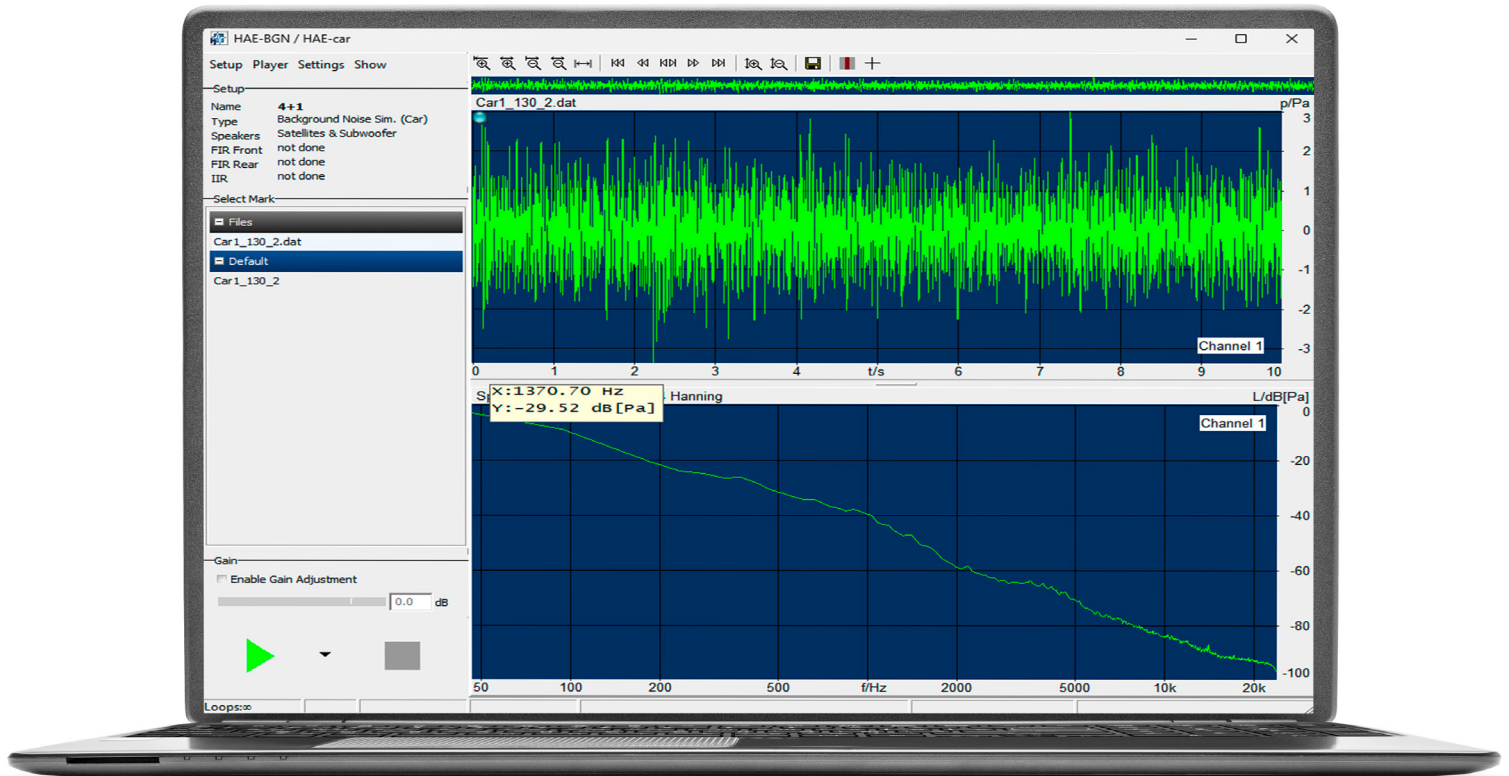




Code 6970

HAE-car

Background Noise Playback and Semi-Automated Equalization in the Car

OVERVIEW

HAE-car

Code 6970

Background Noise Playback and Semi-Automated Equalization in the Car

HAE-car is a background noise simulation system for car cabins. It is designed for testing in-car hands-free telecommunication equipment in the presence of typical car background noises under quasi-stationary and repeatable conditions. Using four loudspeakers and the HSW II.1 subwoofer, HAE-car reproduces previously recorded background noise with high accuracy. Signals can be recorded either through the DUT microphone, when accessible, or with a measurement microphone. For quick and easy setup, HAE-car provides semi-automated equalization using the same microphone.

HAE-car works interactively with the *labBGN* and *labCORE* hardware platforms, providing an equalized recording and playback system.

KEY FEATURES

Semi-automated digital equalization with measurement microphone

Minimal inherent noise and high dynamic range

Synchronization of playback with ACQUA measurements to ensure full repeatability

APPLICATIONS

Background noise simulation for car cabins with semi-automated equalization, e.g. for speech quality evaluation of in-car hands-free telecommunication devices

DETAILS

With an arrangement of four loudspeakers, HAE-car is able to reproduce previously recorded background noise in car cabins with high accuracy. The HSW II.1 subwoofer supports the loudspeakers at low frequencies, ensuring realistic playback and high dynamic range. At the same time, it leaves room for scaling of loudspeaker size and allows quick setup of HAE-car.

Semi-automated equalization enables fast and convenient calibration of the system by compensating for the individual acoustic characteristics of the loudspeakers and the car cabin. The equalization procedure works on several levels, correcting frequency response, level, and delay of the playback system. This ensures high playback accuracy at the reference position.

For recording typical background noise in cars, HAE-car can use either the car's built-in hands-free microphone, when accessible, or a dedicated measurement microphone. To ensure full repeatability of each test, HAE-car can be configured for triggered playback.

Testing of the car's telecommunication equipment can be performed using a HEAD Measurement System (HMS) in conjunction with *labCORE* and ACQUA.

GENERAL REQUIREMENTS

Hardware

Hardware Platform

labBGN (Code 6486)

- › ACQUA/*lab* 16-Channel Background Noise Hardware Platform

Equalization Equipment

Hardware Platform

labCORE (Code 7700)

- › Modular multi-channel hardware platform
- coreBUS* (Code 7710)
- › *labCORE* I/O bus mainboard

One of the following microphone input boards

coreIN-Mic4 (Code 7730)

- › Microphone input board

coreIN-ICP4 (Code 7735)

- › *labCORE* Input Module, ICP

Measurement Microphone

Measurement microphone including a cable and acoustic calibrator

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OPTIONS

PSB III (Code 6001)

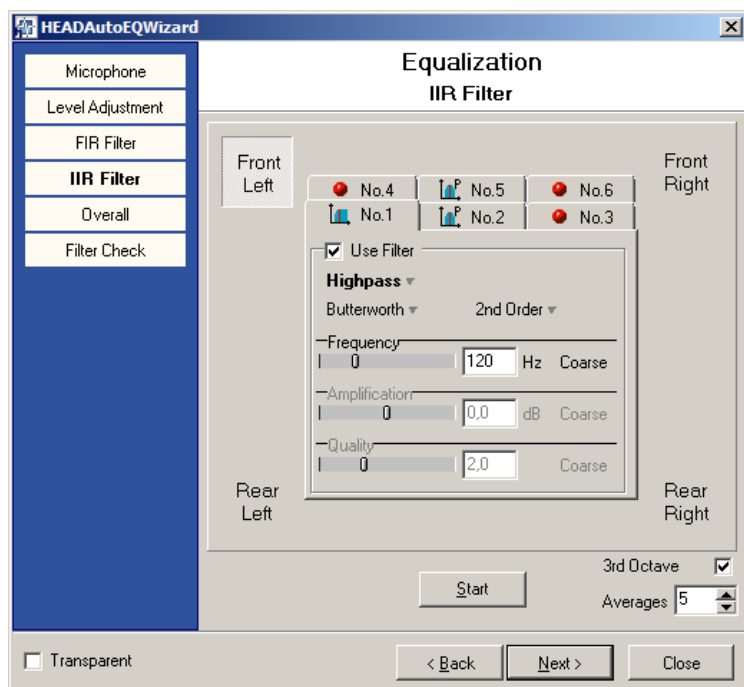
- › Pulse splitter box (for synchronization of non-stationary noise with ACQUA)

CXX II.3 (Code 5177-3)

- › Cable AES/EBU XLR male 3-pin <> XLR female 3-pin, 2.95 m

CUU I (Code 6085)

- › Adapter USB <> USB for Remote Control HAE (Connection between the ACQUA computer and the HAE computer)



The Equalization wizard (HEADAutoEQWizard) of HAE-car guides the user through the equalization procedure. The system uses a combination of FIR and IIR filters to equalize the loudspeaker setup.

GENERAL REQUIREMENTS

Playback Equipment

HEAD acoustics provides a selection of appropriate third-party loudspeakers and power amplifiers for HAE-car configurations.

CSO I.0 (Code 9822)

- › Loudspeaker cable set for HAE-car/HAE-BGN/3PASS (4 speaker connections)

HSW II.1 (Code 2952)

- › Subwoofer with amplifier

Power amplifier(s)

Four loudspeakers

Sound Board

One of the following sound boards

DSB III.1 (Code 2407.1)

- › Digital Sound Board (24 bit), PCIe version

DSB IV.1 (Code 2408.1)

- › Digital Sound Board, USB version

System Requirements

Computer

- › 2 GB free disk space
- › 4 free USB ports

Operating system (one of the listed)

- › Windows 11 x64
 - » Pro, Enterprise, Education; version 21H2 or later; languages: US, Western European
- › Windows 10 x64
 - » Pro, Enterprise, Education; version 1809 or later; languages: US, Western European

SCOPE OF DELIVERY

HAE-car (Code 6970)

- › Software for semi-automated equalization and automated playback of background noises in a car cabin.

USB dongle

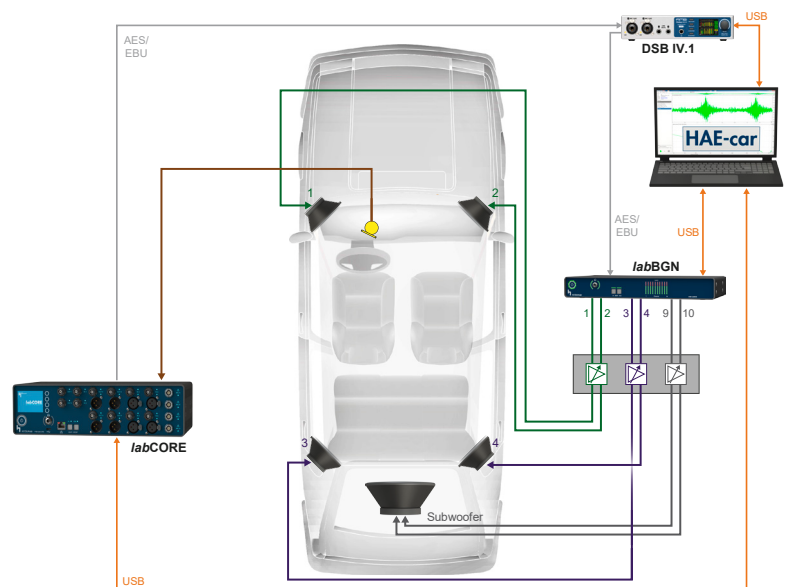
IN PRACTICE

APPLICATION EXAMPLE

Car Handsfree Setup

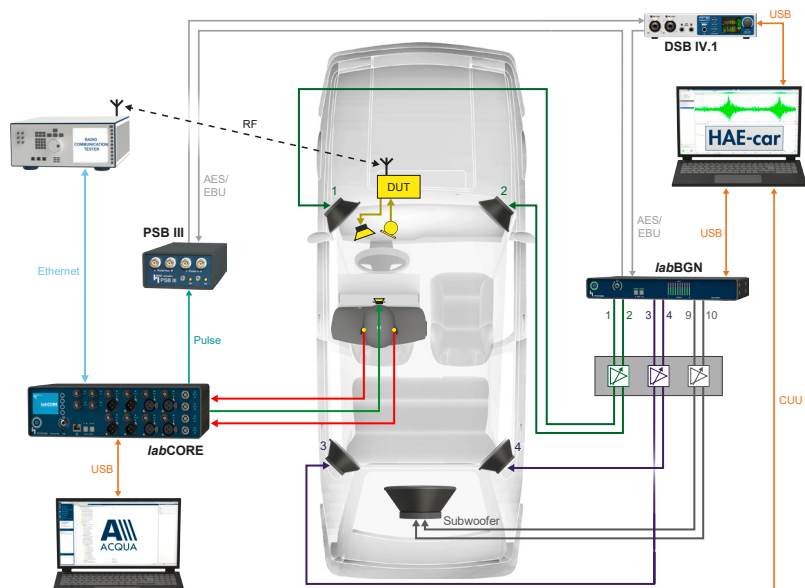
Step 1: Equalization

A measurement microphone is positioned at the reference position in the car cabin and records signals during the equalization process. It is connected to *labCORE*. HAE-car runs on a computer that is connected to *labBGN* and *labCORE*. *labBGN* forwards signals through power amplifiers to four loudspeakers in the car cabin and the HSW II.1 subwoofer in the trunk. The equalization compensates for the individual acoustic characteristics of the loudspeakers and the car cabin and corrects frequency response, level, and delay of the playback system. The equalization is performed in accordance with the procedure specified in ETSI ES 202 396-1.



Step 2: Measurement

The DUT is positioned in the car cabin and connected to the radio communication tester. *labCORE* is connected to both the radio communication tester and the DUT, and performs the measurements under the control of ACQUA. HAE-car runs on a computer connected to *labBGN* and *DSB IV.1* via USB. *DSB IV.1* synchronizes *labBGN* and *labCORE*. During testing of the DUT's telecommunication performance, HAE-car controls the reproduction of the equalized background noise. *labBGN* routes the background-noise signals through power amplifiers to four loudspeakers in the car cabin and the HSW II.1 subwoofer in the trunk.



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