Storing entire test drives

Intelligent, systematic data acquisition

Electronics are the neural system of modern vehicles. Increasingly, electronic systems operate in connected environments and control safety-relevant functions – and that makes them even more complex to develop, calibrate, and validate. Developers need to come up with viable solutions that can keep pace with future developments. One promising approach is to systematically collect data from vehicle systems: Used intelligently, this data can render some test drives unnecessary, as well as facilitating collaboration between teams spread across different locations.

Improvisation is the name of the game in demonstrator vehicles. Piles of measurement hardware fill the trunk, connected by a tangled mass of cables that often leads to an off-the-shelf laptop on the passenger seat. This kind of setup is acceptable up to a point, but its flaws become evident once you start performing winter tests in arctic temperatures. Even in less extreme conditions, this improvised set of hardware poses a very real risk of cables coming loose or data recording being interrupted for some other reason during the test drive. With development cycles for new models running to ever tighter deadlines – and limited time available to spend on expensive hardware prototypes – these kinds of errors simply shouldn't be allowed to happen.

Given the growing number of ECUs and the increasing importance of electronically controlled vehicle functions, well-designed measuring equipment is crucial. As well as ensuring reliable measurements in any temperature range, it must stand up to vibrations and mechanical shocks and offer interfaces for all buses and networks commonly used in modern vehicles. It also needs to be compatible with existing measurement and diagnostic tools to enable calibration and test engineers to seamlessly integrate the new equipment into their standard processes.

Based on stable hardware designed for automotive use

For some time now, ETAS has been actively developing these kinds of reliable hardware solutions to provide a professional basis for testing in the lab, on the test bench, and in test vehicles. These solutions are specifically designed for automotive use, and they work at any temperature, from arctic cold (-40 °C) to tropical heat (+70 °C). A uniform, robust housing with a plug-in connection ensures clear, uncluttered integration. Stacking the modules one on top of the other ensures a reliable shared power supply and internal Ethernet data connection, minimizing wiring work and simultaneously solving issues such as synchronization, wake-up and shutdown. When cables do have to be plugged in, their connections are secured by robust LEMO connectors. The hardware modules also come with a PCI Express bus system.

The ETAS ES820 Drive Recorder is one of the latest additions to the strictly modular ES800 hardware family. Replacing an on-board laptop or INCA PC, it records all data and signals from ECUs, buses, networks, sensors, and measuring instruments for over 22 hours. Recording can begin when the engine starts; alternatively, it can be preprogrammed for certain measurement durations or trigger mechanisms, or initiated by the developers on a situational basis. Since the Drive Recorder – like all the hardware family modules – is compatible with ETAS INCA, developers and calibration engineers can design, test, and modify these mechanisms directly in whichever standard tool they prefer before putting them to use in the Drive Recorder. The advantage is that they can stick to familiar processes while gaining access to a whole host of additional functions for validating future development projects.

Full support for seamless processes

Validating the increasingly complex interaction between connected electronic vehicle systems is a major undertaking that requires drastic increases in the amount of testing and measurement work. Comprehensive documentation is essential, since many of the systems are relevant for the safety of vehicle occupants and for type approval. Fortunately, the ES820 Drive Recorder makes it easy to fulfill these requirements. Thanks to an exchangeable storage system with a capacity of up to one terabyte, the ES820 can capture all the data and measurement signals from an entire test drive and easily copy the results to the relevant in-house networks. The measurement data can be copied across at 200 megabytes per second using a suitable docking station. That means a full one terabyte hard disk can be ready for its next job in 30 minutes or less, and the specialists

in the various departments involved can access the data immediately. This interchangeable system also enables seamless operation across multiple layers with different hard disks, paving the way for faster, more in-depth validation and eliminating delays between test drives and analysis.

Memory module and docking station

To facilitate comprehensive datalogging on all channels, the ES800 system has connectors for ETK, FETK, and XETK interfaces, as well as all standard vehicle buses. That makes it easy to expand the system by connecting CAN, CAN FD, FlexRay bus, and Automotive Ethernet to the ES820 via its USB ports. All this is backed by a powerful Intel i5 processor and 4 gigabytes of working memory to ensure fast data processing. These specifications allow the Drive Recorder to be seamlessly integrated into existing toolchains and provide a good basis to meet future needs, particularly in view of new legal requirements – such as measuring real driving emissions (RDE) – which will see even sharper increases in the depth and complexity of measurement and validation processes.

The ES820 Drive Recorder supports this option through the simultaneous multi-recording of multiple vehicle functions. To achieve this, an ensemble of measurement signals and various start and stop triggers can be assigned to each individual recorder. The recorders then run in parallel, storing the respective data in separate measurement data files at rates of up to 13 megabytes per second – a largely automated process that captures and records a comprehensive snapshot of in-vehicle processes. This is facilitated by four digital inputs and outputs on each device; the inputs can be used as triggers or markers, and the outputs for displaying system status and event messages.

Stacking the modules one on top of the other ensures a reliable shared power supply and internal Ethernet data connection

Broad basis for intelligent reuse of measured data

The broad range of data captured synchronously by the ES800 family of products facilitates precise, in-depth validation. Combined with deep learning and big data methods, it also paves the way for the intelligent reuse of measured data.

Recording this data end-to-end will create an increasingly comprehensive database as each project is completed. This will give users ever deeper insights into development and calibration, resulting in faster and more reliable validation. Systematically reusing data and executing measurement tasks in parallel reduces both overhead time and the need for expensive test vehicles.

ES800 stack
consisting of ES820 and ES891

INCA-TOUCH interface

INCA-TOUCH promises user-friendly operation and advanced connectivity

With its advanced functions, the ES820 Drive Recorder will replace the laptops and displays currently used in the field. That's good news, because operating laptops and similar devices during test drives can pose a serious safety risk. To ensure that users can nevertheless keep track of processes and interact with the measuring system even while on the road, the best choice is to combine the ES820 with the ETAS solution INCA-TOUCH, which enables INCA to be operated via a touchscreen or using voice commands. The values measured by the Drive Recorder can also be shown on the display. This solution has been available since the end of 2018.

As well as user-friendly operation, another key factor is connectivity. Just like so many other devices, measurement and diagnostic systems are part of an increasingly connected world. Modern vehicles, whether on the road or online, are also deeply embedded in the global flow of data. In the context of the new Drive Recorder, this connectivity will enable engineers to make adjustments while sitting at their desks – and even access data wirelessly where necessary. In this case, the data will be transmitted to a predetermined FTP/SFTP/FTPS data server. These kinds of remote functions were made available in the course of 2018 and will be gradually expanded in the future. With the ES820, developers are well equipped for the future flood of data.

Author

Thomas Schlotter is Product Manager responsible for the Drive Recorder ES820 at ETAS GmbH.