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HXB-PreSense (7661)

Playback system for PreSense

Overview

The HXB-PreSense extension box is the playback hardware for the interactive NVH driving simulator PreSense.

HXB-PreSense provides calibrated low latency playback, so that delays between driver interaction and acoustic output are not noticeable. Two independently equalized headphones connectors ensure binaural and aurally-accurate playback via connected headphones.

The integrated CAN FD interface supports CAN (ISO 11898-2) as well as CAN FD and enables real-time transfer of CAN (FD) data from a vehicle to the PreSense simulation software. This allows for controlling various operating states within the simulation by real-time data from the vehicle, such as engine rpm, speed, throttle position, gear selection, and so on.

Additional playback systems, such as *lab*O2/*lab*O2-V1 or *lab*P2/*lab*P2-V1, can easily be integrated into the playback system, enabling further headphones or shakers. Such additional playback systems are connected to HXB-PreSense via the HEAD*link*+ interface on the back.

Feature overview

- Calibrated low latency headphones playback
- Operating state transfer from a vehicle CAN FD bus system to the NVH simulation via the CAN FD interface
- Direct USB connection to a computer makes an additional sound card redundant
- Accurate playback level and calibration ensured in combination with the PreSense software
- USB type A connectors to connect further supported devices, such as USB pedals, USB steering wheels, or software dongles
- Wide range supply voltage of 10 V to 28 V for in-vehicle applications.
- Connection of additional playback systems via HEAD*link*+ to operate further playback hardware such as headphones or shakers
- Status display with level meter
- Rotary knob for operation with mute function and playback status LED
- Limiter for hearing protection

Scope of supply

- HXB PreSense (code 7661) Playback system for PreSense
- HSC VI.1 (code 9871) Carrying case
- CUSB II.1.5 (code 5478.1.5) USB 2.0 cable, 1.5 m/4.9 ft
- Power adapter (110 V/230 V) LEMO 4-pin, 24 V, 60 W
- Manual

Optional accessories

- HD OP II.1 (code 2512.1) Open-back headphones with particularly precise playback
- HD OP III.1 (code 2513.1) Open-back headphones with highest possible acoustic precision
- HD CL II.1 (code 2522.1) Closed headphones with very clear, analytical timbre and a high level of details
- HD CL III.1 (code 2523.1) Closed headphones with highest possible acoustic precision and excellent transparency
- PreSense (code 7600ff) Interactive NVH driving simulator
- Playback equalizers
  - *lab*O2/*lab*O2-V1 (codes 3731/3731-V1) Two-channel playback equalizer with Line outputs, headphones connector, and USB interface
  - *lab*P2/*lab*P2-V1 (codes 3732/ 3732-V1) Binaural headphones equalizer with USB interface

- CLL X.xx (code 3780-xx) HEAD*link* cable LEMO 8-pin ↔ LEMO 8-pin available lengths: 0.17 m/6.6"; 0.26 m/10.2"; 0.36 m/14.1"; 0.5 m/1.6 ft; 1 m/3.2 ft; 1.5 m/4.9 ft; 2.5 m/8.2 ft; 5 m/5.4 yd; 10 m/10.9 yd; 20 m/21.9 yd, 25 m/ 27.3 yd; 30 m/32.8 yd; 40 m/43.7 yd; 50 m/54.6 yd; 60 m/65.6 yd
- RMB IV.3 (code 9852.1) 19" mounting bracket (2 pcs.)

HXB-PreSense in a desktop simulation scenario with a steering wheel, headphones and the driving simulation running on a computer (cabling omitted)

Interactive simulation with PreSense

PreSense (code 7600ff) is an interactive simulator for the NVH assessment of virtual prototypes and virtual test drives. It facilitates analysis of NVH performance during early stages of development and prototyping, and is as such an invaluable tool for reducing development and prototyping costs.

The interactive vehicle simulation with PreSense lets you experience sound and vibration directly and gives a greater insight than charts and numbers. The simulation uses sound data measured under real-life condition as well as data generated by binaural transfer path analyses.

PreSense enables simulation in different simulator configurations, such as a desktop simulator in your office, a mobile simulation of prototyped sounds in a vehicle, or a SoundSeat.

The simulated vehicle reacts in real-time to interactions such as gear selection, acceleration, and braking. Operating state variables such as vehicle speed, engine speed, and load are calculated based on a driving model. PreSense calculates the corresponding sounds accordingly and auralizes them via headphones connected to HXB-PreSense.

Integrate vehicle data with CAN FD

Connecting HXB-PreSense to the CAN FD bus of a vehicle enables you to include various vehicle parameters into the simulation. These parameters are handed over to PreSense in real-time and are used by PreSense to incorporate the operating states of the vehicle into the simulation.

PreSense auralizes changes to the operating states such as throttle position, engine rpm, and speed on the fly, giving you the immersive impression of actually driving the vehicle being simulated.

Headphones equalization

An accurate hearing impression during a simulated drive is heavily dependent on aurally-accurate and equalized sound playback.

Aurally-accurate playback is only possible, if the headphones output is equalized and calibrated for the headphones specimen that is to be connected to it. Otherwise the individual transfer characteristics of a specific headphones specimen would cause inaccurate acoustic impressions.

With HXB-PreSense, both headphones jacks can be calibrated for a specific headphones specimen and then feature the correct equalization filters for these headphones. In order to make sure that the correct pair of headphones is connected to a headphones jack, the serial number of the respective headphones specimen is noted above the headphones jack.
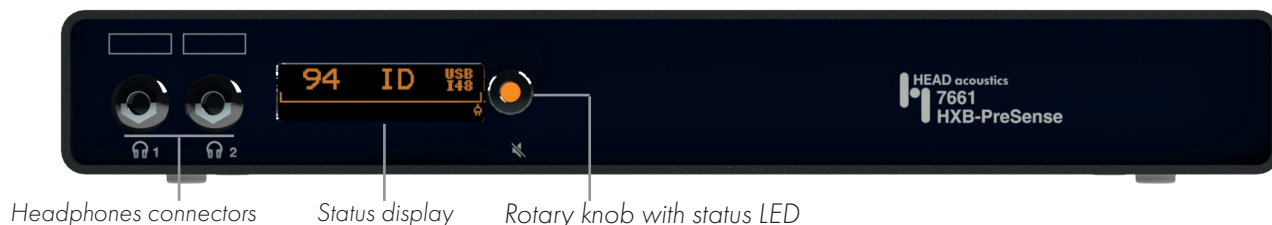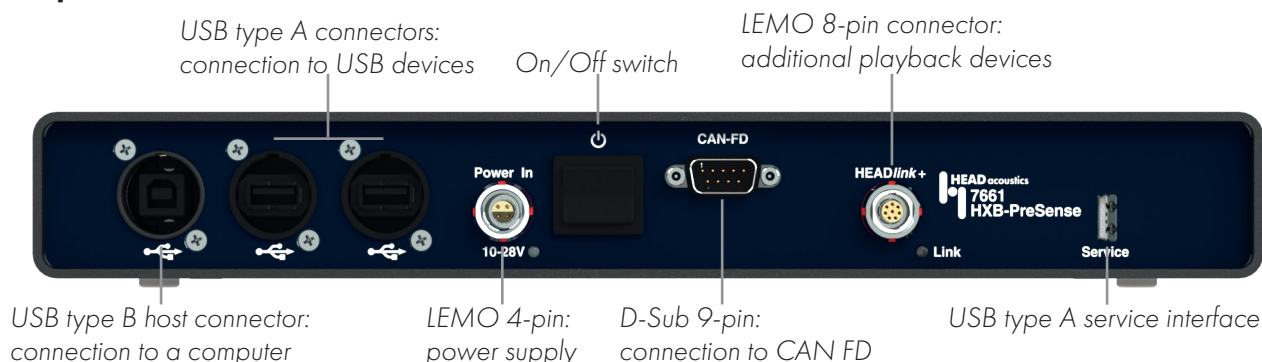
HD OP II.1

HD CL II.1

HD OP III.1

HD CL III.1

Available headphones for aurally-accurate and equalized playback with HXB-PreSense

Front panel elements

Headphones connectors   Status display   Rotary knob with status LED

Rear panel elements

USB type A connectors: connection to USB devices   On/Off switch   LEMO 8-pin connector: additional playback devices

USB type B host connector: connection to a computer   LEMO 4-pin: power supply   D-Sub 9-pin: connection to CAN FD   USB type A service interface

Configurations

The following configurations demonstrate the versatility and simplicity with which commonly used simulation scenarios can be realized using HXB-PreSense and the PreSense software[1]. All simulation scenarios can be extended by additional headphones via playback hardware, such as *lab*P2/ *lab*P2-V1 (code 3732/3732-V1).

Desktop simulator – preparing an evaluation

A desktop simulator in your office can serve several purposes. For example, as a testing and configuration bench where you prepare all parts of the simulation in the quite of your office and transfer them to the actual simulator once they are finalized. Furthermore, a desktop simulator can be used, for example, to perform simulations right at your desk, assess the NVH properties of a virtual prototype, or perform a virtual test drive. All this without leaving your office. All necessary hardware, such as headphones, a steering wheel, and pedals are connected to HXB-PreSense via the respective connectors. HXB-PreSense transfers the control commands from the steering wheel and the pedals to the PreSense software and in turn plays back the simulated sounds via your headphones.

Mobile simulator – real-time data based simulation

In a mobile scenario, real-time vehicle CAN FD data can be integrated into the simulation. This enables you to determine the current vehicle operating states such as speed and engine rpm via CAN FD and use them to control the sound generation in the PreSense software. The computer and HXB-PreSense are supplied via a power station, for example, the Ecoflow Delta Power Station.

SoundSeat integration – concentrating on the essential

SoundSeat (code 7040) is designed as a multi-modal playback system for vehicle interior noise and combines airborne and structure-borne playback with vehicle controls. HXB-PreSense can be used together with SoundSeat enabling you to play back sounds simulated by the PreSense software through SoundSeat. For this, HXB-PreSense is connected via USB to the computer running the PreSense software. The headphones are connected to HXB-PreSense and the SoundSeat shakers are connected to *lab*O2 (code 3731). HXB-PreSense is powered via the SoundSeat rack using the included power supply.

Vehicle simulator – immersive experience

In a vehicle simulator, HXB-PreSense combined with additional playback equalizers for shakers is used as a subsystem to increase the simulator immersion by providing high quality sound and vibration. HXB-PreSense is connected to a computer running the PreSense software. A connected CAN FD bus system or a software interface delivers real-time vehicle operating states for the NVH simulation. *lab*O2 equalizers are connected via HEAD*link*+ as a cascade to HXB-PreSense enabling playback via shakers and loudspeakers. A *lab*P2 equalizer can be added to connect additional headphones.

1   Some scenarios require optional hardware which is not included with HXB-PreSense.

Technical data

General

Ports	2 x jack 6.3 mm (headphones); 1 x USB type B (host connector); 2 x USB type A (peripherals); 1 x LEMO 4-pin (Power In); 1 x D-Sub 9-pin (CAN FD); 1 x LEMO 8-pin (HEAD*link*+); 1 x USB type A (Service)
Supply voltage	10 V – 28 V
Power consumption	10 W
Bandwidth	0 Hz – 20 kHz
Sampling rates	32 kHz, 44.1 kHz, 48 kHz
S/N	104 dB(A)
THD+N	-92 dB(A) at -6 dB_{fs}
Frequency response	0.04 dB (20 Hz – 20 kHz) at F_s = 48 kHz
Crosstalk at 1 kHz at 10 Hz – 20 kHz	 110 dB(A) 105 dB(A)
Cooling	Convection, fan-less
Dimensions (WxDxH)	327 x 188 x 47 mm
Weight	2.25 kg
Operating temperature	10 °C – 60 °C (50 °F – 140 °F)
Storage temperature	-20 °C – 70 °C (-4 °F – 158 °F)
Max. HEAD*link* cable length	60 m

Headphones output

Number of channels	2
Form factor	Jack 6.3 mm
Output impedance	10 Ω
Max. output level	8.86 V_{eff}; corresponds to 119 dB_{SPL}
Nominal level	0.5 V_{eff}; corresponds to 94 dB_{SPL}
Load impedance	≥100 Ω
Max. output power	1.2 W per channel

HEAD*link*+

Number of channels	1
Form factor	LEMO 8-pin
Power supply for one additional device (*lab*O2, *lab*O2-V1, *lab*P2, or *lab*P2-V1)	

CAN FD

Number of channels	1
Form factor	D-Sub 9-pin
CAN specification	ISO 11898-2, High-speed CAN 2.0A/2.0B und FD
Bit rates CAN CAN FD	 25 kbit/s – 1 Mbit/s 25 kbit/s – 12 Mbit/s