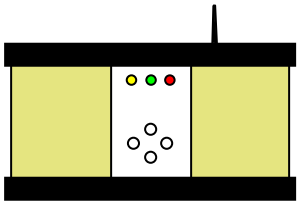
User manual

Diagnostic system OBD / Parallel / Analogue
Manual version 2.3 Eng



User manual

Diagnostic system OBD / Parallel / Analogue Release v2.3

Table of contents

Thank you for choosing our products!

We are certain that you will have great use of this diagnostic equipment for a long time. We will make sure that updated vehicle databases always are available, with the absolutely best coverage on your specific market.

1 Important information

Always read the user manual carefully before connecting, starting up, and using the diagnostic equipment, to eliminate any doubts and risks associated with the diagnostic equipment. All use, including connecting the diagnostic unit near the engine or ignition system, should take place when the engine is not running and when the ignition is off. Any person who hands over the diagnostic equipment to another person should also hand over safety instructions and necessary information for how the diagnostic equipment should be used according to its intended use.

1.1 Agreement

By using this product you accept the following terms:

1.2 Copyright

Software and data are the property of the supplier, and are protected against unauthorised copying by copyright legislation, international contract regulations, and other national rules. Copying or sales of data, or software or parts thereof, is punishable by law. In case of any violation, the supplier reserves the right to prosecute and demand compensation for damages.

1.3 Program versions

We always do the outmost to optimise our products to suit the market and region where the products are sold and used.

As a step in this process, we have automated the setup of geographical preferences during the installation. The only choice the person installing the software has to do is to choose the applicable country.

By making a correct choice of country during installation of the software the customer is ensured to have the best setup to fit regional conditions, regarding content of the vehicle database as well as the functionality of the program to fit the applicable vehicle population and local conditions.

1.4 Responsibility and liability

To the greatest possible extent, all data in the program is based on information from car manufacturers. The supplier does not guarantee that data or software are correct or complete. The supplier does not accept liability for damages caused by defective software or incorrect data. In all cases liability is limited to the amount that the buyer has paid for the product at the time of purchase. This exemption from liability does not include damages caused intentionally or by gross neglect on the part of the customer.

1.5 Warranty

All use of hardware and/or software that has not been approved by the supplier is a modification of our products, and thus no warranties are valid. Our products may not be modified in any way. Only genuine accessories and spare parts may be used, which also applies to adapter cables. All breaches of this will void any claims. The diagnostic equipment may only be used with operative systems approved by the supplier. If the diagnostic equipment is used with an operative system that is not approved by the supplier, the warranty ceases to be valid. Also, the supplier does not accept any liability or responsibility for damages and consequences thereof that have arisen due to the use of a non-approved operative system.
Note that the vehicle manufacturer's instructions must be followed when working on the vehicle. The supplier does not accept any liability or responsibility for damages and consequences thereof that have arisen due to not following the vehicle manufacturer's instructions for the vehicle.

1.6 WEEE (Waste Electrical and Electronic Equipment)

This label shows that the product is manufactured after August 13, 2005, and therefore it shall be recycled according to WEEE (EU Directive 2002/96/EC regarding waste from Electrical and Electronic equipment). Contact your local dealer for more information.

2 System requirements

2.1 Minimum

- Intel® Pentium® II 400 MHz (or similar)
- Windows 7, Windows Vista®, Windows 2003 Server, Windows® XP(*) SP3
- 128-512 MB RAM (depending on operating system)
- 500 MB free hard disk space
- Screen with resolution 800 x 600
- CD-ROM-unit
- Bluetooth (SPP) or USB
- Microsoft .NET Framework 2.0 or later (included in installation)
- Microsoft Data Access Components (MDAC) 2.8 (included in XP SP3, Vista and Windows 7)
- Microsoft Jet Database Engine 4.0 (normally included in all operating systems)
- Adobe Acrobat Reader 4.0 or later

2.2 Recommended

- Intel® Pentium® 4 1.7 GHz or better (or similar)
- Windows 7, Windows Vista®, Windows® XP(*) SP3
- 1024-2048 MB RAM (depending on operating system)
- 500 MB free hard disk space
- Screen with resolution 1024 x 768 or better
- CD-ROM-unit/DVD-unit
- Bluetooth (SPP) or USB
- Microsoft .NET Framework 2.0 or later (included in installation)
- Microsoft Data Access Components (MDAC) 2.8 (included in XP SP3, Vista and Windows 7)
- Microsoft Jet Database Engine 4.0 (normally included in all operating systems)
- Adobe Acrobat Reader 4.0 or later

(*) Windows® XP Media Center Edition and its different version are not supported!

Note! Both 32-bit and 64-bit operating systems are supported, note that 64-bit OS require special handling during installation of USB drivers.

Note! The program can only be started from accounts with administrator or limited user rights. It is not possible to start the program from a Guest account.

2.3 Supplementary programs

Where do I find the necessary supplementary programs?

Microsoft Data Access Components (MDAC) 2.8
http://www.microsoft.com/downloads/details.aspx?familyid=78CAC895-EFC2-4F8EA9E0-3A1AFBD5922E&displaylang=en

Microsoft Jet Database Engine 4.0
http://support.microsoft.com/kb/239114

Adobe Acrobat Reader http://www.adobe.com

3 Installation

3.1 Installation using CD-ROM

NB! On certain computers, antivirus programs and other similar programs may sometimes cause the automatic CD start-up to not work or take a long time. In any such cases, deactivate these programs. Programs known to cause problems are McAfee VirusScan and ZoneAlarm. After installation, the antivirus programs can be reactivated.

1. Insert the CD in the computer's CD-ROM/DVD reader. The installation starts automatically. (If the installation does not start, choose "Run" in the "Start"-menu and write D:\Start. Applies if the CD-ROM/DVD reader is designated as unit D).

2. Enter your Product-ID, serial number, and hardware key. Then choose country and press "Next" to continue.

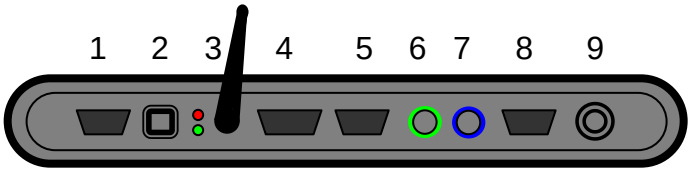
3. Check in the next window that correct product is chosen. From this window it is possible to show application tables, user manuals, release information, etc. This is done by choosing a document in the list and then pressing "View". Before continuing, it is important that you have read the system requirements. Press the button "View" under the heading "System requirements" to show the system requirements. Then confirm that you have read the system requirements and press "Next" to start the installation guide. Follow the guide to finish the installation.

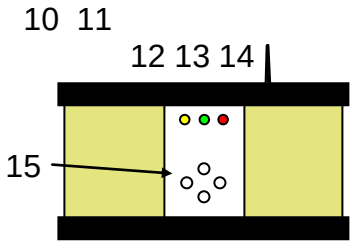
4 Hardware

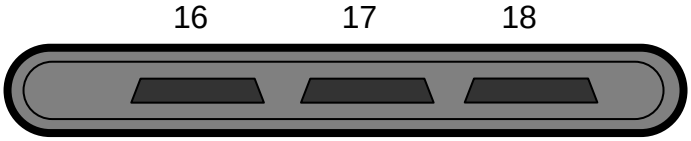
4.1 Introduction

The diagnostic unit has built-in interfaces for most communications available on the market that are used for OBD (On Board Diagnostics). For certain vehicle models, specific connectors are used for OBD. As accessories there are unique cables enabling connection to the car's diagnostic connection.
The diagnostic unit has 186 analogue channels, making it possible to perform parallel measuring directly between the vehicle's wiring and control unit. This enables performance of very advanced yet simple and easy-to-understand diagnostics, even on cars that do not present any fault codes but still have malfunction symptoms. As complement to this there are two Probe channels that can be used in Multimeter function and in Oscilloscope. As accessories there are unique adapter cables making connection to the car's wiring both easy and safe.
Connection to PC is done using any of the alternatives USB (Universal Serial Bus), Bluetooth (wireless communication), or serial Comport (RS-232).

4.2 Connections







1. PC 9-pin connection for PC (RS232)
2. USB USB-connection for PC
3. Bluetooth antenna
4. OBD 26-pin connection for OBD-cable
5. AUX 15-pin for connecting external equipment
6. P1 Connection for probe (multimeter/oscilloscope)
7. P2 Connection for probe (multimeter/oscilloscope)
8. EXT 9-pin for connecting external equipment
9. POWER Voltage connection for tester
10. Green LED Indicates communication using USB
11. Red LED Indicates communication using Bluetooth
12. Yellow LED Power
13. Green LED Test
14. Red LED Fault
15. Control buttons
16. 1-62 62-pin connection for parallel measurment
17. 63-124 62-pin connection for parallel measurment
18. 125-186 62-pin connection for parallel measurment

5 Computer configuration

5.1 Bluetooth

5.1.1 Introduction

To succeed with the Bluetooth configuration, the Bluetooth card in the computer must be installed correctly and support the service Bluetooth SPP – Serial Port Profile (Virtual Comport). 'Bluetooth card' refers to both internal Bluetooth cards that, e.g., are found in laptop computers as well as Bluetooth-USB-adapter and other types of Bluetooth cards. NB! For pin code/passkey, only "0" (one zero) shall be used.

5.1.2 Configuration

The following is a description of Bluetooth configuration. Note that the configuration may vary depending on the Bluetooth card in the computer.

• Start the Bluetooth manager, usually by choosing Start -> Settings -> Control panel -> Bluetooth.

• In the Bluetooth manager, choose to add new unit. Check that the diagnostic unit is connected to a vehicle or other type of voltage source (power source) before you proceed to search for Bluetooth units.

• When the search is finished, a list is shown with the units that were found. Select and choose the diagnostic unit you want to add.

• If you are asked to use passkey you shall use your own passkey. For passkey, only "0" (one zero) shall be used .

• If everything went well the Bluetooth configuration is now finished, and you can go on to the chapter about program configuration and the section hardware settings to search for diagnostic unit.

5.2 USB

5.2.1 Introduction

NB! It is important that the installation of software has been finished before performing the following steps.

5.2.2 Microsoft Windows 2000/XP/Vista

When installing on Microsoft Windows 2000, XP, and Vista, it is possible to pre-install the USB-drivers during the installation. If pre-installation has been chosen, installation of drivers takes place automatically when the diagnostic unit is connected for the first time. Regardless of if the drivers are pre-installed or not, the drivers are always copied to the program directory for the program and added in the subdirectory "/Drivers/USB/".

6 General use of the program

6.1 Introduction

In order to start the program you double-click on the icon found on the desktop. It is also possible to start the program using the start menu. The user manuals are also grouped in the start menu. The program is designed to make it easy for you to use the program. Great effort has been put into making a user-friendly product where the user always is in focus.

6.2 Program design

The program is designed using of a number of elements that are found and look the same throughout the whole program. These are shown in the figure below.

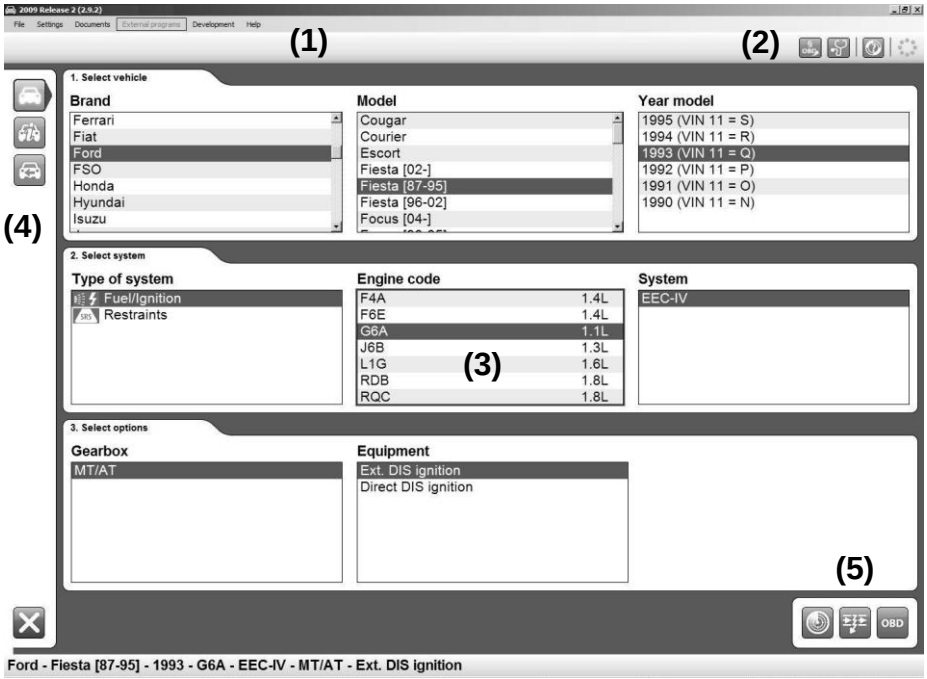
(1) Main menu: This menu contains the following submenus: File, Settings, External programs, and Help. Under the menu alternative "File", you find functions to open saved tests and to exit the program. Under Settings there are functions for entering workshop information, choosing language, as well as configuring the hardware.
External programs contains links to third party programs, if such links are installed.
The last menu alternative, which is Help, contains link to the program help, activation of demo mode, license handling, as well as information about the program.

(2) At the top right in the program window you find general functions such as Generic OBD and Measuring functions, a button to start the Help function, and an activity indicator.

(3) The middle of the program shows the work area which is used to, among other things, present information.

(4) The left button menu in the program is called function menu 1 and contains the different main functions you can choose. At the bottom in the menu there is a button to go back/exit. The function of the button depends on where in the program you are.

(5) The button menu at the bottom right is called function menu 2 and contains the functions connected to the main function as well as that which is shown in the work area.



6.3 Navigation

In order to facilitate navigation in the program, there are some supplements to what you normally find in other programs. An example is the red marker that shows where in the program you are, what you have chosen, or what is active. The marker is seen as a red frame. The red marker's function varies, depending on if you use the mouse or the keyboard to move around in the program. If you use the keyboard to navigate in the program, the red marker moves directly, e.g., to the button you choose.You can navigate by pressing the TAB-key or the arrow keys. In general, the arrows are used to navigate within a field or a work area. The TAB-key is used to switch between menus, etc. The button highlighted by the red marker is activated by pressing Enter ↵. If you use the mouse, a dashed red marker is moved to the button or component that the mouse is over. First when you have pressed on, e.g., the button, then the whole red marker moves.

7 General functionality

7.1 Program help

The easiest way to access help in the program is to press the help button in the program,found at the top right. Another way is to use the key "F1" on the keyboard. The same help in the form of a user manual (PDF) is also available using the start menu.

7.2 Save & print test report

To be able to give the customer a report of what was found and done to the car, it is possible to generate test reports in the program. These test reports can either be printed out immediately when you have done the test, or saved for future use. If you choose to save a test report, a PDF file is generated. It can be read using Adobe Acrobat Reader, which can be downloaded for free from www.adobe.com.
Three different types of test reports can be saved: parallel test, OBD-test, as well as Generic OBD. More information on its function is found ahead in the manual. To save or print a test report you press the button "Print/Save". The function may vary, depending which type of test you have chosen to save or print. Common for all tests is that you can add information about the test that was done, e.g., information about the car, driving distance, or general information about what has been fixed. For OBD-test it is also possible to choose which systems you want to include in the test report, on the condition that several systems have been tested. This makes it easy to compile a complete test report of all systems in the car. It is also possible to print the help instructions available for certain diagnostic functions.

7.3 Open saved test report

To access saved test reports, the easiest way is to go to the main menu and choose "File" and then "Open saved test". If the suggested search path has been used to save a test report it is found in the directory that opens. Select test report to be opened, and click on "Open".

7.4 External programs

Depending on the type of installation and license, the program may include links to other external programs. These may be, e.g., information systems, parts catalogues, etc.

7.5 Demo mode

By enabling the program in demo mode you can run most functions in a simulation. Note that regardless of which car or function you chose, the same simulated information and values will be shown. When the program is enabled in demo mode, a dialogue is shown before you choose function that tells you that the program is running in demo mode.

7.6 License

You need a valid hardware key to be able to use the program. Should it be that you need to enter the hardware key at a later time, go to the main menu and choose "Help", and then "License".
Enter the hardware key consisting of twelve (12) letters and press "OK".

8 Program configuration

Functions for program configuration are accessed using the main menu and "Settings".

8.1 Workshop information

Under the tab "Workshop" you can change/enter information about the workshop as well as add mechanics. This information is used, among others, when you print or save test reports. To add a new mechanic you click on the plus (+). Then a window appears where you can enter information. To delete a mechanic, select the name in the list and then click on the recycle bin.

8.2 Language

Under the tab "Language" you can choose the languages installed in the program. Choose language and then press "OK" to save the selection. Note that you have to restart the program after choosing new language, only then does the language selection change.

8.3 Hardware settings

Under the tab "Hardware configuration" you can set COM-port for the diagnostic unit as well as update connected diagnostic unit with new software (firmware). There are two ways to set COM-port: "Automatic" and "Manual". If you choose "Automatic", the program automatically searches for a diagnostic unit to connect to and then shows information about the diagnostic unit that was found. In "Manual" mode, it is possible to manually choose a specific COM-port as well as test the connection by pressing "Test". Note that for both cases, the diagnostic unit must be configured to the computer as well as supplied with voltage (power).
If the program still does not find a diagnostic unit, you may have to troubleshoot using the unit manager. In that case, contact your distributor for more information. Also see the chapter on Computer configuration.

9 Vehicle choice

9.1 Introduction

There are three (3) different ways to choose vehicle: classic mode, information/tree structure, as well as history. From all modes you can chose to start a test. The choice remains when changing between the different display modes. For example, you can chose vehicle in classic mode and change to information/tree structure to get more detailed information.

9.2 Classic mode

In classic mode the different vehicle choices are shown as lists. This alternative gives a fast overview of what systems there are. Choose the car you want for troubleshooting and click on the desired function in function menu 2.

9.3 Information/Tree structure

This mode shows the same information as in classic mode, but in addition to that also the diagnostic functions that can be performed on the vehicle, as well as an information section. By right-clicking in the tree structure, you can choose to start a new test as well as collapse the tree. The information section consists of, among others, position of diagnostic socket, engine code, as well as which cable shall be used. On certain vehicles there is also a photo of the diagnostic position.

9.4 History

This mode shows all previously used vehicles. Sorting is done by clicking on each column. To delete the whole list, press the recycle bin. To delete a specific vehicle, select the vehicle you want to delete from the list, right-click and chose "Delete". Note that the list for history is deleted when updating the software.

10 OBD – On Board Diagnostics

10.1 Introduction

A modern vehicle uses electronic control systems, e.g., fuel control systems, brake control systems, climate control systems, and control systems for automatic transmissions to control the vehicle's different functions. The control systems use a variety of sensors and actuators (input and output signals) to control the control system's function. When a sensor is defective, it may result in the sensor not being able to report correct information to the control system, which affects the possibility to correctly calculate an output signal to the system's different actuators. This results in incorrect or lost function for the control system.
OBD is really about monitoring these input and output signals to assess the control system's functionality. Thus, in addition to controlling a certain function in the vehicle based on the control system's input and output signals, the system has a built-in self-diagnosis, the function of which is to monitor the control system's own function and indicate to the user that something is wrong. This normally takes place with a flashing system symbol/MIL (Malfunction Indicator Lamp) in the vehicle's instrumentation, or other indication to the driver that the vehicle should be brought to a workshop. Thus, the OBD-system indicates that something in the system is wrong, not what or how serious the fault is. To obtain information about what is wrong, a special-purpose tool has to be connected to the vehicle's diagnostic socket and the required information about the system's status has to be read out.

10.2 Connection

Throughout the years, vehicle manufacturers have had different ways of connecting troubleshooting tools to their vehicles. The connection/connector has been developed in-house to fit the individual vehicle manufacturer's need for connection. Since the middle of the nineties several vehicle manufacturers have chosen to use the standardised diagnostic socket J1962(SAE)/15031-3(ISO), depending on legal requirements in the USA/1996 and in the EU/2001 for gasoline-powered vehicles up to 3,500 kg, as well as USA/2004 and EU/2005/2006 for diesel-powered vehicles up to 3,500 kg. The vehicle manufacturer must use the standardised diagnostic socket to enable primarily government authorities to connect with a general tool and read off statutory emission-related information from the vehicle. This is still not a requirement for other control systems in the vehicle, such as brake control systems or climate control systems,however, a majority of vehicle manufacturers have decided to use one type of connection in their vehicles.

10.3 Distributed control systems

Control systems may be so-called distributed control systems, meaning that they handle several system functions in the vehicle. This is managed in many different ways by different vehicle manufacturers, e.g., by grouping all functions around the right A-pillar in a control system, such as external rear-view mirror, front side airbag, and door electronics such as power windows, locks, and side airbag. The designation of such a system may become ”Airbag, right front”. The designation may be due to the airbag being regarded as the most critical system in the context, but information from the control system may also be related to, e.g., power windows and not only airbag. In cases where the control system is a so-called distributed control system, this shall be stated in the information for the chosen control system in the diagnostic system.

10.4 Diagnostic functions

The diagnostic system is able to perform the functions, ”Read fault codes”, ”Delete fault codes”, ”Real time data”, ”Component activation”, ”Adjust”, and ”Write to ECU”. That which is possible to do depends on what is available in the control system in question. This varies between different control systems, but also between vehicle manufacturers, where strategies are different for what information is required to maintain its vehicles on the aftermarket. The terms ”Read fault codes”, ”Delete fault codes”, ”Real time data”, ”Component activation”,

”Adjust”, and ”Write to ECU” are found in this diagnostic system, but may be described differently in other diagnostic tools available on the market.

10.4.1 DTC - Read fault codes

Fault codes consists of information stored when the OBD-system senses that the control system works outside valid limit value. When the trouble code is stored, in principle this means that the malfunction lamp is lit in the vehicle's instrumentation. Malfunction lamp is most often not available for all control systems in the vehicle, but normally only for systems that affect the vehicle with regards to operation and safety. Other systems store fault codes, but it is customer requests based on malfunction symptoms in the control system's function that is the basis for reading out fault codes.

Read-outs of fault codes from the vehicle's control system may be presented in different ways depending on how much information that the vehicle's control system can supply. In most cases the presentation shows a fault code number, component description, and information about the fault code's status, that is, if it is ”Permanent” or ”Intermittent”.
Ex.
C1016 Brake light switch, intermittent

In some cases there is additional fault description in the form of, e.g., short-circuiting to ground or open circuit.
Ex.
C1016 Brake light switch, intermittent
- Open circuit

More information about so-called ”frozen data”, i.e., data that shows parts of the vehicle's status when the problem occurred, such as engine temperature or rpm, may appear.
Ex.
C1016 Brake light switch, intermittent
- Open circuit
Vehicle speed 87 km/h
Brake pedal position On

Which information and to what extent the information is presented in the diagnostic system depends on what the vehicle's control system is able to present.

10.4.2 DTC - Delete trouble codes

”Deleting trouble codes” will delete saved malfunction information from the control system's memory. In most cases the control system's memory is deleted directly, however, there are control systems that first require an action from a connected diagnostic system, then to be followed by a mechanical action, for example. ”Ignition off for 10 seconds” thereafter ”Ignition on”. When mechanical or other action is required, this shall be stated in the information for the chosen control system in the diagnostic system. When trouble code recurs immediately when reading trouble codes after deleting, it is likely that the trouble code is permanent and that the OBD-system senses the malfunction during its self-test and immediately stores the trouble code again.

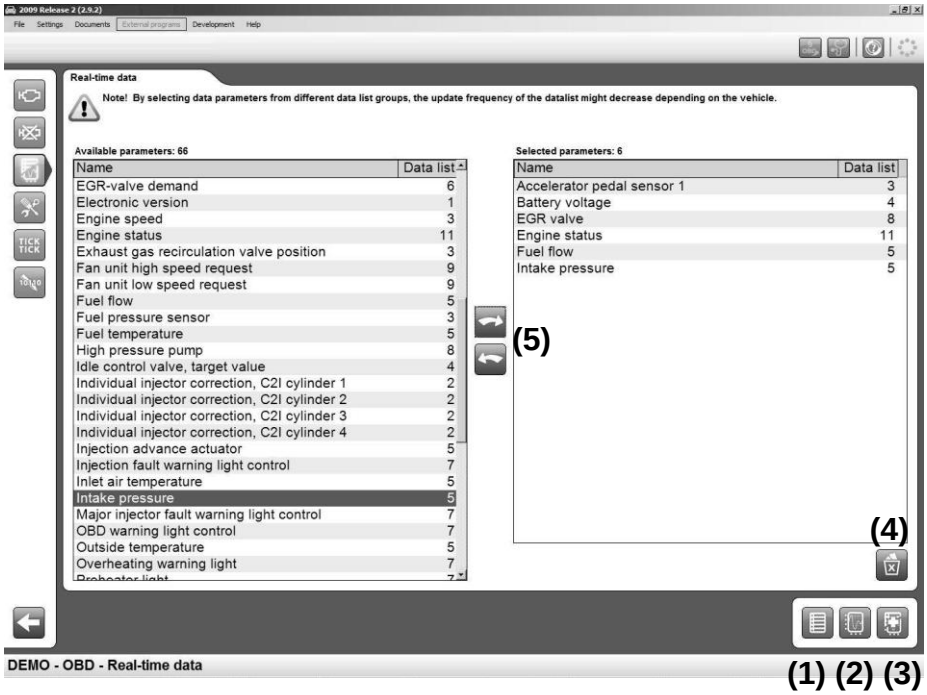
10.4.3 RTD - Real time data

”Real time data” is a partial quantity of the input and output signals that the control system uses to calculate and regulate its control. Real time data presents how the control system experiences the input signals that are the basis for what the output signals should look like.

In diagnostic systems, real time data may be presented in different ways when different input and output signals are suitable for analysis in different ways. For this purpose, the presentation may be a graph or a numerical list. The predefined groups found in the diagnostic system is the most optimal grouping from an update perspective. That is, the or those parameters that are presented at the same time are presented/updated as fast as possible. The number of parameters that are presented together and updating (reading) frequency in the predefined groups vary depending on the control system's design and not the diagnostic system. Using the diagnostic system, it is possible to create a ”customer defined” group composed of different parameters, and these groups can also be presented in the form of a graph or numerical list.

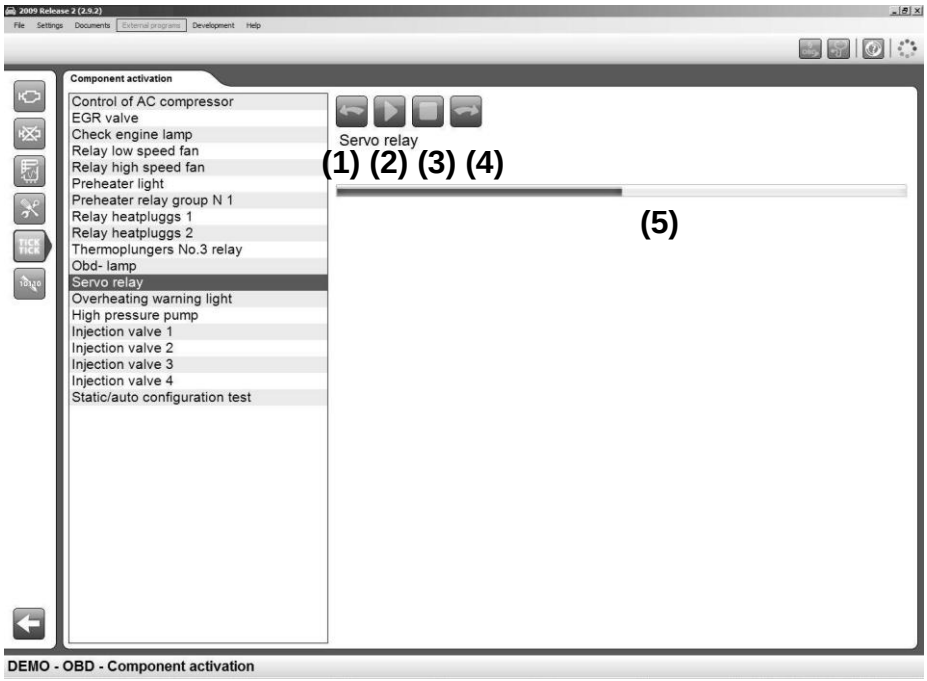
Note! Creating a ”Customer defined” group may mean that the updating (reading) frequency of real time data deteriorates radically. Keep this in mind, primarily when presenting components that are to be changed cyclically, such as lambda (oxygen) sensors. In a worst case, the diagnostic system can update real time data from the lambda (oxygen) sensor at the same time in its cycle, which then results in presentation of a constant value for a component that is expected to change periodically.

To show display mode, use function buttons (1) and (2). Button (1) to show numerical list and button (2) to show graphs. Parameters without numerical values, e.g., status Active/Inactive, are shown as text even in graph mode. Button (3) opens a list with all parameters that are available in the control system. By selecting parameters and moving to selected parameters with the arrow keys (5) you create a personally defined list. Use the recycle bin (4) to empty the list. When the list is done, use the buttons (1) and (2) to show the real time data.



10.4.4 ACT - Component activation

”Component activation” is a way for the diagnostic system to force the control system to bypass its own control function and to let the diagnostic system control/change the output signal. In this way, the diagnostic system can ”force start”, e.g, the engine's cooling fan. Which components and how activation is designed depends on the control system's design. In most activation cases the diagnostic system presents a number of components that are possible to active, the choice of component controls what is activated in the vehicle. It is also possible that the diagnostic system only has the choice to start the activation, then the control system starts a cyclical activation of different components for the control system, which cannot be affected except that it is possible to cancel the cycle. Some actuators require a certain vehicle status to be activated, e.g., that the engine is running. The basic mode is always ”Engine off”/”Ignition on”. If other conditions apply, this is stated either in the connection instructions or in an information dialogue in connection with activation. Certain activations are time-fixed and cannot be cancelled. A sequence indicator (5) is shown in these cases. In other cases activations are controlled with buttons (1), (2), (3), and (4) in the work area.



10.4.5 ADJ - Adjust

”Adjust” is an advanced function where the diagnostic system is used to change the control system's functionality, temporarily turn off functions in the control system, or control system functions in the control system. These functions may be required to finish replacement/repair of defective components or when doing service work. Before an adjustment function is performed, it is important to read through the help instructions and to follow the instructions in the diagnostic system. Not following instructions and directions from the diagnostic system means risk of damaging the vehicle's control system.

10.4.6 COD - Write to ECU

The function ”Write to ECU”, also called coding, is an advanced function where the diagnostic system is sued to add new information to the control system. Examples of coding functions are injector coding, key coding, or replacement of a complete control system/actuator. Before a coding function is performed, it is important to read through the help instructions and to follow the instructions in the diagnostic system. Not following instructions and directions from the diagnostic system means risk of damaging the vehicle's control system.

10.4.7 ISS (Intelligent System Scan)

For some vehicle brands there is ISS (Intelligent System Scan). For the vehicle brands where ISS is available, there is a system choice which is called “All Systems”, that is always found at the top in the choice of system type.

When you have chosen this system type, the ISS button is activated in the right corner at the bottom.
The function scan through the control systems that are chosen/marked in the list in ISS. The scan is started with the button in the right corner at the bottom. Communication is established with the control units and the software reads out fault codes stored in the control systems. The result is presented with one of four colors marked for the chosen control systems.

- Green implies that the control system answers correctly and there are no fault codes stored.
- Red implies that the control system answers correctly with fault codes stored in the system.
- Orange implies that it is not possible to identify the control system in a single-valued way. The user must make a choice.
- Grey implies that the control system does not answer.

To see the stored fault codes, click on the arrow for each respective system. It is possible to erase fault codes by clicking on the symbol for erasing fault codes in the right corner at the bottom. It is also possible to go straight to complete OBD. There are further instructions in the software for each respective part.

Glossary
Permanent: Irreversible – Present
Intermittent: Periodically recurring – Comes and goes
OBD: On Board Diagnostics
MIL: Malfunction Indicator Lamp – Lamp for indicating malfunction
DTC: Diagnostic Trouble Code – Fault code
RTD: Real Time Data – Real time data
ACT: Activation – Activation
ADJ: Adjustment – Adjustment
COD: Coding – Coding
ECU: Electronic Control Unit – Control system, controller (actuator)
SAE: Society of Automotive Engineers
ISO: International Organization for Standardization

11 Parallel measuring

11.1 Introduction

On vehicles where the built-in self-diagnosis (OBD) is not enough to make a correct and problem-solving diagnosis, you have to measure electric signals in the system and compare measured values to a reference value.
”Parallel measuring” means a physical connection in the vehicle. The advantage of this is that you measure signals in the relevant control system, and that is different from OBD which is a data connection where you read out what the control unit experiences. Parallel measuring enables diagnosis of Engine, ABS, Climate system, etc., using direct connection to the control unit. Using purpose-built adapter cables you connect the diagnostic unit between the control unit and the vehicle's wiring. This makes it possible to perform measurements on most components and sensors in the system.
With the test functions Ground & Component test, Workshop test, and Information test, you can easily determine what is causing problems in the vehicle. The order in the test functions is such that incorrect signal shall be detected first. That is, the basic problem is detected before any secondary failures. An example is that a temperature sensor is tested before the injection time. An open circuit on the temperature sensor causes injection time to be abnormally low due to the control system experiencing the temperature as approx. -40° C. Both signals will show incorrect values, but it is only the temperature sensor that requires action. Another example is that a voltage feed deviates from the reference value, which means that the sensor does not work as it should. In this case, voltage feed is checked before the function of the sensor. Take action to solve the malfunctions in the order that they are detected during the test. Check after each action which malfunctions and secondary failures remain. In order for the result of the test to be correct, instructions and directions in the program must be followed, e.g., sensors are measured under different conditions.

11.2 Connecting to vehicle

The diagnostic unit is connected between the control unit and the vehicle's wiring with an adapter cable. Information about which adapter cable that is to be used for the current vehicle is found in the program's car information. All connection and disconnection of control units shall take place with the battery's minus terminal removed or according to description in the vehicle's manual. Note that certain systems, e.g., Radio, requires a code to be started after the electric power has been disconnected. Check that codes are available.

11.3 Ground and Component

This test is used to ensure that ground connections and certain other vital connections in the system are good. The test means measuring only against the car's wiring, that is, without the control unit connected. The reason for this is that measuring with connected control unit may give an incorrect result, since a poor grounding point in the wiring may be hidden to the instrument via a loopback in the control unit to another grounding point. Since ground connections affect just about all other functions in the car, it is suitable to start every diagnosis with this test. When Ground and Component test is chosen, note the order in which the battery should be connected.

The order should be according to:

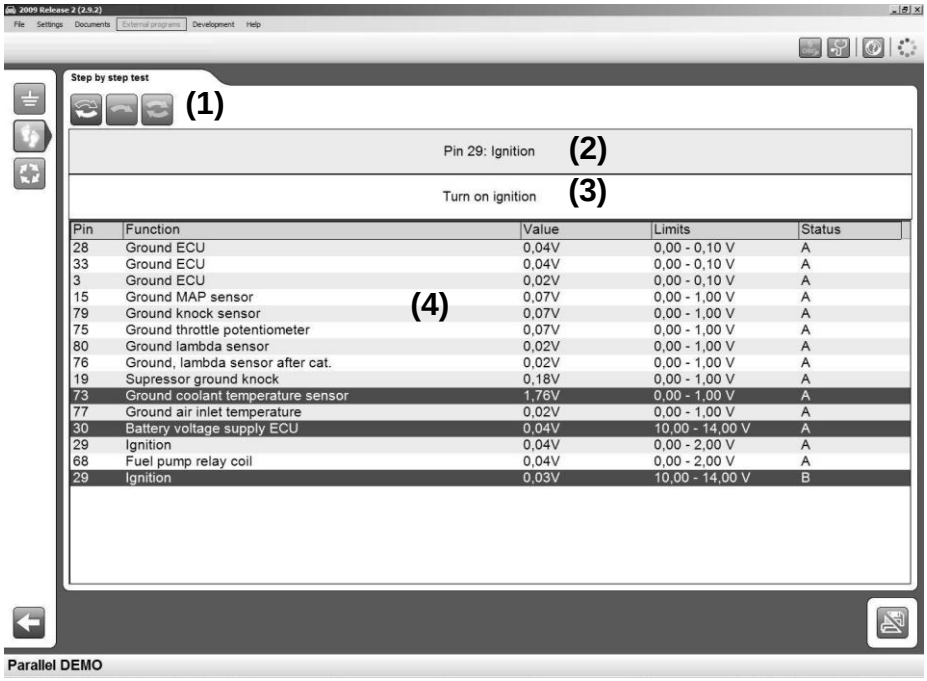
1 : Disconnect the battery's minus terminal.
2 : Disconnect the control unit from the car's wiring.
3 : Connect the test cable to the car's wiring.
4 : Connect the adapter cable to the instrument.
5 : Connect the battery's minus terminal.
6 : Connect the instrument's voltage cable (power) to the battery's terminals.
7 : Start the test, chose Ground and Component test.

The test shows all measuring points with value and limit values (Max./Min.). If measured value is outside the limit values, this is shown with a red marking of the measuring step. Take action to solve any malfunctions before the next diagnostic test is performed.

11.4 Workshop test Step-by-step

Workshop test Step by Step means that the program performs a test sequence and compares measured values with adapted limit values for each function. You are guided through the test by instructions on the screen. These must be followed so that malfunction indications are not obtained as a result of incorrect handling. Examples of instructions may be ”Release throttle”, ”Apply full throttle”, ”Start the engine”, etc. Before certain measuring steps the system will ask validation questions that must be answered. The question will appear in the middle of the screen. Example of such a question may be if the car has automatic transmission or if wheel sensors shall be tested during diagnosis of the brake system.
Every measuring step has a predetermined wait time, within which correct measuring value must be obtained. The time depends on type of signal and if an instruction is to be followed. The test performs measurements of the type voltage (Volt), frequency (Hz), and time (ms). For the measuring step, a measuring range is defined to achieve best possible accuracy. If the value of the measured signal is outside the measuring range, the result is shown as OL (Out of Limit).
During all measurements the green TEST-diode is lit on the diagnostic unit, and the red FAULT-diode flashes in case of detected fault.

At the top in the work area there are buttons for operating the test (1).
The current measuring step (2) is shown under the buttons. The field is updated when measurement is finished and the result is shown. If the result is OK, i.e., measured value is within limit values, the result is shown in black text. If the result is not OK, result is shown in red text. During the current measuring step, there is a field where instructions are shown (3). Note that instructions must be followed for correct results. If an instruction is not followed within the wait time, choose to repeat the measuring step and follow the instruction. The list (4) shows the latest measured test step on the last row and the earlier measuring steps on the rows above. The first column shows pin number and then function/description for the pin, measured value as well as unit for the value, e.g., Volt for voltage or Hz for frequency, limit values for approved measurement and status of the measuring step.



Pin	Function	Value	Limits	Status
28	Ground ECU	0,04V	0,00 - 0,10 V	A
33	Ground ECU	0,04V	0,00 - 0,10 V	A
3	Ground ECU	0,02V	0,00 - 0,10 V	A
15	Ground MAP sensor	0,07V	0,00 - 1,00 V	A
79	Ground knock sensor	0,07V	0,00 - 1,00 V	A
75	Ground throttle potentiometer	0,07V	0,00 - 1,00 V	A
80	Ground lambda sensor	0,02V	0,00 - 1,00 V	A
76	Ground, lambda sensor after cat.	0,02V	0,00 - 1,00 V	A
19	Supressor ground knock	0,18V	0,00 - 1,00 V	A
73	Ground coolant temperature sensor	1,76V	0,00 - 1,00 V	A
77	Ground air inlet temperature	0,02V	0,00 - 1,00 V	A
30	Battery voltage supply ECU	0,04V	10,00 - 14,00 V	A
29	Ignition	0,04V	0,00 - 2,00 V	A
68	Fuel pump relay coil	0,04V	0,00 - 2,00 V	A
29	Ignition	0,03V	10,00 - 14,00 V	B

Examples of status are:
A : Ignition off
B : Ignition on
C : Engine idling
D : Revved engine

The colour of the measuring step in the list is normally black text on white/grey background, but the background turns red if the measured value is outside the limit values.
When the whole test is finished, a dialogue is shown informing that the test is finished and how many faults were detected.

Next measuring step

Next measuring step means that the test continues with the next measuring step.

Repeat measuring step

Repeat measuring step means that the measuring step is done again. Used, e.g., to check that the measurement after any actions or to correct the measurement if an instruction was not followed. If this alternative is chosen, the value from the new measurement will replace the value from the previous. At certain measuring steps, e.g., when checking Lambda (oxygen) sensor, the wait time may be too short. This can be solved by choosing Repeat measuring step, when the test sequence has stopped.

Continuous measuring

Continuous measuring means that the instrument changes to continuous monitoring of only the current signal. With Continuous measuring, any loose connections can be observed by affecting the wiring or components (shaking the wiring, pressing on connectors, etc.), at the same time as measuring is in progress. The instrument continuously stores registered max. and min. values during measuring and shows these on the screen. Continuous measuring cannot be performed when checking for open circuits on the throttle sensor or vibration check for the Lambda (oxygen) sensor, since these measurements are process measurements that go through a special sequence and result in OK or OL. For these checks, refer to Break Out Box (see chapter 12.1).

11.5 Workshop test Automatic

Workshop test Automatic performs the same measuring steps as Workshop test Step by Step, but with automatic function to continue the test if the present measuring step receives an approved result. If the result should be wrong and the measured value is outside limit values, the test stops and the buttons Next measuring step, Repeat measurement, or Continuous measuring are used to continue. Automatic test is good to use to recheck after actions have been performed and you want a quick check of the system .

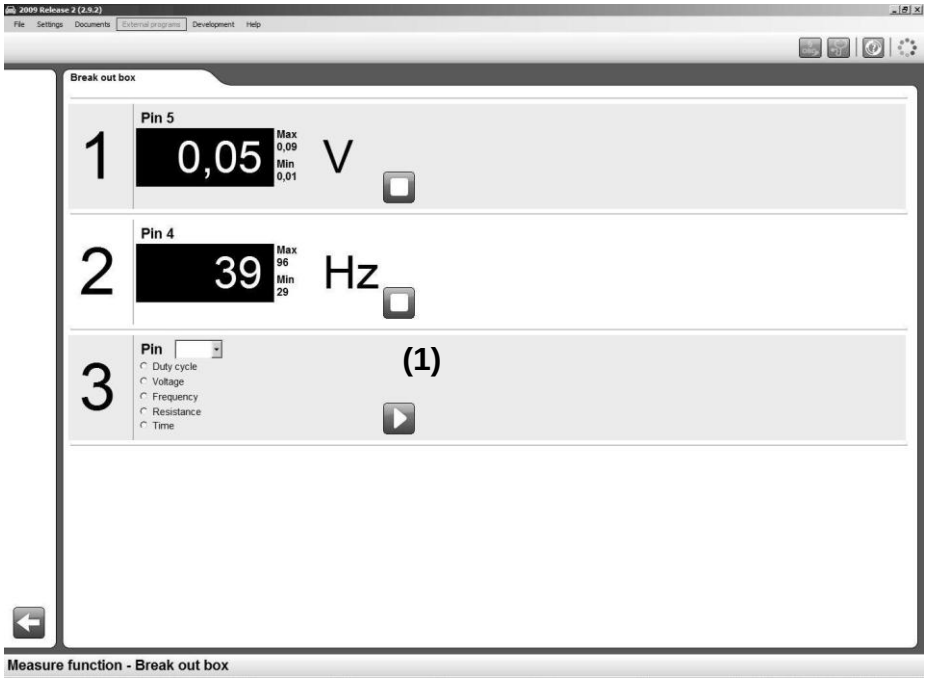
12 Analogue measuring functions

12.1 Introduction

With the analogue measuring functions you can use direct connection to the control unit or external probe to perform a variety of different measurements on any electric component or connection point in the vehicle. Types of possible measurements are: Voltage (Volt), Resistance (Ohm), Time (ms), Frequency (Hz), and Pulse duty factor (%). For certain measurement types it is possible to choose measuring range. Choose the range that best matches the signal's max. value to obtain ŧ the best possible measuring accuracy. If the result is OL, the measured value is outside the measuring range.

12.2 Break Out Box

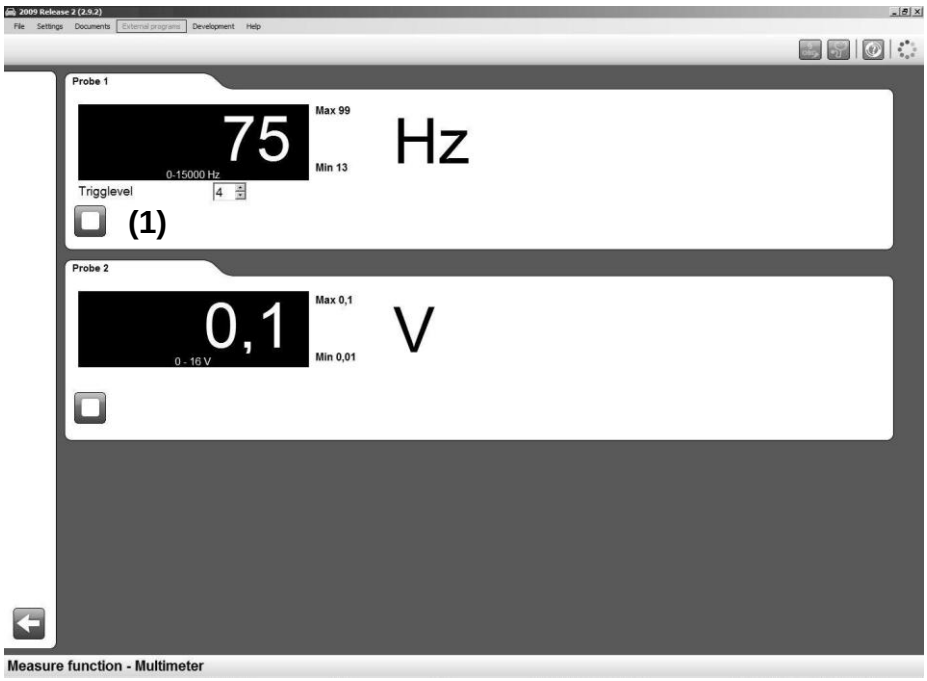
The function is chosen when one or several pins of your choice shall be checked in an order chosen by the operator. Example of this is checking associated functions, e.g., increasing rpm and increasing voltage from mass air flow sensor as well as changes in injection time, etc. Another application is when the vehicle to be tested is not included in installed test protocols, but there is a suitable connection cable available. Using wiring diagrams and basic system knowledge, you can measure the system manually with the instrument's BOB-function. The BOB-function offers the possibility of measuring up to three pins at the same time. State pin number and measurement type. For Resistance measurement and time measurement, state the measuring range and trigger level, respectively. Click the start button (1) on the right to start the measurement.



Measuring is cancelled by pressing the stop button (1). When measuring has been cancelled, it is possible to freely delete/add pin(s) or change measurement type for any pin.

12.3 Probe measurement (Multimeter function)

Probe measurement is used for measuring Voltage (Volt), Resistance (Ohm), Frequency (Hz), Time (ms), or Pulse duty factor (%) using the instrument's P1 and P2 connection. For these measurement types, measuring range and trigger level must be set before measuring can start. If resistance (Ohm) or voltage (Volt) is chosen, the box for setting measuring range on the right lights up. Set desired measuring range. For time measurement (ms), the box for setting trigger level under the value box lights up. Here desired trigger level can be set. In short, trigger level means that you set the voltage level at which you want to measure in the studied signal. When the desired function has been chosen, press the start button (1) and hold the measuring probe's pin against the point where measuring is to be performed. Continuous measuring continues until you press the stop button.



NB! The measuring probe only has one pin and it is connected to the desired measuring point. All measurements are done in relation to the car battery's minus terminal. It is important that the battery's connections are in good condition for exact measuring results. Resistance measurement may NOT be performed on component supplied with voltage (power).

12.4 Oscilloscope

See the document ”User guide Oscilloscope ENG.pdf”, which is found in the start menu.

13 Generic OBD

13.1 Introduction

Generic OBD is a program used to read out data from the car's built-in statutory diagnostic function, the primary function of which is to monitor emission-related components' function. In Europe this standard function is called eOBD, in the USA it is called OBD2, and in Japan it is called JOBD. We have decided to collect these standards in one and the same software. It also contains all standards for reading out statutory OBD on heavy vehicles.

13.2 Connecting to vehicle

Immediately when GOBD is chosen, either using the function key in the top right corner or using the car selection, connection to the vehicle is started. Therefore, it is important that the vehicle has been prepared for diagnosis before you press the button. The vehicle shall have the ignition on or the engine running to enable connection to all systems.

13.3 General use of the program

The program is controlled using the function buttons in function menu 1, function menu 2, and with buttons in the work area. Each function/mode is described below. Generic OBD is available in two user levels. To change level, go to the Settings menu and select/deselect “Generic OBD Advanced mode”. When the program is in Advanced mode all functions are available. In User mode functions for legislated verification of the vehicle manufacturer is hidden. We highly recommend User mode for use in workshops and with the intention to diagnose the vehicle. Note that when the car does not support chosen function/mode, then ”not supported by vehicle” is shown.

13.3.1 Information

The first window that appears is the information window containing general information about the vehicle you are connected to.

- Available control units. The list with available control units includes all those control units that support the eOBD standard.
- Information. In the list under the heading information, specific data is shown for the chosen ECU. To choose another ECU, click on it in the list with available control units. This box shows three different values, such as: MIL status, quantity of fault codes (permanent), as well as which communication standard is being used.
- Main information. Main information shows which communication type that the vehicle uses to communicate and the total quantity of fault codes from all control units. This also shows if the MIL is lit.
- Readiness tests. The list for readiness tests shows tests for chosen ECU, and if they are supported by the control unit. The different values that can be assumed are done or not done. The following tests are standard in OBD II/eOBD:

  • Misfires
  • Fuel system
  • Component test
  • Catalytic converter
  • Preheated catalytic converter
  • EVAP
  • Secondary air system
  • AC-system
  • Preheated lambda (oxygen) sensor

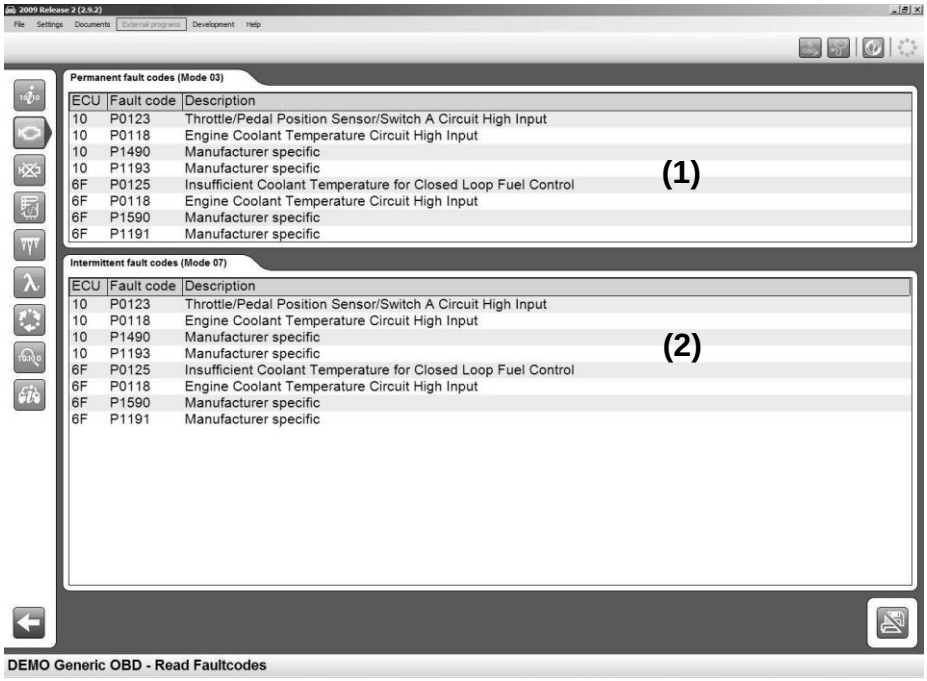
- EGR-system

13.3.2 Reading fault codes

This lists both permanent and intermittent fault codes from the control units that support the eOBD standard. They are shown with ECU-number, fault code number, as well as a description of the fault code in plain text.

- Permanent fault codes (1). The fault codes shown in this list are stored fault codes.
- Intermittent fault codes (2). The fault codes shown in this list are fault codes that must be set for a certain time or a certain number of times to be stored as a permanent fault code.

It is possible to save and print a list with fault codes (3).



13.3.3 Deleting diagnostic information

With this function you can delete fault codes and diagnostic information. Pressing the button delete will delete the fault codes shown under reading fault codes. If this should fail, a message is shown detailing which control units have deleted successfully and which have failed to delete. If all control units successfully delete diagnostic information, a message is shown telling you that all went well. This function not only deletes fault codes, it also deletes the readiness tests as well as frozen data. To perform the readiness tests again, the car has to be run through driving cycles. Some tests are more advanced than other, and therefore take longer time to complete.

13.3.4 Real time parameters

Here you can read data from the chosen ECU and chosen value. The values are updated continuously. If a value is chosen the activity indicator will start to spin again in the top right corner of the window that indicates that continuous reading from the vehicle is in progress.

13.3.4.1 Data list

The function consists of three different parts, Values, Current data, and Information. The value list lists the real time parameters that the user can chose, arranged per ECU. The current data list includes the chosen values that the user has chosen, and the information box shows information about the values that have additional explanation. To be able to see a value, it must be chosen in the box under the heading values. All these values do not have a number value as a result, it may also be a text message, or a value that refers to a text. In order to know if the value refers to a text or a specific value, you can check this in the column for unit. If it reads INFO, you can click on this row and information about the value is shown in the box for information.

13.3.4.2 Graph

Another function is that you can see a graph of up to three chosen values from the list for current data. To chose these, click on the row in the current data list with the value you are interested in. If it is not chosen this may be due to that the chosen value cannot be shown in a graph. A hint informing that the value cannot be chosen is shown to get quick information about this. Then, when one to three values are chosen in the list you can press on the tab graph. When this is done, the graph is shown. With the graph function it is possible to stop and start the graph. It is also possible to go to the beginning or end of the graph. Min. and Max. values change continuously during the graph cycle.

13.3.5 Frozen data

Here you can read stored data values belonging to permanent fault codes from different control units. Control units with stored fault codes are shown in the list ”Available control units”. Values belonging to a chosen ECU are shown in a list. When the fault code is set, current data is stored in the control unit, which then can be read out and used when troubleshooting the vehicle. The list number states which list is shown. A fault code can store up to 255 different lists. The user can scroll between these lists with the buttons Previous and Next.

13.3.6 Lambda

In Lambda you can read out values from the lambda (oxygen) sensor. Values that can be chosen are found in the list ”Oxygen sensors”. These can be chosen and are then added to the list ”Values”, where they are read continuously. The recycle bin empties the list with values.

13.3.7 Non-continuous tests

These test values are read when the button for the function is pressed down and are indicated with TID- and CID-numbers that are defined by the vehicle supplier. The column Results indicates if the test has an approved value or a non-approved value. If there are no limit values, then ”---” is shown in the column. To interpret the values, the user of the program is referred to the vehicle's documentation.

13.3.8 Diagnostic check

The list ”Tests” includes the tests that are available per ECU. The standardised functions are presented with a text, while others are presented with TID-number and the text ”Car specific”. To see a test, click on the test in the list. Then the test will be moved to the value list. The recycle bin empties the list with tests.

13.3.9 Car information

This function can show three manufacturer-specified values per ECU, and these are:

- Chassis number
- Calibration identification number
- Calibration verification number

14 Technical specification

• Meets EU Directive 89/336/EEG and 73/23/EEG
• Dimensions: 370 x 185 x 45 (mm)
• Weight: 1.9 kg
• Voltage feed: 10-32 Volt
• Current consumption: 300 mA
• Operating temperature: 0-50 ºC
• Measuring range:
• Voltage: 0-200 Volt (+/- 0.5%)
• Frequency: 0-15 kHz (resolution 1 Hz)
• Resistance: 0-10 kOhm (+/- 2%)