

CANoe.J1939, Version 7.1

Simulation and Development of J1939 Systems

SAE J1939 is a communication protocol based on CAN for real-time data exchange between control units in the area of commercial vehicles. It originates from the international Society of Automotive Engineers (SAE) and operates on the physical layer with high-speed CAN per ISO11898. J1939 is a multimaster system with decentralized network management and primarily connection-less communication.

Features and Advantages

Using CANoe.J1939 from the very beginning allows the developer to use the same tool through the entire development process, from planning to realization. The models created in the design phase and checked by simulation are continually reused in other forms. It is possible to use the models to verify the implementation and later for functional end-of-line testing.

It is not necessary for the user to become familiar with the J1939 protocol, instead concentrate on the actual task of creating a simulation or data analysis. This significantly increases the quality of the development process and the efficiency of data analysis.

Functions

CANoe.J1939 expands the standard functionality of CANoe with:

- > Support of the transport protocols BAM and CMDT
- > Graphic display of the network nodes (scanner)
- > Protocol-specific representation in the Trace Window
- > Rapid simulation of ECUs
- > Expanded database
- > Diagnostic Trouble Code Monitor (DTC Monitor)
- > Diagnostic Memory Dialog (DiagMem)
- > J1939 XML Test Module Manager

These functions will be described in detail below.



The analysis and simulation properties of CANoe are expanded purposefully with J1939-specific functions. Error memory is accessed via the Diagnostic Memory Dialog.

Application Areas

Because of its simulation capabilities, CANoe.J1939 is well-suited to the development, design and verification of J1939 networks. Its practical application as a diagnostic and debugging tool is just as feasible as its use in simulating the rest of the bus during startup or assembly. Especially the J1939 XML Test Module Manager supports the user in preparing integration and module tests. Since the SAE J1939 specification is the basis for other networks such as NMEA2000, ISO11783, ISO11992, and FMS (Fleet Management System), the Option can be used in those applications as well.

When used in parallel with the .J1939 and .CANopen Options, CANoe is the ideal development and test environment for the CiA DS-413 CANopen Truck Gateway. In combination with the .J1587 Option it offers a uniform approach to systems that extend across bus boundaries with a common time base.

Hardware Interfaces

All interface cards supported by CANoe can be used. For compatibility, however, the use of ISO11898 (ISO High speed) compatible bus drivers (for example CANcab 251 or CANcab 251opto) is recommended.

Transport Protocols

If a transport protocol described in SAE J1939 (BAM and CDMT) is used, CANoe can reassemble the individual CAN telegrams transmitted. The interpretation of the SAE J1939 protocol is limited to the CAN channels configured by the user. Gateway solutions with various protocols can thus be monitored easily. Display of 29 and 11 bit CAN identifiers is supported at the same time.

J1939 Scanner

The scanner monitors communication and makes available a clear display of all network nodes. Changes in a dynamic network can be easily traced and analyzed. If necessary, a central and clear reconfiguration of the node addresses can occur. Information about function or manufacturer is also output.

J1939 XML Test Module Manager

The J1939 XML Test Module Manager supports the user in preparing complex tests based on the CANoe XML Test Feature Set. These tests can be implemented very quickly with CANoe and without programming effort. Many test cases are available specifically for J1939 applications, and the manager can be used to select and configure them. Particularly the tests described in the Draft SAE J1939-82 (Compliance) document are considered. The number of test cases offered will be further expanded in future versions. Applications range from simple test cases to complex integration and compatibility tests for system integrators.

New functions of Version 7.1

Expanded dialog for Diagnostic Memory Access

- > Transmission of parameter group DM13 (start/stop broadcast) by means of a button
- > Object access also contains the raw value in addition to the physical value.
- > The cyclic access can be configured while the measurement is running.

CANdb++ Editor optimized for messages with DLC>8

- > Simplified arrangement of signals for messages with DLC>8Byte

CAPL extension

- > The assignment operator supports parameter groups with DLC>8Byte.

Revised J1939 Scanner

- > Optimized view for dynamic networks

Optimized DTC Monitor

- > The multiple selection of nodes allows targeted representation of error codes.

J1939 Compliance Test

- > The layout of compliance test results is based on the test report from SAE J1939-82. This increases the recognition value which simplifies the exchange of test results between supplier and OEM.
- > The Test Service Library has been expanded to include new test patterns for the test of error codes in diagnostic parameter groups.

Error messages with time stamp

- > Error messages regarding transport protocols contain a time stamp in the Write Window. This simplifies analysis of cause in the Trace Window or in the log file.

The layout of compliance test results is based on the test report from SAE J1939-82. This increases the recognition value which simplifies the exchange of test results between supplier and OEM.

Protocol-specific Display

CANoe.J1939 allows the user to monitor communication on the symbolic level in a Trace Window, where the parameter groups transmitted are displayed. All relevant information is output in individual columns such as parameter group number, priority, source, and target address. Individual topics like transport protocols, network management or diagnostics are shown highlighted in color. Additional functions such as Quick Find and View Filter simplify finding specific parameter groups.

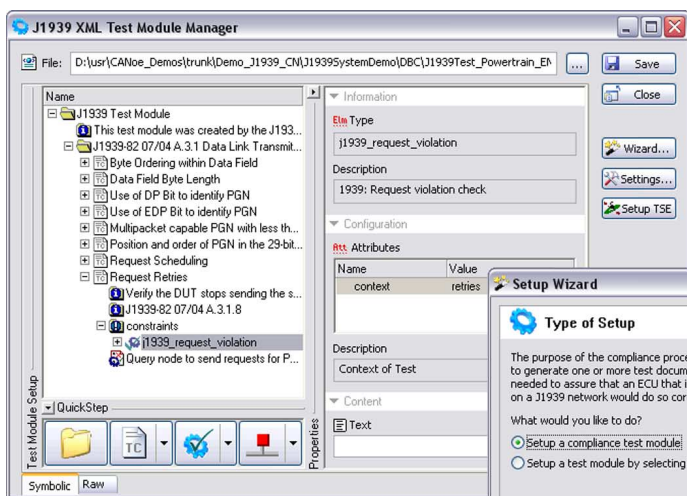
Signals selected by the user are displayed in the Data Window. A wide range of display options is available to the user for this purpose, including bar diagrams, hexadecimal, decimal, and binary display. The SAE J1939-specific coding of signal values (Error and Not Available) is realized with the help of a status display. Signal processes can be displayed and evaluated as a function over time with the online Graphic Window. After stop of measurement, Graphic Window and Trace Window can be synchronized. Conspicuous events in the Graphic Window can thus be simply and quickly analyzed using the Trace Window. So that the analysis remains clear, the J1939 node filter can be used to filter the desired message traffic. Optionally, signals transmitted with the help of parameter groups may be displayed.

Simulation

CANoe.J1939 makes simulation and analysis of network data of control unit networks possible by using the J1939 communication protocol. The system environment is modeled by means of environment variables and graphic interactive control panels. The integrated J1939 CAPL Code Generator generates CAPL models for the entire network based on the communication interrelationships described in the database. In addition, with the J1939 Nodelayer DLL, there is a library for the CAPL programming language available that implement J1939 functions.

Database

J1939 parameter groups and signals are described in a database. This database is already filled with sample standard objects. The user can expand the database using the CANdb++ Editor (included with delivery). This makes it possible to define application-specific parameter groups, for example. The CANdb++ Editor was specially extended for use in the J1939 environment with new dialogs and additional views to significantly simplify the process of creating and verifying files for the user. Parameter groups and signals defined thus can be selected symbolically in the entire program.



J1939-82 Compliance Test
J1939-82 07/04 A.3.1 Data Link Transmitt - General

Row	Test Name	Requiring Document	Description	SAE and User Requirements		Date Tested	Pass/Fail	Test Result Comments
				X: Test is Recommended	D: Additional Test Desired			
				ECU Classes				
				A	B			
				L	S			
				G	C			
				I	F			
				A	S			
				C	O			
				S				
1	Position and order of PGN in the 29-bit Frame Header		Verify proper placement of PGN within 29-bit header of all frames			2008-09-17 1345.07	P	
2	Use of EDP Bit to identify PGN		Verify DUT properly sets the EDP Bit for all 29-bit frames			2008-09-17 1345.17	P	
3	Use of DP Bit to identify PGN		Verify DUT properly sets the DP Bit for all 29-bit frames			2008-09-17 1345.27	P	
			Verify the length of the data field for all 29-bit Frames (Page 1 and 2) is 8 bytes, except for PGN 59904 frames			2008-09-17 1345.37	P	
			Verify proper byte ordering of the parameter data for multiple byte parameters (e.g. Verify Address Claim data, PGN 60928). This verification also applies to -7X.			2008-09-17 1345.47	P	
			Verify DUT indeed uses single CAN frames to send PGN under this situation. Verify any unused bytes are filled with 0xFF.			2008-09-17 1346.11	P	
			Verify the DUT does not send a Request message for a PGN if that PGN was received with the last 50 ms			2008-09-17 1346.27	P	
			Verify the DUT stops sending the same Request message after the third attempt (second retry). A Request retry is issued following a Response Timeout (T1) failure.			2008-09-17 1346.29	F	

Guided creation and configuration of XML files for the test feature set with the help of the J1939 XML Test Module Manager. Result layout of Compliance Tests as per SAE J1939-82.

Training

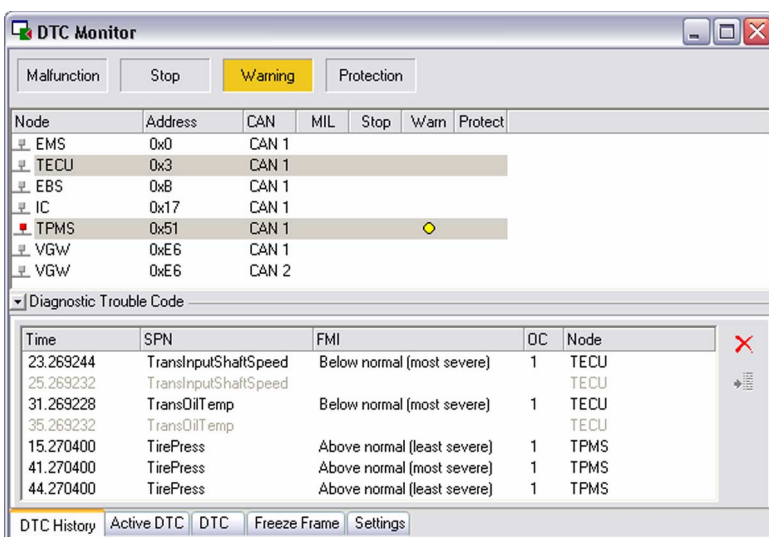
As part of our training program, we offer a range of classes and workshops on J1939 in our classrooms and on-site at our customers. For more information and the dates of our training courses, please visit our homepage on the Internet at: www.vector-academy.com

Diagnostic Trouble Code Monitor (DTC Monitor)

The DTC Monitor offers a simple interface to the J1939 diagnostic protocol. Without programming error codes can be displayed or queried on demand. A button can be used to jump from a selected error code to the respective position in the Trace Window. Also Freeze Frames (group of parameters based on diagnostic trouble codes) are supported. This makes the DTC Monitor very useful for emission related or powertrain diagnostics.

Diagnostic Memory Access

The Diagnostic Memory Dialog gives the user direct access to the memory areas of an ECU. This memory may be an error memory or program code, for example. Addressing is achieved with the help of error codes (Suspect Parameter Numbers) or an address. The dialog is based on the diagnostic services DM14, DM15, DM16 and DM18. Authentication is implemented as a seed and key procedure. Using CAPL the seed and key procedure can be customized for a specific OEM. The support of diagnostic service DM13 (Start/Stop broadcast) also enables temporary reduction of the network load.



The DTC Monitor breaks down the current trouble codes. The multiple selection of nodes allows targeted representation of error codes. A button can be used to jump to a specific message in the Trace Window for a selected error code.