or IEPE microphones, digital I/O, and integrated impedance circuit for all voice-controlled device tests.



### **AudioConnect™**

A compact audio interface with power supply and gain for up to 2 SCM™ microphones. This is a very cost-effective approach for basic smart device testing.



### **SCM™ Measurement Microphones**

SCM measurement microphones are robust, accurate, low noise, stable and cost-effective.



### **SoundConnect 2™**

A 2-channel microphone power supply (SCM, IEPE, 200V polarization) ideal for applications where polarization, TEDS, and high and low pass filtering are required. It also provides autoranging when used with SoundCheck to maximize the dynamic range of a measurement.



### **Bluetooth Audio, MEMS, A2B and other Interfaces**

Bluetooth speakers, headphones and car audio head units, connect to SoundCheck via Bluetooth interfaces, offering full control over all Bluetooth protocol settings and explicit control over the CODEC choice and transmitter power. Mentor's A<sup>2</sup>B interface can also be connected to, and controlled by SoundCheck for automotive testing applications. Other multichannel audio interfaces, MEMS interfaces, amplifiers, current monitors, and 3rd party hardware such as head and torso simulators are available for more complex test requirements.

## R&D Smart Device Testing

In the R&D lab, SoundCheck measures everything from simple driver response to microphone beamforming, speakerphone performance, voice recognition, voice quality and more. SoundCheck's sequence editor makes it simple to re-run tests and compare results as designs are modified. Powerful test capabilities, with many stimuli, analysis, post-processing and statistics options allow you to make all the measurements you need, plus offer unrivalled flexibility to calculate any parameters arising from these without leaving the system.



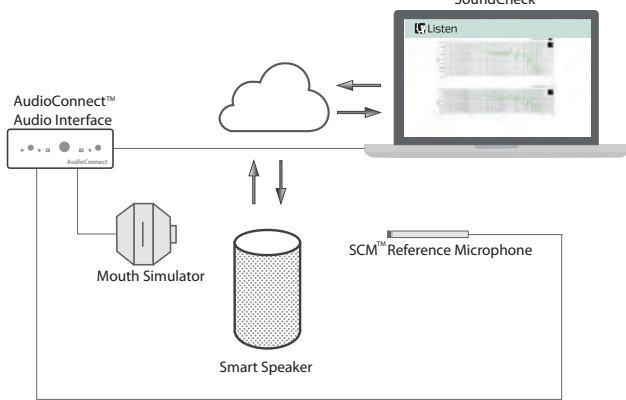
## Production Line Smart Device Testing

On the production line, SoundCheck offers extremely fast and accurate testing of both finished goods and subcomponents such as speaker or microphone array sub-assemblies. It is simple to operate, offers high immunity to background noise, and can carry out complete production tests including frequency response, our advanced Perceptual Rub & Buzz, THD, loose particles, polarity and phase. Results can be compared to pre-set limits or a reference standard, and can be presented as a simple audible or visual pass/fail indication, a detailed failure mode analysis, or automatically written to a database. SoundCheck interfaces with barcode systems, footswitches and PLCs, and can be controlled via 3rd party programs such as National Instruments Test Stand, LabVIEW®, Python, C#, etc. for full integration with automatic production lines and large-scale test systems.

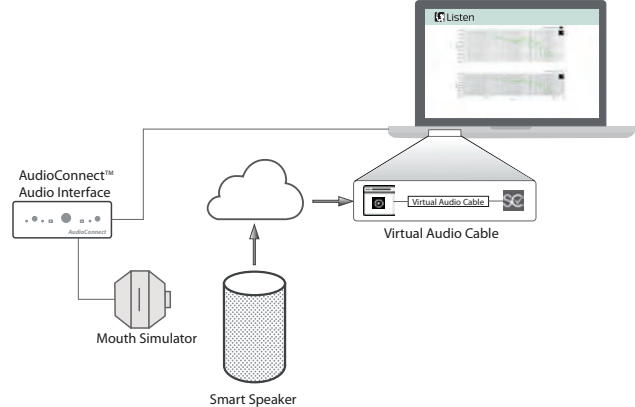
## TEST CONFIGURATIONS

There are many possible smart device test configurations; here are just a few options.

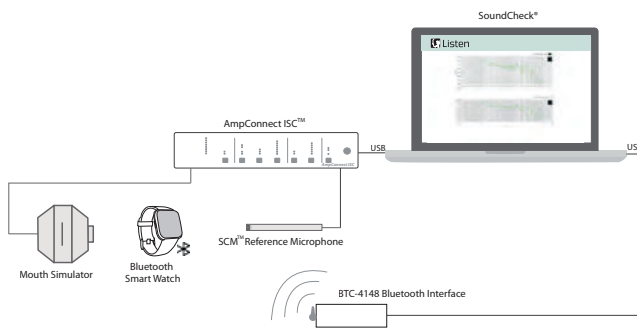
### Smart Speaker Via Cloud Interface Test



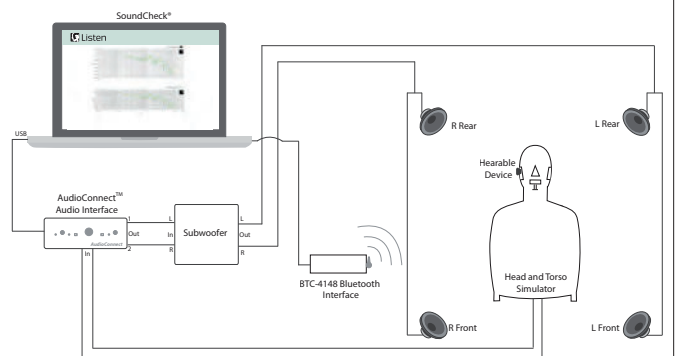
### Smart Speaker Microphone Test



### Bluetooth Smartwatch Test



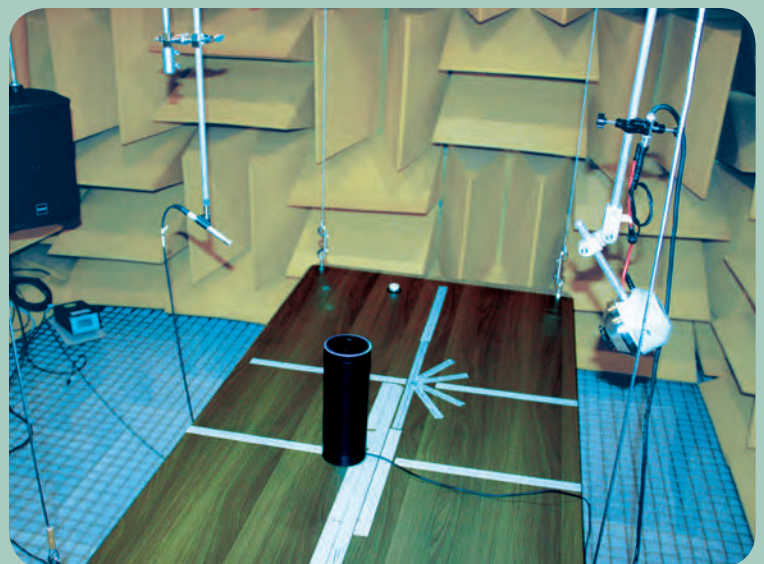
### Hearable Test with Background Noise



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Smart Speaker Test in Anechoic Chamber