Testing of Automotive Electronic Control Units
The objective

... was to develop a test system for steering column modules made by Leopold Kostal GmbH & Co. KG, completed all controls typically arranged in a vehicle’s steering wheel area. In developing safety-related automotive technology, manufacturers today must undertake extensive testing to ensure and document the proper functioning of each and every assembly throughout the development process. For testing complex electronic units (ECUs) with wide-ranging functionalities, such as steering column modules, stochastic testing methods have to be employed in addition to conventional sequential tests. The project brief called for the development of PC-based test workplaces that would support test functions compliant with automotive manufacturer’s specifications. Tests had to be definable in a flexible and user-friendly manner for easy integration into an ongoing development process. Test sequences, too, should be freely configurable by the user. Another basic requirement for an efficient system of this type is the availability of higher-level administration capabilities for managing test instructions and results.

The solution

The steering column modules are tested based on a TestMaster® system. The test hardware essentially consists of a special proprietary interface box decoupled from the test system. Additional components include a set of National Instruments SCXI components for stimulation purposes as well as a NI CAN card featuring two CAN bus ports. The latter provides flexible coupling to the specimen at both the electrical and logic level. The TestMaster® software relies on the LabVIEW™ software based TestMaster sequence control and monitoring concept. The abstraction principle embodied in the hardware design was also adopted for the available sequential functions for defining and executing the diverse test procedures. Test definitions and results are generated in XML-format for easy exchange with management systems.

Outlook

The solution presented here has been in use to date as an in-process development testing facility to verify the operability of steering column modules. Easy to upgrade, it provides a wide range of user-specific functions. The use of this system has yielded substantial test bay efficiency gains as well as new, previously inaccessible insights into specimen behavior through the provision of stochastic testing methods.

The TestMaster™ application can be reconfigured for use with any other ECU or mechatronical components. It also has the capability to run in client/server mode. For example for applications with real-time or HIL-integration.

pictures overleaf:
user interface with sequence editor YASE; steering column modules of Kostal GmbH (picture Leopold Kostal GmbH & Co KG); panel for signal ramping