Vehicle A2B Signal Testing Solution Based on DAQ System

All-in-One DAQ Solutions at Doewe Technologies

Doewe Technologies Application Notes-048-V1.0

https://www.doewe.com

1. Introduction

2. Introduction to Vehicle A2B Equipment

3. Specific Testing Solution

3.1 Test System

The test system uses a customized PXIe chassis with a compact structure that can be installed under the front passenger seat, providing high-performance data acquisition and processing without disrupting cabin layout. During testing, vehicle A2B audio signals are first routed to the A2B acquisition card for precise multi-node signal acquisition and synchronized analysis. Simultaneously, the rain sensor connects to the controller's USB port via a UART-USB converter, enabling compatibility conversion for accurate environmental data parsing. The test system schematic is shown below:

供电

显示模块

供电

供电模块

数采系统

供电

A2B音频数据

车载A2B模块

视频信号

摄像头

车速/时间/GPS等数据

GPS定位模块

UART转换器

UART数字信号

车载雨量传感器

Figure 1 Test System Schematic

Additionally, the system includes a GPS module and dual cameras to record vehicle speed, location, acceleration data, and interior/exterior environmental conditions. One camera is installed inside the cabin to capture cabin conditions and potential audio interference factors, while another is mounted at the front to record external environmental changes during driving, providing comprehensive references for data analysis. Real-time monitoring and analysis are performed via a touchscreen display connected to the DAQ system, allowing testers to observe signal quality, environmental impacts, and test progress.

All devices are powered by a power module supplied by the vehicle voltage converter, ensuring long-term stable operation. Throughout the testing process, the DAQ system not only efficiently acquires vehicle A2B signals but also provides reliable support for real-world driving analysis through synchronized environmental data recording.

3.2 ASMC Analysis Software

The ASMC analysis software is the core of this solution, responsible for real-time monitoring, processing, and visualization of acquired data. Developed in-house and optimized for vehicle A2B signal testing, it delivers efficient data analysis during driving. The software supports real-time monitoring and data recording, enabling testers to view A2B audio signals, GPS data, environmental sensor data, and camera feeds while storing them in real time. It also features anomaly detection and alerting, automatically identifying signal abnormalities based on speed and location data to prompt timely adjustments.

For data analysis, ASMC software supports multi-dimensional data synchronization and visualization. It evaluates A2B signal transmission stability, synchronization accuracy, and environmental impacts through spectrum analysis, signal comparison, and waveform playback. User-friendly functions like one-click data tagging and pausing enhance operational efficiency. The software also allows data trimming and filtering based on speed, time, or GPS paths, enabling automated export to streamline subsequent analysis.

Deep integration with the PXIe DAQ system allows this solution to deliver high-precision, efficient data acquisition and analysis in real driving environments, providing robust support for A2B system optimization, fault diagnosis, and performance evaluation. The software interface schematic is shown below:

Figure 2 Software Interface Schematic

3.3 Testing Methodology

3.4 Solution Analysis

4. Core Test Equipment

This solution employs a high-performance DAQ system to ensure precise acquisition, storage, and analysis of A2B signals and environmental data. The system primarily consists of a PXIe storage card, PXIe controller, A2B acquisition card, and ASMC analysis software. Each component plays a critical role in ensuring data integrity, real-time performance, and efficient processing.

4.1 PXIe Storage Card

The PXIe storage card handles high-capacity data storage for long-duration, high-speed recording. Utilizing NVMe protocol, it offers high throughput and low latency within a compact PXIe chassis. Its host interface is PCI Express X8 GEN3, supporting up to 8GB/s data bandwidth to meet high-precision storage demands for A2B signals

and environmental data. With sustained write speeds exceeding 6GB/s, it ensures data integrity and real-time acquisition. Compatible with Windows OS, it delivers efficient data access.

Figure 3 Storage Card

4.2 PXIe Controller

The PXIe controller serves as the central computing unit for data processing, synchronized analysis, and communication management. Equipped with a high-performance processor and multi-threading capabilities, it handles large-scale data processing and multi-tasking. Standard with high-capacity DDR4 RAM (expandable as needed) and SSD storage (scalable for long-duration recording), it features multiple USB ports and Gigabit Ethernet interfaces for data transfer and device expansion. Compliant with PXIe specifications, it operates stably under harsh automotive environments (high temperature/vibration), providing efficient and reliable computational support.

Figure 4 Controller

4.3 A2B Acquisition Card

The A2B acquisition card is the key module for high-precision acquisition and real-time processing of vehicle A2B signals. Designed as a PXIe module, it supports high-resolution, high-sampling-rate acquisition and synchronized multi-channel processing of multiple A2B nodes. Compliant with A2B bus master/slave testing standards, it precisely measures transmission quality, clock synchronization, and environmental interference impacts. Its high-precision acquisition capability ensures audio signal integrity and low-latency transmission for complex in-vehicle audio systems.

Figure 5 A2B Acquisition Card

5. Conclusion

The vehicle A2B signal testing solution based on the DAQ system, proposed by Doewe Technologies, enables precise monitoring and analysis of A2B signal transmission stability, synchronization accuracy, and environmental impacts during actual vehicle operation. This comprehensively evaluates the stability and reliability of in-vehicle A2B audio systems.

Implementing this solution overcomes the limitations of traditional laboratory testing, enabling in-depth study of A2B signal integrity, anti-interference capability, and transmission characteristics under dynamic driving conditions. It provides reliable data support for optimizing in-vehicle audio systems, enhancing performance, and enabling engineering applications, driving further advancement of A2B technology in intelligent vehicles.

Doewe Technologies is always committed to achieving innovative, unique, and reliable product solutions in the field of data acquisition. We deeply understand that these elements are the cornerstone for enterprises to establish themselves in market competition. For this reason, we derive innovative inspiration from customers' real application needs, rather than merely showcasing flashy product features. By continuously optimizing and enhancing data acquisition solutions, Doewe Technologies empowers partners to move towards an efficient and precise future. Welcome to choose Doewe Technologies and together embark on a new chapter in data acquisition. Contact Tel: +86-10-64327909.