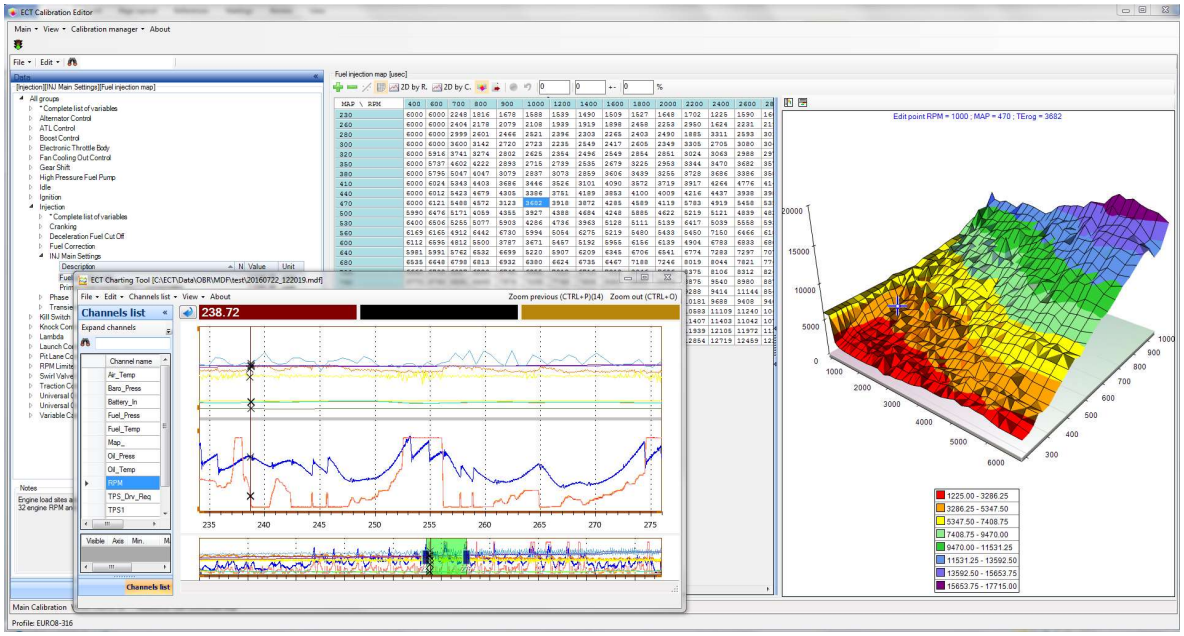
Quick guide to ECU Configuration Tool ECT

The smart tool for calibrating engine management systems and data analysis of logged data



OBR Control Systems

Version 2.01 – June 2017

For use with ECT version 4.12.457

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1 Introduction

The ECT communication tool is developed to give the user full access to all features in any of our engine management systems for use in motorsport and automotive development enviroment.

The tool gives access to:

- Display of engine data
- Off-line modifications of main and setup calibrations
- On-line modifications of main and setup calibrations
- Sending calibrations to the ECU
- Receiving calibrations from the ECU
- Sending learn calibrations to the ECU
- Receiving learn calibrations from the ECU
- Resetting the ECU's automatic learn system
- Configuration of the ECU data logger
- Downloading data from the ECU logger
- Graphic analysis of the logged data
- Modification of the ECU databases

2 Software Requirements

- A PC running Windows 7, Windows 8 or Windows 10.
- ECT is developed with Microsoft ®. NET Framework 4.0 which must be present on the PC. If the Framework is not installed during the installation you will be asked to authorize the installation software to download and install the Framework. Alternatively you can manually install the Framework from another source and then proceed with the installation of ECT.
- The PC must have at least 110 Mb free on the hard disk.
- The PC must have at least one available USB port and/or an Ethernet port.
- A communication interface from EFI Technology S.r.l. for communication with all current devices or an Ethernet connection for Euro-5, Euro-8 and Euro-12.
- The other software included in the package 'EFI Software Installer', ECT version 433 or higher.
- The databases provided by OBR Control Systems.
- The fundamental database to manage a device is the database in XML format. It contains the communication IDs and optionally the memory map, the list of channels to read, the structure of the calibration and other characteristics of the device.
- Display databases. These databases contain lists of channels or values of the calibration along with all necessary information to graphically render data. The database can be created from scratch in ECT or imported into the environment with wizards and can be modified using the tools provided by ECT.
- Firmware of the device. Developed by EFI and already present in the device. ECT gives you the ability to reprogram the ECU with a new version of firmware released by EFI (if the device includes the ability to be reprogrammed).
- Calibration of the device. Usually developed by the customer, on an initial basis provided by EFI or OBR. If the device allows it, can be transmitted to the device and downloaded from the device through ECT. In most devices you can also view and edit the contents of the calibration on-line.

3 Software Installation

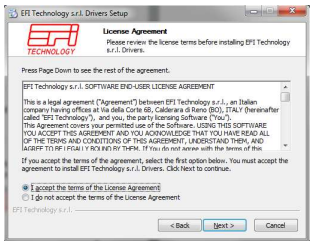
To install the ECT tool, please download the software from our website, www.obr.uk.com, look for the ‘Support’ then ‘Software’ section.
Download these driver packages:

- USB driver package
- Double Server
- Pseudo Programmer
- PC tool ‘ECT’.

3.1 USB Communication Drivers

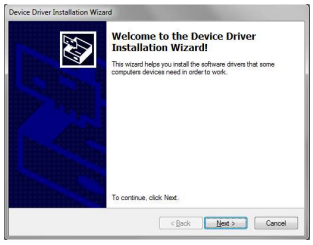
The Windows driver required for the functioning of the communication interfaces EFI. The installation of this software is essential for all functions involving communication with ECT devices.

Click on **Next** to start the installation.



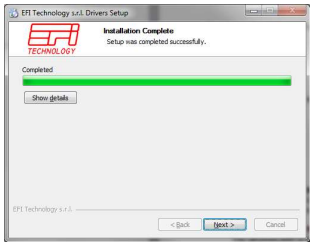
Accept the license terms and click **Next**.

Select the USB option and then click **Install**.



Click **Next**.

Click **Finish** to complete the installation of the device drivers.

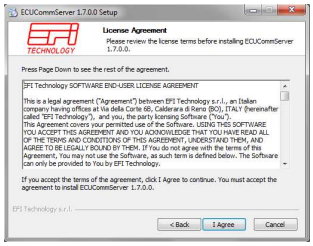


Click **Next** to finish the driver installation.

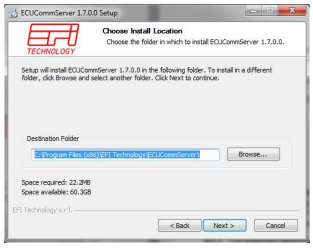
3.2 EFI Communication Server.

This software interfaces with the driver and provides the communication conditions to other programs such as ECT. Installation of this software is essential for all functions involving communication with devices.

Click **I Agree** to start the installation of the communication server.

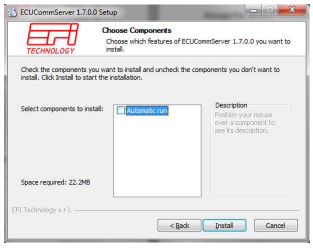


Accept the default installation path or change it now, then click **Next**.

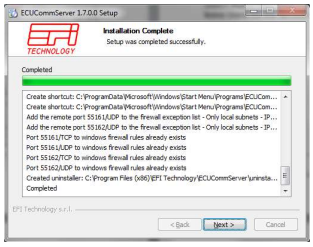


Select **Automatic Run** if you want to start the server with Windows or leave blank for the service to start when the tool is opened.

Click **Install** to proceed.



Click **Next** to continue.

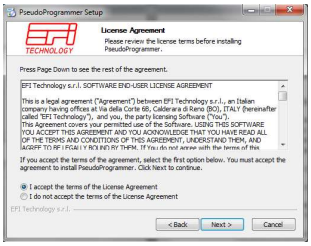


Click **Finish** to close the setup.

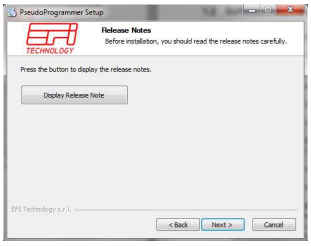
3.3 Pseudo Programmer – Programmer for EFI ECUs

This software is used for programming devices with a kernel of the latest generation. It can operate in stand-alone mode or be invoked as a tool by ECT. The installation of this software is essential if you intend to use ECT for programming devices based on the latest kernel.

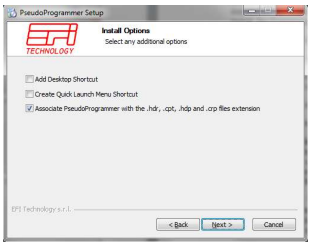
Click Next to start the installation.



Accept the license terms and click **Next**.

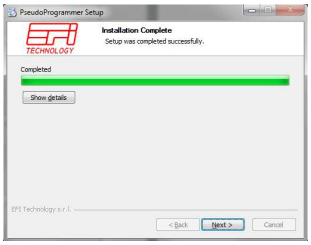


Click **Next** to start the installation.



In normal installations you do not need to add neither desktop nor a quick launch shortcut. Just tick the last box to associate certain file extensions with Pseudo Programmer.

Click **Next** to proceed.



Click **Next** to finish the installation.

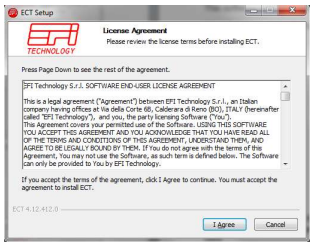
Click **Finish** to close the setup.

3.4 ECT Main Tool

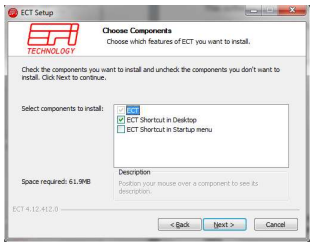
This software is ECU tool which is described in this documentation. This guide supports of ECT version 421.

Click OK to proceed with the installation.

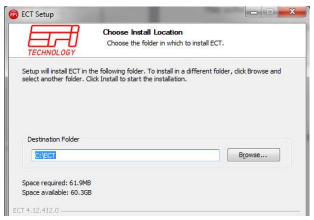
Click **I Agree** to proceed with the installation.



Select where to add shortcuts and click **Next** to start the installation.

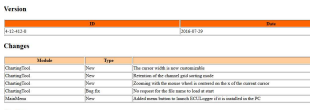


Accept the default installation path or change it now, then click **Next**.



When the installation is complete a tool version history is displayed.

Close it and then click **Close**.



3.5 ECU Logger

This is the software used for configuring the on-board data recording module available in most of our engine management modules. The software is also used for downloading logged data.

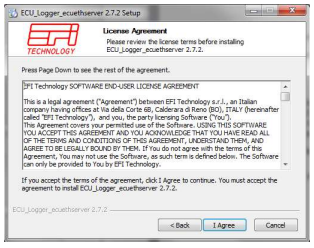
Data saved in the MDF format can be visualised and analysed graphically in the Chart Tool.

If data is saved in the “2D” format you must purchase a license from 2D in Karlsruhe in Germany, website www.2d-datarecording.com.

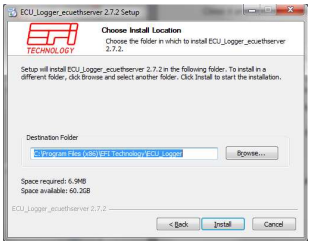
Click OK to proceed with the installation.

Click Next to proceed with the installation.

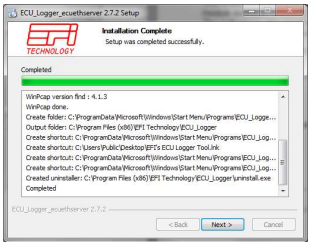
Click I Agree to proceed with the installation.



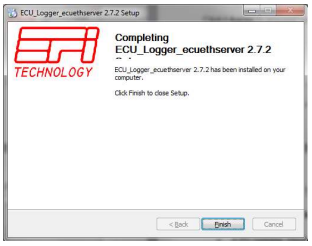
Accept the default installation path or change it now, then click Install.



Click Next to finish the installation.



Click Finish to close the setup.



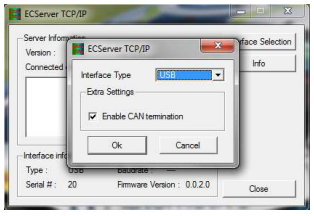
4 Communication

Communication with the ECU is either via CAN using a dedicated EFI Technology USB CAN interface, part number EFP02C, the CAN logger EFT20 or via Ethernet.

Ethernet communication is available with Euro-5, Euro-8 and Euro-12 ECU's.
Communication via Ethernet is generally faster than CAN communication but the CAN interface is recommended in noisy conditions and required to update the ECU firmware.
When communicating via CAN, the PC must be connected using the EFP02C or EFT20 interface to CAN1.

Please note that CAN1 is terminated internally in the ECU, the EFP02C or EFT20 interfaces should be terminated via software.

The server  icon is found on the PC screen, in the lower right hand corner. Right click it and select **Show**:
Tick the box **Enable CAN Termination** and click **OK**.



With this tool an optional ASAP3 communication is available.
ASAP3 communication allows data exchange between an engine dyno and the ECU.

It is also possible, as a cost option, to replace ECT with either INCA or ATI editor systems.

5 Directory Structure

Several folders are created in the ECT main folder:

BIN
Contain program folders and associated files, for example a data base editor.

CALIBRATIONS
Suggested folder for your firmware, engine and ECU setup maps.
Installing an updated version a new folder is created, containing the related firmware.

COMMON
Contains the main program data files.

DEVICE
Individual database files for each type of ECUs and for various versions of firmware releases.

DOC
System version history files are stored in this folder.

LANG
Various system files.

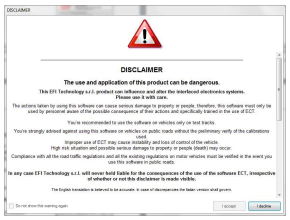
TEMPLATES
Various system files.

TOOLS
Various system files.

USER
This folder contains variations of display files for supported ECUs.

6 ECT Main Menu

First time you start ECT after an installation or updated version has been installed this screen appears:



Scroll down, tick the box **Do not show this warning again** and click **I Accept**.

The ECT Main Menu now appears as a slim tool bar across your monitor:

- **Device editor**. This section gives access to the databases for each individual ECU version installed in the tool. In order to access data of a physical device, ECT must have a database file [devicename].XML corresponding to the physical device. From this database ECT reads the information required to visualize data, to program firmware, manage engine maps etc.

- **Profile manager**. A profile is a custom environment that allows you to save collections of displays together with a set of data stored in a database file [profilename].PDB. The profile manager provides commands to create, delete, copy, import and export profiles.

- **Displays**. You can create screens displaying any ECU parameter measured and calculated for each type of ECU. A screen can display any number of channels in any size, font and colour. You can add LED's in various colours to ease the data monitoring and potentiometers for easy, adjustments of numerous parameters. Furthermore you can add access to any section of the ECU maps, allowing you to edit for example the main fuel and spark maps directly within a display window. The display screen is also used to configure your AMC, Active Mapping Controller. The display tool provides commands to create, modify, organize and load data display screens. It also features an option to record live data from any display screen.

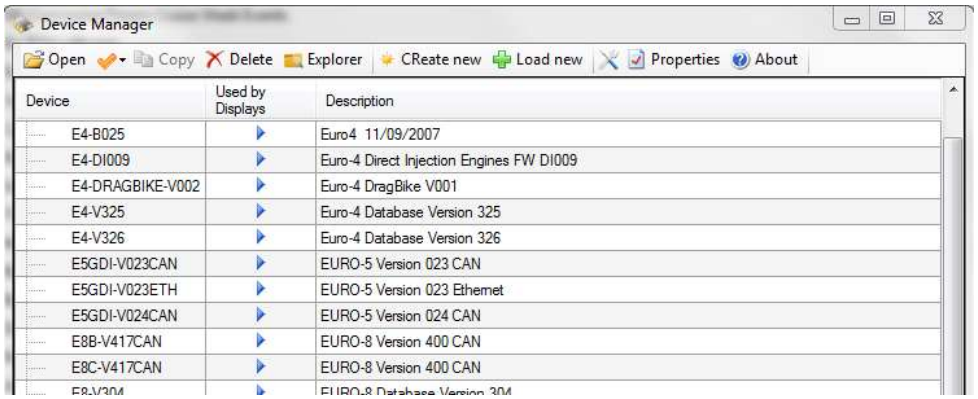
- **Calibration editor**. The calibration editor opens the map editor and gives access to the data in both the engine maps and the ECU setup calibrations. Both types of calibrations can be accessed working either online with the ECU or offline.

- **Memory interface**. Memory interface provides access to commands to flash the device memory, to read and write the calibration, to manage diagnostic functions (if available for the current device), to manage the creation of HDP and CRP files.

- **Charting tool**. This is a tool used for graphical display of data recorded by the built-in data logger available in most of our ECUs and by the data recording option in the Display section. It can also open MDF files from other systems.

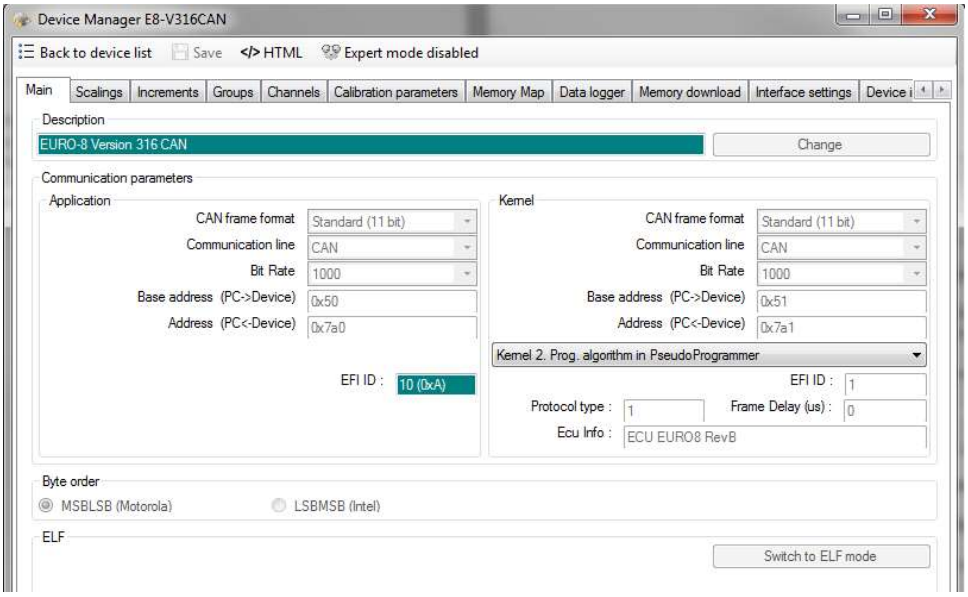
- **ECU Logger**. If you have installed the ECU logger configuration tool you can access it from this section. Here you can create logger configuration files, set sampling rates and trigger conditions. Data is also downloaded from the ECU to your PC in this section.

7 Device Manager



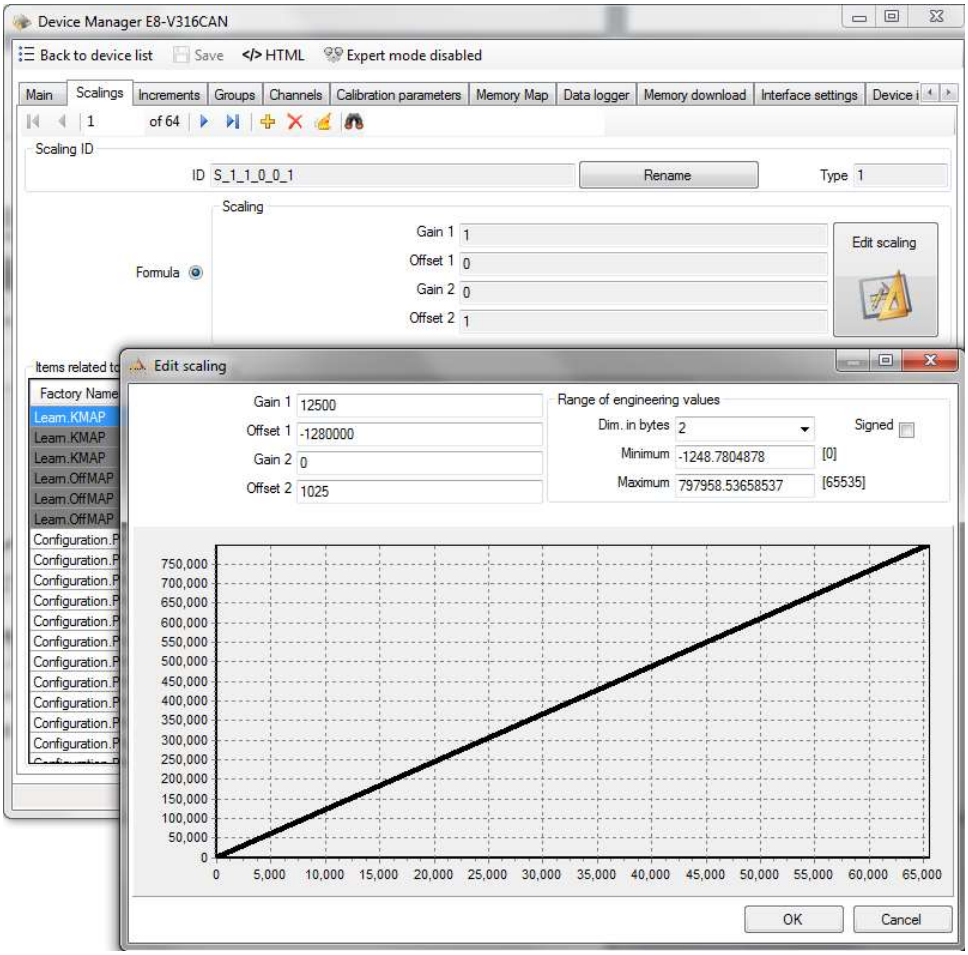
The Device Manager gives access to view and modify the database for each software and hardware version of ECUs supported.
This section is recommended for expert users only!

Click on the database you want to open and then click **Open**.



This screen displays the main information about the communication protocol with the ECU.
Changing any settings here might result in total loss of communication with the ECU.

7.1 Scaling



You can edit existing scaling and create new scaling if you introduce a new sensor to be calibrated in the system.
A sensor is calibrated following this calculation:

ENGINEERING VALUE = [(BITS x GAIN1) + OFFSET1] / [(BITS x GAIN2) + OFFSET2]

Gain 1 is the theoretical sensor range between 0V and 5V.
This value is 0 for a frequency sensor.

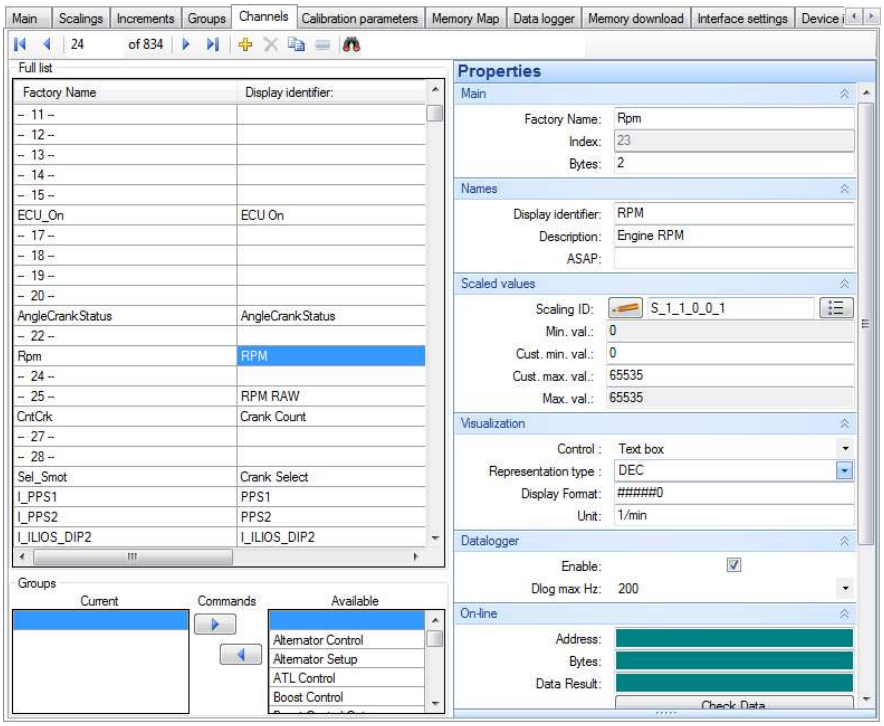
Gain 2 is the gain for a frequency sensor.
This value is 0 for an analogue sensor

Offset1 is a scaling constant to be calculated.

Offset2 is typically 256 for a 1 byte channel and 1024 for a 2 bytes channel.

Save the new channel scaling using either the proposed name or your personal preference.

7.2 Channels



Section Channels gives you the option to change the appearance of selected data channels. Each channel is located in a unique position, called Index. This index number is used to identify channels in other sections of the ECT tool.

In Properties you see several sections:

- **Main**, do not change anything here.

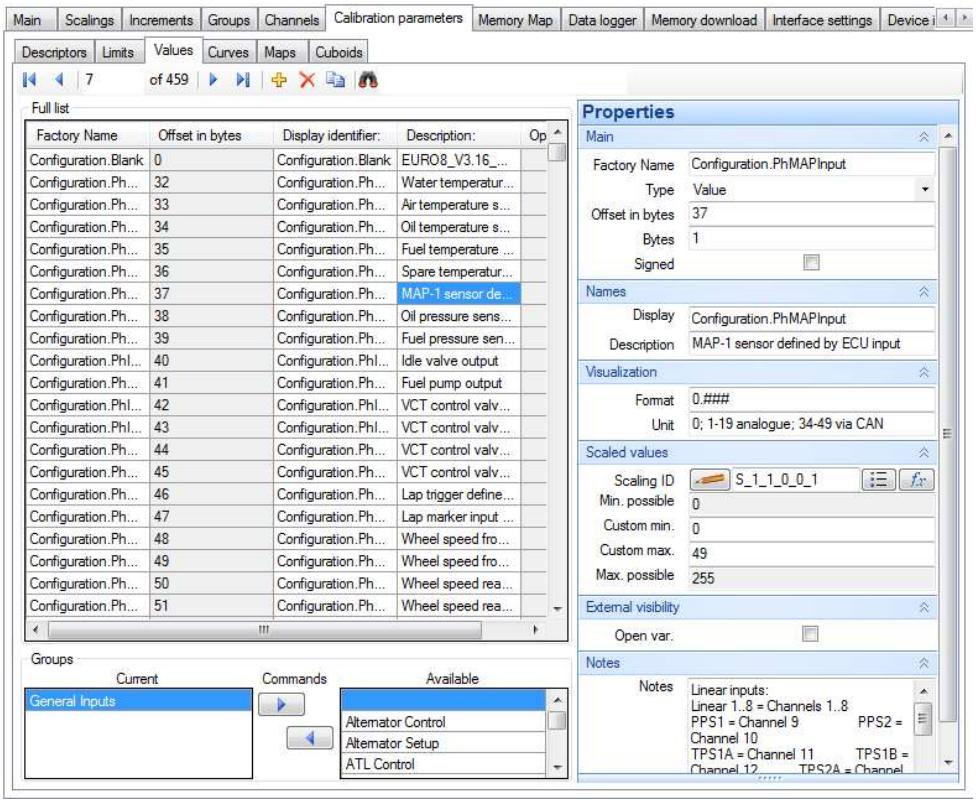
- **Names**, you can name the channel, you can add a short description which will be displayed on other parts of the ECT tool. ASAP, name the channel so it is recognised when used in the data exchange protocol ASAP3.

- **Scaled values**, select the correct scaling for your custom sensor. Be very careful if you decide to change existing scaling.
  Use ‘Cust. min. val’ and ‘Cust. max val.’ to set minimum and maximum values displayed in channel windows and strip charts.

- **Visualization**, select whether your channel is a data channel or a potentiometer. Also select which type of data it represents, for example a normal or signed byte, decimal, hex or binary etc.

- **Data logger**, tick the box if you want this channel to be selectable within the data logger tool. Also set your preferred sampling rate, this can be changed in the logger tool. In Display Format you define how to display values. Using “0” means you want to display this digit while “#” means reserve space for this digit. Using the “#.#” gives the option to define the desired number of decimals. For example, ##0.0 means you will reserve space for 2 additional digits in front of the comma and display the value with 1 decimal, for example 2.5.

7.3 Calibration Parameters



This section gives access to change settings in the engine and ECU setup maps.
It is recommended to leave any intentions of modifications to OBR for this section.

7.4 Memory Map

It is strongly recommended to avoid making any changes in this section.

7.5 Data Logger

It is strongly recommended to avoid making any changes in this section.

7.6 Memory Download

It is strongly recommended to avoid making any changes in this section.

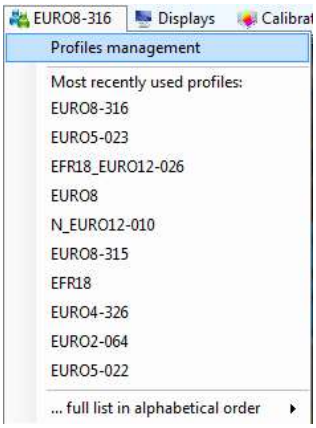
7.7 Interface Settings

In this section you can set you preferred colours of your data windows used in data display screens.

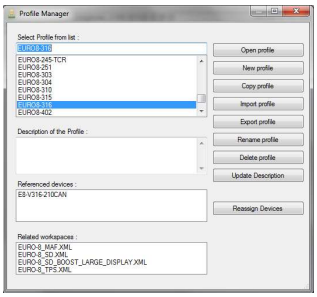
7.8 Device Info for Display

It is strongly recommended to avoid making any changes in this section.

8 Profiles Manager

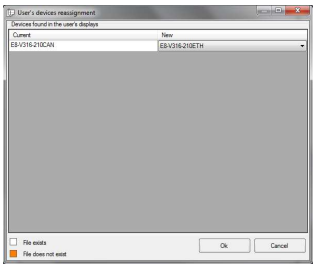


Use this section to switch between various ECU communication protocols. From the drop down menu you click on the preferred version and this sets the display screen protocol for the selected ECU.

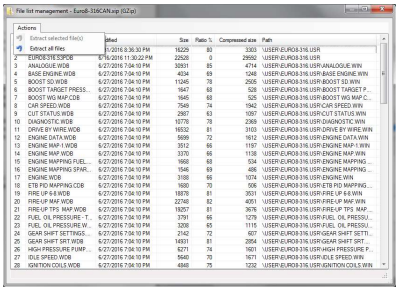


This section also gives access to create a new profile, to copy profiles, to import and export profiles, rename and delete profiles.

It is also possible to assign a specific database version to data display screens. For Euro-5, Euro-8 and Euro-12 we provide database versions with either CAN or Ethernet based PC communication. You use this section to assign the preferred database to the data display files.
As shown on the left the data display files are linked to a database communicating via CAN. If you want to change this to Ethernet communication, click on **Reassign Devices** and the select the database with ETH listed in its name, then click **OK**.



8.1 Importing New Profile



We release new versions of ECU data files as XIP files. This format is used by the ECT tool to import files.
When you have received a file from us click on Import Profile and locate the file, then click OK to open it.

A new display opens, showing which files are included in the new release.
Click on **Actions** in the top left corner of this wind and select **Extract All**. Close the window when done.
If you only want to import part of the files, click on those files and then select **Extract selected file(s)**.

The new database will be saved in a new folder in the main Device folder, new display files will be saved in a new folder in the main User folder.
Firmware and sample maps will be found in a new folder in the main folder Calibrations.
Once installed you select the new version now appearing in the version list and click **Open Profile**.

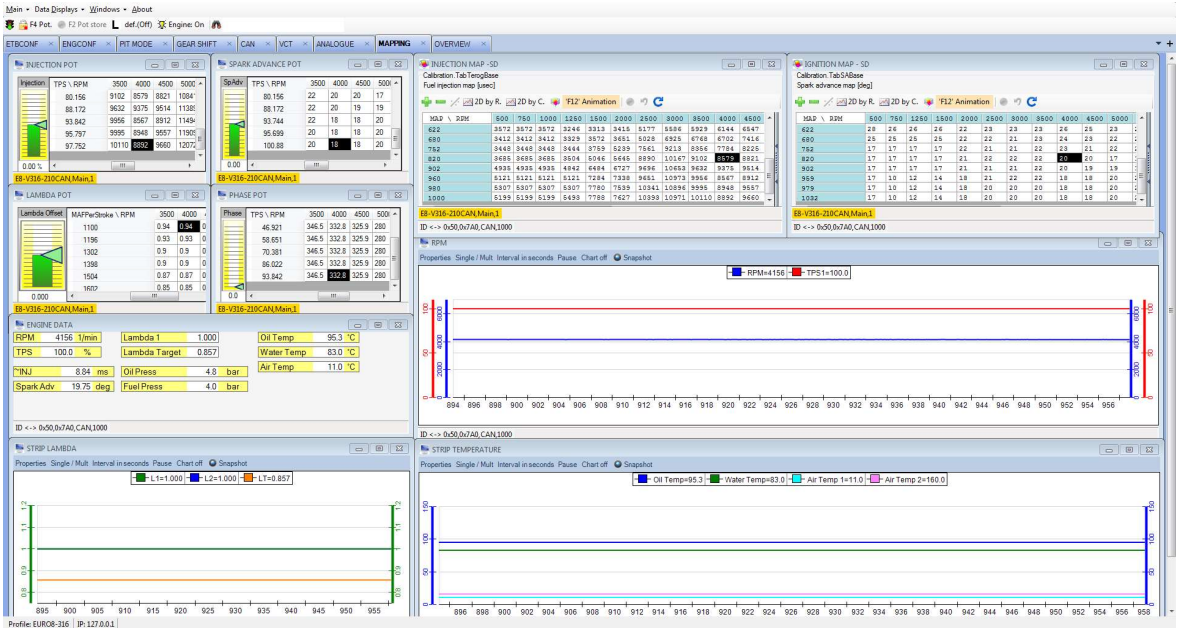
By default the XIP files we supply includes sample maps the ECU firmware corresponding to the release number. These files will be copied into the 'Calibration' folder found in the main ECT folder when installing the data files.

9 Displays

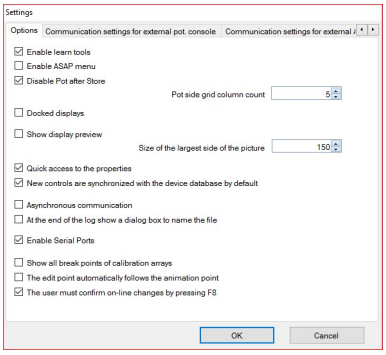
This section gives access to visualize live data from the ECU on your PC.
It is possible to create display screens displaying:

- Data windows
- Potentiometers
- Strip charts
- ECU tables and maps

Here you see an example, combining all features of the display program.



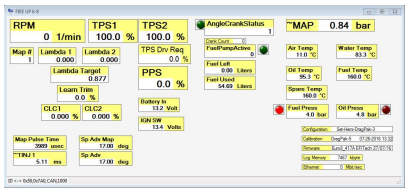
9.1 Data Display



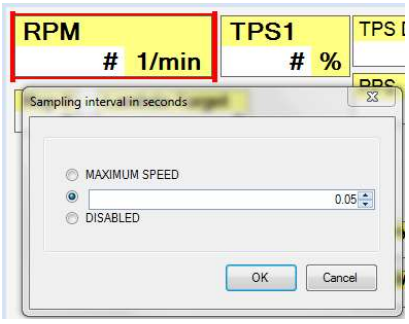
First time you have installed the ECT tool you should check the settings of the display program.
Open the display program, flick on **Main** and then select **Settings**.

- Recommended settings are:
- Enable learn tools.
- Enable ASAP3 menu (only if you need it).
- Disable potentiometers after Store.
- Set the grid size for potentiometer map window, normally displayed with 3 to 5 breakpoints shown.
- Quick access to the properties.
- New controls are synchronised with the device database by default.
- If you use an AMC connected to your PC via a USB serial port adaptor you should enable serial ports. The AMC is a mapping controller which can be configured to control any of the available software potentiometers found in the tool.

- It is possible to open any calibration tables or maps in a display. By default any data change in a table or map will be written instantly to the ECU. If you want to manually confirm any update by pressing F8 to change the ECU data tick the box 'The user must confirm online changes by pressing F8'.



We supply the software with several different sample display layouts but you can easily create your own displays or modify any of our sample layouts to suit your requirements.
With a display open you click the right hand mouse button to access:

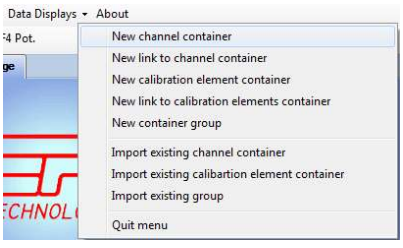


- **Enable Edit mode.**
  Use this to open to open the display editor where displays can be created and modified.
- **Property**
- **Sampling interval**
  Set the time interval between refreshing the channel value. Select between maximum refresh rate, a set time interval between 0.05 second to 5 seconds or channel disabled.
- **Sampling interval list**
  Display refresh rates for all channels present in the open display.

- **Enable Strip Chart mode**
  Displays with up to 12 channels can be displayed graphically. See section 9.1.7.
- **Sort controls**
  Sort channels for recording mode.
- **Enable Log**
  See section 9.1.8.
- **Device Information**
  Displays information about maps and firmware loaded into the ECU.
- **Display Data**
  Shows base information about current display.
- **Save display**
  Save changes made to display.
- **Save display as**
  Save display to a new file name.
- **Save and lock display**
  Save display as a locked file, can be viewed by user without the database.
- **Exit**

9.1.1 Create New Display

To create a new layout right click the Data Displays tab and select **New channel container**. You will be prompted for a name, then click on **OK**.



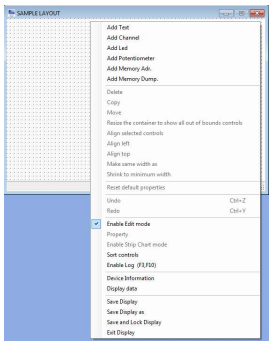
Right clicking on the display you can now add the following:

- Text
- Data channels
- LED warning lights
- Potentiometers
- Memory addresses (special applications only)

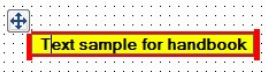
You can load any of the many sample display windows we provide with the software. Simply click on **Data Displays** and scroll down to view all available displays, all marked with a blue icon on the left. Click on the one you want to load.

You can load multiple display screens if you want.
Displays marked with a red icon are online maps with ECU data.

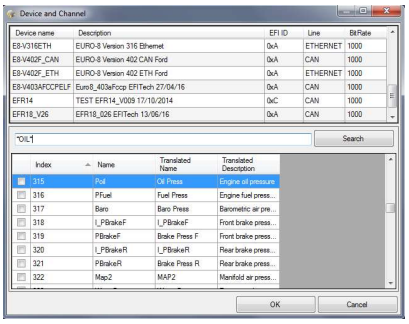
9.1.2 Add Text



The command allows you to add a text to a display screen.
You can edit a display if you see a grid on the grey back ground. To enable the edit mode you double click on the grey back ground or you right click and select **Enable Edit Mode**.
When the grid is visible you add text by right clicking and select **Add Text**.
Write the text in the window which opens.
Click on Look to change the font and colour.
When done, the text window will appear on your screen.
You can move the window to any position on your display by click the cross at the upper left hand window, move your cursor to the desired position and then click again.



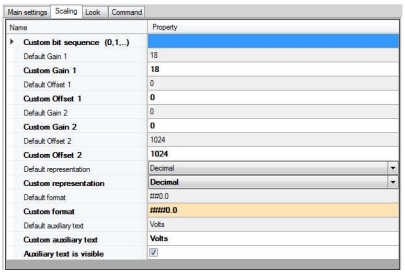
9.1.3 Add Channel



The command creates a window which will numerically display the value of any of the ECUs data channels.
You can edit a display window if you see a grid on the grey back ground. To enable the edit mode you double click on the grey back ground or you right click and select **Enable Edit Mode**.
When the grid is visible you add a window by right clicking and select **Add Channel**.
Check that you have selected the right database.

Now look for the channel. You can scroll through the channel list if you know the index number of the channel or you can search for it.

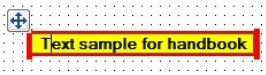
Use the * to search any combination where your wording exists. For example, if you are looking for oil temperature and oil pressure you could type ***OIL*** and then press Enter. The search will jump to the first channel which includes the words OIL. If this is one of the channels you want you tick the box. To continue your search click the word in the search line again and press Enter.
Once you have ticked all the channels you have searched for you clock **OK**. The search window closes and you return to the main display window, now showing your channels.



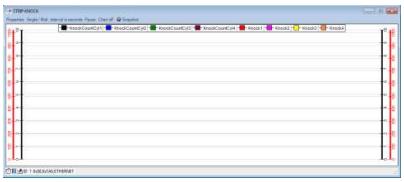
You can change the appearance of any display window.
Double click on the window and the property window opens.
Click on **Scaling** if you want to change the channel scaling, to toggle between decimal / signed / hex / binary presentations or change the unit.

Click on **Look** if you want to change font, colour and text orientation.

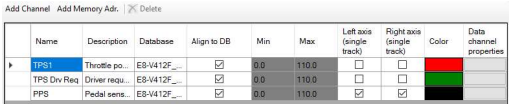
You can move the window to any position on your display by click the cross at the upper left hand window, move your cursor to the desired position and then click again.



9.1.3.1 Add Strip Chart



You can covert a regular display screen having up to 12 data channels into a graphic strip chart.
Create a display screen with the required data channels.
Save the display and disable the display edit mode.
Right click the display and select “Enable Strip Chart Mode”.

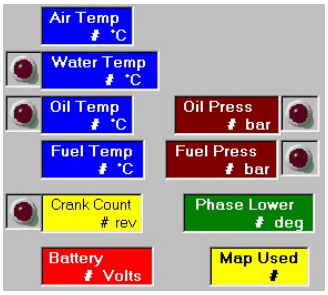


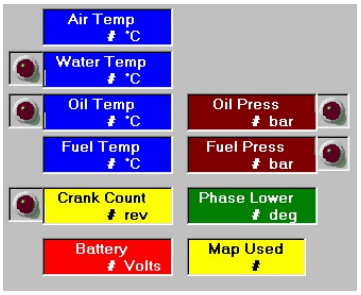
You have 6 menu options:

- **Properties**, set channel scaling, colour and Y-axis values for each of the data channels.
- **Single / Mult**, select to display all channels in a shared display or in separate strips for each channel.
- **Interval in seconds**, set the time interval for a graph to pass through the window, right to left.
- **Pause**, pause the display and use the **+** and **-** keys to zoom in or out.
- **Legend dock mode**, select where to show channel parameters.
- **Chart off**, switch off graphic layout and return to channel data windows.
- **Snapshot**

9.1.3.2 Align Windows

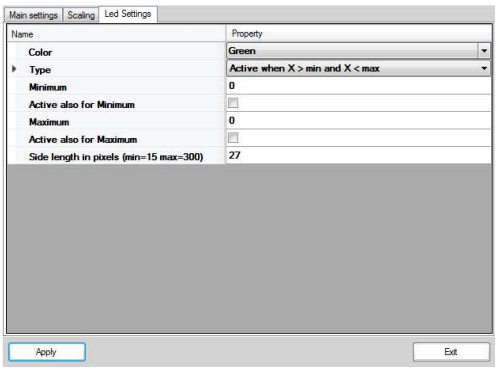
You can resize and realign the controls on the display screen.
Select a group of controls using the mouse, click and drag to mark windows to be resized. Now right click and select **Redim**, now click on the window in the selected group which is your target size.
In the same way you can automatically align windows left or top.





9.1.4 Add LED

The command creates a LED which can change status depending on the value of a channel.
This type of control is linked to a database device and it can be associated with any ECU channel.
The colour of the LED image is bright if the activation conditions are true and dark if the conditions are false.
When the display is in online, the value is updated continuously to a variable frequency which depends on the number of variables sampled, the bit rate, the speed of response of the control unit and the time of processing data received.



You can add a LED if you see a grid on the grey back ground. To enable the edit mode you double click on the grey back ground or you right click and select **Enable Edit Mode**.
When the grid is visible you add a LED by right clicking and select **Add LED**.
Check that you have selected the right database.

Now look for the channel. You can scroll through the channel list if you know the index number of the channel or you can search for it.

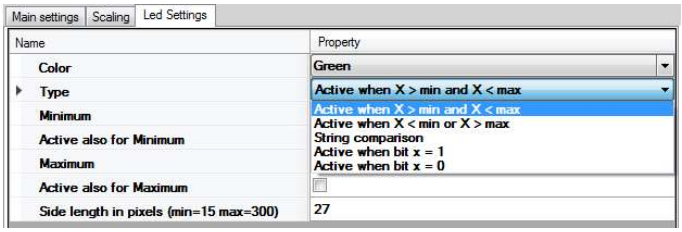
Use the * to search any combination where your wording exists. For example, if you are looking for oil temperature and oil pressure you could type ***OIL*** and then press Enter. The search will jump to the first channel which includes the words OIL. If this is one of the channels you want you tick the box. To continue your search click the word in the search line again and press Enter.
Once you have ticked all the channels you have searched for you clock **OK**. The search window closes and you return to the main display window, now showing your new LEDs.

To calibrate the LED double click on it and the property window opens up. As with other channels added you can in general change the scaling and name.
Click on **Led Settings** to configure the control.

You can select several between several colours for the LED:

- Red
- Orange
- Yellow
- Green
- Blue
- Magenta

You can select the switching conditions for the LED.



- **String comparison**. The LED is active if the string resulting from the conversion to a string of the bytes read from the control unit, is equal to the specified word in the 'string' field.

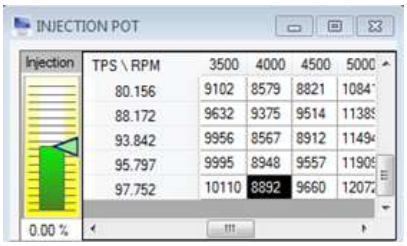
- **Active if bit x = 1** The LED is on when the value of the bit at position 'Meaningful bit' of the variable read from the control unit is equal to 1.

- **Active if bit x = 0** The LED is on when the value of the bit at position 'Meaningful bit' of the variable read from the control unit is equal to 0.

Use the command **Apply** to commit the changes.
Click **Exit**, press ESC or close the property page to cancel changes.

9.1.5 Add Potentiometer

This command will add a potentiometer to a display screen. It can be associated with many ECU channels and can provide a real time global trim while running the engine.
The potentiometer can be linked directly to the engine map and can store any trims into the map.
It can be operated externally by our AMC, the Active Mapping Controller, as well as in software.



You can edit a display if you see a grid on the grey back ground.

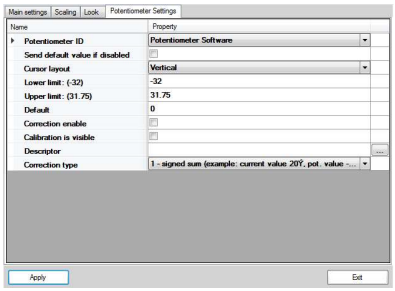
To enable the edit mode you double click on the grey back ground or you right click and select **Enable Edit Mode**.
When the grid is visible you add a potentiometer by right clicking and select **Add Potentiometer**.
Check that you have selected the right database.

Now look for the channel. You can scroll through the channel list if you know the index number of the channel or you can search for it.
Use the * to search any combination where your wording exists. For example, if you are looking for a potentiometer to control the ECU spark advance you could type ***SPARK*** and then press Enter.
The search will jump to the first channel which includes the words SPARK. If this is one of the channels you want you tick the box. To continue your search click the word in the search line again and press Enter.
Once you have ticked all the channels you have searched for you clock **OK**. The search window closes and you return to the main display window, now showing your new potentiometers.

You can change the appearance of the potentiometer.
Double click on the window and the property window opens.
Click on **Scaling** if you want to change the channel scaling, to toggle between decimal / signed / hex / binary presentations or change the unit.

Click on **Look** if you want to change font, colour and text orientation.

Click on **Potentiometer Settings** to configure the potentiometer.



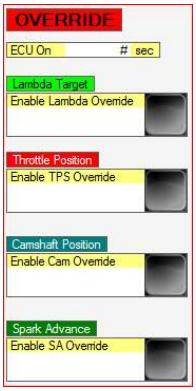
- **Potentiometer ID**, you can assign the potentiometer to any of the 6 dials on the AMC or to work as a software potentiometer.
- **Default value**, tick the box to send a default value when the potentiometer is disabled.
- **Cursor layout**, select between vertical or horizontally.
- **Limits**, these values are defined within the ECU device.
- **Default**, key in the default value to use when disabled.
- **Correction enabled**, tick the box if you want the potentiometer to store changes into the ECU. Corrections will be made to map #1 if you press the red button on the AMC or if you press **F2**.
- **Calibration is visible**, this will show part of the ECU map for the selected function.
- **Descriptor**, select the preferred descriptor from the ECU device.
- **Correction type**, this will show you which type of correction of the base map is performed. This is defined within the ECU device.

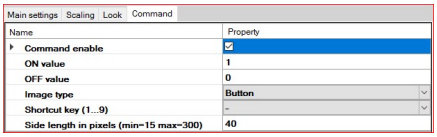
To activate and deactivate the potentiometers on open display screens, press **F4**.

9.1.6 Add Button

Some data channels displays status flags for given functions.
When adding such windows to a display screen there is an option to add a button, allowing direct access to the function, overriding the need to jump between a display and the calibration tool.

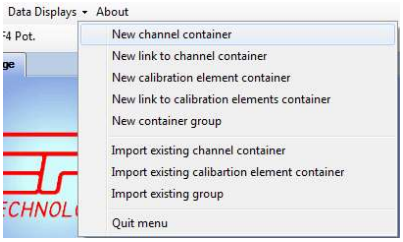
This function requires an optional programming of the EFP02 and EFT20 CAN interfaces.



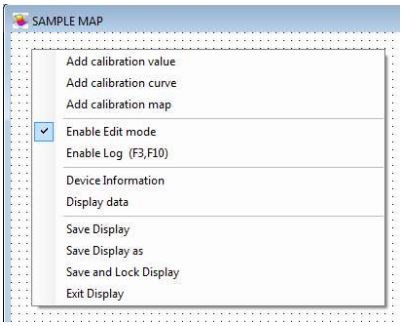


9.1.7 Add Maps to Displays

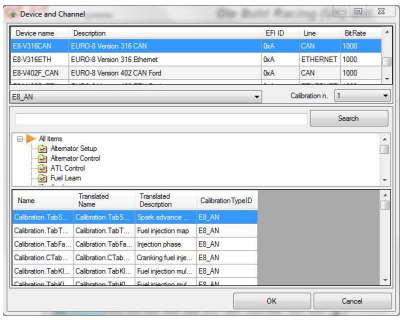
This section described how you can load an online access to any maps in the ECU.



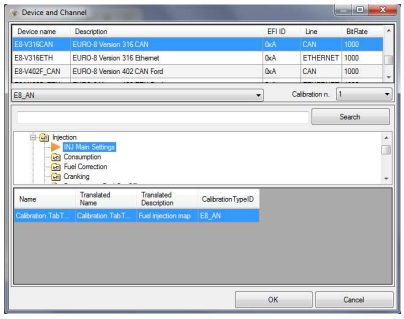
You can add any map from the ECU to a display window.
To create a new layout right click the **Data Displays** tab and select **New calibration element container**.
You will be prompted for a name, then click on **OK**.



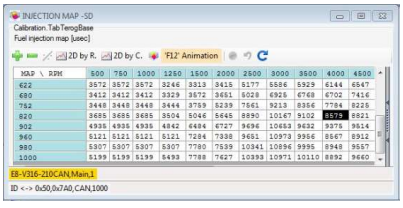
Select the type of ECU data you want to add, for example a calibration map.
A window called **Device and Channel** now opens.



Select the ECU database.
Select the preferred expression of the ECU engine load.
You can select the engine load (the Y-axis in the map) expressed as the throttle angle (AN, alfa-N), as manifold air pressure (MAP, speed density) or as mass air flow (MAF).
Next scroll through the ECU tree to find the map you are looking for.



In the example the **INJ Main Settings** has been selected and the base fuel map is shown as an option in the lower part of the window.
Click OK to select it.

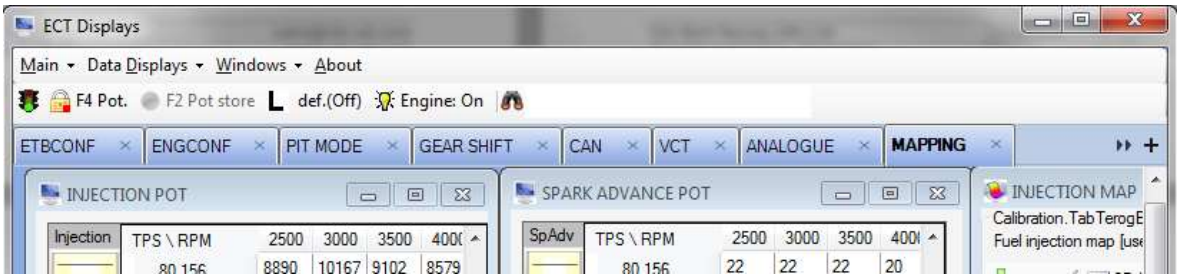


The fuel map now opens and you have full access to the injection pulse widths on a display page.
You can add any map from the ECU to a display page.

Once created a real-time table or map are marked with a red icon next to its name while a display screen are marked with a blue icon.

Any changes to a table or map will be written momentarily into the ECU, updating the engine settings in real time.
If you manually want to control the ECU update by pressing F8, check the settings for F8 in 'Main Settings'.

9.1.8 Multiple Display Sections



You can create displays with multiple sections. This gives you the option to switch from one set of display windows to another without having to close and then open displays.

To add another set of display windows click on the **+** at the right edge of the main display window. This will add a tab to the main window. Type a name for the new page and click **OK**.
A new blank display page will open and you can start assigning display windows.

To save the new display layout it must be saved as a workspace. In the 'ECT Main Menu' click on 'Workspace', then click on 'Save Workspace' and key in a name.
To open the new layout click on 'Workspace' and then click on 'Load Workspace'.

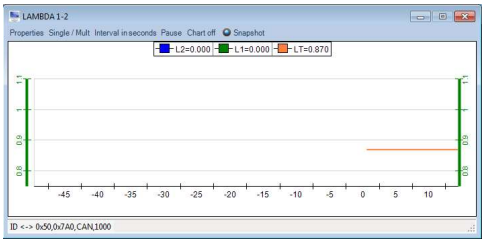
9.1.9 Strip Chart Mode

The command creates a window which will graphically display the value of any of the ECUs data channels. The maximum number of channels allowed in a window for a strip chart is limited to 12.

You can edit a display window if you see a grid on the grey back ground. To enable the edit mode you double click on the grey back ground or you right click and select **Enable Edit Mode**.
When the grid is visible you add a window by right clicking and select **Add Channel**.
Check that you have selected the right database.

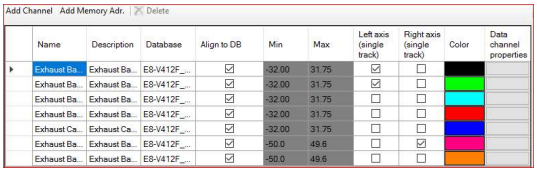
Now look for the channel. You can scroll through the channel list if you know the index number of the channel or you can search for it.
Use the * to search any combination where your wording exists. For example, if you are looking for oil temperature and oil pressure you could type ***OIL*** and then press Enter. The search will jump to the first channel which includes the words OIL. If this is one of the channels you want you tick the box. To continue your search click the word in the search line again and press Enter.
Once you have ticked all the channels you have searched for you clock **OK**. The search window closes and you return to the main display window, now showing your channels.

Once you have created a normal display window with the required channels, right click the window and select **Enable Strip Chart Mode**.
The window is now transformed into a graphic display.



You can configure the display to suit your requirements:

In **Properties** you can set the displayed minimum and maximum thresholds, link data to default database, define whether you want Y-axis displayed on left and/or right side of the window and the colour of the graph.



In **Single / Mult** you can select to display all graphs in one single window or to display each channel individually.

In **Interval** you set the time interval from the right to the left Y-axis, from 2 seconds to 256 seconds.

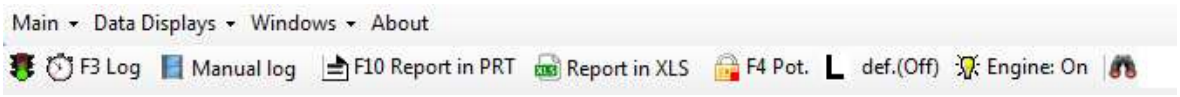
Pause allows you to stop the strip chart moving and zoom in to analyse the chart.

Legend dock mode lets you position the window channel information window in top of the strip chart, to the right, at the bottom or at left.

Snap Shot transfer the data to the Charting Tool.

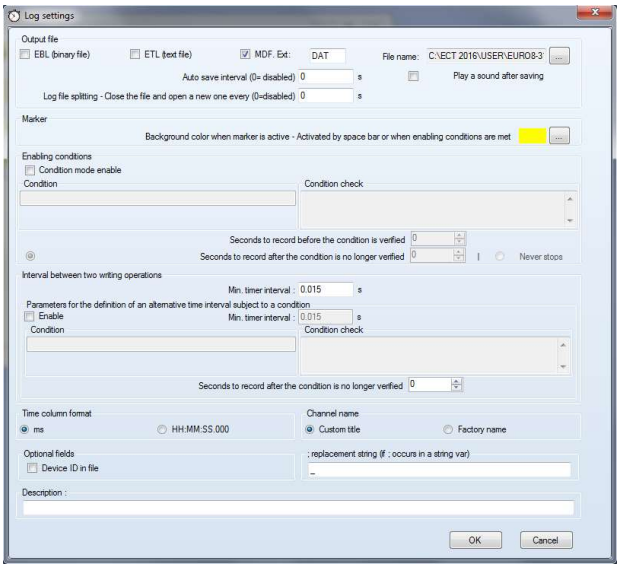
9.1.10 Data Logging

The ECT tool has a built-in data logging capability. Data will be stored on your PC's hard disk.
The logger will record data using any of the available display windows.
Open a display window and right click anywhere on it and select **Enable Log**.
The window heading now changes to this layout:



Click on F3 to access the logger.
Data can be stored in 3 different formats:

- **EBL**, a binary format
- **ETL**, a text format
- **MDF**, data format



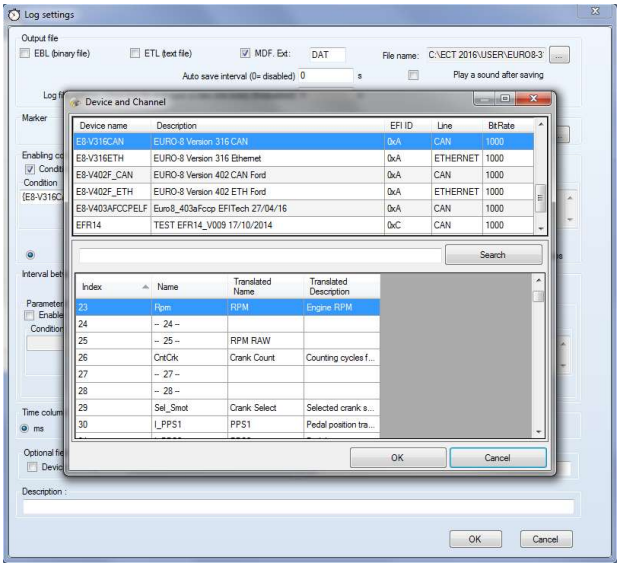
Data can be recorded in fixed time intervals, keyed in as Auto Save Interval.
If you set this interval to 0, the data will be recorded at the highest possible rate allowed via the communication with the ECU and the PC.

It is possible to add a marker during data recording.
Press the space bar to add a marker.
You can define the preferred colour of this marker.

You can define the conditions for start recording.
Tick the box for enable conditions.
Now type your condition as {device1,channel} (condition) (value).

If you want to start the recording when the engine speed exceeds 2,000 RPM proceed this way:

Double click on the expression between the two brackets. A new window opens, **Device and Channel**, select the ECU device and then select the channel. Click OK to proceed.
The condition now looks like:
{E8-V316CAN,*23} > 2000.
You can combine channels and you can use logic conditions.



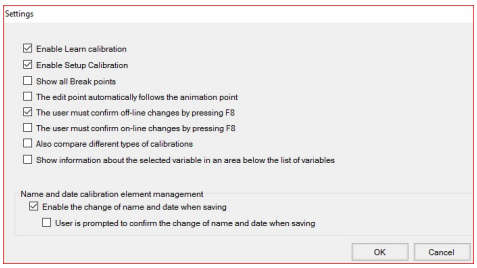
You can define a condition to change to a different sampling rate if a given condition appears and the time for which this condition has to be true.

You can define the time column in ms or in HH,MM,SS.000.

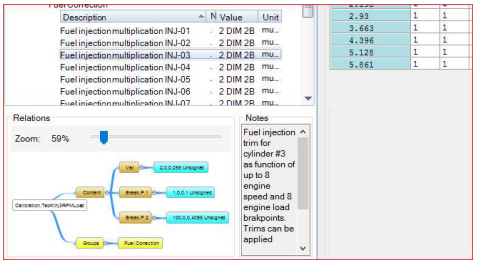
Recorded data can be visualised using the Charting Tool, also found in the ECT main tool.

10 Calibrations

This section gives access to the engine and ECU setup maps.
You can access the main settings for this tool by clicking on **Main** then **Settings** and selecting your preferred options:



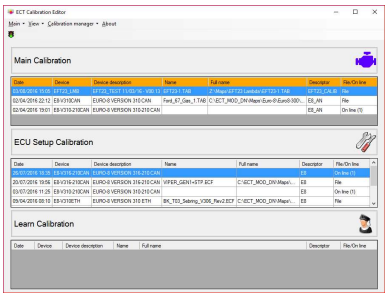
- **Enable learn calibration**, enables the calibration tool to open learn maps. It is recommended to tick this option.
- **Enable setup calibration**, enables the calibration tool to open learn the ECU setup maps. Except for Euro-2 this option should always be selected.
- **Show all break points**, select this option if you want all available breakpoints in tables and maps to be displayed. If you want to hide unused breakpoints do not tick this option.
- **The edit point automatically follows the animation point**, this this option if you want the manual mapping cursor to follow the animated cursor. Do not select this option if you prefer to move the manual cursor yourself.
- **The user must confirm off-line changes by pressing F8**, select this option if you want to manually confirm changes made to settings when working off-line by pressing F8. Upon pressing F8 changes are stored in the map being edited but not to disc.
  If you want to store changes momentarily, but not to disc, do not select this option.
- **The user must confirm on-line changes by pressing F8**, select this option if you want to manually confirm changes to be written to the ECU when working on-line by pressing F8. Upon pressing F8 changes are stored in the map in the ECU.
  If you want changes to be written to the ECU momentarily do not select this option.
- **Also compare different types of calibrations**, select this option if you always want to compare setting in two maps, even if of different types.
  It is recommended not to select this option.
- **Show information about the selected variable in an area below the list of variables**, enable this option if you like the tool to show how parameters are linked:
- **Enable the change of name and date when saving**, it is recommended to check this option.
- **User is prompted to confirm the change of name and date when saving**, select this option if you want to confirm name and date each time you save a map to disc.



It is possible to work with the maps off-line as well as on-line. While any changes in the engine map reflect the engine calibration on the fly, the setup map needs the ECU to be reset in order to read the new settings.

10.1 Open a Map

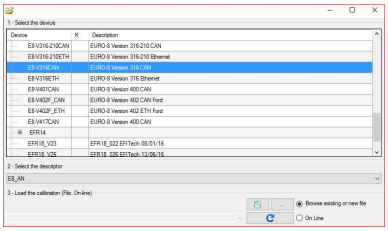
Click on the grey area where you see **Main Calibration** to load an engine map. This is the map used to optimise the engine mapping. The engine map file has a TAB or TABX file extension.



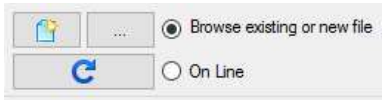
Click on the grey area where you see **ECU Setup Calibration** to load the ECU setup map. This is the map used to configure the ECU to the engine type, the vehicle type and the sensors used on the engine and transmission.

The ECU setup map file has an ECF or ECFX file extension.

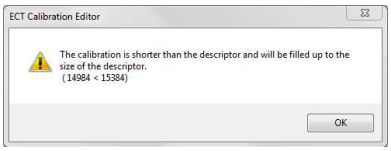
Click on the grey are where you see the **Learn Calibration** to load the ECU learn maps. Learn maps contain the correction factors, the factors stored for adjusting the injection times to reach the lambda target values.
The learn map file has a LRN file extension.



Now click on the ECU database for the ECU in use. This sets the communication protocol.
Select the engine load – you can select the engine load (the Y-axis in the map) expressed as the throttle angle (AN, alfa-N), as manifold air pressure (MAP, speed density) or as mass air flow (MAF).



Load the map off-line – click the button with the 3 dots.
Load the map on-line – click the button with the arrow. Make sure you are connected to the ECU and the ignition is switched on.

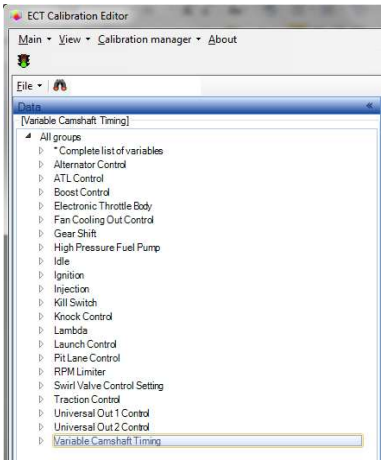


You might see a message about the length of the map:
"The calibration is shorter than the descriptor….."
This is because you have loaded a map from an older version of database than the one you have selected. It is not an error message, just click **OK**. When you save the file to disc the size will be adjusted automatically.

When you import a file from an earlier version you must check settings of any new features. Failure to do so can prevent you from starting the engine or – in the worst case – cause damages t the engine!

Once a map is loaded into the Calibration tool – on-line or off-line – you can save it to disc by clicking in **File** and then click on either **Save to file** or **Save to file as**.

10.2 The Calibration Map Display



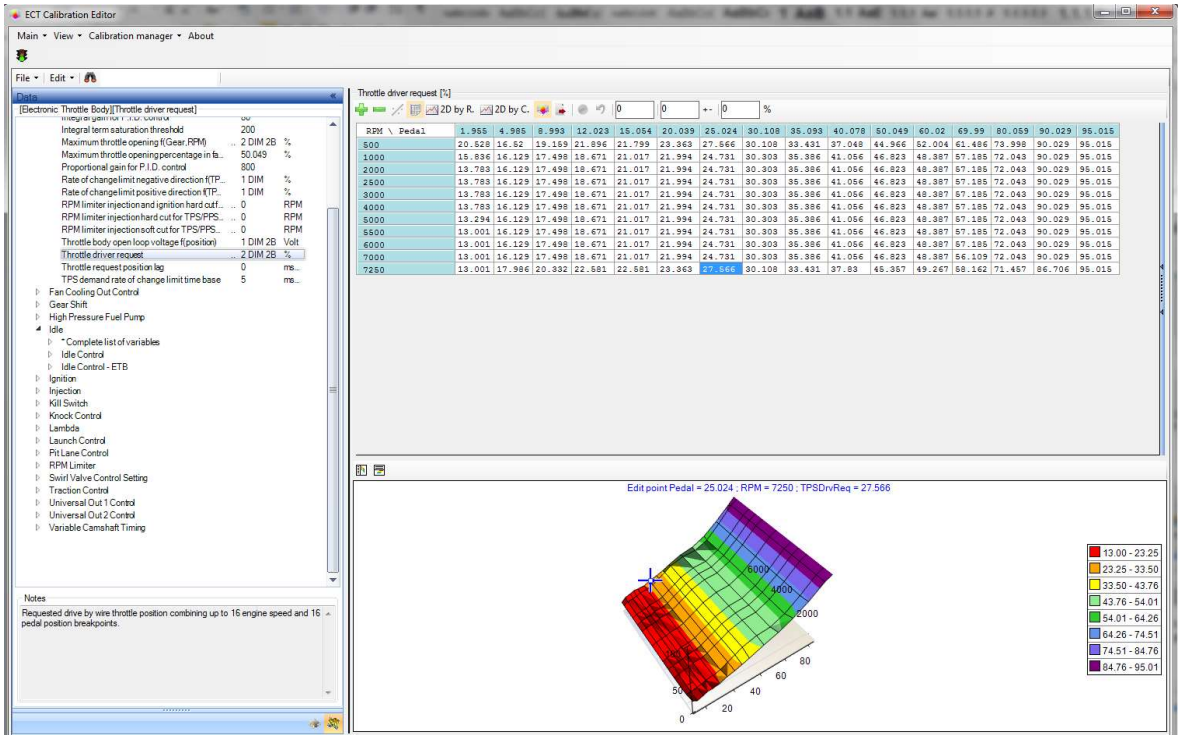
When you open a calibration file all available features for this version of ECU and software version are listed with its main groups shown in a tree at the left side of the display.

To open a group to gain access to the calibration parameters click on the right hand arrow to the left of the group name.

When you open a group you can sort the content alphabetically or by numeric values.

- Sort content alphabetically by clicking on the heading "**Description**".
- Sort content by numeric value by clicking on the heading "**Value**".

The screen is split between the tree on the left and selected tables and graphics are displayed on the right.

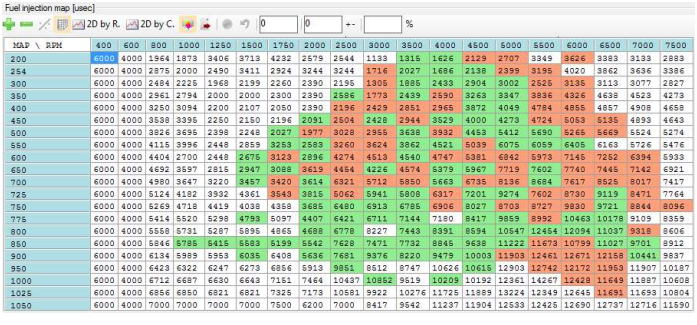


You can adjust the slit ratio between left and right. Using your mouse, grab the split line between the 2 screen halves and mode it to your preferred position.
In the same way you can adjust the split between top and bottom in the right hand display, between the numeric of the map and the graphic display.
The settings are saved when you exit the Calibration Manager.

10.3 Reference Map

You can load a reference file in the calibration editor once you have loaded the engine map.

Using the colours red and green it is very easy to check changes in any sections of the map.
Red illustrates a decreased value where green illustrates an increased value.



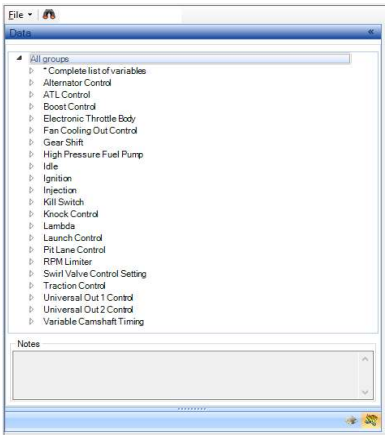
By right clicking on the main group the changes can easily be cancelled, returning the values to those in the reference map.

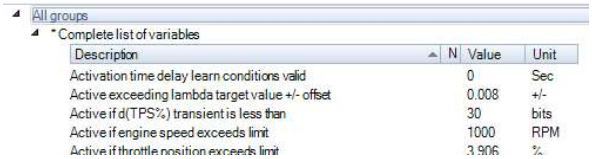
Once a map is loaded in the editor click **File**, then click **Load Reference File**. Now locate the file you want to use as a reference and click **Open**.

You can unload the reference file by clicking **File**, then click **Unload Reference File**.

10.4 Map Editing

This is an example of loading and changing the engine map.
The map is divided into various groups, these can be expanded by clicking the arrow pointing right.
You can navigate between the sections using the up, down, left and right arrow keys and the mouse.





You can sort the content in each group alphabetically by clicking on the heading named **Description** and numerically by clicking on **Value**.

Calibration parameters are divided into 3 categories:

- Constants
- 1 dimensional tables
- 2 dimensional maps

10.4.1 Change a Constant

To change the value of a constant, simply double click the constant text and then key in a new value. Press Enter to confirm the change.
If you work on-line with the ECU then the ECU will immediately change its setting once the new data is entered – unless you are working on-line with the ECU setup map.

10.4.2 Change a 1-dimensional table

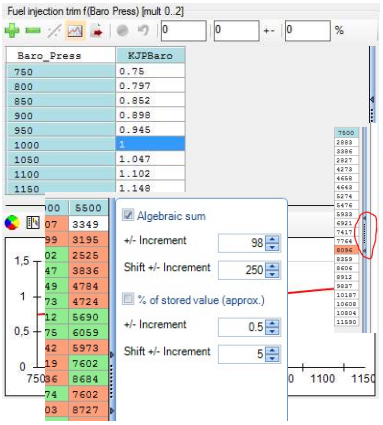
A 1-dimensional calibration table links values of a sensor or a calculated parameter with a variable output, which can be i.e. a trim offset or a multiplication factor.
Use the up and down arrows keys to move the cursor between breakpoints.

If you are working online, an animated cursor displays the current load condition. You can toggle the cursor ON and OFF by clicking the button **F12 ANIMATION**.
You can let the edit point follow the animation point. If you always want this feature active then click on **Main** in the calibration editor and tick the box **The edit point automatically follows the animation point**.

Optionally, you can select this feature directly from the engine map by clicking the icon  .

Click on  to open the graphic display of the data.

To change a value of any of the cells either double click on it using your mouse or move the blue cursor to the cell and then press Enter. Now key in the new value and press Enter.



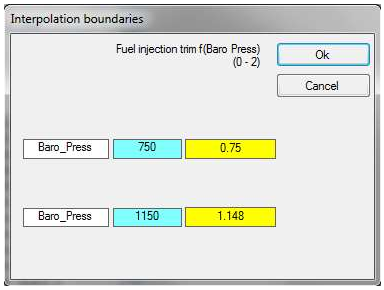
Alternatively, use the **+** and **–** keys to change the values.

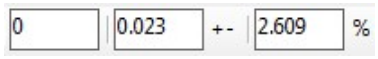
You can adjust the steps applied by these keys.
Look for the button on the right edge of the table; it is marked with two arrows pointing to the left and dots, here marked in red.

Click on the dots to open the configuration window. You can select to modify the cells using an algebraic sum or a percentage correction.
You can define the changes of each **+** key press and the coarse change by **SHIFT +**.

If you want to mark several or all cells in the table click on the first cell, hold your left mouse button pressed and drag the cursor down, marking the cells. Then release the button.

Using the interpolation function the tool can automatically calculate calibration values. Mark the cells in the column or row you want to linearize, click the icon and now key in the interpolation boundaries. Click OK to perform the calculation and return to the map.



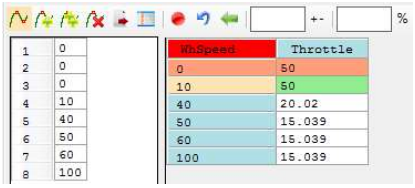


The 3 windows can be used for modification of the table as well as displaying the change to each cell from the base setting.
The left window can be used to fill all marked cells with a new value for all cells. This can also be done by marking the cells to be changed, then press Enter, key in the new value and then press Enter again.

- The left window can be used to fill all marked cells with a new value for all cells. This can also be done by marking the cells to be changed, then press Enter, key in the new value and then press Enter again.
- The middle window is used if you want to increase or decrease cells with a specific value.
- The right window will increase or decrease selected cells with a percentage correction.
- If you want to cancel your changes press **F11** or click the icon .
- If you want to save your changes into the map then press **F8** or click the icon .

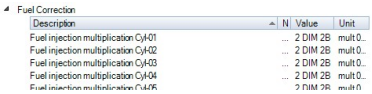
You can change the breakpoints in tables and maps.

Press F9 or click the icon to access the break point editor.
Now click on any of the break points, it will turn light brown.
Using the keys on top of the window you can now:



- Delete a break point, press DEL or click the icon .
- Insert a break point, press INS or click the icon .
- Free edit of all break points, click the icon .

Press F9 or click the icon to close the break point editor.
Please also see the section with map comparison.

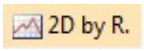


10.4.3 Change a 2-dimensional map

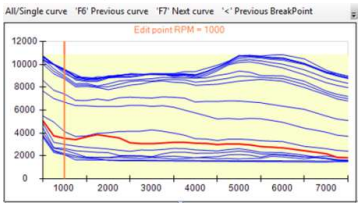
A map links values of two measured channels to a calculated parameter with a variable output, which can be i.e. injection pulse width, spark advance degrees, solenoid valve duty cycles, camshaft positions, offsets or multiplication factors.
Use the up, down, left and right arrow keys to move the cursor between breakpoints.

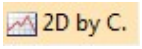
If you are working online, an animated cursor displays the current load condition. You can toggle the cursor ON and OFF by clicking the button **F12 ANIMATION**.
You can let the edit point follow the animation point. If you always want this feature active then click on **Main** in the calibration editor and tick the box **The edit point automatically follows the animation point**.

Optionally, you can select this feature directly from the engine map by clicking the icon  .

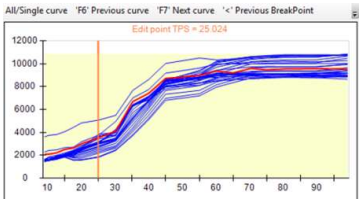
Click on 

to open 2-dimensional graphic display, showing fuel lines for each engine load site.
You can toggle between showing a single line and all lines.



Click on 

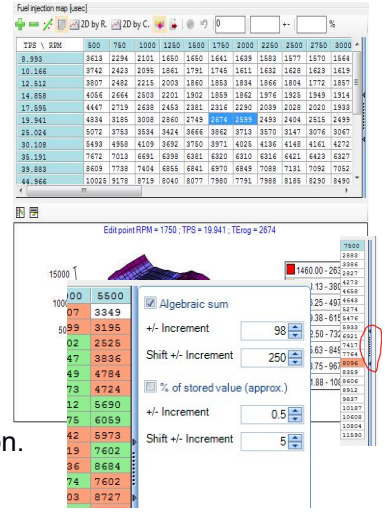
to open 2-dimensional graphic display, showing fuel lines for each engine speed site.
You can toggle between showing a single line and all lines.



Click on  to open 3-dimensional graphic display.
You can rotate the display, click and hold your left mouse button and rotate the graphics.
To change a value of any of the cells either double click on it using your mouse or move the blue cursor to the cell and then press Enter. Now key in the new value and press Enter.

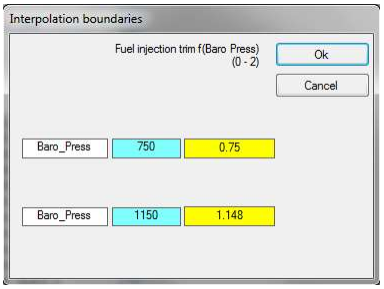
Alternatively, use the **+** and **–** keys to change the values.
You can adjust the steps applied by these keys.
Look for the button on the right edge of the table; it is marked with two arrows pointing to the left and dots, here marked in red.

Click on the dots to open the configuration window. You can select to modify the cells using an algebraic sum or a percentage correction.
You can define the changes of each **+** key press and the coarse change by **SHIFT +**.



If you want to mark several or all cells in the table click on the first cell, hold your left mouse button pressed and drag the cursor down, marking the cells. Then release the button.

Using the interpolation function  the tool can automatically calculate calibration values. Mark the cells in the column or row you want to linearize, click the icon and now key in the interpolation boundaries. Click OK to perform the calculation and return to the map.



The 3 windows can be used for modification of the table as well as displaying the change to each cell from the base setting.

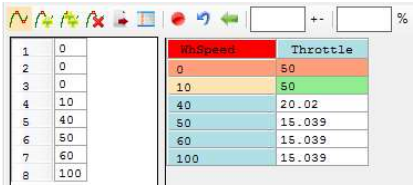
The left window can be used to fill all marked cells with a new value for all cells. This can also be done by marking the cells to be changed, then press Enter, key in the new value and then press Enter again.

- The left window can be used to fill all marked cells with a new value for all cells. This can also be done by marking the cells to be changed, then press Enter, key in the new value and then press Enter again.
- The middle window is used if you want to increase or decrease cells with a specific value.
- The right window will increase or decrease selected cells with a percentage correction.

- If you want to cancel your changes press **F11** or click the icon .
- If you want to save your changes into the map then press **F8** or click the icon .

You can change the breakpoints in tables and maps.

Press F9 or click the icon to access the break point editor.
Now click on any of the break points, it will turn light brown.
Using the keys on top of the window you can now:

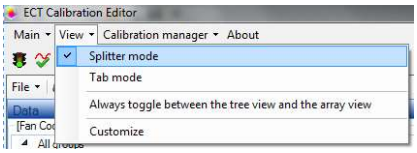


- Delete a break point, press DEL or click the icon .
- Insert a break point, press INS or click the icon .
- Free edit of all break points, click the icon .

Press F9 or click the icon to close the break point editor.

Please also see the section with map comparison.

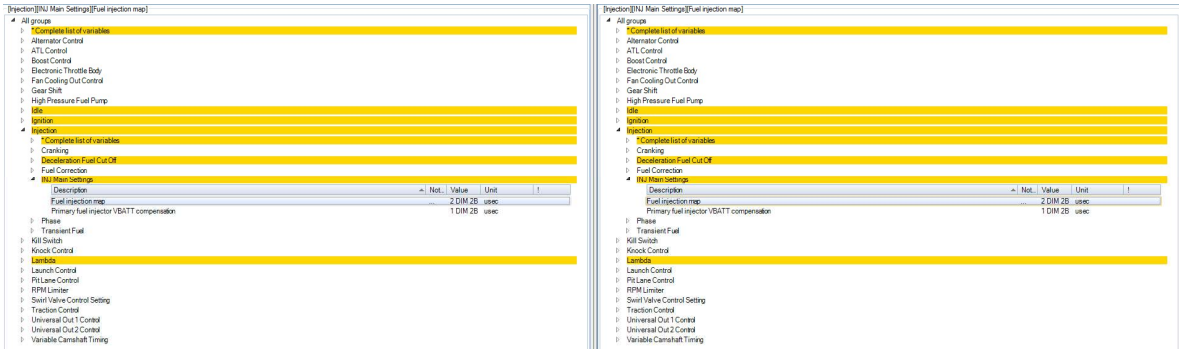
10.5 Map Comparison



You can compare the contents of two calibrations from your PC.
You can choose to display the two calibrations side by side (Splitter mode) or on two individual tabs (Tab mode).

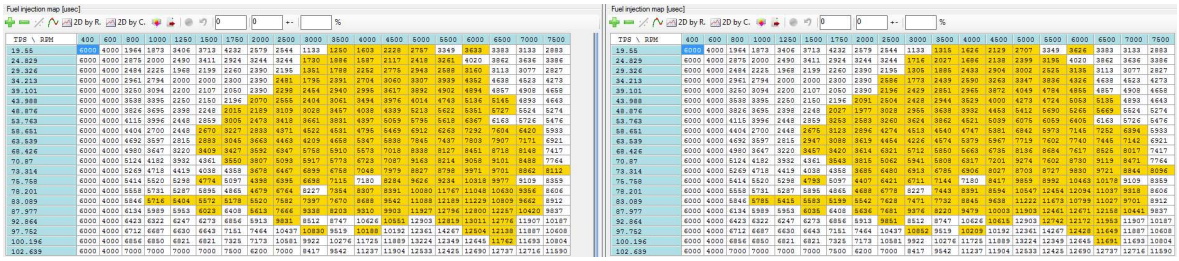
Open the calibration manager and load the first of the two calibrations to compare.
Now click on **Calibration Manager** and select **Load empty frame for Main Calibration**.
Load the second calibration.

Displaying the two calibrations side by side any differences between the two are marked in yellow:



You can compare calibrations working either off-line or on-line with the ECU..

To see the differences between i.e. the two fuel maps, open the fuel map in both maps. The coloured cells indicate that values differ between the two maps:

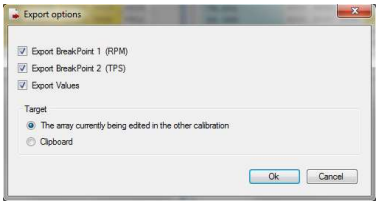


10.5.1 Copy and insert data

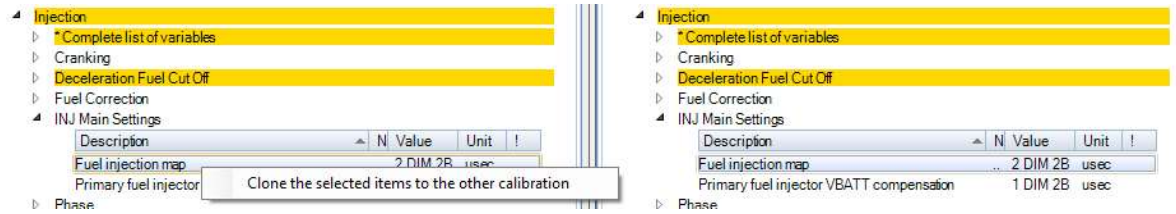
While comparing calibrations there are several ways you can blend values from one map to another map.

If you want to copy all cells and break points from map to the other you can do so with two clicks of the mouse.

Having the two maps next to each other click on this icon on the calibration you want to export data from.
In Export Option select your preferences and click **OK**.
The complete map, including breakpoints, is now being copied to the other map.
This method can be used with tables and maps.



You can also clone settings from one calibration directly into a second calibration.
Go to the section in the calibration you want to copy.



Right click the section you want to copy to the other calibration and select **Clone the selected items to the other calibration**.
This way you can easily copy constants, tables and maps between calibrations.

Furthermore, you can copy parts of one map or the complete map and paste the data into the same map or different maps and documents, spreadsheets etc.
Mark the map cells to copy by clicking on the first breakpoint, hold the left mouse-button down and drag the cursor to the last breakpoint to copy.

Press **CTRL+C** to copy the data.

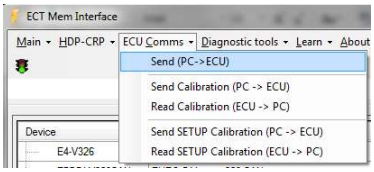
Now mark the other part of the map where you want to copy the data to. (Make sure you highlight the same number of cells in the map you are copying to).
You can also import data from a spreadsheet.

Press **CTRL+V** to paste the data.

Click or press **F8** to save the changes or **F11** to discard changes.

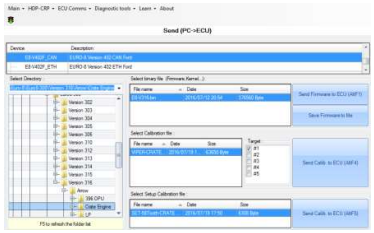
11 Memory Interface

The Memory Interface is used to program an ECU with firmware and calibrations. It is also used to read calibrations from the ECU.
Furthermore, it can be used to create files for protected and encrypted ECU versions.



11.1 Send Calibrations

Click on **ECU Comms** and select **Send** to get access to commands for sending main calibrations, ECU setup calibrations and learn files to the ECU.



Make sure you have selected the right ECU database.
Next locate you calibration map folder in the tree on the left.
This section will allow you to send firmware, main calibration file and ECU setup calibration.

To send firmware to an ECU you will need to use CAN communication, using EFI Technology's EFP02C or EFT20 USB CAN interface.
Start by switching the ECU ignition off.
Click the firmware version you want to send.
Click **Send Firmware to ECU** and follow the instructions on screen.

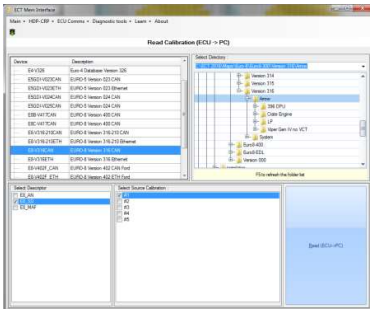
Warning:
If you switch the ECU off during the transmission of firmware, the ECU will appear to communicate when you switch it on again. But this is quickly sorted out.
Simply repeat the firmware transmission, the ECU will be back communicating.

To send the main calibrations to the ECU click on the calibration to send.
Now select which of the multiple locations you intend to update.
Click **Send Calib to ECU**.

To send the ECU setup calibrations to the ECU click on the calibration to send.
Now click **Send Calib to ECU**.

11.2 Read Calibrations

Click on **ECU Comms** and select **Read** to get access to commands for sending main calibrations, ECU setup calibrations and learn files to the ECU.



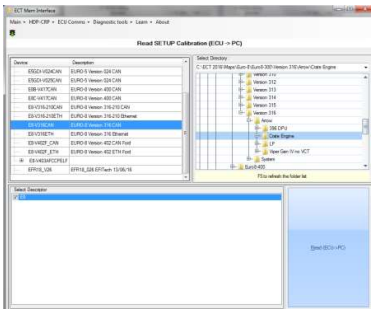
Make sure you have selected the right ECU database.
Next locate you calibration map folder in the tree on the right.
This section will allow you to read main calibration files and ECU setup calibrations.

To read the main calibrations from the ECU click to select the descriptor settings and select which of the multiple locations you intend to read from.
Click **Read**.

You will be prompted for a calibration name but the tool will propose the current name.

Next you will be asked if you want to mix the calibration with the learn calibration map.

- If you are mapping the engine and are using the ECU self-learn feature, you select YES to this option. Have patience while the tool creates the new fuel map, you will see when it has finished.
- If you are not mapping the engine and only want the calibration from the ECU, select NO to this option.



To read the ECU setup calibration make sure you have selected the right ECU database.
Next locate you calibration map folder in the tree on the right.
Click **Read**.

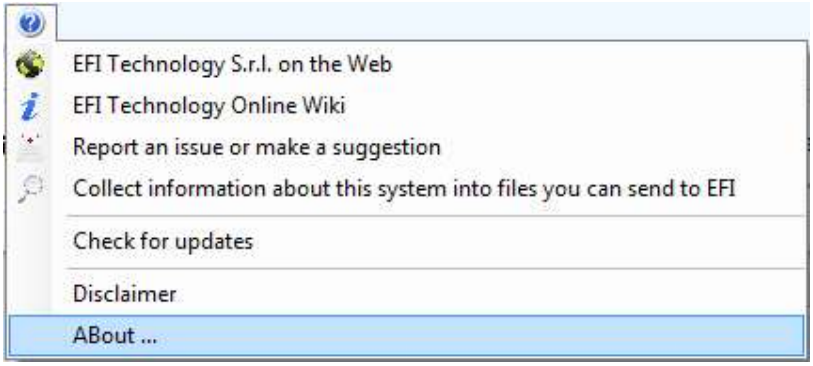
11.3 ECT Calibration File Verification Function

A new way to compare and verify maps programmed into any of the ECU's has been developed. Using this process, it is possible to let for example a scrutineer check if the ECU maps conform to provided sample maps. It is not necessary for the engine builder to hand over the real maps.
The engine builder will use the ECT to generate a signature file for each of the maps programmed into the ECU, being either engine or setup maps.

11.3.1 Tool Version

The compare function is available in ECT from version 314.
Please check your ECT version is compatible, otherwise you can always download the latest tool version from our website - www.obrcontrolsystems.com – from the Support section.

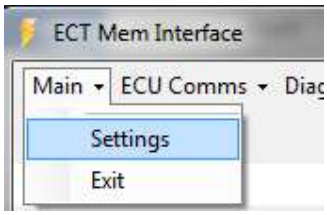
To check which tool version you have installed, please click on the "?" in the main menu, then select "About":



11.3.2 Configuration

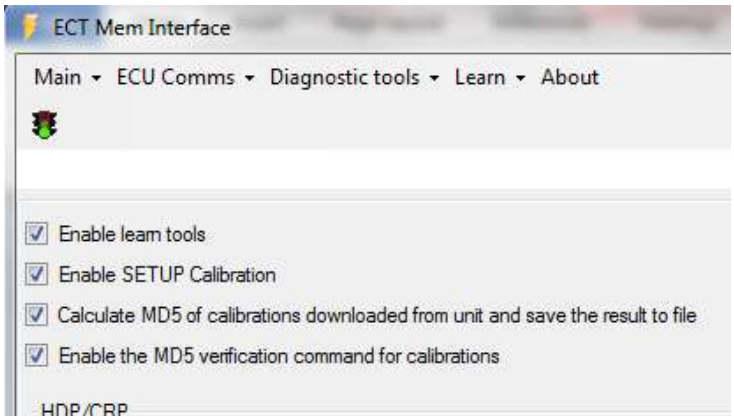
Once the right tool is installed on your PC, start the ECT program.
Click on the icon for "Memory Interface" in the main menu:

When the new window appears click on “Main” and then on “Settings”.



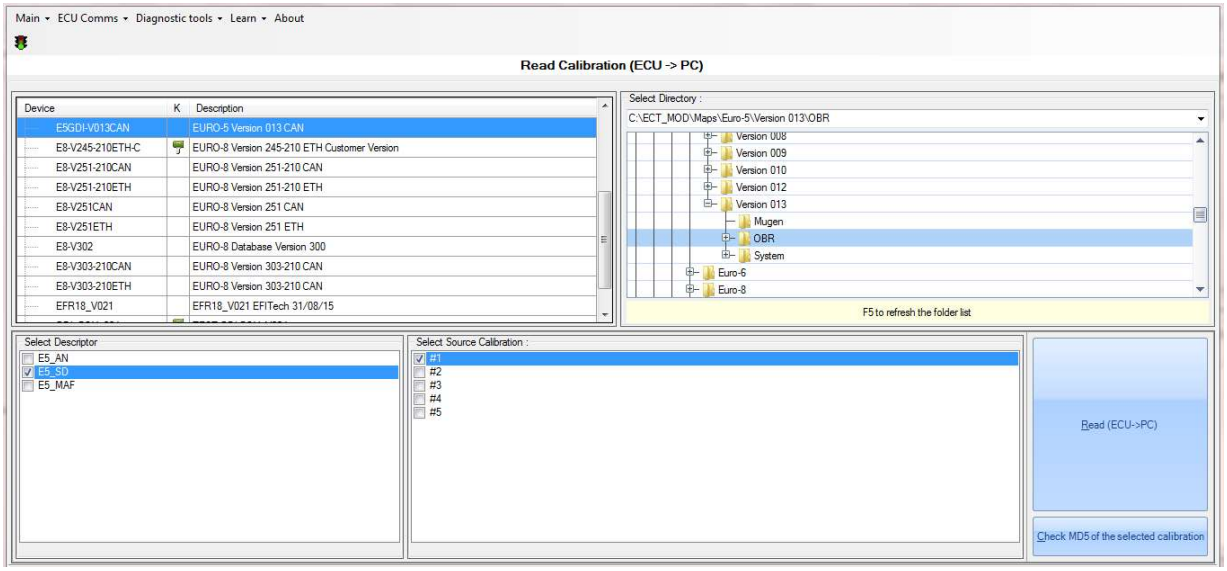
In Settings tick the 2 boxes:

- “Calculate MD5 of calibrations downloaded from unit and save the result to file”.
- “Enable the MD5 verification command for calibrations”.

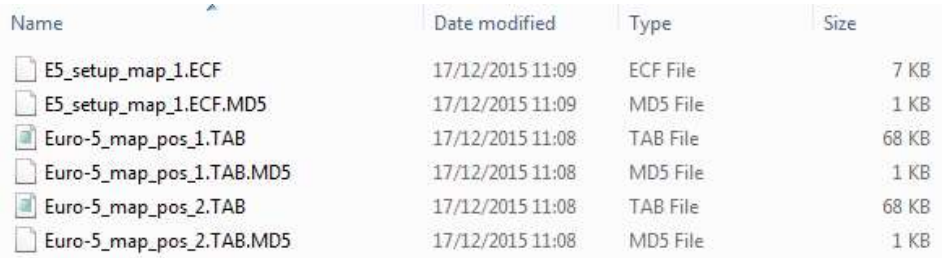


11.3.3 Creating MD5 files

Creating the MD5 files used for map verification is very easy. Simply copy the finalised maps from the ECU to your PC.
Select “ECU Comms” and then “Read Calibration” to copy an engine map to your PC.
Do not mix with the learn table.
Select “ECU Comms” and then “Read Setup Calibration” to copy an ECU setup map to your PC.



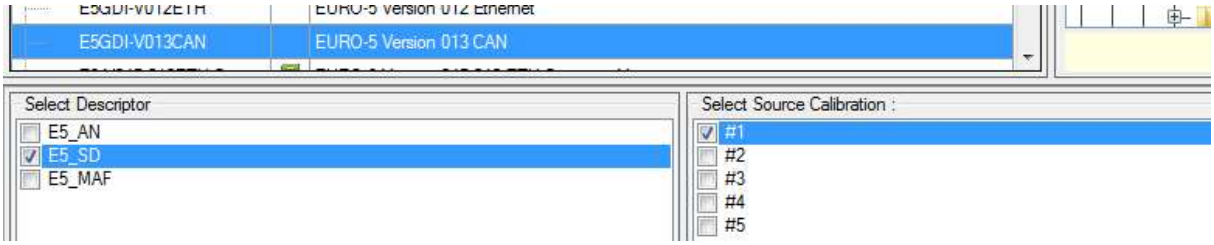
Here is shown the result of downloading two engine maps and one ECU setup map:



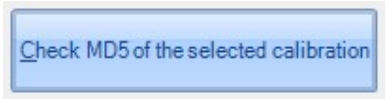
The files with extension MD5 are the files used for use with the verification process.

11.3.4 Verifying Engine Maps

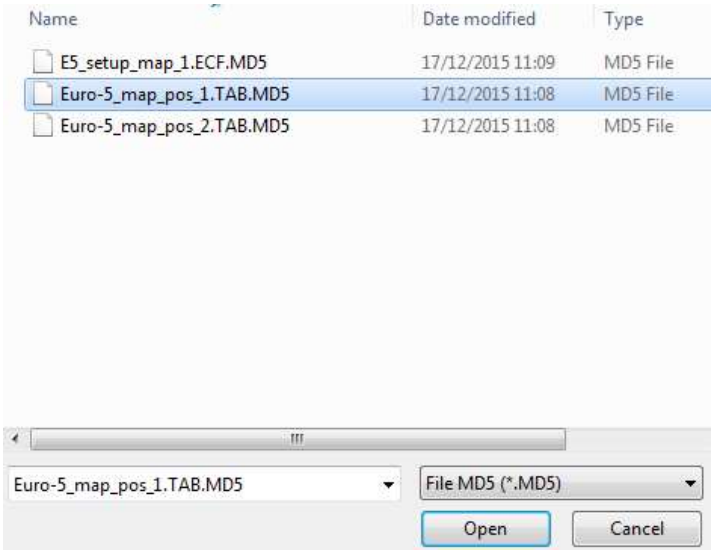
To verify maps in the ECU proceed this way:
Connect your PC to the ECU and open the “Memory Interface“ section in ECT.
Click “ECU Comms” and then “Read Calibration”.
Select which engine map to verify:



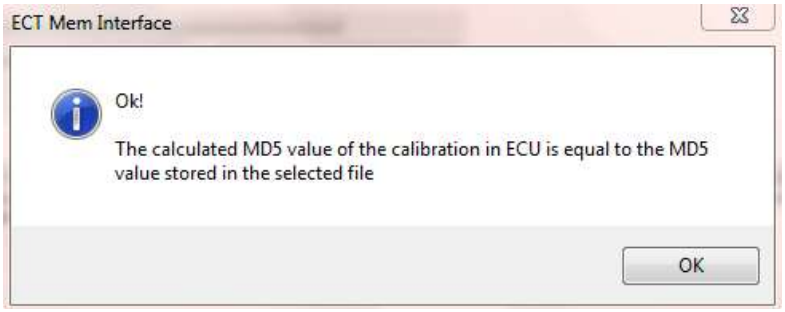
Now click the verification button to start the process:



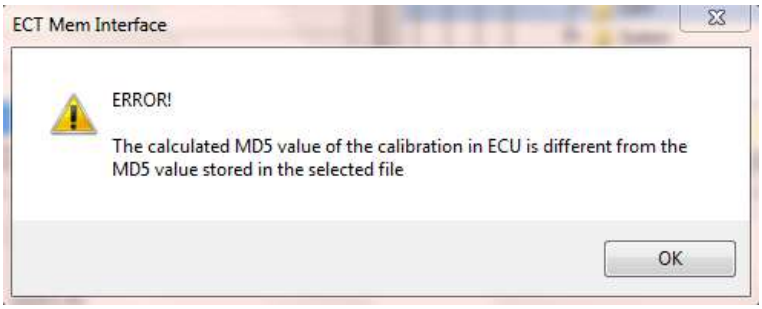
Now select the signature file linked to the selected engine map:



If the signature file is generated from the map found in the checked location you will see a confirmation:



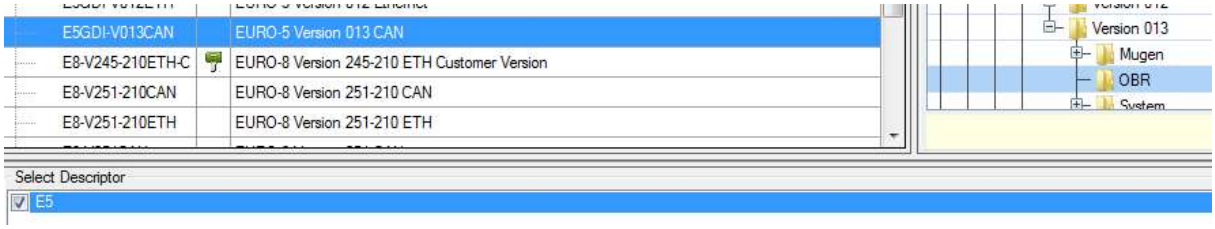
If the map and the signature files do not correspond you will see an error message:



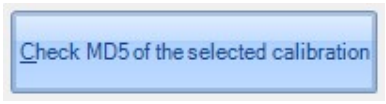
11.3.5 Verifying ECU Setup Maps

To verify the setup map in the ECU proceed this way:

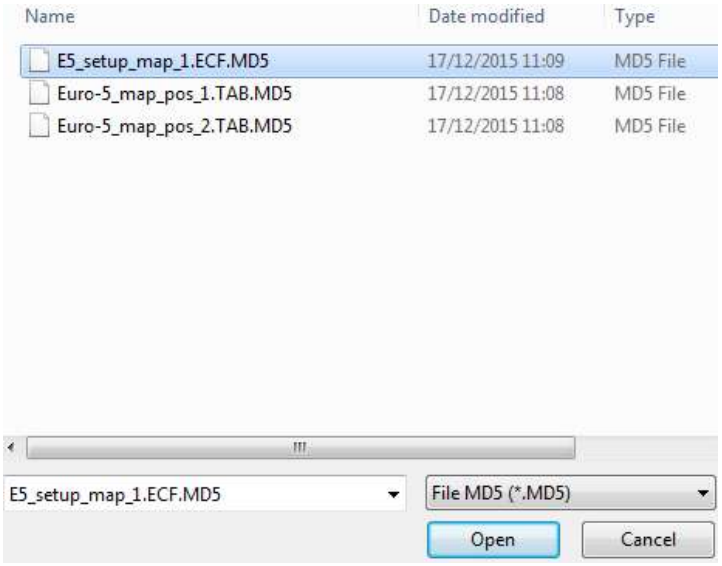
Connect your PC to the ECU and open the “Memory Interface“ section in ECT.
Click “ECU Comms” and then “Read Setup Calibration”.



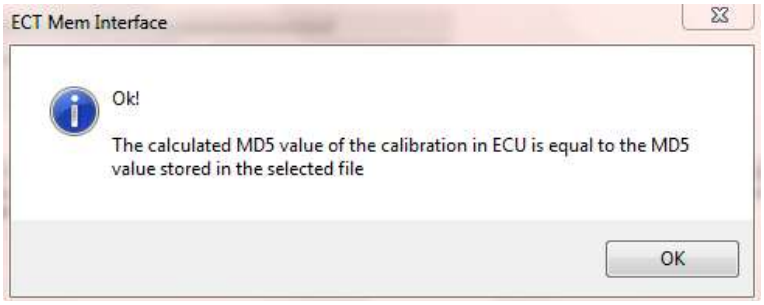
Now click the verification button to start the process:



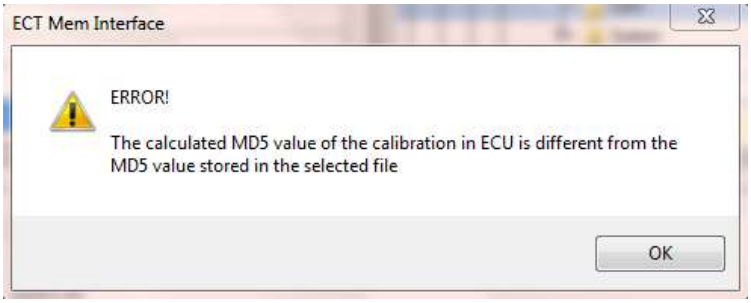
Now select the signature file linked to the selected ECU setup map:



If the signature file is generated from the map found in the checked location you will see a confirmation:

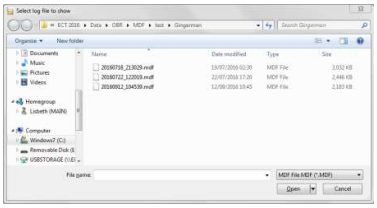


If the map and the signature files do not correspond you will see an error message:

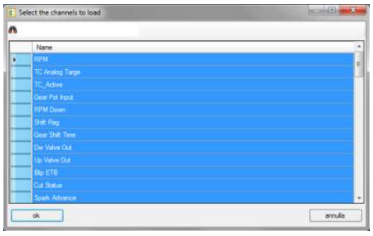


12 Charting Tool

The Charting Tool is a graphic data analysis tool, displaying recorded data in a strip chart mode.
It can display data from both the ECU's with on-board data recording as well as the ECT logger tool.
It can read the dedicated file formats used in ECT as well as the standard MDF file format.
This description is for the Charting Tool included in ECT version 421.
It is a graphic data analysis tool, displaying data in a strip chart mode.
It can display data from both the ECT logger tool as well as from the ECUs with on-board data recording modules.
It can read the dedicated file formats used in ECT for logged data as well as the standard MDF format.
Data can be displayed in up to 5 separate windows plus an overview window at the bottom of the display.



When you open the tool you will be prompted to load a logger file to analyse.
Click on the file name (which you can define within the Logger Tool, section 13) and then click open.



The tool now opens a channel window giving you the option to load all recorded data channels or to select individual channels - by default all channels are selected.
Click OK to open selected files.

The channel manager opens together with a main graphic display.

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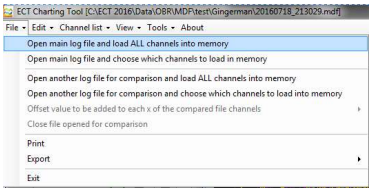
12.1 Main Menu



File in the main menu gives access to:

- **Open main log file and load ALL channels into memory**, locate your data logger file and open it in the Chart Tool.
- **Open main log file and choose which channels to load into memory**, locate your data logger file and open it in the Chart Tool.
- **Open another log file for comparison and load ALL channels into memory**; you can compare 2 files in the Chart Tool.
- **Open another log file for comparison and choose which channels to load into memory**; you can compare 2 files in the Chart Tool.
- **Offset value to be added to each of the compared file channels;** synchronise two data sets.
- **Close file added for comparison**, close the 2nd file opened.
- **Print**, print the current layout.
- **Export**, export the current view as a picture file.
- **Exit**, close the Charting Tool.

Edit in the main menu gives access to:

- **Channel Manager**, opens the manager to create a math channel.
- **Convert to constant sampling rate**, only used with EBL and ETL files.

Channels List in the main menu gives access to:

- **Hide all**, hide all logged channels.
- **Show all**, display all logged channels.
- **Expand channels**, show full channel list.
- **Compact channels**, show only channels loaded in current display.
- **Expand details**, show all channel data option.
- **Compact details**, show minimal channel data.

View in the main menu gives access to:

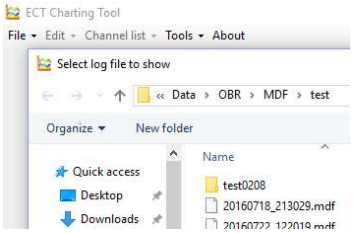
- **Cursors**, select between 1 or 2 cursors visible in the strip chart. The 2nd cursor can anyway be loaded using CTRL+R. Also select the width of the cursor(s).
- **Background colour**, select between white or black background.

Tools in the main menu gives access to:

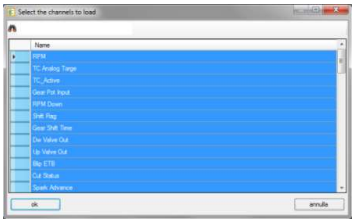
Tool tip on mouse-over; will show help topics in various sections of the tool.
Show…; options of how to display channels data.

About in the main menu gives access to:
Information about the ECT tool version and displays the software license agreement.

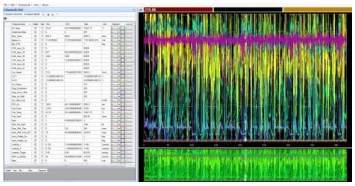
12.2 Load a File



Charting Tool opens directly, displaying a file manager.
Locate the folder where you store your downloads.
Select the **MDF** file format if you load a file from an ECU logger.
Click Open to select the data file to analyse.

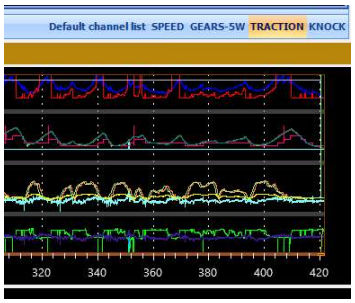


The tool opens a channel window giving you the option to load all recorded data channels or to select individual channels - by default all channels are selected.
Click **OK** to open selected files.
The channel manager and a main graphic display now opens.
First time the Charting Tool opens it will display all files as default.
If you change any channel data, for example scaling or colours, these settings are saved when you exit Charting Tool.
All files are displayed in a main single segment large strip chart and an overview window at the bottom of the screen.



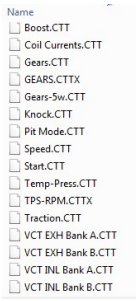
On the left is shown the default channel list with access to recorded data. In this window you can change the colour of each channel, it shows the minimum and maximum channel values and gives access to change the minimum and maximum displayed channels.

12.3 Create, Save and Load a Personalised Display Layout

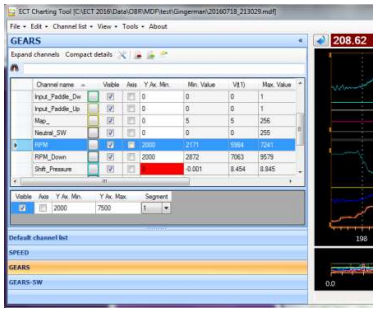


You can create personalised data layouts, making it easy to switch between for example analysis of combustion, gear shift and traction control.
Opening the tool select the channels you want to open for a specific layout.
If you loaded all channels when you opened the tool, you can generate a personalised layout by de-selecting channels.

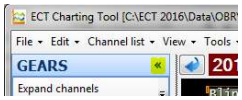
- Select channels to be included in the new group by un-ticking the box **Visible** to remove data channels you do not want to display in your personalised group.
- Select your preferred colour for the data channel.
- Tick the box **Axis** to add the channel scale on the left Y-axis in the display segment.
- Select in which segment of 5 to display the data channel.
- Select the line width; recommended setting is **1**.



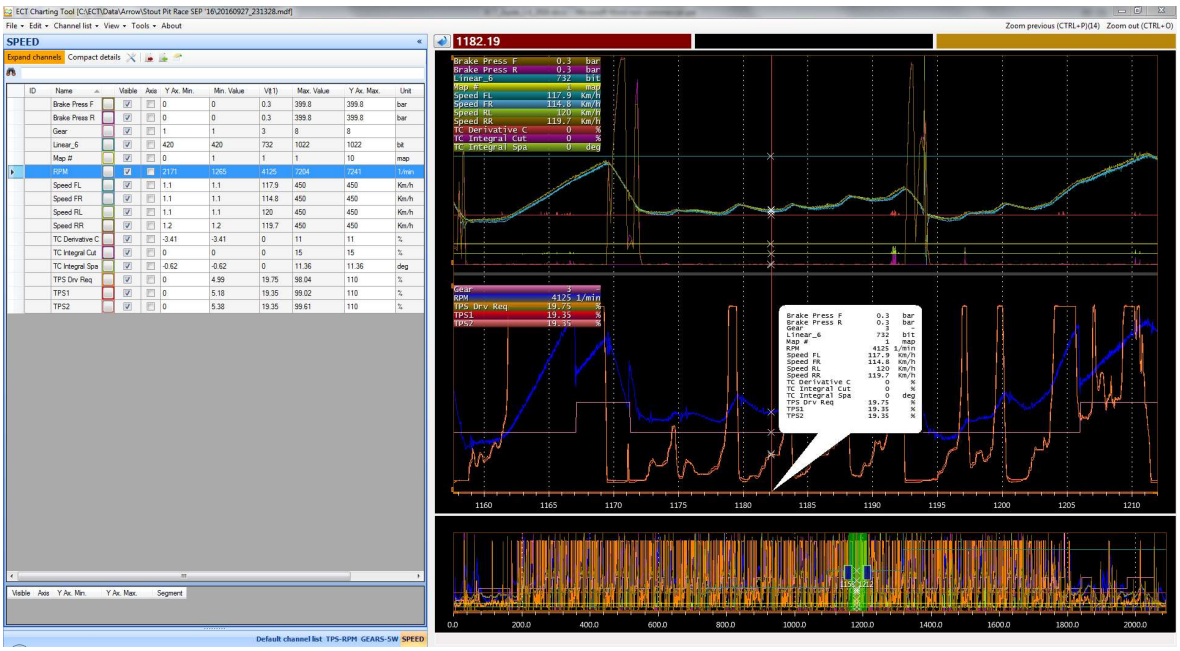
When the display is created, click the icon to save the layout.
Click the icon to load a layout. Select your layout from the list of your saved layouts.
Once a new layout has been created, any changes made to it will be saved automatically when the layout is closed.
You can load several layouts in a display screen. Depending of the display orientation, you will see a tab either to the left or at the bottom of the display screen, listing the layouts loaded.
Switch between layouts with a single mouse click.
The tool will automatically set minimum and maximum channel values but you can change these to suit your preferences.
In the channel window click the column to the left of the data channel you want to manually set minimum and maximum display values for.



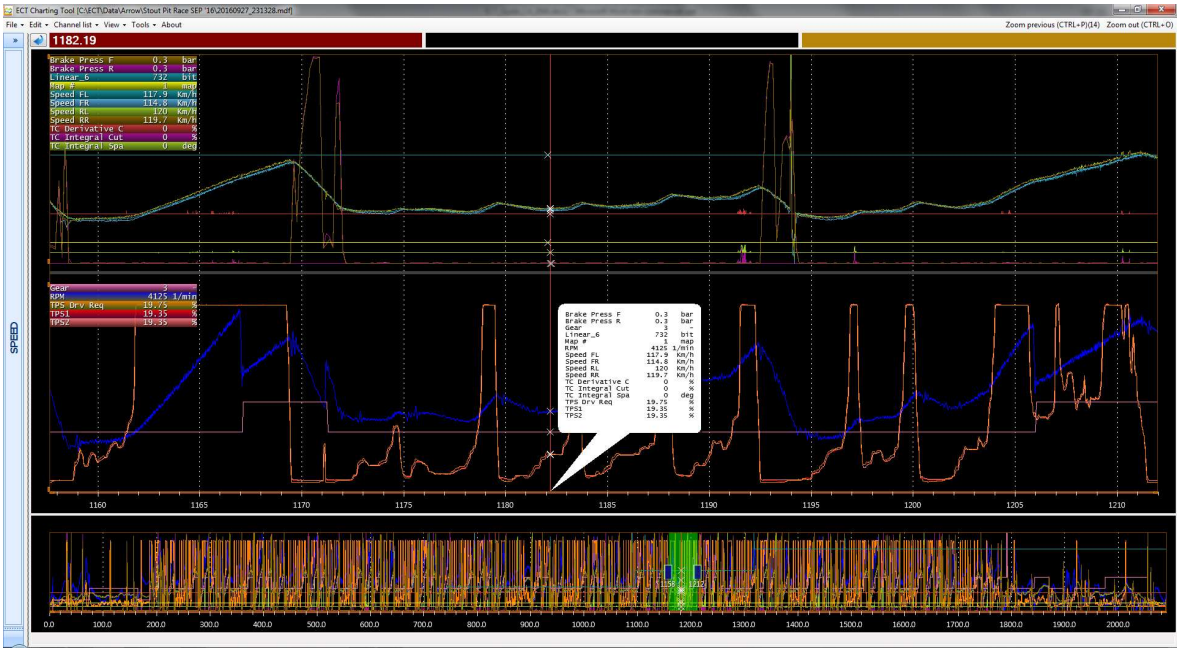
The channel selected turns blue and settings for the Y-axis can now be modified in the window below the channel data.
You can maximise the graphic display window by closing the channel list.
Click on the double arrow, **<<** marked in yellow, to expand the graphic window.



Change from this layout:



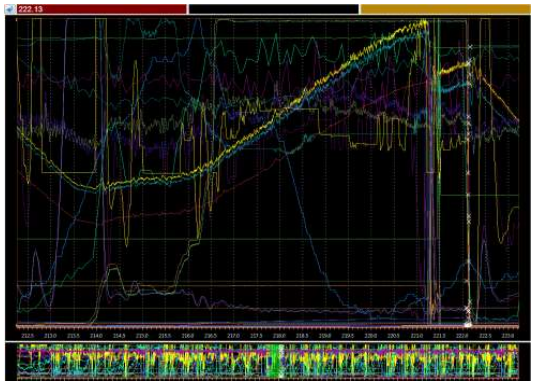
To this layout:

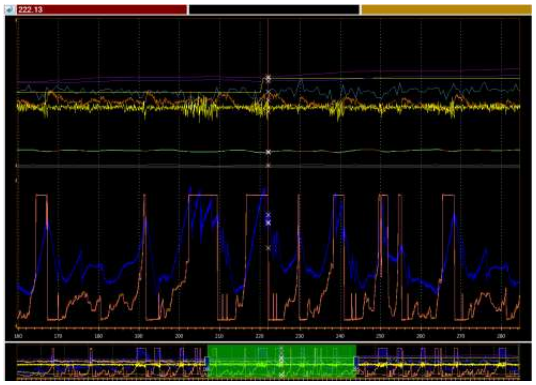


Click on the double arrow **>>** to return to the channel list.

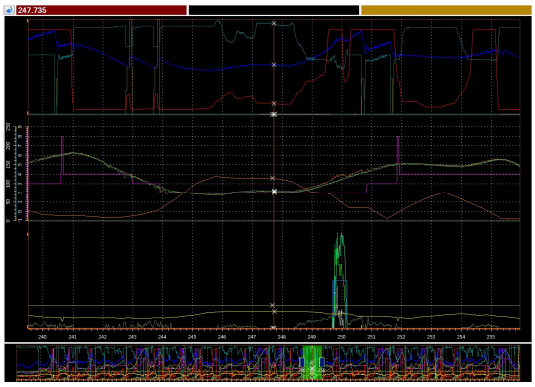
12.4 Display Segments

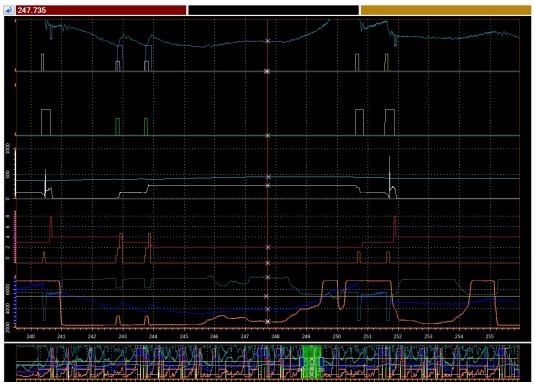
Data can be visualized in individual segments. You can select up to 5 individual segments. Additionally, an overview window is shown at the bottom of the window.
Here are examples of 1 and 2 segments layout:



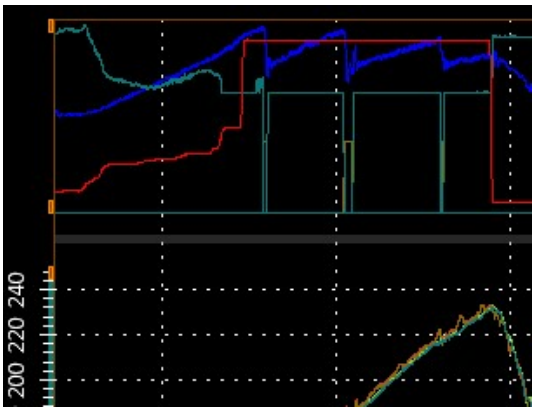


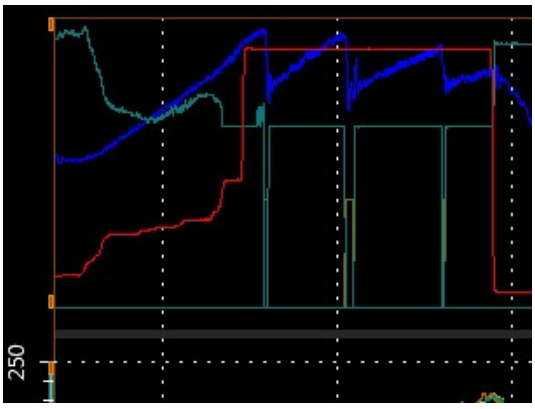
Here are layouts having 3 and 5 segments:



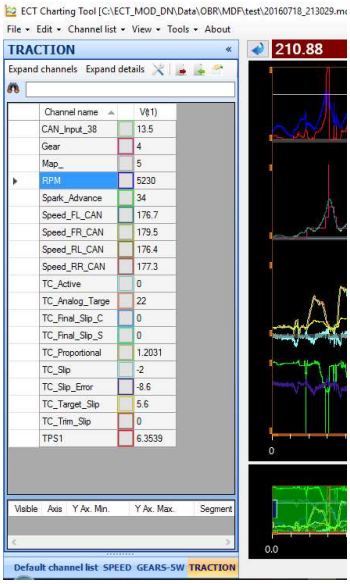


The height of each display segment can be adjusted to suit personal preferences.
Place the cursor on the segment's bottom line, it will turn to fat grey.
Click your left mouse button and mode the line up or down.





12.5 Channel List

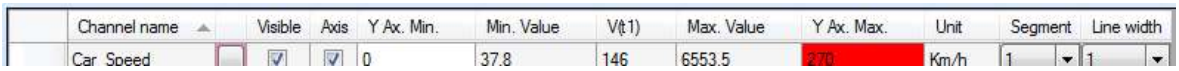


To the left of the strip chart graphic data window you have the channel list. This list displays either all channels loaded with the data file if you click “Expand channels” or, if you click “Compact channels” only the channels open in the data window.

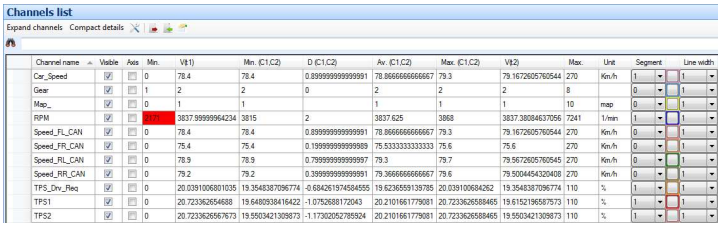
- Click **Channel Name** to sort channels alphabetically.
- Tick or untick the box marked **Visible** to add or remove channels.
- Tick or untick the box marked **Axis** to add or remove the channel scaling on the Y-axis.
- **Y Ax. Min.** shows the display’s minimum value of the particular channel.
- **Min Value** shows the data channels global minimum value.
- **V(t)** shows the channel data at the cursor position.
- **Max Value** shows the data channels global maximum value.
- **Y Ax. Max.** shows the display’s maximum value of the particular channel.
- **Unit** shows the unit of the data channel, for example bar, degrees, RPM.
- Using **Segments** you can assign the data channel to 1 of 5 available display segments.
- In **Line width** you select the thickness of the data graph, recommended value is “1”.
- **Format** allows you to define number of channel data decimal points.

Hoover the mouse over any channel listed in the channel list to highlight the channel in the graphic window.
You can also hoover the mouse over the data graph in the display window and the channel will be highlighted in the channel list.

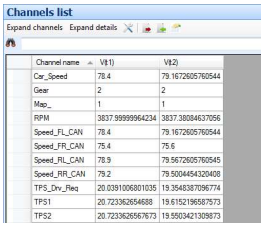
- If you double click on the minimum channel value in the channel list a cursor will be placed in that position within the full run. Using the zoom function you can view the data in detail.
- If you double click on the maximum channel value in the channel list a cursor will be placed in that position within the full run. Using the zoom function you can view the data in detail.



Click on the icon  to define which channels shall be visible in the channel list.

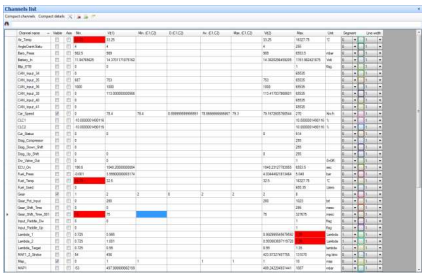


Typical full channel list for a user configured display having 2 cursors.

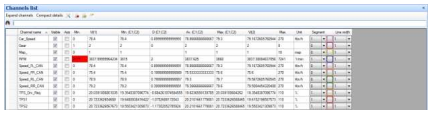


Click on **Compact Details** to reduce the channel list to display the data channel values at cursor positions only.

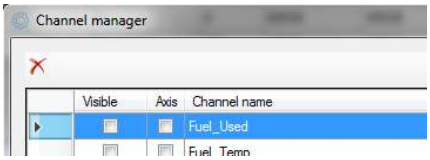
A full channel list could look like this:



Click on **Compact Channels** to show only channels active in the open graphic window.

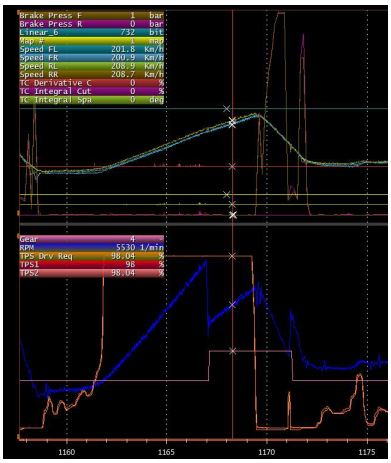


Click on **Channels Manager** to open a window displaying all channels loaded with the current data file.



If you want to unload a data channel click on the cell to the left of the channel name and then click on the red cross.

You can also use a math function to load a calculated data file.
Select a base file for use with the math function.
Key in a name for the new data channel, select which segment to add it into and also select its colour.
Click in **Use selected channel** to proceed.
Select the math function, click on **D** to add a decimal number or click on another file name.
Click **Add channel** when done.



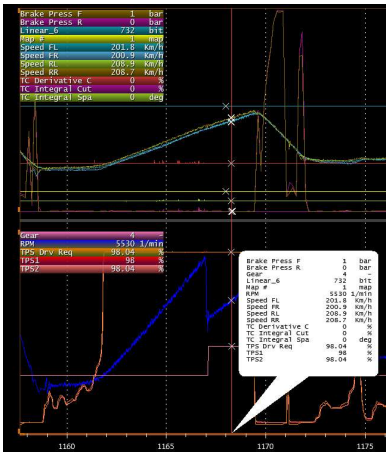
12.6 Cursor

You can place a cursor anywhere in the display window.
Simply double click on the desired position to place the cursor.

You can adjust the width of the cursor by clicking on **View**, then **Cursors** and finally **Cursor line width**.

Column V(t1) in the channel list now shows the data the value of individual channels at the cursor position is shown.

The measuring points are marked with an **x** where the lines are crossing.



You can open a window displaying channel values for all channels displayed in the display window.
Click on Tools in the main menu, and then click on **Show the values related to the current cursor on the chart background**.
Data will be shown in the upper left hand corner of the data window.

Displaying channel data can also be linked directly to the cursor position, shown in a separate window.
Click on Tools in the main menu, and then click on **Show the values related to the current cursor in a balloon**.

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Using your mouse you can grab the cursor and move it to any position. Place your mouse pointer over the cursor, it will change to show arrows, now click and hold the left mouse button while dragging the cursor.
Using the left arrow key (**<-**) and the right hand arrow key (**->**) you can move the cursor in steps of 5 ms.

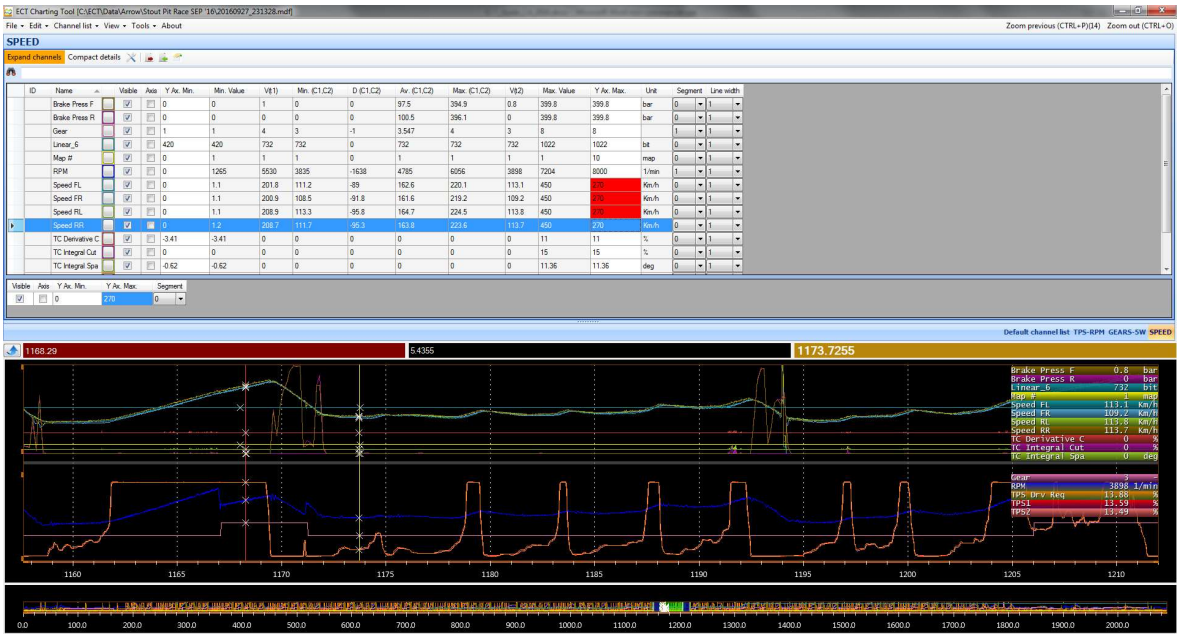
Using the scroll wheel on your mouse you can zoom in and zoom out centred around the cursor position. While dragging the cursor you can monitor the channel values change in window V(t1).

The overview window at the bottom of your monitor will show the full log while the sections above shows any level, zoomed in or zoomed out. The part of the logged data analysed is shown as a green area in the overview window.

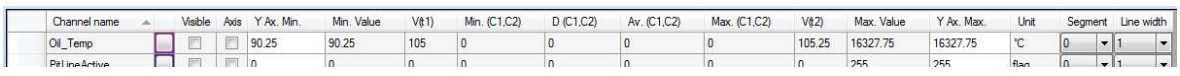
- **CTRL+O** is a hot key to zoom out to show the complete run.
- **CTRL+P** is a hot key for zoom out in steps to finally show the complete run.
- **CTRL+R** bring up a 2nd cursor, placing it close to the primary cursor.

12.7 Two Cursors

It is possible to load a 2nd cursor. With this feature you can for example measure times between events and it displays mean values of the data channels between the two cursors.



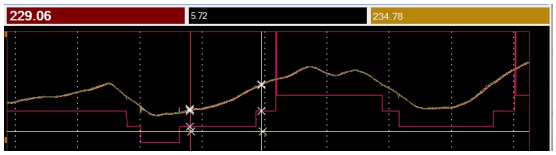
Click **CTRL+R** to add a second cursor on you display.
With 2 cursors in a display you can measure time between events and you can quickly evaluate data channel values between the two cursors:



Channel name	Visible	Axis	Y Ax. Min.	Min. Value	V(t1)	Min. (C1,C2)	D (C1,C2)	Av. (C1,C2)	Max. (C1,C2)	V(t2)	Max. Value	Y Ax. Max.	Unit	Segment	Line width
Oil_Temp			90.25	90.25	105	0	0	0	0	105.25	16327.75	16327.75	°C	0	1
PitLineActive			0	0	0	0	0	0	0	0	255	255	flag	0	1

Additional columns are now displayed in the channel list:

- **D (C1,C2)** shows the difference between channel values at cursor 1 and cursor 2 positions.
- **Av (C1,C2)** shows the average channel value between cursor 1 and cursor 2 positions.
- **Max (C1,C2)** shows the maximum channel value found between cursor 1 and cursor 2 positions.
- **V(t2)** shows the channel data at cursor 2 position.

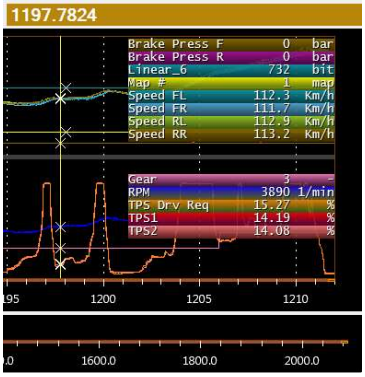


The time measured since start recording data and to the position of cursor 1 is shown in the left window above the graphic display.

The time measured since start recording data and to the position of cursor 2 is shown in the right window above the graphic display.

The time difference between the positions of cursor 1 and cursor 2 are shown in the middle window above the graphic display.

By clicking on either of these windows you can change which cursor is the active one.
If you have activated the display of channel data values the data for cursor 1 position will be shown on the left side of the display when you move the cursor.



The data for cursor 2 position will be shown on the right side of the display when you move the cursor.

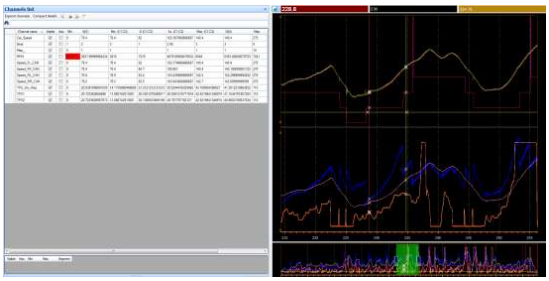
12.8 Zoom In / Zoom Out

There are two ways you can zoom in on data for a closer analysis of events.

You can draw a rectangle by click and hold the left mouse button and move the mouse from left to right. Let go of the mouse button when the desired area is marked and the display zooms into the desired area.
Click **CTRL+P** to return to the previous level in steps or press **CTRL+O** to the initial view.

Another way is by using the cursor position and the scroll wheel on your mouse.
Double click on the display to place your cursor in a desired position.
Now use the scroll wheel on your mouse to zoom in, centred on the cursor.

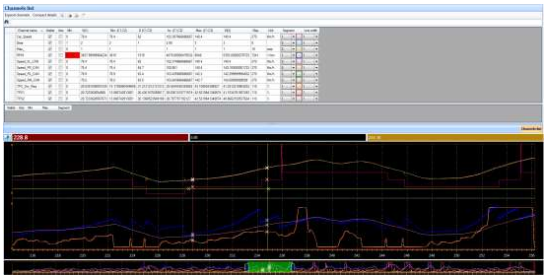
12.9 Display Orientation



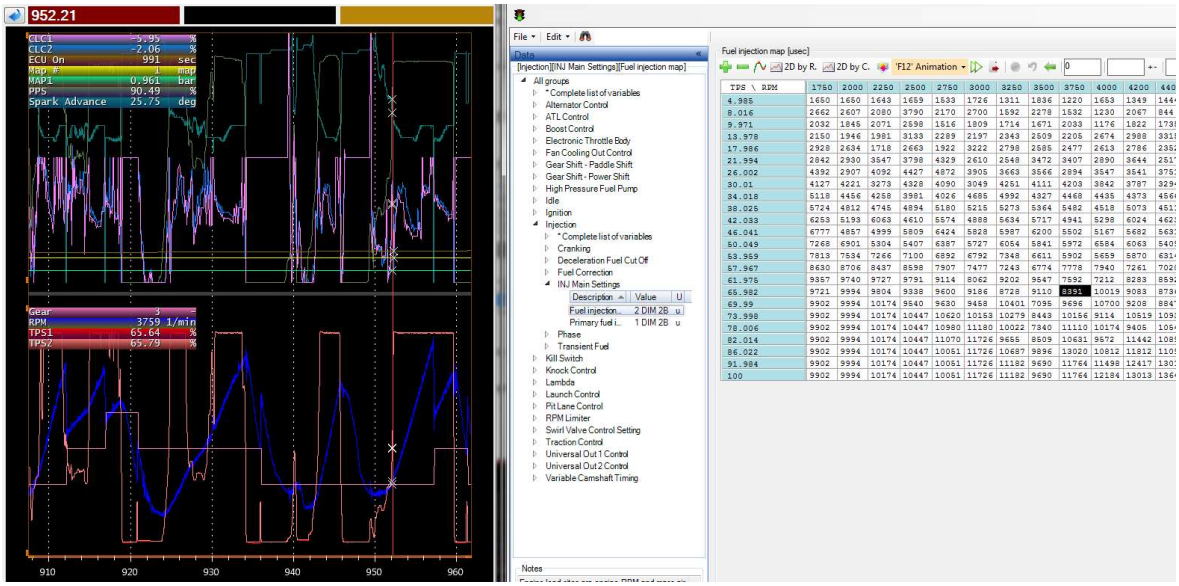
You can change your display layout orientation:

Click on the icon  in the upper left hand corner of the graphic display to change the layout to:

Click on the icon  to return to the first orientation.



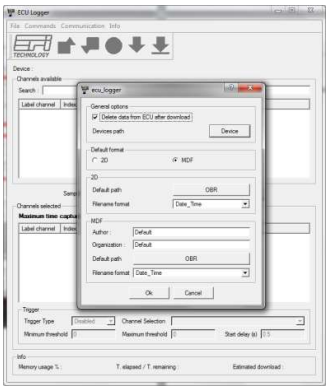
12.10 Link analysis display with engine map



You can link the logged data with the actual speed and load position within the engine calibration. The logged data has to contain a data channel with the same name as the X-axis in the engine map, for example RPM.
This way you can follow the settings with for example the base fuel map, the boost map and the spark advance base map.
To link the data simply open the logged data file, then open the tool Calibration.
Open the engine calibration which generated the data log file.
Select the base map, shown here as the fuel map, and note the black cursor indicating the location of the data cursor in the data display.

13 ECU Logger

Most of the ECUs have a built-in data recording module. If you have installed the EFI data logger tool you can access the logger tools.



13.1 Initial Setup

First time you start the logger tool, click on **File** and then **Options**.

Tick the box to clear the logger after downloading data.

Next define the path to ECU databases, it is recommended to select the main Device folder.

Select whether you prefer to download logged data in a format for use with 2D's WinaRace data analysis tool or in a standard MDF format. You can use the Charting Tool for analysing MDF data files.

Select you preferred path for data downloads. You can use different paths for 2D as for MDF files.

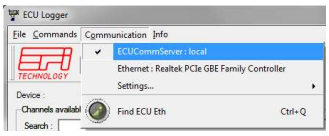
Click **OK** to confirm settings.

Now click on File again and click on **Select Device** to choose which ECU database you want to load.

13.2 Communication

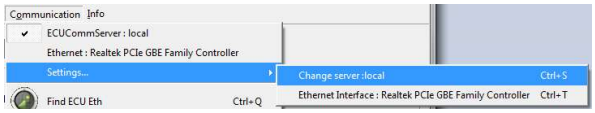
The logger tool can communicate with the ECUs either via CAN or optionally via Ethernet (if the ECU supports this protocol).

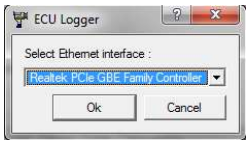
- Select **ECUCommServer : local** to use CAN communication.
- Select **Ethernet** to use Ethernet communication.



Next confirm server connection.

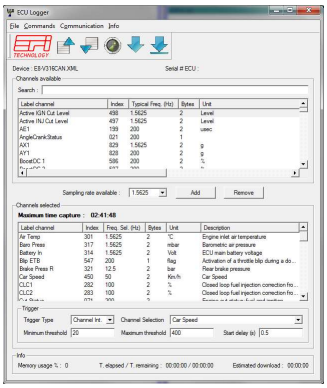
- Select Local when using CAN communication.
- Select the Ethernet interface if you use Ethernet and then confirm the controller in use in your PC.





13.3 Configuring

When you have loaded an ECU database you will see he channels available for the recorder module in the upper window, **Channels Available**.
Double click on channels in this list which you want to record. They will appear in the window below, **Channels Selected**.



Data channels can be recorded at sampling rates between 1 Hz and 200 Hz.
To change a selected sampling rate for a channel click on the channel in the Channels Selected window and use the right or left arrow key to select the preferred rate.

Activation of the logger can be controlled by several options:

- **Continuous**, ECU logging data when the ECU is switched on.
- **External switch**, the logger is activated by an external switch.
- **Internal switch**, the logger is controlled by one of the logged channels.

Typical data channels used for activating the logger are car speed and engine RPM. Select the threshold for activating the logger.
If you have chosen to use the engine RPM as a trigger it is recommended to have the activation threshold above the engines idle speed.
You can set a high threshold for stopping the data recording. If you want to record data with no upper limit then it is recommended to set engine RPM or car speed well above what will be achieved.

In **Start Delay** you can key in a delay for activating or deactivating the recording when the lower threshold is reached.

Click on **File** and then **Save Configuration** to save the logger configuration file to disk.

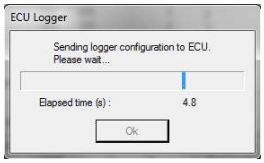
13.4 Update Logger – Download Data

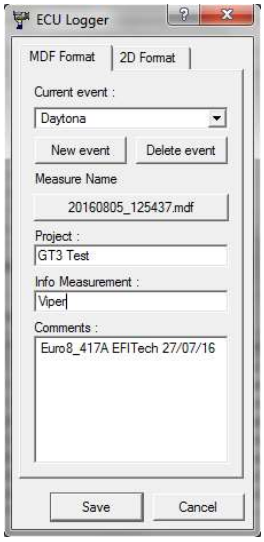
Upload logger configuration, this takes a few seconds.
This process clears the logger memory.

Download logger configuration

Download logged data, click icon when you have connected to the ECU

Download logged data as soon as tool finds ECU connected





When the download has finished you will be prompted to add comments about the recording.
Click OK when done editing.

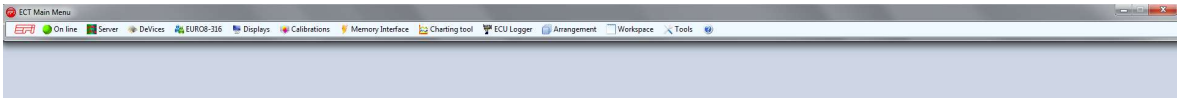
If you have chosen NOT to clear the logger memory when configuring the system, you will now be asked if you want the data cleared.

If you have chosen to delete data automatically, the ECU will clear the memory. In this process the ECU clears the memory and will start recording new data when done if the start conditions are met.

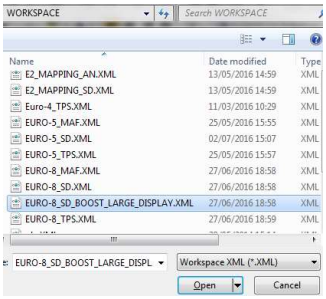
14 Workspace

Once you have created your preferred layout of the tool, combining for example displays and editor, you can save your current layout as a workspace.
This way you can load your preferred layout with a few clicks with your mouse.

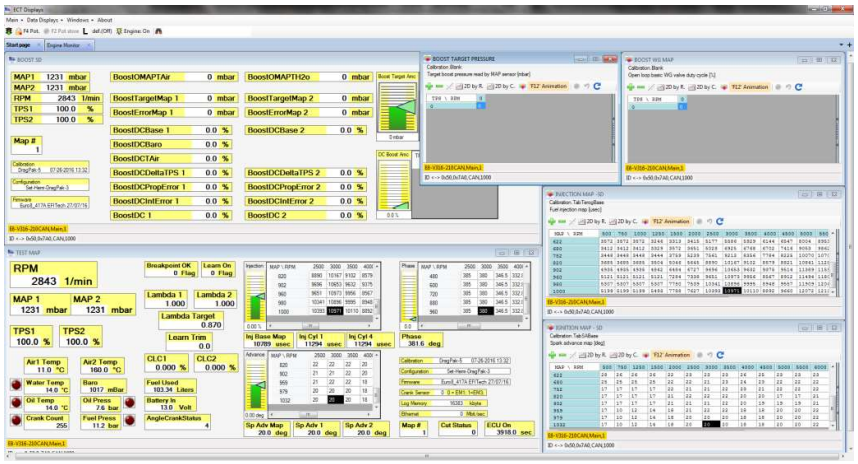
As an example, you start with this layout:



Now click on **Workspace** in the main menu, click on **Load Workspace** and select one of your layouts.



Now click on Open and your display could for example look like this:



or