DRIVING EMBEDDED EXCELLENCE

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Storing entire test drives

Electronics are the neural system of modern vehicles. As electronic systems increasingly operate in connected environments and control safety-relevant functions, it is becoming more complex to develop, calibrate, and validate them. Developers need viable practical solutions that will keep pace with future changes. One key field of activity is collecting data from vehicle systems. Used intelligently, systematically collected data can render some test drives unnecessary – and facilitate collaboration between teams spread across different locations.

In demonstrator vehicles, improvisation is the name of the game. Piles of measurement hardware fill the trunk, connected up by a tangled mass of cables that often extends to an off-the-shelf laptop on the passenger seat. The limits of this kind of setup become evident, at the latest, when performing winter tests in arctic temperatures. Even if that is not a cause for concern, it can happen that cables slip out during the drive, or data recording could be interrupted for other reasons. Because time spent on

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expensive hardware prototypes is so limited, in the tightly scheduled development cycles of new models, there is simply no room for these kinds of errors.

Given the growing number of ECUs and the increasing importance of electronically controlled vehicle functions, carefully thought out measuring equipment is crucial. It must ensure reliable measurements in any temperature range, stand up to vibrations and shocks, and offer interfaces for all buses and networks commonly used in modern vehicles. This equipment must also be compatible with existing measuring and diagnostic tools to enable calibration and test engineers to seamlessly integrate it into their familiar processes.

Image 1: INCA-TOUCH interface.

Based on robust hardware that is suitable 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 rigorously 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. If the modules are stacked one on top of the other, then both their shared power supply and their internal Ethernet data connection are ensured, minimizing wiring effort while simultaneously solving the issues of synchronization and of wake-up or shutdown. When cables do have to be plugged in, their connections are secured by robust LEMO connectors. The hardware modules also have a PCI Express bus system.

The ETAS ES820 Drive Recorder is the latest addition to this rigorously modular ES800 hardware family. It replaces a laptop or INCA PC on board and records all data and signals from ECUs, buses, networks, sensors, and measuring instruments for over 22 hours. Recording can begin when the engine starts, it can be preprogrammed for certain measurement durations or trigger mechanisms, or it can be triggered by developers on a situational basis. Since the Drive Recorder, like all of the hardware family modules, is compatible with ETAS INCA, developers and calibration engineers can design, test, and modify these mechanisms directly in their usual standard tool before using the Drive Recorder. They are therefore using familiar processes, but have a lot of additional functions at their disposal for securing future development projects.

Full support for smooth processes

The testing and measurement effort needed to secure the increasingly complex interaction between connected electronic vehicle systems is skyrocketing. Since many systems are relevant for the safety of vehicle occupants and for type approval, the tests must be comprehensively documented. The ES820 Drive Recorder makes it easy to fulfill these requirements. Thanks to a removable storage system with a capacity of up to one terabyte, not only can data and measurement signals from test drives be recorded in full, they can also be quickly transmitted to relevant company networks. The measured data can be read out at 200 megabytes per second on a suitable docking station, which means that a full terabyte hard disk is ready for the next task in 30 minutes or less, and the specialists in the various departments involved can access the data immediately. The removable system also enables seamless operation across multiple layers with different hard disks, making faster, more in-depth validation possible and eliminating delays between test drives and analysis.

Image 2: ES800 stack consisting of ES820 and ES891.

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. The system can thus be expanded to connect CAN, CAN FD, FlexRay bus, and automotive Ethernet to the ES820 using the available USB interfaces. And all of this is backed by a powerful Intel i5 processor and

4 gigabytes of working memory to ensure fast data processes, allowing the Drive Recorder to be seamlessly integrated into existing tool chains while simultaneously providing a high degree of security for the future – particularly in view of new legal requirements, such as measuring real driving emissions (RDE), which are resulting in sharply increasing measurement efforts and rapidly growing complexity in the validation process.

Outlook: User friendly thanks to INCA-TOUCH – and advanced connectivity

In the field, with its advanced functions, the ES820 Drive Recorder will replace the laptops and displays currently used – also because of the high risk to safety involved in operating the latter during test drives. To ensure that users can nevertheless keep track of processes and interact with the measuring system even

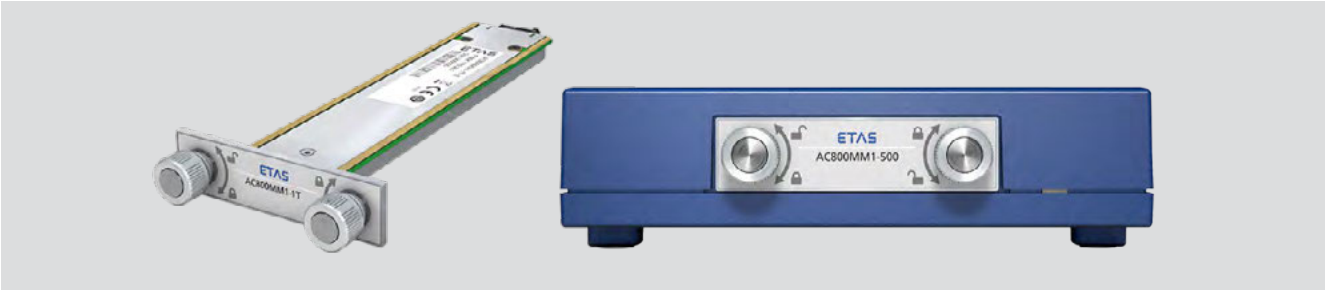

Image 3: Memory module and docking station.

Broad basis for intelligent reuse of measured data

This broad database – which in the ES800 family is recorded synchronously – not only opens up opportunities for such in-depth validation, but in conjunction with deep learning and big-data methods, it also paves the way for intelligent reuse of measured data. Recording this data end-to-end will create an increasingly solid data foundation with each project and give users ever deeper insights into development and calibration – resulting in more in-depth and faster validation. Systematically reusing data and executing measurement tasks in parallel reduces both the overhead time and the need for expensive test vehicles.

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 of the individual recorders. The recorders then run in parallel and store 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 statuses and events.

while on the road, it is useful to combine this with ETAS' INCA-TOUCH solution, which enables INCA to be operated via a touchscreen or with voice commands. The measured values from the Drive Recorder can also be shown on the display. This solution will be available by late 2018.

User-friendliness is a key area of focus, but more and more, so is connectivity. Measuring and diagnostic systems, too, must cope with an increasingly connected world. Modern vehicles, whether on the road or online, are also immersed in global data traffic.

When this involves the new Drive Recorder, this connection will enable engineers to make adjustments while sitting at their desks – and readout data wirelessly, if necessary.

The data will in this case be transmitted to a predetermined FTP/SFTP/FTPS data server. These kinds of remote functions will be provided over the course of 2018 and gradually expanded in the future.

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