



A Direct Line

The versatile diagnostics module for direct ECU access



The diagnostic interface is a central access point to an electronic control unit (ECU), and often the only available one. For tests performed on a simulator, this interface is fundamentally important. With the ECU Diagnostics Module, ControlDesk Next Generation can be used flexibly for diagnosing ECUs.

Talk to Me, ECU!

When developing electronic control units (ECUs), it is often necessary to access the ECUs by using a diagnostic interface. One of the major application areas this occurs in is hardware-in-the-loop (HIL) tests, where not only individual ECUs but also ECU networks are put under test. On the one hand, the diagnostic functions themselves must run through HIL tests. On the other, the diagnostic interface of the ECU can be used for many other tasks: in general, handling the fault memory, and reading and setting variants and calibration/measurement val-

ues; more specifically, activating and deactivating functions, and flashing data sets. The diagnostic interface is also often the only available way to access the ECU, so there is no way to avoid using this specific interface during the tests. When accessing ECUs via diagnostic interfaces it is necessary to use corresponding standards, such as the description language ODX (Open Diagnostic Data Exchange, ASAM MCD-2 D) and ASAM MCD-3, which is the standard for object-oriented API interfaces in measurement, calibration and diagnostic applications.

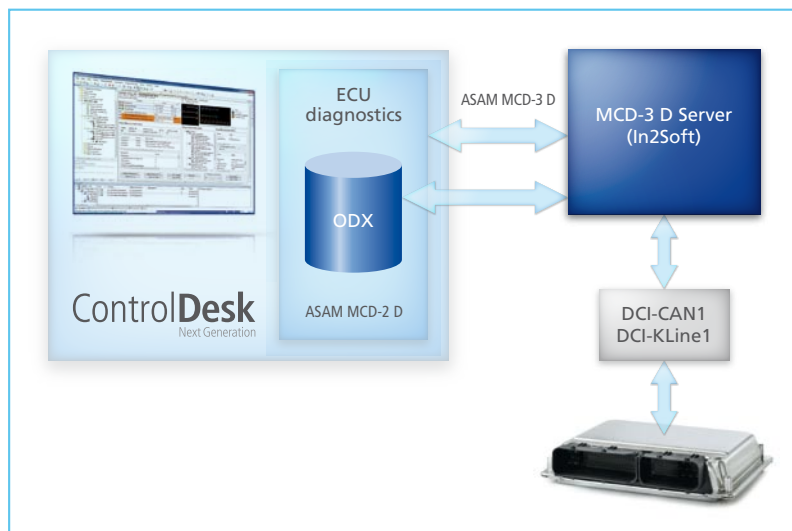


Figure 1: ControlDesk Next Generation, ECU Diagnostics Module, and the In2Soft MCD-3 D server working together

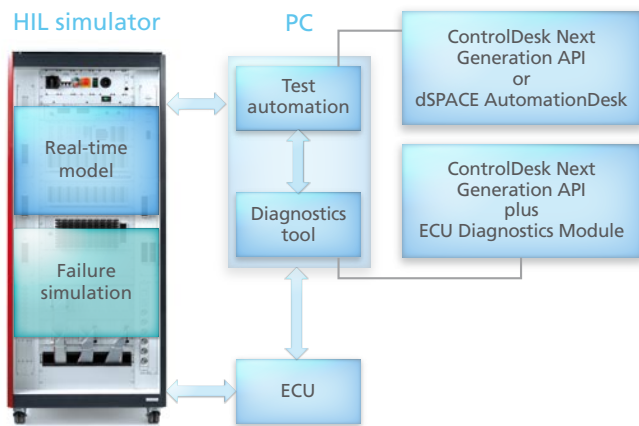


Figure 2: Structure of an HIL simulator with integrated diagnostics.

Flexibility with the ECU Diagnostics Module

With the optional ECU Diagnostics Module, ControlDesk Next Generation becomes a very versatile tool for directly accessing ECUs. The module supports the ODX standard and integrates the MCD-3 D server from the company In2Soft (Figure 1). The server license is included in the purchase of the ECU Diagnostics Module. The module also supports various CAN hardware interfaces offered by dSPACE (such as DCI-CAN1) and by third parties, a K-line interface (DCI-KLine1), and certain diagnostic protocols. The ECU Diagnostics Module for ControlDesk Next Generation offers a wide selection of functionalities. This includes methods for reading and erasing the ECU fault memory, connecting to diagnostic services and jobs in ControlDesk Next Generation, displaying diagnostic errors, saving faults in a file, using faults as triggers, setting bookmarks during the data recording, and flash programming. The ECU Diagnostics Module supports the diagnostic protocols KWP2000 on K-Line, KWP2000 on CAN, UDS on CAN, TP2.0 on CAN, OBD on CAN, and GMLAN on CAN.

Diagnostic Services and Jobs

One important component of the ECU Diagnostics Module is the Generic Diagnostics Instrument, with which the diagnostic services and jobs can effortlessly be parameterized and executed (once or cyclically). The function classes are displayed in a tree structure, which makes it easy to find the specific services and jobs. It is also possible to log the actions that are performed on

the instrument. One special feature is that the Request PDU (protocol data unit) can be manipulated directly for data entering the bus, in order to deliberately sidestep the constraints in an ODX definition. Among other things, this enables the user to send distinct service calls, even if it is not possible to find a suitable adaptation of the ODX file for a specific situation.

Fault Memory Access and Data Display

To work with the ECU fault memory, there is the Fault Memory Instrument. No matter whether for reading the fault memory of one or several ECUs (once or cyclically), displaying the status information and environment conditions of diagnosed faults, erasing the fault memory partially or completely, or storing the fault memory information as an ASCII file or an XML file, the Fault Memory Instrument is always convenient to work with. With the aid of the ECU Diagnostics Module, ODX diagnostics data can also be displayed in a plotter together with signals from other sources. This makes it easy to display and analyze the temporal relation to other values (message signals on the CAN bus, model signals and parameters in the HIL simulator, memory addresses in the ECU, etc.).

HIL Tests via the Diagnostics Interface

Diagnostic tests on the hardware-in-the-loop simulator are one of the typical application areas for the ECU

With the integrated, ODX-based diagnostics solution, ControlDesk Next Generation is ideal for use as an MCD tool in current and future ECU projects.

Diagnostics Module (Figure 2). For these tests, the user must set the operating points and events whose functions to be tested are active. The deliberate inclusion of faults plays a key role here. For example, faults can be created at signal level via failure simulation, after which the diagnostic interface is used to read the ECU fault memory and compare it with the expected fault

codes (diagnostic trouble codes, DTCs). It is even possible to validate diagnostics communication via HIL tests; namely, by using protocol tests in which, for example, the user tests all of the services that are defined in the respective ODX file. Communication faults can also be forced by sending invalid data (i.e., via a HexService or direct manipulation of the request PDU on a service). The test process can be automated (Figure 2) with dSPACE AutomationDesk (and ControlDesk's MCD3 Automation Module) or with ControlDesk Next Generation's API tool Automation Interface.

Measurement and Calibration

With the ECU Diagnostics Module, measurement and calibration tasks can also be carried out effortlessly

(Figure 3). For example, with the diagnostics interface the ECU data can be changed and the consequences can be documented in the form of measurement data. In this type of scenario, the access to the measurements, calibration and diagnostics can be combined in any desired configuration. On the one hand, the ODX data can be used together with the diagnostics instruments of the ECU Diagnostics Module. On the other, the measurement variables and parameters from the ODX description can be used in all of ControlDesk Next Generation's standard instruments. All of this makes the ECU Diagnostics Module the ideal supplement for any ControlDesk Next Generation user who wants to benefit from the maximum possible flexibility for ECU access. ■

Profile

ControlDesk Next Generation's ECU Diagnostics Module

- Integrated measurement, calibration and diagnostics tool (MCD tool)
- To read and erase the ECU fault memory
- Integration of diagnostic services and jobs (incl. measurement and instrumentation)
- Display diagnosed faults and store them in a file
- Use faults as a trigger and/or set bookmarks during data recording
- Support ECU flash programming

Figure 3: Example of a possible measurement and calibration workflow – diagnostic data can be used with diagnostic instruments (1) and also with standard instruments (2).

