



## CASE STUDY

# Future-proof and cost-effective PC connection of test systems

Solution: PCAN-USB Pro FD interface

Country: Germany

Industry: Automotive



## Flexible hardware-in-the-loop (HiL) testing for radar control units

### OVERVIEW

A leading German automotive supplier faced the task of efficiently and reliably testing a new radar control unit. The manufacturer of driver assistance systems such as adaptive cruise control (ACC) and emergency braking (NCC) must meet the highest safety and reliability requirements. Therefore, these safety-critical systems must be comprehensively tested in the early development phases. At the same time, the test environment had to be flexible, cost-effective, and usable by multiple teams in parallel. This application report highlights the use of the PCAN-USB Pro FD interface as a connection between the radar ECU and the test PC.

### THE STATUS QUO: EXPENSIVE, RIGID, AND SLOW TESTING PROCEDURES

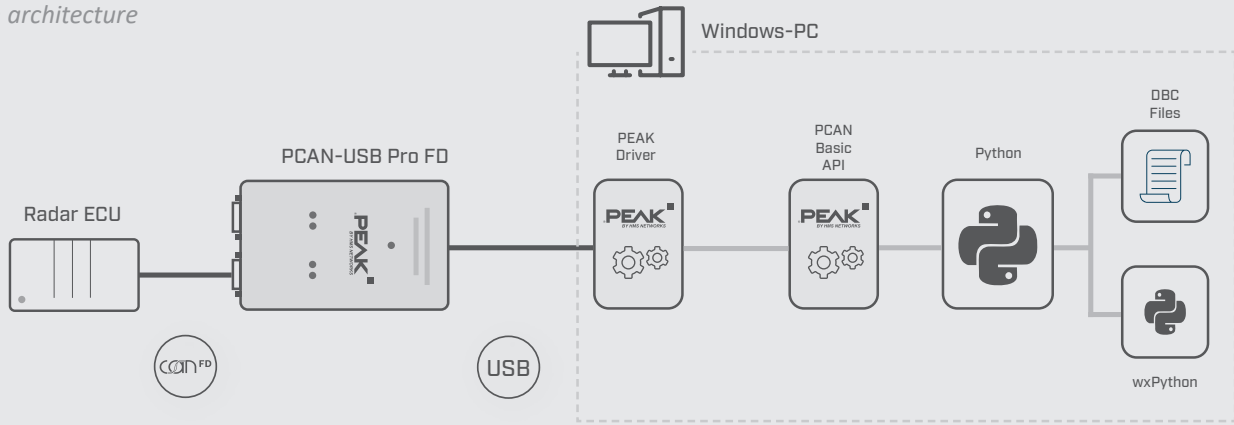
The previous HiL test benches were very expensive to purchase and operate, and only available in limited numbers. Furthermore, they were technically difficult to adapt, meaning new test ideas and last-minute adjustments could only be implemented with considerable effort. This situation led to bottlenecks in validation and delayed the development process. For developers, this meant that tests could not be conducted with the required breadth and depth, which compromised both the quality of the results and the speed of the driver assistance system's market launch.

### THE SOLUTION: STANDARDIZED HARDWARE AND EXTENSIBLE SOFTWARE

To overcome these challenges, a hardware-in-the-loop system was developed based on standardized hardware and flexibly expandable software. The core of the solution is the PCAN-USB Pro FD interface, which connects the radar control units directly to a test PC via USB. The PC runs specially developed test software under Windows, simulating typical driving maneuvers such as acceleration, braking, steering, and the functions of the adaptive cruise control system. The corresponding signals are transmitted to the control units via the CAN FD bus, while a DBC parser ensures correct signal interpretation.

### CUSTOMER BENEFITS

- ✓ Cost-effective testing through standardized hardware instead of expensive HiL systems
- ✓ Flexible adaptation to new scenarios and automated processes
- ✓ High future-proofing thanks to CAN FD, LIN, and backward compatibility
- ✓ Reliable operation thanks to robust design and galvanic isolation



Reliable and secure communication between the radar ECU and test software: The PCAN-USB Pro FD serves as a flexible interface.

In addition, the developers use the PCAN-Basic API to implement automated test sequences in Python. A graphical interface visualizes the results in real time and enables convenient operation. The result is a realistic simulation environment in which developers can precisely test the behavior of the radar control units under various conditions – and at a significantly lower cost and greater flexibility than conventional HiL systems.

## ROBUST AND FLEXIBLE USB CONNECTION THANKS TO PCAN-USB PRO FD

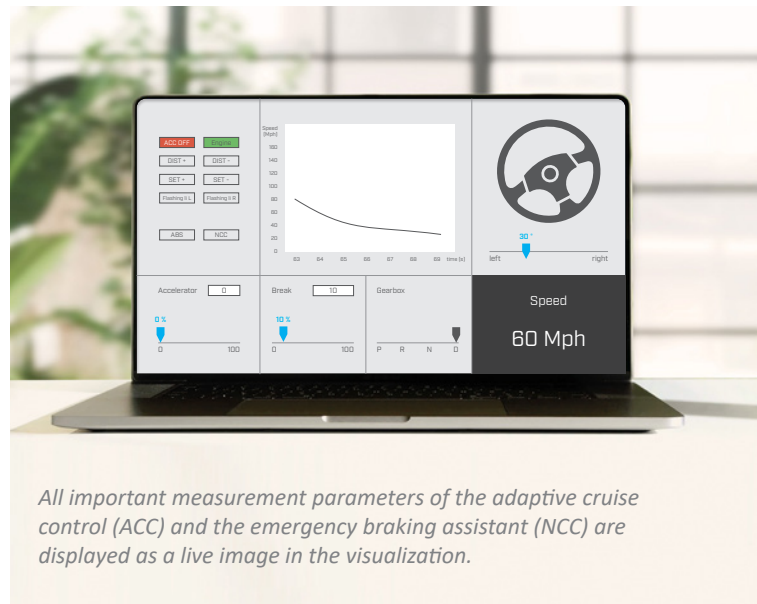
The key advantage of the PCAN interface lies in its combination of flexibility and robustness. The simple USB connection with plug-and-play functionality allows for mobile use without complex installations. With support for CAN and CAN FD (there are now variants for CAN XL), the solution is ready for both current and future vehicle generations.

The USB-to-CAN interface enables the simultaneous connection of multiple fieldbuses: two CAN FD and two LIN, all simultaneously with the appropriate connecting cables. Each CAN FD channel is galvanically isolated (up to 500 V) – compared to USB and LIN – making it ideal for industrial or mobile test applications. The robust aluminum housing ensures high mechanical stability and durability, ideal for daily use in the lab or in the field.

Thanks to the CAN FD standard, up to 64 bytes of user data can be transmitted per frame, at data rates of up to 12 Mbit/s. At the same time, full backward compatibility with classic CAN (CAN 2.0) is maintained, making existing networks seamlessly usable. Another strength lies in precise time measurement: The timestamp resolution of 1  $\mu$ s enables highly accurate analysis when sending and receiving messages. Termination and an optional 5 V supply (for example, for external converters)

can be flexibly configured via solder jumpers. This flexibility makes the device easily adaptable to specific test setups. Furthermore, the free PCAN-Basic programming interface allows for seamless integration of customer-specific test software – ideal for comprehensive automation of test processes.

By using the PCAN-USB Pro FD interface, the automotive supplier was able to significantly expand its testing capacities while reducing costs. Development cycles were shortened because tests could now be performed faster and with greater flexibility. The solution proved to be scalable, reliable, and future-proof and is now an integral part of the validation of driver assistance systems.



All important measurement parameters of the adaptive cruise control (ACC) and the emergency braking assistant (NCC) are displayed as a live image in the visualization.

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