CASE STUDY

PLIN-USB accelerates the development of climate control units

Solution: PLIN-USB Interface
Country: Japan
Industry: Automotive

Validation booster for LIN-based development of climate control panels

One of Asia's leading automakers set out to make the development of its next generation of climate control units more powerful and cost-effective. However, during the development and validation phase of a completely new vehicle platform, the development team discovered significant technical challenges in analyzing and reproducing the LIN (Local Interconnect Network) communication between various electronic control units (ECUs), particularly between the Body Control Module (BCM) and the new climate control unit. The validation methods used up to that point did not provide a reliable view of the bus communication. This made it difficult to understand and optimize the behavior of individual components under real-world operating conditions. The engineers therefore needed a new tool that would allow them precise, real-time insights into the LIN communication defined by the LDF file.

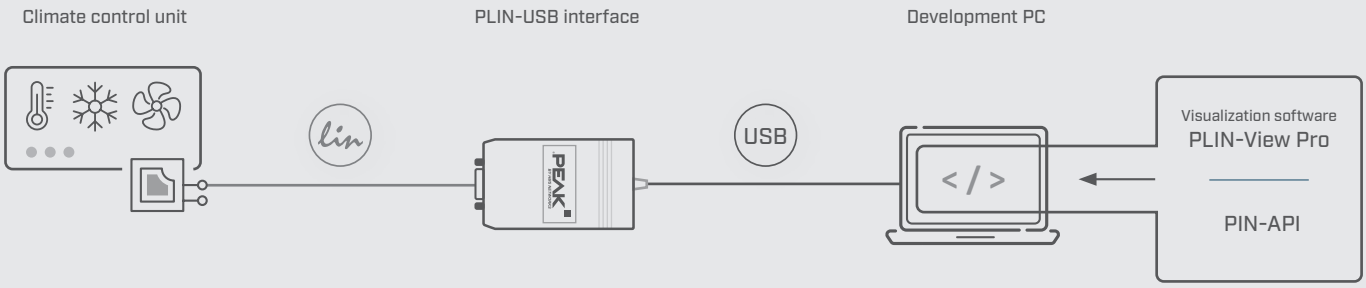
THE CHALLENGE: LACK OF TRANSPARENCY IN LIN DATA TRAFFIC

The development team's main task was to analyze the existing LIN communication of the current climate control system and adapt it for new vehicle functions. This involved integrating enhanced multi-zone control, adaptive airflow control, and automated temperature sensor calibration – all while validating changes in real time. The biggest challenge lay in the lack of real-time transparency of the existing LIN frames between the central control unit and the climate control unit. Previously, the developers had to record the data traffic to identify the signal structures, identifiers, and data bytes. Only in this way could they trace which information regarding temperature, fan speed, air distribution, or recirculation control was actually transmitted and compare it to the LDF specification. Furthermore, components in the existing system used different LIN protocol versions. While some modules were still based on LIN 1.3, others already used LIN 2.x with enhanced checksum logic and diagnostic functions, leading to misinterpretations and communication failures.

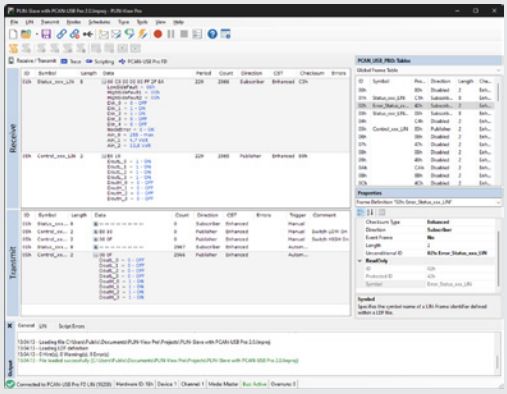
These tasks required a PC-based interface that could perform master, slave, or monitor functions.

CUSTOMER BENEFITS

- Faster development: Precise LIN analysis significantly shortens test and validation cycles.
- High reliability: Accurate timestamps and stable communication ensure dependable results.
- Easy integration: Thanks to plug-and-play functionality and an open API, the interface integrates seamlessly.
- Flexible use: The same tool can be used in the lab and in vehicles without modification.



The previously used in-house solutions based on simple microcontroller boards were unsuitable. They offered neither stable communication nor accurate timestamps and therefore provided insufficient data for reliable analysis. Since validation was performed both on the test bench and in the prototype vehicle, the hardware also had to be compact, robust, and easy to install.



PLIN-View Pro

BETWEEN DEVELOPMENT PC AND CLIMATE CONTROL: THE PLIN-USB INTERFACE

To meet these requirements, the company opted to implement the PLIN-USB interface from PEAK-System. This interface combined, for the first time, a high-performance LIN interface with the flexibility of a USB connection, allowing it to be integrated into the existing development environment. The validation system consisted of a development computer running the PLIN-View Pro software. The computer was directly connected to the LIN bus via the PLIN-USB interface.

Both the BCM simulator (acting as the LIN master) and the prototype climate control unit (acting as the LIN slave) were connected to the bus. PLIN-View Pro displayed and recorded the transmitted messages, identifiers, and data bytes. The software allowed for filtering communication, analyzing frame structures, and graphically displaying signal waveforms. Furthermore, the engineers used the PLIN API to program automated validations in Python. This enabled them to selectively send, modify, or re-repeat LIN messages to verify the behavior of the control units under defined conditions. This ability to not only passively observe messages but to actively intervene in data traffic proved to be a crucial advantage.

FASTER AND MORE RELIABLE: AN OVERVIEW OF THE PLIN-USB INTERFACE

The PLIN-USB is a compact, robust USB-to-LIN interface that supports LIN 1.3 to 2.2A and can be operated as a master, slave, or monitor. It complies with ISO 17987-4, offers data rates up to 20 kbit/s, precise timestamps, and is powered directly via USB. The free tools PLIN-View Pro and the PLIN-API (both included) allow for flexible integration of the interface into development and test environments.

“With the PLIN-USB, we were able to completely reconstruct the communication between the master and slave and document it in a database,” explains Holger Adamiak, Technical Support at PEAK. “Fault analyses that previously took days were reduced to just a few hours. At the same time, the system could be easily used between the lab and the vehicle environment, as no complex reconfiguration was necessary. That‘s what ultimately convinced the customer.”

By using PEAK-System‘s compact interface, the automotive manufacturer was able to significantly optimize its development processes for climate control units. The interface provided developers with complete transparency regarding LIN communication and enabled precise analysis and real-time simulation of bus behavior. Engineers benefited from significantly higher reliability of measurement data and a reduced development time.

FURTHER INFORMATION IS AVAILABLE AT
www.peak-system.com