MD35 Manual V4.19

Kronenburg Management Systems

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Kronenburg Management Systems

1 KMS (Kronenburg Management Systems)

Kronenburg Management Systems (KMS) is a complete line of programmable engine control units (ECU), that offers you an extremely reliable and user-friendly system at a very competitive price. It gives you the possibility to manage all turbo and naturally aspirated Otto engines (engines in which the fuel mix is ignited via a spark plug) up to 12 cylinders.

An engine control unit is a type of electronic control unit that determines the amount of fuel, ignition timing and their parameters which are needed to keep an internal combustion engine running. It does this by reading values from multidimensional maps which contain values calculated by sensor devices monitoring the engine.

The programmable KMS ECU doesn't not have a fixed behaviour, but can be (re)programmed by the user. Programmable ECU's are required when a significant modification has been made to a vehicle's engine. For example adding a turbocharger, changing the camshaft profile or a conversion to an alternative fuel. In these situations, a programmable KMS ECU can be wired in. The KMS ECU's can be programmed/mapped with a computer connected using a serial or USB cable, while the engine is running.

The programmable ECU controls the amount of fuel to be injected and the ignition moment for each cylinder. This varies depending on the engine's RPM and the position of the throttle valve and/or the Manifold Absolute Pressure (MAP). This can be adjusted by bringing up a spreadsheet page on the screen where each cell represents an intersection between a specific RPM value and a throttle position. In this cell a value corresponding to the amount of fuel injected can be entered. This spreadsheet is referred to as a fuel table or fuel map. The same way the ignition spreadsheet can be setup.

By modifying these values while monitoring the exhaust gas composition (best way is using a wide band lambda sensor) you can see if the engine runs rich or lean. This way you can find the optimal amount of fuel and optimal ignition moment needed for all possible combinations of RPM and throttle position/manifold absolute pressure. This process can be best carried out at a dynamometer, giving a controlled environment (without influence from outside) to work in. An engine or chassis dynamometer gives a more precise calibration for your (racing) applications.

The KMS MD35 ECU offers a complete self learning air fuel ratio control (lambda control) for most common types of oxygen sensors (broadband/narrow band). In addition to lambda control, this management system also provides the following functions: load-dependent boost pressure control, water injection control, (variable) launch control, power-shifting, (variable) A.L.S., staged/banked injection, mapselector, odd fire, idle control, rpm limiters, engine diagnostics, 4mb datalogging, etc.

This management system can be used as an independent injection/ignition system for virtually all types of Otto engine, but can also be used in combination with a standard engine management system. It can take over the standard injection/ignition at any desired engine speed, boost pressure or throttle valve position. Precise ignition and air/fuel mixture control leads to excellent drive-ability and low fuel consumption.

We advice to read the manual complete before starting. The set-up of the system software is kept as clear and simple as possible, so that even people with little computer experience will be able to use this system. Working with the software is simple, but if the settings are incorrectly configured,

there is a serious risk of engine damage. In this manual there are warning signs ⚠ and notes that need your extra attention to bring this setup to a good end. We recommend you leave the programming to specialists.

WARNING:

Disconnect the battery cables when you're doing electrical work.

Disconnect the KMS ECU from the wiring harness connector when welding on the vehicle.

Make sure there are no fluid leaks and all connections are secured and/or tightened.

Wiring and fuel system components must be mounted away from heat sources or shielded if necessary.

Do not use a batterybooster or a 24V charger. Do not reverse the polarity of the battery or the charging unit. Do not change the battery with the engine running. The peak power supply could severely damage the KMS ECU and other electrical devices.

Avoid open sparks and flames near flammable substances.

Do not use unsuppressed spark plugs and leads. They cause electromagnetic interference.

2 Software installation

The software is supplied together with the system, on a CD-ROM. Installing the software is very easy. The CD-ROM carries the KMS installation program, which launches automatically when the CD is inserted.

The program **KMS FIRMWARE DOWNLOADER** can be used to update the ECU. When there are new options available, they can be downloaded as a zip file from the Van Kronenburg website. The zip file consists of 3 files and a 'readme' text file, see figure below.
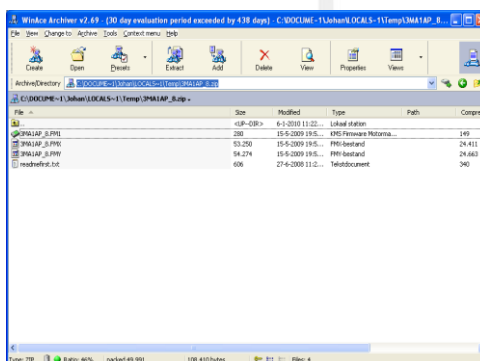
Unpack the zip file on your computer in the KMS Firmware downloader folder. This is the location where you installed the Firmware downloader, see example below.
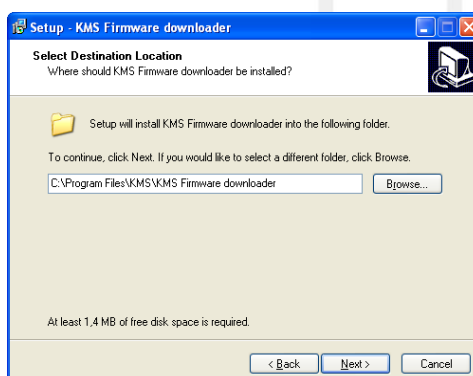
With the firmware downloader this update file can be sent to the ECU (only 1 of the 3 files is visible with the firmware downloader, (see figure below).
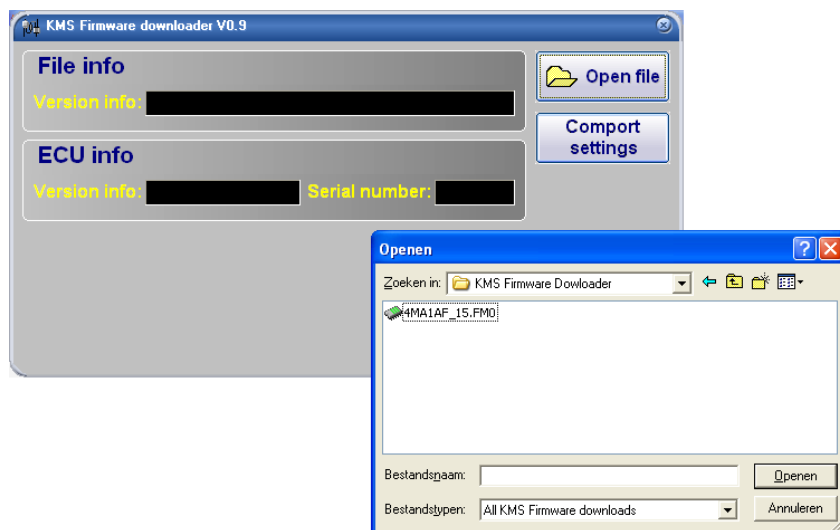
The MD35 update file starts with the number 4 and also has extension *.FM1.

Once installed, the program is set to work via communication port COM1. If this port is already being used or not available, another communication port can be used. For the procedure to change the communication port, see 3.2.4.1.17 Communication port.

(USB connections have the most various numbers of communication ports, so make sure you've got the communication port right. For settings and finding the right communication port check paragraph 3.2.4.1.17 Communication port)

3 KMS software

When the program is started, the main screen will appear, which is composed of three parts:

- ➢ The main screen
- ➢ The function bar
- ➢ The communication bar

The following sections describe the possibilities and functions of the system.

3.1 The main screen

The main screen consists of two spreadsheets (ignition and injection) of which only one is visible at a time. To toggle between the diagrams use function key F11.
The spreadsheets are two-dimensional diagrams showing engine speed against engine load.
The engine speed range can stretch from 500 rpm to 20.000 rpm. Standard the screen stretches from 500 rpm to 12.500 rpm. This however can be changed (see 3.2.4.1.1 RPM pickup). The RPM range is divided over 25 boxes.
The engine load range is sub-divided into 16 boxes dividing the range that has been set for the engine load sensor.
The rows and columns are shown in graphs (in the form of bar charts), when the left mouse button is clicked on an engine speed or a load value. For further information, see section 4. Programming.
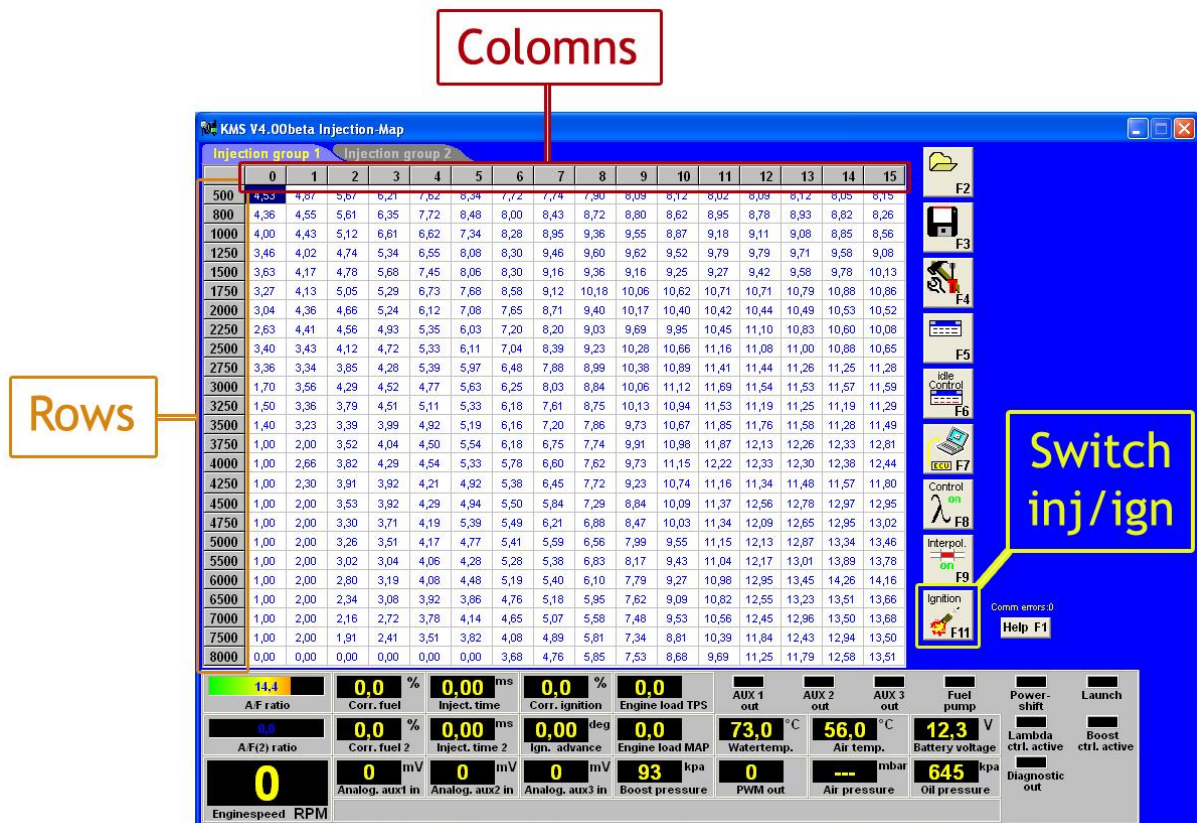
3.1.1 The injection characteristic diagram

In the injection characteristic diagram, figures can be entered that indicate the injector opening time per injection in ms. This means that at any engine speed and any engine load, the desired quantity of fuel can be injected.
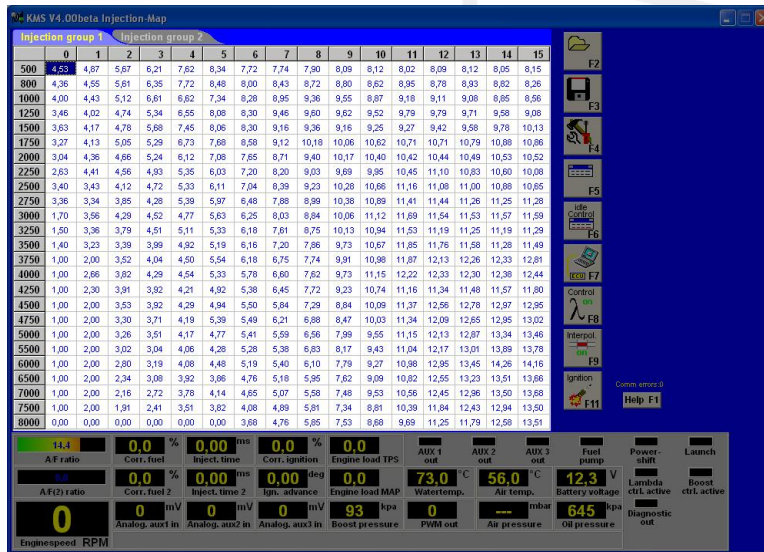
You can switch between injector groups (when activated, see section 3.2.4.1.4 Injection settings) by clicking on the buttons that are marked in the drawing below. These groups can be set for different kind of injector banks. For more settings look at the hardware configuration and the injection settings (see 3.2.4.1.7 Hardware configuration and 3.2.4.1.4 Injection settings).

3.1.2 The ignition characteristic diagram

In the ignition spreadsheet, figures can be entered that indicate the ignition advance (in crankshaft degrees before TDC). This means that for any engine speed and any engine load, the desired ignition moment can be entered.
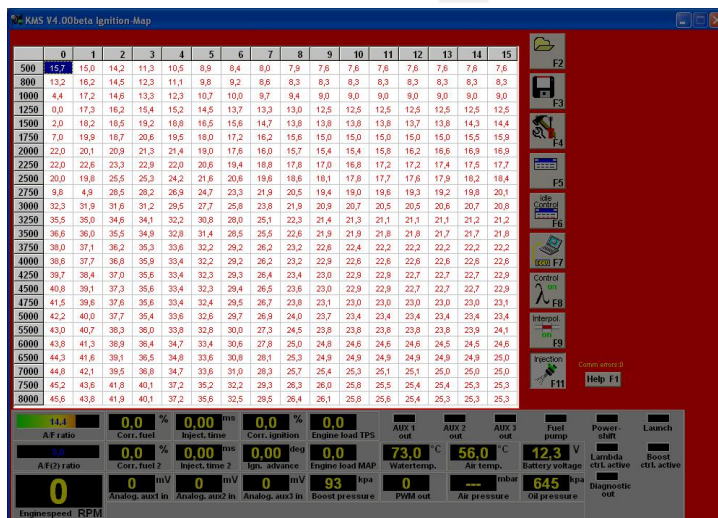
3.2 The function bar

The vertical bar on the right-hand side of the screen shows several function keys, which can be activated using the mouse arrow or the relevant function keys on the keyboard. An explanation on the different function keys is given in the following sections.

3.2.1 Function key F1

This function key gives access to the manual in Acrobat reader. Acrobat reader 3.0 or higher is required. Acrobat reader 4.0 can be found on the installation CD-ROM.

3.2.2 Function key F2

This function key enables a previously saved file to be opened from the hard disk, CD-ROM, USB

memory key, etc. The files can be recognised by a floppy   icon
MD35 files have the extension *.M04

3.2.3 Function key F3

This function key is used to save modified files.
The names of these files automatically receive the extension.
MD35 files have the extension *.M04

3.2.4 Function key F4

When this function key is activated, a menu will appear on the screen, which gives the option of several settings and tests.
The options will be explained in the following sections.

Version info: 4MA1AI1AC   Serial number: 000000
Options
Output Test
Cranksensor Test
Motor + system diagnostics
Change User Access level
CAN settings
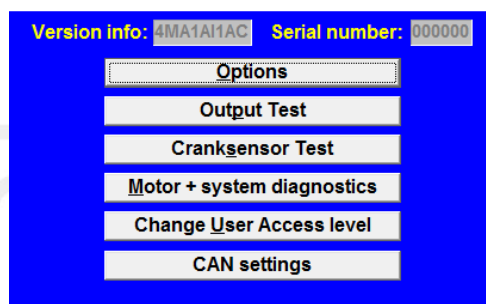
3.2.4.1 Options

If 'Options' is selected, a menu appears which lists several possible settings. These settings are described below.
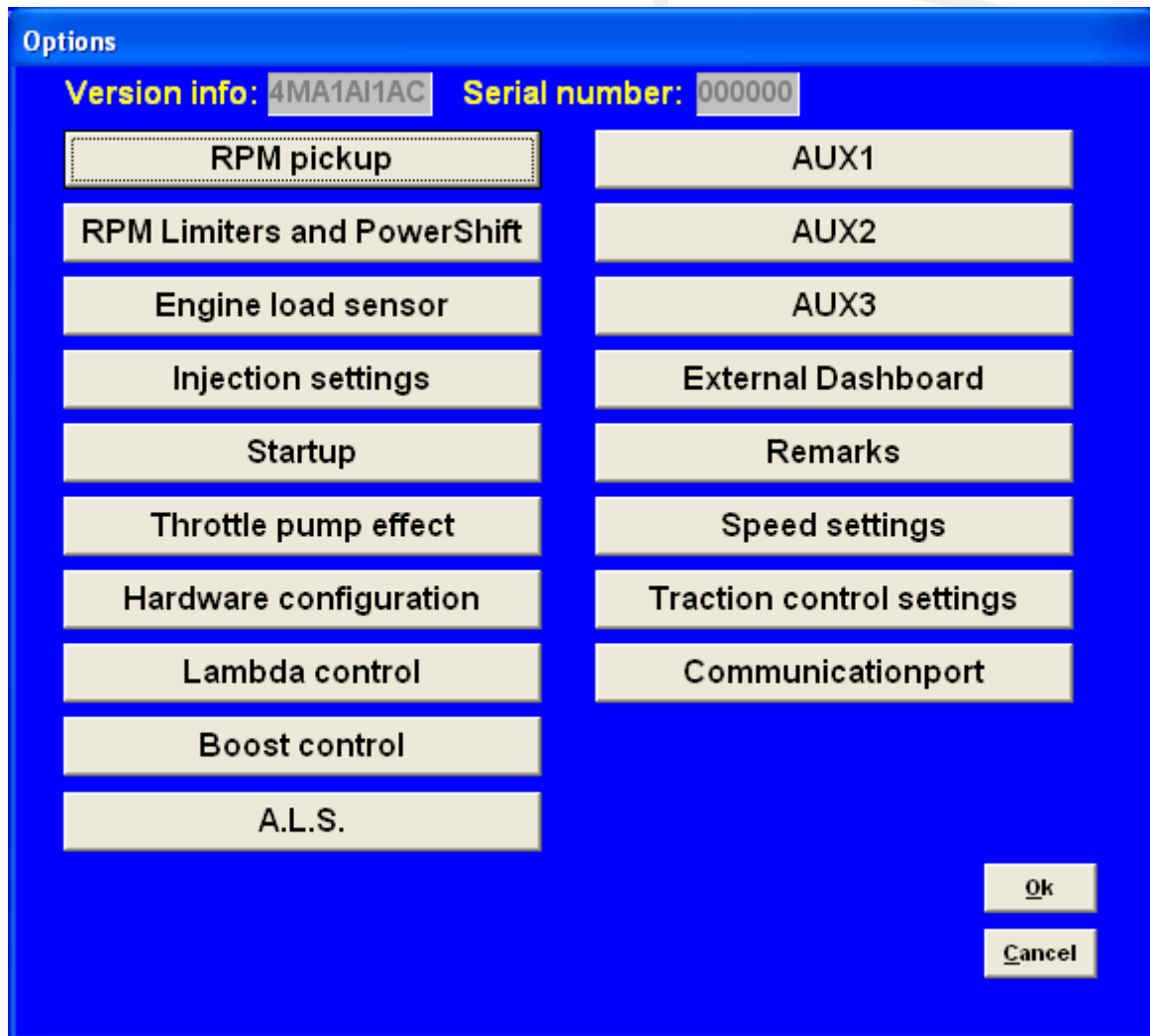
3.2.4.1.1 RPM pickup

In this menu, the settings for the RPM pickup signal, the type of ignition and the number of cylinders can be entered.
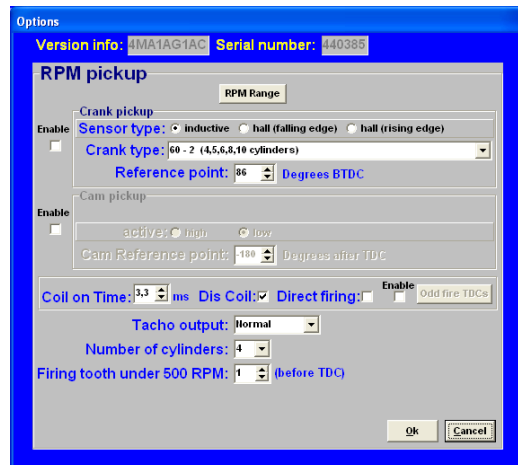
RPM Range:

By clicking on the function you can set the rpm range for the main parameter maps (minimum rpm is 500 and maximum is 20.000).
Standard the 25 rows are divided over a rpm range 12.500 rpm (example see left figure below). If your engine doesn't make more than 6.500 rpm, you can devide the 25 rows over this 6.500 rpm (example see right figure below). So the mapping will be more fine tuned for this engine rpm range.
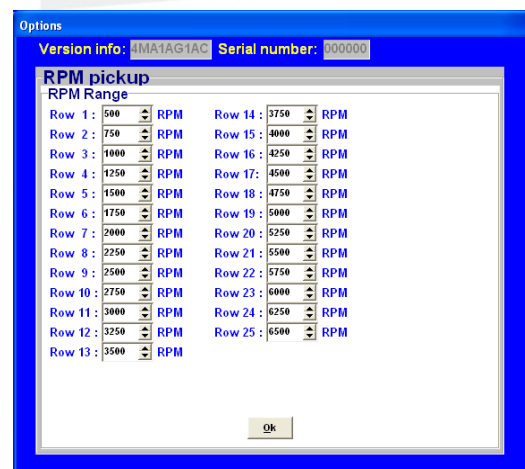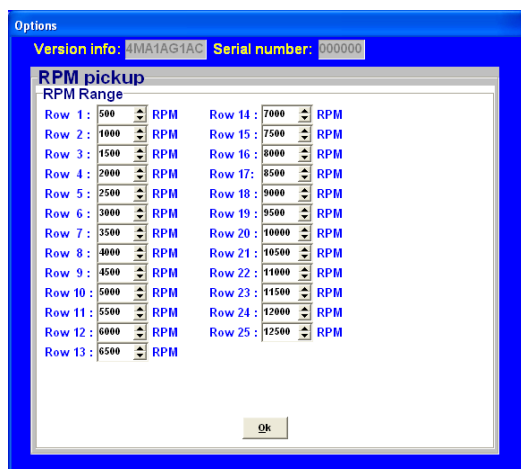
3.2.4.1.1.1 Crank pickup

Users can enable the crank pickup and set the references.

Sensor type:

Here you can select if your connected sensor is hall or inductive.
Hall sensor: a current runs through a thin Hall-plate. When this plate is undergoing a magnetic field a voltage arises between the two sides of the plate. When a tooth passes the plate the magnetic field changes.

Inductive sensor: consists of coil around constantly magnet. The change in magnetic field generates a current in the coil. When a tooth passes the coil with magnetic core the magnetic field changes. When a tooth is approaching the signal gets stronger. When a tooth is passed the signal gets weaker. Difference is the Hall sensor generates a Voltage and the inductive sensor generates a current.

TIP: Measure the resistance between two pins by using a multimeter. When sensor is inductive the resistance should be between 0.5kΩ and 2 kΩ. When the sensor uses a 3 pole connecter there should also be the resistance of 0.5kΩ – 2 kΩ between two pins. The remaining pin is the shield of the sensor cable. If resistance is not measurable the sensor will be likely a Hall effect sensor.

Warning:

Do not use unsuppressed spark plugs and leads. They can cause electromagnetic interference.

Crank-type:

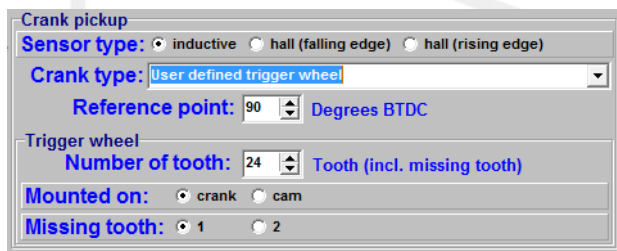The rpm signal has to be delivered by an hall/inductive sensor using a rotating trigger pattern. The individual pattern types are listed under the pulldown menu, possible combinations are listed in this table. Some trigger patterns are shown in Appendix 1: Trigger pattern drawings.

It's also possible to configure your own trigger pattern when choosing the 'User defined trigger wheel'. You can specify the number of tooth of the triggerwheel. This number must be an equal number and must lie between 24 and 72 tooth. You can also choose to mount the trigger wheel on the crank- or camshaft and choose to make the reference point 1 or 2 missing tooth.
Note: It's still only possible to use **one reference point**.

When using the 'User defined trigger wheel', the number of coils (ignition outputs used on the MD35) and odd fire TDC's (see chapter 3.2.4.1.1.3) must be defined.

Note: When using a 60-2 trigger pattern the maximum engine speed is limited to 12.500 rpm.

When using a Hall-sensor, it is nescessary to use a convertor that will change the Hall-signal into an inductive signal (exception below). The convertor has KMS partnummer 01-01-07-0333.

A Hall-sensor crank pickup can be used directly without convertor on the cam pickup signal input pin 34 (see section cam pickup below). 'Direct fire' is disabled because a cam signal is needed and there is only cam signal input which is used by the hall sensor. To keep direct fire enabled together with a Hall-sensor crank pickup, it is nescessary to use a convertor that will change the Hall-signal into an inductive signal. The convertor has KMS partnummer 01-01-07-0333.

Reference point:

The reference point (the position of the piston at the moment the first tooth after the missing tooth/teeth passes the sensor) of the crank pickup sensor can be set between 0 and 180 degrees before TDC (for most engines recommended between 70 - 120degrees). The position of the reference point in the software must be checked. Mark the TDC on the crankshaft pulley or flywheel. Check with a timing light the degrees when igniting on cylinder 1 in TDC with a static engine speed. If the ignition advance set in the software deviates from the measurement with the timing light, than you have to correct the reference point in the software.

TIP: set for the complete rpm-range the ignition advance map to 10 degrees. The ignition advance read out on the software screen will be stable and doesn't change when your engine speed varies a bit.

For example your reference point set in the software is 90 degrees. The ignition advance 10 degrees at 1000 rpm. Checking with the timing light on cylinder 1 gives you 5 degrees ignition advance. That's a deviation of 5 degrees which must be corrected on the reference point. The correct reference point is 90 – 5 = 85 degrees.

Warning:

When using wasted spark, the read out on the timing light must be divided by 2. A timing light displaying 20 degrees advance with wasted spark is in reality 10 degrees ignition advance.

3.2.4.1.1.2 Cam pickup

You can enable cam pickup for recognizing the compression stroke for direct fire.

Active:

The cam reference can be set between -180 and +180 degrees TDC of the compression stroke. Select the kind of pickup signal, high or low. There is a easy way to find out whether the signal is high or low. Just apply power to the KMS system (engine not running) with the cam sensor connected. Right below in the main screen in the communication bar of the KMS software you can find 'Cam valid'. When the cam sensor signal is 'high' at the degrees after TDC (set at the cam reference point) of the compression stroke the cam valid control light in the communication bar lights (see figure below). 360 crank degrees later the signal must be low. If the sensor signal is 'low' in TDC of the compression stroke the cam valid control light doesn't light up. 360 crank degrees later the signal must be high.
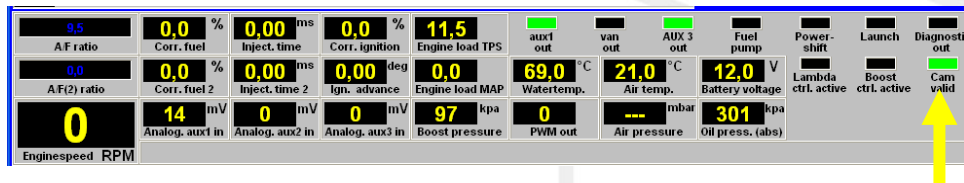
The cam reference must be set in a way that the cam signal in the compression stroke is always the opposite signal of the exhaust stroke. In the figure below an example of 2 cam patterns is shown.
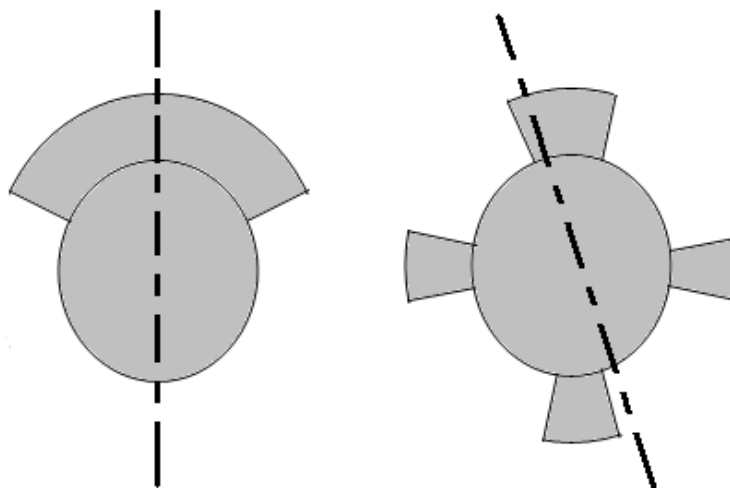
Important is that the cam reference point is not set on the edge of the (missing) tooth, but as far as possible in the centre of the (missing) tooth. With the pattern on the right in the figure above, it's impossible to set the cam reference point in the middle of the tooth. When the sensor is positioned in the middle, 360 crank degrees later, the signal will be the same. The top tooth is wider than the bottom tooth. The cam reference should be set in the middle of this extra width.

3.2.4.1.1.3 Coil on time

A coil should be charged before every discharge (plug spark). The coil charging time is indicated in ms. It should normally be 1.4 to 3.5 ms depending on the type of coil. Longer coil charging leads to unnecessarily high power consumption and heat development, shortening the service life of the coil.

Warning:

The coils can only be operated via a driver circuit. If the computer is connected to the coil directly, the ECU can get damaged beyond repair. Many modern coils feature a built-in driver stage. However, if a coil without an integrated driver stage is used, the separate KMS ignition driver module with partnumber 01-01-04-0001 will be needed.

Dis-coil:

The choice is between dis-coil (wasted spark) and single coil control (rotor and distributor cap). If you have a dis-coil (and also when using coil per plug wasted spark) the box has to be ticked.

Direct-firing:

This option detects the compression stroke which enables you to ignite directly on one cylinder at a time (you have to connect the cam sensor to make this work). With dis-coil it is a wasted spark. Separate coils per cylinder is requiered for this sequential ignition. Make sure that the connections of the KMS ECU to the single coils are in the right igniting order. For example a 4 cylinder inline engine with firing order 1-3-4-2. The coil outputs get activated in the order 1-2-3-4. For direct-firing coil output 1 fires cylinder 1, coil output 2 fires cylinder 3, coil output 3 fires cylinder 4 and coil output 4 cylinder 2.

Odd fire TDCs:

You can advance/retard the ignition time for every cylinder. This can be useful at assymetrical engines.
You have to fill in the angles of different cyliders. The degrees must be ascending with a maximum of 360 degrees. How to determine the odd fire TDC's for a V6:
First check what the engine firing order is. The cylinder that is in TDC and where the reference point is set to is 0 degrees. Devide the number of cylinders in the right firing order evenly over 720 degrees (= 2 rotations for 4 stroke). The cylinders on the same crankpin but later in the firing order and different bank have to be corrected for the angle of the block. So the degree for these cylinders isn't on the degree calculated before when deviding 720 dregrees through all cylinders but the angle of the block. The degree for the second cylinder on the same crankpin is the sum of the degrees from the first cylinder on the same crankpin and the angle of the block.
In the software you can fill in a maximum of 360 degrees after TDC so you have to subtract 360 degrees from the cylinders which have higher degrees than 360 (this is needed in case of a camsensor failure to keep the engine running on all cylinders but as a wasted spark).
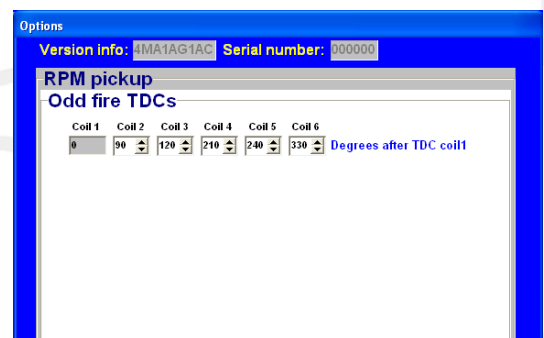
In the KMS software the degrees must be ascending. Set the degrees in the software and connect the right coil signal to each cylinder. You can find an example of the determination of odd-firing degrees on the following page.

Example:
6 cylinder 90 degree 4-stroke V-engine with firing order 1-4-3-6-2-5 and reference point on cylinder 1. Bank 1 is cylinder 1, 2, 3. Bank 2 cylinder 4, 5, 6.
When the 6 cylinders are evenly devided over 2 rotations (720 degrees) you get 120 degrees between the cylinders.

Cyl. 1	Cyl. 4	Cyl. 3	Cyl. 6	Cyl. 2	Cyl. 5
0	120	120	120	120	120
0	120	240	360	480	600

There are only 3 crankpins. Each crankpin connects 2 connecting rods. With the 90 degree V-shape lay-out and only 3 crankpins, the cylinders aren't evenly devided. With cylinder 1 at 0 degree the next cylinder is 4 not at 120 degrees but on 90 degrees (same crankpin but on other bank). The following cylinder after cylinder 4 is cylinder 3. Cylinder 3 is at 240 degrees (difference cylinder 3 to 4 is 240 – 90 = 150 degrees). Cylinder 6 is on the same crankpin so only 90 degrees devided from cylinder 3 what gives 240 + 90 = 330 degrees. Cylinder 2 is at 480 degrees (difference cylinder 2 to 6 is 480 – 330 = 150 degrees). Cylinder 5 is again on the same crankpin and 90 degrees further which gives 480 + 90 = 570 degrees.

Cyl. 1	Cyl. 4	Cyl. 3	Cyl. 6	Cyl. 2	Cyl. 5
0	90	150	90	150	90
0	90	240	330	480	570

In the software you can fill in a maximum of 360 degrees after TDC cylinder1. So this would mean that cylinder 2 and 5 can't be set up. Every value above 360 you need to subtract 360 degrees. Which result for cylinder 2 in 480 – 360 = 120 degrees and cylinder 5 in 570 – 360 = 210 degrees

Cyl. 1	Cyl. 4	Cyl. 3	Cyl. 6	Cyl. 2	Cyl. 5
0	90	240	330	480	570
0	90	240	330	120	210

In the KMS software the degrees must be ascending. This would result in:

Coil 1	Coil 2	Coil 3	Coil 4	Coil 5	Coil 6
Cyl. 1	Cyl. 4	Cyl. 2	Cyl. 5	Cyl. 3	Cyl. 6
0	90	120	210	240	330

Tacho output:

The tachometer output normally sends out an output signal adapted to the engine's no. of cylinders. In case you want to use the tachometer of another engine type, you can adjust the tachometer output correspondingly.

No. of cyl.:

Select the amount of cylinders of the vehicle. You can choose between 4, 5, 6, 8 and 10 cylinders. For a 1, 2 choose 4 cylinders. For a 3 cylinder choose 6 cylinder. For equal firing V12 engine choose 6cylinder and set odd firing to 0-60-120-180-240-300 degree

Warning:

For adaption to a 6 cylinder with direct fire or a 12 cylinder configuration, ensure that the "No. of cylinders" has been specified correctly before connecting the coils. If the coils are connected with the numbers of cylinders incorrectly set, the coil via output 6 will be seriously damaged.

Firing tooth under 500 rpm:

This is for setting the number of teeth before TDC at which an ignition impulse is given (under 500 rpm). Keep this number as low as possible to prevent backfiring when the engine is started. For engines with a high compression ratio it is recommended not to set this to a number higher than 1.

3.2.4.1.2 RPM limiters and Power Shift

This menu can be used to set various RPM limiters, powershift and gearposition parameters.

3.2.4.1.2.1 Standard Limiters

The standard limiters include a soft and a hard limiter. The soft limiter stops ignition partially so that power is lost. The hard limiter switches off ignition completely.
For the KMS MD35 management system the maximum rpm limiter is 20.000 rpm *.

*: with a 60-2 crank trigger pattern the maximum engine speed is limited to 12.500 rpm.
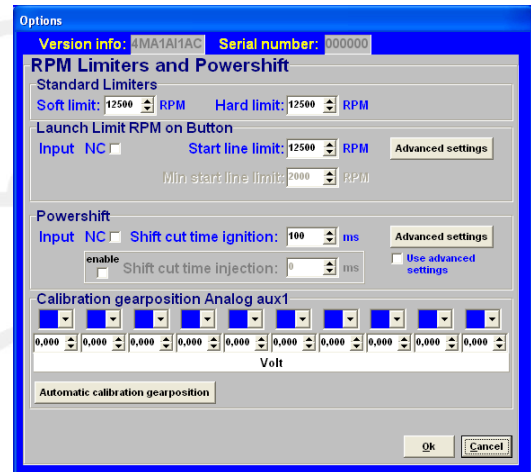
3.2.4.1.2.2 Launch Limit RPM on button

At launch limit an extra limiter ('start line') can be set which is activated, for instance, by a button that connects pin 21 to the ground. Depending on the type of button, NC (normally closed) or NO (normally open), 'Input NC' will have to be ticked or not. If the NO type is used (recommended) do not tick the box. There is also the possibility to set an extra launch limiter which makes it possible to make the launch limiter variable between these two rpm's by connecting a potentiometer signal to the analog aux2 input or analog aux3 input for the MD35, which can be configured for this function, see 3.2.4.1.7 Hardware configuration. The potentiometer must have a range between 1kΩ and 47kΩ. The 5V and ground for the potentiometer can be branched from the 5V and ground sensor supply. The signal (wiper) of the potentiometer must be connected to one of the analog inputs.

Advanced settings:

'Advanced settings' gives the possibility of setting a fixed ignition moment (between 54 degrees before and 54 degrees after TDC. After TDC is indicated by a negative number), fixed fuel enrichment and fixed PWM boost for several ascending engine speeds. This enables a high boost pressure to be built up in turbocharged engines without further increasing the engine speed. Additional fuel enrichment can be set when launch control is activated, this is needed to cool the engine. During activation lambda-control is switched off. Should the engine speed increase in spite of 'ignition retard', the startline limiter will intervene by stopping ignition. The boost pressure can also be limited during launch by setting the duty-cycle (PWM-value) of the boost control-solenoid.
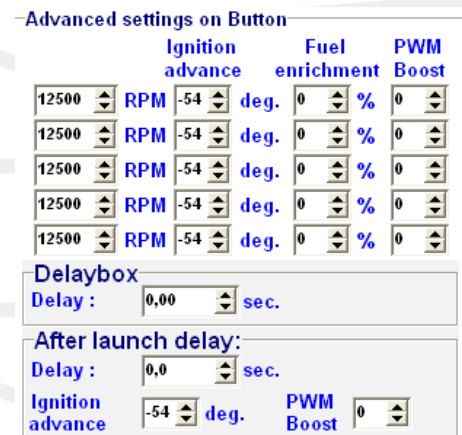
The 'Delay Box' is a special timing parameter for the launch control. The timer is activated when the launch control button is released. During the countdown of the timer, the launch control settings are still active meaning that the engine will continue the launch control limit for the entire duration of the timer. Setting the delay to 0 seconds means that the launch control limit is ended at the exact moment that the launch control button is released.

'After launch delay' will start after the launch control button has been released and the delay box timer has expired. The after launch delay enables users to set the ignition advance and boost pressure (duty-cycle/PWM value of the boost control-solenoid) for a certain time period. This means that engine power is reduced for the entire duration of the delay timer and thus better traction can be achieved in high power vehicles after launching.

3.2.4.1.2.3 Powershift

Powershift is a function that can be used for changing gear in sequential gearboxes.
A switch on the gearbox shifter enables the engine output to be briefly interrupted, so that a gear change can be made with the throttle valve fully open. This minimises the duration of gear-change. Powershift is only possible when the engine RPM is higher than 3000. The duration of the interruption can be set to a maximum of 200 ms. Depending on the type of switch, NO (recommended) or NC, the 'NC' box should be ticked. If the "use advance settings" control box is selected, the "advanced settings" menu must be set. The maximum current on the powershift input (pin 22) must not exceed 60mA. When for example the voltage is 12V, a resistor of ±1.0kΩ must be used between the signal wire to limit the current.

Advanced settings:

In the 'advanced settings' different parameters can be set for the powershift gear changes. The columns represent the transitions between the available gears. Note that a gearposition sensor must be present on the transmission housing for the use of these features. When 0 is entered in one of the cells it will not be taken into effect.
Cut time ignition: Here you can set the desired ignition cut time for each gear(change) position. The ignition will be interrupted for the time set here.
Cut time injection: You can set the desired injection cut time for each gear(change) position. The injection will be interrupted for the time set here.
Delay time: At the moment the Power-shift switch is activated, it is often desirable to have a short delay before the switch takes effect. This is because some resistance is required to build sufficient power for sequential shifting (charasteristic of sequential gearbox).
Recovery time ignition: The time set in this row is the time used to graduately increase the ignition advance to the original value in the ignition table after shifting. This will build up the engine power smoothly after powershifting putting less stress on the gearbox and driveline. (In the graph on the right, the recovery time is set to 25 ms)
Recovery ignition advance: The recovery ignition advance and recovery time are linked together. After shifting, the recovery ignition advance is the value from where the ignition advance is increased to the original value in the ignition table. (In the graph on the right, the recovery ignition advance is set to 10 deg)
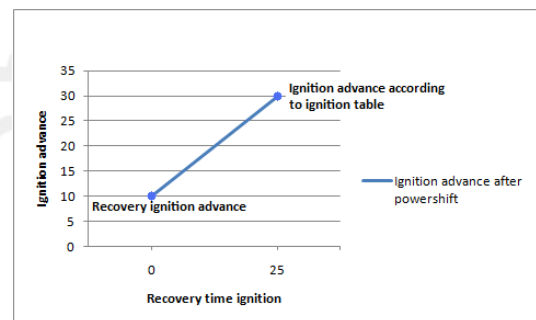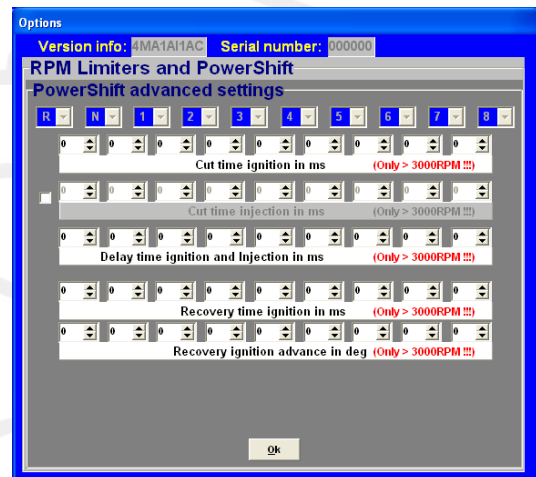
3.2.4.1.2.4   Calibration gearposition Analog aux

In this menu, you can then specify the output voltages corresponding to the various gears. The input channel for the gearposition must be set in the hardware configuration, you can choose between analog aux input 1 to 3. A gearposition sensor must be present with a voltage range between 0 and 5V. In the top row, the various gears (from reverse to 8th gear) can be selected. The second row contains the corresponding sensor output voltages to the various gears.

The gearposition sensor output voltages can be set manually or automatically. For automatic calibration of the voltages, please select 'Automatic calibration gearposition'. The software will tell the user which gear to select and to press 'ok' to calibrate the output voltage for that gear. Before using the automatic calibration, the gears (reverse to 8th gear) must be selected in the top row using the drop down menu's.

3.2.4.1.3 Engine load sensor
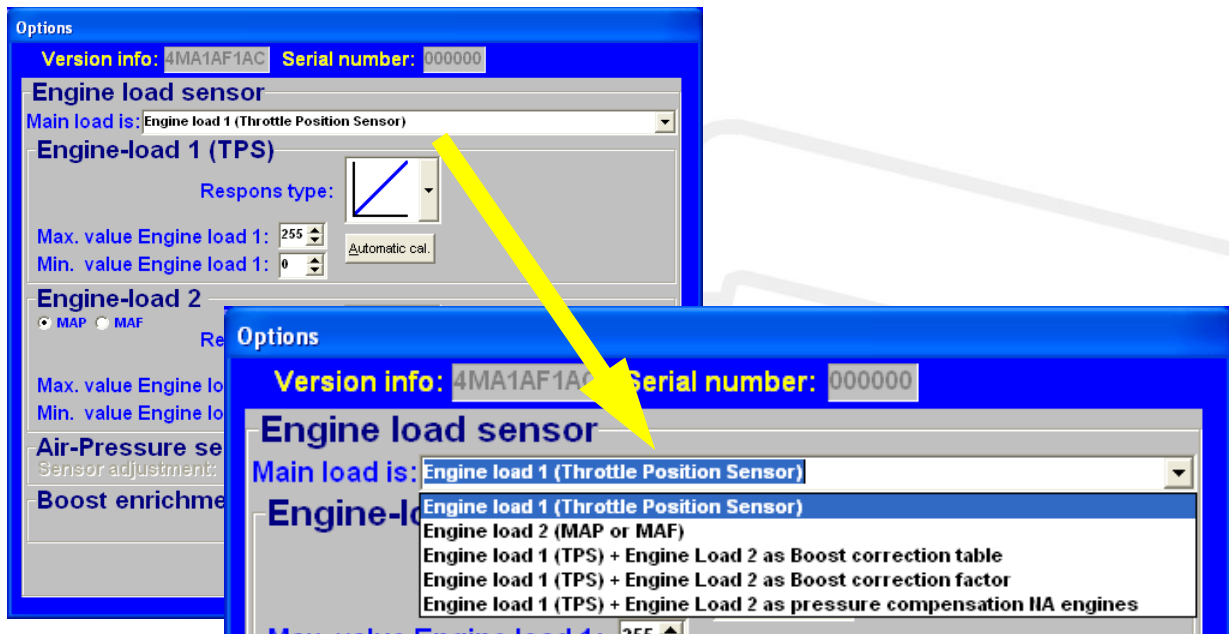
Two engine load sensors called "Engine load 1" (for TPS = throttle position sensor) and "Engine load 2" (for MAP = manifold absolute pressure sensor) can be connected. Even a MAF sensor (mass air flow meter) can be connected (not recommended). Please note that certain combinations will result in the exclusion of some options.

The use of two load sensors for most N/A and all turbo-charged engines is higly recommended.
Some settings in the software are always related to TPS and some to the MAP-sensor. However there is the possibility to select on which sensor (TPS, MAP, combination TPS/MAP) the main load tables are linked to. In the picture above you can see all the possible combinations.

The possible combinations are explained below.

➢ Main Load is : TPS

All the load tables included lambda target are linked to TPS value.
This is normally used for N/A engines with throttle bodies.

➢ Main Load is : MAP

All the load tables included lambda target are linked to MAP value.
This is normally used for turbo/supercharged engines .

➢ Main Load is: TPS + MAP as boost correction table

The ignition load table and lambda target are linked to MAP value (The ignition table for a turbocharged and supercharged engine should always be linked to MAP). The injection table however is linked to TPS and works in combination with the boost correction table to determine the main fuel injection time.
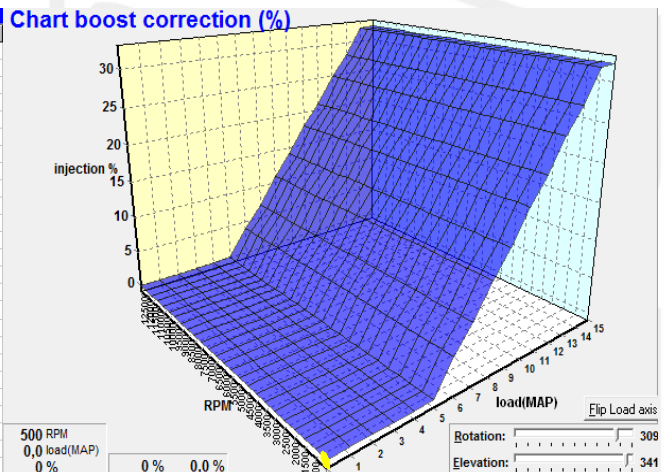
KMS V4.13 Injection-Map

Injection group 1 (TPS)		Boost correction (%) (MAP)								
3D	0	1	2	3	4	5	6	7	8	
500	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0

The values in the boost correction table stand for a correction percentage over the nominal correction ratio of 1:1. This means that if all values are 0 the fuel injection time will be calculated by the injection time set in the injection table (TPS v RPM) and corrected with 1% per 1 kPa of MAP pressure offset from 100 kPa. So if the injection time in the complete injection table is set at 10 ms and boost correction table is set on 0, the injection time increases with 10ms/100kPa. What results in a injection time of 20 ms at 200 kPa (1 bar boost) and 30 ms at 300 kPa (2 bar boost). If the engine runs on 50 kPa (0.5 bar vacuum) the injection value will be 50% of 10 ms = 5 ms.

With the boost correction table set on 25% this will result in an extra 25% enrichment. So if MAP pressure raises with 100 kPa the enrichment will not be 100% but 100 + 25 = 125% which results in an injection time of 22.5 ms at 200 kPa (1 bar boost) and 35 ms at 300 kPa (2 bar boost).

In theory an engine runs on lower loads lambda = 1.00 (A/F 14.7 on pump gas) to meet emission standards. However on higher loads it is recommended to run a richer mixture to keep the engine under the critical combustion temperature where engine damage can occur. Typically for a charged engine this would be a recommended lambda value between 0.75 - 0,85 (A/F 11.0 - 12.5). In theory this means 17.6% - 33.6% more fuel is needed. In the boost correction table you can set extra enrichment at every RPM and Map-load, see example in the figures below.

Injection group 1 (TPS)		Boost correction (%) (MAP)														
3D	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
1000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
1500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
2000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
2500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
3000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
3500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
4000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
4500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
5000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
5500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
6000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
6500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
7000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
7500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
8000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
8500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
9000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
9500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
10000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
10500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
11000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
11500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
12000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
12500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32

Chart boost correction (%)

injection %
30
25
20
15
10
5
0

RPM   load(MAP)

500 RPM
0,0 load(MAP)
0 %   0 %   0,0 %

Flip Load axis
Rotation: 309
Elevation: 341

➢ *Main Load is : TPS + MAP as boost correction factor*

The ignition load table and lambda target are linked to MAP value (the ignition table for a turbocharged and supercharged engine should always be linked to MAP). The injection table however is linked to TPS and works in combination with the boost correction factor to determine the main fuel injection time.

Boost enrichment correction factor
1,25 ⬍ (under 100kpa factor fixed at 1,00)

TPS + MAP as boost correction factor
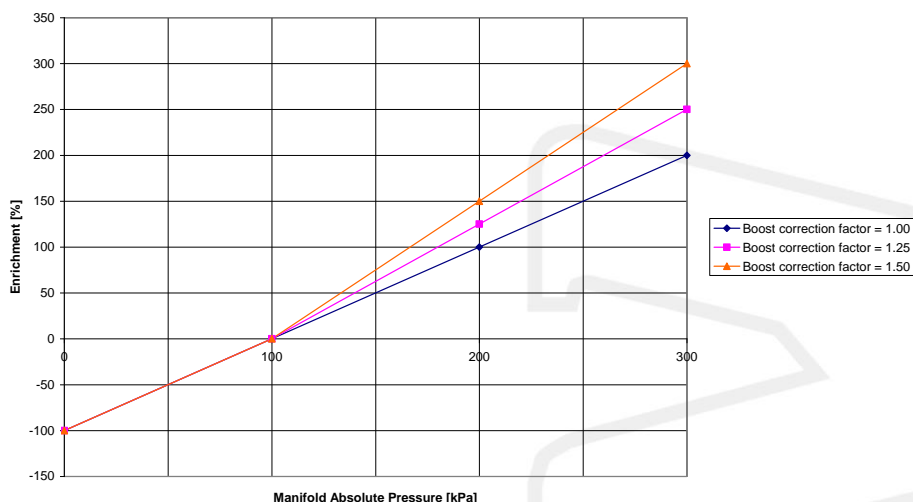
In the figure above, you can see an example of how different boost correction factors influence the enrichment percentage and injection time. So if the injection time in the complete injection table is set at 10 ms and correction factor set on 1.00 the injection time increases with 10ms/100kPa what results in a injection time of 20 ms at 200 kPa (1 bar boost) and 30 ms at 300 kPa (2 bar boost). With the correction factor set on 1.25 this is 1.25 x 10 ms = 12.5ms/100kPa and thus giving an injection time of 22,5 ms at 200 kPa (1 bar boost) and 35 ms at 300 kPa (2 bar boost). Unregarded the correction factor the negative fuel enrichment (under 100 kPa) will always be at a 1:1 ratio.
So if engine runs on 50 kPa (0,5 bar vacuum) the injection value will be 50% of 10 ms = 5 ms.

TIP: Try to start the engine with the complete fuel map at the same injection time (4 - 12 ms depending on the injector size) and the boost correction factor set on 1.25. Try to get the engine running smooth with changing the complete fuel map (all cells at once) with positive or negative percentage (using the edit menu). If lambda control is active and the engine is at normal operating temperature you can start programming (the separated cells in) the fuel map with the boost pressure (set) as low as possible. After the injection table is mapped at low boost, the next step is to raise the boost level in steps to the desired boost pressure. Check your fuel correction again. Now don't correct the injection table with this percentage but correct your boost correction factor with this percentage.

➢ *Main Load is : TPS + MAP as pressure compensation for N/A engines*

All the load tables included lambda target and correction tables are linked to TPS value. The injection tables are compensated for the manifold absolute pressure. Engines with standard manifolds often have bypasses and/or solenoids for situations when extra air is needed. This extra air isn't compensated with fuel when only linking to TPS.
The injection table (TPS v RPM) gets corrected with 1% per 1 kPa of MAP pressure offset from 100 kPa. So if the injection time in the complete injection table is set at 10 ms, the injection time decreases with 1ms/10kPa. What results in a injection time of 7.5 ms at 75 kPa. If the engine runs on 50 kPa (0.5 bar vacuum) the injection value will be 50% of 10 ms = 5 ms.
This is used for N/A engines.
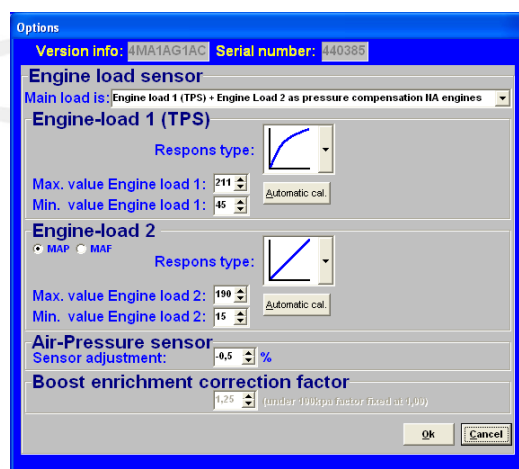
Engine load sensor calibration:

The engine load sensor connected to the system will have to be calibrated.
The range within which the sensor operates can be set here. A load sensor issues a voltage of 0 to 5V. The range is divided into 8 bits (256 steps). In practice a load sensor does not run through its full range. For this reason, the upper and lower limits must be set, so that the 16 columns in the spreadsheets can be best utilized.
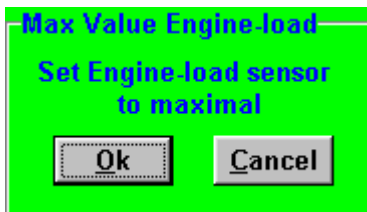
There are two ways of calibrating the load sensor:

  ➢ Automatic calibration

  ➢ Manual calibration

Automatic calibration. When a throttle valve potentiometer is used, it is easy to opt for automatic calibration. Select 'Automatic cal.' and then keep the throttle valve in rest position, pressing OK.
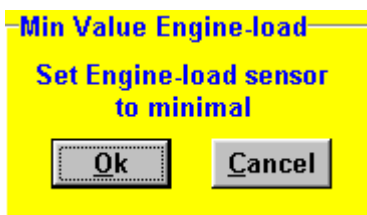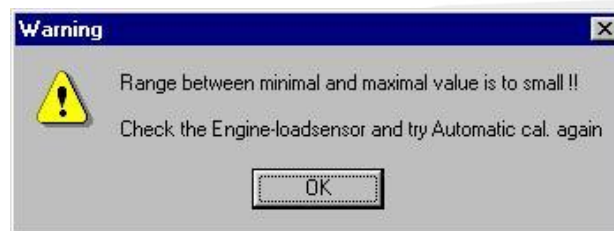

Then turn the throttle valve to full load and press OK again.

The minimum and maximum values of the throttle positions will now be shown.
A warning will appear if automatic calibration cannot be finished correctly. For possible causes, see 'Fault tracing'.
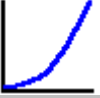

Manual calibration. When a map sensor or an air mass sensor is used, automatic calibration is not easy, because the minimum and maximum output signals of the sensor are not known before the engine has run. We recommend filling in the figures by hand, making sure that the output signal of the sensor under any engine operating condition is between the two figures set.

Tip: first set the minimum value 15 and the maximum value 250. If you use a KMS 400 kPa Map sensor there are recommended settings for the calibration on the datasheet of the sensor.

Not all load sensors emit signals that are linear with the engine load. For this reason the system offers the possibility to choose between three load characteristics. This enables the upper/lower areas to be made more sensitive or less sensitive.
The three load characteristics are linear, logarithmic and e-log and are explained in a overview on below.

| Image	Definition	Function	Application
	Linear	The load steps are divided in proportion to the signal.	MAP-sensor
	Logarithmic	At lower loads the load signal is divided over a smaller number of steps and at higher loads it is divided over a larger number of steps.	Air mass sensor
	e-log	The action is opposite to that of the logarithmic parabola.	Single Throttle body setup

3.2.4.1.4 Injection settings

Injection in "x" stroke mod:

The injection frequency (*x*) can be set to:
  - ➢ 2 times per crankshaft revolution
    (*x* = 1)
  - ➢ 1 time per crankshaft revolution
    (*x* = 2)
  - ➢ 1 time per two crankshaft revolutions
    (*x* = 4)

Normally, it is recommended to select the 4-stroke setting.
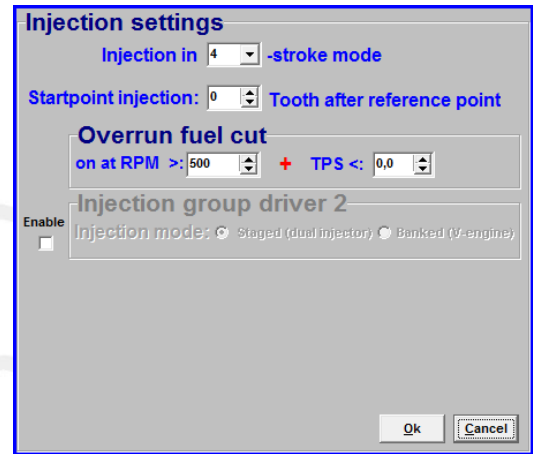
Startpoint injection:

The starting point of the injection cycle can be set here in number of tooth after the set reference point for the crank pickup.

Overrun fuel cut:

Here a deceleration fuel cut can be set above x RPM and below x TPS.

Injection driver 2:

If you have selected (enabled) the second injection driver in the hardware configuration (see section 3.2.4.1.7 Hardware configuration), you will be able to configure the type (banked or staged) of injection here depending on the kind of injector configuration.

TIP: Mapping a banked (V) engine can be easily done by disabling 'banked injection' and selecting the first lambda controller, so both injection outputs (1 and 2) run on one fuel map and lambda controller. Then quickly make a 'rough/global' mapping using the lambda control. If the engine runs ok, activate the banked injection and copy fuel map 1 to fuel map 2. After this activate the second lambda controller and map each bank separately.

3.2.4.1.5 Start-up

When the engine is started, a certain quantity of extra fuel (in most cases dependent on the coolant temperature) will have to be injected to ensure proper firing of the engine. There is a possibility of giving a start-up injection impulse and start-up enrichment. The start-up injection impulse is given once, at the moment the first crankshaft signal is registered.

After the start-up injection impulse, the injection periods shown in the injection graph will be adhered to. As long as the engine speed is lower than 500 rpm, the quantity of injected fuel shown in the first row applies. Proper firing of the engine often requires more fuel (depending on coolant temperature) than the quantity needed when the engine is already running at the same engine speed. This extra enrichment can be entered in the table for the duration of a certain amount of crankshaft rotations. There are four coolant temperature ranges for which an enrichment table can be completed. The additional enrichment (%) in the table can be set during the input of the rpm range. An enrichment map and a startup-pulse can be filled in for four coolant temperature ranges. Above the highest temperature the normal startup pulse will be used.
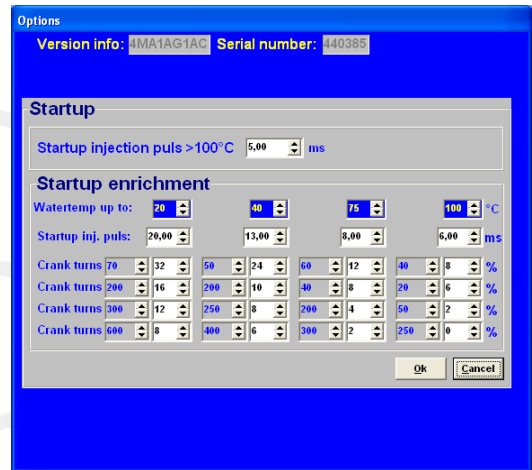
3.2.4.1.6 Throttle pump effect

When the throttle valve is opened, the engine will draw in more air and therefore need more fuel to keep the mix ratio at a constant level. As air is a gaseous substance, it will reach the inlet valve earlier than the liquid fuel, which because of its higher inertia needs more time to accelerate. As a result, there will briefly be a weak mix, causing the engine to 'hesitate'. The faster the throttle valve is opened, the greater this effect will be. To neutralise the effect of fuel having a higher inertia than air, acceleration enrichment can be applied. This means that, depending on the throttle valve opening speed, extra fuel is injected. This prevents the formation of a poor mixture.

There are two types of acceleration enrichment (these can be set on/off separately).

We recommend to use 'Type 2' acceleration enrichment.
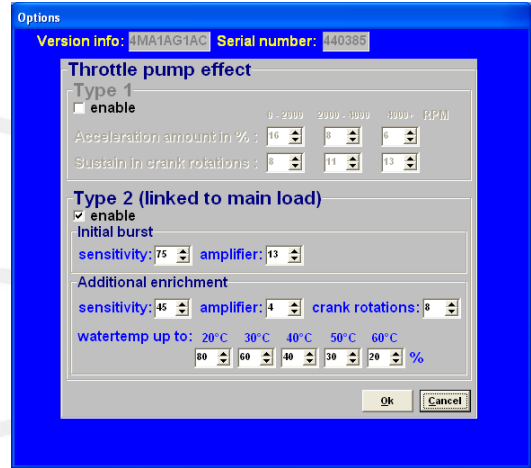
Type 1:

The quantity of extra fuel to be injected can be set for the three engine speed ranges indicated. The duration of enrichment can be set by entering the number of crankshaft rotations. The acceleration enrichment will automatically decrease at lower throttle valve opening speeds. Acceleration enrichment type 1 is always linked to "Engine load 1".
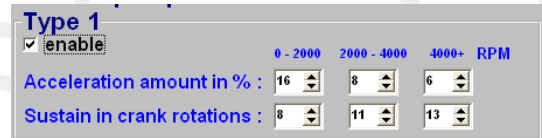
Type 2:

With most engines it is recommended to use only this acceleration type2. However type 2 can be combined with type 1 (for some engines useful).

Acceleration enrichment type 2 is always linked to main engine load.

The initial burst is one pulse that is directly injected when needed no matter what crank position and will intervene to avoid a short lean mixture. The sensitivity is linked to opening speed of the throttle. A low value for sensitivity means that the initial burst won't occur fast, a high throttle opening speed is needed. For a high sensitivity value a lower throttle opening speed is needed for initial burst enrichment to occur. The amplifier is more or less a factor for the amount of fuel injected. A higher amplifier results in more enrichment.

Additional enrichment follows after the initial burst. After the initial burst, the mixture briefly can get lean again. More enrichment is needed. You can choose how many rotations the additional enrichment is needed. The amount of extra fuel will slowly decrease during these rotations. Sensitivity and the amplifier function the same as they do with the initial burst. The additional enrichment can be increased by a percentage for the water temperature. More enrichment is needed with a low water temperature.
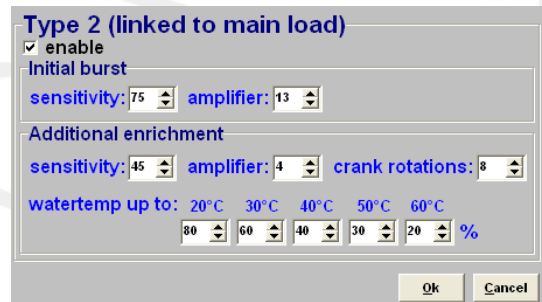
The figure on the right gives an indication of how these two types of enrichments affect the mixture, when suddenly the throttle valve is opened.
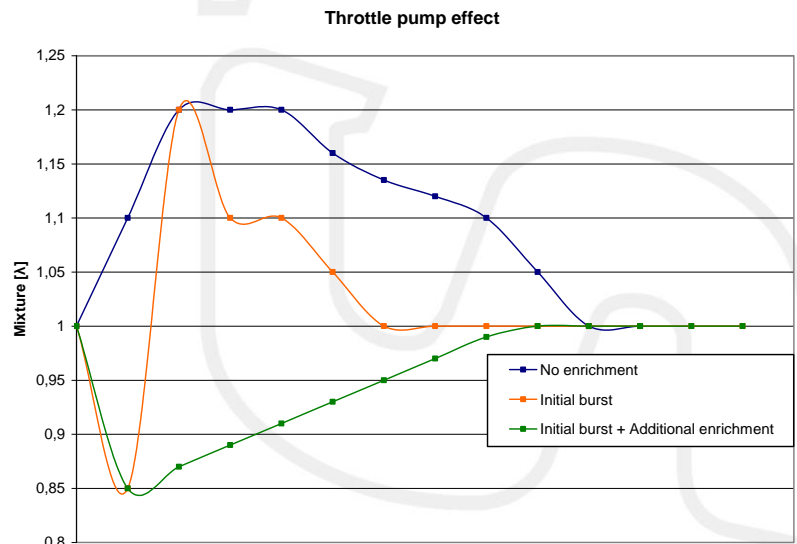
3.2.4.1.7 Hardware configuration

It is possible to change the function of certain pins in the main connector. Consequently, several extra functions can be created.
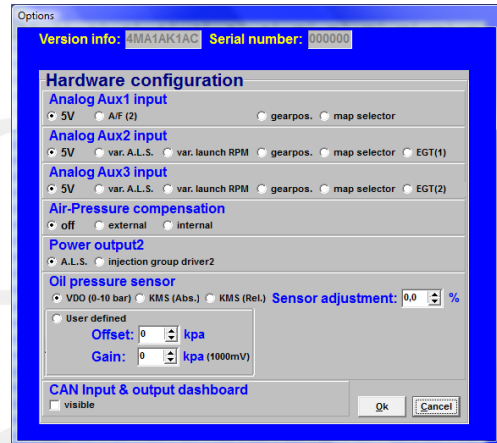

Analog Aux1 input:

You can feed in an additional analog signal.
For this specific input there can be a second Oxygen sensor fitted. Also there's the option to fit a potentiometer for gearposition or to switch between maps as a map selector.
Gearbox position: If gearbox has 0 – 5V position sensor, the signal can be connected to the analog input in order to make variable settings in the powershift and boost control.
Map selector: When a switch is connected to this pin 32 and in rest connected to ground on pin 23, map 1 will be active. When the switch is activated and a 5V signal (for example branched from the 5V sensor supply pin 20) is put on the pin 32 the ECU switches to map 2. 'Map 2' will shortly appear large on your screen, letting you know in which map your running. When switching back 'Map 1' will shortly appear on your screen. Make sure that the settings in both maps and settings are correct and working in the right way on the engine. This option also works real-time so it will immediately change your settings of the ECU. The values on the communication bar change to the values for map 1 or map 2 when switching. However the injection map has to be uploaded from the ECU if you want to change those values.

Analog Aux2 input:

For this input the 5V, gearpostion and map selector are the same as the first input but there are three different options. At this input you can't connect a second Oxygen sensor but you can connect a KMS EGT sensor, a potentiometer (1 kΩ - 47 kΩ) for variable A.L.S. or variable Launch RPM. See also section 3.2.4.1.10 A.L.S. and 3.2.4.1.2.1 Standard Limiters. The variable signal from the potentiometer must be connected to pin 25. The 5V for the potentiometer can be branched from the 5V sensor supply on pin 20. The remaining pin of the potentiometer must be connected to the ground on pin 23.

Analog Aux3 input:

This input works the same as input number 2 only on pin 24.

Warning :

Be careful with the map selector. Make sure that the settings in both maps are correct and working in the right way on the engine. This option works real-time so it will immediately change your settings of the ECU. The values on the communication bar change to the values for map 1 or map 2 when switching. However the injection map has to be uploaded from the ECU if you want to change those values.

If you give two inputs the same value, you will get a warning pop-up. For example when you select variable launch rpm for aux2 and aux3 you get the warning screen displayed on the right.
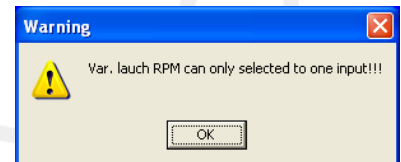
Air-pressure compensation:

There are two possible options for the sensor. There are ECU's that have a sensor on the circuit board. If that's the fact tick the box internal. If an external KMS MAP 75 – 120 kPa sensor is connected select external. It's only possible to use a KMS 75 – 120 kPa sensor.
The air-pressure compensation can only be used in combination with engine load TPS (see section 3.2.4.1.3 Engine load sensor**).**
With the air-pressure compensation active the ECU uses the correction table (in the main screen click or push 'F5'). See also section 3.2.5 Function key F5.

Air-Pressure in mBar																
750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	%

Power output2:

This option is to switch between ALS and Injection driver 2. If you select ALS then staged (dual injector) or banked (V-engine) injection is not possible. Vice versa it's not possible to use ALS if you use staged or banked injection. See also section 3.2.4.1.4 Injection settings and 3.2.4.1.10 A.L.S..

Warning:

When connecting the injectors, do not allow the engine to flood – make sure the fuel pump is switched off and the Power output2 is set to Injection driver 2 and not to A.L.S.!

Oil pressure sensor:

You can use any type of oil pressure sensor. The VDO and KMS oil pressure sensor have been precalibrated for easy use.
The VDO sensor must have a range from 0 – 10 bar (0 - 1000 kPa). You can calibrate the oil pressure sensor. This can be done by adjusting the sensor adjustment value to compensate the tolerance in the sensor.
The KMS 1000 kpa oil pressure sensor (01-01-07-0023) can be displayed in absolute or relative pressure. Absolute means that when the engine is not running the oil pressure read out will be at 100 kPa (outside air pressure). With KMS relative the oil pressure will be at 0 kpa when the engine is not running.
The latest KMS oil pressure sensor is the 1010 kpa sensor (01-01-07-1010). This sensor, and all other types of pressure sensor, can be calibrated in the 'User defined' section by setting the offset and gain. See the KMS oil pressure sensor 1010kpa for more information.

CAN input & output dashboard:

Selecting/ticking the box "visible" allows users to display the CAN input & output dashboard. When selected, an extra screen will appear containing all CAN inputs (EGT 1-16, Speed signals and analog/digital inputs and outputs). This screen can be dragged anywhere, it's position is saved so the next time the software is opened, the screen will be in the same position.

3.2.4.1.8 Lambda-control

A standard (narrow band) BOSCH lambda sensor or one of the KMS UEGO controllers can be connected to the system. Select the relevant lambda sensor in the menu (top left).
When the engine is running, the A/F ratio/lambda ratio will show in the communication bar.

It is also possible to connect a second lambda sensor/UEGO controller to the system. This 2nd sensor/controller has to be the same as the first one.
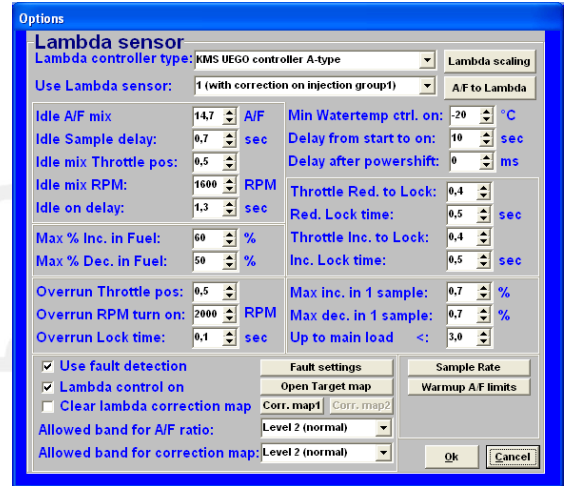
3.2.4.1.8.1 Adjustment of air fuel ratio feedback control

Lambda controller type:

Via this menu you can specify the lambda sensor/controller in use. For wideband sensors, the input signal is via the included controller, while standard narrow band BOSCH lambda sensors can be connected directly to the ECU.

Warning:

When you have a KMS UEGO Display controller you can choose 3 different types of output signal (type a,b and c) for the UEGO display. Always check if the output type is the same as selected in this software. Type "a" of the KMS UEGO Display controller has the same output curve as the KMS UEGO controller.
When using the KMS UEGO CAN controller, the lambda controller type must be set up correctly. When the UEGO CAN controller operates by CAN communication, you must set the lambda controller type to KMS UEGO controller CAN. When operating by serial (RS232) communication, you must set the controller type to KMS UEGO controller C-type.

Use Lambda sensor:

There are different options in this submenu. You can select your attached oxygen sensor and on which injection group the correction has to work.

Use lambda sensor:

| 1	with correction on injection group 1
2	with correction on injection group 1
1+2	banked with 2 injection maps
1	with correction on injection group 2
1	correction on injection group 1 and 2
1	with correction on Boost_correction map

Lambda scaling:

In this menu the values of the different types of sensors/controllers is visible. The KMS UEGO (display) controllers are pre-calibrated.

A/F to Lambda (or vice versa):

All the ECU's are standard set to A/F ratio. You can change all the settings of your ECU to Lambda values. All values will be converted. It is always possible to switch back to A/F ratio.

When you switch between A/F and Lambda, these settings have to be saved in the ECU. The KMS software will do this automatically. When 'yes' is selected in the pop-up screen, the software will start downloading to the ECU. It will automatically lock the settings after downloading.
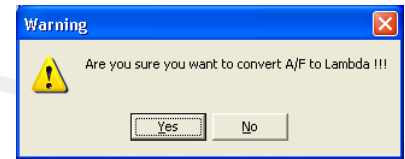
Idle A/F mix:

For inputting the desired A/F ratio for idle rpm.
The range is limited by "idle mix Throttle pos" and "idle mix RPM" which will be explained later.

Idle Sample delay:

During idle rpm, the sampling rate needs to be much lower (for smooth engine operation). This parameter sets the time span between two measurements.
Recommended value: 0.5 - 1.0 sec.

Idle mix Throttle pos:

When the throttle angle decreases under the threshold set here, this is considered as idle. In other words, the sampling or measurement frequency becomes dependent on the value set under "Idle Sample delay" while the A/F ratio adopts the desired value of the "Idle A/F mix".
Recommended value: 0.5 - 2.0 TPS-value

Idle mix RPM:

When the engine speed decreases under the threshold set here, this is considered as idle. In other words, the sampling or measurement frequency becomes dependent on the value set under "Idle Sample delay" while the A/F ratio adopts the desired value of the "Idle A/F mix".
Recommended value: ±500 rpm higher than idle rpm.

Idle on delay:

This value specifies the delay before the ECU reactivates the A/F ratio feedback control after an engine has returned to idle. In this way idle rpm can stabilize first before the A/F feedback control takes effect.
Recommended value: 0.5 - 1.5 sec.

Throttle Red. To Lock:

During rapid reduction of the throttle position (without entering throttle overrun state) the air fuel ratio feedback control has to be deactivated in most engines. At a certain deceleration speed the lambda-signal is disturbed due to less efficient combustion. Here you can specify the decreasing rate that triggers the de-activation of the lambda control. The value input here represents the decrease in engine load between 30 ms.
Recommended value: 0.3 - 1.0

Red. Lock time:

If the A/F ratio feedback control has switched off during rapid deceleration, the control loop will close again (if the throttle position stabilizes or increases again) after a time specified here. Recommended: 0.5 - 1.0 sec.

Throttle Inc. To Lock:

During rapid increase of throttle position the air fuel ratio feedback control has to be deactivated in most engines. Here you can specify the increasing rate that triggers the de-activation of the lambda control. The value input here represents the increase in engine load between 30 ms. Recommended value: 0.3 - 1.0

Inc. Lock time:

If the A/F ratio feedback control has switched off during rapid acceleration, the control loop will close after a time specified here. Recommended: 0.3 - 1.0 sec.

Overrun Throttle pos:

Below certain throttle positions, combustion changes to such an extent that the exhaust gas contains a relatively high amount of oxygen. A lean mixture is registered by the lambda sensor, although that is not necessarily the case. Under these conditions it is therefore preferable to deactivate the air fuel ratio control loop.
When the throttle position is less than this value (TPS) input here, the air fuel ratio feedback control will be deactivatedd. Make sure this value is always set higher than the Fuel Cut Off value. For example a value between 0.5 - 1.5 (depending on your FCO-value).

Overrun RPM turn on:

In case of overrun (TPS < overrun throttle position) with the engine speed below a certain threshold, it is desirable to activate the air fuel ratio feedback control again. This will usually have to be set to an rpm of 200 to 1000 above idle rpm.

Overrun Lock time:

When an engine recovers from throttle overrun, it is usually necessary to wait a while before reactivating the A/F ratio feedback control in order to allow the engine to stabilize. This delay can be input here.
Recommended 0.3 - 1.0 sec.

Minimum watertemp control on:

The coolant temperature above which the A/F ratio feedback control activates.
If a KMS UEGO lambda controller is used, the lambda control can already be activated at cold water temperatures. If your using a standard BOSCH lambda sensor (narrow band) is used, it is recommended to activate the lambda control only above a water temperature of 60° Celsius.

Delay from start to on:

Oxygen sensors require a certain warm-up time after engine start.
During this warm-up period, the A/F ratio feedback control cannot function. The warm-up period in seconds can be set here.
KMS UEGO recommended time: 10 - 15 sec.
Standard BOSCH recommended time: 20 - 30 sec.

Max % inc. in Fuel:

Specifies the maximum positive (increase) injection compensation.

Max % dec. In Fuel:

Specifies the maximum negative (decrease) injection compensation

Max inc. in 1 sample:

Specifies the maximum positive injection compensation between two samples as a percentage. If 0.0 is set in here this function is not active.
For example: if the sample rate is set on 10 samples per second. The maximum increase in 1 sample is set on 0.5%. Then the lambda control can only compensate 10x0.5= 5% fuel increase per second.

Max dec. in 1 sample:

Specifies the maximum negative injection compensation between two samples as a percentage. If 0.0 is set in here this function is not active.
For example: if the sample rate is set on 10 samples per second. The maximum decrease in 1 sample is set on 0.5%. Then the lambda control can only compensate 10x0.5= 5% fuel decrease per second.

Up to main load <:

Above this main load value, there is no limit on the compensation between two samples. If 0.0 is set in here this function is not active.
Recommended is to set this value after the engine is properly mapped, and to a value of 4.0-6.0.


3.2.4.1.8.2 Fault settings

Increase A/F target to:

When engine load and a certain air temperature exceed both the values set under "Air-temp" and "Engine-load", the whole "lambda target map" can be increased or decreased by the value set under "increase A/F target with".
Recommended: -0.2 - -1.0.

When engine load and a certain exhaust gas temperature exceed both the values set under "EGT" and "Engine-load", the whole "lambda target map" can be increased by the value set under "increase A/F target with". The EGT signal can be supplied by the KMS EGT display on Analog aux 2 or 3, or the KMS EGT → CAN converter 4-channel. When the EGT → CAN converter is connected, input 1 will be the EGT used for the fuel correction.
Recommended: -0.5 - -1.5.
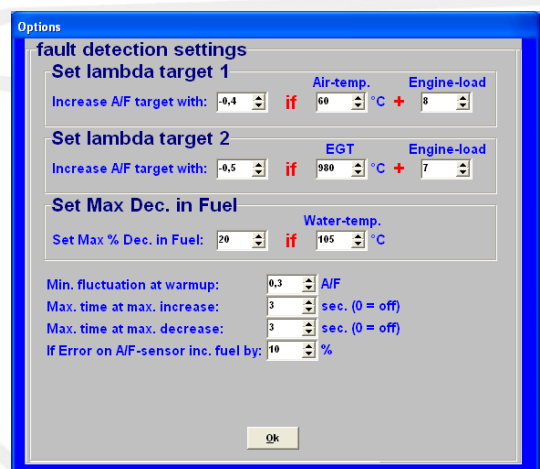
Set Max Dec. in Fuel:

Here you can input a maximum negative injection correction when the coolant temperature exceeds a certain setting. This parameter can be used as protection against engine overheating. If supplementary enrichment has been set in the coolant temperature compensation table for high water temperatures in order to protect the engine, this parameters of this function can help prevent the A/F ratio feedback control from curtailing supplementary enrichment.

Min. Fluctuation at warm-up:

Before the A/F ratio feedback control will activate, the oxygen sensor signal first has to fluctuate with the amplitude set here. This is a way to recognize if the lambda sensor is connected and working.
Recommended: 0.2-0.5.

Max. time at max. increase:

Here you can input the maximum permissible time for the A/F ratio feedback control to be set to maximum positive correction. After this time span the lambda-control will shut down.
If set to 0.0 this function will not be active.
Recommendeed time: 3-10 sec.

Max. time at max. decrease:

Here you can input the maximum permissible time for the A/F ratio feedback control to be set to maximum negative correction. After this time span the lambda-control will shut down.
If set to 0.0 this function will not be active.
Recommendeed time: 3-10 sec.

If Error on A/F-sensor inc. Fuel by:

Here you can input a compensation value (as a percentage) in case of lambda shut down due to error. This can be used as a protection for the engine against running a too lean mixture.
Recommended value: 3-10%

3.2.4.1.8.3 Target map

The A/F target map constitutes the same map structure used in the parameter maps for fuel/ignition. The values input here constitute the target A/F ratio. The A/F ratio feedback or lambda control will strive in each map position to control the A/F ratio towards this target value. This means that you can drive with minimized consumption in the partial load range and fulfill the requirements of emission laws. Towards a full load a richer A/F mixture can be automatically delivered, for the benefit of power and cooling capacity of the engine. The adaptation of values in the target map works in the same way as with the main maps (ignition/injection). When you input 0 in a frame, the A/F ratio feedback control will not be active in the relevant range.
In the figure on the left side on the next page is a recommended target map shown for a N/A engine. Next to that (on the right) is a recommended target map shown for a turbocharged engne.

Lambda target map for a N/A engine

Lambda target map for turbocharged engine

3.2.4.1.8.4 Correction map

The A/F ratio feedback control corrects injection times so that the target values (specified in the target value map) are attained. The percentage that the A/F ratio feedback control must correct in order to realize the target values is recorded in a correction map. The values recorded in the correction map can be selected and send as a correction percentage to the injection map. Thus the map can be adapted to minimize percentage of the A/F ratio feedback control, which ensures optimum driving characteristics. Make sure that the engine runs smooth after the correction percentages are send to the injection map. After the percentages have been send to the injection map the entire correction map needs to be reset to zero. Select the control box 'clear lambda correction map' and press '**OK**' twice.

There are 2 correction maps to work with. Depending on which lambda sensor(s) you have selected and the specified correction on the selected injection group.

These correction maps will adjust the injection group;
  ➢ corr.map1 → injection group 1
  ➢ corr.map2 → injection group 2

There are some exceptions:
  ➢ **1**   **(with correction on injection group 2)**
  ➢ **1**   **(correction on injection group 1 and 2)**

By these settings only the corr.map1 will be available but will also work on the second injection group.

Allowed band for A/F ratio:

Correction percentages are only recorded in the correction map if the A/F ratio value (lambda value) comes within a specific range of the desired value. This range can be adjusted in two settings. By choosing level 2, the correction value will be recorded in the correction map if the A/F ratio feedback value comes within 0.2 of the target (with level 1 ≤ 0.1). With level 2, a 95% accurate correction map is therefore created while a more precise one is created with level 1.
Recommended: Map the engine first on level 2. This way you can create the correction map faster.

Allowed band for correction map:

The 2 levels that can be selected here relate, in this case, to the deviation between actual and nominal rpm and TPS (value set in map). Correction values are only recorded in the correction map when the rpm and TPS comes within a specific range of the nominal value. With level 2, a 95% accurate correction map is therefore created while a more precise one is created with level 1.
Recommended: Map the engine first on level 2. This way you can create the correction map faster.

3.2.4.1.8.5 Sample rate

Main sample rate:

Specifies the number of corrections per seconds of the A/F ratio control.
Recommended corrections per second: 6 - 10.

| Main sample rate: | 10 | /sec |
| Correction amplifier: | 1 | |

Correction amplifier:
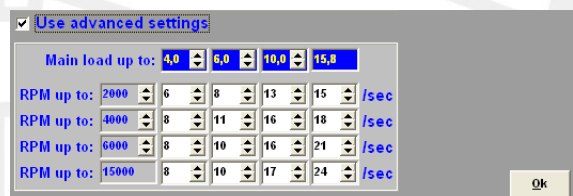
For input of the control amplifier gain. For a rapid correction to the desired target, the first step of correction must be larger. The gain factor can be entered here.
Recommended: 1 or 2.

Advanced settings:

If the 'use advance settings' control box is selected, the 'advanced settings' menu must be set.
You can set here different sample rates for various RPM/Engine-load ranges.
In general with higher engine speeds and engine loads the sample rate can be set higher due to more combustions per second and higher exhaust gasflow.
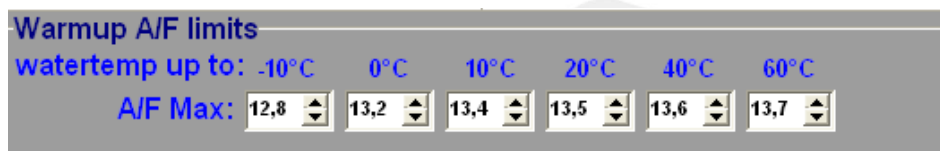
☑ Use advanced settings

Main load up to:	4,0	6,0	10,0	15,8	
RPM up to: 2000	6	8	13	15	/sec
RPM up to: 4000	8	11	16	18	/sec
RPM up to: 6000	8	10	16	21	/sec
RPM up to: 15000	8	10	17	24	/sec

Ok

If the sample rate is set too low, the lambda control does not reach the desired target in time. On the other hand when the sample rate is set too high the lambda control will get instable.

3.2.4.1.8.6 Warm-up A/F limits

At lower engine temperatures you can set an upper limit on air/fuel ratio. Lambda-control will, under these temperatures, not control the mixture leaner (higher A/F) than the values set in this table.

Warmup A/F limits

| watertemp up to: | -10°C | 0°C | 10°C | 20°C | 40°C | 60°C |
| A/F Max: | 12,8 | 13,2 | 13,4 | 13,5 | 13,6 | 13,7 |

This can be used when KMS UEGO control is set active at cold engine/water temperatures to prevent the engine from stalling, by limiting the A/F ratio, when lambda control will try to reach a too lean target. Most petrol engines will not run on an A/F ratio of 14.7 (λ=1) below 60° Celsius.

3.2.4.1.9 Boost control

In this menu, the parameters for boost control can be set.

Boost value calibration:

First of all, the boost pressure readout has to be calibrated so that the boost pressure indicated in the communication bar corresponds to the actual pressure.

Boost at MAP output 3.75 V:

For inputting the boost pressure (kpa) at a MAP sensor (manifold pressure sensor) output voltage of 3.75 V. These calibration values are included with the KMS MAP sensors.

Boost at MAP output 1.25 V:

For inputting the boost pressure (kpa) at a MAP sensor (manifold pressure sensor) output voltage of 1.25 V. These calibration values are included with the KMS MAP sensors.

Solenoid off is:

If there is no current to the solenoid valve, the boost pressure will adopt either minimum or maximum pressure depending on the connection of the solenoid valve. Here you need to select the correct control boxes.

Boost control (on/off):

Here you can decide to switch the boost control on or off. If the boost control is activated in the hardware configuration, the boost pressure will be regulated by the PWM percentages in the PWM table.

Boost PID control:

Here you can activate the control to not only use the fixed PWM values from the PWM chart, but PID control calculates an 'error' value between the measured and the target boost. The controller attempts to minimize the 'error' by adjusting the solenoid position untill the desired boost is reached.
This control will only reach the set target pressure if the throttle position value is >15. If the throttle position value is not 15, this control will not be active. However, if the boost pressure exceeds the target pressure in spite of the specified PWM values, the control will intervene to prevent the boost pressure from increasing further.
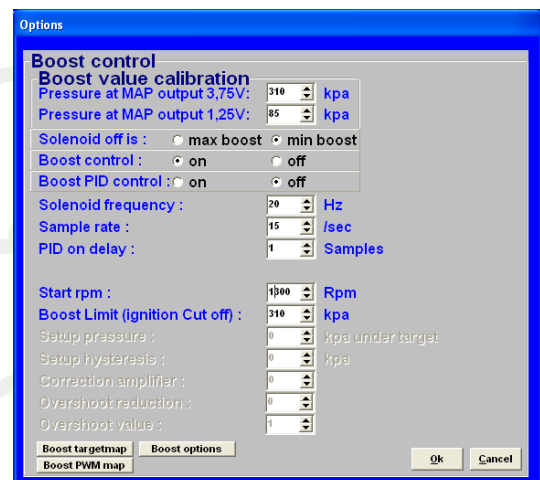
3.2.4.1.9.1 Parameters Boost Control

Solenoid frequency :	20	Hz
Sample rate :	15	/sec
PID on delay :	1	Samples
Start rpm :	1300	Rpm
Boost Limit (ignition Cut off) :	310	kpa
Setup pressure :	0	kpa under target
Setup hysteresis :	0	kpa
Correction amplifier :	0	
Overshoot reduction :	0	
Overshoot value :	1	

Solenoid frequency:

Each control valve has a specific frequency at which it operates best. This frequency can be entered here between 16 and 40 Hz.

Sample rate:

Specifies the number of measurements per seconds for detecting boost pressure. In case of control instability, you need to input a lower value. If the control system responds too slowly, a higher value has to be entered.

PID on delay:

As described before, the PID boost control activates at full throttle. When the throttle is fully open but the boost pressure target hasn't been reached, the PID control will adjust the solenoid position in order to reach the boost pressure target. However this may cause the boost pressure to build up so fast, that it will overshoot the target pressure.
The PID on delay can be used to delay the start of the PID control after fully opening the throttle. This way the boost pressure can build up before the PID control will adjust the solenoid and thus preventing an overshoot of the boost target pressure. The number of samples entered and the sample rate determine the duration of the PID on delay.

Start RPM:

Here you can enter the rpm at which the control may activate. This helps avoid unnecessary operation of the solenoid valve at low revs.

Boost Limit (ignition cut off):
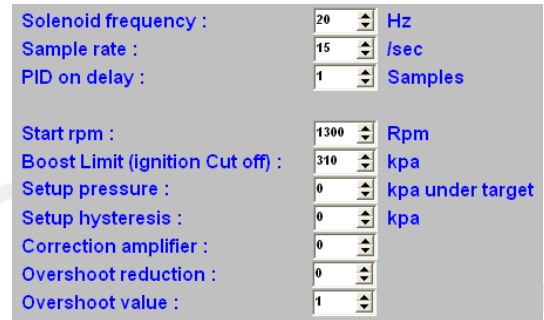
In case the boost pressure exceeds the target value (risk of engine damage), you can specify a limit with this parameter. When the boost pressure reaches this limit, ignition and injection will be interrupted.

Setup pressure:

To allow the turbo system to respond as quickly as possible but not overshooting the target, it is important that the PID control only activates above a certain boost pressure (the boost pressure should reach first a stable pressure with the fixed PWM value). Therefore the setup pressure (in kPa) should be kept slightly lower than the target boost pressure (recommended: 20 – 40 kPa below target pressure). From this setup pressure the PID starts to control the boost up to the target.
So it is important that boost pressure will reach setup pressure with the fixed PWM values, otherwise PID control wil not activate!

Setup hysteresis:

Once the setup target pressure has been reached and the pressure consequently decreases, it is advisable not to switch off the control at once, but to allow for a certain pressure reduction prior to switching off.

Correction amplifier:

For input of the control amplifier gain. With a gain factor the first step will be larger to reach the target boost value faster.

Overshoot reduction:

Under certain conditions the boost pressure can exceed the set target pressure faster than normal. With this parameter you can enter the maximum boost pressure increase (in kPa) between 2 samples, before the turbo control intervenes to reduce turbocharging pressure.

Overshoot value:

If the boost pressure increase exceeds the range specified by overshoot reduction, the turbo control will require a certain gain factor to ensure a rapid reduction of the boost pressure to its target value. The gain factor can be entered here.

3.2.4.1.9.2 Boost target map

Via this menu you can enter target boost pressures for separate engine speeds.

3.2.4.1.9.3 Boost PWM map

In this field you can specify for each throttle opening and rpm a fixed duty cycle percentage (PWM %) for operating the control solenoid valve. In other words, you can ensure that boost pressure becomes dependent on throttle opening. If the boost control is activated in the hardware configuration, the boost pressure will be regulated by the PWM percentages in this table. The values in this boost PWM map can be easily copied to the overboost PWM map by selecting the cells and choose 'copy boost to overboost map'. So the values in the overboost PWM map can easily be increased/decreased by a percentage over the boost PWM map values.

3.2.4.1.9.4 Boost options

Clicking the 'Boost options' tab gives you a pop-up screen where the overboost and boost-reduction settings can be setup.
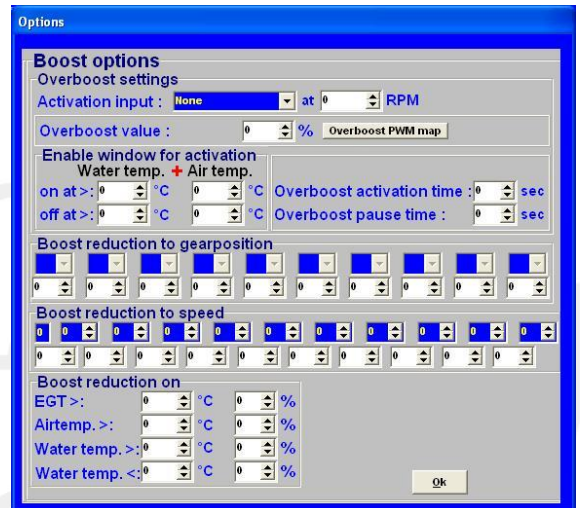
3.2.4.1.9.4.1 Overboost settings

This system allows overboost for a limited time span. The raise above the normal boost pressure can be activated by various variables (refer to 'activation input').

Activation input:

In the pulldown menu you can select which variable will trigger overboost. Behind the variable the value can be set from which the overboost is allowed.

Overboost value:

When overboost is triggered, the boost pressure will rise above the target value by the percentage entered here.

Overboost PWM map:

If overboost is active, the system will use the overboost PWM map.
The values in the boost PWM map can be easily copied to the overboost PWM map by selecting the cells and choose 'copy boost to overboost map'. So the values in the overboost PWM map can easily be increased by a percentage over the boost PWM map values.

3.2.4.1.9.4.2 Enable window for activation

Here you can set the margins within which overboost is permitted.

Engine temp. + Air temp. On/off at>:

The overboost starts/stops when the engine temperature and air temperature are higher/lower then the specified values.

Overboost activation time:

Specifies the time span during which overboost functions are active after being triggered.

Overboost pause time:

To prevent the overboost from being activated too rapidly (after a preceding overboost), you can set a pause interval here before overboost can be triggered again.

3.2.4.1.9.4.3   Boost reduction to gear position

Boost pressure can be reduced for each separate gear (only possible after the gearpositions are calibrated) shown in the first row. The second row contains the correction in percentages on the actual used PWM-map.

3.2.4.1.9.4.4 Boost reduction to speed

Boost pressure can also be reduced for up to ten speeds (only possible if the KMS speed sensor to CAN converter is used). The first row contains ten boxes where speeds can be entered, the first box is fixed at 0. In the second row, the boost correction in percentages can be entered for each corresponding speed interval. In the example below the first speed interval ranges from 0 to 10 km/h and has a boost reduction of 80%. The second speed interval ranges from 10 to 20 km/h and has a boost reduction of 75%, etc.

3.2.4.1.9.4.5   Boost reduction on

Here you can select the boost reduction for separate variables. For example you can reduce boost if you exceed a specific exhaust gas temperature. The values for the reduction which can be set here are correction percentages on the actual used PWM-map.

3.2.4.1.10 A.L.S.

A.L.S. (Anti Lag System): This feature can be used in order to maintain boost pressure (only with turbocharged engines) during "closed throttle" situations to eliminate turbo lag. With the help of an electronic air-valve which can make a bypass around the throttle body, the turbocharger can keep on pumping air into the engine. To do so the ALS output must be set to 'On'. It's also possible to use the KMS Electronic Throttle Control (ETC), to open the electronic throttle valve, allowing more air into the engine.

To prevent the engine from over-revving the ignition can be retarded here at the different rpm levels. For cooling of the engine extra fuel can be added. To limit the boost pressure also a fixed PWM value can be set. The fuel enrichment and PWM boost are both percentages.

If using variable A.L.S. by connecting a potentiometer signal you can vary the PWM value from 0 to the value set here in the A.L.S. settings. The potentiometer must be in the range of 1 kΩ - 47 kΩ. The variable signal from the potentiometer must be connected analog aux2 input on pin 25 or analog aux3 input on pin 24. The 5V for the potentiometer can be branched from the 5V sensor supply on pin 20. The remaining pin of the potentiometer must be connected to the ground on pin 23.

When staged or banked injection is used, A.L.S. can only be used in combination with the KMS ETC and an electronic throttle valve.
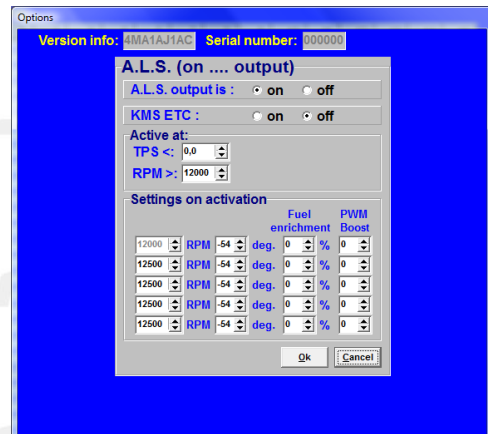
Warning:

When using the A.L.S. be aware of extreme wear and shortage of lifespan of the turbo, exhaust-valves, exhaust manifold etc.

3.2.4.1.11 AUX 1

The system features three extra outputs. These extra outputs can be separately activated via direct ground (up to 1A) or via relay. They can be used for shift indicators, water injection, cooling fan, spray bar, etc.

3.2.4.1.11.1 Text on dashboard

In these two rows you can set the name or function of the aux output. The name or function will be visible in the communication bar of the main screen. Both text lines have a maximum of eight characters.
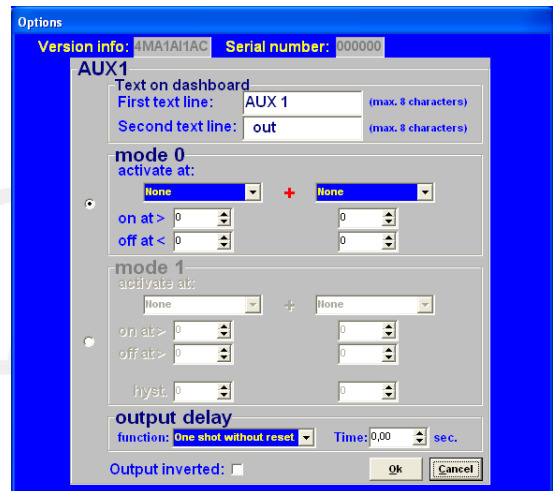
3.2.4.1.11.2 Mode 0

In the dropdown menu's various criteria can be selected to activate the aux output. There is a choice of several combinations including engine speed, throttle position, boost pressure, analog aux, oil pressure, lambda, water temp, air temp, powershift, launch, EGT, speed and speed difference. If 'none' is selected, this channel will be ignored. The 'on at >' values should be exceeded for the AUX output to activate. When the criteria parameters drop below the preset 'off at <' values, the aux output will deactivate. An example is a cooling fan (water temp) that activates (on at >) at 88° Celsius and deactivates (off at <) at 85° Celsius.

3.2.4.1.11.3 Mode 1

Mode 1 functions a lot like mode 0, except for two things. The aux output will deactivate when the criteria parameters exceed the preset 'off at >' values.
It's also possible to set a hysteresis for both criteria. This means that the aux output can also be deactivated when the criteria parameters drop below the hysteresis and 'on at >' values. The advantage of this is that the output does not need to be switched on and off unnecessarily. For example a cam switch which activates above (on at >) 2000 rpm and deactivates above (off at >) 5000 rpm, but also deactivates if the engine rpm drops below 1800 rpm (in case of a 200 rpm hysteresis).

3.2.4.1.11.4 Output delay

The aux output can also be delayed using multiple timing possibility's. If the time is set to 0, the aux output doesn't take the timer into effect. The duration of the timer can be set to one hundred's of seconds in the time box. There are five possible timers which can be chosen.
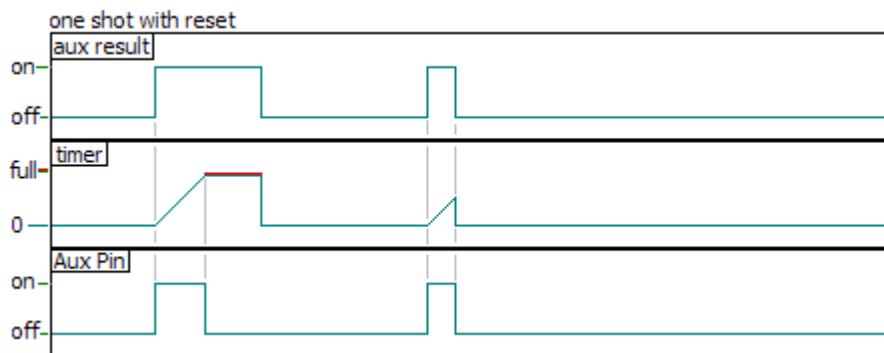
One shot without reset

The aux output (aux pin in the graph) will be activated when the criteria (aux result) that have been set for mode 0 or mode 1, are met/fullfilled. The aux output will stay active untill the timer expires, regardless of the aux result.
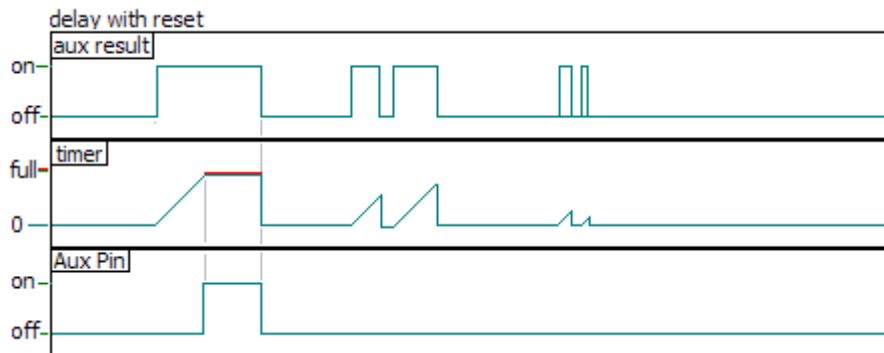See the following graph for more information.

one shot without reset
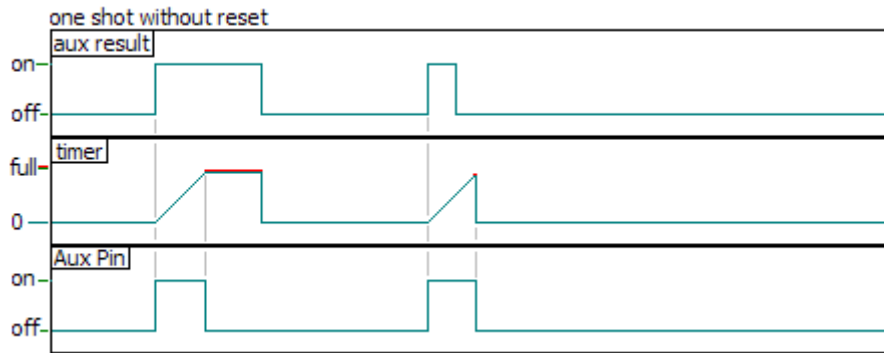
One shot with reset

The aux output (aux pin in the graph) will be activated when the criteria (aux result) that have been set for mode 0 or mode 1, are met/fullfilled. The aux output will be deactived when either the timer expires or when the aux result is expired.
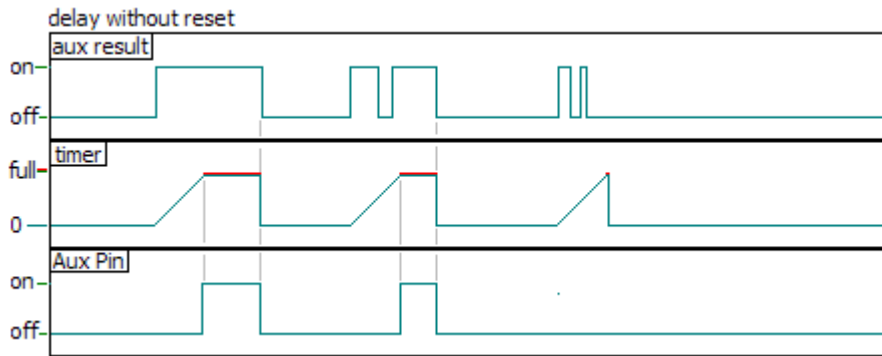

one shot with reset

Delay with reset

The aux output (aux pin in the graph) will be activated when the criteria (aux result) that have been set for mode 0 or mode 1, are met/fullfilled and the timer has expired/finished. As soon as the aux result drops below the criteria, the timer is reset and the aux output expires.


delay with reset

Delay without reset

The aux output (aux pin in the graph) will be activated when the criteria (aux result) that have been set for mode 0 or mode 1, are met/fullfilled and the timer has expired/finished. As soon as the aux result drops below the criteria, the timer isn't reset untill the aux output also expires.

delay without reset

Watchdog

The aux output (aux pin in the graph) will be activated as soon as the timer has expired. However the timer is reset each time the criteria (aux result) that have been set for mode 0 or mode 1, are met/fullfilled or expire.

watchdog
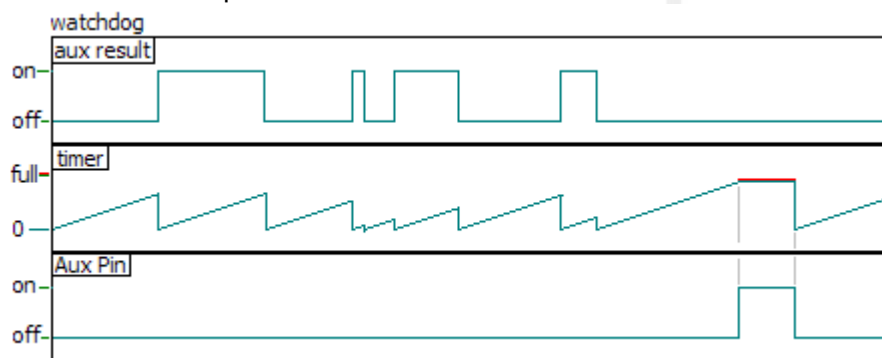
3.2.4.1.12 AUX 2

See section 3.2.4.1.11 AUX 1

3.2.4.1.13 AUX 3

See section 3.2.4.1.11 AUX 1

3.2.4.1.14 External Dashboard

The KMS Management system can sent all sensor values to an external dashboard or data-logger.

MD35
Output (TXD)   :   Pin 2 of the MD35 connector
Input (RXD)   :   Pin 1 of the MD35 connector

There are six different output protocol's that can be selected. When the protocol is set to 'none', the ECU will automatically send out the parameters at CAN communication speed of 0.5 MHz (500 KHz).
Users can also manually set the CAN communication speed at KMS_CAN 0.5 MHz or KMS_CAN 1 MHz.
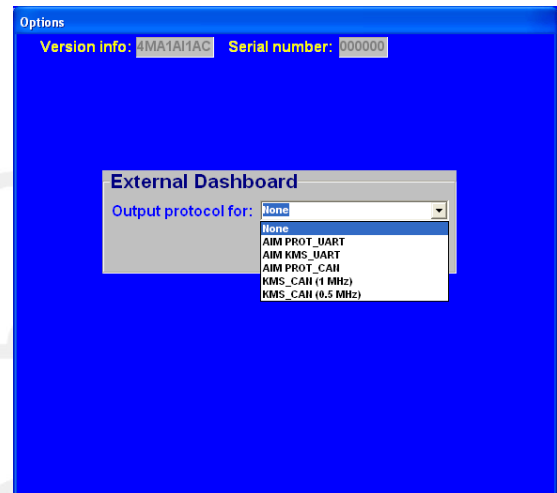
Specially for AIM dashboards, there are communication protocols in the KMS software. Users can choose between AIM PROT_UART, AIM KMS_UART and AIM PROT_CAN. Select in the AIM Racestudio2 software the configuration with the correct ECU manufacturer (AIM or KMS) and model (PROT_UART, KMS_UART or PROT_CAN).
Configure the channels, design your display and 'transmit' the configuration to the AIM logger.
Connect TX (pin 2 of the KMS MD35 connector) to the RX input from AIM. Not all channels are working from KMS, this depends on which sensors are connected to KMS. You can see this 'on line' and 'disable' these channels in your configuration. Please contact your AIM dealer for more details and information.

3.2.4.1.14.1 CAN protocol

The KMS CAN display and UEGO CAN controller communicate, as their names suggest, by CANbus (preset at 0.5 MHz). The CAN communication has the advantage of being faster and more versatily through the use of multiple displays and controllers on one CANbus.
It can also be used for various AIM-displays.

MD35
CAN High   :   Pin 1 of the MD35 connector
CAN Low   :   Pin 2 of the MD35 connector

The protocol of the KMS ECU CAN systems is available for your specific requirements.
Don't hesitate to contact us about details.

3.2.4.1.15 Remarks

In this part of the software you can specify notes, remarks and other information, for instance; engine specifications.
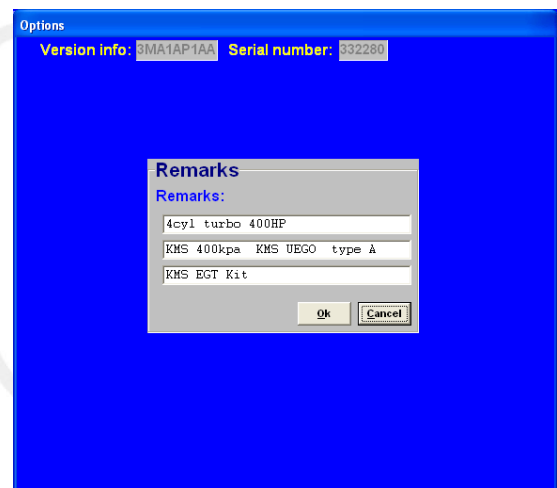
3.2.4.1.16 Speed settings

For the displaying of speed or the use of traction control on the MD35 you have to define some settings in the software. These functions can only be used in combination with the KMS speed sensor -> CAN converter 4-channel!

3.2.4.1.16.1 Speedpulse convertor

When the incoming speedpulse (for example gearbox or wheelspeed) is not matching the desired output speedpulse for the tachometer it can be converted.
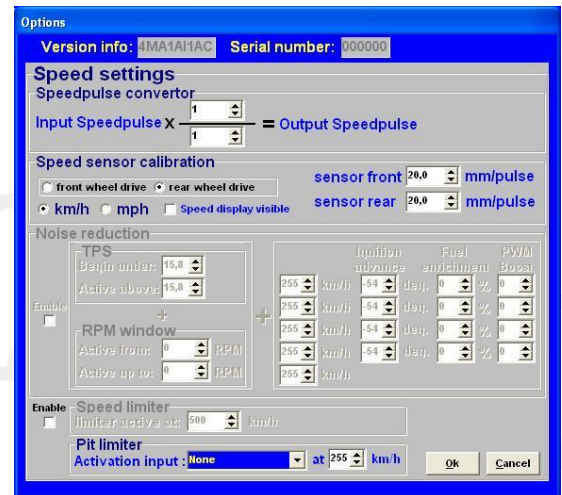
3.2.4.1.16.2 Speed sensor calibration

The calibration and display of the speed signals can be set here.
First the vehicle configuration must be defined as a front wheel drive car of rear wheel drive car. This way, the KMS ECU knows which of the speed inputs is the real vehicle speed (non-driven wheels) and how much slip the vehicle is having on the driven wheels.
You can choose to use the speed in km/h or mph. These settings apply for all the functions in the management software.
Displaying of the speed inputs can be activated by enabling the box 'Speed display visible'. This opens a small window in the right side of the main screen containing the four speed inputs, but also the lowest vehicle speed and speed difference between the driven and non-driven wheels.

It's only possible to separately calibrate the speed sensors on the front and rear axle of the vehicle. This means that if there are two sensors on one axle, these sensors must be mounted in the same way and have the same trigger wheel to prevent an incorrect measurement of the speed on one side of the vehicle. For example sensor 1: front left, sensor 2: front right, sensor 3: rear left and sensor 4: rear right, then sensor 1 and 2 must be mounted in the same way and have an equal trigger wheel. The same goes for sensor 3 and 4.
To calibrate the speed sensors, users must specify the distance travelled by the vehicle for each input speedpulse of the speed sensors. This can be easily calibrated if the circumference of the tires and number of tooth of the speed sensor trigger wheel are known. For example when the tires have a circumference of 2000 mm, and there are 20 tooth on the trigger wheel, the sensor has a calibration value of 100 mm/pulse.

3.2.4.1.16.3 Noise reduction

Not available for MD35. **MP24(i) only.**

3.2.4.1.16.4 Speed limiter

It's possible to set a maximum speed limit for the vehicle. The speed limiter must be enabled to use it.
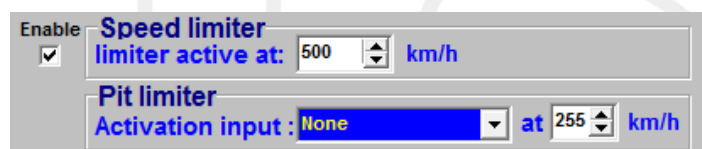
3.2.4.1.16.5 Pit limiter

There are five different activation inputs for the pit limiter to activate: Powershift, Launch control, Analog aux 1 to 3. The pit limiter speed can be set between 0 and 255.

3.2.4.1.17 Traction control settings

To enable the traction control you have to enable the box in front of the 'Activate traction control'. Traction control is only possible if the KMS speed sensor -> CAN converter 4-channel is used! Users can put a switch in the 12V supply of the speed sensors or KMS speed sensor -> CAN converter, to enable them to switch the traction control on and off.
Users can also define at which speed the traction control should activate.
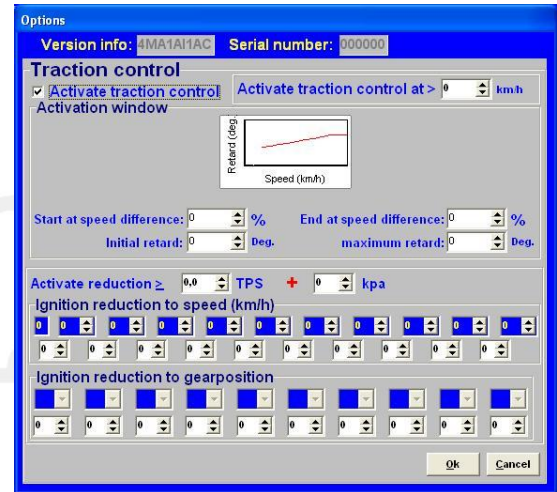

3.2.4.1.17.1 Activation window

In the Activation window, users can define the parameters for the traction control. The 'start at speed difference' determines at which percentage of speed difference between front and rear, the traction control will activate. 'Initial retard' is the initial ignition retard which is used by the traction control when the speed difference between front and rear exceeds the set value ('start at speed difference').
'End at speed difference' determines the maximum percentage of speed difference between front and rear, where the traction control ends. The 'maximum retard' is the maximum ignition retard for the traction control. If the speed difference increases above the set 'end at speed difference' value, the traction control will stay active using the maximum ignition retard.

For example when the traction control starts at a speed difference percentage of 10% (front speed sensors at 100 km/h and rear speed sensors at 110 km/h = 10% difference in speed) and ends with a speed difference percentage of 40% (front speed sensors at 100 km/h and rear speed sensors at 140 km/h = 40% difference in speed), with an initial retard of 5 deg and maximum retard of 20 deg, the traction control is set to the ignition retard and speed in the graph on the right.
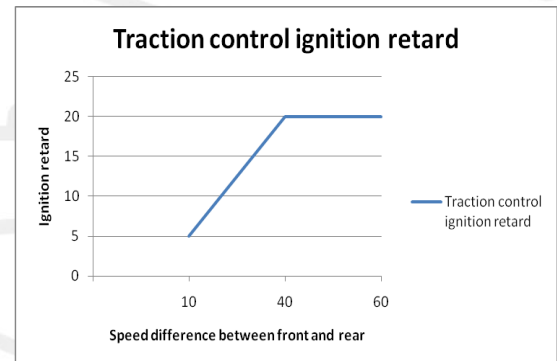
3.2.4.1.17.2 Ignition reductions

Before the traction control intervenes, it's possible to reduce power(ignition) for better traction. This can be done for the different gearpositions or speeds. If a value or box is set to 0, it won't be taken into effect.

Activate reduction

The ignition reductions should become active at the moment that the engine starts to make too much power (high boost/throttle position) and the vehicle looses traction. If the ignition reductions start too early (at low boost or throttle position), the reductions can intervene with the idle control or you can loose 'bottom end' power. Therefore you can determine which throttle position (TPS) and boost pressure (kpa) the ignition reductions should become active.

Ignition reduction to speed

Users can determine the amount of ignition retard for multiple speed intervals. The first row contains ten boxes where speeds can be entered, the first box is fixed at 0. Corresponding to each speed intervals (sections between the ten speed boxes in the first row), the retard of the ignition can be set in the second row.

Ignition reduction to gear position

Ignition can be reduced for each separate gear (only possible after the gear positions are calibrated) shown in the first row. The second row contains the corresponding reduction in ignition for each gear.
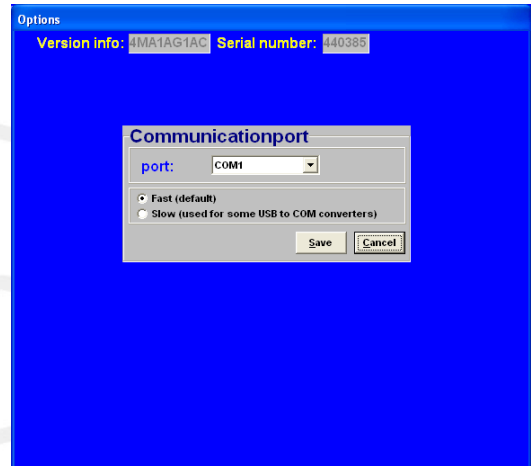
3.2.4.1.18 Communication port

Select the required communication port and save using the 'Save' button.
The MD35 system is based on USB communication.
Depending on your laptop/desktop system your communication port will be selected for you. You can see this on your computer in the hardware profile.
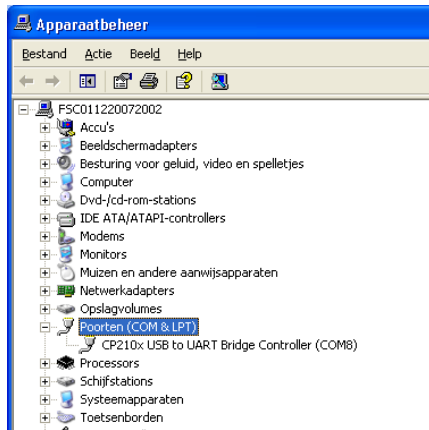
In this example you can see that the USB connection has set to COM 8.

(If you have the datalog software installed, then you can see it in that software. There's an option in de KMS datalog software which automatically searches the right communication port)

3.2.4.1.18.1 Communication with a Windows Vista or Windows 7 based desktop/laptop

Windows Vista and Windows 7 use a different kind of communication compared to for example Windows XP.
The KMS software must be modified to match the compatibility of Windows XP. To match the KMS software compatibility to a Vista or 7 computer, look for the 'KMS motormanagement.exe' file. (if you installed the KMS software the standard way, you can find this file at C:/program files/KMS/KMS Motormanagement).
Click with the right mouse button on this file and select 'properties'. You will now see a screen with some tabs. Select the tab 'compatibility' and set the compatibility mode in this screen to Windows XP SP2. Don't forget to click the box above it to select the compatibility modes.
The KMS software will now 'see' the different communication ports and you will be able to connect the ECU to the computer.
If this is not the case, another communication driver should be installed. These communication drivers can be found on our website. Unpack the file after downloading and double click on the '.exe' file. Follow the instructions on your screen to successfully complete the installation.

3.2.4.1.18.2 Windows Firewall

To start this procedure you must logged in as administrator on your computer. Open Windows Firewall. By default, most programs are blocked by Windows Firewall, to help make your computer more secure. To work properly, some programs might require you to allow them to communicate through the firewall. Here's how to do that:
Open Windows Firewall by clicking the Start button, clicking Control Panel, clicking Security, and then clicking Windows Firewall. In the left pane, click Allow a program through Windows Firewall.
If you are prompted for an administrator password or confirmation, type the password or provide confirmation. Select the check box next to the program you want to allow, and then click 'OK' .

3.2.4.2 Output test

With this test function all final stages can be tested separately without the engine running. The choice is between continuous and pulsating testing, except for the coil test (pulsating only). When the coil outputs are being tested, the tacho output will also emit a pulse every 8 ms.

The option enables the injector output to be tested. A pulsating test lasts 1 minute, during which the injectors are activated for periods of 10 ms, alternating with rest periods of 10 ms.
During a continuous test the injectors are continuously active for 1 minute. The fuel pump is switched on 10 seconds before the test is started, to ensure that the system is at operating pressure.
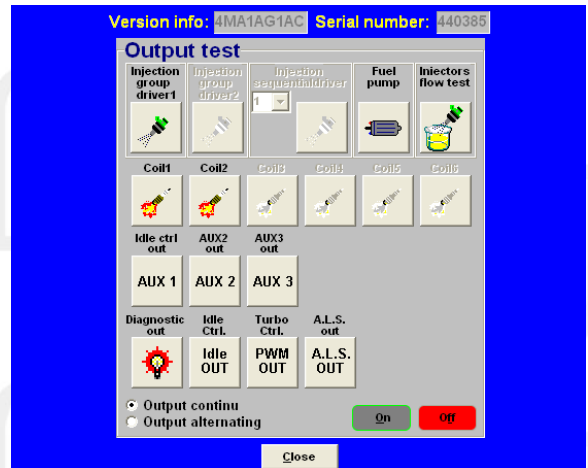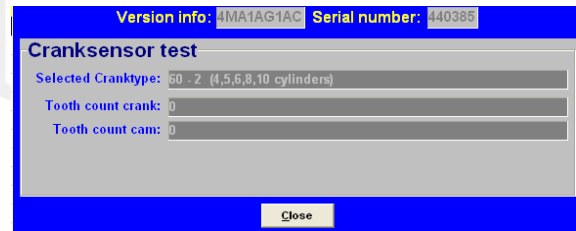

Warning:

When testing the injectors, do not allow the engine to flood – make sure the fuel pump is switched off!

3.2.4.3 Crankshaft sensor test

The crankshaft sensor function is used to check whether the crankshaft position sensor registers the correct number of teeth. The number of teeth shown should be 60 for a 60-2 toothed wheel and 36 for a 36-1 version.
If another reading is shown, check whether the sensor is correctly connected and properly mounted. Electronic interference can occur when the leads are not properly shielded or positioned close to the coil and spark leads. A sensor taking a reading from an external cog may have metal particles attached to it as a result of grinding or drilling. If a failure only starts occurring at higher engine speeds, it is likely that it is caused by sensor vibrations.

Warning:

Crankshaft position sensors have a highly sensitive core. If the sensor is dropped, the core may break as a result of which the sensor will give a weak or incorrect signal.
Electronic interference can occur when the leads are not properly shielded or positioned close to the coil and spark leads.

3.2.4.4 Motor + system diagnostics

In this page different parameters are displayed from wich the values have exceeded maximum or minimum, as well runtime of the ECU etc.

With "save logfile" you can save the diagnostics on your computer. If the adress isn't changed the data will be stored in the KMS Management folder. The name of the logfile can be changed to whatever you want. Keep the extension .log.

You can load a previous log-file by selecting "open log-file". Then select the log-file in the folder where you stored the loge-file and op open it.

Under "reset all diagnostics" de diagnostic trouble codes can be reset.

3.2.4.4.1 Runtime

Here you can check the operation times of the ECU and engine.

Runtime ECU: Indicates how long the ECU was powered.
Runtime > 500 rpm 1:   Indicates the running time of engine above 500 rpm.
Runtime > 500 rpm 2:   Indicates the running time of engine above 500 rpm.

Under " reset runtime > 500 rpm 2" the runtime > 500 rpm 2 can be reset. The "runtime > 500rpm 1" as well as "runtime ECU" cannot be reset.

3.2.4.4.2 Over-revving of the RPM limiters

In this part you can see how many crank turns the engine exceeded the rpm limiter.
Rpm limit 200 up to 400 rpm shows how many crank turns the engine exceeded the limiter by 200 till 400 rpm.
Rpm limit 400 up to 600 rpm shows how many crank turns the engine exceeded the limiter by 400 till 600 rpm.
Rpm limit 600 up to 1000 rpm shows how many crank turns the engine exceeded the limiter by 600 till 1000 rpm.
Rpm limit 1000 rpm and higher shows how many crank turns the engine exceeded the limiter by 1000 or more.
Highest rpm shows the highest rpm that was measured.
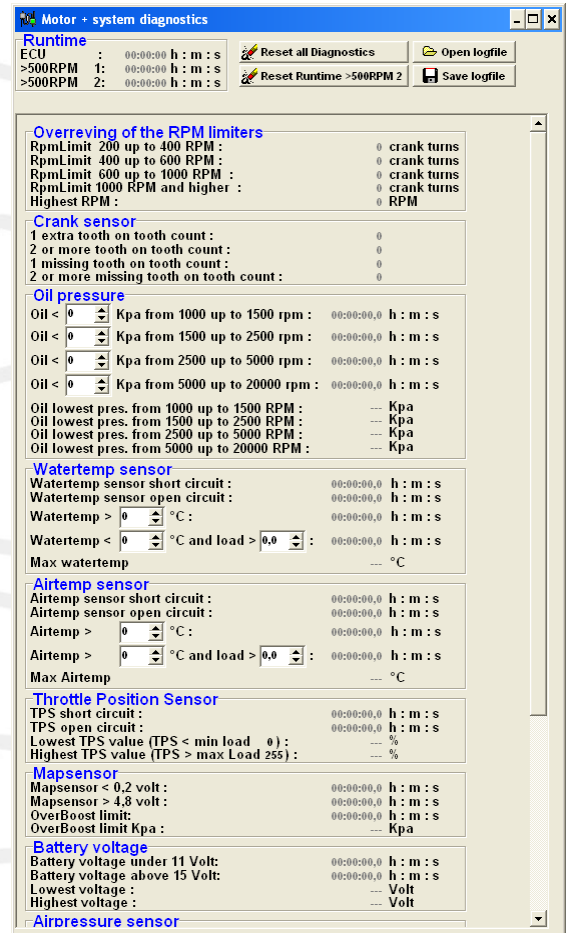
3.2.4.4.3 Crank sensor

In the crank sensor part it is visible how many times 1 or 2 extra tooth(s) were counted or 1 or 2 extra tooth(s) were missing.

```
Crank sensor
1 extra tooth on tooth count :                      0
2 or more tooth on tooth count :                    0
1 missing tooth on tooth count :                    0
2 or more missing tooth on tooth count :            0
```

For example when using a 60-2 trigger wheel. When the system diagnostics shows 1 extra tooth on tooth count, it means that the crank sensor measured a 61-2 trigger wheel. When the system diagnostics shows 2 missing tooth on tooth count, it means that the crank sensor measured a 58-2 trigger wheel.

Missing or having extra teeth can lead to igniting a the wrong moment and can even lead to misfires.

3.2.4.4.4 Oil pressure

The minimum oil pressure can be set here for different rpm's. This has to be setup before, because afterwards when the fault is set in the diagnostics you can't change it anymore, or else the diagnostic data will be lost. When you set the oil pressure, the changes you have made have to be saved to the ECU. The management software will automatically ask if you want to save the changes you made when you close the system diagnostics screen.

```
Oil pressure
Oil <  0   Kpa from 1000 up to 1500 rpm :    00:00:00,0  h : m : s
Oil <  0   Kpa from 1500 up to 2500 rpm :    00:00:00,0  h : m : s
Oil <  0   Kpa from 2500 up to 5000 rpm :    00:00:00,0  h : m : s
Oil <  0   Kpa from 5000 up to 20000 rpm :   00:00:00,0  h : m : s
Oil lowest pres. from 1000 up to 1500 RPM :      --- Kpa
Oil lowest pres. from 1500 up to 2500 RPM :      --- Kpa
Oil lowest pres. from 2500 up to 5000 RPM :      --- Kpa
Oil lowest pres. from 5000 up to 20000 RPM :     --- Kpa
```

If the oil pressure is below the in the rpm range specified oil pressure, time will start counting until the specified oil pressure is reached.

The lowest oil pressures measured for the different rpm ranges are shown.

3.2.4.4.5 Water temperature sensor

This part is for the diagnostics of the water temperature sensor or measurements from the sensor.
The time a short circuit or a open circuit is detected will be shown here.
The time the maximum water temperature is reached or exceeded is shown here.

```
Watertemp sensor
Watertemp sensor short circuit :            00:00:00,0  h : m : s
Watertemp sensor open circuit :             00:00:00,0  h : m : s
Watertemp >  95   °C :                      00:00:00,0  h : m : s
Watertemp <  55   °C and load >  12,0  :    00:00:00,0  h : m : s
Max watertemp                                    --- °C
```

The time the engine is running on a water temperature lower and a engine load higher than the specified water temperature and engine load will be shown here.
The water temperature and engine load have to be setup before, because afterwards when the fault is set in the diagnostics you can't change it anymore. If you do change it, the diagnostic data will be lost. The changes you made have to be saved to the ECU. The management software will automatically ask if you want to save the changes you made when you close the system diagnostics screen.
The maximum water temperature that was reached is shown.

3.2.4.4.6 Air temperature sensor

This part is for the diagnostics of the air temperature sensor or measurements from the sensor.

The time a short circuit or a open circuit is detected will be shown here.
The time the maximum air temperature is reached or exceeded is shown here.
The time the engine is running on a air temperature and a engine load higher than the specified air temperature and engine load will be shown here.
The air temperature and engine load have to be setup before, because afterwards when the fault is set in the diagnostics you can't change it anymore. If you do change it, the diagnostic data will be lost. The changes you made have to be saved to the ECU. The management software will automatically ask if you want to save the changes you made when you close the system diagnostics screen.
The maximum air temperature that was reached is shown.

3.2.4.4.7 Throttle Position Sensor

This part is for the diagnostics of the throttle position sensor or measurements from the sensor.

The time a short circuit or a open circuit is detected will be shown here.
When the TPS value reaches a lower value than the minimum load 0 (steps from 0 until 255) the percentage it deflects will be shown.
When the TPS value reaches a higher value than the maximum load 255 (steps from 0 until 255) the percentage it deflects will be shown.

3.2.4.4.8 MAP sensor

The time the MAP-sensor reaches a voltage lower than 0.2V or a voltage higher than 4.8V will be recorded.
The time the MAP exceeds the overboost limit will be recorded here. The overboost limit in kPa is shown.

3.2.4.4.9 Battery voltage

The time the battery voltage reaches a voltage lower than 11V or a voltage higher than 15V will be recorded.
The lowest and highest battery voltage reached are shown here.

3.2.4.4.10 Air pressure sensor

The lowest and highest barometric air pressure are shown here. Only active when a barometric sensor is connected or present on the main board.

```
Airpressure sensor
Lowest airpressure :                    --- Kpa
Highest airpressure :                   --- Kpa
```

3.2.4.4.11 Overflow injection time

You get overflow of injection time when one injection takes more time than the time for two rotations. The time of these two rotations is the maximum injection time because the upcoming rotation is for the next injection.

```
Overflow injectiontime
Injection time overflows :                  0
Highest injection time overflow :       0,000 milisecond
```

For example a injection time of 23 ms and a engine speed of 6000 rpm. The time of 2 rotations = 1/(rpm/minute)x2 = 1/(6000/60)x2 = 20 ms. The overflow is 23-20 = 3 ms.
When choosing injectors it's important that the flow is high enough so that injection time doesn't occur. When there is a correction on watertemperature injection time overflow can occur when the injector flow is to narrow.

3.2.4.4.12 Lambda control

The total time that the maximum % increase or decrease in fuel has been reached is recorded here as MaxIncLambda or MaxDecLambda. The values for maximum % increase in fuel or maximum % decrease in fuel are set in Lambda Control (see section 3.2.4.1.8 Lambda control).

```
Lambda control
MaxIncLambda :                  00:00:00,0 h : m : s
MaxDecLambda :                  00:00:00,0 h : m : s
MaxIncLambdaError :             00:00:00,0 h : m : s
MaxDecLambdaError :             00:00:00,0 h : m : s
LambdaWarmupErrorTime :         00:00:00,0 h : m : s
```

The time behind MaxIncLambdaError or MaxDecLambdaError is the total time Lambda control was shut down as a result of maximum time at increase or maximum time at decrease in fuel. The time lambda measures maximum increase or decrease before shutting down lambda control can be set as Max time at max increase or Max time at max decrease in Lambda Control (see section 3.2.4.1.8 Lambda control).

3.2.4.4.13 5V sensor supply

The time the 5V sensor supply is less than 4.8V is recorded here. Also the lowest sensor supply voltage is shown here.

```
5V sensor supply
5Volt under 4.8Volt :           00:00:00,0 h : m : s
Lowest value :                       --- Volt
```

3.2.4.4.14 ECU

System status indicator (for manufacturer only).

```
ECU
:                                    0
:                                    0
```

3.2.4.5 Change user access level

Determines security level and access restriction by setting a password.

- ➢ Motor + system diagnostics visible: This menu is displayed

- ➢ Motor + system diagnostics resettable: Reset from menu possible.

- ➢ ECU settings read only: Settings are displayed but not adjustable

- ➢ Display dashboard only: Only the communication bar is displayed (no maps)

- ➢ No access to ECU: No access to ECU
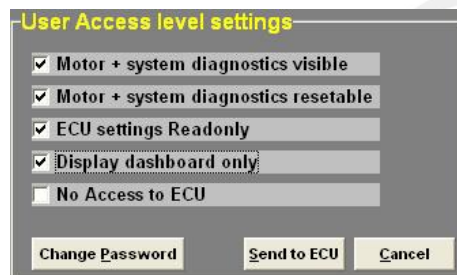
The standard password in the system can be changed to a password you like.

To save the changes made 'click Send tot ECU'

3.2.4.6 CAN settings

The CAN settings can be used for two purposes. Users can check whether the CANbus works properly by pressing on 'search for devices'. The ECU will search for all devices connected to the CANbus and display them under 'current configuration'. This way users can check whether all devices connected to the CANbus really communicate with the ECU. If a connected device (or multiple devices) are not found, please check the CANbus for correct connection and power supply.
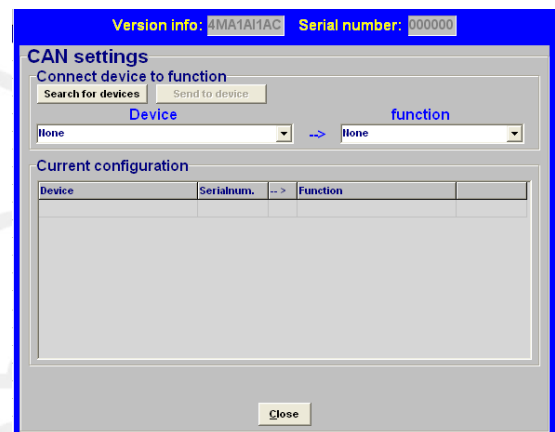
When more than one UEGO CAN controller is connected to the CANbus, the lambda controllers have to be designated to a function; lambda 1 to lambda 16.

Lambda 1 has the highest priority and will be selected first for the lambda control. Lambda 2 has the second highest priority and will be selected as the second lambda controller, etc.
For example when you have connected four UEGO CAN controllers on each cylinder of a 4-cylinder engine, users can set the UEGO CAN controller on cylinder 1 as lambda 1, etc. When a KMS CAN display has been connected, you can display the lambda of all 4 cylinders in accordance to the cylinder number.
Designating the function to the UEGO CAN controllers can be done by selecting the particular UEGO CAN controller (note the serial numbers) under 'Device', and then select its 'function' (lambda 1 to 16). Select 'send to device' to designate the function to the controller.

3.2.5 Function key F5

By clicking this function, correction tables are displayed that allow you to correlate ignition/injection to certain sensor values.

Function key F11 switches between injection correction charts and ignition correction charts.

Coolant temperature correction:

These tables are used to enter figures that indicate the relative richness or weakness (over the entire injection diagram in % and/or ms) at readings that are within the range of the coolant temperature sensor. You can use the diagram in %, or the diagram in ms or even both at the same time.
This enables cold start enrichment to be achieved and it can also be used as a safeguard against overheating, by providing enrichment at unduly high coolant temperatures. Cold start enrichment is essential at low engine temperatures, because the fuel condenses against the cold cylinder walls and is forced out of the exhaust without having been burned. As a result, the mix becomes too weak, so that the engine will hesitate. To compensate for the loss of fuel at low engine temperatures, more fuel will have to be injected.
There is also an option to completely cut off the injection so no fuel will be injected. If you insert exactly -100% in the water temp. correction fields, fuel will cut off.

In the ignition correction table you can enter percentages for more/less pre-ignition. This allows improvement of cold starting abilities for example.

Air temperature correction:

Here figures can be entered that indicate the relative richness or weakness (over the entire injection diagram in %) at readings that are within the range of the air temperature sensor.
As air density is dependent on temperature, the quantities of fuel to be injected will at low temperatures be larger than at high temperatures. This table can also be used to offer protection when the inlet temperature is excessively high, by providing extra enrichment.
In the ignition correction table you can enter percentages for more/less pre-ignition. For example, this helps protect turbo engines from knocking when intake temperatures become too high.

Battery voltage correction:

The battery voltage correction is used to compensate for the opening loss time of an injector. The opening loss time is dependent on the battery voltage and may vary from 1.8 ms at 8V to 0.4 ms at 16V. When battery voltage correction is not applied, the mix will weaken when the battery voltage decreases, with the risk of engine damage. In this table this effect can be compensated for by matching the injector opening time to the battery voltage. The correction values are indicated in ms per injection. For instance, 0.68 ms will be added to the duration of injection when the battery voltage is 12.6V. The table is suitable for injectors with a resistance of 12Ω - 15Ω.

Atmospheric pressure correction:

If you use an internal or separate atmospheric pressure sensor, you can set correction percentages for ambient pressure levels in this table.

3.2.6 Function key F6

This function (idle-control) will show tables and parameters, where you can adjust the fuelling in ms, ignition in degree advance and opening of the idle-valve in %. (500 - 1250rpm)

3.2.6.1 Idle-control options

Settings:

Solenoid frequency: Each control valve has a specific frequency at which it operates best. This frequency can be entered here between 16 and 40 Hz.
Active if: Here you can set when the idle-control is active. It activates under a here specified engine speed an engine load. When idle-control is active the fuel and ignition values will not be used from the main maps, but from the idle maps.
If the KMS idle-control valve is connected, you can set the opening percentage in the idle-valve table. For low water temperatures you can increase the idle-valve opening. You can set up 3 different temperatures between the increase takes place.

Airco settings:

The system can compensate (extra air and fuel) when air-conditioning system is activated.
Tick the box when the airco switch is normally closed. The airco activating signal from the pump needs to be connected on the powershift input pin. For the MD35 this is pin 22. The maximum current on the powershift input pin must not exceed 60mA. With a 12V sensor a resistor of ±1.0kΩ can be used between the signal wire to limit the current.
When the airco is activated on idle extra air and fuel is needed to keep the engine running properly. This is because of the friction in the pump when pumping the Freon gas. The extra air can be delivered by opening the idle valve. The idle valve must be activated in the hardware configuration setup, see 3.2.4.1.7 Hardware configuration. The percentage that the idle valve opens can be set up as Inc. Idle valve. The extra fuel needed for the extra air can be set up as Inc. Injection this is in ms.

3.2.7 Function key F7

When data is changed or downloaded to the system, the screen will show the text 'DATA IS NOT LOCKED !!!'. At the same time, the silver-colour bar of the diagram will change to a yellow colour. This is to indicate that the changes have not been saved yet. Save the changes by pressing the F7 function key.

	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
500	6,49	9,12	11,20	11,60	12,60	13,20	13,40	13,40	13,35	13,50	13,45	13,40	13,45	13,30	13,05	12,80
1000	5,05	6,85	9,94	10,82	11,80	12,44	12,69	13,00	12,95	12,96	13,13	12,86	12,82	12,85	12,65	12,85
1500	4,70	6,70	8,79	10,34	11,19	11,45	12,08	12,47	12,37	12,43	12,52	12,53	12,41	12,49	12,47	12,79
2000	4,22	6,55	8,79	9,75	11,00	11,70	12,67	13,27	13,26	13,49	13,31	13,24	13,31	13,28	13,15	13,43
2500	3,72	6,09	8,51	9,40	10,91	11,87	13,00	13,60	13,77	13,84	13,81	13,86	13,89	13,73	13,87	13,78
3000	3,39	6,26	8,42	9,34	10,45	11,69	12,90	13,64	14,17	14,40	14,43	14,46	14,39	14,42	14,45	14,72
3500	1,00	5,90	8,04	9,07	10,11	11,54	12,68	13,72	14,36	14,50	14,85	14,69	14,73	14,77	15,11	15,59

When the Unlocked **box is clicked, the changes will be saved. If saving is successful, the box will automatically change to** Locked **. Once again, if UNLOCKED is not clicked after the program has been changed, the changes in the system will be lost when the power supply to the system is broken.**

3.2.8 Function key F8

This function key allows temporary activation/deactivation of the air fuel ratio feedback control. However, the control will resume if the system has been without voltage or if the F8 key is pressed again.

3.2.9 Function key F9

With this key the interpolation between the boxes can be switched on or off. When the interpolation function is on, interpolation to the surrounding boxes will take place during engine operation, taking account of engine speed and engine load. When the interpolation function is off, there will be no interpolation to adjacent boxes, but the value shown in the box matching the situation in which the system is functioning at that moment will be adhered to.

3.2.10   Function key F10

communication is offline

Press F10 for online

Function key F10 offers the choice of working off-line or on-line. It switches communication with the system on or off. Communication will also be stopped when the power supply to the system is broken. If there is no communication, a red bar will appear at the bottom of the screen. To resume the communication with the system, function key F10 should be pressed. A menu will appear offering a choice between loading the file on the PC to the system and loading the file in the system to the PC. There will still be the possibility of breaking the communication again.
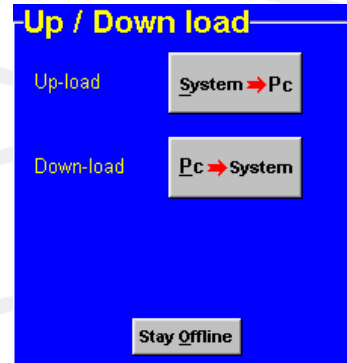
Warning:

Make sure that the battery of the vehicle supplies more than 10V. If the battery doesn't exceed 10V the changes you made to the ECU will not be saved.

Tip: On vehicles with an ignition lock switched in such a way that the power supply to the system is cut off when the engine is started, always download the data from the PC to the system (as in the PC the modified data will not get lost when the power supply to the system is broken). This is of course only necessary if the data has not been saved to the system.
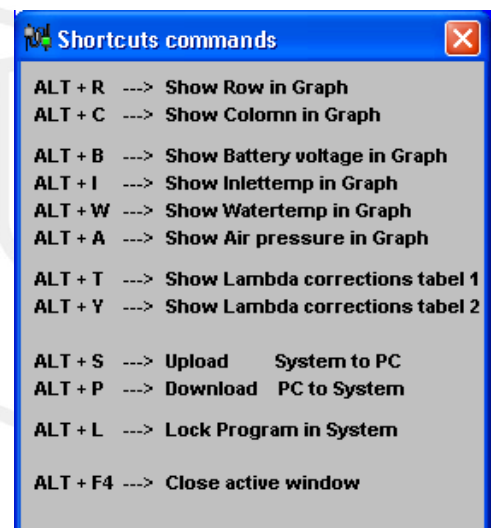
3.2.11   Function key F11

This function key is used to toggle between the injection diagram (blue) and the ignition diagram (red).

3.2.12   Remaining shortcuts   Alt + H

To activate this menu press Alt+H. In this menu the remaining shortcuts are shown.

3.3 The communication bar

The horizontal bar at the bottom of the screen is the communication bar. If the system is connected to the COM or USB port of the PC and the power supply to the system is on, function key F10 can be used to activate the communication.
There are nine check lights in the communication bar, which indicate the status of the relevant outputs.
The following readings will show:

These readings can be used to check whether the right sensors are being used and all settings are correct.

There is an option to get an enlarged picture of the lambda sensor reading by clicking on the display bar. An extra reading window will appear at the top of the screen.

0,0
A/F ratio

0,0
A/F ratio aux in
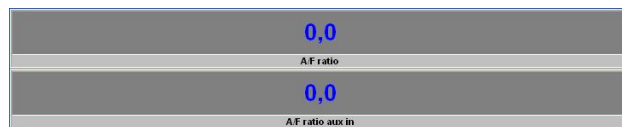
4 Programming

Before programming is started, all connections and sensors must be checked. Look at the communication bar to check the sensors for correct functioning and setting.
If everything is in good working order, the programming of the diagrams can be started.
There are four ways of changing the values shown in the diagrams:

- Filling in the data manually

- Making changes using potentiometer and button (mapping box)

- Changing bar charts using arrow keys

- Changing 3D graph

4.1 Manual changing

By checking a control box, the relevant parameter can be set manually.
If a control box has been selected, an edit menu will appear that allows you to change the selected values in various ways.
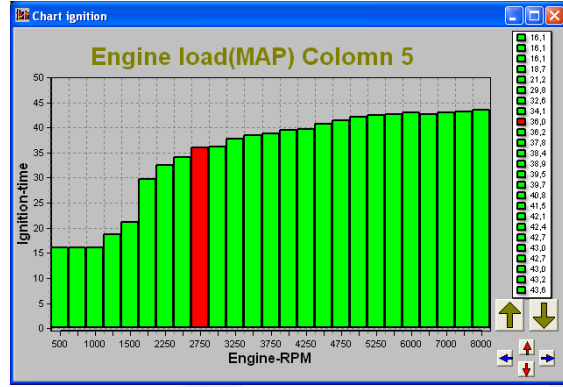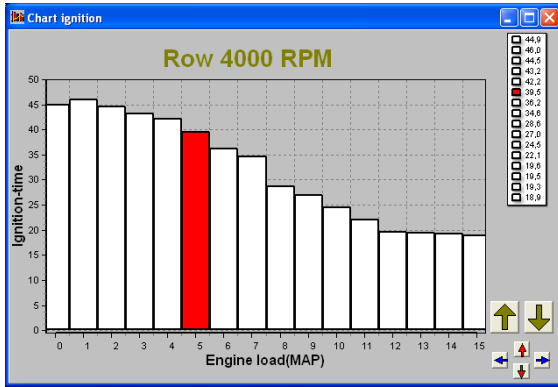
4.2 Bar charts

The columns or rows of the diagrams can also be shown in the form of bar charts. The bar charts will appear when an engine speed or engine load value is clicked. If an engine speed is clicked, a bar chart will appear showing all the values related to that engine speed.
If an engine load value is clicked, a bar chart will appear showing all the values related to that engine load value. Access to the bar charts can also be obtained by pressing the ALT + C keys or the ALT + R keys simultaneously. The thin yellow line in the graphs of the injection diagram indicates the maximum duration of injection for the engine speed concerned. If the yellow line is exceeded, injection time overflow occurs (see section 3.2.4.4.11 Overflow injection time).
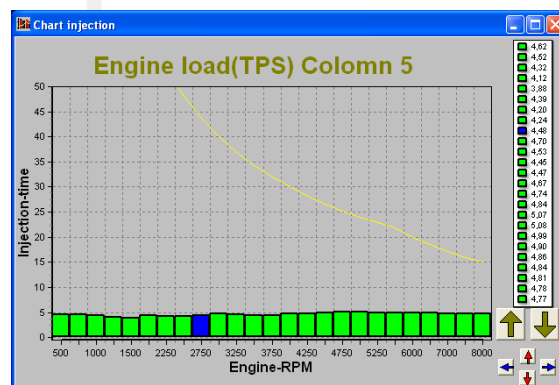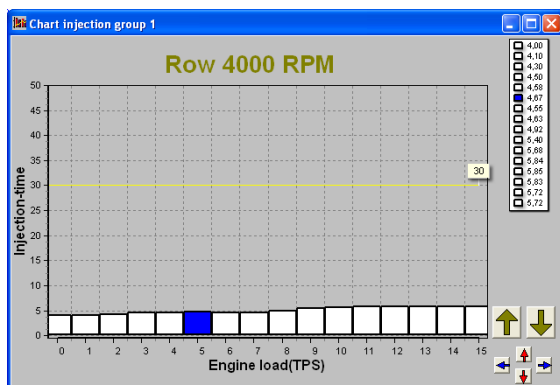
It is also possible to modify the diagram values in the bar charts by using the arrow keys, or the arrow keys in combination with the Ctrl or Alt key. The left/right arrow keys can be used to move through a column or row. When the upward or downward arrow key is used, the value will go up or down 0.10 with each touch of the key. If the Alt key is pressed simultaneously, the value will

change 0.01 per touch and if instead of the Alt key the Ctrl key is pressed, the value will change 1.00 per touch.

When the engine is running, the space bar can be touched to go automatically to the relevant value in the bar chart (matching the current situation of the engine), even when this value is at another engine speed or engine load.
To go to another engine speed or engine load, use the Page Up / Page Down keys.
The correction tables can also be shown in the form of a bar chart if a correction figure is clicked. And here can also the arrow keys be used to change the values.
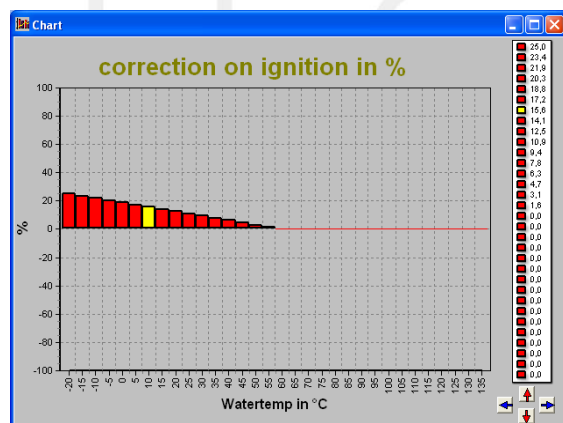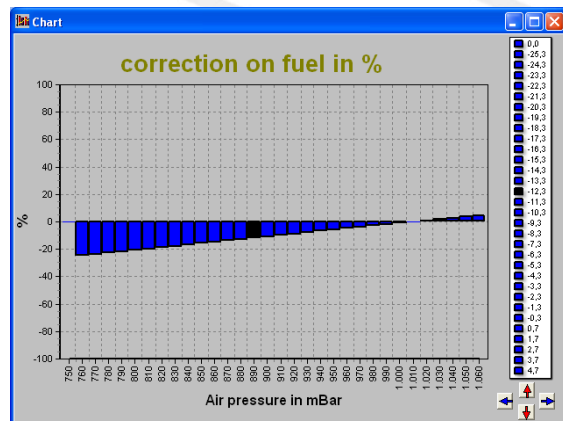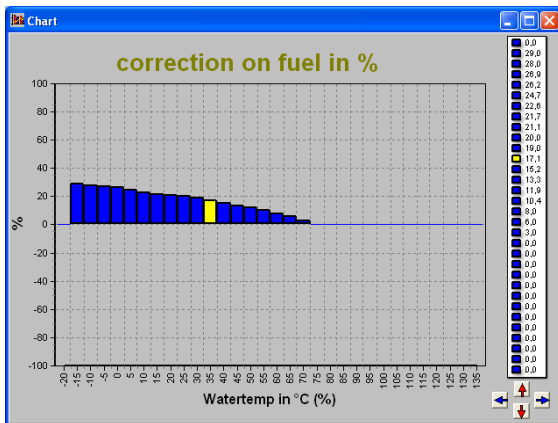
4.3 3D graph changing

The combination of columns and rows of the diagrams can also be shown in the form of one 3D graph.

You can go to an engine speed-engine load by moving the yellow spot using the arrow keys.

When the Ctrl key is pressed simultaneously with upward or downward arrow key, the value will go up or down 1.00 with each touch of the key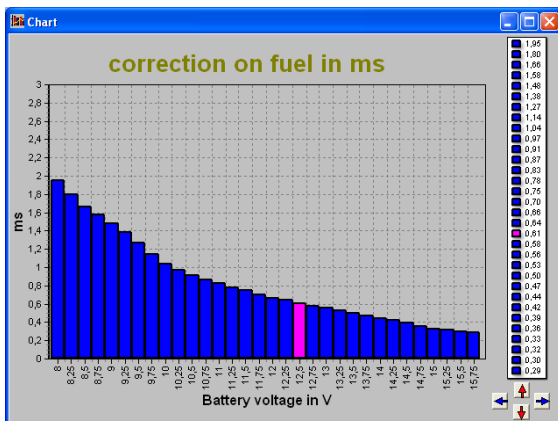. I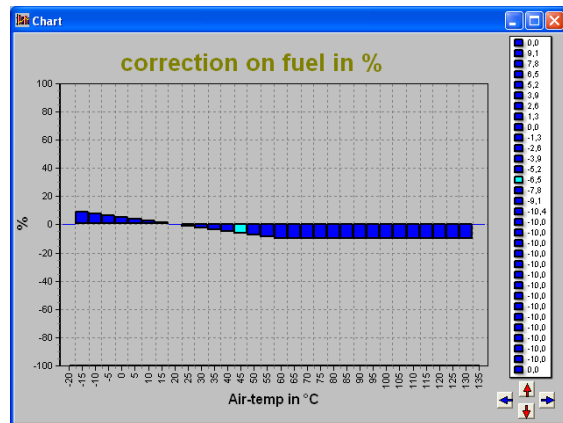f the Shift key is pressed simultaneously, the value will change 0.10 per touch and if instead of the Shift key the Alt key is pressed, the value will change 0.01 per touch.
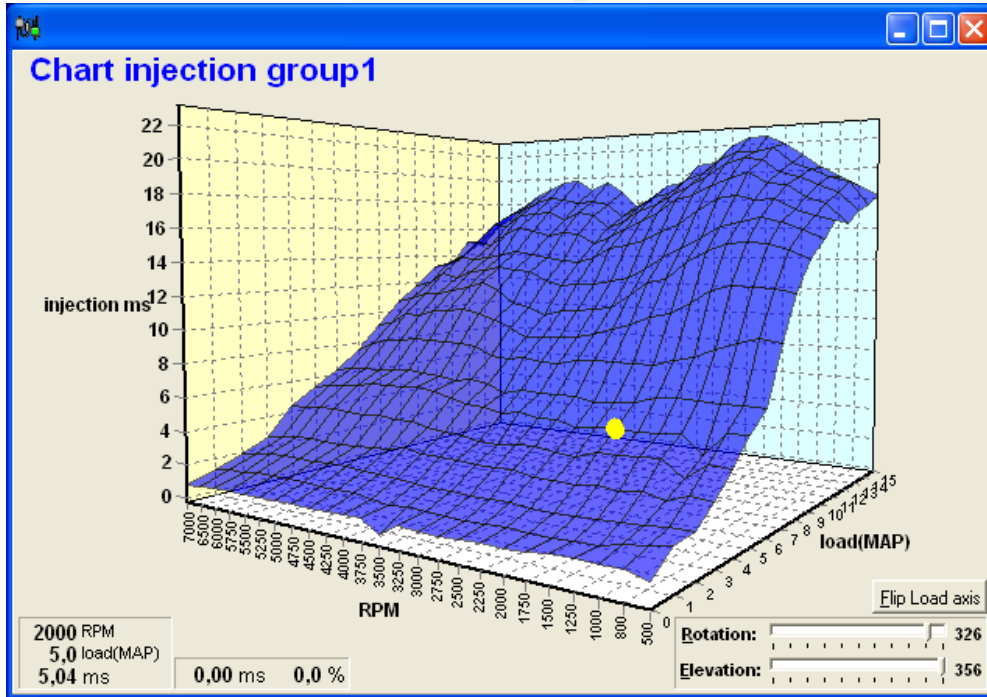
5 Hardware installation

To guarantee that the system functions properly, it is of utmost importance to adhere to the instructions given below.

5.1 Fitting the ECU

It is important that the ECU should be fitted in a dry and not too hot place. When fitting it, make sure that the cover is readily accessible for easy removal. Removal is necessary for the connection of a communication cable.

5.2 Connecting the communication cable

There is a cover at the front of the ECU. Removing this cover gives access to the communication connector. A standard USB cable (A-male : B-male) can be connected to this connector. This cable is included in the standard package.

6 Fault tracing

Fault	Possible causes	Solution
No communication between PC and system	- No power supply to the system	- Switch the contact on or check the fuse
	- Defective or incorrect communication cable	- Use a USB A Male – USB B Male data cable
	- Cable connected to wrong COM port (standard is COM3)	- Connect cable to COM3 or select another COM port; see section 3.2.4.1.17 Communication port
Engine does not start	- No engine speed signal	- Check the sensor and wiring
	- Crank Type set is not correct	- See section 3.2.4.1.1 RPM pickup
	- Start-up menu settings are not correct	- Set duration of injection to the correct value
Poor engine starting when the engine is cold	- Engine temperature correction table not correctly set	- Set correction table correctly
Poor accelerator to engine response	- Incorrect setting of acceleration enrichment	- Adjust values in throttle pump effect menu
	- Defective engine load sensor	- Check whether the engine load indicated on the dashboard changes evenly when the accelerator is slowly depressed
	- Engine load sensor not calibrated	- See paragraph 3.2.4.1.3 Engine load sensor
Temperature reading gives incorrect value	- Wrong type of NTC temperature sensor	- Fit the correct temperature sensor; see the Appendix about sensors on the CD-ROM for the correct type
Temperature reading gives --- in the communication bar	- Sensor not connected or short circuit in sensor wiring	- Check the wiring
Auto calibration gives message 'warning range too small'	- Sensor range too small or potentiometer connected incorrectly	- Check the wiring - Fill in the values of the engine load sensor manually
Auto calibration gives message 'warning signal reversed'	- Throttle valve potentiometer turns in the wrong direction	- Interchange the earth and 5V wiring of the potentiometer
Auto calibration gives message 'engine load sensor not connected'	- The engine load sensor signal does not change	
	- Interruption in potentiometer signal wiring or potentiometer does not turn when the throttle valve is opened	
Only coils 1-4 give ignition	- Dis coil box not ticked	- See paragraph 3.2.4.1.1 RPM pickup

7 Specifications

Minimum system requirements:

Windows 95,98,2000,NT,ME,XP or Vista
Internal memory 32Mb
Screen resolution 1024x768
Standard USB port
CD-ROM station
Acrobat reader 3.0 or higher (Acrobat reader 4.0 is included on the CD-ROM supplied)

ECU specifications:

Supply voltage 8.5 - 16V
Power consumption 200 mA at 12V
5V supply to sensors can have maximally 100 mA

Inputs:

Inputs are protected up to 50V.

Input for coolant and air temperature is suitable for an NTC-sensor as standard.
(2,2 kΩ at 25° Celsius)

Input for engine load is suitable for potentiometers, air mass meters and map sensors with an output between 0 - 5V.

Outputs:

Injector output can deliver at most 7A at 12V (for instance 6 injectors with a resistance of 16Ω)
Shift-lamp, AUX, cooling fan and fuel pump outputs: max. 1A at 12V per output

Dimensions:

MD35

LxWxH: 126 x 98 x 36 mm

Weight: 440 gram

8 Wiring diagram MD35

Standard colours KMS management MD35 wiring loom					
Pin nr. KMS	Colour	Length	Diameter: 0,5mm²	Diameter: 0,75mm²	Function
1	red		*		CAN High
2	green		*		CAN Low
3	orange/black		*		Boost Control
4	yellow/red		*		Idle Control
5	white/black		*		Fuel pump relay
6	yellow/green		*		Diagnostic out / Ignition output 6
7	blue		*		Aux 1 out
8	pink		*		Aux 2 out
9	yellow/red		*		Aux 3 out
10	white/black			*	Power output2: Injector output 2 / A.L.S.
11	white			*	Injector output 1
12	red			*	12V injector supply
13	orange		*		Ignition output 1
14	green		*		Ignition output 2
15	purple		*		Ignition output 3
16	pink		*		Ignition output 4
17	blue		*		Ignition output 5
18	red/black		*		Tacho output
19	black		*		Sensor ground: water / air / MAP / TPS / etc.
20	yellow		*		5V sensor supply
21	yellow/black		*		Launch control
22	green/red		*		Powershift / Airco
23	black			*	ECU ground
24	orange/red		*		Analog aux 3: A.L.S. / launch / gearpos / map selector / EGT(1)
25	purple/red		*		Analog aux 2: A.L.S. / launch / gearpos / map selector / EGT(2)
26	pink/black		*		Oil pressure signal
27	grey/blue		*		Water temperature signal
28	red/blue		*		Air temperature signal
29	grey/black		*		MAP signal
30	grey		*		TPS signal
31	white		*		Lambda signal 1
32	white/red		*		Analog aux 1: Lambda signal 2 / gearpos / map selector
33	red		*		Crank-sensor signal inductive
34	red/green		* (shielded)		Hall input: Crank / Cam
35	red			*	12V ECU

Appendix 1: Trigger wheel drawings

FORD 36-1
engine in TDC

reference point

honda bike engine 4 cyl.
reference min 60 max 70
engine in TDC

reference point

bosch 60-2
engine in TDC

reference point

Toyota 36-2
engine in TDC

reference point

renault / rover 4 cyl. with distributor
engine in TDC

reference point

rover k series
engine in TDC

reference point