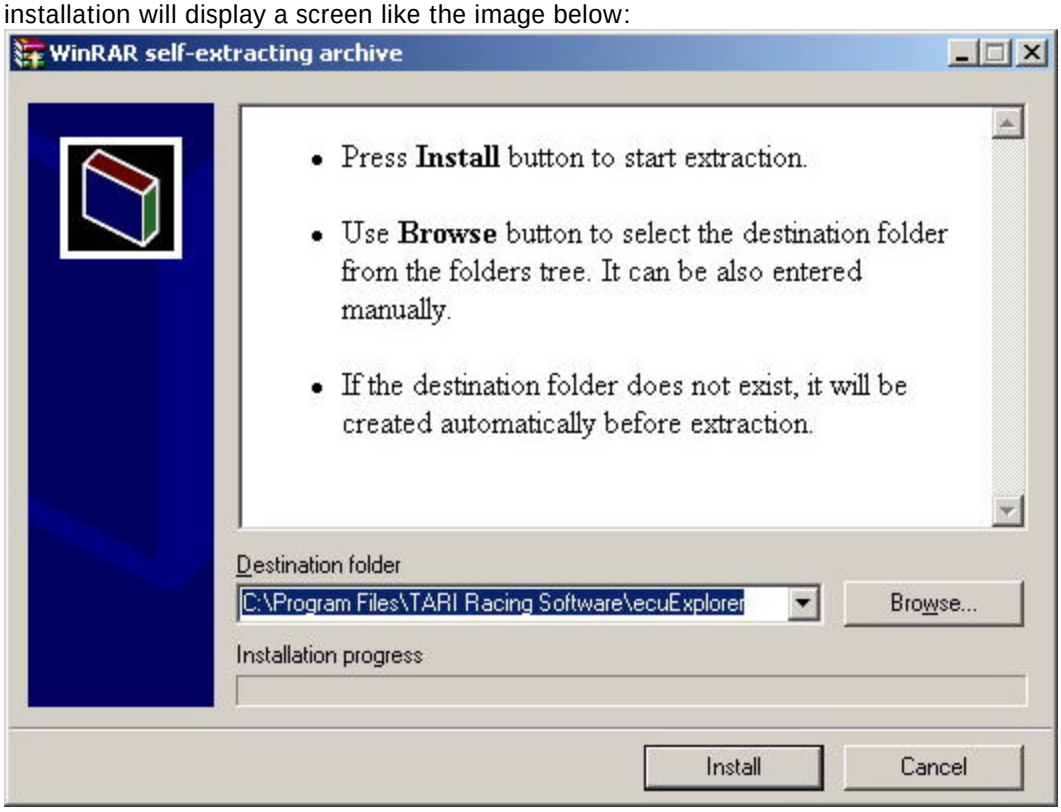
ecuExplorer User Guide

Installation

ecuExplorer is distributed by means of a self-extracting installation application. Executing the installation will display a screen like the image below:

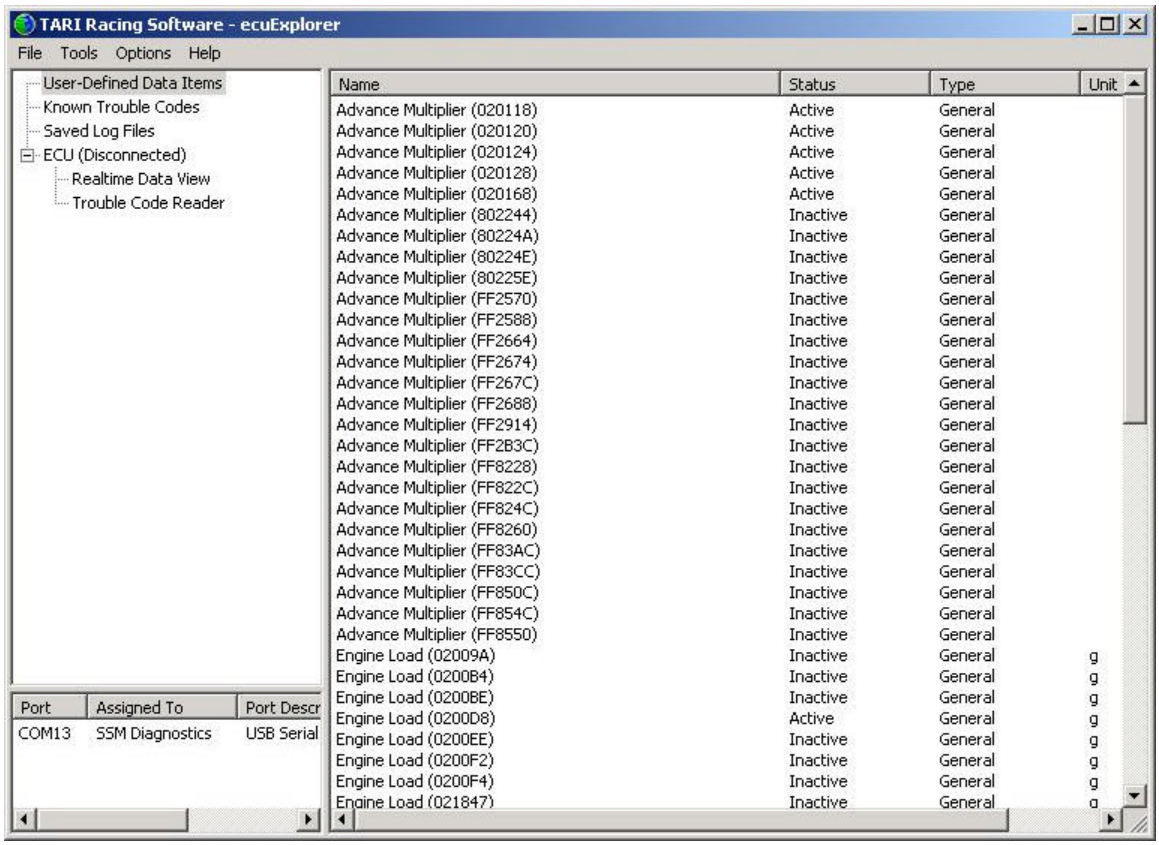


If you need to change the default installation path you can type the new location in the 'Destination Folder' box provided, or use the 'Browse' button to navigate to the desired folder. Click 'Install' to start the installation.

The installation package will create a shortcut on the desktop to the ecuExplorer application; it will also create a new folder in the Start -> Program folder. Use these for easy access to the application and this user guide.

Getting Started

User Interface



The user interface for ecuExplorer looks like the image above. The top left pane is the navigation tree, clicking on the different tree nodes will change the right-hand area to the relevant view. The bottom left pane displays the communications ports that are available on the system. The right-hand pane will display the relevant view according to the node selected in the navigation tree.

Menu Structure

File -> Open Log File
Use this to open a saved log file into ecuExplorer. Each loaded log file will appear as a separate item in the 'Saved Log Files' navigation tree node.
File -> Exit
This will close the application.

Tools -> Reset ECU
Use this to reset the ECU. Resetting the ECU will clear any trouble codes that may be currently registered in the ECU. The reset will also clear out any learnt ignition timing and fuel trim learning.
Tools -> Adjust Idle Speeds
This function allows you to change the idle speed of the engine. There are 2 modes that are available to adjust; normal idle and idle with the air conditioning system on. The idle speed can be adjusted to add or remove engine RPM. The maximum for each mode is 300RPM either added or removed.

Note: The adjustment limits are set in the ECU ROM image and differ between ECU versions, therefore total adjustment is dependant on these ECU values.

Tools -> Adjust Ignition Timing

This function allows you to adjust the ignition timing. The base ignition timing can be adjusted to add or remove timing. This adjustment is a global setting and is applied to the base timing across all RPM and Engine Load. The maximum is 5° either added or removed.

Note: The adjustment limits are set in the ECU ROM image and differ between ECU versions, therefore total adjustment is dependant on this ECU value.

Tools -> ecuQuery

This function allows you to query the RAM memory space between 2 entered addresses. The output is also stored in a file of your choice for later analysis. This feature is useful in finding certain data item locations or looking for maps within RAM memory.

Tools -> Read ECU Flash Memory

Note: The ecuFlash tools can cause irreparable damage to the connected ECU. Please do not use them until you fully understand what is being done and the associated risks!

This function allows you to download the current ROM image that is stored in the connected ECUs' flash memory. Downloading the ROM image will cause the connected ECU to lose all learnt ignition and fuel values, just like an ECU Reset. It will take a few miles/kilometers of driving before the ECU is running at its optimum.

Tools -> Write ROM Image to ECU Flash Memory

Note: The ecuFlash tools can cause irreparable damage to the connected ECU. Please do not use them until you fully understand what is being done and the associated risks!

This function allows you to upload a new ROM image to the flash memory in the connected ECU. It is important that the new ROM image is compatible with the connected ECU, otherwise the ECU will be useless. It is important that the new ROM image is not encrypted by any third-party application, otherwise the ECU will be useless. Writing the new ROM image will cause the connected ECU to lose all learnt ignition and fuel values, just like an ECU Reset. It will take a few miles/kilometers of driving before the ECU is running at its optimum.

Note: DO NOT TURN OFF THE IGNITION DURING THE FLASH PROCESS. IF THE FLASH PROCESS SHOULD FAIL FOR SOME REASON, DO NOT TURN OFF THE IGNITION, TRY THE FLASH PROCESS AGAIN.

Tools -> Test Write to ECU Flash Memory

Note: The ecuFlash tools can cause irreparable damage to the connected ECU. Please do not use them until you fully understand what is being done and the associated risks!

This function will do the same as the 'Write ROM Image to ECU Flash Memory' BUT it will not actually write to the flash memory. It is a test routine which can be used to verify that all is working correctly before actually committing to writing to the flash memory. Test writing the ROM image will cause the connected ECU to lose all learnt ignition and fuel values, just like an ECU Reset. It will take a few miles/kilometers of driving before the ECU is running at its optimum.

Tools -> Compare ROM Image to ECU Flash Memory

Note: The ecuFlash tools can cause irreparable damage to the connected ECU. Please do not use them until you fully understand what is being done and the associated risks!

This function will allow you compare a new ROM image to the ROM image that is currently in the connected ECU flash memory. Comparing the ROM image will cause the connected ECU to lose all learnt ignition and fuel values, just like an ECU Reset. It will take a few miles/kilometers of driving before the ECU is running at its optimum.

Options -> Show Debug Console
ecuExplorer is able to display a console window while it is active. The console will display various debugging information during program execution. It is not necessary to have this console active unless you are noticing unwanted application behavior. Keep the debug console off if you want to increase application speed.
Options -> Capture Error Log
This setting determines whether all application errors are logged to a file. This setting should be left activated to keep a record of any application errors. This can be useful in debugging any unwanted application behavior.
Options -> Capture SSM Trace File
ecuExplorer has the ability to record all SSM communication received from the ECU to a trace file. This setting determines whether the trace file is actively used.
Options -> Configure Comm Settings
Note: Alter these settings only if you have connectivity problems. Some hardware cannot support the required refresh rates.
The default settings are:
XonLim = 2048
XoffLim = 512
ReadIntervalTimeout = -1
ReadTotalTimeoutConstant = 0
WriteTotalTimeoutConstant = 50

The adjusted settings are:
XonLim = 2048
XoffLim = 2048
ReadIntervalTimeout = 500
ReadTotalTimeoutConstant = 1000
WriteTotalTimeoutConstant = 5000

Options -> ecuFlash
These options are used to determine which communication protocol is used by ecuFlash. There are currently 4 options available:

- Subaru WRX USDM 2002-2003
- Subaru WRX USDM 2004-2005
- Subaru WRX International 2001-2005 (Non USDM)
- Subaru STI International 2001-2005 (Non USDM)

Note: ecuFlash DOES NOT currently support the older MY99/00 JECS processor ECU's. It only supports the DENSO range of ECU's which have been used since 2001.
Note: ecuFlash DOES NOT currently support the Drive-By-Wire (DBW) ECU's found in the USDM STI and 2006 (AUS/SA/EURO) models.

Help -> About
This will display a message box with the application version and credits.

Initial Configuration
When the application is installed and used for the first time there is no communications port selected. Available communication ports are displayed in the bottom left-hand pane.

Note: If you are using a USB cable or a USB <-> Serial Converter the COM port may only be visible when the cable is connected to the pc/laptop. These are virtual COM ports.

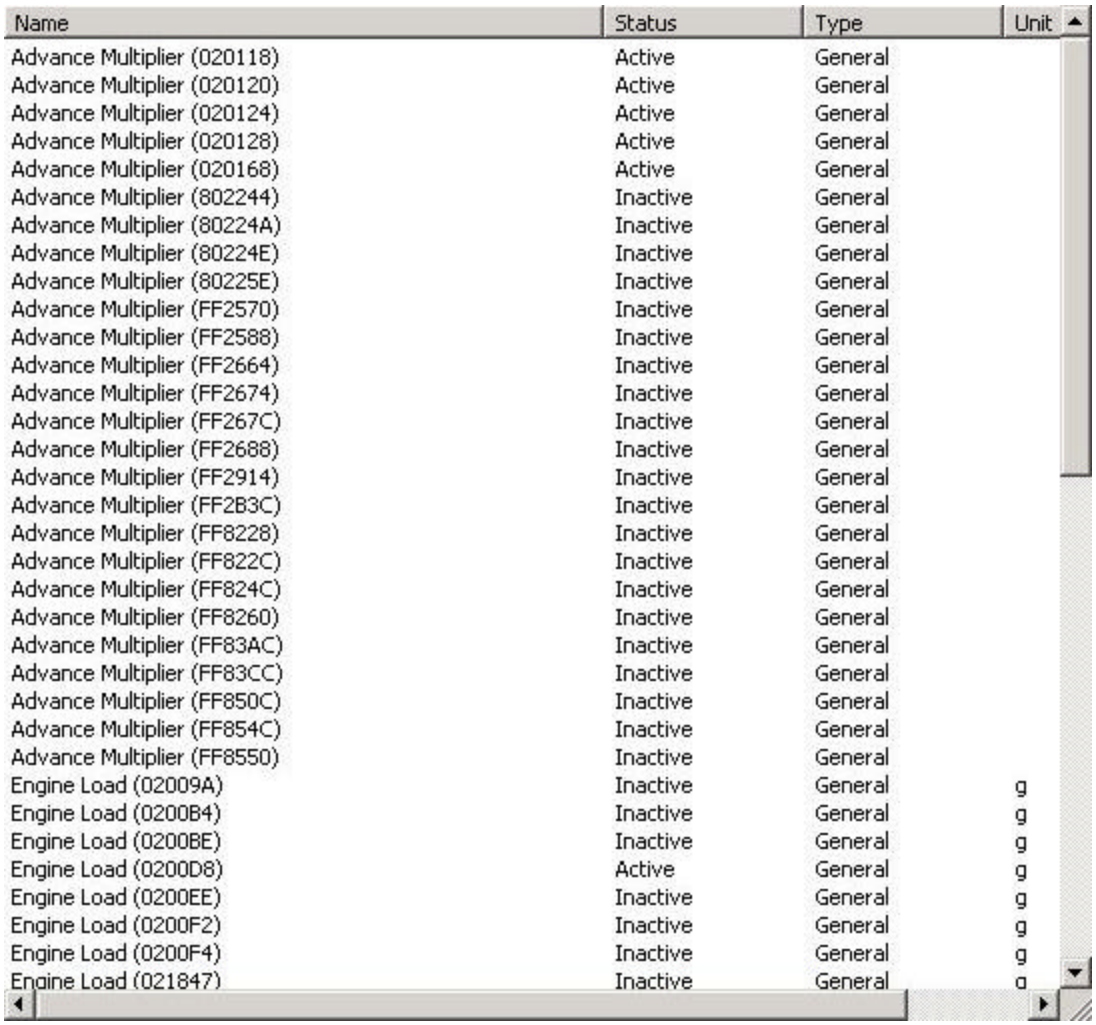
To select a communications port right-click in the bottom left-hand pane and you will see a menu allowing you to select which feature you want to use the com port for. Choose the desired assignment and restart ecuExplorer to effect the change.

Hotkeys

Ctrl-O :: Open Log File
Ctrl-X :: Exit
F7 :: Reset ECU
Ctrl-F1 :: About

Navigation Tree

User-Defined Data Items



Name	Status	Type	Unit
Advance Multiplier (020118)	Active	General	
Advance Multiplier (020120)	Active	General	
Advance Multiplier (020124)	Active	General	
Advance Multiplier (020128)	Active	General	
Advance Multiplier (020168)	Active	General	
Advance Multiplier (802244)	Inactive	General	
Advance Multiplier (80224A)	Inactive	General	
Advance Multiplier (80224E)	Inactive	General	
Advance Multiplier (80225E)	Inactive	General	
Advance Multiplier (FF2570)	Inactive	General	
Advance Multiplier (FF2588)	Inactive	General	
Advance Multiplier (FF2664)	Inactive	General	
Advance Multiplier (FF2674)	Inactive	General	
Advance Multiplier (FF267C)	Inactive	General	
Advance Multiplier (FF2688)	Inactive	General	
Advance Multiplier (FF2914)	Inactive	General	
Advance Multiplier (FF2B3C)	Inactive	General	
Advance Multiplier (FF8228)	Inactive	General	
Advance Multiplier (FF822C)	Inactive	General	
Advance Multiplier (FF824C)	Inactive	General	
Advance Multiplier (FF8260)	Inactive	General	
Advance Multiplier (FF83AC)	Inactive	General	
Advance Multiplier (FF83CC)	Inactive	General	
Advance Multiplier (FF850C)	Inactive	General	
Advance Multiplier (FF854C)	Inactive	General	
Advance Multiplier (FF8550)	Inactive	General	
Engine Load (02009A)	Inactive	General	g
Engine Load (0200B4)	Inactive	General	g
Engine Load (0200BE)	Inactive	General	g
Engine Load (0200D8)	Active	General	g
Engine Load (0200EE)	Inactive	General	g
Engine Load (0200F2)	Inactive	General	g
Engine Load (0200F4)	Inactive	General	g
Engine Load (021847)	Inactive	General	g

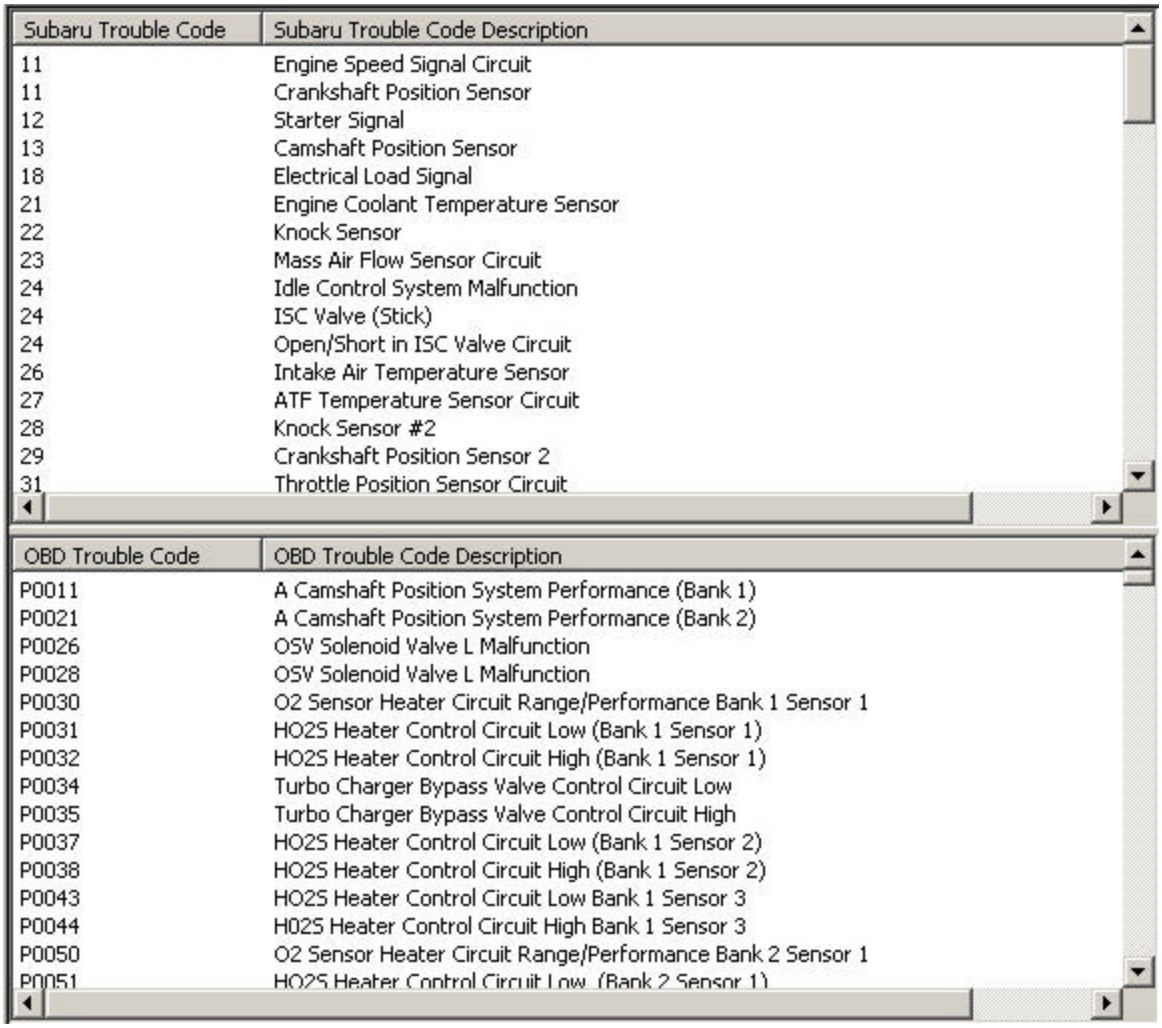
Above is a screen-cut of the 'User-Defined Data Items' view. This view will display a list of all extra user-defined data items that the application will add to the 'Realtime Data View' view and be able to report on. Each data item is either 'Active' or 'Inactive'. To change the state of the data item right-click on the specific row and a menu will be shown where you choose the new state. The new state is effected immediately and the selected data item is either added or removed from the relevant data item list in the realtime data view.

Advance Multiplier
0x80xxxx - this range is for the MY99/00 ECU vehicles
0x02xxxx – this range is for the MY01 -> MY05 ECU vehicles (Non-USDM)
0xFFxxxx – this range is for the USDM vehicles

Engine Load
0x80xxxx - this range is for the MY99/00 ECU vehicles
0x02xxxx – this range is for the MY01 -> MY05 ECU vehicles (Non-USDM)
0xFFxxxx – this range is for the USDM vehicles

Manifold Relative Pressure (Corrected)
This parameter overcomes the 1.27b (18.42PSI) limit of the regular 'Manifold Relative Pressure' value. This value is a result of Manifold Absolute Pressure – Atmospheric Pressure; therefore it will scale to the limits of the stock pressure sensor.

Known Trouble Codes

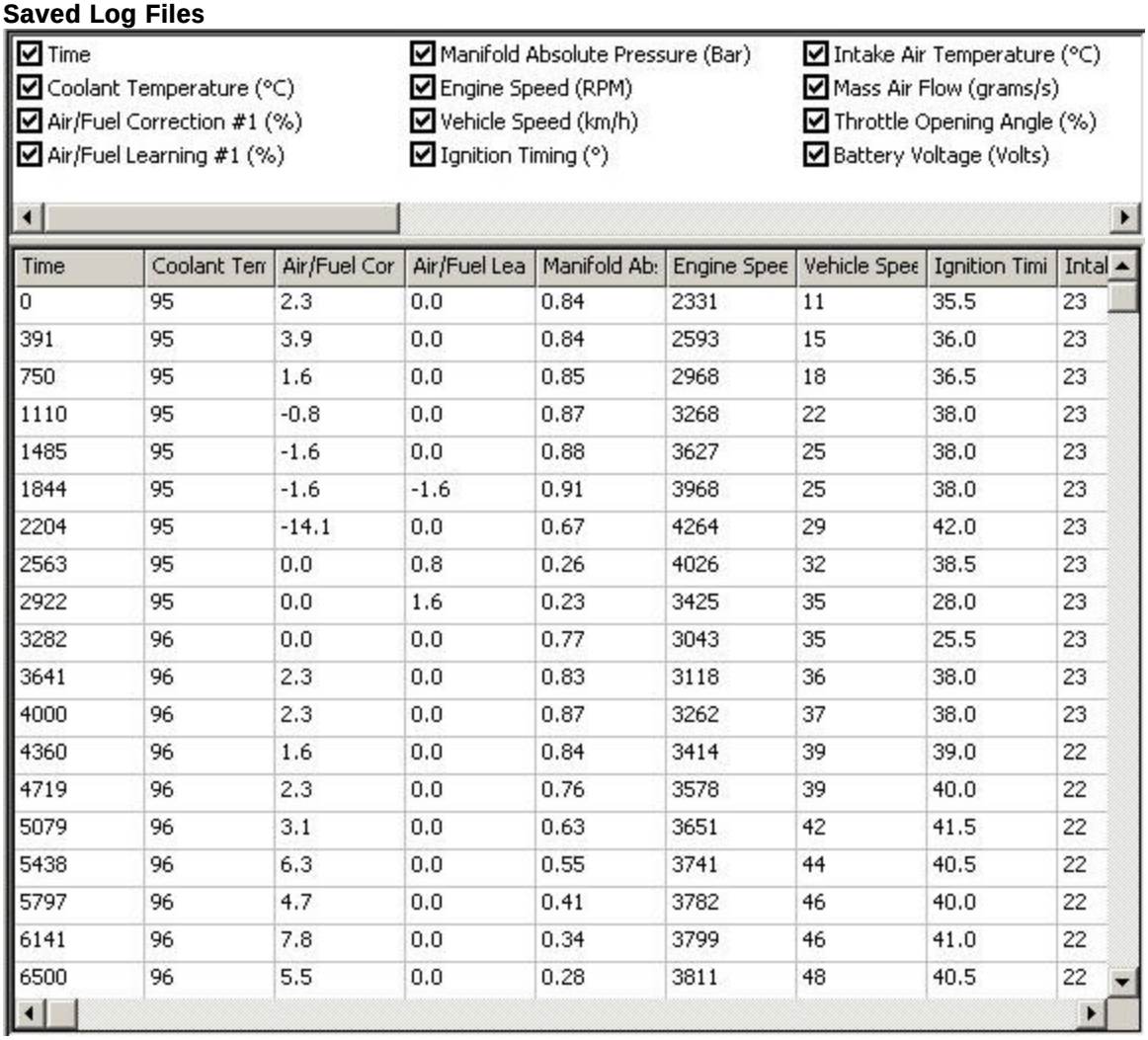


Subaru Trouble Code	Subaru Trouble Code Description
11	Engine Speed Signal Circuit
11	Crankshaft Position Sensor
12	Starter Signal
13	Camshaft Position Sensor
18	Electrical Load Signal
21	Engine Coolant Temperature Sensor
22	Knock Sensor
23	Mass Air Flow Sensor Circuit
24	Idle Control System Malfunction
24	ISC Valve (Stick)
24	Open/Short in ISC Valve Circuit
26	Intake Air Temperature Sensor
27	ATF Temperature Sensor Circuit
28	Knock Sensor #2
29	Crankshaft Position Sensor 2
31	Throttle Position Sensor Circuit

OBD Trouble Code	OBD Trouble Code Description
P0011	A Camshaft Position System Performance (Bank 1)
P0021	A Camshaft Position System Performance (Bank 2)
P0026	OSV Solenoid Valve L Malfunction
P0028	OSV Solenoid Valve L Malfunction
P0030	O2 Sensor Heater Circuit Range/Performance Bank 1 Sensor 1
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0034	Turbo Charger Bypass Valve Control Circuit Low
P0035	Turbo Charger Bypass Valve Control Circuit High
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0043	HO2S Heater Control Circuit Low Bank 1 Sensor 3
P0044	H02S Heater Control Circuit High Bank 1 Sensor 3
P0050	O2 Sensor Heater Circuit Range/Performance Bank 2 Sensor 1
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)

Above is a screen-cut of the 'Known Trouble Codes' view. The top pane lists all Subaru specific trouble codes. The bottom pane lists all OBD standard defined trouble codes.

Saved Log Files



Time	Coolant Tem	Air/Fuel Cor	Air/Fuel Lea	Manifold Ab:	Engine Spee	Vehicle Spee	Ignition Timi	Intal
0	95	2.3	0.0	0.84	2331	11	35.5	23
391	95	3.9	0.0	0.84	2593	15	36.0	23
750	95	1.6	0.0	0.85	2968	18	36.5	23
1110	95	-0.8	0.0	0.87	3268	22	38.0	23
1485	95	-1.6	0.0	0.88	3627	25	38.0	23
1844	95	-1.6	-1.6	0.91	3968	25	38.0	23
2204	95	-14.1	0.0	0.67	4264	29	42.0	23
2563	95	0.0	0.8	0.26	4026	32	38.5	23
2922	95	0.0	1.6	0.23	3425	35	28.0	23
3282	96	0.0	0.0	0.77	3043	35	25.5	23
3641	96	2.3	0.0	0.83	3118	36	38.0	23
4000	96	2.3	0.0	0.87	3262	37	38.0	23
4360	96	1.6	0.0	0.84	3414	39	39.0	22
4719	96	2.3	0.0	0.76	3578	39	40.0	22
5079	96	3.1	0.0	0.63	3651	42	41.5	22
5438	96	6.3	0.0	0.55	3741	44	40.5	22
5797	96	4.7	0.0	0.41	3782	46	40.0	22
6141	96	7.8	0.0	0.34	3799	46	41.0	22
6500	96	5.5	0.0	0.28	3811	48	40.5	22

For each opened log file a new node will be added to the 'Saved Log File' navigation tree node. Clicking on the opened log file node will display a view like the screen-cut above. The top pane of the window lists each column that is in the saved log file. The bottom pane lists each column from the saved log file along with the saved data.

When the saved log file is opened all columns are shown by default, if you do not want to see a certain column uncheck the relevant item in the top pane. This will hide the data column in the grid below.

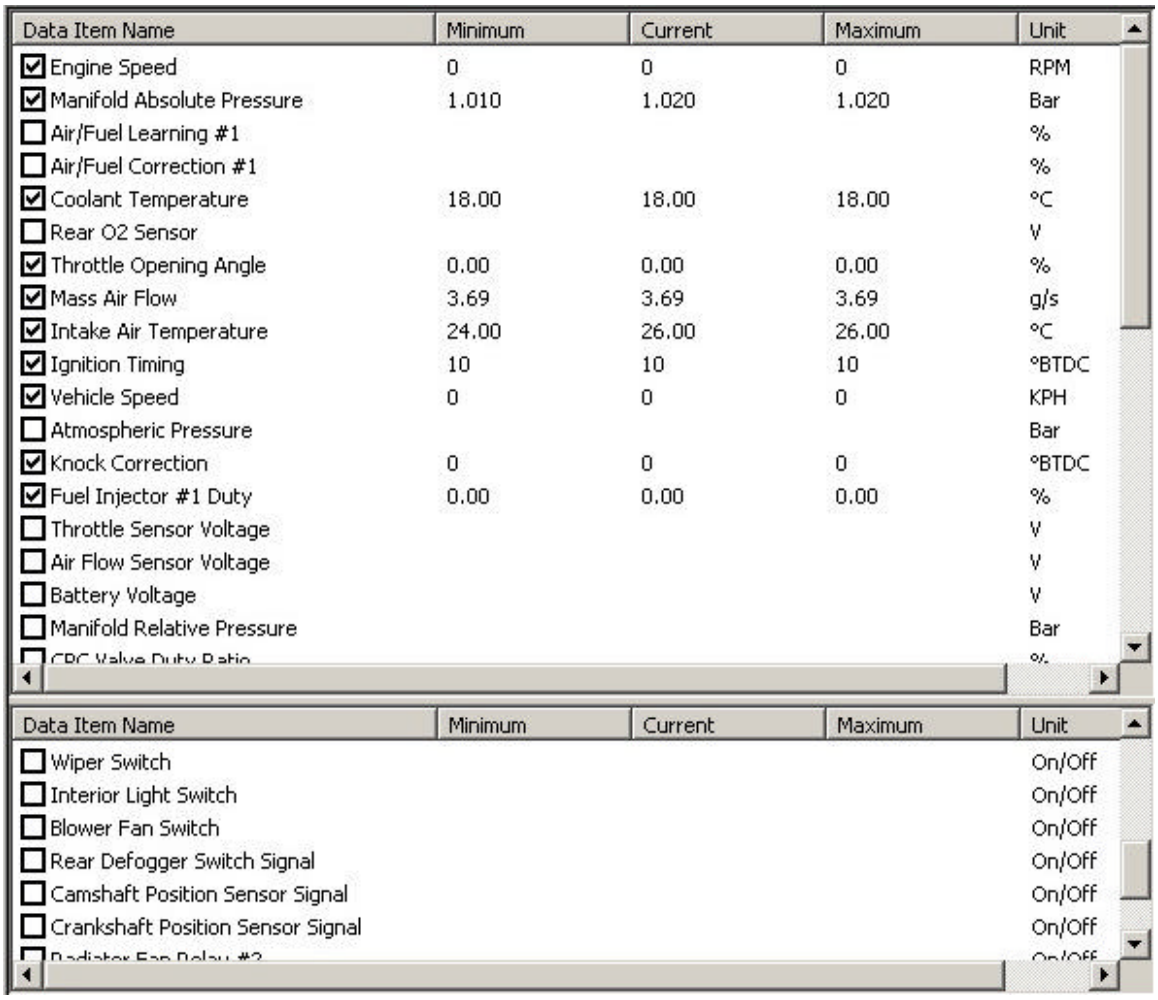
ECU Connectivity

When the application is started this navigation node is displayed as 'ECU (Disconnected)'. When the application has made a successful connection to the ECU it will display the ECU type in the node. The ECU connectivity node consists of the following views:

- Realtime Data View
- Trouble Code Reader

Note: The ECU ID that is displayed in the navigation tree may differ from the vehicle type or ID printed on the ECU cover. This is because some remapping vendors use another ECU's base code to achieve certain features.

Realtime Data View



Data Item Name	Minimum	Current	Maximum	Unit
☑ Engine Speed	0	0	0	RPM
☑ Manifold Absolute Pressure	1.010	1.020	1.020	Bar
☐ Air/Fuel Learning #1				%
☐ Air/Fuel Correction #1				%
☑ Coolant Temperature	18.00	18.00	18.00	°C
☐ Rear O2 Sensor				V
☑ Throttle Opening Angle	0.00	0.00	0.00	%
☑ Mass Air Flow	3.69	3.69	3.69	g/s
☑ Intake Air Temperature	24.00	26.00	26.00	°C
☑ Ignition Timing	10	10	10	°BTDC
☑ Vehicle Speed	0	0	0	KPH
☐ Atmospheric Pressure				Bar
☑ Knock Correction	0	0	0	°BTDC
☑ Fuel Injector #1 Duty	0.00	0.00	0.00	%
☐ Throttle Sensor Voltage				V
☐ Air Flow Sensor Voltage				V
☐ Battery Voltage				V
☐ Manifold Relative Pressure				Bar
☐ CPC Valve Duty Ratio				%

Data Item Name	Minimum	Current	Maximum	Unit
☐ Wiper Switch				On/Off
☐ Interior Light Switch				On/Off
☐ Blower Fan Switch				On/Off
☐ Rear Defogger Switch Signal				On/Off
☐ Camshaft Position Sensor Signal				On/Off
☐ Crankshaft Position Sensor Signal				On/Off
☐ Radiator Fan Relay #2				On/Off

Above is a screen-cut of the realtime data view actively connected to an ECU and retrieving data.

Note: Data items are only added to this view when there is a successful connection to the ECU. If you do not get any data items in this view ensure that you have done the following:

- **connected the cable to the car's OBD port**
- **selected the correct COM port for communication**
- **the ignition must be in the ON position**

The realtime data view is split into 2 panes. The top pane holds all analogue data items, while the bottom pane lists all digital data items.

Each data item has a check-box next to it. Only if the check-box is ticked will the application query the ECU for the realtime data. Each data item has 4 columns for data display. The 'Minimum' column will display the lowest value received during the data collection period. The 'Current' column displays the value that is actively being received from the ECU. This is the most active column. The 'maximum' column will display the highest value received during the data collection period. The 'Unit' column displays the relevant unit of measure for the specific data item.

The current sample rate is displayed next to the 'Realtime Data View' navigation node. It is shown as milliseconds (ms). 1000ms = 1 second. This is the time taken for ecuExplorer to query the ECU, process the response and display the received values.
Note: The more data items you select to read the slower the sample rate will get. To increase the sample rate select only the items you want to monitor. Having a better sample rate will allow you to notice smaller trends in the captured data and provide a higher resolution for graphing or analysis.

Right-click in either pane and you will be shown the realtime data view context menu. It has the following commands:
Start File Capture
This is a manual way to start capture to a .csv log file. Some cars do not have a rear defogger switch or it may not work correctly. This allows those users to still capture their ECU data for analysis at a later stage.
Choose Logging Directory
This menu command will open a folder browse dialog box. You can select the directory where your .csv log files will be stored to. This setting is stored in the registry and used each time the application starts.

Trigger Logging on Defog Switch
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will monitor for the 'Rear Defogger Switch Signal'. When the application receives data that the defog switch has been activated it will automatically begin logging the received data for the selected data items to a .csv log file.
Note: For previous users of DL1, you do not need to have the 'Rear Defogger Switch Signal selected to begin file logging. It will automatically query the ECU for this value.
Automatically add new log files to Saved List
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will add all captured log files to the 'Saved Log Files' navigation tree node. This is useful to keep a record of all data logged during a capture session.
Note: This setting only applies to the active application period. It will not automatically add log files from previous capture periods.
Use Absolute Time in File Capture
This option will use an hh:mm:ss.mmm time column rather than a showing the time elapsed since the log was started.

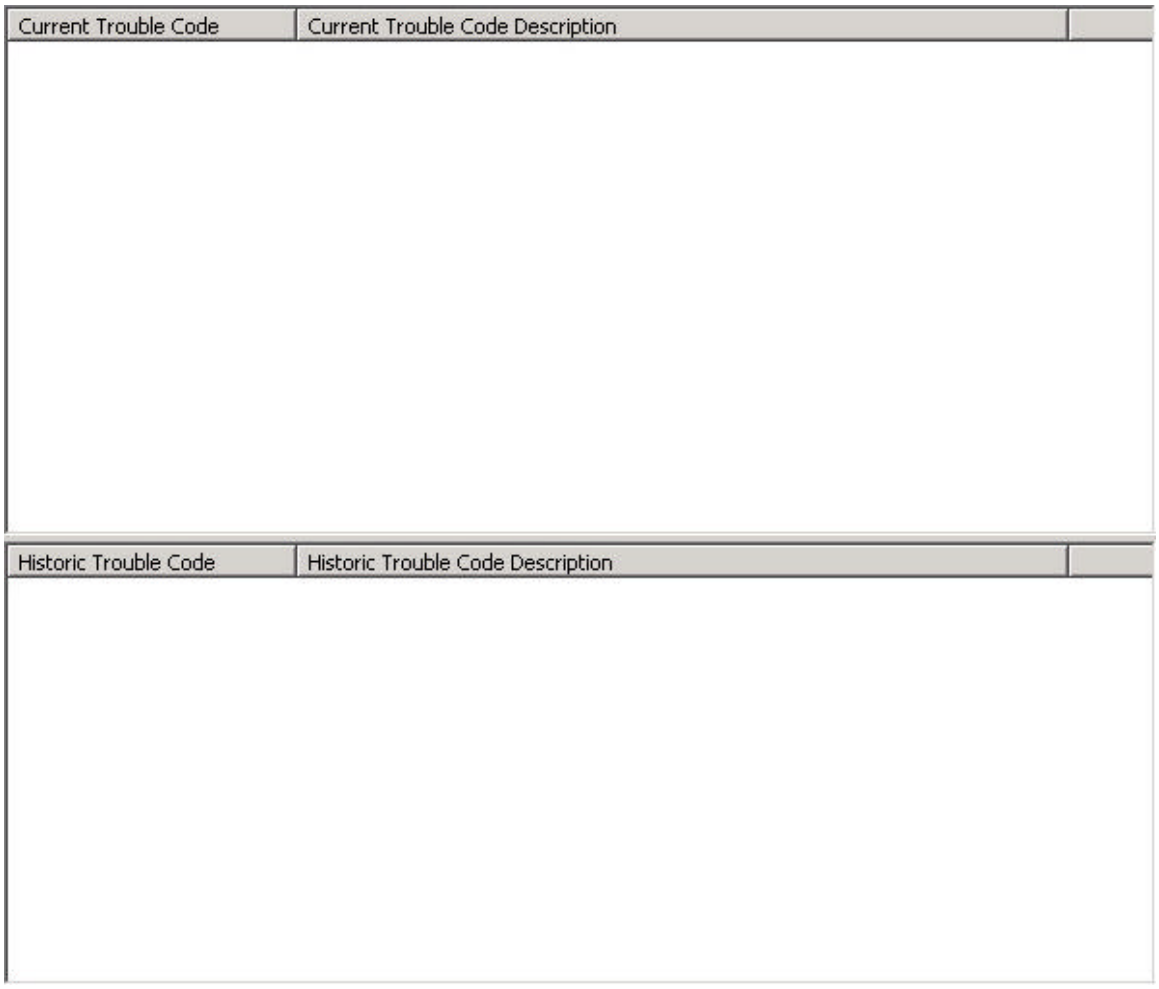
Display Options -> Convert Injector Pulse Width to Duty %
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will convert the received injector pulse width into a duty % value. The pulse width value is a millisecond (ms) time measured unit and is not particularly useful. The duty % is an indication of how much the injector is working. A 100% duty cycle would indicate the injector is permanently open.
Note: If you are regularly getting a Duty % of greater than 90%, it is advisable to fit larger injectors. You will also require an ECU remap to make use of the larger injectors.
Note: There are some piggy-back systems that interfere with the ECU's signal processing. These piggy-back systems can cause inflated duty % values.
Display Options -> Convert Celsius to Fahrenheit
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will convert all Celsius temperature data items to display the Fahrenheit value.

Display Options -> Convert KPH to MPH
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will convert all Kilometer per Hour (KPH) speed data items to display the Miles per Hour (MPH) value.
Display Options -> Convert PSI (psig) to Bar
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will convert all PSI pressure data items to display the Bar value.
Display Options -> Convert Lambda to AFR
This option is either checked to indicate that it is active or unchecked for the non-active state. If this setting is active the application will convert the Lambda data items to display the Air/Fuel Ratio (AFR) value. Air/Fuel ratio is an indication of how many parts of air there are to fuel in the exhaust gases. Typically you should see ~14.7 on idle and between 11.1~12.5 on the stock sensor with wide-open throttle runs. The AFR value on wide-open throttle is dependant on the ECU ROM fuel maps.
Note: If you are tuning your own ECU *DO NOT USE THE STOCK LAMBDA SENSOR* to set the AFR values. The stock sensor is only a narrow-band sensor and cannot provide accurate AFR values beyond the ~14.7AFR value. You will need to use a wide-band Lambda sensor to accurately set your AFR targets.

Capture Options -> Pause Data Capture
This menu function will pause the current data capture.
Capture Options -> Reset Min/Max Values
This menu function will reset the 'Minimum' and 'Maximum' column values to zero (0). This only applies to data items that are checked.
Capture Options -> Select All Analogue Parameters
This menu option will select all the data items listed in the top pane.
Capture Options -> Deselect All Analogue Parameters
This menu option will deselect all the data items listed in the top pane.
Capture Options -> Select All Digital Parameters
This menu option will select all the data items listed in the bottom pane.
Capture Options -> Deselect All Digital Parameters
This menu option will deselect all the data items listed in the bottom pane.

View Item Description
This menu option will display a message box with a brief explanation of the selected data item.

Trouble Code Reader



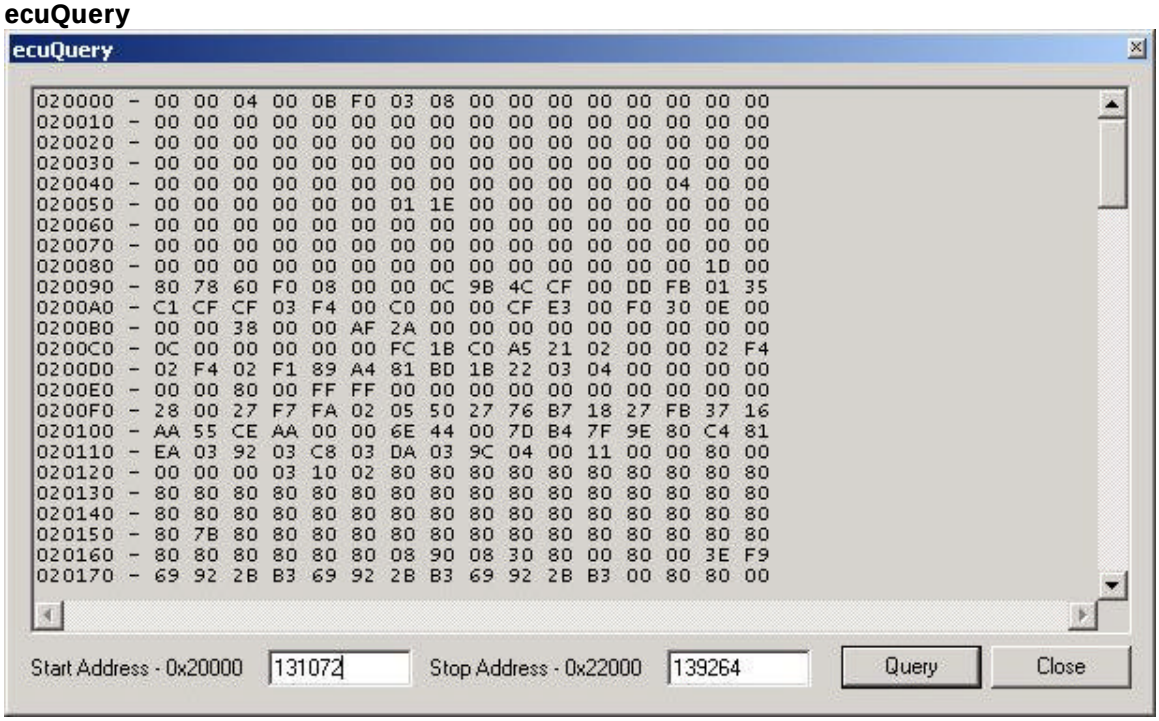
Above is a screen-cut of the trouble code reader view.

The trouble code reader view is split into 2 panes. The top pane holds all current trouble codes, while the bottom pane lists all historic trouble codes.

Current trouble codes indicate that the ECU has detected an immediate problem. Historic trouble codes indicate that the ECU detected a problem in the past but it has since been resolved or is no longer detected. Some trouble codes will cause the Check Engine Light (CEL) to be illuminated on the dash.

Tools

ecuQuery



The above image shows the ecuQuery window. Modify the 2 text boxes to set the start and end RAM memory addresses that will be queried. The values in the text boxes are in decimal format, once edited the label next to the text box will change to reflect the hex values. Typical RAM space within the ECUs is from 0x20000 (131072) -> 0x22000 (139264).

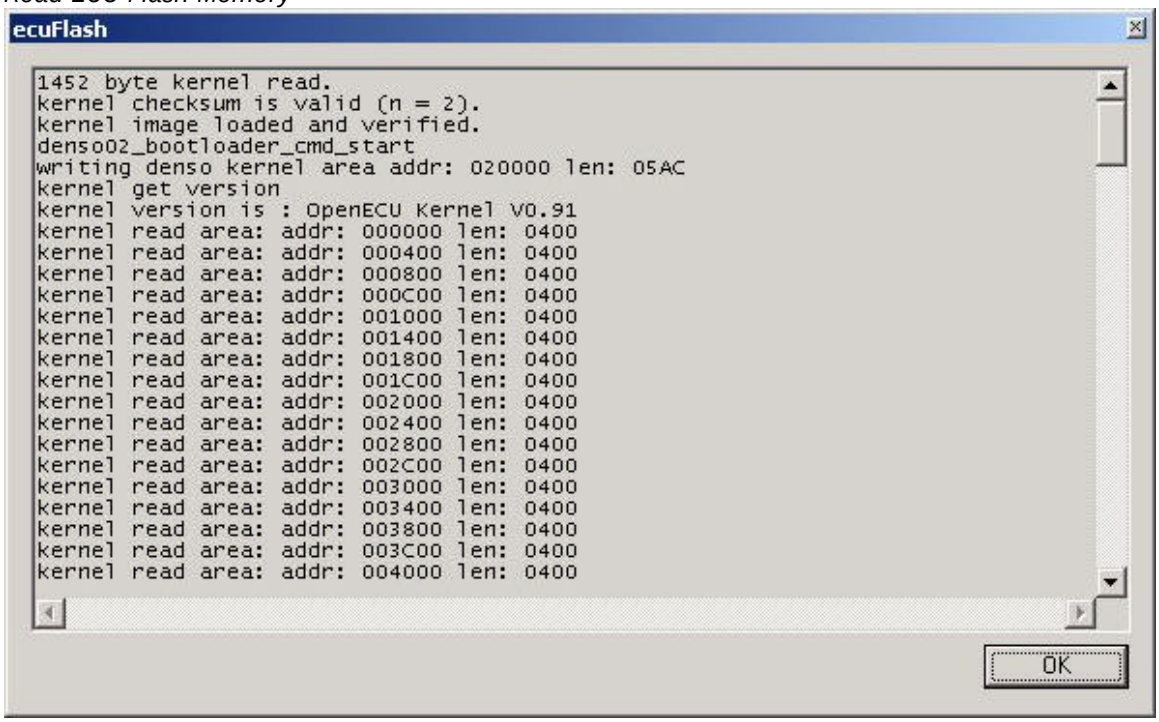
When you click 'Query' the application you will need to chose a file in which to save the received memory data. During the query routine the memory blocks and their contents will be displayed to the ecuQuery window.

ecuFlash

Note: To use the ecuFlash tools successfully you must connect the green diagnostic connectors together – these are located under the dash. Some ECU's also require that the white flash block is shorted before the ecuFlash tools successfully work.

Note: The ecuFlash tools can cause irreparable damage to the connected ECU. Please do not use them until you fully understand what is being done and the associated risks!

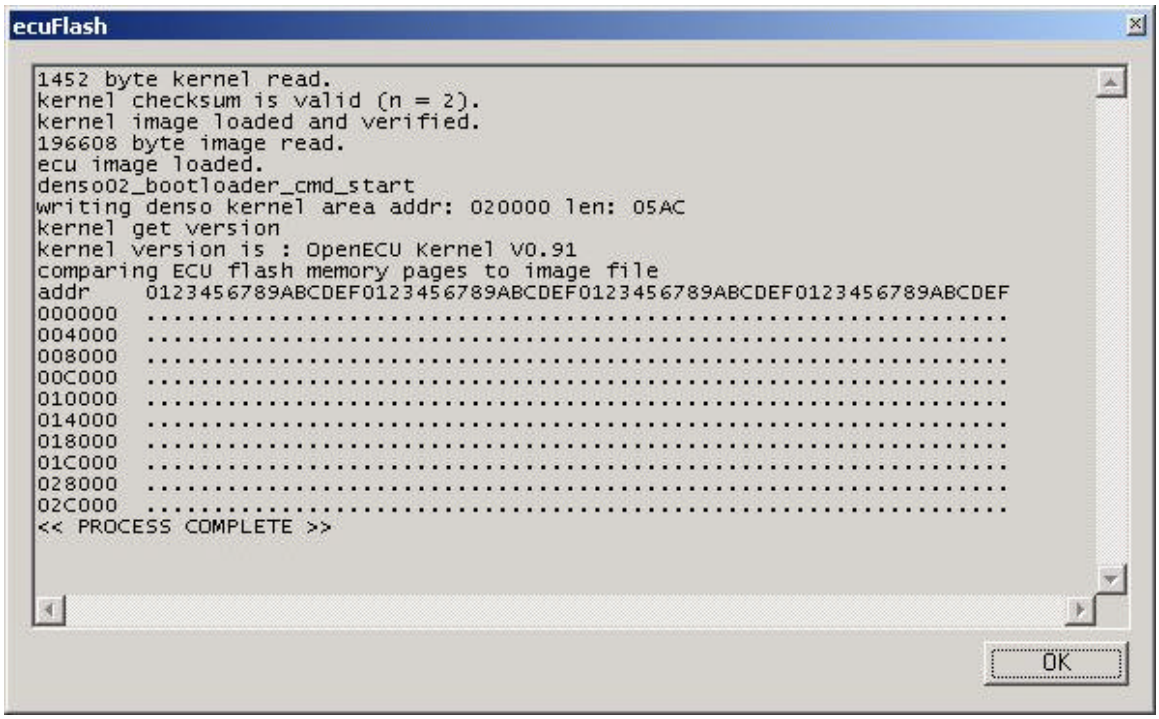
Read ECU Flash Memory



This functionality allows you to read and store the contents of the ROM flash memory. This is the memory that stores the tables/maps that are used by the ECU for engine operation.

The above image shows the ecuFlash window and the output for the read function. At the beginning of the process you will need to supply a file name for the output ROM flash memory.

Note: The output image file does not carry the RAM memory block, this is filled with zero's (0).



The above image shows a compare function being performed through ecuExplorer. The '.' represents a data block of flash memory. If the flash memory contents match the ROM image then a '.' is shown. If the memory blocks differ then a '*' is shown.

Write ROM Image to ECU Flash Memory
This functionality allows you to write a new ROM image to the ECU flash memory. During the initial process the ecuFlash tools will compare the new ROM image with the existing ROM flash memory contents. If they match the new ROM image will not be written to the flash memory. **Note: It is imperative that the new ROM image is suitable for the ECU type. If it is not there is a chance that the ECU will be corrupt and you will not be able to use it again.**

Test Write to ECU Flash Memory
This functionality allows you to perform the same process as the write functionality except that the flash memory write will be disabled. It is good process to do a test before actually writing the new ROM image. This will verify that the ROM images are different and that the required battery voltage is present.

Compare ROM Image to ECU Flash Memory
This functionality will only compare the new ROM image with the current ROM flash contents. It will not write to the flash memory.