HEAD acoustics

DATA SHEET

APPLICATION EXAMPLE INCLUDED

Code 7791

# coreA2B-Basic

***lab*CORE I/O Board, A²B® Interface (up to 32 Channels)**

# OVERVIEW

## coreA2B-Basic

### Code 7791

*lab*CORE I/O Board, A²B Interface (up to 32 Channels)

*core*A2B-Basic is a *lab*CORE extension board for connecting to any Automotive Audio Bus® (A²B®). The board enables *lab*CORE to connect to A²B in four selectable modes.

*core*A2B-Basic is the basis for all A²B applications with *lab*CORE. It includes the board as hardware component as well as basic application within the A²B bus. It can represent the main node or a sub-node in the bus system. Additionally, *core*A2B-Basic can also be used as an A²B evaluation board, enabling to use all capabilities of analyzing and manipulating signals in ACQUA.

*core*A2B-Basic is extendable by two optional applications. *core*A2B-Proxy enables receiving and inserting customized signals from/into a fully-operational bus. Hence, *lab*CORE including *core*A2B-Basic and *core*A2B-Proxy gains full control over any signal on the bus without any need for its reconfiguration. Further, there is *core*A2B-Bus Monitor which enables to monitor signal traffic on the bus ("sniffing").

ADI A²B®
AUTOMOTIVE AUDIO BUS

## KEY FEATURES

Testing of built-in and aftermarket hands-free systems, wired and wireless headsets used in vehicles

Recording and digital injection of background noise via A²B

Operating up to two *core*A2B-Basic boards with *lab*CORE

## APPLICATIONS

Experimental development and optimization of vehicle hands-free terminals with objective evaluation of sound quality

Optimizing positioning of hands-free microphones and loudspeakers in vehicles

Testing and design verification of A²B buses and devices

Measuring and manipulating data on A²B buses

Inserting and receiving configuration and audio data into/from A²B buses

Developing new A²B configurations and devices

Troubleshooting existing A²B buses and devices

# DETAILS

Automotive Audio Bus is a digital bus system for vehicles developed by Analog Devices. It is designed to transmit audio data, control commands, and other information between audio devices across a two-wire bus system. A²B connects all devices (nodes) in a daisy chain configuration. This significantly reduces the amount of wiring required for the complex audio systems of modern vehicles with multiple amplifiers, microphones, and loudspeakers.

## DESCRIPTION

A²B is a duplex system. The main node can distribute data to sub-nodes and sub-nodes can send data to the main node. Thus, a sub-node can be a sink, e.g., an amplifier for a loudspeaker, or a source, e.g., a microphone. Additionally, it is possible to exchange status data and other information across the bus. Having access to the bus is vital for performing comprehensive tests and measurements in a vehicle with an A²B system.

*core*A2B-Basic is the basis for four application modes to connect to any A²B bus:

- Main node mode
- Sub-node mode
- Proxy mode (requires the *core*A2B-Proxy upgrade option, not included in *core*A2B-Basic)
- Bus monitor mode (requires the *core*A2B-Bus Monitor upgrade option, not included in *core*A2B-Basic)

The desired mode is selectable via the ACQUA interface. It shall be selected according to the customized integration of *core*A2B-Basic into the present bus system. Furthermore, *core*A2B-Basic can be used as an A²B evaluation board, enabling to use all capabilities of analyzing and manipulating signals in ACQUA.

The table below indicates individual requirements and features of each application mode.

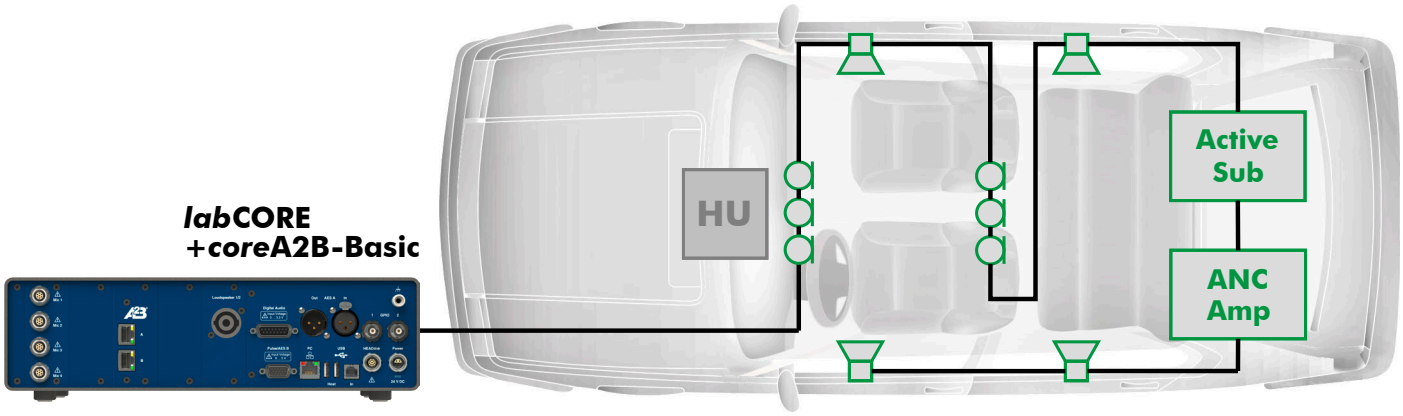
| **Mode** | **Requirements** | | | **Features** | | | |
|---|---|---|---|---|---|---|---|
| | | | | Configuration data | | Audio data | |
| | Bus configuration has to be accessible | *core*A2B-Basic takes node position | Position on bus | Insert | Receive | Insert | Receive |
| Main node mode | Yes | Yes | Main node | ✓ | ✗ | ✓ | ✓ |
| Sub-node mode | Yes | Yes | Sub-node | ✗ | ✓ | ✓ | ✓ |
| Bus monitor mode | Only sniffing bit | No | Arbitrary[1] | ✗ | ✓ | ✗ | ✓ |
| Proxy mode | No | No | Arbitrary[1] | ✓ | ✓ | ✓ | ✓ |
| Evaluation board | n/a | Yes | Main node | ✓[2] | ✗ | ✓ | ✓ |

1 Due to the design of A²B buses, *core*A2B-Basic can only access data of downstream sub-nodes. Thus, it is recommended to establish the connection between the main node and the first sub-node in order to access all data on the bus.
2 Via the freely available Analog Devices SigmaStudio® software tool.

# MODES

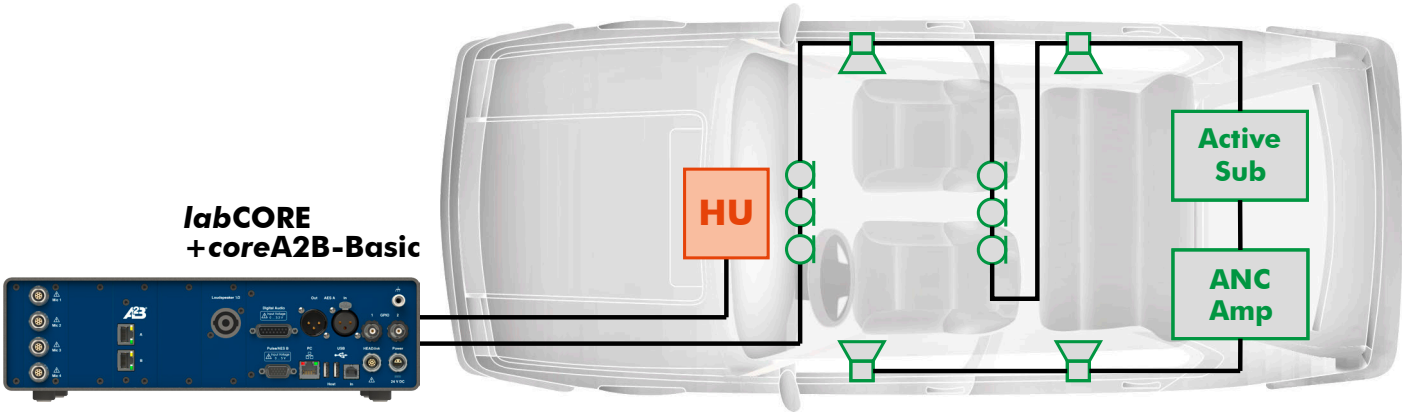
## Main Node Mode

In main node mode, *lab*CORE with *core*A2B-Basic replaces the bus main node (e.g., head unit) and thus takes control over the bus. It is able to insert and receive audio data into/from the bus and can insert configuration data for sub-nodes. Up to ten sub-nodes can be connected. The bus configuration has to be accessible. Setup is performed via a configuration file exported from the Analog Devices SigmaStudio® software tool. *core*A2B-Basic supplies bus-powered sub-nodes. Externally powered sub-nodes may require manual triggering to ensure power supply.




## Sub-Node Mode

In Sub-node mode, *lab*CORE with *core*A2B-Basic replaces one sub-node on the bus. It is able to insert and receive audio data into/from the bus and can receive configuration data from the bus main node. The bus configuration has to be accessible. *core*A2B-Basic shall be added to the bus as a new sub-node in the configuration file. It can be inserted at any position on the bus, taking one of the ten sub-node positions.

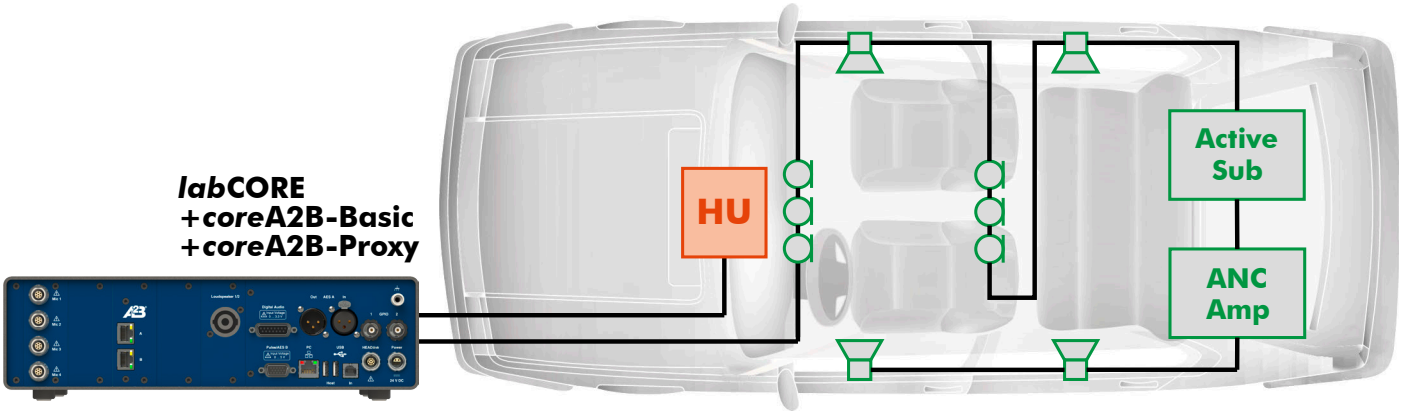



## Evaluation Board

In conjunction with an adapter cable, *core*A2B-Basic can also serve as an evaluation board for $A^2B$. Setup of the bus is performed via the Analog Devices SigmaStudio™ software tool. As an evaluation board, *core*A2B-Basic operates in main node mode and enables to use all capabilities of analyzing, filtering, and manipulating signals that ACQUA offers. The board enables to examine, measure, test, manipulate, and perform design verification of $A^2B$ buses and devices.

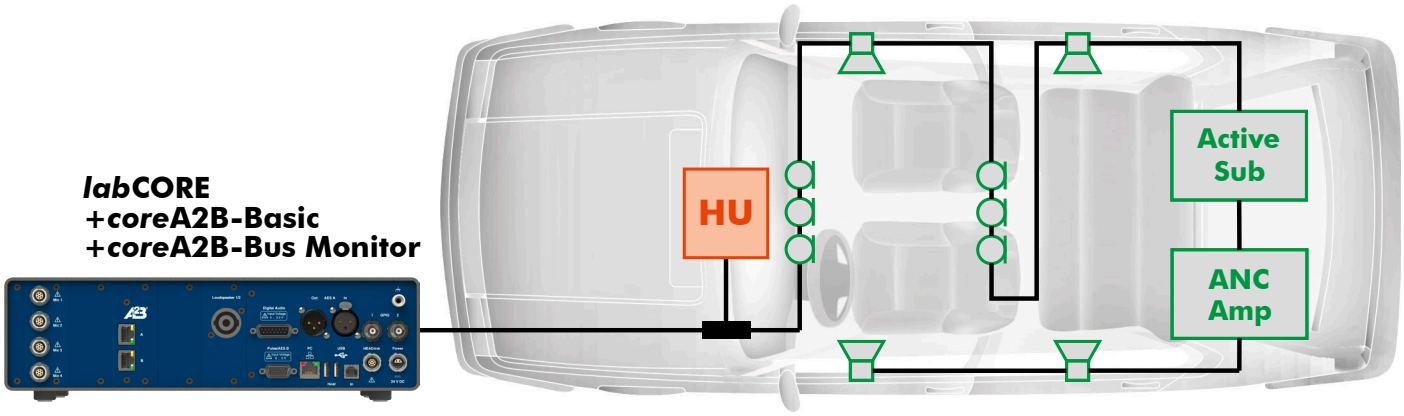
## Proxy Mode

The proxy mode is the most versatile mode and requires the *core*A2B-Proxy upgrade. It enables receiving, mixing, and inserting arbitrary signals into the bus without interference with the original, unaltered signal. The board can be connected anywhere on the bus (preferably between main node and first sub-node) and taps into its audio and $I^2C$ data. The bus does not require any reconfiguration.




## Bus Monitor Mode

The bus Monitor mode requires the *core*A2B-Bus Monitor upgrade. It enables to monitor the configuration and audio data on the bus with ACQUA. Therefore,  inserting any data into the bus is impossible, but no node position on the bus is occupied. The configuration of the bus does not have to be accessible. However, the sniffing bit of the bus has to be activated. This mode enables analyzing data traffic on the bus without interference, e.g., for troubleshooting an existing bus configuration.



# OPTIONS

*core*A2B-Bus Monitor (Code 7792)
- › *lab*CORE bus monitor mode for A²B, option for A²B (*core*A2B-Basic required)

*core*A2B-Proxy (Code 7793)
- › *lab*CORE proxy mode for A²B, Option for A²B (*core*A2B-Basic required)

Alternative to *core*BUS if *lab*CORE shall be extended only with the *core*A2B-Basic extension board:
- › *core*BUS One (7711)
  - » *lab*CORE I/O bus mainboard, supporting only one extension board

# EQUIPPING

*lab*CORE supports the operation of up to two *core*A2B-Basic boards. The optional upgrades have to be acquired for each *core*A2B-Basic board individually if the features are desired.

The upgrades are delivered as license files for *lab*CORE. Each license file has to be installed on *lab*CORE via the *lab*CORE options in ACQUA.

# GENERAL REQUIREMENTS

## Hardware

*lab*CORE (Code 7700)
- › Modular multi-channel hardware platform

*core*BUS (Code 7710)
- › *lab*CORE I/O bus mainboard

## Software

One of the following software applications:

ACQUA (Code 6810)
- › Advanced Communication Quality Analysis Software, full license version

ACQUA Compact (Code 6860)
- › Compact test system

RC-labCORE (Code 6984)
- › Remote control software for *lab*CORE

# SCOPE OF DELIVERY

*core*A2B-Basic (Code 7791)
- › *lab*CORE I/O board, A²B Interface (up to 32 channels), hardware + main-/sub-node mode

CSR I (Code 6110)
- › Cable set (2 × RJ45 <> Molex DuraClik, 1 × RJ45 evaluation adapter) for *lab*CORE board *core*A2B-Basic

Initial equipping
- › *core*A2B-Basic is installed to *lab*CORE during production

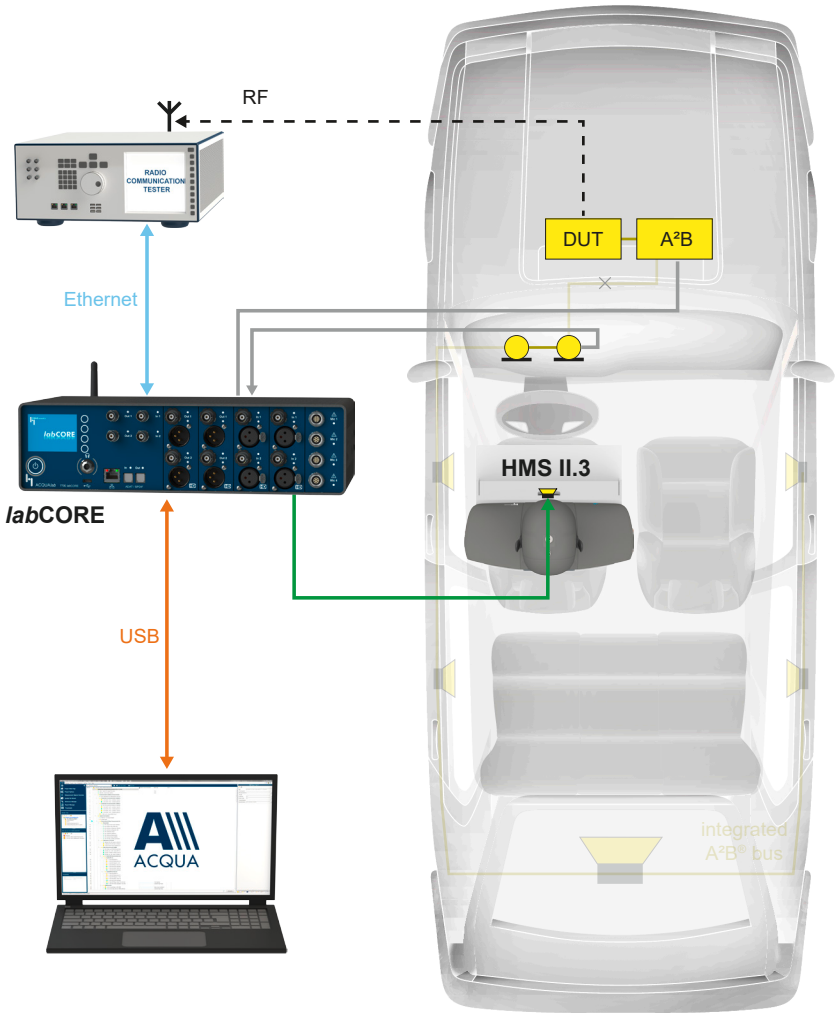
Retrofitting
- › Send in *lab*CORE to HEAD acoustics for installation

# IN PRACTICE

## APPLICATION EXAMPLE

### Speech Quality Measurement with Digitally Injected Background Noise

*lab*CORE includes *core*A2B-Basic and *core*A2B-Proxy. It connect to the A²B bus of the vehicle between the head unit (main node) and the microphones (sub-nodes). Background noise has been recorded with the microphones in the vehicle beforehand. A speech signal is played back by HMS II.3. This acoustic signal is picked up by the microphones and routed through the A²B board of *lab*CORE. ACQUA digitally injects the previously recorded background noise to the acoustic signal of the microphones. Then, the mixed signal is transmitted to the head unit and further via a radio tester to *lab*CORE and ACQUA for analysis. The head unit has received and processed a degraded mixed signal and applied its noise canceler to enhance the signal. Therefore, the effect of the noise canceler on the speech signal can be evaluated by the 3QUEST algorithm in ACQUA.



Automotive Audio Bus® (A²B®) is a trademark of Analog Devices, Inc.
SigmaStudio® is a trademark of Analog Devices, Inc.
DuraClik™ is a trademark of Molex, LLC.

HEAD acoustics

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