MaxxECU
engine management

English manual for MaxxECU Engine management

2015-02-18

Refers installation with wiring harness ”Flying lead” and
MTune PC applications.

Important Information!
(must be read before installing)

Maxxtuning.eu

Dynotuning ■ Engine Management ■ Motorsport

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Text marked with "blue" in this manual are references to the PC program MTune. Internal references to sections or pictures are made with p**owerful text**.

MTune screenshots of version 1.57.

Introduction to MaxxECU.

MaxxECU is an electronic engine management system that controls: injection, ignition, boost, idle motors, fans , etc. and works with almost all 4-stroke engines.

This manual will give you guidance in performing a reliable installation of MaxxECU as well as instructions to how the PC program MTune works. This manual is intended for people who have the knowledge and understanding of how the engine and its electronics work together.
Misuse of MaxxECU or MTune can cause engine / electronics or personal injuries/damages.
Maxxtuning AB and it's retailers assumes no responsibility for the engine / electronics / personal injuries that may occur if incorrectly used.

It is strictly forbidden to open and try to "repair" an MaxxECU unit , all service must be performed by Maxxtuning AB Sweden!

Maxxtuning AB assumes no responsibility for errors or accidents caused by:
Faulty installations and/or repairs not performed by Maxxtuning AB.
The product must be installed by skilled and trained personell in accordance with the instructions presented in this manual! This is important!

The contents of this manual are copyrighted by Maxxtuning AB and may only be spread through maxxtuning.eu
All, or parts of this manual may not be copied, or used for any purpose other than support for MaxxECU.
Modification of its content is prohibited!

Contents on delivery:

- MaxxECU unit including mounting hardware and a bluetooth mobile antenna.
- Wiring harness (also known as: flying lead).
- Additional cables for stripping.
- 12-pin connector to the wiring harness.
- USB-memory with MTune PC applications.
- USB-cable for data communication between MaxxECU and PC (MTune).
- Bosch LSU 4.2 wideband lambda sensor.
- Bosch LSU 4.2 connector.
- Pneumatic fittings and tubing for connection to MaxxECUs internal MAP-sensor.
- This manual.

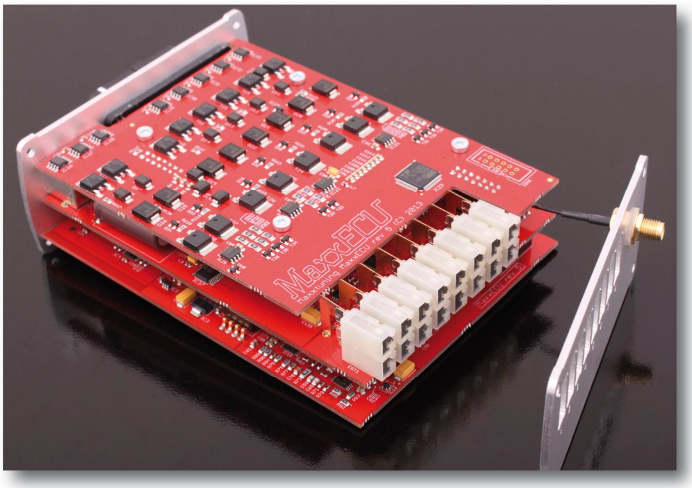
The PC software, MTune, is copyrighted by Maxxtuning AB and may only be spread through maxxtuning.eu/maxxecu/
(We welcome your comments on the MTune PC applications and functions in MaxxECU to make a better product!)

MaxxECU will always be delivered in a nicely packaged box with all accessories.

1 - Technical specifications.

- 4,5,6,8,10 and 12-cylinder engines.
- Up to 8 cylinders full sequential.
- Up to 16 cylinders in waste-spark mode.
- Supports markets most common trigger systems (VR or digital (hall, opto) sensor).
  Standard "missing tooth" (12-1 till 150-4). Recommended to use the 60-2 trigger wheel.
  Multitooth trigger (4+1 till 150+4).
  Audi 5-cyl.
  Nissan CAS.
  Mitubishi 4/2 + 4/2 inverted mode.
  GM LSX 24x.
  Honda K20Z4 12+1 crank with 4+1 cam sensor.
- 8 individual injector output, switchable "peak and hold" power.
- 8 ignition output, 5v operation of ignition modules, CDI units or ignition coils.
- 8 outputs for extra features. Fuel pumps, idle valves, boost control valves, gear-shift light, fans, etc. Max 1.5A.
- Inputs
  Intake air temperature sensor (IAT), Bosch, GM, user-defined sensors.
  Engine coolant temperature sensor (CLT), Bosch, GM, user-defined sensors.
  Throttle position sensor (TPS). Linear sensors are required. Not polarity sensitive (automatically during calibration).
  Lambda sensor. Built-in driver for wideband oxygen sensor (Bosch LSU 4.2).
  2 trigger inputs. VR, hall or opto. The signals are processed by a completely separate processor for maximum per formance and ferrites.
  2 extra temperature inputs.
  2 extra 0-5v inputs, for example, measurement of exhaust back pressure, fuel pressure, oil pressure, etc.
  2 extra digital inputs for example RPM/speed sensor or switches.
  8 exhaust gas temperature (EGT) amplifiers built-in.
  CAN-buss for expansion modules.
- USB connection to PC.
- Bluetooth (wireless) connection to mobile devices. Android app for download on our website.
- Up to 8MB internal logging memory (Rev 7+). Earlier REV has 4MB.
- Up to 100Hz internal logging speed.
- 8-22v power supply to the ECU.
- Main processor ARM Cortex M3, 120MHz, with 3 co-processors for the management of trigger, injectors and EGT.
- Resolution on ignition: 0.1degree.
- Resolution on injectors: 0.001ms.
- Updates the fuel and ignition 2000times each second!
- Selectable voltage to tachometers (GPO8) output (REV4+).
- DIN1 / 2 can be used with the VR sensor directly (REV7+).
- Up to 8A on each injector output (REV 7+). Former REV has 4A max per output).
- Internal wideband lambda can measure lamba below 0.65 (for methanol) with the standard LSU 4.2 sensor (REV6 +).

We continuously update MaxxECUs hardware and thus it may differ a bit between the different versions (REV).
Every MaxxECU is equally from scratch and use the same software (MTune) and are backward compatible.



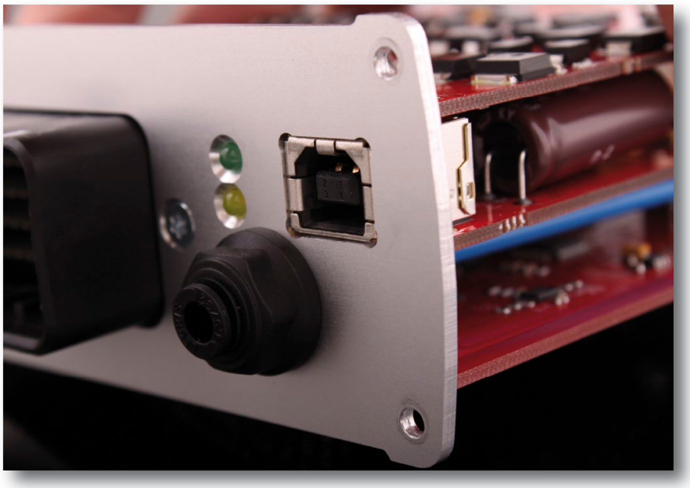


Fig 1a - MaxxECU control electronics, without protective cover.

Fig - Included. Bosch LSU 4.2 wideband connector.

Fig - Included.16-pole connector.

Fig - Included. extra cabling for stripping of flying lead.

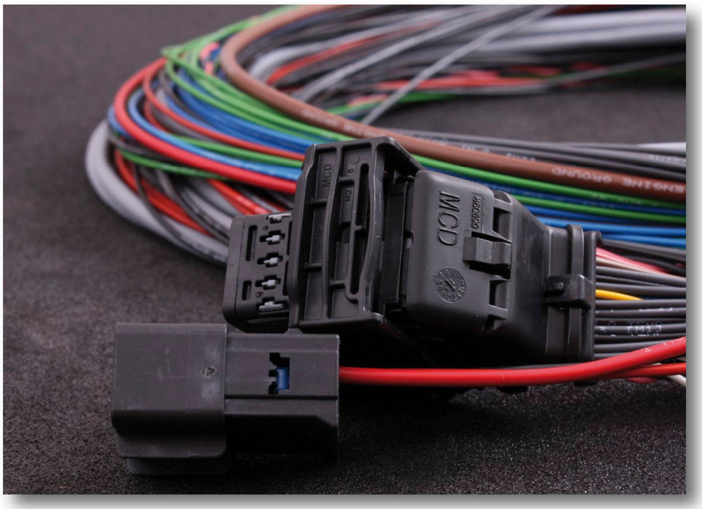


Fig - Included. connector premounted on flying lead.

Fig - Included. printed shrink-hose intended for heatshrinking the cutted triggercables in the engineroom for easy identification of cables.

Fig - Included. USB-cable for PC connection.

2 - How MaxxECU controls the engine.

MaxxECU takes information from connected sensors, and treats them according to setting made in MaxxECU, and controls the engine through different outputs.

MaxxECU reads the engine RPM from a triggersensor (**5.1.2**), which sends pulses recieved from a trigger wheel (**5.1.3**).
The engine load, is processed by a throttle position sensor (TPS) and pressure sensor (MAP). Since the density of air differs alot at different temperatures, an inlet temperature sensor is needed. The air density (number of oxygen molecules needed for combustion of our fuel mixture in the engine) vary widely for different air temperatures and, therefore, a intake air temperature sensor (IAT) for MaxxECU is needed to be able to correct the fuel mixture.
A cold engine requires additional fuel at start-up and during the warmup phase, therefore MaxxECU REQUIRES a CLT (Coolant Temperature sensor) to function. Extra fuel is also required immediately at startup to wet the walls, for example, the intake.
Heavy acceleration also requires additional fuel supplement, and this is done with signals from throttle position sensor (TPS), RPM and boost pressure (MAP). MaxxECU supports additional tables for compensation, based on measured values.
The built-in barometer compensate for differences in height depending on where in the world you are, a very small correction to the fuel is required depending on the air pressure.
MaxxECU also has a built-in driver for wideband lambda sensor which allows the emission requirements can be met.
Activation of this compensation on the fuel, also results in reduced fuel consumption!
If the exhaust gas temperature sensors are used, MaxxECU can add fuel per cylinder or generally if the exhaust temperature for some reason become too high.
Buttons or additional readings can be switched on and, control outputs and features!

Ignition advance angle is controlled by the engine's all connected sensors.
How much throttle (TPS), boost pressure (MAP), coolant temperature (CLT) and the intake temperature (IAT) is a couple of the input sensors that affect the ignition advance. Here are options for secondary tables, for additional compensation.
When the engine is cold, we usually want to run a little more ignition to keep up the RPM, likewise if the intake temperature is lower, one can increase engine firing position (ignition advance). Sometimes you need to make a quick spark retard when the driver presses on the accelerator quickly, all these functions are built into MaxxECU and calculated in real time!

MaxxECU not only controls the ignition coils and injectors, but also controls the idling solenoids/motors, boost solenoids, fuel pump, etc.
All these output signals are controlled based on the settings made in the MaxxECU unit, via the PC software MTune!

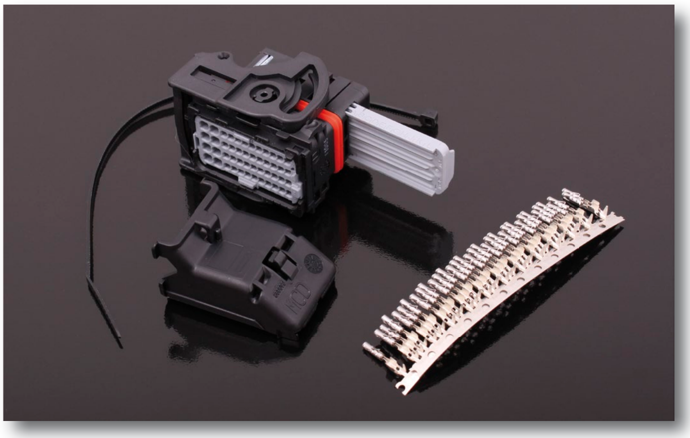


Fig 2a - MaxxECU connector (Molex) can be purchased as a "spare part" if anyone want to build a completely custom wiring harness. NOTE! MaxxECU is normally always delivered with "flying lead" harness where this connector already is installed! See Figure **4.1.2a**

3 - Cable Stripping and bonding.

A bad wiring will cause problems!! We will therefore explain how to strip cables and to crimp connectors in a professional way!

3.1.1 - Stripping wires.

The following three images show cable stripping, and must be done regardless the joint manner.

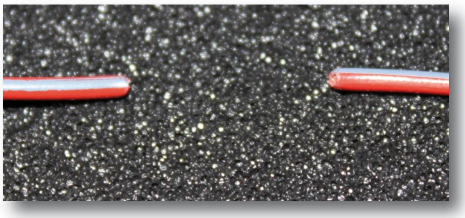


Fig 3.1.1a - Cut cable.

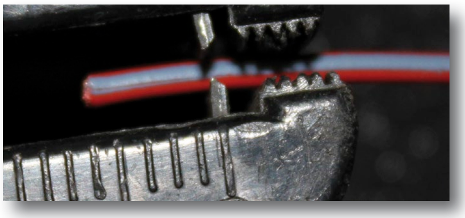


Fig 3.1.1b - Use correct wire stripper to strip away the protective plastic. Strip off about 5-10mm.

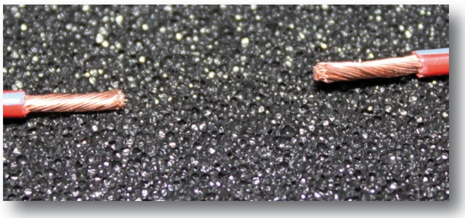


Fig 3.1.1c - The cable ends stripped and twisted together to not "splay" apart.

After the cable-ends are stripped, join the wires with either a sealed wire strip or soldering. We recommend sealed wire strips for a easy and reliable connection

3.1.2 - Strip with glue! (do not use strip connectors without glue, threads come off easily and is not waterresistant!)

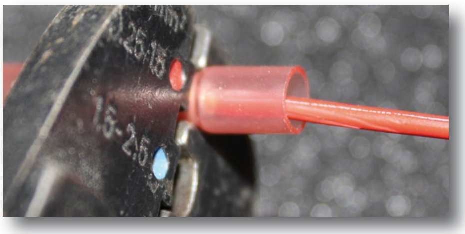


Fig 3.1.2a - Insert the stripped cable into the connector, and crimp the strip with a quality crimp tool. Do this with both cable ends.

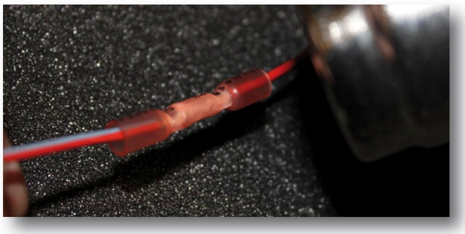


Fig 3.1.2b - Heat the connector with a heat gun until it starts to shrink and the adhesive starts to flow.

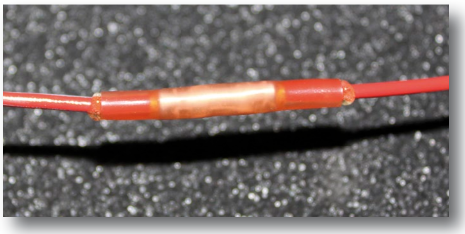


Fig 3.1.2c - Finished cable joint. There should be no burns on the cable, and glue should protrude past the ends.

3.1.3 - Solder joint and heat shrink tubing.

This method should be used with extra caution! IF done incorrecltу, one or more strands can "stand out" from the solder and poke through in the shrink tube and result in short circuit and other problems!
Use heat shrink tubing with a thicker wall (with glue). These can be purchased at maxxtuning.eu.

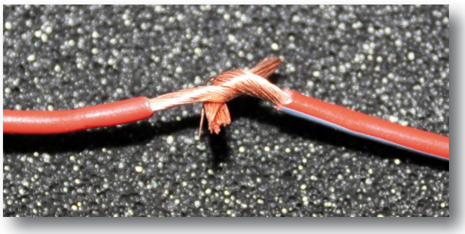


Fig 3.1.3a - Twist the wire ends, so that no cable strands stand out!

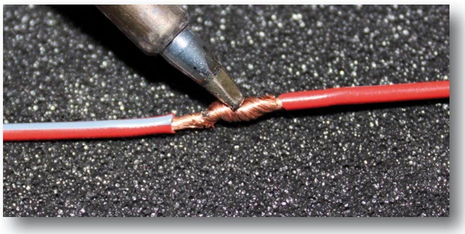


Fig 3.1.3b - Heat the wire with a soldering iron, add solder to the conductor itself (not on the soldering iron) hold the soldering iron until you see that the solder "flows" out, hold for a few seconds without melting cable.

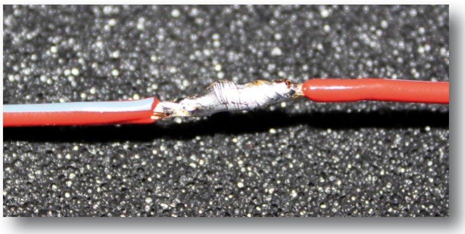


Fig 3.1.3c - Example of a good solder joint, where you can clearly see that the tin has entered everywhere! There is an art to making stylish and durable solder joint, practice makes perfect!

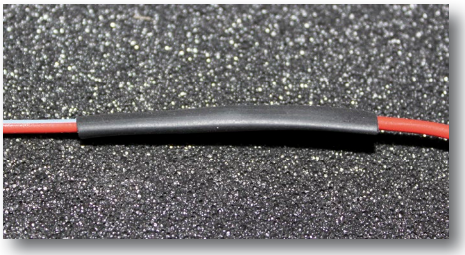


Fig 3.1.3d - Pull the shrink tube and place it over the center of the joint.

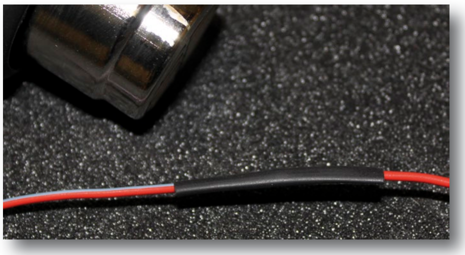


Fig 3.1.3e - Heat shrink tubing with a heat gun until it shrinks around the cable.

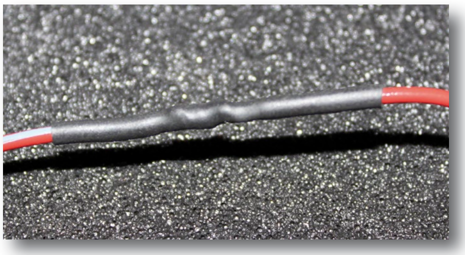


Fig 3.1.3f - A good, sturdy, solder joint with heat shrink tubing looks like this!

3.1.4 - Cable bonding.

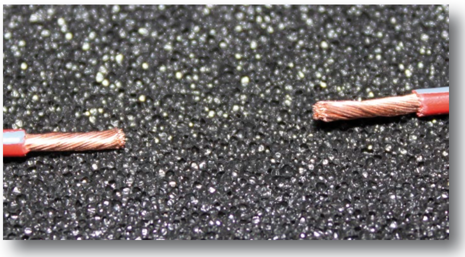


Fig 3.1.4a - Strip and twist the wire ends as described in 3.1.1.

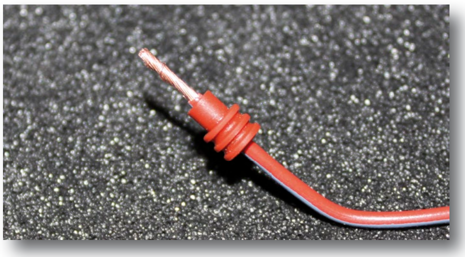


Fig 3.1.4b - Slip on the supplied rubber gasket as shown.

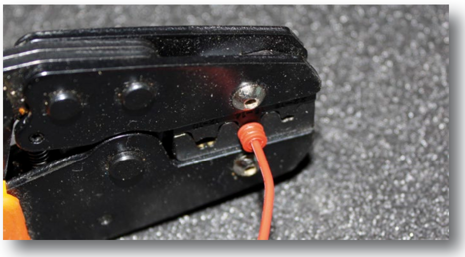


Fig 3.1.4c - Thread the cable with the seal in the cap and crimp with a quality crimp tool.

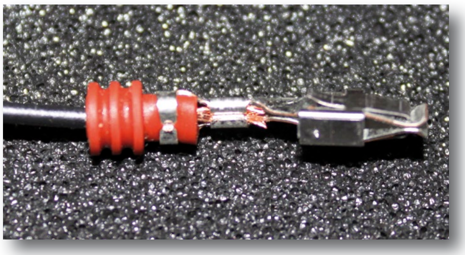


Fig 3.1.4d - A good bonding, pin both isolation (strain relief) and the electrical conductor.

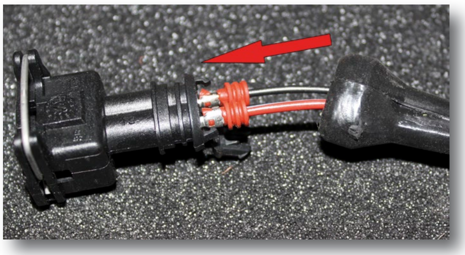


Fig 3.1.4e - Insert the contact pin in the connector until you hear a "click". The pins should not be pressed in with force.

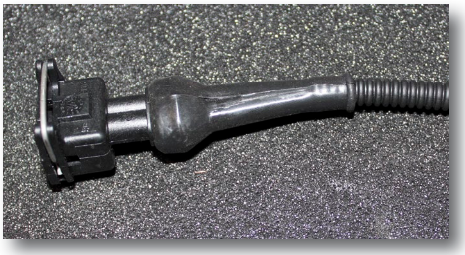


Fig 3.1.4f - Cover over with protective rubber and dress cable with slotted protector tube.

3.1.5 - Cable bonding (if the correct crimping tool is missing)

If proper crimping tool for the connector pin is missing, bonding can be made with needle nose pliers and soldering.

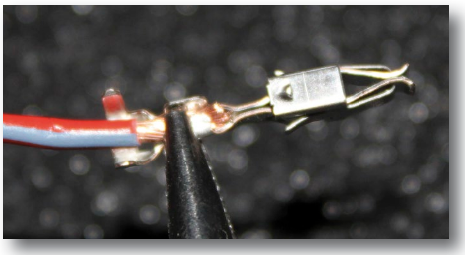


Fig 3.1.5a - Clamp scaled cable with beak pliers.

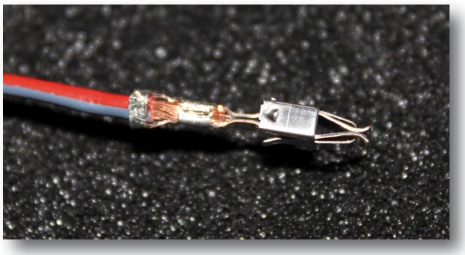


Fig 3.1.5b - Squeeze the strain relief, ensuring that the cable insulation really clamped in the outer portion of the pin.

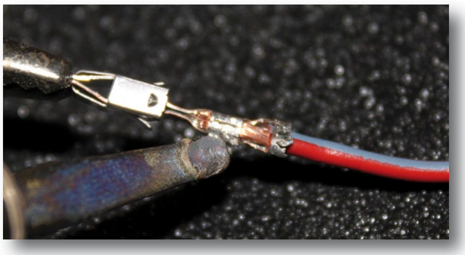


Fig 3.1.5c - Heat up the pin with a heat gun and add the solder, melt together.

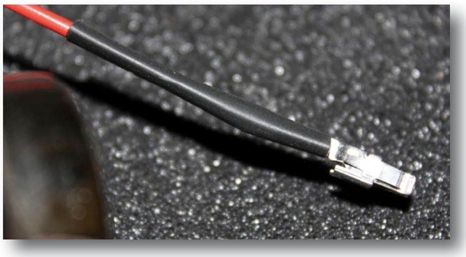


Fig 3.1.5d - We recommend using heat shrink tubing with glue! in this case to protect, cover and heat with a heat gun.

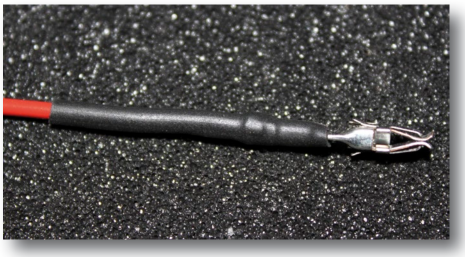


Fig 3.1.5e - A finished cable bonding that has been done with soldering.

3.1.6 - Removing the connector.

Maxxtuning AB is storeholder of tools for removing more common connectors and pins.

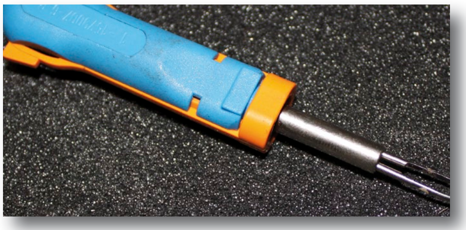


Fig 3.1.6a - Tool to safely remove contact pins without marring the connector.

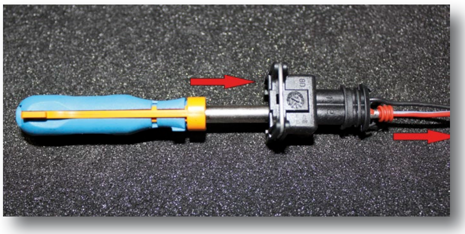


Fig 3.1.6b The tool is used simply by squeezing the guide pins on the pin that holds it firmly in the connector. Before the tool is pressed into the pin it must be pressed from behind to enable the guide pins releasing the connector.

3.2.1 - Sensor connectors (not supplied) and wiring.

Use new connectors to the fullest extent possible! Some car models have connectors that can be very difficult to obtain, then they should simply strip (see Chapter 3) in on existing cables and make the safest installation possible!
Use corrugated tubing/tape to protect the cables from external influences.

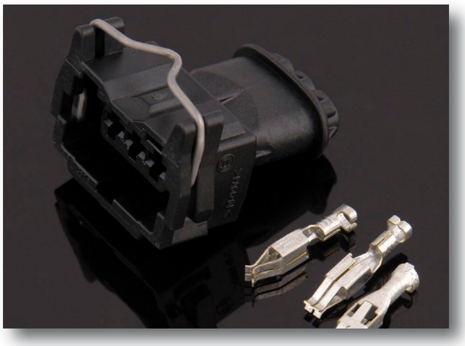


Fig 3.2.1a - Bosch JPT standard-connector.

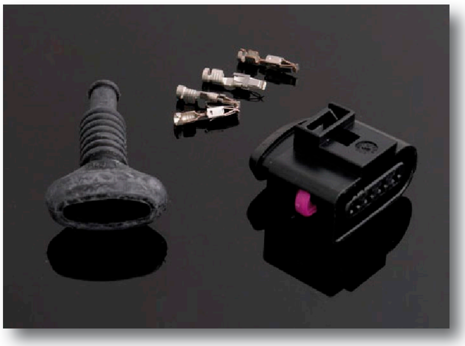


Fig 3.2.1b - Examples of VAG connector for the ignition coil with built-in amplifier.

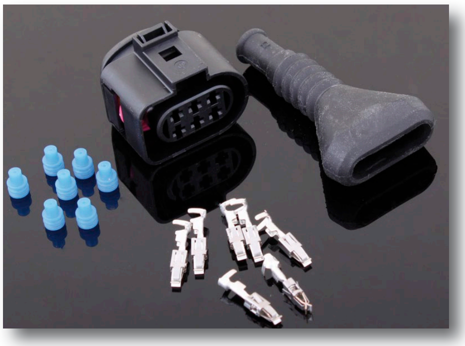


Fig 3.2.1c - Bosch LSU 4.2 connector that is always included in a MaxxECU package. (Also Bosch sensor included in delivery).

Fig 3.2.1d - Robust and durable slotted protector tubing for fancy installations is something that should always be used!

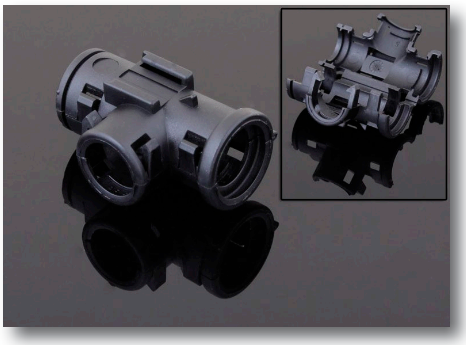


Fig 3.2.1e - To tidy pieces together the various tubes, we have these splicing sleeves to buy.

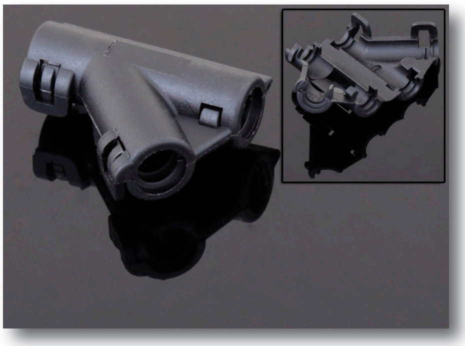


Fig 3.2.1f - Splicing sleeve for missile tubing, y-execution.

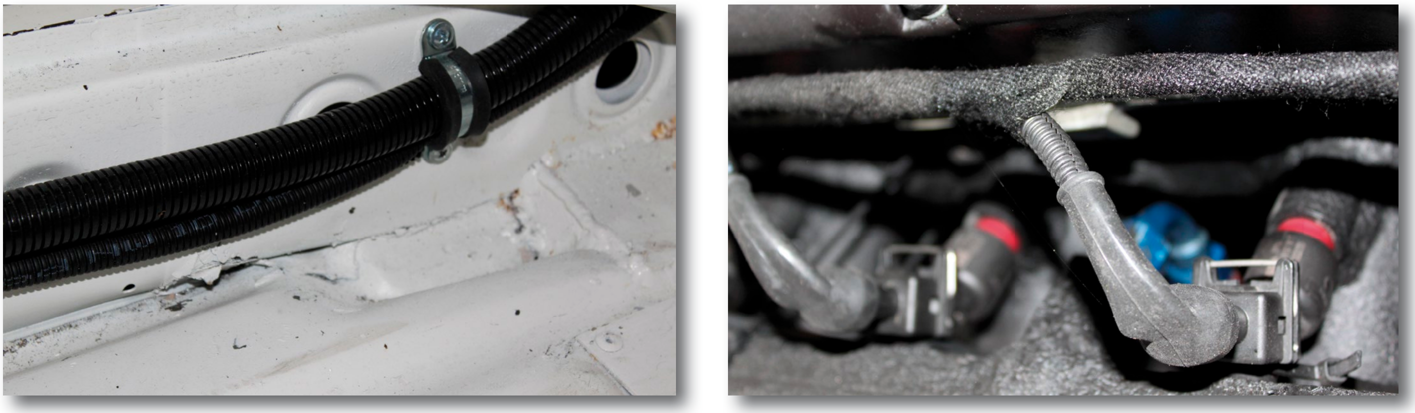


Fig 3.2.1g - Examples of the use of corrugated tube and tape. The installation is more attractive and safe!

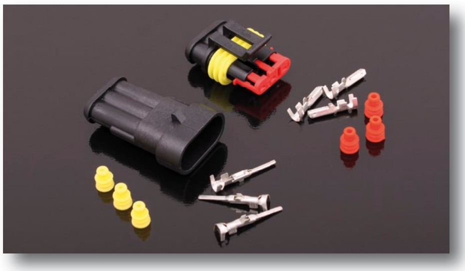


Fig 3.2.1h - ”Superseal” connectors, suitable to be used for stripping wires where needed.

NOTE! Work all the time with the battery disconnected to avoid shorting when the wires are laid out in the engine compartment!!

availible in webshop www.maxxtuning.se

3.2.2 - Wire dimentions.

A wire must always be designed to handle the power the connected equipment consumes.
One should always choose a wire with a little larger area than you need. It reduces heating and voltage drop, as example the fuel pump gets better voltage, and thus can deliver maximum flow!

All wires must have fuses! The fuse protects the cable and consumer against overheating and fire at(if) fault!
Keep in mind that the wire closest to the battery has no fuse! Insulate the wires and fit the fuse holder near the battery!

Maximum continuous current in relation to the area!
The connecting wire to MaxxECUs and MaxxECU accessory wiring harness are of a particular stream durable thin-wall wire.
Wires typically sold in generalstores must be thicker to withstand the current!

Thin-wall wire (TXL, R2)

Cabelarea (mm2)	Max current (A)
0.5	10
1	15
1.5	20
2	25
3	30
4	40
6	50
8	60
10	70

Regular wire (RK, RKUB etc.)

Cabelarea (mm2)	Max current (A)
0.5	5
0.75	7.5
1	10
1.5	15
2.5	20
4	30
6	40
8	50
10	70

3.2.3 - Secure and reliable installation.

Use proper tools and good materials at installation!
Maxxtuning AB provides what we consider to be good products for all these installations!

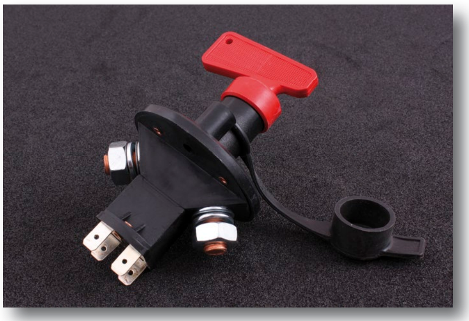


Fig 3.2.3a - Main switch.

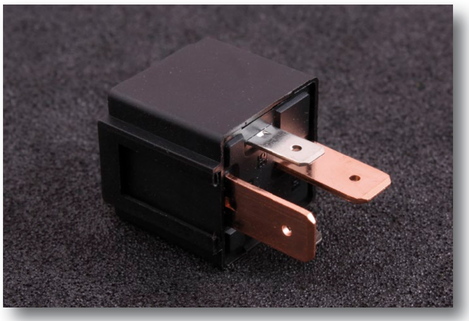


Fig 3.2.3b - Relay.

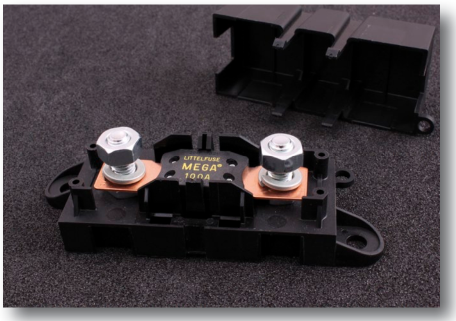


Fig 3.2.3c - Megafuse fuseholder.

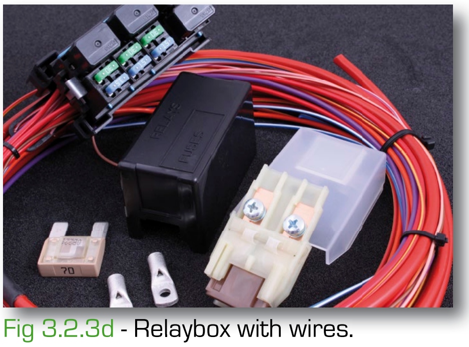


Fig 3.2.3d - Relaybox with wires.

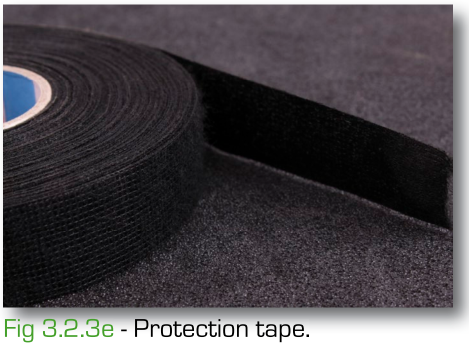


Fig 3.2.3e - Protection tape.

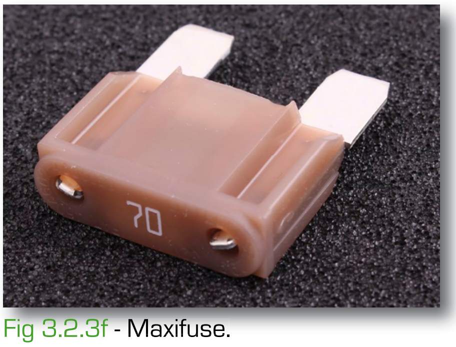


Fig 3.2.3f - Maxifuse.

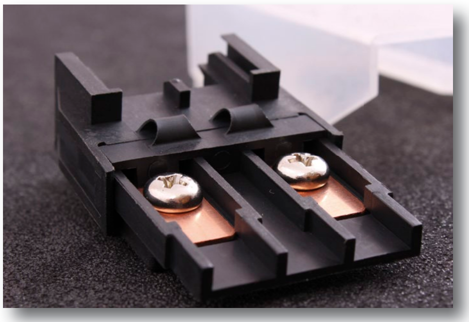


Fig 3.2.3g - Maxifuse fuseholder.

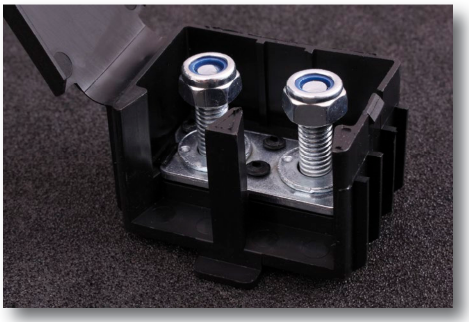


Fig 3.2.3h - Connectorbracket

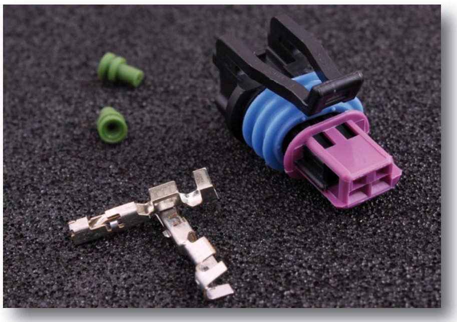


Fig 3.2.3i - Delphi connector.

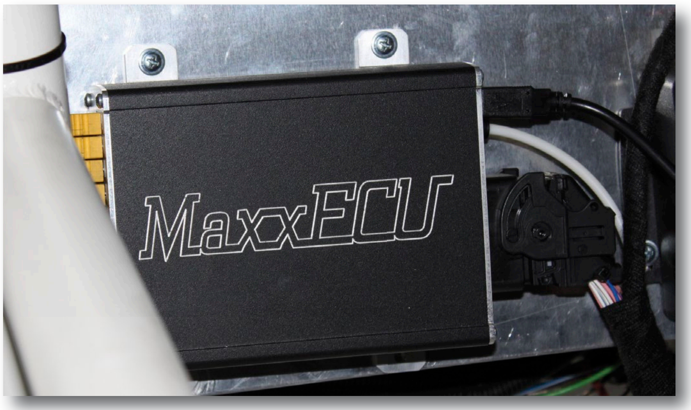
4 - Installation of MaxxECU.

Before starting the installation of MaxxECU, we recommend that all else is completed, and all sensors are mounted! One should to the greatest extent, draw electricity the last thing you do! Planning is very important! Go through which sensors to use before wiring begins!

The most common source of error in an installation is faulty contact pins to the different sensors that can provide very elusive problems. Maxxtuning AB sells approved tools for cable crimping and stripping and regular sensors and connectors. Always use rubber seals that usually accompanies sensor connectors to avoid future problems!

4.1.1 - Placing the MaxxECU-unit.

MaxxECU is not watertight, and thus requiers suitable mounting location, to prevent water or other liquids found in the enginecompartment to enter the unit!



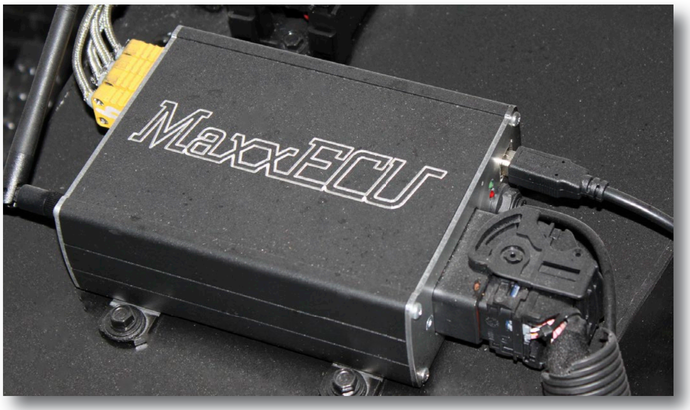


Fig 4.1.1a - Examples of MaxxECU-point locations.

4.1.2 - MaxxECU harness.

MaxxECU is always delivered with a so-called ”flying lead” harness for installation (or with easy plug harness that fits directly into the car’s original connector to the engine control unit). That is the 48-pin connector (Figure **2a**) for connecting against MaxxECU and 3m cable to the engines all sensors. In the same end as the 48-pin connector is also a 12 pin connector (see Figure **4.2.2c**).

NOTE! MaxxECU Plugin package does NOT contain this harness, and it is covered with separate installation manual for each model!

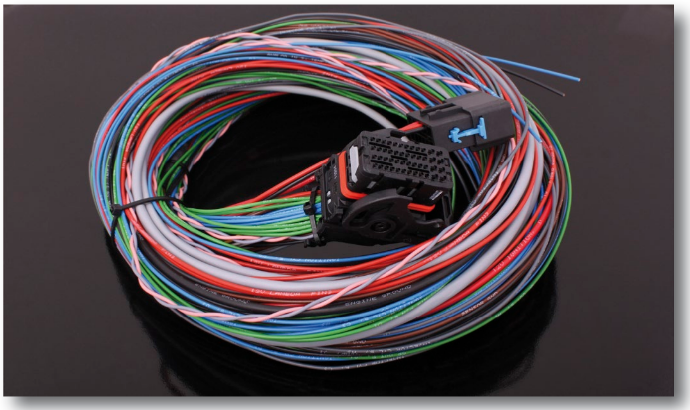


Fig 4.1.2a - MaxxECU ”flying lead” .

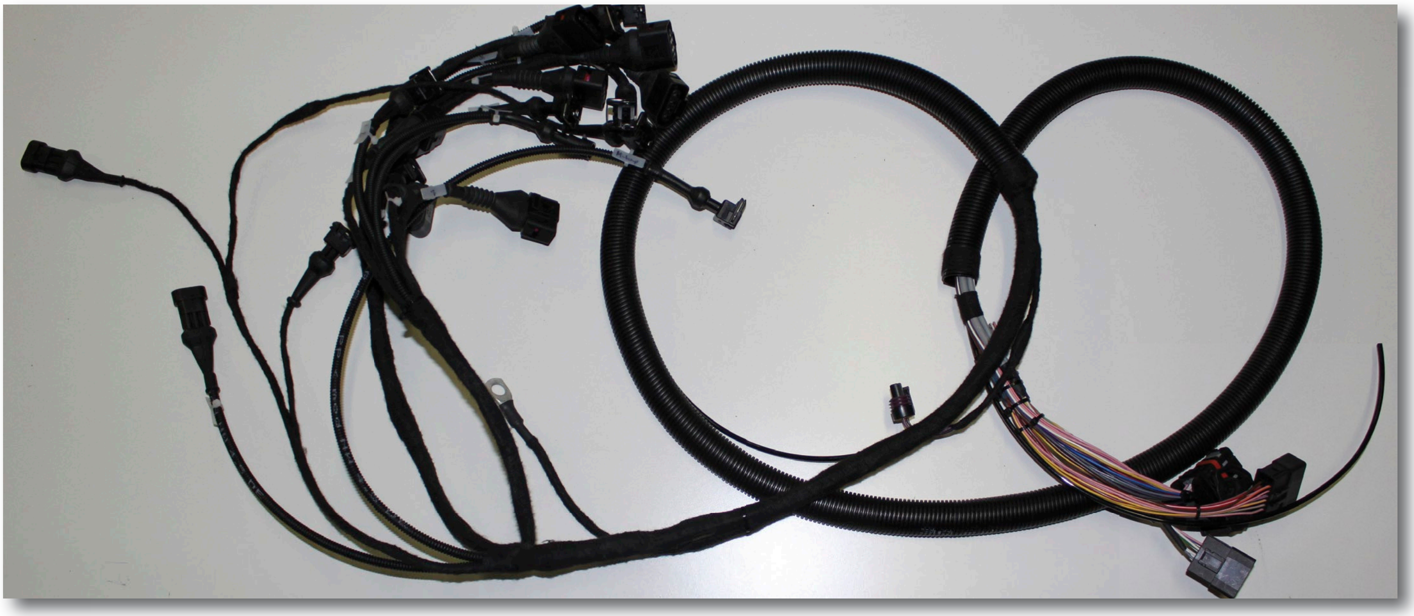


Fig 4.1.2b - Example of how a complete ”wiring harness” ”flying lead” might look like, fully assembled with all sensor conectors!

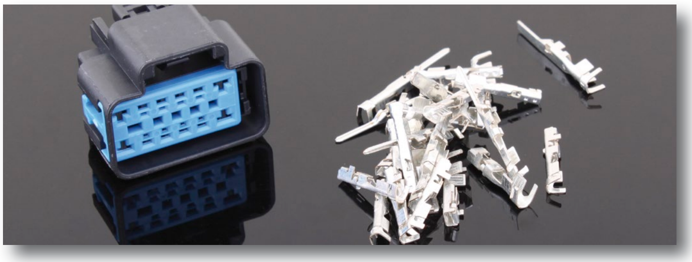


Fig 4.1.2c - 12-pin connector for connecting the power supply, buttons, warning lights, tachometer and such. Even MaxxECUs power should go through this connector! The idea behind this "extra" connector is that in principle we should be able to release the two connectors (this and the 48-pin Molex connector) and then be able to "lift the engine incl harness" without cutting any wires.

4.1.3 - Fuses and relays.

For MaxxECU to do a good job in controlling the engine, it requires that everything around MaxxECU is of good quality and works properly!

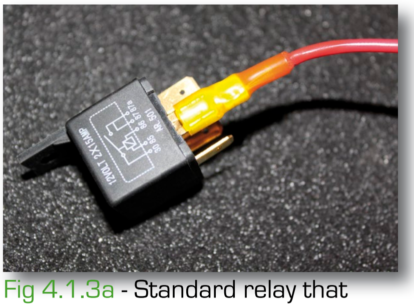


Fig 4.1.3a - Standard relay that most people use in their electrical installations.

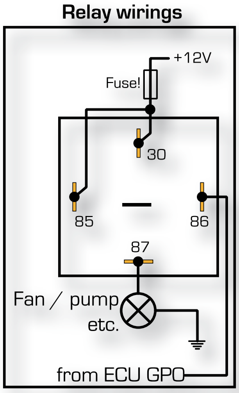
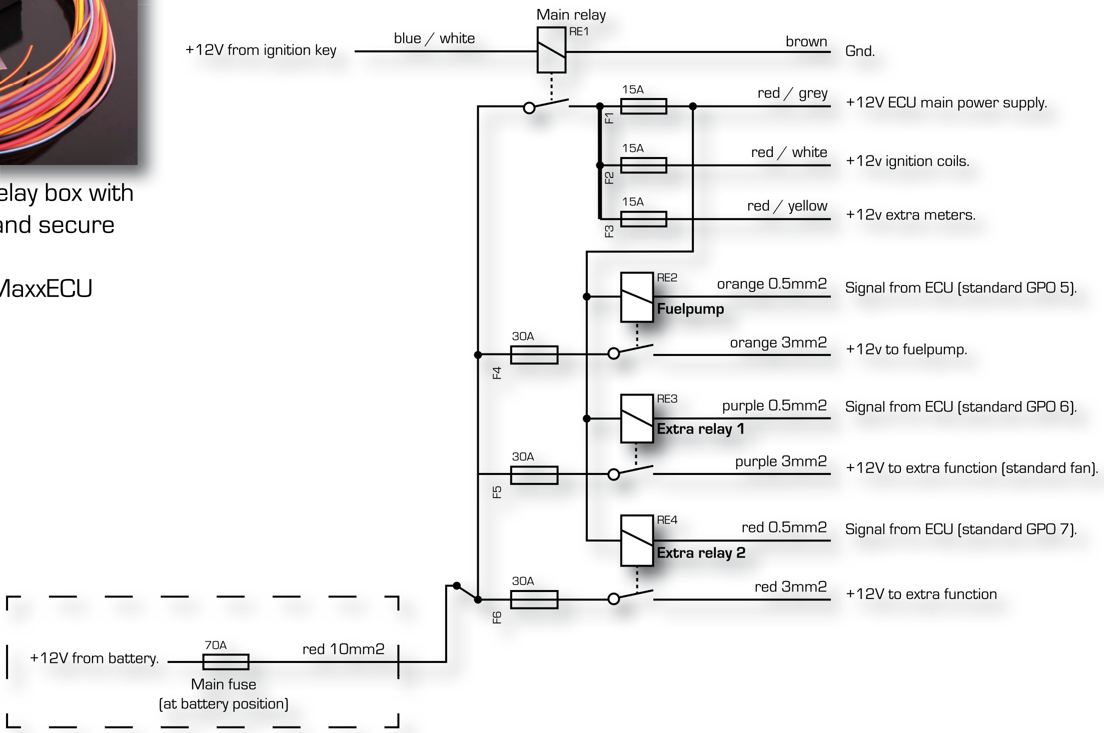


Fig 4.1.3b - Connecting a standard relay.
87 - +12 v to consumers.
86 - Grounding signal from MaxxECU, any GPO output.
85 - +12 v (fused).
30 - +12 v (fused).

When the relay get ground signal (86) from MaxxECU, incoming voltage close (30) with the output pin (87) that prevents the high current to go through the MaxxECU GPO so this is only used as a control current for the relay.

Optional accessories - MaxxECU relay box.

Fig 4.1.3b - MaxxECU relay box with 4m cables. Does neat and secure installation!
NOTE! Not included in MaxxECU package!

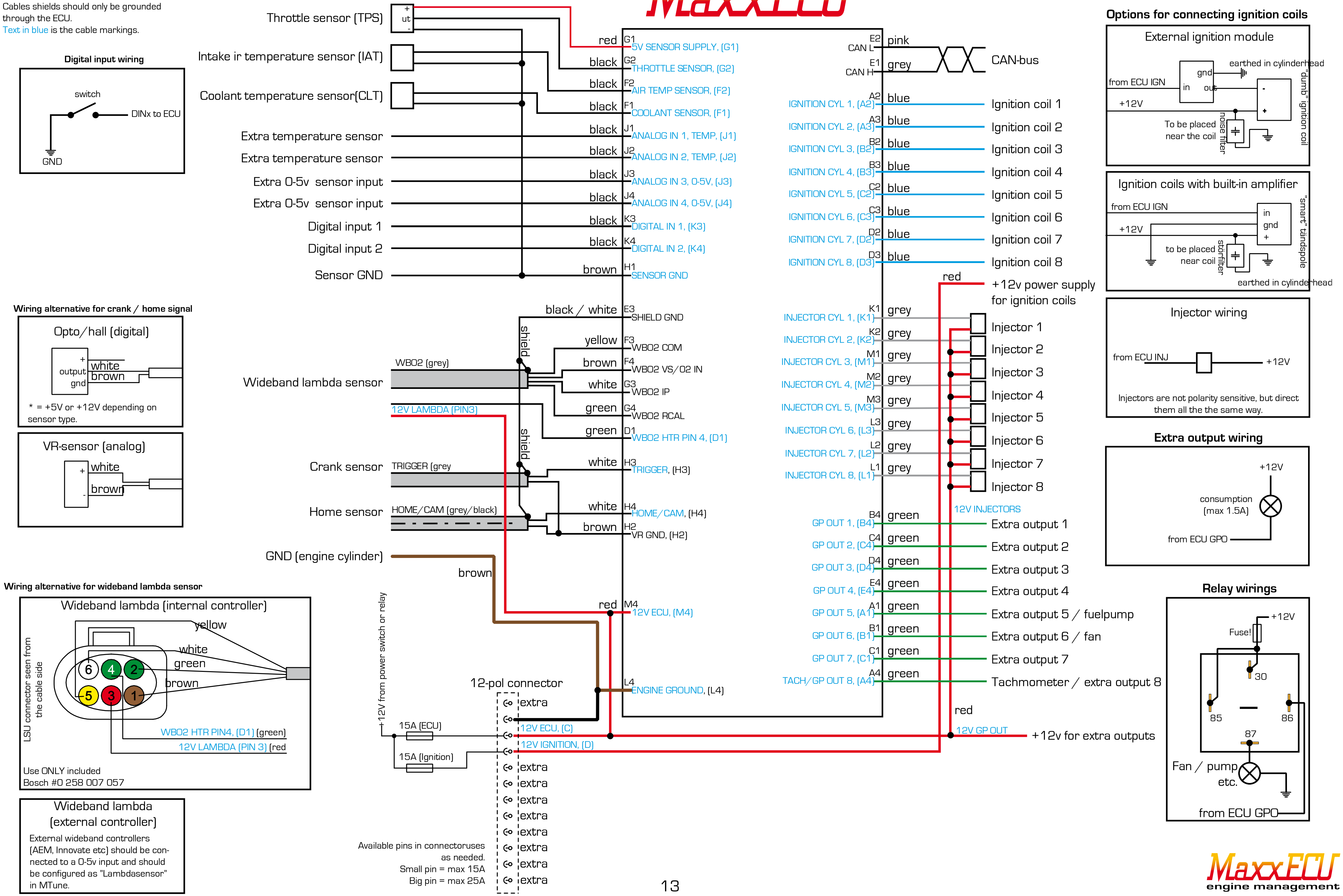


4.1.4 - Wiring and preparation.

When MaxxECU, fuses and relays are mounted one begins to organize the wiring harness. Place the 48-pin connector at the MaxxECU unit WITHOUT plugging it in! Pull the harness through the firewall, to the engines all sensors, injectors, ignition coils, fans, etc! Separate the wires and put them out on each site.

4.1.5 - Wiring diagram

Notes:
Cables shields should only be grounded through the ECU.
Text in blue is the cable markings.



Digital input wiring
switch
DINx to ECU
GND
Throttle sensor (TPS)
+
ut
-
Intake ir temperature sensor (IAT)
Coolant temperature sensor(CLT)
Extra temperature sensor
Extra temperature sensor
Extra 0-5v sensor input
Extra 0-5v sensor input
Digital input 1
Digital input 2
Sensor GND
red
black
black
black
black
black
black
black
black
black
brown
G1 5V SENSOR SUPPLY, (G1)
G2 THROTTLE SENSOR, (G2)
F2 AIR TEMP SENSOR, (F2)
F1 COOLANT SENSOR, (F1)
J1 ANALOG IN 1, TEMP, (J1)
J2 ANALOG IN 2, TEMP, (J2)
J3 ANALOG IN 3, 0-5V, (J3)
J4 ANALOG IN 4, 0-5V, (J4)
K3 DIGITAL IN 1, (K3)
K4 DIGITAL IN 2, (K4)
H1 SENSOR GND
Wiring alternative for crank / home signal
Opto/hall (digital)
+
output
gnd
white
brown
* = +5V or +12V depending on sensor type.
VR-sensor (analog)
+
-
white
brown
Wideband lambda sensor
WBO2 (grey)
12V LAMBDA (PIN3)
shield
shield
black / white
yellow
brown
white
green
green
E3 SHIELD GND
F3 WBO2 COM
F4 WBO2 VS/O2 IN
G3 WBO2 IP
G4 WBO2 RCAL
D1 WBO2 HTR PIN 4, (D1)
Crank sensor
TRIGGER (grey
white
H3 TRIGGER, (H3)
Home sensor
HOME/CAM (grey/black)
white
brown
H4 HOME/CAM, (H4)
H2 VR GND, (H2)
GND (engine cylinder)
brown
red
M4 12V ECU, (M4)
L4 ENGINE GROUND, (L4)
Wiring alternative for wideband lambda sensor
Wideband lambda (internal controller)
yellow
white
green
brown
6
4
2
5
3
1
LSU connector seen from the cable side
WBO2 HTR PIN4, (D1) (green)
12V LAMBDA (PIN 3) (red
Use ONLY included Bosch #0 258 007 057
Wideband lambda (external controller)
External wideband controllers (AEM, Innovate etc) should be connected to a 0-5v input and should be configured as "Lambdasensor" in MTune.
+12V from power switch or relay
15A (ECU)
15A (Ignition)
12-pol connector
extra
12V ECU, (C)
12V IGNITION, (D)
extra
extra
extra
extra
extra
extra
extra
extra
Available pins in connectoruses as needed.
Small pin = max 15A
Big pin = max 25A
MaxxECU
E2 CAN L
E1 CAN H
pink
grey
CAN-bus
A2 IGNITION CYL 1, (A2) blue Ignition coil 1
A3 IGNITION CYL 2, (A3) blue Ignition coil 2
B2 IGNITION CYL 3, (B2) blue Ignition coil 3
B3 IGNITION CYL 4, (B3) blue Ignition coil 4
C2 IGNITION CYL 5, (C2) blue Ignition coil 5
C3 IGNITION CYL 6, (C3) blue Ignition coil 6
D2 IGNITION CYL 7, (D2) blue Ignition coil 7
D3 IGNITION CYL 8, (D3) blue Ignition coil 8
red
+12v power supply for ignition coils
K1 INJECTOR CYL 1, (K1) grey Injector 1
K2 INJECTOR CYL 2, (K2) grey Injector 2
M1 INJECTOR CYL 3, (M1) grey Injector 3
M2 INJECTOR CYL 4, (M2) grey Injector 4
M3 INJECTOR CYL 5, (M3) grey Injector 5
L3 INJECTOR CYL 6, (L3) grey Injector 6
L2 INJECTOR CYL 7, (L2) grey Injector 7
L1 INJECTOR CYL 8, (L1) grey Injector 8
12V INJECTORS
B4 GP OUT 1, (B4) green Extra output 1
C4 GP OUT 2, (C4) green Extra output 2
D4 GP OUT 3, (D4) green Extra output 3
E4 GP OUT 4, (E4) green Extra output 4
A1 GP OUT 5, (A1) green Extra output 5 / fuelpump
B1 GP OUT 6, (B1) green Extra output 6 / fan
C1 GP OUT 7, (C1) green Extra output 7
A4 TACH/GP OUT 8, (A4) green Tachmometer / extra output 8
red
12V GP OUT
+12v for extra outputs
Options for connecting ignition coils
External ignition module
from ECU IGN
+12V
gnd
in
out
earthed in cylinderhead
"dumb" ignition coil
-
+
To be placed near the coil
noise filter
Ignition coils with built-in amplifier
from ECU IGN
+12V
in
gnd
+
to be placed near coil
störfilter
"smart" tändspole
earthed in cylinderhead
Injector wiring
from ECU INJ
+12V
Injectors are not polarity sensitive, but direct them all the the same way.
Extra output wiring
+12V
consumption (max 1.5A)
from ECU GPO
Relay wirings
+12V
Fuse!
30
85
86
87
Fan / pump etc.
from ECU GPO
MaxxECU engine management

4.2.1 - Installation of MTune PC applications.

Before we connect too much, we have to go through the PC software MTune and get a quick overview).

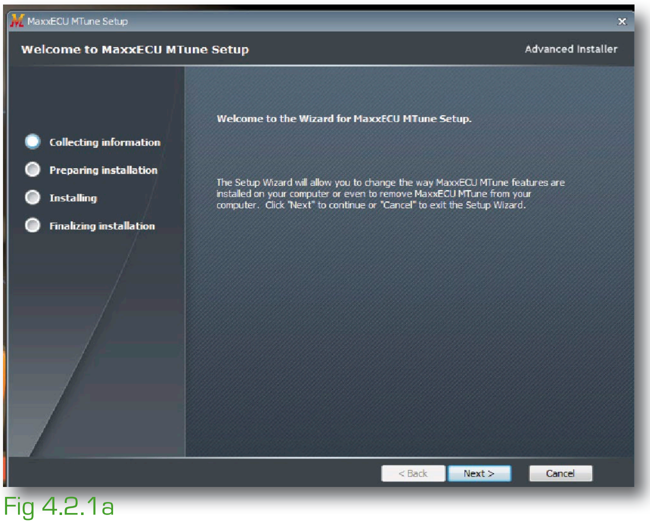
For MTune to communicate with MaxxECU it requires +12 V and ground, to the unit. It is also important that the power from the ignition switch/button really closes the power to MaxxECU at disabling of ignition switch or breaker!

A good procedure when doing an install for the first time is to solve one task at a time, and examine whether the connected sensor operates directly after operation!

MTune requires Microsoft Windows XP/Vista/7 as well as latest Microsoft. NET, works in both 32 and 64 bit environment. (MTune is included with each shipment of MaxxECU packages, and downloading is available on www.maxxtuning.eu/maxxecu/.

NOTE! Do not connect MaxxECU to computers USB port before installing MTune, since the driver needs to be installed first!

NOTE! MTune versions before 1.59 will not work with Windows8 due to driver signing!



MaxxECU MTune Setup

Welcome to MaxxECU MTune Setup

Advanced Installer

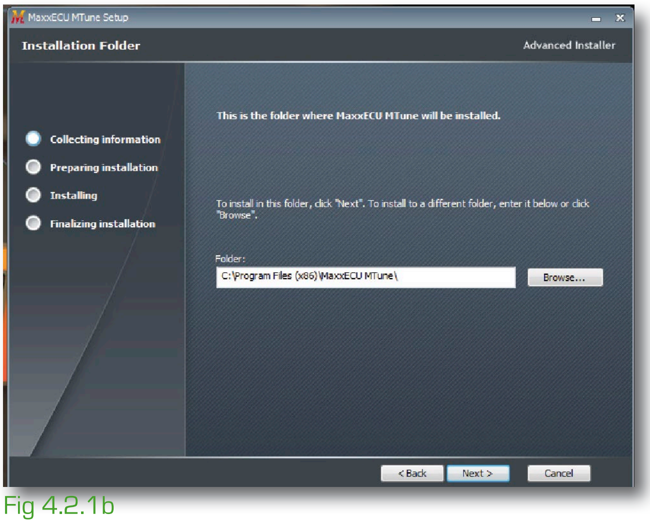
- Collecting information
- Preparing installation
- Installing
- Finalizing installation

Welcome to the Wizard for MaxxECU MTune Setup.

The Setup Wizard will allow you to change the way MaxxECU MTune features are installed on your computer or even to remove MaxxECU MTune from your computer. Click "Next" to continue or "Cancel" to exit the Setup Wizard.

Fig 4.2.1a

Start the installer by clicking on MTune-Installer X.XX.exe. If Windows UAC (User Account Control) enabled (enabled by default on Windows), the admin rights is needed to install MTune. If Microsoft .NET is not installed on your computer, the installer will try to download this for installation on the computer.



MaxxECU MTune Setup

Installation Folder

Advanced Installer

- Collecting information
- Preparing installation
- Installing
- Finalizing installation

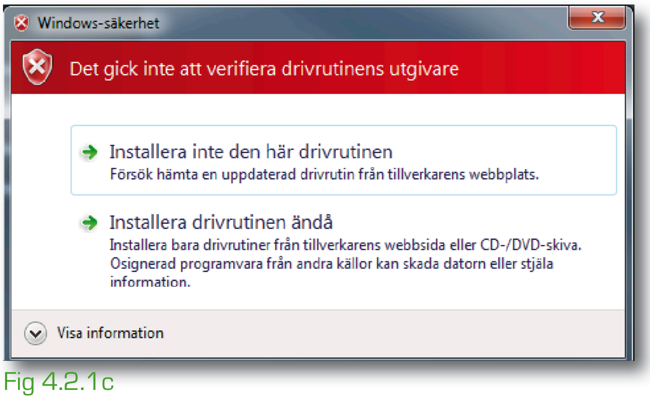
This is the folder where MaxxECU MTune will be installed.

To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".

Folder: C:\Program Files (x86)\MaxxECU MTune\

Fig 4.2.1b

The installer will suggest a suitable location on your hard drive where the program files will be installed. Change the proposed path if you want the installation to be carried to another path by clicking the browse button and select the new path.



Windows-säkerhet

Det gick inte att verifiera drivrutinens utgivare

→ Installera inte den här drivrutinen
Försök hämta en uppdaterad drivrutin från tillverkarens webbplats.

→ Installera drivrutinen ändå
Installera bara drivrutiner från tillverkarens webbsida eller CD-/DVD-skiva. Osignerad programvara från andra källor kan skada datorn eller stjäla information.

Fig 4.2.1c

NOTE! Applies only MTune versions before 1.59!

USB driver is unfortunately not signed by Microsoft, which means that an additional information box will appear when the installer tries to install the driver. Important to click "Install this driver software anyway". USB driver is not Windows Update, but must be installed from MTunes installer.

The installation is now complete and MTune can now be introduced!

4.2.2 - MTune connection to MaxxECU.

Fig 4.2.2a - Load MTune by double clicking on the MTune program icon located on your desktop after installation!

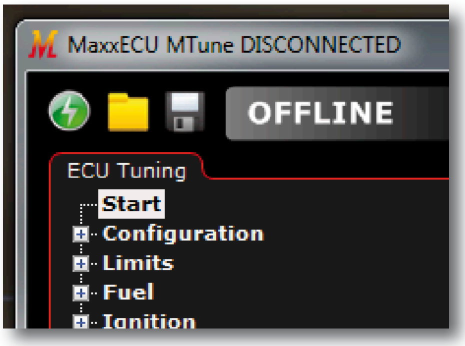

MaxxECU MTune DISCONNECTED

Fig 4.2.2b - MTune will in this situation inform you that you are offline (OFFLINE) and NO adjustments can be made online. MTune, now charged with a ”default tune” for you, the user, should be able to get an overview of the settings that are available and how MTune can be managed!

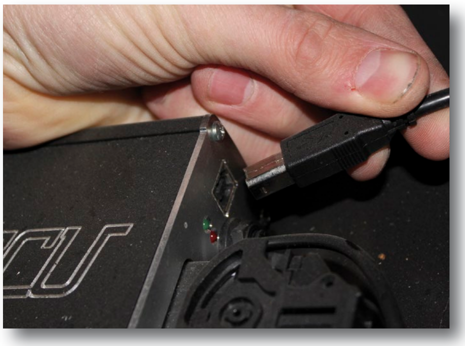


Fig 4.2.2c - Connect the supplied USB cable to the USB port on your MaxxECU device. Always try to keep the USB cable attached, mounted in the MaxxECU device for future use!

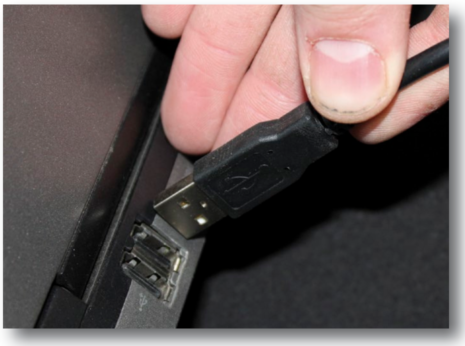
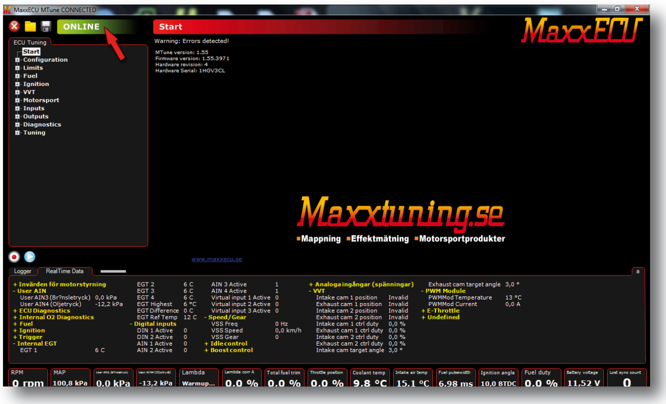


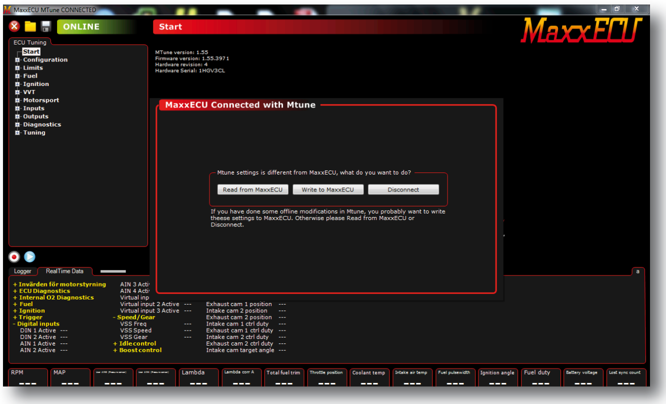
Fig 4.2.2d - Connect the USB cable from MaxxECU to your computer’s USB port. Remember to always connect to the same USB port on the computer you use to MaxxECU. Windows do not always recognize the USB connected devices if they are connected on ports other than the one used when the driver was installed.


MaxxECU MTune CONNECTED

Warning: Errors detected!

MTune version: 1.55
Firmware version: 1.55.3971
Hardware revision: 4
Hardware Serial: 1HGV3CL

Fig 4.2.2e - Windows will detect when MaxxECU is connected and thus can find the device without MaxxECU is powered, however, no form of communication will occure before MaxxECU is powered by turning on the ignition. When the ignition is on, MTune indicate that communication exists by changing the status text to ”ONLINE” instead of ”OFFLINE” in the upper left corner of MTune!


MaxxECU MTune CONNECTED

MTune version: 1.55
Firmware version: 1.55.3971
Hardware revision: 4
Hardware Serial: 1HGV3CL

MaxxECU Connected with Mtune

Mtune settings is different from MaxxECU, what do you want to do?

Read from MaxxECU | Write to MaxxECU | Disconnect

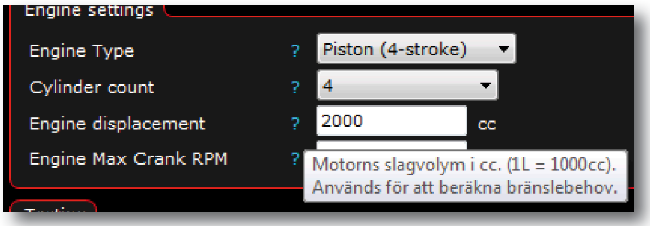
If you have done some offline modifications in Mtune, you probably want to write theese settings to MaxxECU. Otherwise please Read from MaxxECU or Disconnect.

Fig 4.2.2f - If a locally opened settings file (which is different from the basic tune or MaxxECU settings) is open and communication between MTune and MaxxECU occurs, do users get a choice what to do: Writing computer settings to MaxxECU, read MaxxECUs settings to MTune or simply stop communication.

NOTE! Only connect the +12V and ground to MaxxECU before the remaining sensors, injectors and ignition switched on. An incorrect configuration in MTune may have unintended consequences on engine and electronics!

4.2.3 - Quick overview of MTune.

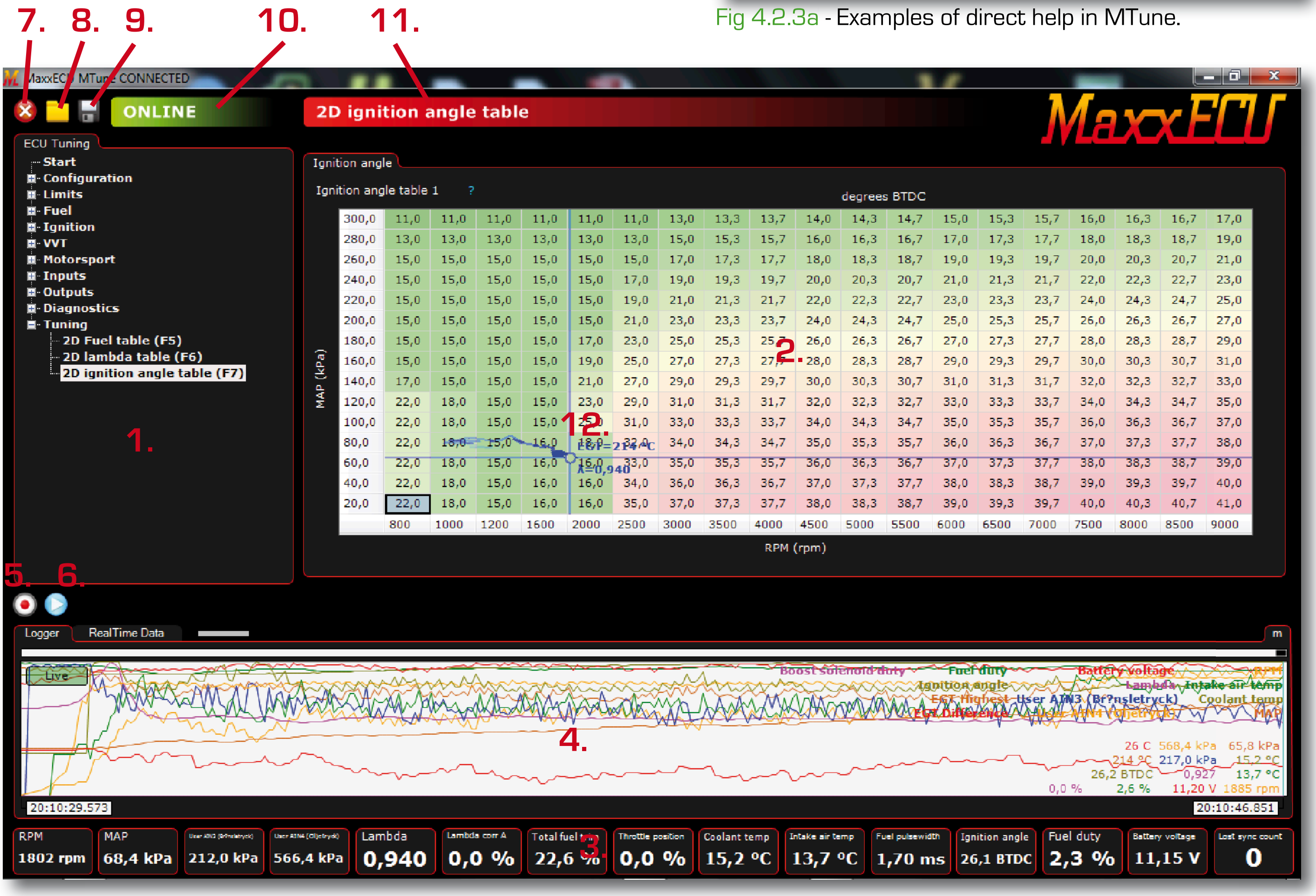
We have tried to make MTune as user friendly as possible! Improvements and new features are constantly being made! However, we will only ”basically describe” how MTune works because additional function help is in the program itself by moving your mouse over the ”?” at the selected function!!



Engine Type	?	Piston (4-stroke)	
Cylinder count	?	4	
Engine displacement	?	2000	cc
Engine Max Crank RPM	?		

Motorns slagvolym i cc. (1L = 1000cc).
Används för att beräkna bränslebehov.

Fig 4.2.3a - Examples of direct help in MTune.



Ignition angle

Ignition angle table 1 ?

degrees BTDC

MAP (kPa)																			
300,0	11,0	11,0	11,0	11,0	11,0	11,0	13,0	13,3	13,7	14,0	14,3	14,7	15,0	15,3	15,7	16,0	16,3	16,7	17,0
280,0	13,0	13,0	13,0	13,0	13,0	13,0	15,0	15,3	15,7	16,0	16,3	16,7	17,0	17,3	17,7	18,0	18,3	18,7	19,0
260,0	15,0	15,0	15,0	15,0	15,0	15,0	17,0	17,3	17,7	18,0	18,3	18,7	19,0	19,3	19,7	20,0	20,3	20,7	21,0
240,0	15,0	15,0	15,0	15,0	15,0	17,0	19,0	19,3	19,7	20,0	20,3	20,7	21,0	21,3	21,7	22,0	22,3	22,7	23,0
220,0	15,0	15,0	15,0	15,0	15,0	19,0	21,0	21,3	21,7	22,0	22,3	22,7	23,0	23,3	23,7	24,0	24,3	24,7	25,0
200,0	15,0	15,0	15,0	15,0	15,0	21,0	23,0	23,3	23,7	24,0	24,3	24,7	25,0	25,3	25,7	26,0	26,3	26,7	27,0
180,0	15,0	15,0	15,0	15,0	17,0	23,0	25,0	25,3	25,7	26,0	26,3	26,7	27,0	27,3	27,7	28,0	28,3	28,7	29,0
160,0	15,0	15,0	15,0	15,0	19,0	25,0	27,0	27,3	27,7	28,0	28,3	28,7	29,0	29,3	29,7	30,0	30,3	30,7	31,0
140,0	17,0	15,0	15,0	15,0	21,0	27,0	29,0	29,3	29,7	30,0	30,3	30,7	31,0	31,3	31,7	32,0	32,3	32,7	33,0
120,0	22,0	18,0	15,0	15,0	23,0	29,0	31,0	31,3	31,7	32,0	32,3	32,7	33,0	33,3	33,7	34,0	34,3	34,7	35,0
100,0	22,0	18,0	15,0	15,0	25,0	31,0	33,0	33,3	33,7	34,0	34,3	34,7	35,0	35,3	35,7	36,0	36,3	36,7	37,0
80,0	22,0	18,0	15,0	16,0	18,0	32,0	34,0	34,3	34,7	35,0	35,3	35,7	36,0	36,3	36,7	37,0	37,3	37,7	38,0
60,0	22,0	18,0	15,0	16,0	16,0	33,0	35,0	35,3	35,7	36,0	36,3	36,7	37,0	37,3	37,7	38,0	38,3	38,7	39,0
40,0	22,0	18,0	15,0	16,0	16,0	34,0	36,0	36,3	36,7	37,0	37,3	37,7	38,0	38,3	38,7	39,0	39,3	39,7	40,0
20,0	22,0	18,0	15,0	16,0	16,0	35,0	37,0	37,3	37,7	38,0	38,3	38,7	39,0	39,3	39,7	40,0	40,3	40,7	41,0
	800	1000	1200	1600	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000

RPM (rpm)

RPM	MAP	User AIN3 (Br?nsletryck)	User AIN4 (Oljetryck)	Lambda	Lambda corr A	Total fuel trim	Throttle position	Coolant temp	Intake air temp	Fuel pulsewidth	Ignition angle	Fuel duty	Battery voltage	Lost sync count
1802 rpm	68,4 kPa	212,0 kPa	566,4 kPa	0,940	0,0 %	22,6 %	0,0 %	15,2 °C	13,7 °C	1,70 ms	26,1 BTDC	2,3 %	11,15 V	0

Fig 4.2.3b - MTunes main window.

1: Setting categories - Select what type of setting you want to work with.

2: Setting page - Shows all controls available on the selected setting category.

3: Real-time data - Here you can add/remove display of selected real time measurements , right-click menu .

4: Live logger - Real-time data display in graphical form, can be paused and restarted at any time by pressing the ”live” button. You can also save the log file based on the live data - logger by right-clicking . All data is always logged here, choosing only what you want to see by right-clicking.

5: Start/stop logging - Pressing this button launches the PC logging (**4.2.5**) that is stored on your computer's hard drive. When logging is enabled it stops logging when pressing the same button!

6: View logging. - By pressing this ”play” one can see saved log file displayed in a new window. (Wherever you are in the tune , you can see a red mark that shows where MaxxECU reads data anywhere, at selected logging session) .

7: Communication - Start/stop communication with MTune and MaxxECU (normally occurs automatically when the device is connected).

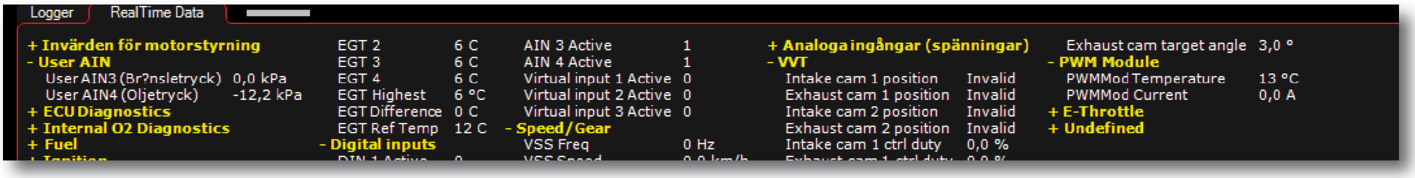
8: Open - To open locally saved configuration files, click here!

9: Save - Saves MTunes settings file (tune) to your computer's hard drive.

10: Status - Communication status and indication. At ANY writing done, this status line is flashing ”busy”! Double click on this, to get the chart and any failure history of communications!

11: Name of the setting page. - The title bar will help you to more easily get an overview of where in the navigation you are.

12 : Cursor - Current position where MaxxECU reads data from.

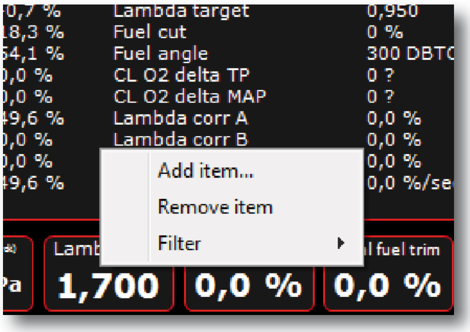


```
+ Invärden för motorstyrning          EGT 2              6 C     AIN 3 Active             1        + Analoga ingångar (spänningar)       Exhaust cam target angle  3,0 °
- User AIN                            EGT 3              6 C     AIN 4 Active             1        - VVT                               - PWM Module
   User AIN3 (Br?nsletryck)  0,0 kPa  EGT 4              6 C     Virtual input 1 Active   0           Intake cam 1 position    Invalid     PWMMod Temperature        13 °C
   User AIN4 (Oljetryck)   -12,2 kPa  EGT Highest        6 °C    Virtual input 2 Active   0           Exhaust cam 1 position   Invalid     PWMMod Current            0,0 A
+ ECU Diagnostics                     EGT Difference     0 C     Virtual input 3 Active   0           Intake cam 2 position    Invalid   + E-Throttle
+ Internal O2 Diagnostics             EGT Ref Temp       12 C  - Speed/Gear                           Exhaust cam 2 position   Invalid   + Undefined
+ Fuel                              - Digital inputs               VSS Freq                 0 Hz        Intake cam 1 ctrl duty   0,0 %
```

Fig 4.2.3c - Realtime Data tab, where all the magic numbers are presented! Superb at troubleshooting!!

4.2.4 - MTune handling.

When communication exists between MTune and MaxxECU, all the changes are in real time, ie you do not need to do anything to save your changes! These changes are also persistant if MaxxECU losses power! If the settings differ between MTune and MaxxECU for some reason (wrong entry (very rare) or locally opened file) a question pops up asking what you want to do.



```
0,7 %    Lambda target     0,950
18,3 %   Fuel cut          0 %
54,1 %   Fuel angle        300 DBTC
0,0 %    CL O2 delta TP    0 ?
0,0 %    CL O2 delta MAP   0 ?
49,6 %   Lambda corr A     0,0 %
0,0 %    Lambda corr B     0,0 %
0,0 %                      0,0 %
49,6 %                     0,0 %/se
```

Fig 4.2.4a - Right click.
Throughout the program, You, the user, can right click to get options!

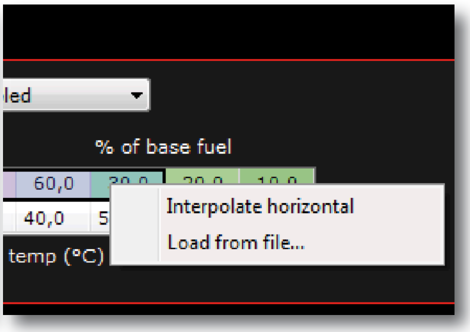
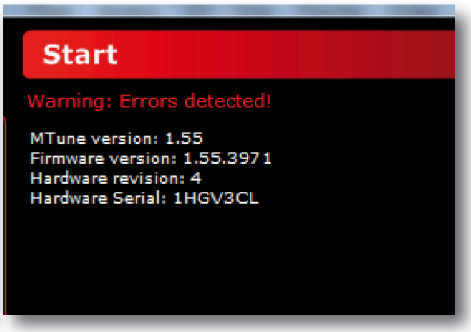


Fig 4.2.4b - Right click.
Select multiple cells with mouse or keyboard, right-click to change the selected cells.



Start

Warning: Errors detected!

MTune version: 1.55
Firmware version: 1.55.3971
Hardware revision: 4
Hardware Serial: 1HGV3CL

Fig 4.2.4c - Warning message.
If MaxxECU has a stored error code or warning, it will flash a warning message to appear as shown above! By double clicking on the text, you will be directed to the page that deals with error codes!

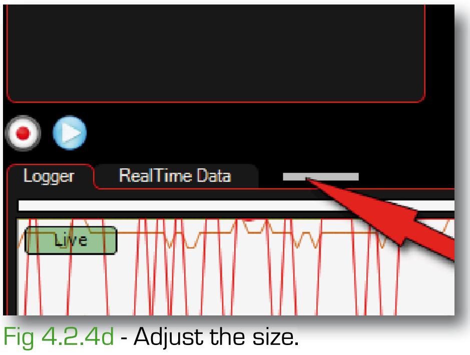


Fig 4.2.4d - Adjust the size.
Place your mouse over this ”gray” rectangle and drag it, to make the bottom area bigger/smaller.

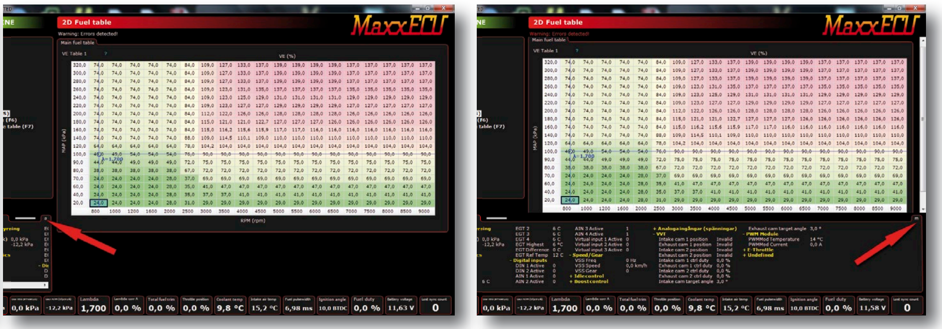


Fig 4.2.4e - Adjust the horizontal size automatically or manually!
At certain times during the mapping one would want to show all Real Time Data while browsing around in the settings! Far out in the corner is an ”m” (manual) or an ”A” (automatic). By choosing manual mode, the bottom part of either the log window or Realtime data is displayed, regardless of if the setting page requires more space on the screen! Just click on the character (m or a) to change mode!

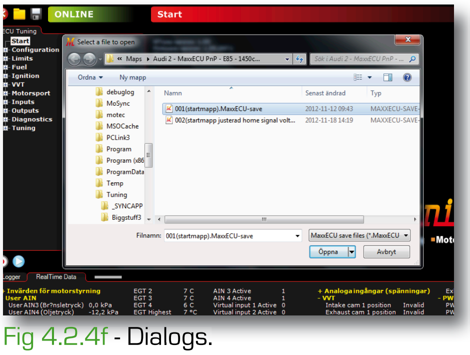


Fig 4.2.4f - Dialogs.
MTune use Windows standard dialog boxes that provides a number of advantages such as easier file management, while you also can choose to example open or save the settings file.

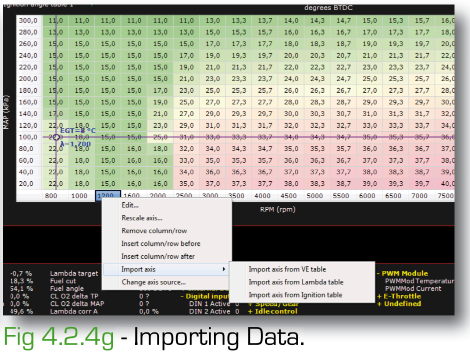


Fig 4.2.4g - Importing Data.
All tables have the option to import from external config file. In the above example, one can load an entire ignition curve from a locally stored file, in a fast and simple way without touching anything else except current table.

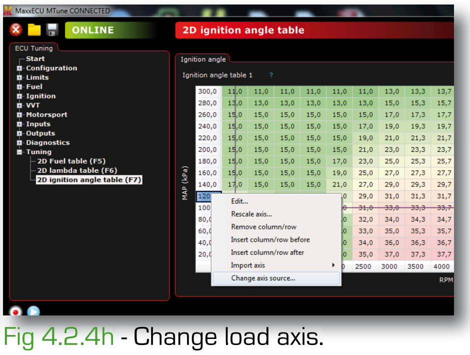


Fig 4.2.4h - Change load axis.
By right-clicking on the load axis one can example change from MAP to TPS based mapping. TPS is mainly used in normally aspirated and supercharged engines with separate throttle bodies.

4.2.5 - MTune PC logging.

MaxxECU have both PC logging and internal logging (see **4.3.1**).

PC logging means that you first need to choose where you want the log data to be saved on the computer hard drive, when this choice is made, ALL data will be logged to this file, whatever values you see in the log window!

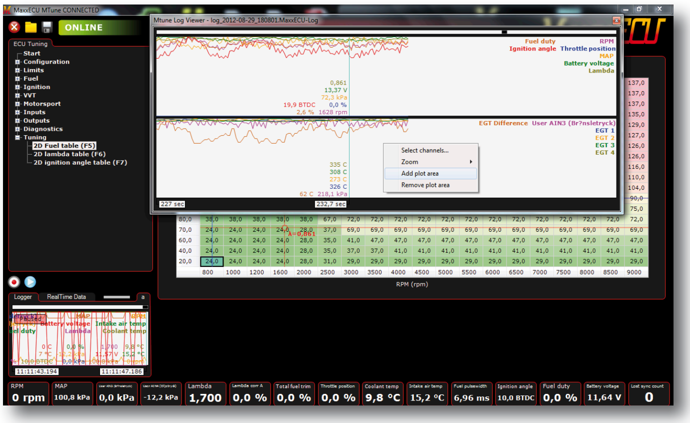


Fig 4.2.5a - You get additional options by right clicking on the background or objects. In this case, right click on the external log window and choose to delete a drawing area. Sometimes the display window become a bit messy, as it is also possible to create multiple "plot areas" for dividing the display in a better way. Right click to see the options that are available.

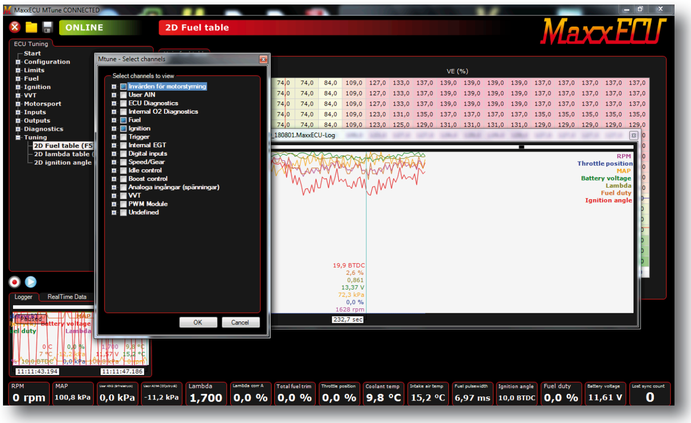
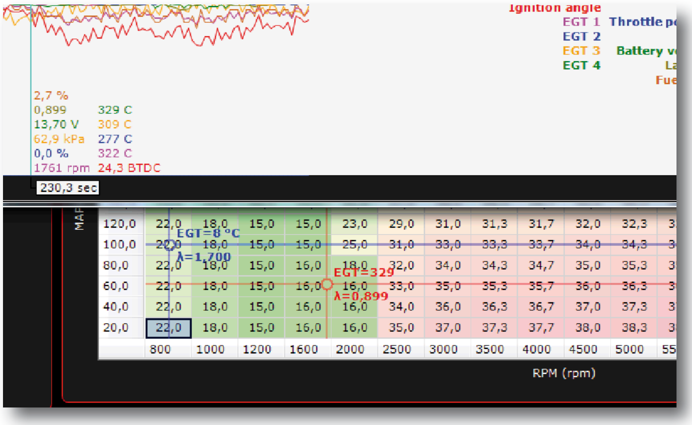


Fig 4.2.5b - To choose what to display in the log, right click and select "Select Channels". This displays a new window where you can actively make choices based on the data that is available in the log file. (the various settings that are enabled, and if the CAN modules are used means that the amount of available settings vary between different installations).



120,0	22,0	18,0	15,0	15,0	23,0	29,0	31,0	31,3	31,7	32,0	32,3	3
100,0	22,0	18,0	15,0	15,0	25,0	31,0	33,0	33,3	33,7	34,0	34,3	3
80,0	22,0	18,0	15,0	16,0	18,0	32,0	34,0	34,3	34,7	35,0	35,3	3
60,0	22,0	18,0	15,0	16,0	16,0	33,0	35,0	35,3	35,7	36,0	36,3	3
40,0	22,0	18,0	15,0	16,0	16,0	34,0	36,0	36,3	36,7	37,0	37,3	3
20,0	22,0	18,0	15,0	16,0	16,0	35,0	37,0	37,3	37,7	38,0	38,3	3
	800	1000	1200	1600	2000	2500	3000	3500	4000	4500	5000	55

Fig 4.2.5c - When you have an open external log window and select different cells, a red marker show the location on the basis of the log file location, which facilitates much at adjusting and mapping! Same function at paus of live logging. Here, both the exhaust temp and lambda value at that position in the log file above 2D ignition table.

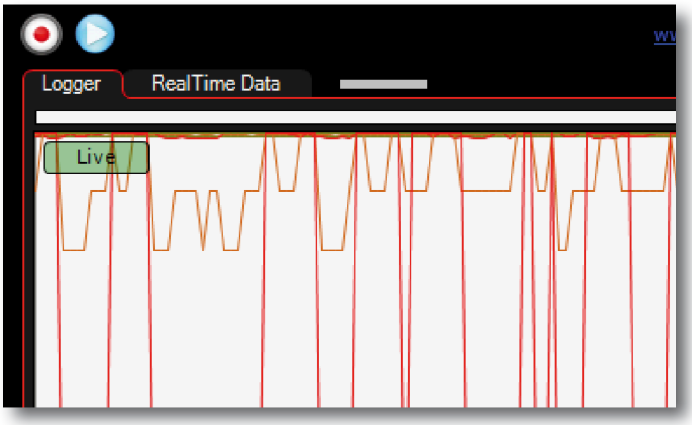


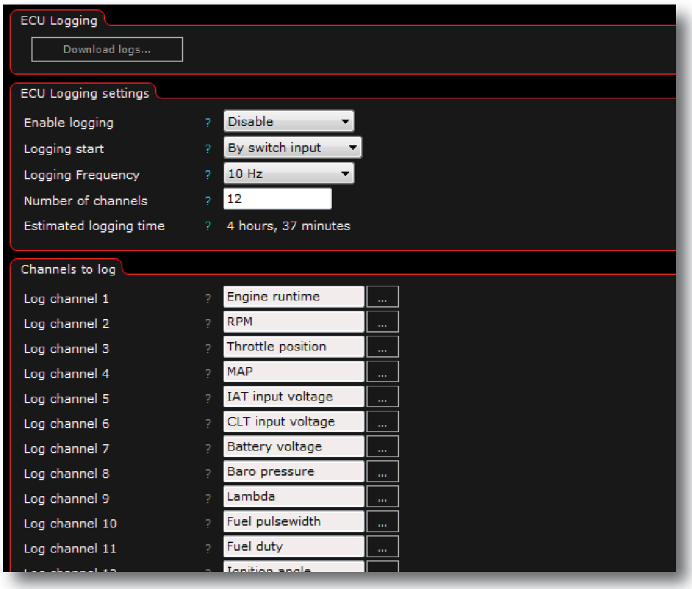
Fig 4.2.5d - Live logging is always active until you pause it by clicking on the "Live" button as illustrated above. As live logging is paused, no data is logged, and navigation is done with the mouse. By clicking on any (and interesting for the moment) position in the log box, a red mark, mark each tune cell MaxxECU reads data from at exactly this time!

4.3.1 - MaxxECU internal logging.
MaxxECU also has an internal logging function that works when the PC is not connected to MaxxECU. The internal log settings is found under Configuration -> ECU Logging settings in MTune.

Logging can be activated depending on different premises, (Logging start). The refresh rate (Logging frequency) for logging can also be customized according to what to use logging for.
By default 10Hz is chosen, which means 10 log points per second on each sensor! Select the number of channels to be logged (Number of channels).

Then choose the value for each channel to be logged, by pressing the button with the three dots after each channel.
Estimated logging time is a calculated and shown value for how long the internal memory is sufficient for logging, by the number of channels to be logged and the refresh rate.

When the memory is full, the oldest log data is overwritten with new log data!


ECU Logging

Download logs...

ECU Logging settings

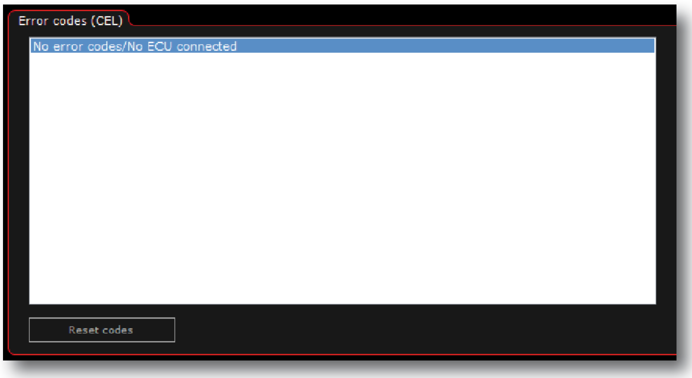
Enable logging	?	Disable
Logging start	?	By switch input
Logging Frequency	?	10 Hz
Number of channels	?	12
Estimated logging time	?	4 hours, 37 minutes

Channels to log

Log channel 1	?	Engine runtime
Log channel 2	?	RPM
Log channel 3	?	Throttle position
Log channel 4	?	MAP
Log channel 5	?	IAT input voltage
Log channel 6	?	CLT input voltage
Log channel 7	?	Battery voltage
Log channel 8	?	Baro pressure
Log channel 9	?	Lambda
Log channel 10	?	Fuel pulsewidth
Log channel 11	?	Fuel duty
Log channel 12		Ignition angle

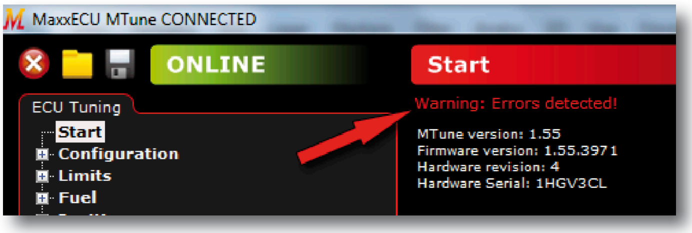
Fig 4.3.1a - Settings for internal ECU logging in MTune.

4.3.2 - Internal fault diagnostics..
MaxxECU has a built-in error handling system that is an effective way to "flash" any error codes without using a PC. The troubleshooting is found in MTune Diagnostics -> Error codes. See **4.3.3** for the current error codes.


Error codes (CEL)

No error codes/No ECU connected

Fig 4.3.2a - Diagnostic system in MaxxECU has no settings, viewing and deleting fault codes is the only thing that can be done!


MaxxECU MTune CONNECTED

Warning: Errors detected!

MTune version: 1.55
Firmware version: 1.55.3971
Hardware revision: 4
Hardware Serial: 1HGV3CL

Fig 4.3.2b - If an error code is stored in memory, MTune will alert you by flashing a red text at the top edge of the application window like the picture above shows.
Click on the flashing warning text to go directly to the fault diagnostics page!

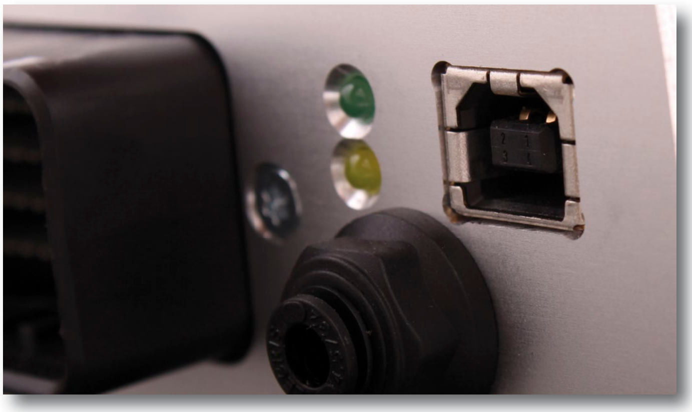


Fig 4.3.2c - MaxxECU has two indicator LEDs on the side of the connector.
The green light means that MaxxECU have the power it needs to operate and will always shine (even during cranking).
MaxxECU also have a yellow or red light indicating if MaxxECU have discovered an error (error code stored).

The red/yellow light "flashes" out a possible error code that is stored, see **4.3.3**.

4.3.3 - Fault codes

11	IAT sensor error	Intake temperature sensor open or shorted.
12	CLT sensor error	Coolant, open or short.
13	TPS sensor error	Throttle sensor, open or shorted.
15	VVT position sensor error	Faulty signal or camshaft sensor.
16	VVT control error	Defective VVT-valves or setting error.
17	5v output error	5v output short-circuit or overloaded
19	Electromagnetic interference detected	Interference levels to high. See **6.1.2**
21	Configuration error: Incorrect fuel/ignition-mode with current trigg-system	
22	Configuration error: Wrong cylindercount with current fuel/ignition-mode	
23	O2 sensor: Reference shortcircuit	
24	O2 sensor: Incorrect drive signal	
25	O2 sensor: Heating error	
26	O2 sensor: Sensor to cold	
27	O2 sensor: Sensor to hot	
32	Triggererror: Timeout	
33	Triggererror: To few trigger-teeth before sync signal	
34	Triggererror: To many trigger-teeth before sync signal	
35	Triggererror: Triggersignal to early	
36	Triggererror: Triggersignal to late	
37	Triggererror: Error in trigger pattern	
41	Protection: Boost limit activated	
42	Protection: Lean power cut	
43	Protection: EGT power cut	
44	Protection: Warning system: Level 1 reached	
45	Protection: Warning system: Level 2 reached	
51	High load on injector output	
61	E-Throttle: TPS error	
62	E-Throttle: Pedal error	
63	E-Throttle: Position control error	
71	EGT-sensor: Error detected on EGT-sensor 1	
72	EGT-sensor: Error detected on EGT-sensor 2	
73	EGT-sensor: Error detected on EGT-sensor 3	
74	EGT-sensor: Error detected on EGT-sensor 4	
75	EGT-sensor: Error detected on EGT-sensor 5	
76	EGT-sensor: Error detected on EGT-sensor 6	
77	EGT-sensor: Error detected on EGT-sensor 7	
78	EGT-sensor: Error detected on EGT-sensor 8	
79	EGT-sensor: Sensor shortcircuit to ground	
82	CAN-bus: No connection with Input module	
83	CAN-bus: No connection with PWM module	
84	CAN-bus: PWM-modul, overtemperature or overcurrent	
85	CAN-bus: No connection with DBW module	
86	CAN-bus: No connection with Trac module	
91	MaxxECU internal error: I2C-error	Repeated I2C-faults Contact support!
92	MaxxECU internal error: High internal temperature. Contact Support!	
93	MaxxECU internal error: Debugerror. Contact Support!	
98	MaxxECU internal error: Watchdog reset. Contact Support!	
99	MaxxECU internal error: Bootloader error. Contact Support!	
101-	Warning system CH x, High/Low	

The error codes can be read with MTune or "flashed" out if a bulb is connected to any output and enabled by "Check Engine Light". See **6.3.8**.

The red / yellow LED (see Figure **4.3.2c**) on one side of MaxxECU unit also flashes out these codes.

Examples of "blink":

13: BLINK {break} - BLINK {short pause} - BLINK {short pause} - BLINK {short pause} - {long pause}.

23: BLINK {short pause} - BLINK {break} - BLINK {short pause} - BLINK {short pause} - BLINK {short pause} - {long pause}.

If there is more than one fault code stored, all flash out one after the other, separated by a longer pause.

5 - Reviewing the trigger system and the engine input sensors.

5.1.1 - Different trigger system and electrical wiring.

The two most common trigger systems available are ”Missing tooth” and ”Multi-tooth + Home”.
”Missing tooth” is the most common form of trigger wheel where one or more teeth have been removed and creates a ”gap” of off-picked trigger points which gives MaxxECU a reference point when the engine crankshaft has spun one revolution.

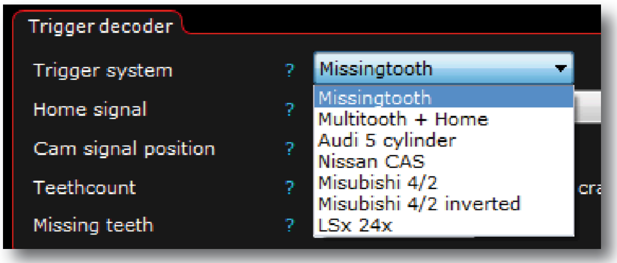
”Multi-tooth + Home” means an equilateral trigger wheel on the crankshaft (without off-picked trigger teeth, so-called ”missing tooth”), which together with a camshaft indicates when the engine has spun a revolution. ”Multi-tooth + Home” thus requires two input sensors to work while ”Missing tooth” only requires a single sensor to provide an appropriate RPM to MaxxECU.
”Multi-tooth + Home” is common in for example Toyota.

”Audi 5 cylinder” is the trigger system that Audi uses in its five -cylinder engines where triggering occurs with 3 sensors. 2 on the flywheel and one on the camshaft.

”Nissan CAS ” are usually found , not surprisingly, in many Nissan cars and is a combined ”cam and crankshaft sensor ” that is mounted on the exhaust camshaft on these engines (CA18, SR20, RBXX etc.).
CAS = Cam Angle Sensor) .

”Mitsubishi 4/2” also found in engines from Mitsubishi. MaxxECU also supports this sensor in reverse (”Mitsubishi 4/2 inverted”).

”LSX 24x” is found in the GM angle engines (V8) and is a relatively complicated trigger, and very few manufacturers support the ”true” reading of the trigger signal! MaxxECU supports a correct reading! This causes the engine to start very quickly. It takes 3-5 trigger teeth to know exactly what position the engine is, thus, one could try to start the engine extremely fast. Normally, the engine spins several revolutions for the engine to be able to sync and know exactly where to send fuel and ignition. Using this type of trigger is beneficial!



Trigger decoder

Trigger system ? Missingtooth

Home signal ?

Cam signal position ?

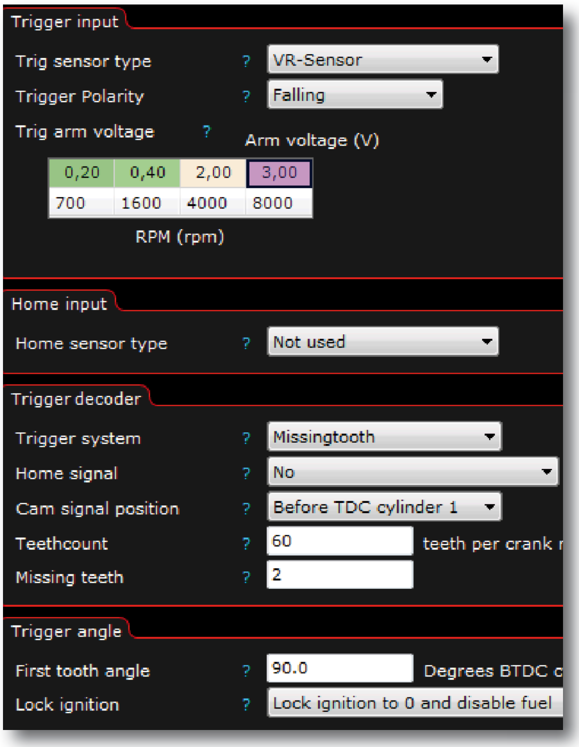
Teethcount ?

Missing teeth ?

Fig 5.1.1a - Different trigger systems MaxxECU supports. More trigger systems will be added if there is demand. These settings are in MTune under Inputs -> Trigger / Home inputs, section ”Trigger decoder”.

5.1.2 - Crankshaft sensor.

MaxxECU requires a crankshaft sensor to control ignition and fuel injection properly. Crankshaft reads a certain amount of "teeth" (so-called "tooth") on a trigger wheel that is mounted on the crankshaft. Mounting the sensor itself and trigger wheel is extremely important, an off-centered trigger wheel will lead to problems!! Exaggerate gladly mounting workpieces size so that the crankshaft sits stably mounted and can not flex during vibration or other external influences! See chapter **5.1.3**.
MTune has a built-in oscilloscope to check the signal for crank and crank sensor, as well as polarity inversion if one is unsure of the sensor polarity. Diagnostics -> Trigger oscilloscope and Diagnostics -> Trigger Logger.
"Lost sync count" MTune (Real Time Data) is increased if triggerfault is repeated and the error code will be stored, see **4.3.2.**



Trigger input

Trig sensor type ? VR-Sensor
Trigger Polarity ? Falling
Trig arm voltage ?

Arm voltage (V)

0,20	0,40	2,00	3,00
700	1600	4000	8000

RPM (rpm)

Home input

Home sensor type ? Not used

Trigger decoder

Trigger system ? Missingtooth
Home signal ? No
Cam signal position ? Before TDC cylinder 1
Teethcount ? 60 teeth per crank r
Missing teeth ? 2

Trigger angle

First tooth angle ? 90.0 Degrees BTDC c
Lock ignition ? Lock ignition to 0 and disable fuel

Fig 5.1.2a - Settings for the crank and sensor is done under Inputs -> Trigger/Home input in MTune. This chapter is one of the most difficult pieces to understand! READ, and PONDER the manual thoroughly!!
Trig sensor type indicates whether it is VR-sensor (wave-shaped signal) or if it is a digital sensor (square signal) to be used as crank-reference.
Trigger polarity indicates whether MaxxECU is to trigger on rising or falling edge . See Figure **5.1.6a**. If a wrongful wiring has been done on the sensor, one can in this position "flip" the polarity and avoid electrical operation!
Trig arm voltage means what voltage the sensor first must achieve to be considered as a "high" signal , then at zero cross trigger .
In 95% of cases the default settings will work. In principle, this value at different speeds should be half that of the lowest peak voltage arising from the sensor. See Figure **5.1.5a**.

Home sensor type specifies if a crank sensor is mounted and enables MaxxECU to control the motor sequentially. Required in certain combinations of trigger system, but not "Missingtooth". Crank sensor is additionally always a requirement when running odd number of cylinders, such as 5 or 10 cylinders.
Upon activation of the Home input more settings pop up like those we described above for the crank signal.
Trigger system indicates the trigger system used. In the above, "Missingtooth" i.e. a pulse wheel with one or several teeth is removed.
If a system other than "Missing tooth" is stated, a crank sensor MUST be used, ie activation of the "Home input" section on this setup page.

Home signal indicates if the cam signal is to be used.
Cam position signal indicates when the crankshaft cam signal comes in relation to the 720degree engine turn.
Teeth Count indicates the number of teeth on the crankshaft trigger wheel, given the total number of teeth that the wheel would have had if the "missing" teeth were not removed. ie a 60-2 wheel really has only 58 teeth), enter 60 here.

Missing teeth specifies number of teeth removed. Teeth Count - "Missing teeth" = total number of teeth that are on the wheel!

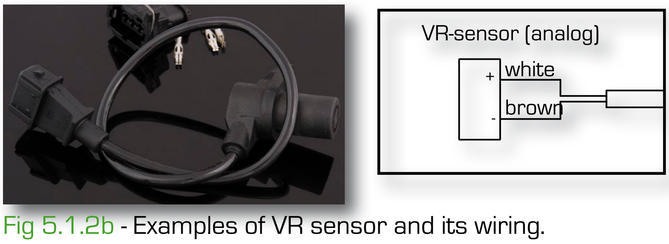


Fig 5.1.2b - Examples of VR sensor and its wiring.

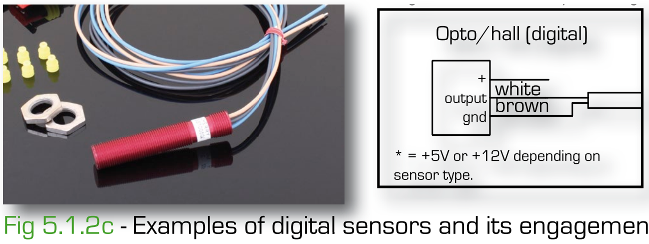


Fig 5.1.2c - Examples of digital sensors and its engagement.

Trigger angle section and it's setting "First tooth angle" indicates how many degrees before the engine top dead center (TDC) as crank get zero reference input pulse. This value is useful to try to estimate visually before trying to start by setting the engine in neutral position (TDC, ie cylinder 1piston at top position), turn the engine backwards until the crankshaft is just over the missing teeth ("Missing tooth") and estimate how many degrees you got back off the engine before this happened. A 100% adjustment of the sensor position is made later in section (**5.1.5**) with an ignition timing lamp.

Lock ignition is a smart feature that is used when to adjust the trigger angle , activate the function and MaxxECU will lock ignition to "0" degrees regardless of speed or load!
Locking the ignition can also be done in Ignition -> Ignition settings and setting "Lock ignition angle" where you can also specify the number of degrees (Ignition lock angle) you wish to lock the ignition on.

5.1.3 - Crankshaft trigger wheel.

The design of the trigger wheel is extremely important because the entire engine is controlled based on this sensor. MaxxECU works with most types of pulse wheels. We recommend using the factory installed pulse wheel if they are intact and functioning. MaxxECU supports the market's most common types of trigger system, see **5.1.1**.

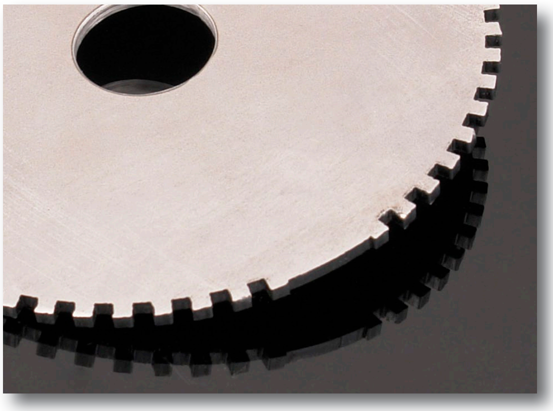


Fig 5.1.3a - Example of a well designed trigger wheel (called pulse wheel) where the "missing teeth" are not as deep as the others.
A good benchmark is to make the depth of the "missing teeth" only 60-70% of remaining teeth deep.
In order for this type of sensor to work, it requires that the material on the trigger wheel is magnetic, ie pure steel.

NOTE! Do not use stainless steel or aluminum!

Important to note is NOT to mount the trigger wheel on the outside of the crankshaft vibration damper but mount it as close to the engine as possible where the pulse wheel is not able to flex!!

5.1.4 - Crank sensor distance from the trigger wheel.

Sensor's distance from the trigger wheel is very individual depending on what type of sensors used and the trigger wheel design. By examining the voltage (see Figure **5.1.6a**) in Diagnostics -> Trigger oscilloscope can determine if the sensor needs to be moved closer, or that the distance needs to be increased in case of any problems. A good benchmark is 0.8mm distance to work from. If the signal is too low, decrease the distance, and vice versa.

5.1.5 - Crank sensor position from TDC

Crank sensors position must be specified in MTune so MaxxECU with the utmost care, control the fuel and ignition accurate.If MaxxECU sends for example 20graders ignition, it should also be 20degrees ignition looking at the engine! The setting is made with illuminated light switched on the ignition coil input signal or output ignition cable down to the spark plug of the first cylinder in the firing order.

The setting is then made in MTune under Inputs -> Trigger / Home inputs and the "First tooth angle" located under "Trigger angle". Lock the ignition on the same settings page and disable the fuel by choosing "Lock ignition to 0 and disable fuel" under "Lock ignition" or provide locking at different fixed angle during Ignition -> Ignition settings , the "Lock ignition angle" and "Lock angle" on this setup page.

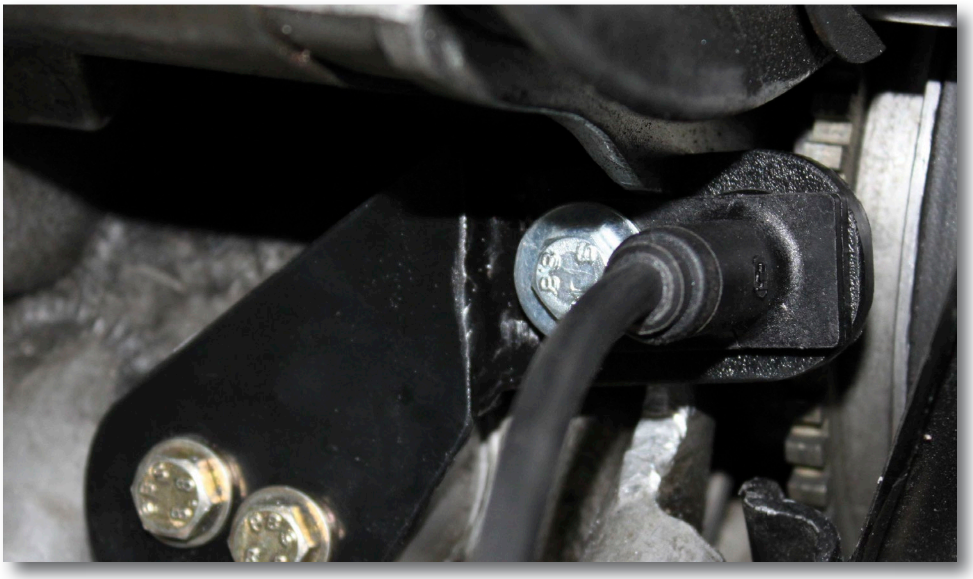


Fig 5.1.5a - Custom-made trigger attachment for bosch crankshaft sensor on a porsche 911.

5.1.6 - Oscilloscope (built-in function)

MTune has built-in oscilloscope function to facilitate troubleshooting of crank and crank sensor.

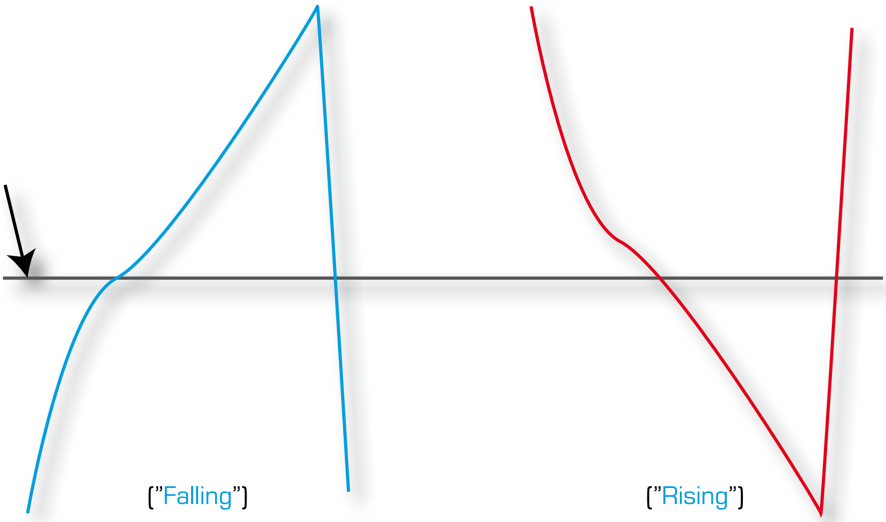


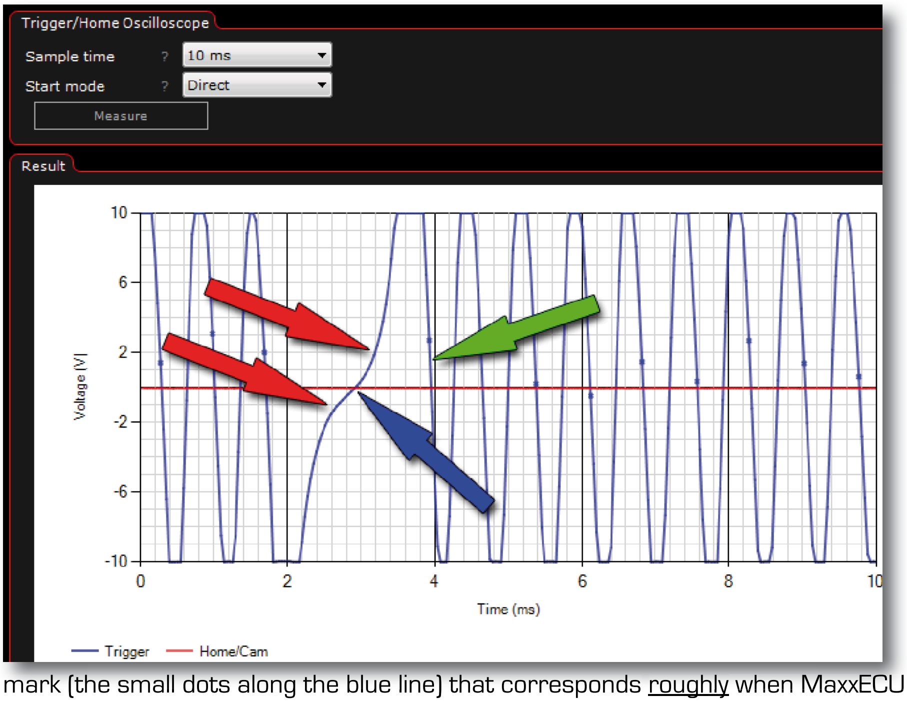
Fig 5.1.6a - Examples of trigger signals. Illustrates the differences between falling and rising curves.

Quickly explained: One always wants to "trigger" on the fastest rising/falling signal, ie the curve that is fastest downward or upward.

-If signal is falling "fastest", then signal should trigger on a "Falling".

-If signal rises "fastest" then signal should trigger on "Rising".

The black arrow shows the sensor zero crossing.


Trigger/Home Oscilloscope

Sample time ? 10 ms

Start mode ? Direct

Fig 5.1.6b - On this screen we see a zero crossing from a 60-2 "Missingtooth" trigger wheel with VR-sensor.
This curve shows that one should trigger on falling ("Falling") and we will now describe how to deduce this:
When no trigger tooth is above the sensor it gives no signal. Zero (blue arrow) marks when the voltage from the sensor exceeds zero volts, ie the sensor detects the trigger tooth.

The red arrows indicate the signal created by the sensor (and MaxxECU reads) when a trigger-tooth is reading a tooth.

The voltage, (vertical) increases during the entire time the sensor detects the trigger tooth. When the trigger tooth has passed, the voltage drops dramatically (green arrow) and we can also see here a small mark (the small dots along the blue line) that corresponds roughly when MaxxECU trigger signal ("Trig arm voltage").
Since the signal goes "faster" off peak voltage down to zero crossing than zero to peak, the signal should be triggered on the falling edge.

It is also with this measurement indicated if the pulse wheel is off center by checking so that the peak voltages are equally "high" throughout the engine RPM. Triggering on digital sensors generally occurs always on the falling edge ("Falling").

At what voltage MaxxECU first must exceed to trigger at zero crossing we touched in Figure **5.1.2a** , ie "Trig arm voltage" under Inputs -> Trigger/Home inputs.
To determine and discern if the signal will be triggered on rising or falling can sometimes be very difficult.

Because the built-in oscilloscope is time based (measurement performed during a specific period of time) it requires adjusting the measurement sampling time ("Sample time") as the engine RPM is a function over time.

When you press "Measure" a picture (snapshot) of the signal will be created and presented, ie the engine has to spin and the button must be pressed at that moment you want MTune to present how the signal looked at that time.
To find the missing teeth ("Missing tooth") (if available on the trigger wheel to measure) and zero crossing, one can adjust the sampling time and press a button several times in order to get a good picture of the signal!

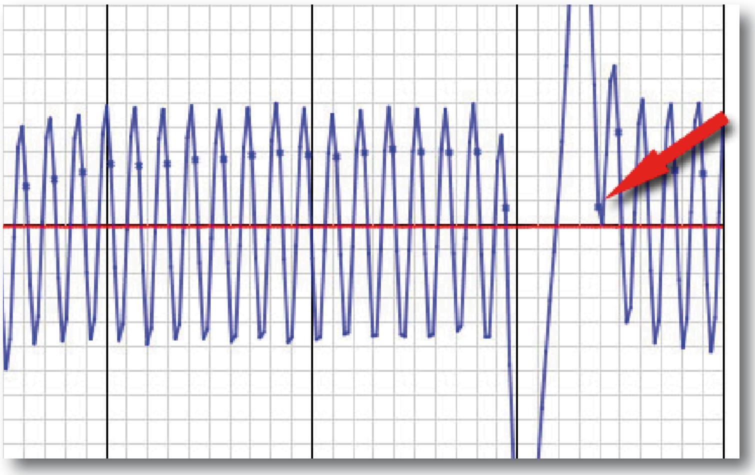


Fig 5.1.6c - Example of a very common triggerfail when the sensor ”sees” the removed teeth (called ”Missing tooth”), sensors receive a ”shock” and stop working for a short period, which means that the signal does not have a zero crossing (see the red arrow above) and thus detects an incorrect number of teeth.
The reason for the above problem is a faulty trigger wheel.

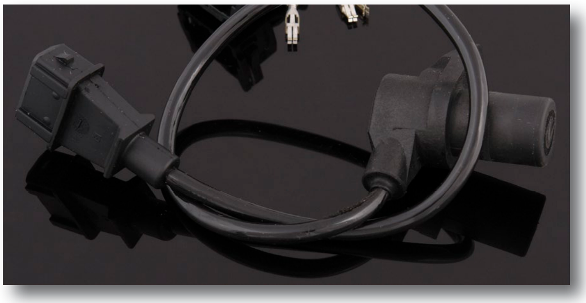
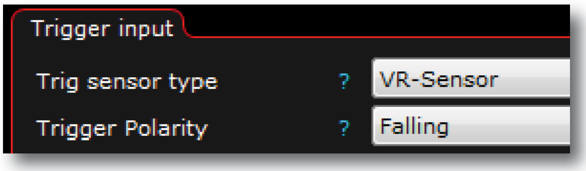


Fig 5.1.6d - Bosch crankshaft sensor (VR) that is often used when the original mounted sensors do not work as they should. Usually require the manufacturing of new trigger mounts and new pulse wheel.

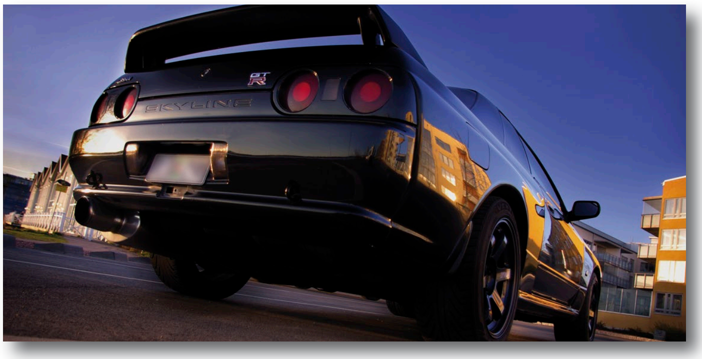


Trigger input

Trig sensor type ? VR-Sensor

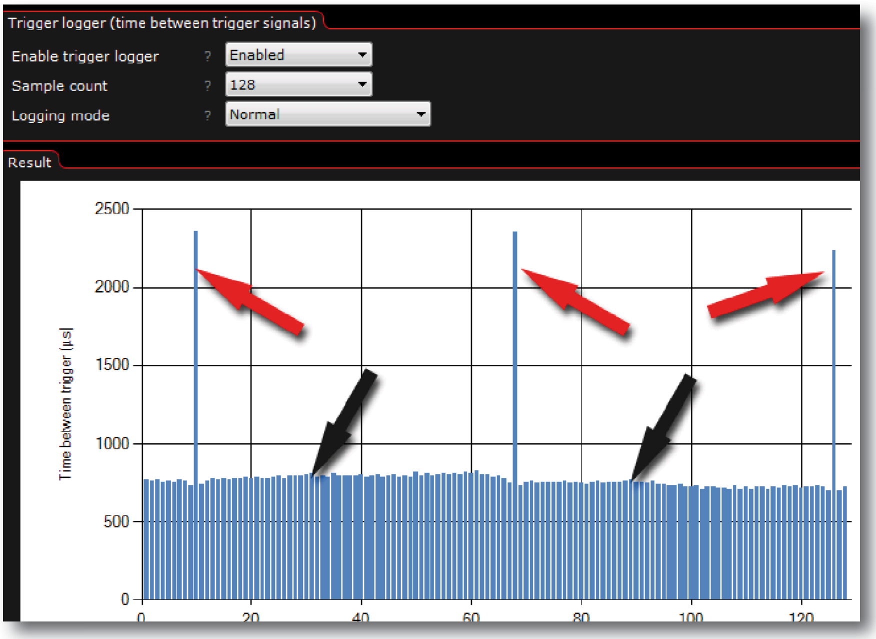
Trigger Polarity ? Falling

Fig 5.1.6e - Upon the adjustment of the trigger polarity (”Trigger polarity”), firing angle will change a few degrees depending on the number of teeth on the pulse wheel. Always check ignitiom timing with a timing light.



5.1.7 - trigger logger.

MTune has a powerful tool that we call ”Trigger logger” that you find in MTune, Diagnostics -> Trigger logger.



Trigger logger (time between trigger signals)

Enable trigger logger ? Enabled

Sample count ? 128

Logging mode ? Normal

Result

Fig 5.1.7a - Examples of how a trigger log might look like.

Activate the function by changing the ”Enable trigger logger” to ”Enabled”. Leave the rest of the settings as default.

When the engine is running on the starter motor, this trigger logger show the signals MaxxECU senses. What you see and how much, is dependent on the ”Sample count” selected.

The black arrows indicate the trigger wheels normal teeth and if you count them, it's 58pcs between each ”long tooth” (red arrow).

To explain the view: the blue bars are the trigger wheels normal teeth and the time between each tooth. When MaxxECU see the missed teeth (”Missing tooth”) then time between the teeth increase, ie, the stack will be higher.

Theoretically, a 60-2 pulse wheels have 58 stacks of equal height and another one which is 3 times as high as the rest, which is in good agreement with the image.

This involves simple troubleshooting when one can visually inspect and read what signal MaxxECU see. The short stacks should all be on the same height!

5.2.0 - Examples of different sensors.

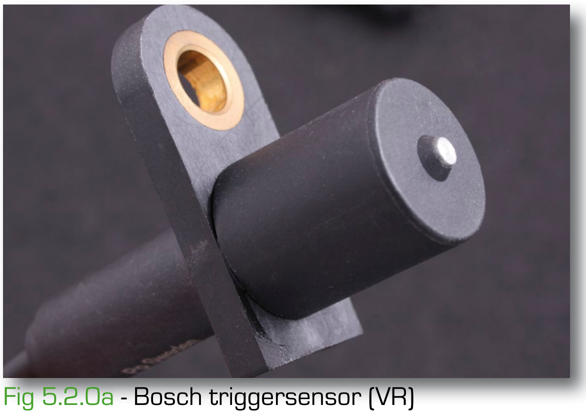


Fig 5.2.0a - Bosch triggersensor (VR)

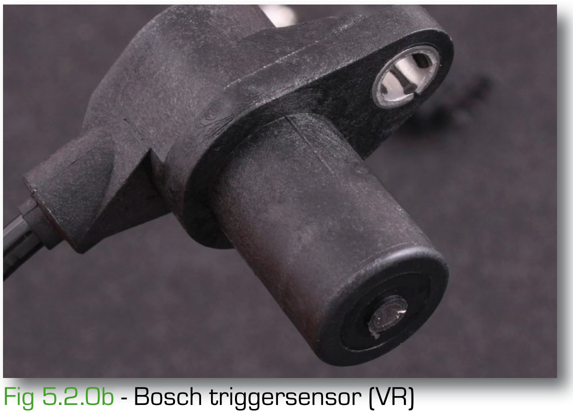


Fig 5.2.0b - Bosch triggersensor (VR)

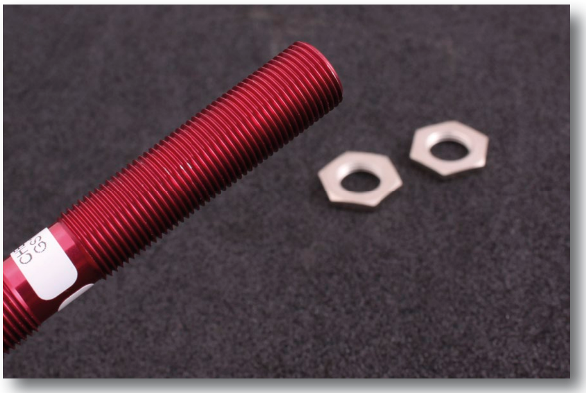


Fig 5.2.0c - Digitalsensor

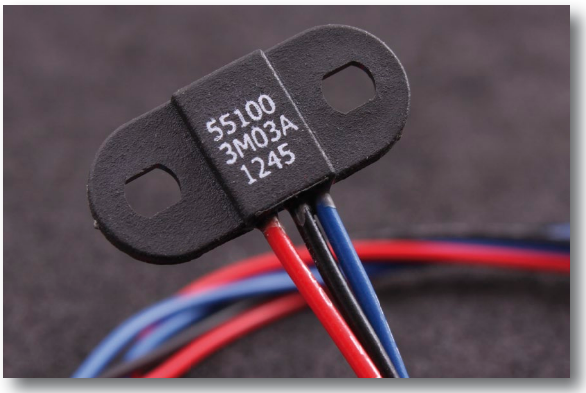


Fig 5.2.0d - Digitalsensor

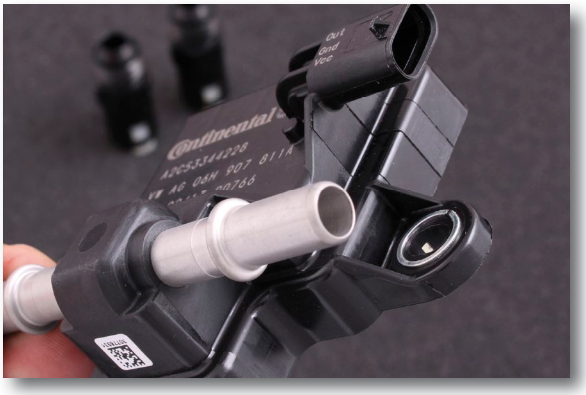


Fig 5.2.0e - Digital ethanol sensor for reading the fuel temperature and ethanol concentration.

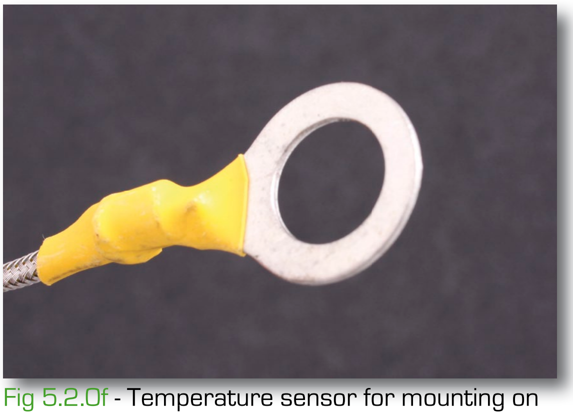


Fig 5.2.0f - Temperature sensor for mounting on eg gearbox, diff or engine blocks. Type-k.

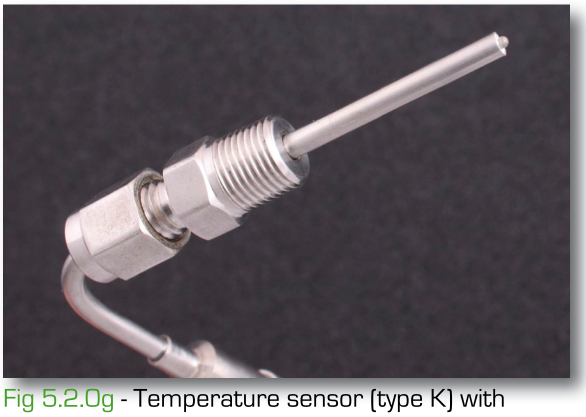


Fig 5.2.0g - Temperature sensor (type K) with 1/8 NPT connection for measuring eg temperature by the turbocharger. Connects via MaxxECU mini-k.

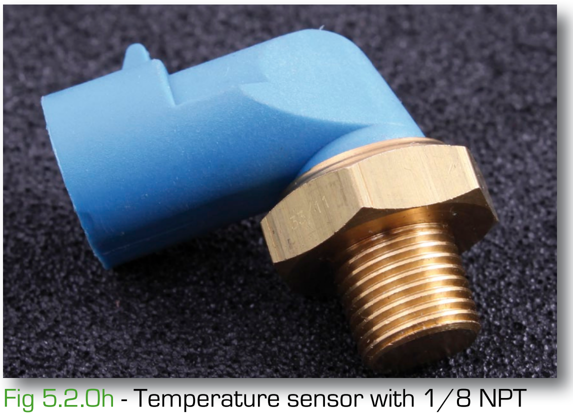


Fig 5.2.0h - Temperature sensor with 1/8 NPT connection for example monitoring the oil temperature.

5.2.1 - Camshaft sensor.

If the motor is to be controlled sequentially (or 5 or 10 cylinders) a signal is required to MaxxECU from a camshaft that indicate which combustion cycle the engine is on. This sensor is used continuously to synchronize the ignition and fuel with the correct valve opening and valve closing, as opposed to competing engine control units that usually only uses this signal at startup! MaxxECU require one pulse per camshaft revolution in general, but there is support for other types of home signals, see settings at Inputs -> Trigger / Home inputs and Home Input.

MaxxECU supports both 5V and 12V sensors. VR or digital sensors, just as crank signal!
At the "Missing tooth" trigger system, avoid placing camshaft sensor so it does not give the signal while cranksensor is triggered (signal should not come at the same time as the position of the missing teeth) to avoid problems.
At "Multitooth + Home" crank signal MUST come between two trigger teeth on the crank.

In MTune, Realtime Data tab -> Trigger's "Home Position" that should be within 10-90% to work best.
Check this value even at higher RPMs! 50 % means that the cam signal is exactly halfway between two trigger teeth.

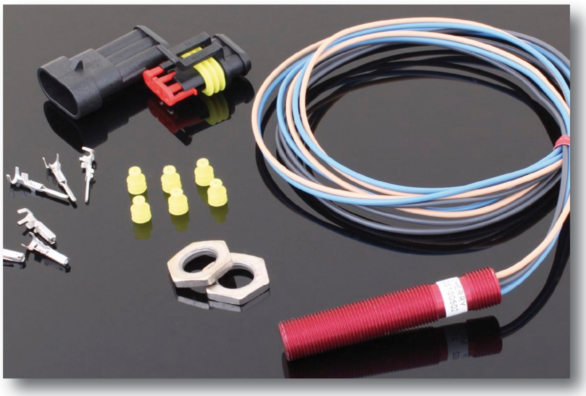
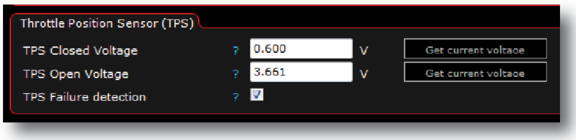


Fig 5.2.1a - Good, and functional camshaft sensor.

5.2.2 - Throttle position sensor (TPS)

MaxxECU requires a functioning **Throttle position sensor** to control the engine properly. The voltage from the sensor should vary linearly with the angle increase in the sensor. The signal to MaxxECU can increase or decrease, calibration (important to do) and automatic recognition is done in MTune. Check that TPS does not go into any bottom position at unaffected gas, OR full throttle, otherwise the sensor may be broken from within! Inputs -> Sensors (CLT, IAT, TPS).


Throttle Position Sensor (TPS)

TPS Closed Voltage ? 0.600 V
TPS Open Voltage ? 3.661 V
TPS Failure detection ? ☑

Fig 5.2.2a - Throttle position settings in MTune

5.2.3 - MAP sensor

MaxxECU has a built in 400Kpa pressure sensor thus capable of 3bar boost. If higher boost pressure is required, the ability to install an external MAP sensor exists. Connect into any available analog 0-5v input. Inputs -> AIN 3-4 (voltage). See **5.4.1** for more information.

It is recommended to always connect the internal MAP sensor even if the engine is not supercharged or overloaded. When the built-in MAP sensor is plugged in and turned on (enabled by default but can be turned off), its value is always used for fuel calculation. Fuel –> Fuel inj general.

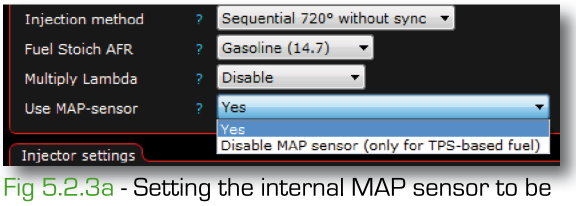
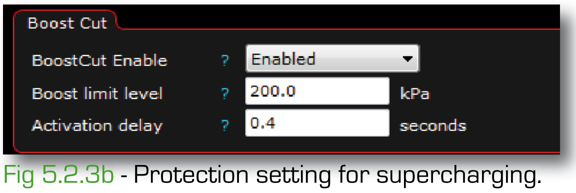

Injection method ? Sequential 720° without sync
Fuel Stoich AFR ? Gasoline (14.7)
Multiply Lambda ? Disable
Use MAP-sensor ? Yes

Fig 5.2.3a - Setting the internal MAP sensor to be used for fuel calculation.

MaxxECU also have many built-in security features, including an "overcharge protection" (Boost cut) if the boost would run wild, you can activate the feature that breaks the engine to prevent damage if exceeded boost pressure (set in atmospheric pressure, 200kPa = 1bar boost). Limits -> Boost Cut.

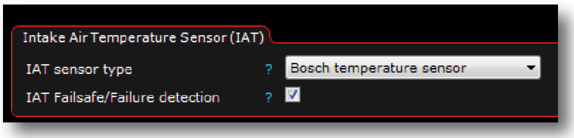

Boost Cut

BoostCut Enable ? Enabled
Boost limit level ? 200.0 kPa
Activation delay ? 0.4 seconds

Fig 5.2.3b - Protection setting for supercharging.

5.2.4 - Intake temperature sensor (IAT)

MaxxECU supports the market's most common sensors and the ability to use a used defined is available. Compensation of intake temperature is required for the engine to run good (fuel quantity must be compensated at different air temperatures). Especially important on supercharged engines where temperatures can vary significantly over a relatively short period of time. Mounted as far as possible, after the throttle body in intake. The sensor is not polarity sensitive. Inputs –> Sensors (CLT,IAT,TPS).

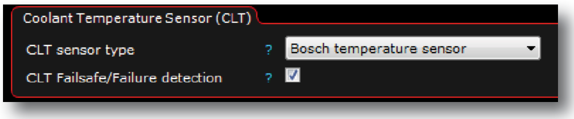

Intake Air Temperature Sensor (IAT)

IAT sensor type ? Bosch temperature sensor
IAT Failsafe/Failure detection ? ☑

Fig 5.2.4a - Selection of the intake temperature sensor.

5.2.5 - Engine coolant temperature sensor (CLT)

MaxxECU supports the market's most common sensors and the ability to use a user defined sensor is available. MaxxECU requires a coolant temperature sensor mounted where coolant always is circulating. The sensor must not be mounted on: eg hose to the radiator. Required to compensate the fuel and ignition at different coolant temperatures and startup on a cold engine. Not polarity sensitive. Inputs –> Sensors (CLT,IAT,TPS).


Coolant Temperature Sensor (CLT)

CLT sensor type ? Bosch temperature sensor
CLT Failsafe/Failure detection ? ☑

Fig 5.2.5a - Selection of Coolant temperature sensor.

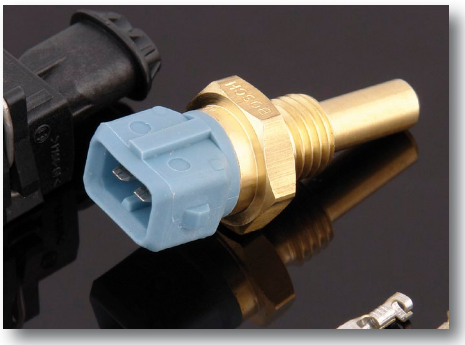


Fig 5.2.5a - Bosch engine coolant temp sensor (CLT)

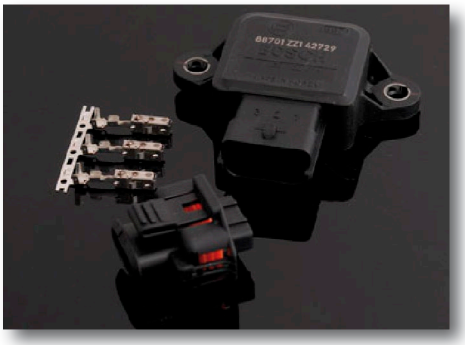


Fig 5.2.5b - Bosch Throttle position sensor (TPS)

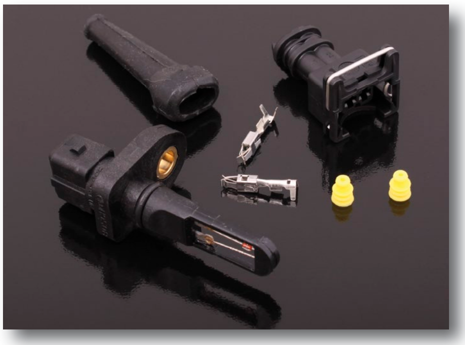


Fig 5.2.5c - Bosch intake temperature sensor (IAT)

5.2.6 - Lambda sensor.

MaxxECU has integrated electronics for wideband lambda, ie no external electronics is needed to connect the wideband lambda sensor. NOTE! use only genuine Bosch LSU 4.2 (# 0280 007 057) sensor. This probe is always included with the purchase of MaxxECU! Wideband lambda should be used together with MaxxECU to use built-in functions.
Activation of wideband lambda is here: Inputs -> Lambda Sensor

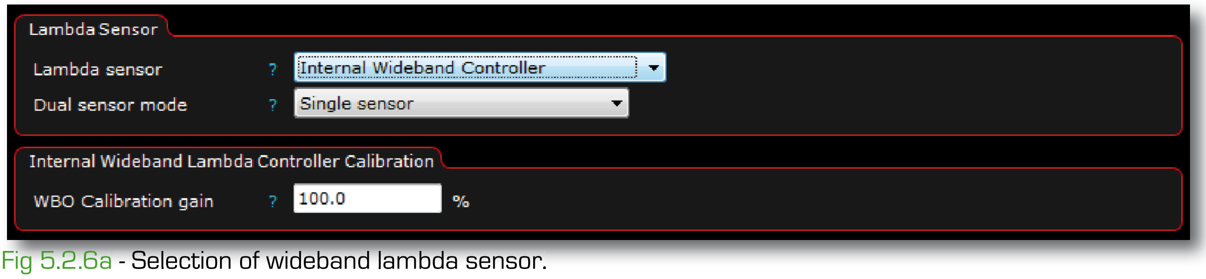

Lambda Sensor
Lambda sensor ? Internal Wideband Controller
Dual sensor mode ? Single sensor
Internal Wideband Lambda Controller Calibration
WBO Calibration gain ? 100.0 %

Fig 5.2.6a - Selection of wideband lambda sensor.

If external wideband kit (with external electronics) is used, connect this to any available analog 0-5v input.
Inputs -> AIN 3-4 (voltage)
In Inputs -> Lambda Sensor, choose instead "External Wideband Controller". Innovate, AEM, Tech Edge, Zeitronix available as presets.

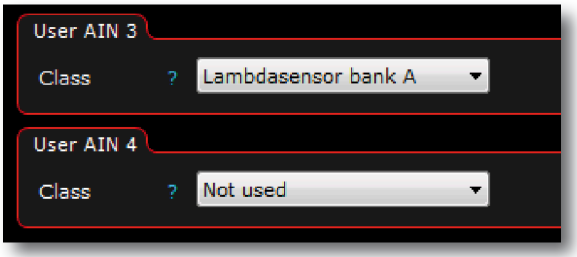

User AIN 3
Class ? Lambdasensor bank A
User AIN 4
Class ? Not used

Fig 5.2.6b - Selection of lambda sensor on an analog input.

MaxxECU also supports dual wideband lambda probes. However, one can not combine the internal driver stage with an external driver.
Upon activation of the dual sensor it requires two external alike drivers. When this feature is enabled, you are now under Inputs - Lambda sensor and dual sensor mode, you can also select which cylinder belongs to which "side" (bank) on the engine.

MaxxECU also supports narrowband lambda (although we do not recommend using this type). Select "Narrowband sensor" under Inputs -> Lambda sensor and uses an analog input (AIN 3-4) activated as "Lambda sensor bank A".

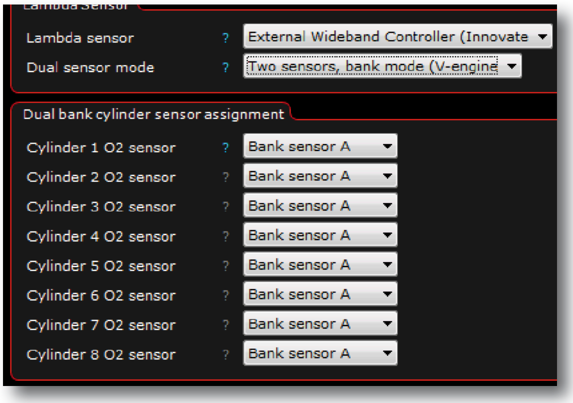

Lambda Sensor
Lambda sensor ? External Wideband Controller (Innovate
Dual sensor mode ? Two sensors, bank mode (V-engine
Dual bank cylinder sensor assignment
Cylinder 1 O2 sensor ? Bank sensor A
Cylinder 2 O2 sensor ? Bank sensor A
Cylinder 3 O2 sensor ? Bank sensor A
Cylinder 4 O2 sensor ? Bank sensor A
Cylinder 5 O2 sensor ? Bank sensor A
Cylinder 6 O2 sensor ? Bank sensor A
Cylinder 7 O2 sensor ? Bank sensor A
Cylinder 8 O2 sensor ? Bank sensor A

Fig 5.2.6c - Allocate what cylinder belongs to wideband lambda sensor.

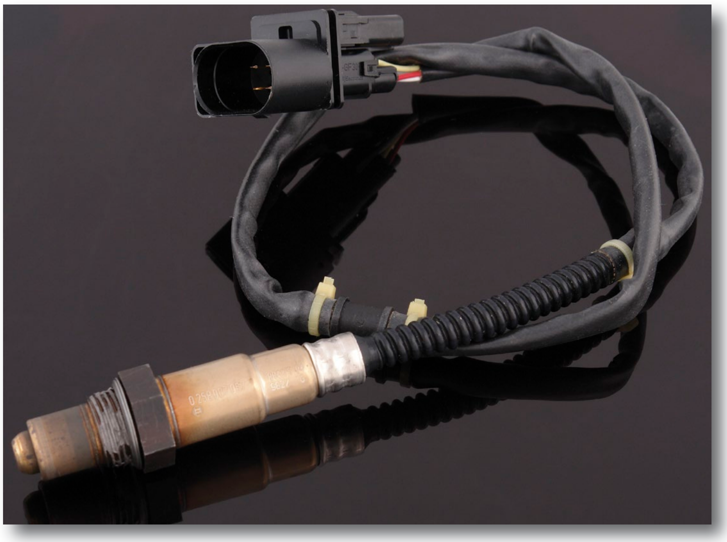
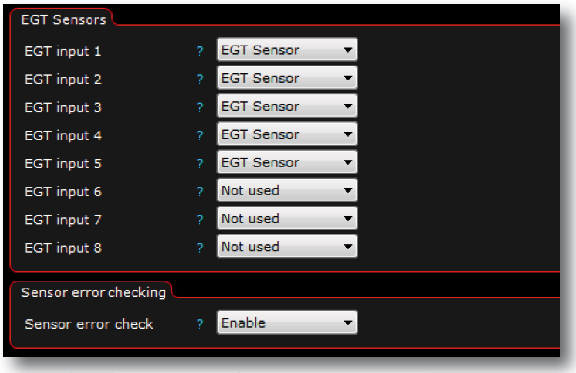


Fig 5.2.6d - Bosch wideband lambda sensor.
NOTE! use only BOSCH LSU 4.2 sensor to MaxxECU.

5.2.7 - Exhaust gas temperature sensor.

MaxxECU has 8 inputs for exhaust gas temperatures (EGT). On one side of the unit there are eight "mini-k" connectors for type-K EGT sensors.

MaxxECU here also has built-in safeguards to remedy the fault and shut the engine off in time if something is about to happen. Beneficially connect a EGT sensor on each cylinder port.
One can then in MTune log differentials among sensors, and activate the warning / switch functions if the differential would be too high or that any cylinder would be warmer than the set value. Inputs -> EGT sensors
Each input must be activated before use.



EGT Sensors

EGT input 1	?	EGT Sensor
EGT input 2	?	EGT Sensor
EGT input 3	?	EGT Sensor
EGT input 4	?	EGT Sensor
EGT input 5	?	EGT Sensor
EGT input 6	?	Not used
EGT input 7	?	Not used
EGT input 8	?	Not used

Sensor error checking

Sensor error check	?	Enable

Fig 5.2.7a - MTune EGT-sensor setting.

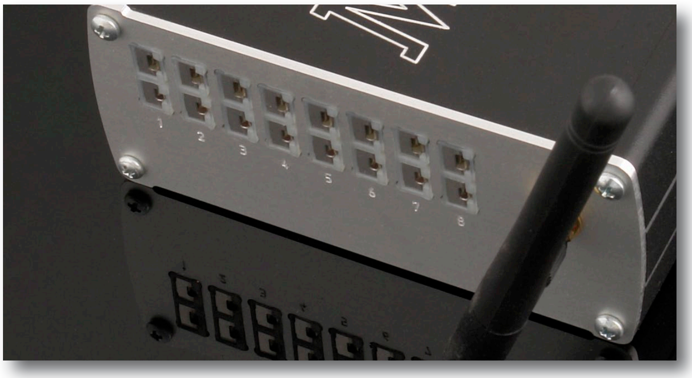


Fig 5.2.7b - On the side of the MaxxECU device you can connect the exhaust temperature sensors.

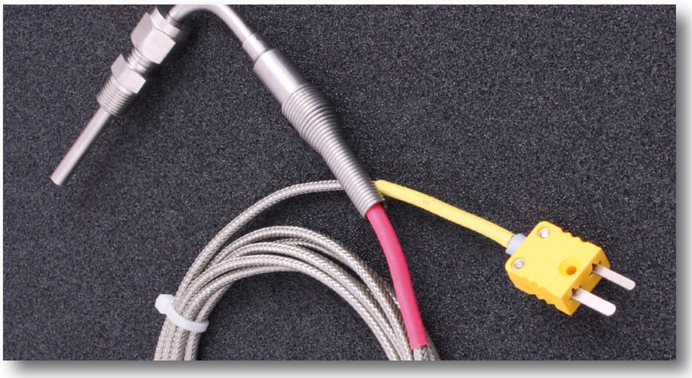


Fig 5.2.7c - Exhaust gas temperature sensor (EGT) with Mini-k connector designed for exhaust gas temperature measurements together with MaxxECU.

5.3.1 - Digital Inputs.

MaxxECU have 2 dedicated digital inputs (DIN 1-2), but additional analog inputs can be used as digital inputs (AIN 1-4).
Activation of the input is done via either chassis ground ("5V pullup enabled") or with +5v/+12v ("No pullup resistor"). Selections are to activate the active high or active low. MaxxECU REV4 + are also able to activate GPO7 output as a digital (DIN3) input.

A digital input can be used to eg enable the launch-control, logging, shift-cut, etc. An analog input can also be used as a digital input, see **5.4.1**.

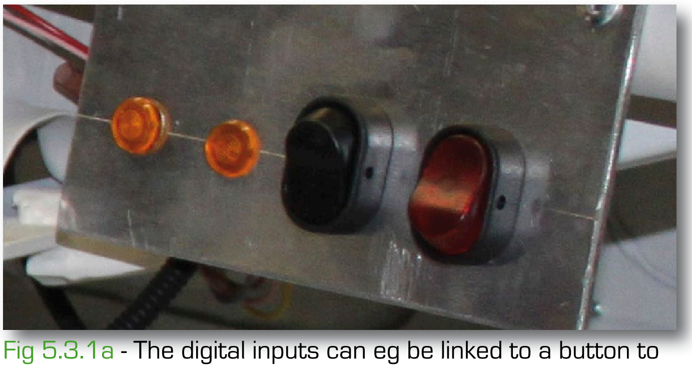
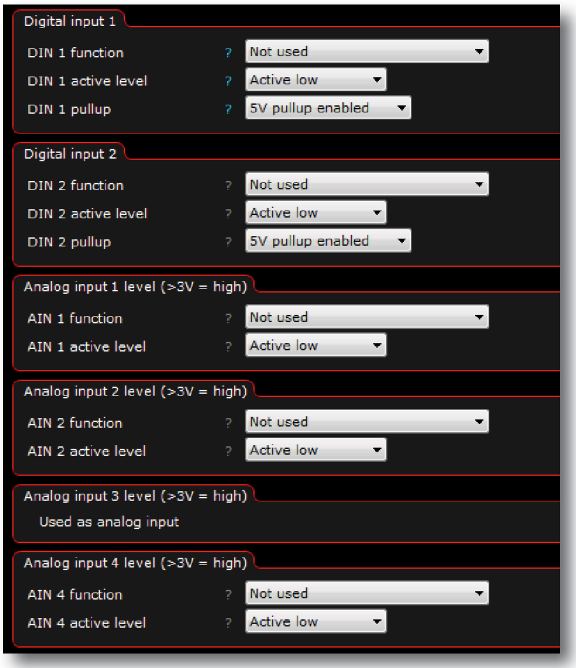


Fig 5.3.1a - The digital inputs can eg be linked to a button to control or activate various functions, such as launch-control.



Digital input 1

DIN 1 function	?	Not used
DIN 1 active level	?	Active low
DIN 1 pullup	?	5V pullup enabled

Digital input 2

DIN 2 function	?	Not used
DIN 2 active level	?	Active low
DIN 2 pullup	?	5V pullup enabled

Analog input 1 level (>3V = high)

AIN 1 function	?	Not used
AIN 1 active level	?	Active low

Analog input 2 level (>3V = high)

AIN 2 function	?	Not used
AIN 2 active level	?	Active low

Analog input 3 level (>3V = high)

Used as analog input

Analog input 4 level (>3V = high)

AIN 4 function	?	Not used
AIN 4 active level	?	Active low

Fig 5.3.1b - MTune settings page for digital inputs. Inputs -> Digital inputs.

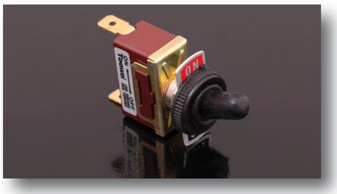
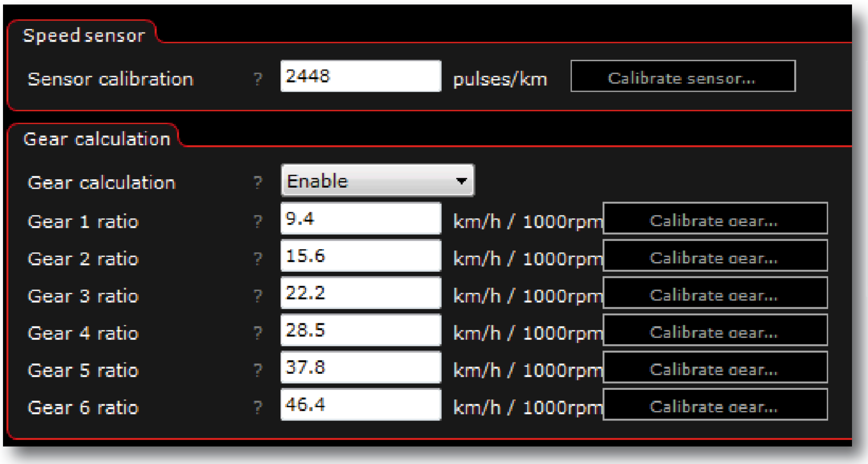


Fig 5.3.1c - Examples of switches that can be used.

5.3.2 - Speedsensor.

MaxxECU supports digital speed sensor, ie original or retrofit signals from a digital sensor such as one sitting on the cars drive shafts and sends speed signals. In Inputs -> Digital inputs, select the input and set the input as a "speed sensor (gearbox)"

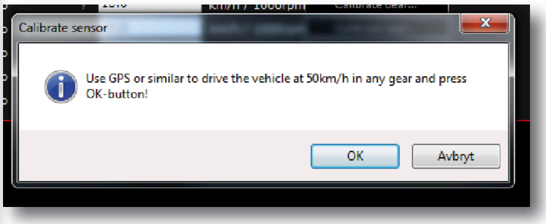


Speed sensor

Sensor calibration	2448	pulses/km	Calibrate sensor...

Gear calculation

Gear calculation	Enable		
Gear 1 ratio	9.4	km/h / 1000rpm	Calibrate gear...
Gear 2 ratio	15.6	km/h / 1000rpm	Calibrate gear...
Gear 3 ratio	22.2	km/h / 1000rpm	Calibrate gear...
Gear 4 ratio	28.5	km/h / 1000rpm	Calibrate gear...
Gear 5 ratio	37.8	km/h / 1000rpm	Calibrate gear...
Gear 6 ratio	46.4	km/h / 1000rpm	Calibrate gear...



Calibrate sensor

Use GPS or similar to drive the vehicle at 50km/h in any gear and press OK-button!

Fig 5.3.2b - Question that arises in the calibration of the number of pulses / km.

Fig 5.3.2a - When a digital input is activated as a speed signal, it will provide an extra settings page found in Inputs -> Speed / Gear.

"Sensor calibration" is the number of pulses the sensor gives per each km / h

Press "Calibrate sensor..." button, drive the car in 50km / h (check with GPS for best results) in an appropriate gear (does not matter which gear) and press the "OK" button to confirm (see Figure **5.3.2b**).

After this calibration is performed it requires the making of a calibration in each gear, by driving the car at a constant speed and current gear and click on the appropriate "Calibrate gear..." button on the gear running at the moment.

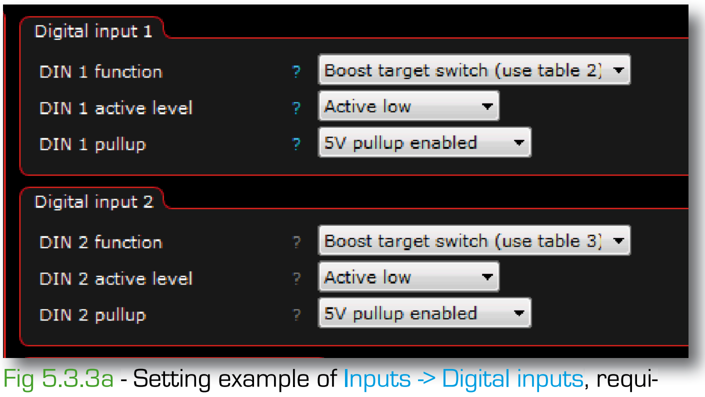
Start with the first gear and move up through the gears. Once it calibrated, the Speed / Gear - > VSS Speed and Speed / Gear - > VSS Gear can be used for logging, boost control, or other flexible features as input.

Appropriate number of pulses for sensors:
- Mounted on drive line : 5-25pcs/revolution
- Mounted on a driveshaft : 20-100pcs/revolution

NOTE! This calibration is only possible when driving with the engine running!

5.3.3 - Various boost levels.

MaxxECU supports a maximum of 3 different boost tables by activating inputs to "boost target switch (Use Table 2)" and / or "boost target switch (Use Table 3)" in MTune Inputs settings. Both digital and analog input can be used for this type of input activation. NOTE! to use different boost levels, an electrical solenoid valve is required which is connected to any of the GPO outputs, see **6** and **6.3.2**.



Digital input 1

DIN 1 function	Boost target switch (use table 2)
DIN 1 active level	Active low
DIN 1 pullup	5V pullup enabled

Digital input 2

DIN 2 function	Boost target switch (use table 3)
DIN 2 active level	Active low
DIN 2 pullup	5V pullup enabled

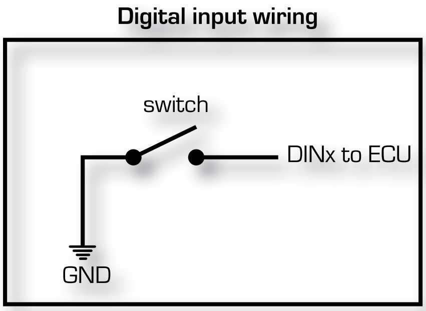


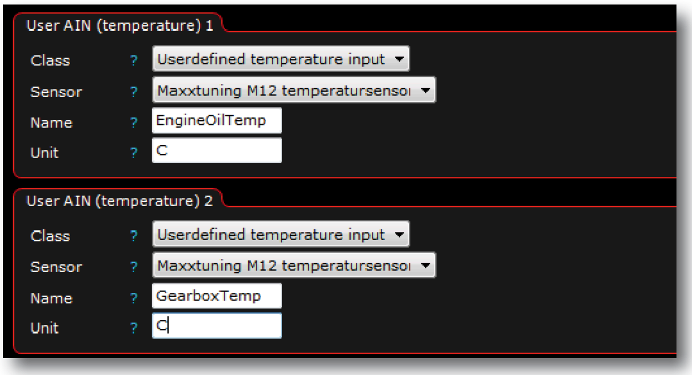
Fig 5.3.3a - Setting example of Inputs -> Digital inputs, required for 3 different boost levels.

DIN active level indicates whether the input should be "active low" or "active high", ie, the position in which the input should be in the unaffected position. "Pullup" is specified if you want MaxxECUs 5V internal resistance to be used at the input to truly ensure a digital one (+5V) or digital zero(GND).

Fig 5.3.3b - Connecting the digital switch to MaxxECU is done by grounding the input to the car chassi. When grounding the input required the "pullup" = "5V pullup enabled" in Inputs -> Digital inputs. see **5.3.1**.

5.4.1 - Analog inputs.

MaxxECU have 4 extra analog inputs, which 2 are analog temperature inputs (AIN 1-2) and two 0-5v inputs (AIN 3-4). AIN 1-4 can also be used as digital input for eg switches.
These settings can be found under Inputs -> AIN -1-2 (temperature).



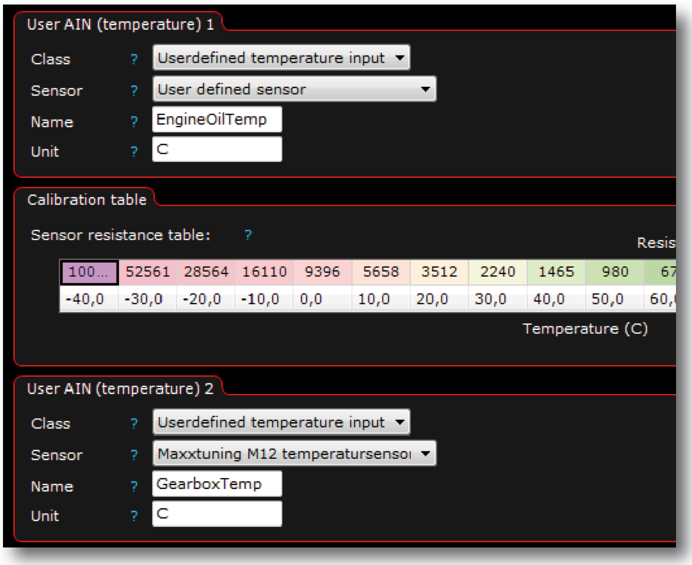
User AIN (temperature) 1

Class ? Userdefined temperature input
Sensor ? Maxxtuning M12 temperatursensoi
Name ? EngineOilTemp
Unit ? C

User AIN (temperature) 2

Class ? Userdefined temperature input
Sensor ? Maxxtuning M12 temperatursensoi
Name ? GearboxTemp
Unit ? C

Fig 5.4.1a - The settings page for temperature inputs (AIN 1-2) is easily constructed. To activate the input select "User-Defined temperature input" in the list for "Class". Then select the sensor, enter any name (Name) and the unit (Unit) that will be used. Sensors can be renamed to just about anything in order to facilitate reading in MTune.



User AIN (temperature) 1

Class ? Userdefined temperature input
Sensor ? User defined sensor
Name ? EngineOilTemp
Unit ? C

Calibration table

Sensor resistance table: ? Resis

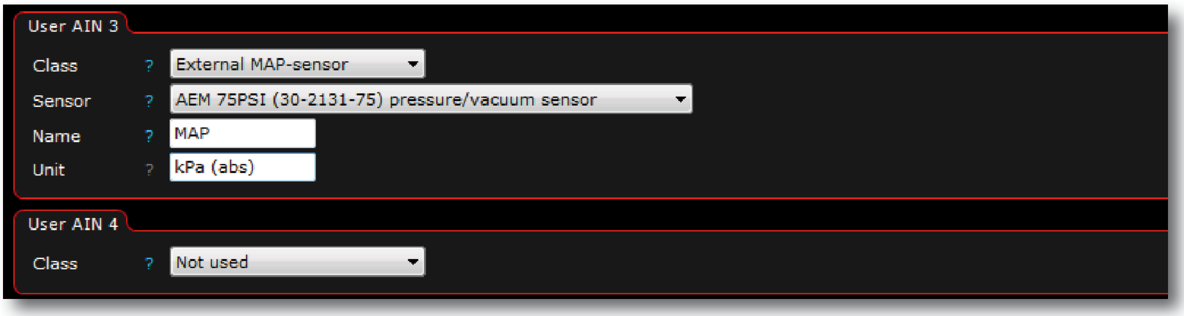
100...	52561	28564	16110	9396	5658	3512	2240	1465	980	67
-40,0	-30,0	-20,0	-10,0	0,0	10,0	20,0	30,0	40,0	50,0	60,(

Temperature (C)

User AIN (temperature) 2

Class ? Userdefined temperature input
Sensor ? Maxxtuning M12 temperatursensoi
Name ? GearboxTemp
Unit ? C

Fig 5.4.1b - In the above screenshot, we have chosen a "User defined sensor" because the sensor to be used is not available by default in the list. If no sensor is supported and there is data for this, contact us and we will add it as a predefined sensor!



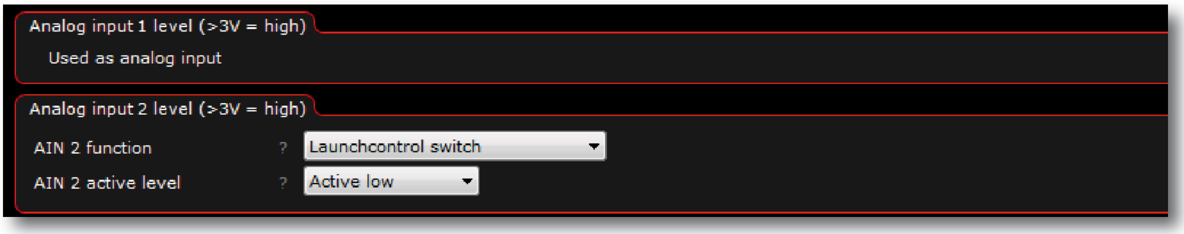
User AIN 3

Class ? External MAP-sensor
Sensor ? AEM 75PSI (30-2131-75) pressure/vacuum sensor
Name ? MAP
Unit ? kPa (abs)

User AIN 4

Class ? Not used

Fig 5.4.1c - Examples of preference to use a larger MAP sensor than the built-in 400Kpa. When an external MAP sensor is enabled, the internal MAP sensor is disabled. Used when the turbo pressure exceeds 3.0bar.



Analog input 1 level (>3V = high)

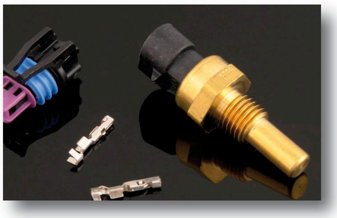
Used as analog input

Analog input 2 level (>3V = high)

AIN 2 function ? Launchcontrol switch
AIN 2 active level ? Active low

Fig 5.4.1d - The analog inputs can also be used as digital inputs, see **5.3.1**.
Above we see examples of how it might look in MTune if an analog input is already assigned (can not be used as a digital input at the same time) and an analog input as a digital input to activate launch control.
To activate the analog inputs +5 V or +12 V is required.

Fig 5.4.1e - Oil temperature sensor that can be used on the analog inputs.



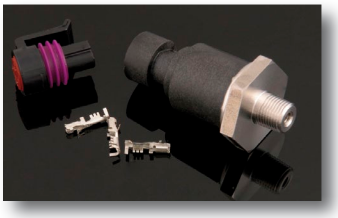
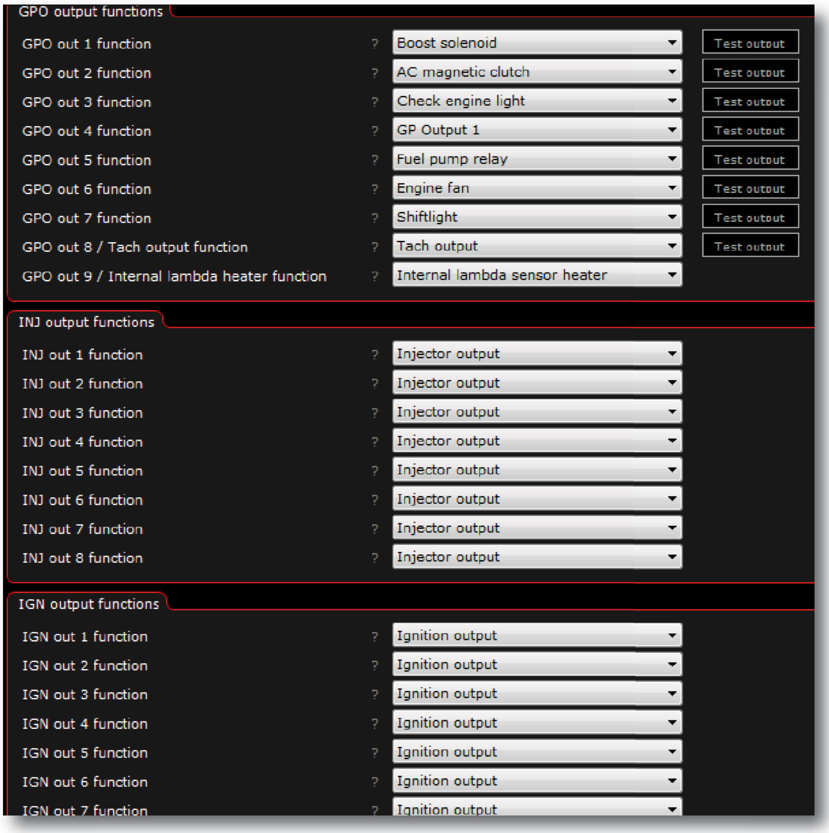


Fig 5.4.1d - 0-10bar pressure sensor which can be used eg oil pressure, fuel pressure and connected to the analog 0-5V inputs.

6 - MaxxECU outputs.

MaxxECU has 8 individual ignition and fuel outputs, as these can also be used as outputs for other things if they are not used for ignition / fuel control. All use of the outputs is under Outputs in MTune. The different outputs have different technical specifications so it is important not to overload an output with too high load (power). See **1** - Technical Specifications.



GPO output functions

GPO out 1 function	Boost solenoid	Test output
GPO out 2 function	AC magnetic clutch	Test output
GPO out 3 function	Check engine light	Test output
GPO out 4 function	GP Output 1	Test output
GPO out 5 function	Fuel pump relay	Test output
GPO out 6 function	Engine fan	Test output
GPO out 7 function	Shiftlight	Test output
GPO out 8 / Tach output function	Tach output	Test output
GPO out 9 / Internal lambda heater function	Internal lambda sensor heater	

INJ output functions

INJ out 1 function	Injector output
INJ out 2 function	Injector output
INJ out 3 function	Injector output
INJ out 4 function	Injector output
INJ out 5 function	Injector output
INJ out 6 function	Injector output
INJ out 7 function	Injector output
INJ out 8 function	Injector output

IGN output functions

IGN out 1 function	Ignition output
IGN out 2 function	Ignition output
IGN out 3 function	Ignition output
IGN out 4 function	Ignition output
IGN out 5 function	Ignition output
IGN out 6 function	Ignition output
IGN out 7 function	Ignition output

Fig 6a - Setup page for all settings regarding outputs in MaxxECU .

By default, the GPO (General Purpose Output) 5 is active as the fuel pump relay (Fuel pump relay), GPO6 is cooling fan (Engine fan), GPO8 is tachometer (Tach output). GPO9 used for internal wideband lambda (if used, Internal lambda sensor heater).

To change the output to something completely different, you click the list and select the type of output to be used. There are several "test outputs" which can be selected as "Always on", "Test PWM" etc.

To the right of the list, there is a button which we have labeled "Test output" which simply sends a test signal to quickly and easily identify a faulty connection and see if the connected device is functioning properly.

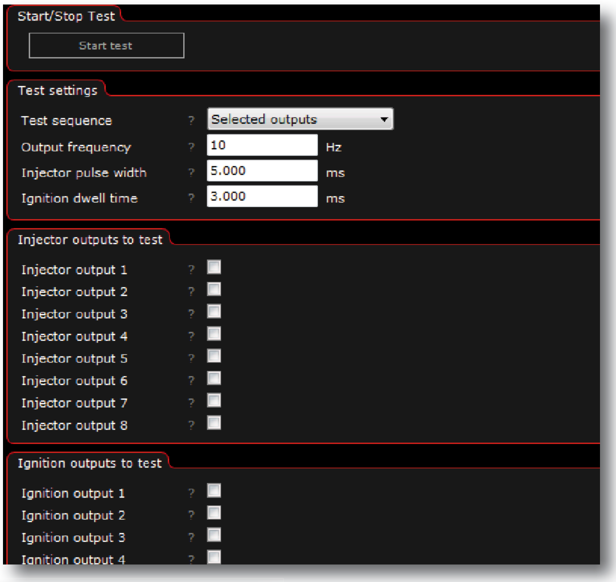
At Diagnostic -> Output test there are test functions for spark and fuel outputs, see 6.0.1.

INJ and GPO are grounded output where the load (lamp / relay) is connected between +12 V and the output.

IGN operates only on 5v, eg a LED can be connected between ground and IGN output.

6.0.1 - Test the ignition and fuel outputs.

Outputs that are either ignition/fuel output can not be tested directly on the settings page above, but this is done for security reasons at Diagnostic -> Output Test in MTune. NOTE! In these tests be very careful, first test the coils, then the injectors otherwise it can result in damaged intakes. NOTE! The outputs that are not enabled as a fuel / ignition output will NOT be able to be tested! Enable them as described above first!



Start/Stop Test

Test settings

Test sequence	Selected outputs	
Output frequency	10	Hz
Injector pulse width	5.000	ms
Ignition dwell time	3.000	ms

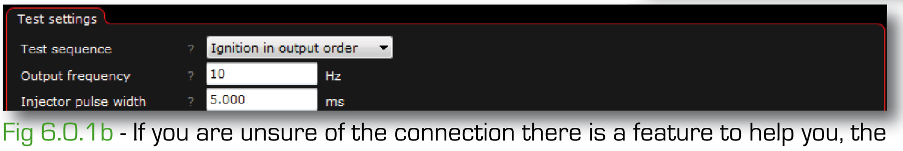
Injector outputs to test

Injector output 1 ☐
Injector output 2 ☐
Injector output 3 ☐
Injector output 4 ☐
Injector output 5 ☐
Injector output 6 ☐
Injector output 7 ☐
Injector output 8 ☐

Ignition outputs to test

Ignition output 1 ☐
Ignition output 2 ☐
Ignition output 3 ☐
Ignition output 4 ☐

Fig 6.0.1a - To test each output separately, select "Selected outputs" at "Test sequence". Then click on the top button labeled "Start Test". The test does not actually start until one of the check boxes are activated by clicking on them! Settings concerning frequency ("Output frequency"), pulse width ("injector pulse width") or dwell time ("Ignition dwell time"), is done here aswell. Be sure to press the STOP button (same button as start) after a completed test!



Test settings

Test sequence	Ignition in output order	
Output frequency	10	Hz
Injector pulse width	5.000	ms

Fig 6.0.1b - If you are unsure of the connection there is a feature to help you, the user by being able to run the injectors / ignition in the cylinder order or firing order.

6.1.1 - Ignition Outputs.

MaxxECU has 8 individual spark outputs that can trigger the ignition coils with internal ignitionmodule or external ignition modules. Whether it's running sequentially or not, it should always be connected to the correct cylinder, MaxxECU does not triggers ignition in spark output order, but in firing order which is set in MTune, Configuration -> Engine settings -> Firing order.
IGN1 -> CYL1, IGN2 -> CYL2 ...

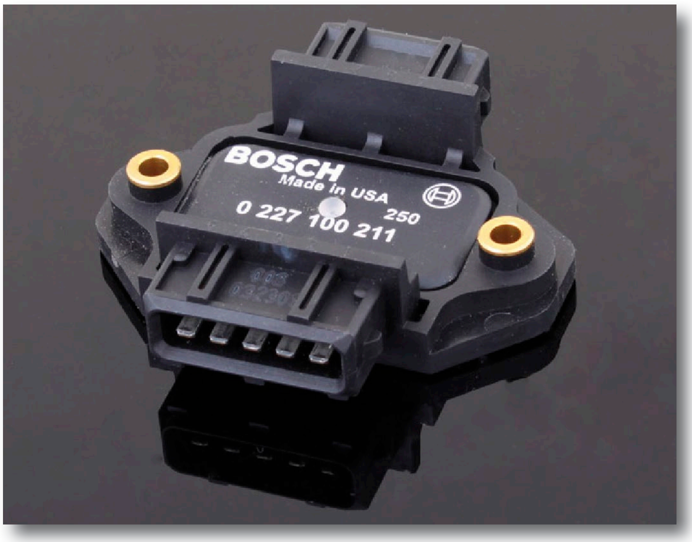


Fig 6.1.1a - The Bosch ignition module is usually used when to trigger ignition coils without integrated electronics.

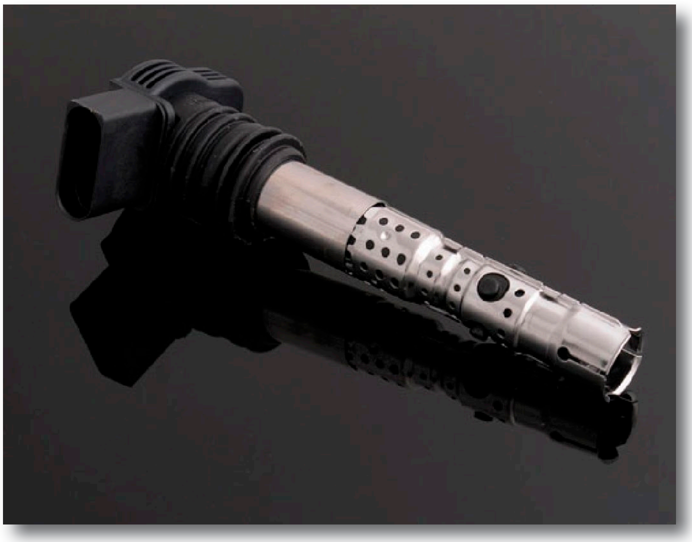


Fig 6.1.1b - VAG coil is often used because they are relatively cheap and good ignition coil with built-in module which means you do not need any external electronics between coil and MaxxECU.

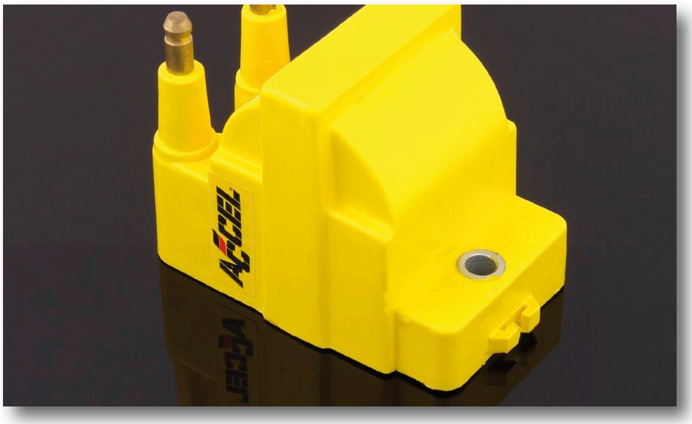


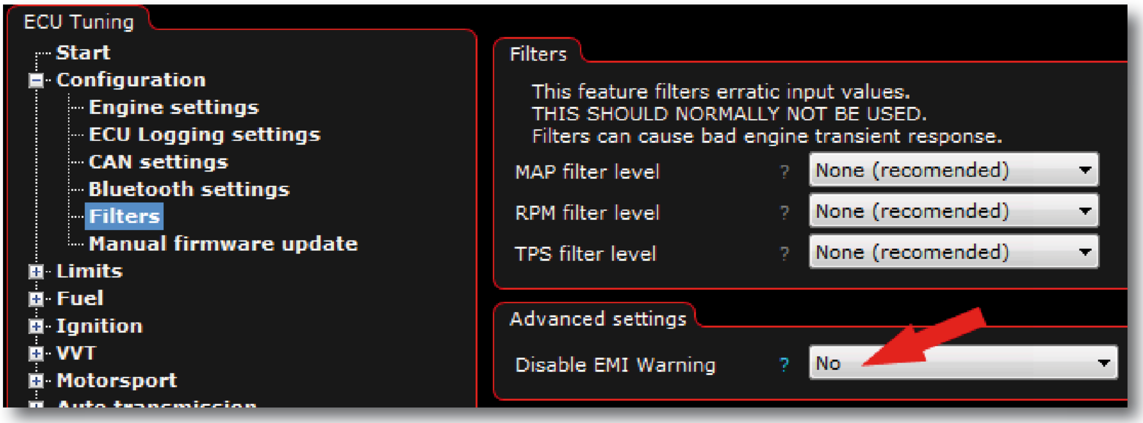
Fig 6.1.1c - Example of ignition coil without built-in module.

Fig 6.1.1d - These copper spark plugs, for example, NGK BCPR7ES is widely used and are preferred over expensive designer plugs.

6.1.2 - Ignition interference.

MaxxECU is just like any electronic systems sensitive to electrical distortion.
The disruption occurs mainly in the ignition system where the high-voltage and high-speed pulses can be induced in surrounding cables, and engine management is perceived as false trigger signals. In 90% of the cases where we have seen disorders that primarily affect trigger system is the use of non-resistor spark plug that was the cause!

In MTune 1.70 and later, we added an additional warning that outsource an error code when MaxxECU believe that distortion levels are too high and unmanageable. This warning can be turned off, but the interference source must first be investigated and dealt with appropriately! Contact support if there is uncertainty.



Filters

This feature filters erratic input values.
THIS SHOULD NORMALLY NOT BE USED.
Filters can cause bad engine transient response.

MAP filter level ? None (recomended)
RPM filter level ? None (recomended)
TPS filter level ? None (recomended)

Advanced settings

Disable EMI Warning ? No

Fig 6.1.2a - MTune settings page for filters and EMI warning. Configuration -> Filters

- Common causes:
- Non-resistor spark plug is used!
- Non-resistor spark plug is used!
- Non-resistor spark plug is used!
- Ignition cables with low internal resistance with non resistor spark plug!
- Trigger sensor mounted into the distributor to which high power ignition systems is connect (fireworks a few millimeters from sensitive sensors is not helping...)
- Problems with grounding.

If the distortion levels are extremely high, this may not only affect the trigger system, but also the internal components such as MAP sensor, therefore you should NEVER turn off "EMI Warning" without really being 100% sure what you do!

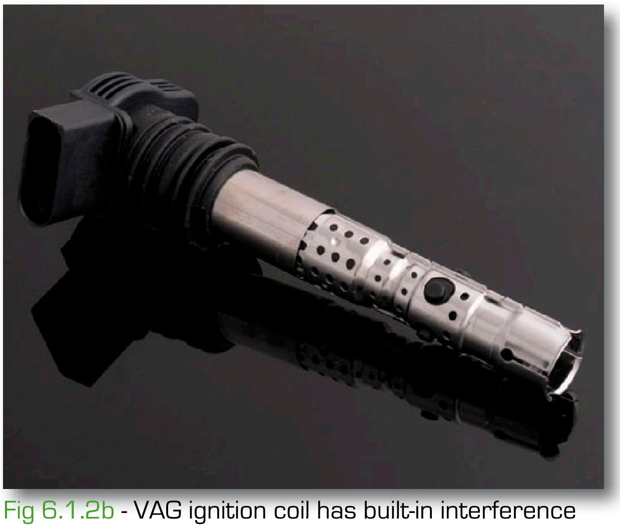


Fig 6.1.2b - VAG ignition coil has built-in interference suppression and is a good option for most engines where it is possible to mount it directly on the spark plug. Three different lengths of the coil is available to suit most engines.

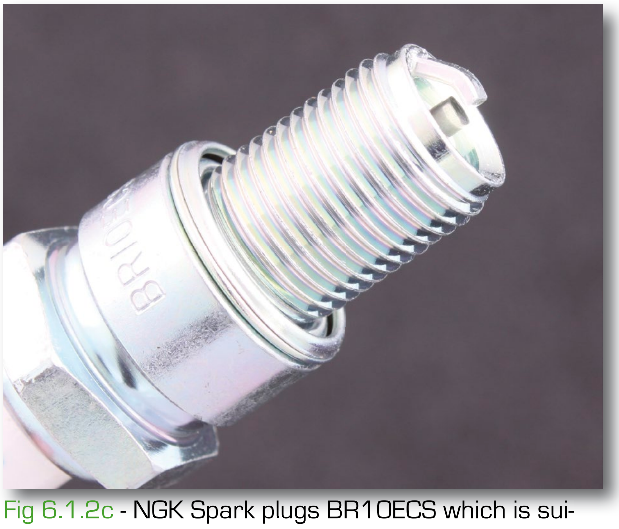
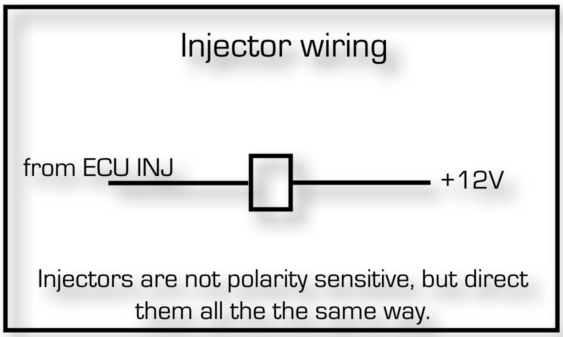


Fig 6.1.2c - NGK Spark plugs BR10ECS which is suitable for use on methanol engines. Good replacement for older non resistor spark plug that is often used on supercharged V8 engines.

It is not easy to visually determine whether a spark plug is supressed or not.
Spark plug resistor-has more than 500ohm resistance between the connector and the electrode.

6.2.1 - Fuel outputs.

MaxxECU has 8 individual injection outputs that can drive both low ohm and high ohms injector, without extra injector resistance components. Whether it's running sequentially or not, injection outputs should always be connected to the correct cylinder. MaxxECU does not inject fuel in output order, the injection sequence set in MTune, Configuration -> Engine settings -> Firing order.
Always link together right output with the right cylinder, eg INJ1 -> CYL1, INJ2 -> CYL2, INJ3 -> CYL3.

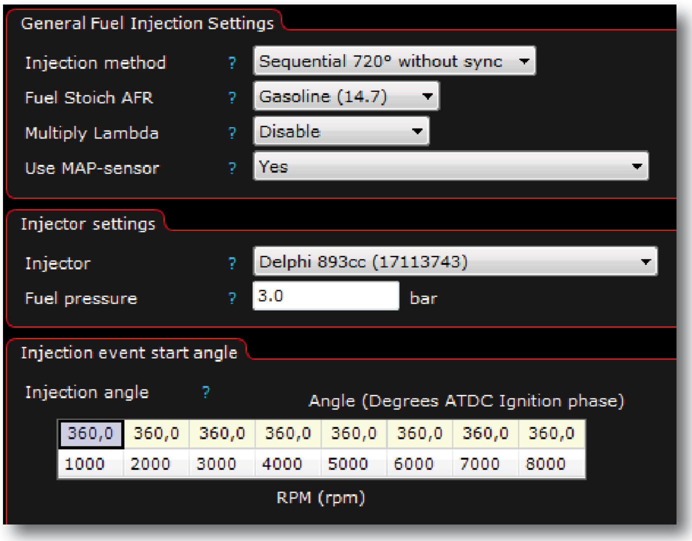


Injectors are not polarity sensitive, but direct them all the the same way.

Fig 6.2.1a - Injector wirings.

Fig 6.2.1a - Bosch 1680cc injector.

The choice of the injectors is very important for a smooth running engine, although MaxxECU have a very advanced and accurate driver for the injectors it is required that injectors do what MaxxECU tell it to do!
Large injectors often suffer from poor low-load properties, but is capable to shovel fuel in sufficient quantity at higher power output. Choose injector for desired engine power. Remember to size up the entire fuel system! When driving with E75/E85 fuel it requires about 30-35% more fuel to achieve the same engine power as gasoline. A good rule of thumb when running on petrol is to a total of 550-600cc fuel yields about 100hp. As an example (using petrol as fuel) for 600hk in a six-cylinder engine, a total of 3600cc in total, ie 6x 600cc injectors.



General Fuel Injection Settings

Injection method	?	Sequential 720° without sync
Fuel Stoich AFR	?	Gasoline (14.7)
Multiply Lambda	?	Disable
Use MAP-sensor	?	Yes

Injector settings

Injector	?	Delphi 893cc (17113742)
Fuel pressure	?	3.0 bar

Injection event start angle

Injection angle ?

Angle (Degrees ATDC Ignition phase)

360,0	360,0	360,0	360,0	360,0	360,0	360,0	360,0
1000	2000	3000	4000	5000	6000	7000	8000

RPM (rpm)

Fig 6.2.1a - All injectorsettings in MTune during Fuel.

Setting Page Fuel -> Fuel Inj General is the main settings page for the injectors. "Injection method" is how we want the injectors to be controlled, even if the ignition eg is set sequentially there is no need to run the injectors sequentially and vice versa.
If camshaft sensor is used then "Sequential with sync" can be used.

Fuel Stoich AFR is the fuel mix ratio to air and is different depending on the type of fuel. Choose from the list!

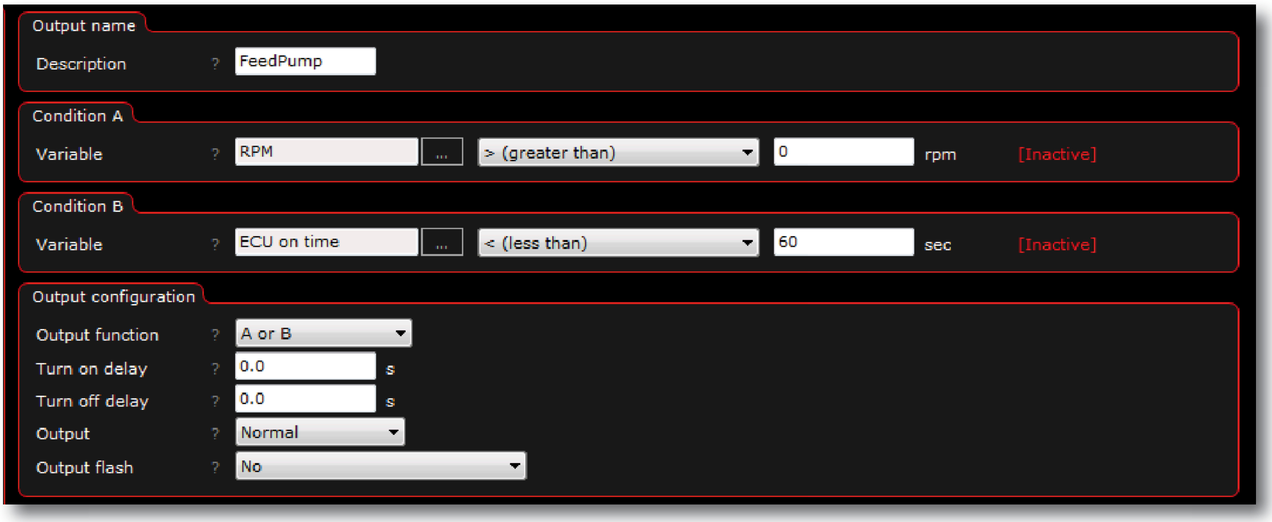
Multiply Lambda, if lambda target (Tuning -> Lambda table) should be used for calculation of engine efficiency (VE).

MTune has the market's most common injectors predefined to simplify the start-up and other injector settings such as the diffuser opening. Is the injector not in the list, there is also the possibility to enter custom values by selecting "User defined" in the list and fill in the correct values. New injector presets are constantly added!

When installing multiple injectors per cylinder, these can be connected both in parallel or serially.
An assessment of the application and the selection of injectors should be made in consultation with support.

6.3.1 - Flexible outputs (General Purpose Output (GPO))

MaxxECU has 8 GPO outputs (grounding). These GPO outputs are flexible and it can be a bit messy to understand on how powerful a MaxxECU can be, so we'll try to describe these outputs by giving examples of different procedures. Worth noting is that if the fuel / ignition output is not used, these can also be used as a flexible output, such as controlling BMW vanos, boost control valve, auxiliary fuel pump relay, lights, fans, or even your coffee maker. 😃
Here are some examples of what you can do with the output based on various input sensors.



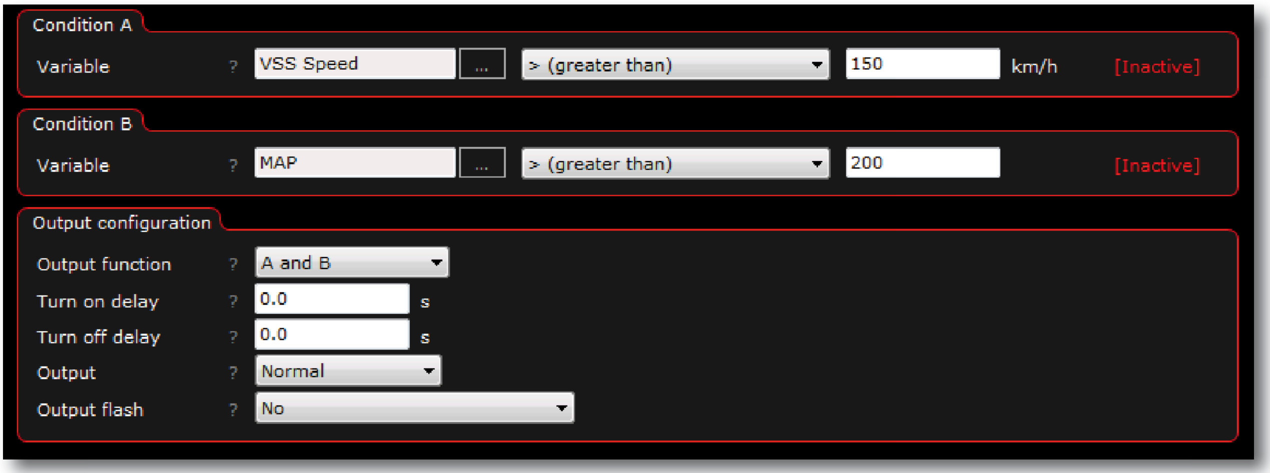
Output name
Description ? FeedPump

Condition A
Variable ? RPM ... > (greater than) 0 rpm [Inactive]

Condition B
Variable ? ECU on time ... < (less than) 60 sec [Inactive]

Output configuration
Output function ? A or B
Turn on delay ? 0.0 s
Turn off delay ? 0.0 s
Output ? Normal
Output flash ? No

Fig 6.3.1a - In the example above, we have chosen to activate a feed pump (fuel pump) via the User Output 1. Configuration to start the feed pump is based on an either-or function (OR). With the above configuration it will start the feed pump immediately when the ignition is turned on and running in 60sec (then stops if the engine speed is below 0 RPM) or start the pump when the engine speed is above 0, ie at the start attempt. This means that the feed pump only runs when it is needed to fill a catch tank or when the engine is running.

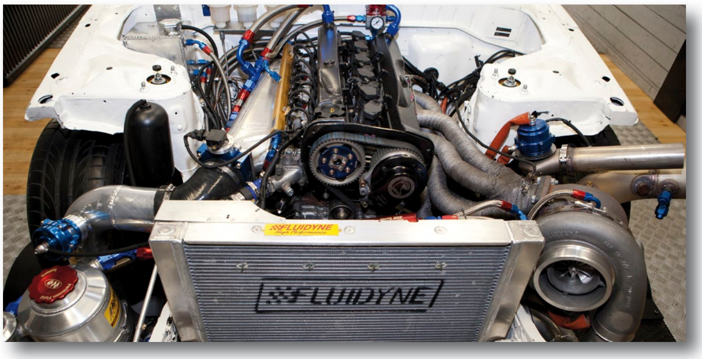


Condition A
Variable ? VSS Speed ... > (greater than) 150 km/h [Inactive]

Condition B
Variable ? MAP ... > (greater than) 200 [Inactive]

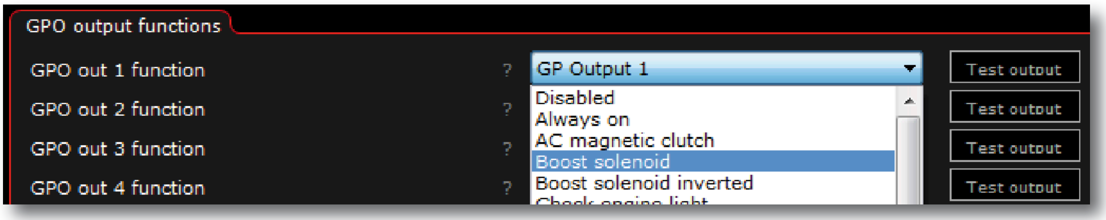
Output configuration
Output function ? A and B
Turn on delay ? 0.0 s
Turn off delay ? 0.0 s
Output ? Normal
Output flash ? No

Fig 6.3.1b - In the example above, the User Output 1 will be grounded when the speed exceeds 150km/h, AND boost pressure is above 1 bar (200kPa). As an example, maybe you need to adjust rear-wing position to get more "downforce" at the selected speed and boost pressure.



6.3.2 - Boost control (turbo).

MaxxECU can control the electric solenoid valves (called turbo pressure valve) which simply regulates the air to either the internal wastegate or a internal wg with pressure clock. The best valve that exist today is from MAC.
MaxxECU can control most solenoids simultaneously on different channels and for different purposes.



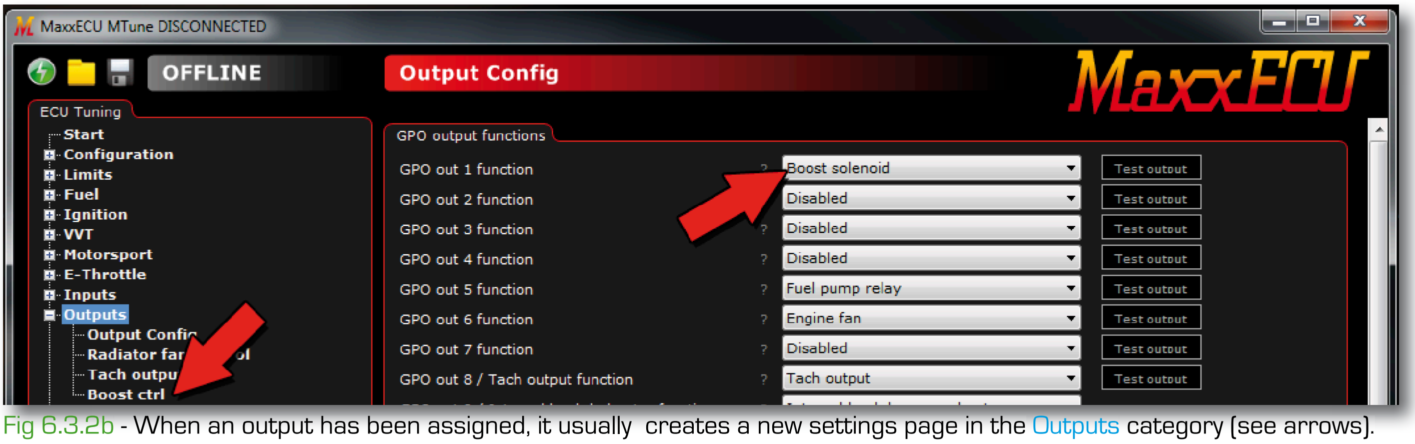
GPO output functions

GPO out 1 function ? GP Output 1 — Test output
GPO out 2 function ? — Test output
GPO out 3 function ? — Test output
GPO out 4 function ? — Test output

Disabled
Always on
AC magnetic clutch
Boost solenoid
Boost solenoid inverted
Check engine light

Fig 6.3.2a - In the list of GPO1, select "Boost solenoid" when the choice is made MaxxECU "feels" the output type (in this case boost valve) and creates a button ("Test output") which means that you can directly function-test the connected valve. The valve is connected between the GPO and +12V.

Fig 6.3.2b - Good valve that is widely used for boost control.



MaxxECU MTune DISCONNECTED

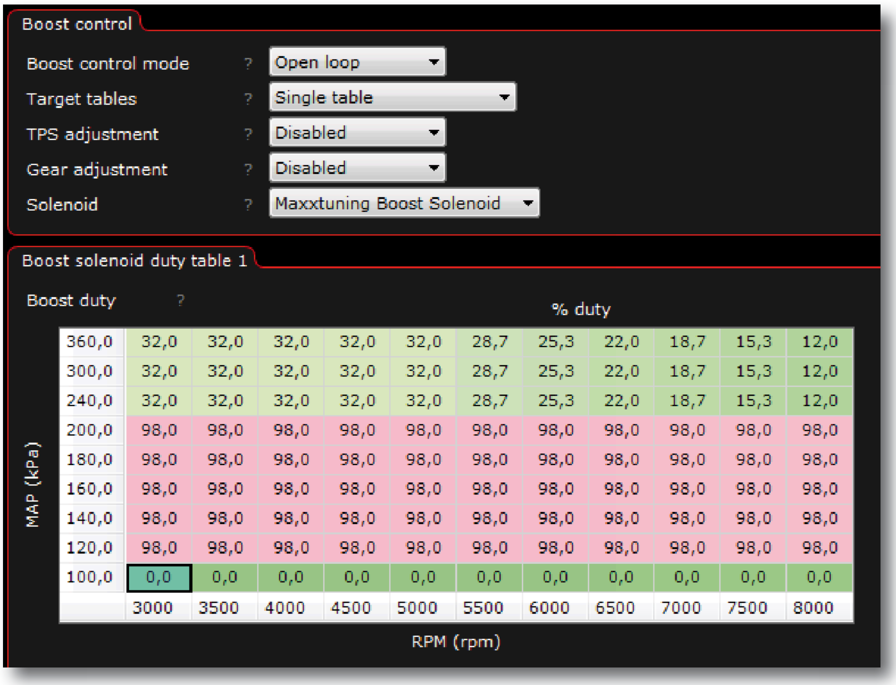
OFFLINE — Output Config — MaxxECU

ECU Tuning
- Start
- Configuration
- Limits
- Fuel
- Ignition
- VVT
- Motorsport
- E-Throttle
- Inputs
- Outputs
  - Output Config
  - Radiator fan control
  - Tach output
  - Boost ctrl

GPO output functions

GPO out 1 function	Boost solenoid	Test output
GPO out 2 function	Disabled	Test output
GPO out 3 function	Disabled	Test output
GPO out 4 function	Disabled	Test output
GPO out 5 function	Fuel pump relay	Test output
GPO out 6 function	Engine fan	Test output
GPO out 7 function	Disabled	Test output
GPO out 8 / Tach output function	Tach output	Test output

Fig 6.3.2b - When an output has been assigned, it usually creates a new settings page in the Outputs category (see arrows). This occurs generally throughout MTune not showing settings that are not enabled.



Boost control

Boost control mode	Open loop
Target tables	Single table
TPS adjustment	Disabled
Gear adjustment	Disabled
Solenoid	Maxxtuning Boost Solenoid

Boost solenoid duty table 1

Boost duty — % duty

MAP (kPa) \ RPM (rpm)	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000
360,0	32,0	32,0	32,0	32,0	32,0	28,7	25,3	22,0	18,7	15,3	12,0
300,0	32,0	32,0	32,0	32,0	32,0	28,7	25,3	22,0	18,7	15,3	12,0
240,0	32,0	32,0	32,0	32,0	32,0	28,7	25,3	22,0	18,7	15,3	12,0
200,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0
180,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0
160,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0
140,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0
120,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0	98,0
100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Fig 6.3.2c - At a quick glance, boost-cut control seem fairly simple, but the boost control is one of the most difficult parameters to set. MaxxECU has only "open loop" boost control activated until further notice, we are working on "Closed loop" control, but this option will not be activated until we consider that the function works reliably and well.

"Target tables" indicates how many different boost tables to use. Three different levels can be used and then require grounding (via button) of 2 digital inputs, see 5.3.3.

"TPS adjustment" activates an additional table (to adjust boost-control in % relation to the "Boost duty" table which is active). Good at track days to reduce power on eg, half throttle.

"Gear adjustment" adjusts the boost cut control depending on which gear is activated. Requires ofcourse, speed sensors and accurate calibration of this. See **5.3.2**.

Solenoid indicates the type of valve that is connected to the output settings can be made here if changing to "User defined"

6.3.3 - Fuel pump control (via relay)

MaxxECU can control most fuel pumps with a relay. In normal use, only one output is activated as ”Fuel pump relay”.

NOTE! Relay must be used for fuel control, MaxxECU can not directly support the large currents a fuel pump uses.

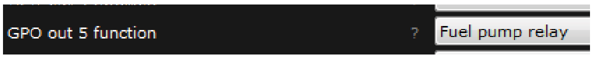
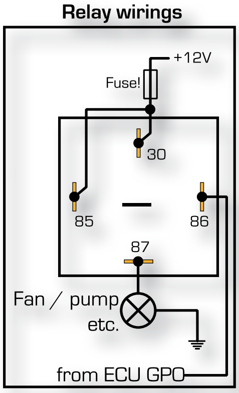

GPO out 5 function ? Fuel pump relay

Fig 6.3.3a - By default, MaxxECU uses GPO5 as the fuel pump control (Fuel pump relay). This output has no configuration options, therefore no new settings page shows when output is enabled. By default, the fuel pump output is activated for 3 seconds immediately when MaxxECU become powered.

Fig 6.3.3b - Examples of electrical wiring with relay for controlling the fuel pump.



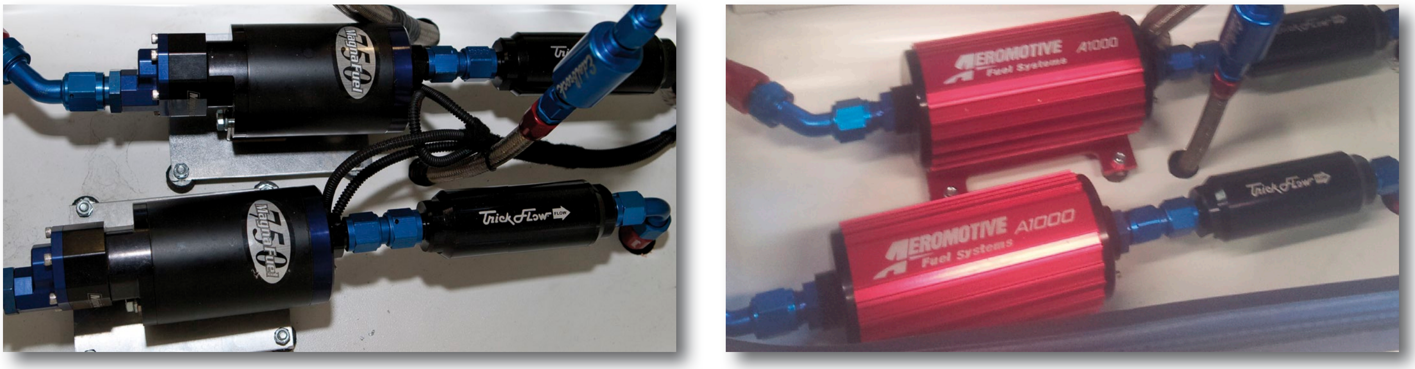
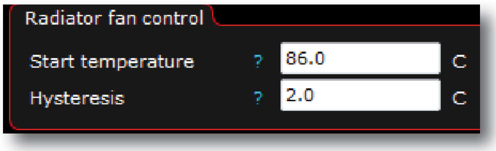


Fig 6.3.3c - Examples of mounted fuel pumps controlled by MaxxECU.

6.3.4 - Fan control (via relay).

MaxxECU can control the majority of fans via relay. MaxxECU grounds Output (GPO6 by default) upon activation. ”Start temperature” is the coolant temperature required to activate (grounding) output. Hysteresis is the temperature difference required based on the activation temperature to turn off the output when the temperature drops. In Figure **6.3.4a** the fan starts at 86 degrees and turns off, when the temperature drops down to 84 degrees, to once again start the fan at 86grader.


Radiator fan control

Start temperature ? 86.0 C

Hysteresis ? 2.0 C

Fig 6.3.4a - Setup page created when the GPO output is defined as ”Engine fan”.

NOTE! Relay must be used at fan-control, MaxxECU can not support the amount of current required.

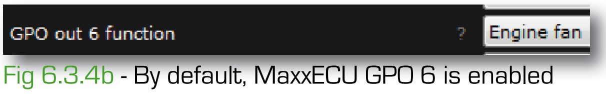
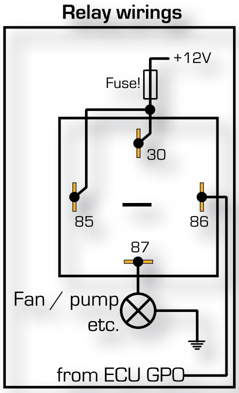

GPO out 6 function ? Engine fan

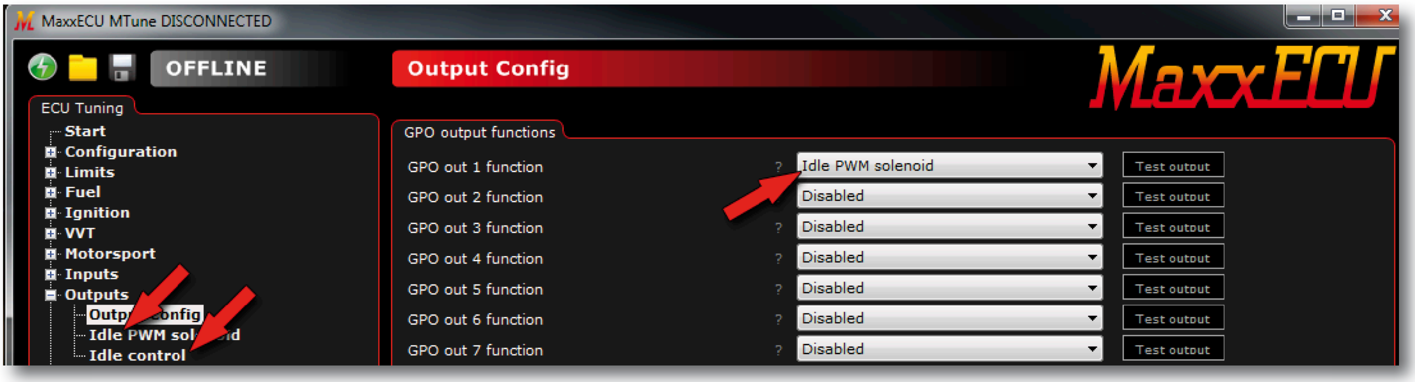
Fig 6.3.4b - By default, MaxxECU GPO 6 is enabled and activated for fan control (”Engine fan”). This output has additional configuration options, therefore, a new settings page is shown when this output is activated.

Fig 6.3.4c - Examples of electrical wiring with relay for controlling the fan.



6.3.5 - Idle control.

Control of idle is operated electrically via a valve that controls the mount of air passing by the mechanically closed throttle and leads air into the intake manifold to accommodate the engine with more air and thus increase the idle speed. More air = higher engine RPM. MaxxECU is able to control the markets most common idling valves. Most are of PWM type, which means idling engine has a 2-pin connector where one pulses +12 V to achieve a given speed.

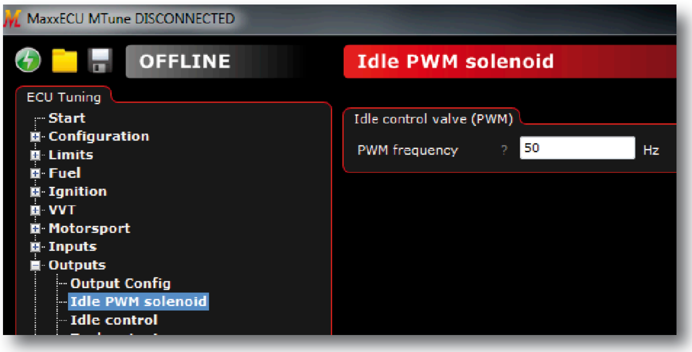


Output Config

GPO output functions

GPO out 1 function	Idle PWM solenoid
GPO out 2 function	Disabled
GPO out 3 function	Disabled
GPO out 4 function	Disabled
GPO out 5 function	Disabled
GPO out 6 function	Disabled
GPO out 7 function	Disabled

Fig 6.3.5a - When an output is assigned and enabled by the "Idle PWM solenoid", additional settings page appear under the Outputs category.

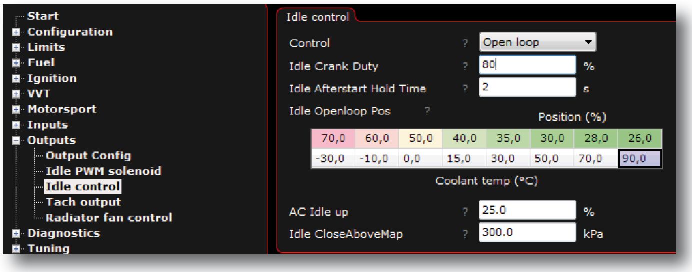


Idle PWM solenoid

Idle control valve (PWM)

PWM frequency 50 Hz

Fig 6.3.5b - Idle PWM solenoid is a setting for solenoid valves and has only one setting, the valve frequency. Important to use the correct frequency set to manufacturer's specification otherwise the regulation becomes unreliable.



Idle control

Control: Open loop

Idle Crank Duty: 80 %

Idle Afterstart Hold Time: 2 s

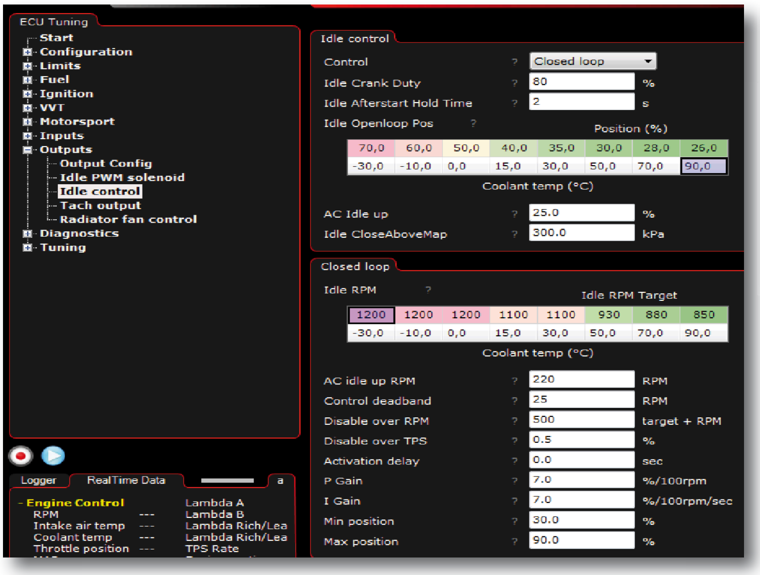
Idle Openloop Pos

Coolant temp (°C)	-30,0	-10,0	0,0	15,0	30,0	50,0	70,0	90,0
Position (%)	70,0	60,0	50,0	40,0	35,0	30,0	28,0	26,0

AC Idle up: 25.0 %

Idle CloseAboveMap: 300.0 kPa

Fig 6.3.5c - In the above example, we specify that we should run the idle control in "open loop", ie no feedback from the engine RPM but only send a fixed duty cycle of the valve based on coolant temperature.



Idle control

Control: Closed loop

Idle Crank Duty: 80 %

Idle Afterstart Hold Time: 2 s

Idle Openloop Pos

Coolant temp (°C)	-30,0	-10,0	0,0	15,0	30,0	50,0	70,0	90,0
Position (%)	70,0	60,0	50,0	40,0	35,0	30,0	28,0	26,0

AC Idle up: 25.0 %

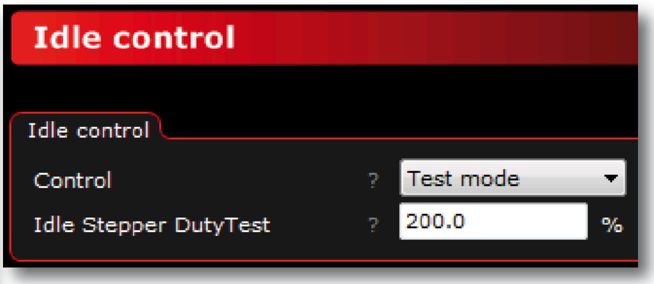
Idle CloseAboveMap: 300.0 kPa

Closed loop

Idle RPM

Coolant temp (°C)	-30,0	-10,0	0,0	15,0	30,0	50,0	70,0	90,0
Idle RPM Target	1200	1200	1200	1100	1100	930	880	850

AC idle up RPM	220	RPM
Control deadband	25	RPM
Disable over RPM	500	target + RPM
Disable over TPS	0.5	%
Activation delay	0.0	sec
P Gain	7.0	%/100rpm
I Gain	7.0	%/100rpm/sec
Min position	30.0	%
Max position	90.0	%



Idle control

Idle control

Control: Test mode

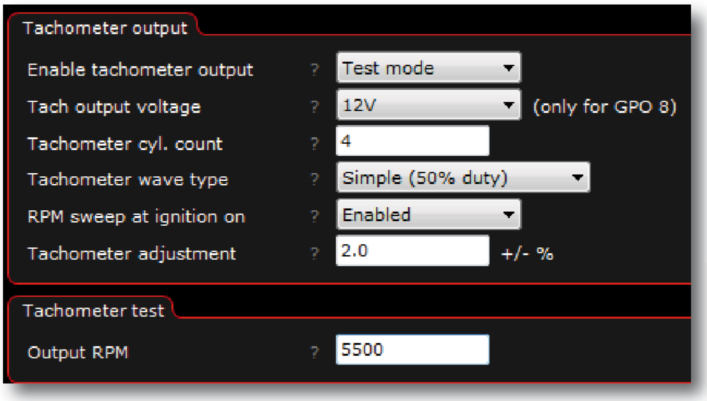
Idle Stepper DutyTest: 200.0 %

Fig 6.3.5e - MaxxECU also has a built-in test mode for this control, instead of choosing "Open loop" / "Closed loop", select "Test Mode" where you can easily enter the duty cycle you want the valve to run with. Good test to do after turning on, to see if the valve is working properly!

Fig 6.3.5d - In the above example, we specified that we should run the idle control in "Closed loop" ie feedback from the engine RPM and coolant temperature for an "active" control. Important that all settings are done first as "Open loop" settings, as these parameters is also used in "Closed loop" control, which is a classical PI controller, see **9.1.1** for a brief description of how PID control works. Idle regulation in MaxxECU uses only PI control.

6.3.6 - RPM (Tacho).

MaxxECU can control the markets most common rev counters, +5V (GPO 1-7) and 12V (only GPO8) are supported. GPO8 is intended for tachometer and should always be used primarily just for tachometers!
In Outputs -> Output config specified GPO 8 ”tach output” (enabled by default).

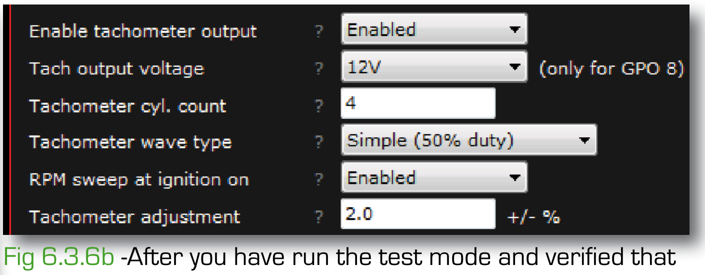


Tachometer output

Enable tachometer output ? Test mode
Tach output voltage ? 12V (only for GPO 8)
Tachometer cyl. count ? 4
Tachometer wave type ? Simple (50% duty)
RPM sweep at ignition on ? Enabled
Tachometer adjustment ? 2.0 +/- %

Tachometer test

Output RPM ? 5500



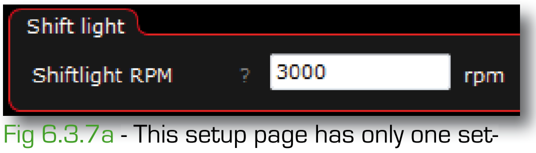
Enable tachometer output ? Enabled
Tach output voltage ? 12V (only for GPO 8)
Tachometer cyl. count ? 4
Tachometer wave type ? Simple (50% duty)
RPM sweep at ignition on ? Enabled
Tachometer adjustment ? 2.0 +/- %

Fig 6.3.6b -After you have run the test mode and verified that the RPM is correct, change it to ”Enable tachometer output” to ”Enabled”.

Fig 6.3.6a - Here again there is a test mode (”Test Mode”) to test the output and simulates RPM, to make calibration of tachometer that often differs from actual RPM. Japanese cars in particular have a tendency to show a slightly high RPM...
”RPM sweep at ignition on” means that the rev counter goes from 0 to lap top, as soon as you turn on the ignition to show that motor control is ok and ready to start the engine!
(On some cars, this ”sweep” function causes warning lights to come on because the signals passes through external electronics that can trigger warning system, due to RPM's but no oil pressure, a good example is MaxxECU PnP for Audi S2/S4 engine where this feature can cause warnings and therefore should be avoided in this setup).

6.3.7 Shift light.

Enable any output to ”Shift Light” during Outputs -> Output config, new setting page is created and is called ”Shift light”. Lamp (or LED) connected with +12V on one side and grounded from the ECU.
NOTE! make sure not to exceed 1.5A current over the lamp since this is the max load for GPO outputs.
NOTE! See 9.2.1 for information about the LEDs on these outputs.



Shift light

Shiftlight RPM ? 3000 rpm

Fig 6.3.7a - This setup page has only one setting (Shift Light RPM) and is the RPM that the selected output should close to ground to light eg a lamp.

6.3.8 - Check engine light

Enable any output to the ”Check Engine Light” in Outputs -> Output config. Light (or LED) connected with +12 V on one side and grounded from the ECU. NOTE! make sure not to exceed 1.5A current over the lamp.

This lamp is intended to ”blink” out any error codes that may occur and is stored in MaxxECUs internal memory. These error codes (see **4.3.3**) is retained even after the power loss to MaxxECU and disappears only when these DTCs are erased via MTune. see **4.3.2**.

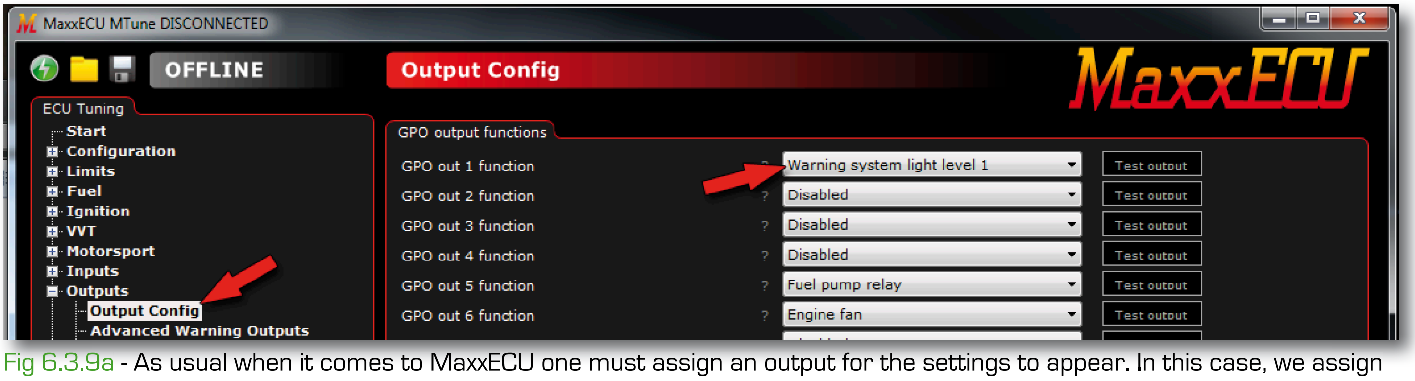
6.3.9 -The warning system (Advanced)

MaxxECU has a very advanced, flexible, and powerful built-in warning system adapted, so you as the driver can concentrate on just driving instead of relying blindly on most gauges in the car! The warningsystem is fully configurable for entrusting the decision to break/stop the engine from MaxxECU in case of any problems that could damage the engine.

On the following pages we will try to explain some example areas on how to use these warning functions and see the possibilities of MaxxECU.

We start by creating a relatively simple warning so you, the user should understand how the warning system works.

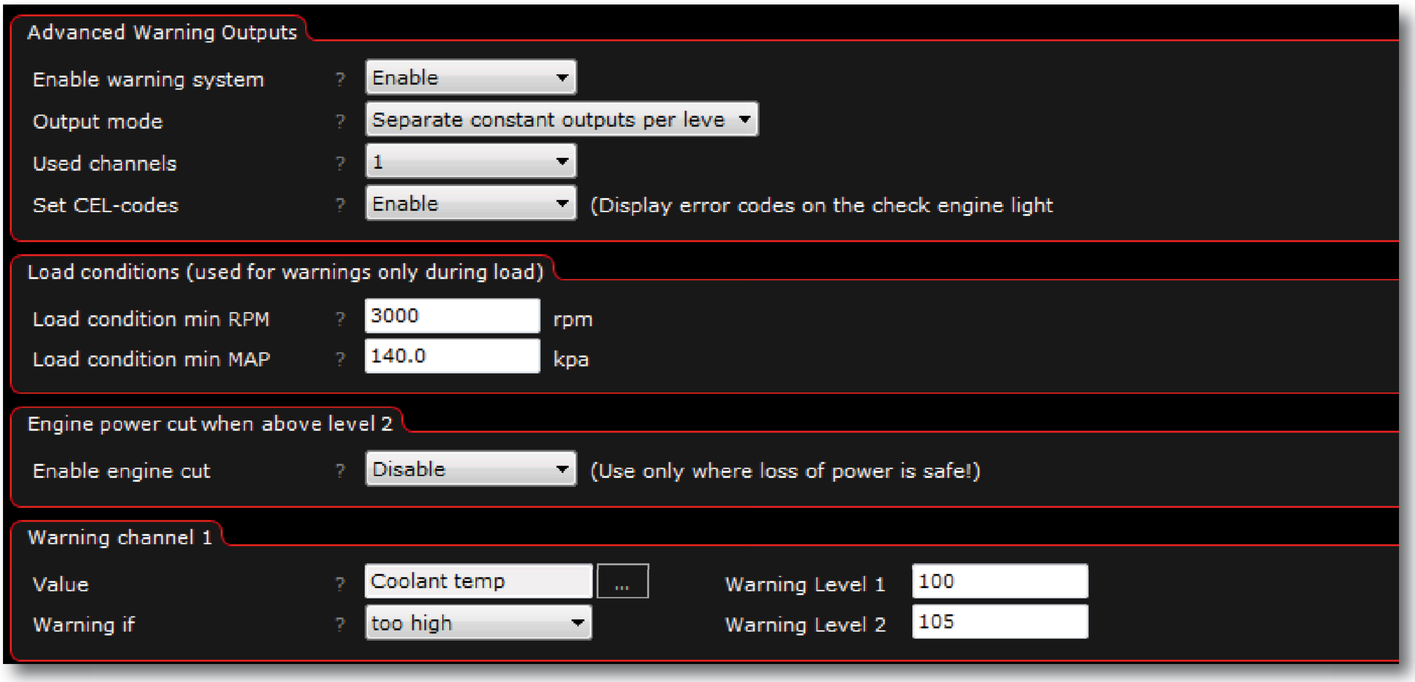
Example 1:
A light connected to GPO 1 will light up when the coolant temperature exceeds 100degrees C.



GPO output functions

GPO out 1 function ? Warning system light level 1 — Test output
GPO out 2 function ? Disabled — Test output
GPO out 3 function ? Disabled — Test output
GPO out 4 function ? Disabled — Test output
GPO out 5 function ? Fuel pump relay — Test output
GPO out 6 function ? Engine fan — Test output

Fig 6.3.9a - As usual when it comes to MaxxECU one must assign an output for the settings to appear. In this case, we assign the GPO 1 output as "Warning light system level 1". The new settings page is called "Advanced warning output"



Advanced Warning Outputs

Enable warning system ? Enable
Output mode ? Separate constant outputs per leve
Used channels ? 1
Set CEL-codes ? Enable (Display error codes on the check engine light

Load conditions (used for warnings only during load)

Load condition min RPM ? 3000 rpm
Load condition min MAP ? 140.0 kpa

Engine power cut when above level 2

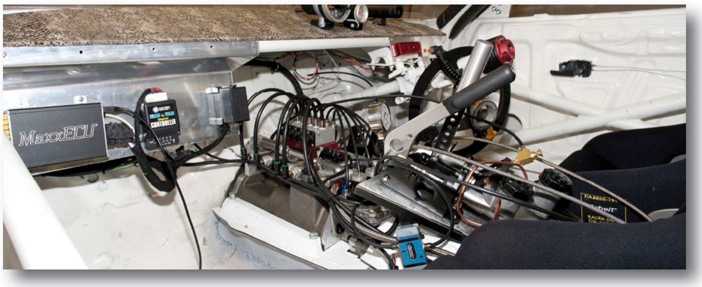
Enable engine cut ? Disable (Use only where loss of power is safe!)

Warning channel 1

Value ? Coolant temp ... Warning Level 1 100
Warning if ? too high Warning Level 2 105

Fig 6.3.9b - GPO1 (which we assigned in Figure **6.3.9a**) should light when the coolant temperature exceeds 100degrees C, do according to this setting! First you must enable the "Enable warning system".
"Output mode" is set to "separete constant outputs per level".
"Used Channels" is set to 1 because only one channel ("Coolant Temp") is to be used in this warning.
"Set CEL codes" to "Disable". "Enable" this means that the engine light (see 6.3.8) will flash an error code (if the engine light is activated on any output).
"Load conditions" settings we do not modify in this example.
"Engine power cut", set as "Disable". We do not want to turn off the engine already at 100degrees coolant temperature.
Since we have chosen only one channel ("Used channels"), there is only one tab with settings for channel 1 ("Warning channel 1").

Select, which input sensors to use, which in this case is "Coolant temp". Click the button with the three dots, to browse and choose the right sensor. "Warning if" should be set to "to high" which means that this output (GPO 1) should be grounded when the coolant temperature exceeds 100degrees C ("Warning level 1").



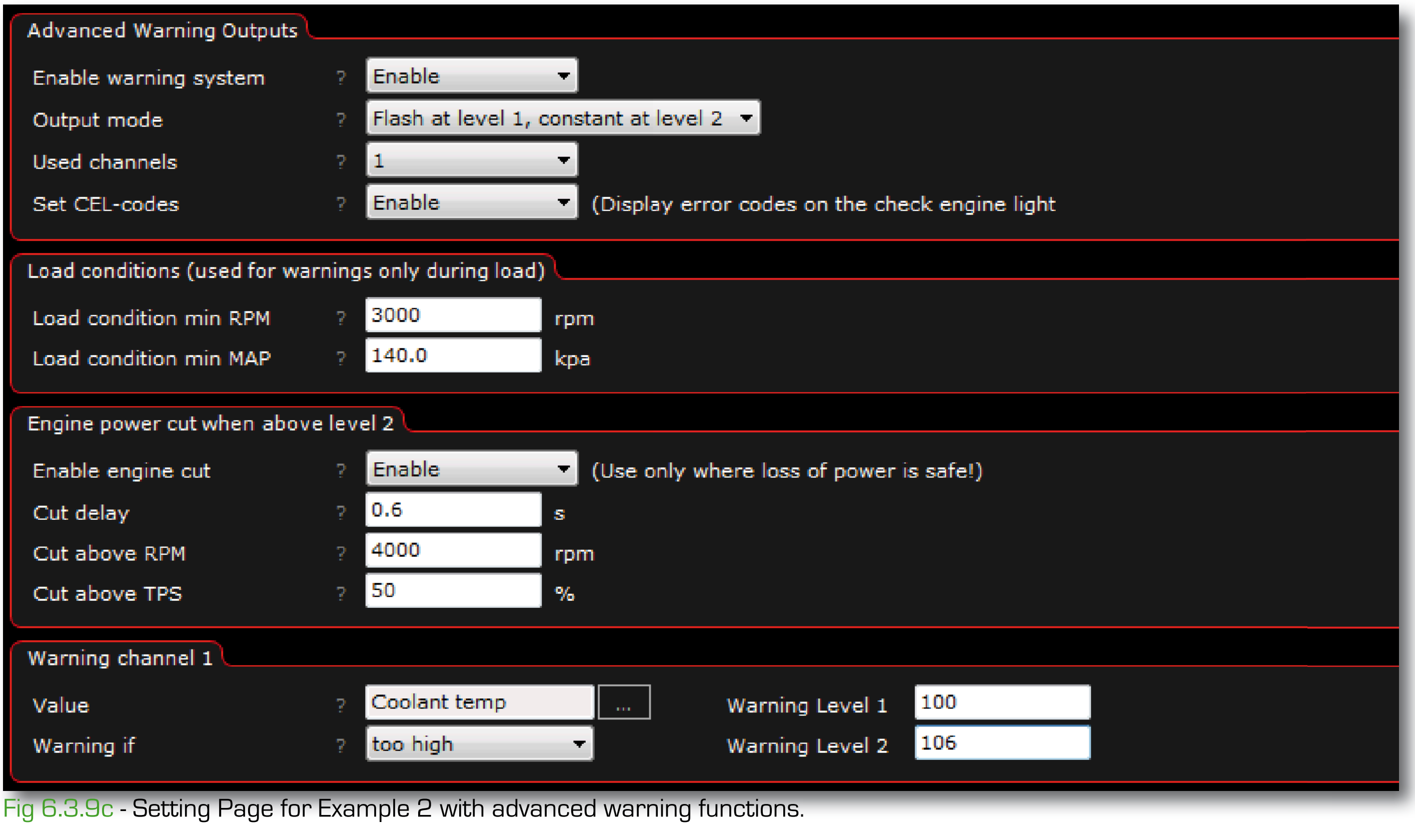
Example 2:

We extend Example 1, that we want to start flashing the lamp connected to GPO 1 at 100degrees C coolant temperature and when the coolant temperature exceeds 106grader, we want to light the lamp, put out the error code, and turn off the engine!

A note of caution regarding the protection of the engine:

If the driver is driving in 200km/h, think about whether it is worthwhile to turn off the engine and possibly lose control of the vehicle in order to save the engine!

We assign as usual "Warning light system level 1" to GPO 1 in Outputs -> Output config in MTune.



Advanced Warning Outputs

Enable warning system ? Enable

Output mode ? Flash at level 1, constant at level 2

Used channels ? 1

Set CEL-codes ? Enable (Display error codes on the check engine light

Load conditions (used for warnings only during load)

Load condition min RPM ? 3000 rpm

Load condition min MAP ? 140.0 kpa

Engine power cut when above level 2

Enable engine cut ? Enable (Use only where loss of power is safe!)

Cut delay ? 0.6 s

Cut above RPM ? 4000 rpm

Cut above TPS ? 50 %

Warning channel 1

Value ? Coolant temp ... Warning Level 1 100

Warning if ? too high Warning Level 2 106

Fig 6.3.9c - Setting Page for Example 2 with advanced warning functions.

Enable "Enable warning system".

"Output mode" is set to "Flash at level 1, constant at level2".

"Used Channels" is set to 1, because only one channel ("Coolant temp") is to be used in this warning.

"Set CEL codes" to "Enable", because we want to give warning on engine light and flash the error code (see **6.3.8**).

"Load conditions", we let be with the default values.

"Engine power cut", set as "Enable" as shown in this example would just cut the engine when the coolant temperature exceeds level 2. When this setting is configured as active, additional settings will appear:

"Cut delay" means that you can delay engine controller activation of the engine cut function .

"Cut above the RPM" indicates over which RPM engine cut should be activated.

"Cut above TPS" indicates the minimum throttle angle you need to activate the cut function.

The above setup work like this:

When the coolant temperature exceeds 100degrees C the lamp connected to GPO 1 start flashing. If the driver continues to drive and coolant temperature goes over 106degrees C, GPO 1 will start to light (engine light also flashes and adds error code 101). After 0.6 seconds, the engine will shut off IF the engine is over 4000rpm AND more than 50% throttle opening.

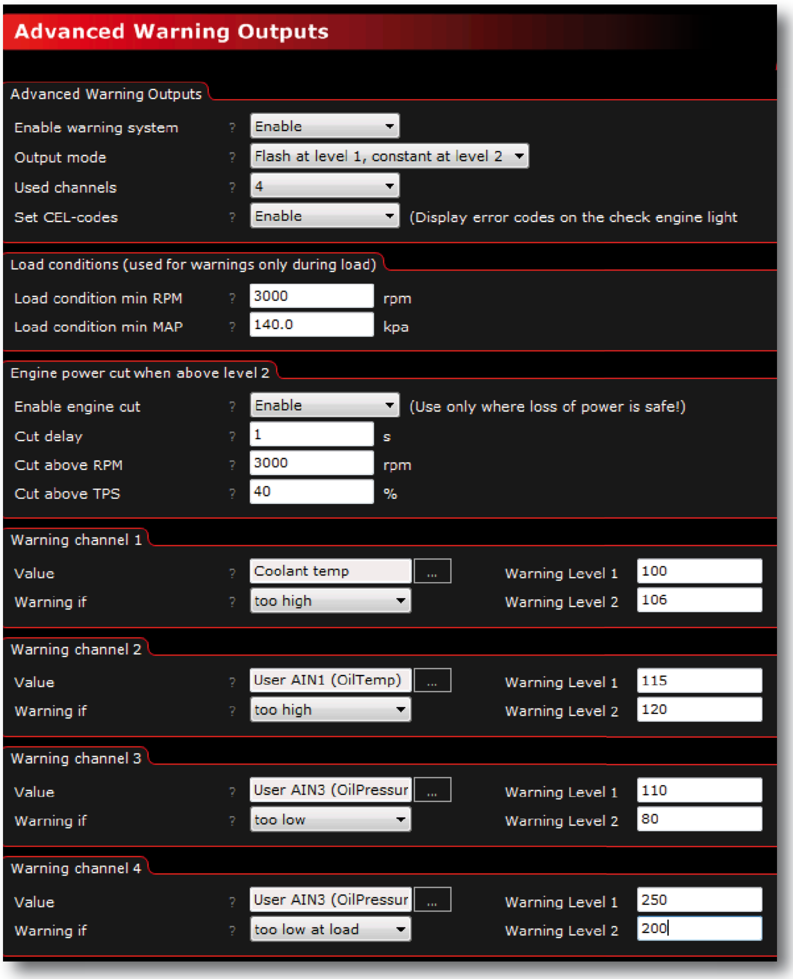
The next example will expand this warning with more sensors and multiple features, if something is unclear, we ask you to go through this again until you have a full understanding of how everything works, for the next instance is guaranteed not to be easier to understand!

Example 3:

We extend Example 1 and 2 with the following feature: GPO 1 to blink at 100degrees coolant temperature, engine should be turned off at 106degrees and the lamp lit. We also want the engaged engine light to blink.

Example-engine has also now become overloaded with a large turbo that is sensitive to both low and high oil pressure, but at different levels, depending on boost or not. Although this engine has poor lubricity on idle below 1 bar, and is very sensitive to high oil temperature. First we need to activate these "input sensors" see **5.4.1**.

We assign as usual "Warning light system level 1" to GPO 1 in Outputs -> Output config in MTune.



Advanced Warning Outputs

Advanced Warning Outputs

Enable warning system ? Enable

Output mode ? Flash at level 1, constant at level 2

Used channels ? 4

Set CEL-codes ? Enable (Display error codes on the check engine light

Load conditions (used for warnings only during load)

Load condition min RPM ? 3000 rpm

Load condition min MAP ? 140.0 kpa

Engine power cut when above level 2

Enable engine cut ? Enable (Use only where loss of power is safe!)

Cut delay ? 1 s

Cut above RPM ? 3000 rpm

Cut above TPS ? 40 %

Warning channel 1

Value ? Coolant temp ... Warning Level 1 100

Warning if ? too high Warning Level 2 106

Warning channel 2

Value ? User AIN1 (OilTemp) ... Warning Level 1 115

Warning if ? too high Warning Level 2 120

Warning channel 3

Value ? User AIN3 (OilPressur ... Warning Level 1 110

Warning if ? too low Warning Level 2 80

Warning channel 4

Value ? User AIN3 (OilPressur ... Warning Level 1 250

Warning if ? too low at load Warning Level 2 200

Fig 6.3.9d - Setting Page for example 3.

Enable the "Enable warning system". "Output mode" is set to "Flash at level 1, constant at level 2".

"Used Channels" is set to 4 channels.

"Set CEL codes" we set in this example to "Enable", because we want to give warning on engine light, and flash the error code. (see **6.3.8**).

"Load conditions", set to 3000rpm and 140kPa which means that the engine management believes that the engine is considered to be "loaded" over 3000rpm and 0.4bars overpressure.

"Engine power cut", set as "Enable" as shown in this example, to turn off the engine when any sensor reaches level 2.

We will now try to explain in words what happens: The alarm feature is enabled with 4 channels.

The light switched on GPO 1 will blink when any channel reaches level 1. The same lamp will glow solid when any channel reaches level 2.

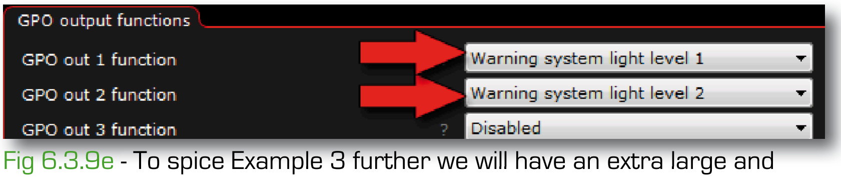
When any channel reaches level 2 and the lamp remains lit MaxxECU will take 1 second ("Cut delay"=1) to turn off the engine IF we rev more than 3000rpm AND have more than 40% throttle.

Channel 1: CLT level1: 100, CLT Level2: 106

Channel 2: Oil temp level1: 115, oil temp level2: 120

Channel 3: Oil pressure (low load) level 1: 110, oil pressure (low load) level 2: 80

Channel 4: Oil pressure (load) level 1: 250, oil pressure (load) level 2: 200



GPO output functions

GPO out 1 function Warning system light level 1

GPO out 2 function Warning system light level 2

GPO out 3 function ? Disabled

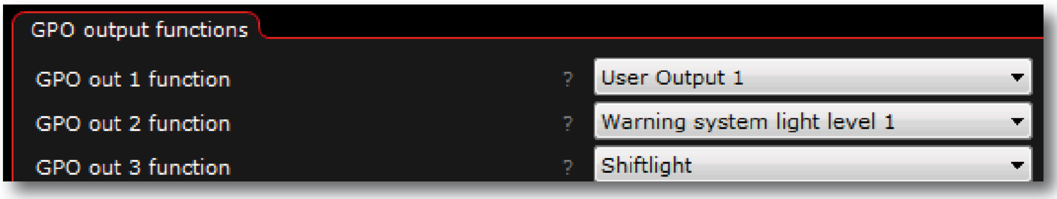
Fig 6.3.9e - To spice Example 3 further we will have an extra large and strong warning light connected to the GPO 2 that lights up when a channel has reached level 2. In combination with a slightly longer "Cut delay" on 2-3s and if the lamp is mounted highly visible may "Engine power cut" be used safely when the driver probably can let off the throttle and steer the vehicle to safety before stopping the engine.

Example 4:

In previous examples we have used the "Advanced warnings output" as output at GPO 1 (and GPO2) and we will now see another example of flexibility.

A green light is connected on GPO 1 and a red light is connected on GPO 2nd

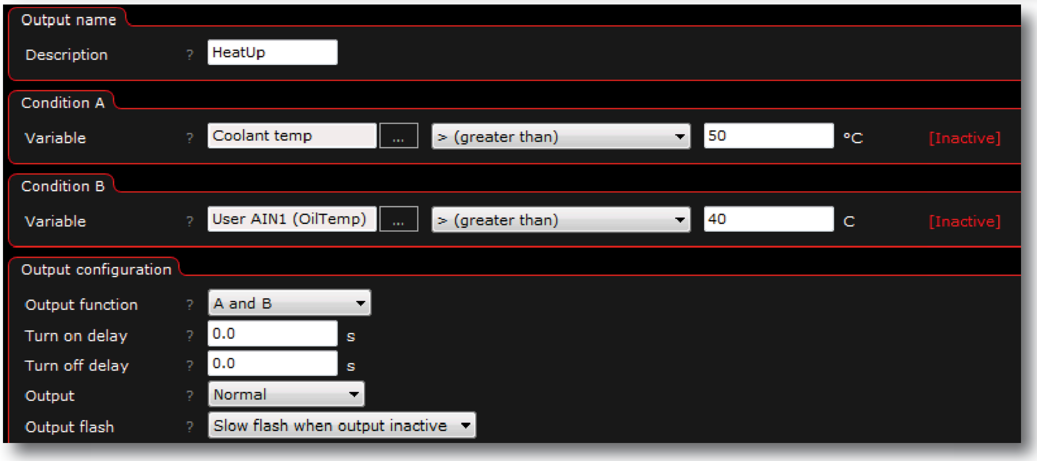
Fig 6.3.9f - This rear-wheel drive turbocharged power monsters are really wild on the track and there is not a chance in the world that the driver can keep track of all critical readings while driving. Instead, we let MaxxECU perform that operation! Oil pressure, oil temperature, transmission oil temperature, and 8 exhaust temperatures and of course Lambda allows us to get a really good and effective warning system.



GPO output functions

GPO out 1 function	User Output 1
GPO out 2 function	Warning system light level 1
GPO out 3 function	Shiftlight

Fig 6.3.9g - GPO 1 is set as "User Output 1", GPO 2 as "Warning light system level 1".



Output name

Description: HeatUp

Condition A

Variable: Coolant temp | > (greater than) | 50 | °C | [Inactive]

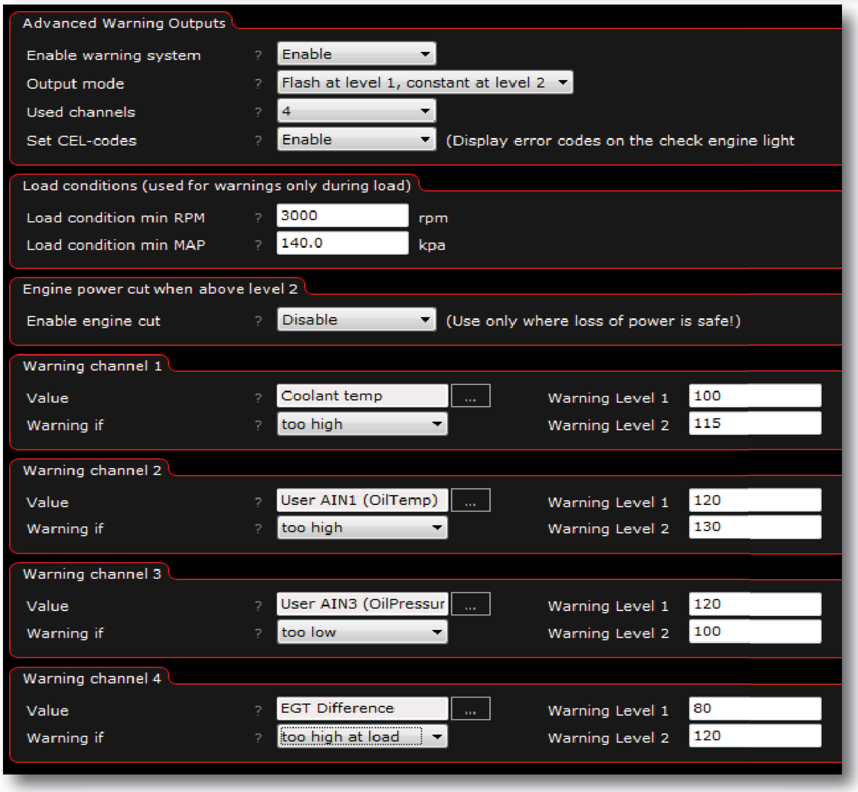
Condition B

Variable: User AIN1 (OilTemp) | > (greater than) | 40 | C | [Inactive]

Output configuration

Output function	A and B
Turn on delay	0.0 s
Turn off delay	0.0 s
Output	Normal
Output flash	Slow flash when output inactive

Fig 6.3.9h - GPO 1 (green light) is renamed to "HeatUp", ie heating. When the car is cold and heating, the lamp will blink. When the engine is hot enough to push a little harder, the green light will glow steadily. Smooth and easy!



Advanced Warning Outputs

Enable warning system	Enable
Output mode	Flash at level 1, constant at level 2
Used channels	4
Set CEL-codes	Enable (Display error codes on the check engine light

Load conditions (used for warnings only during load)

Load condition min RPM	3000 rpm
Load condition min MAP	140.0 kpa

Engine power cut when above level 2

Enable engine cut: Disable (Use only where loss of power is safe!)

Warning channel	Value	Warning if	Warning Level 1	Warning Level 2
Warning channel 1	Coolant temp	too high	100	115
Warning channel 2	User AIN1 (OilTemp)	too high	120	130
Warning channel 3	User AIN3 (OilPressur	too low	120	100
Warning channel 4	EGT Difference	too high at load	80	120

Fig 6.3.9i - GPO 2 is activated as "Warning light system level 1" and in this example will blink the red light when any channel reaches level 1, and shine when any channel reaches level 2.

This means that the green light will flash when the car is warming up, the same light comes on when connected sensors are at operational temperature and it is okay to start skidding on the runway. If the red light starts blinking then you should take it easy for a few laps to see if it stops flashing. If the light comes on, then you should cut the engine fast!

7 - Start the engine.

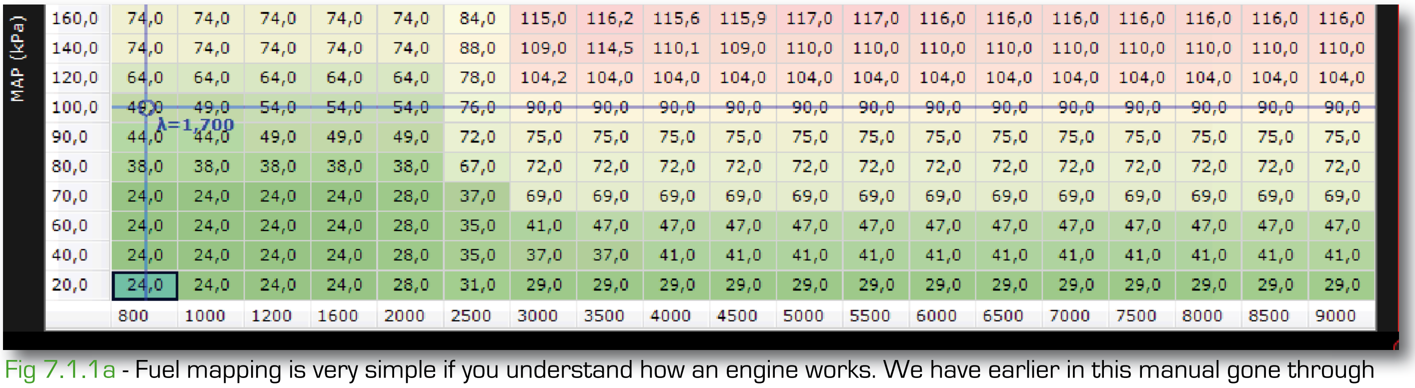
Before we try to start the engine, we will here explain a bit how quickly the fuel and ignition mapping is done, because you probably will have to adjust to these curves for the engine to run smoothly.

7.1 - Quick Review how the mapping is done.

That type of "mapping" (tune the engine control), we will show here is only for start-up!

7.1.1 - Fuel Mapping.

Made in Tuning -> 2D Fuel table in MTune.



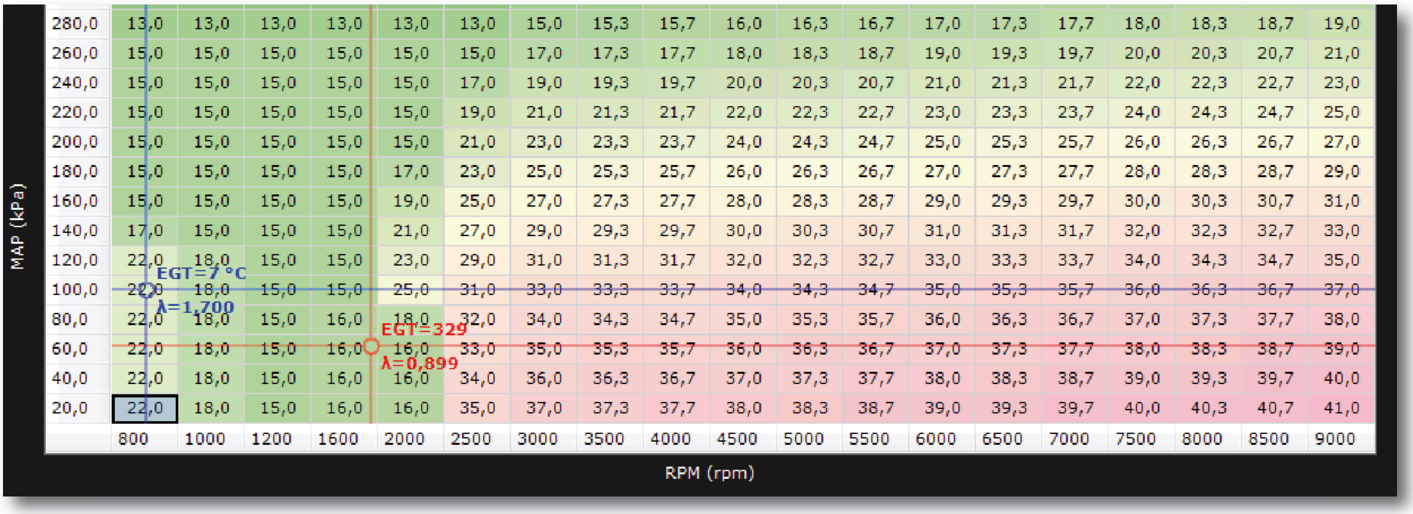
MAP (kPa) 160,0	74,0	74,0	74,0	74,0	74,0	84,0	115,0	116,2	115,6	115,9	117,0	117,0	116,0	116,0	116,0	116,0	116,0	116,0	116,0
140,0	74,0	74,0	74,0	74,0	74,0	88,0	109,0	114,5	110,1	109,0	110,0	110,0	110,0	110,0	110,0	110,0	110,0	110,0	110,0
120,0	64,0	64,0	64,0	64,0	64,0	78,0	104,2	104,0	104,0	104,0	104,0	104,0	104,0	104,0	104,0	104,0	104,0	104,0	104,0
100,0	49,0	49,0	54,0	54,0	54,0	76,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0	90,0
90,0	44,0	44,0	49,0	49,0	49,0	72,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0	75,0
80,0	38,0	38,0	38,0	38,0	38,0	67,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0	72,0
70,0	24,0	24,0	24,0	24,0	28,0	37,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0	69,0
60,0	24,0	24,0	24,0	24,0	28,0	35,0	41,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0	47,0
40,0	24,0	24,0	24,0	24,0	28,0	35,0	37,0	37,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0	41,0
20,0	24,0	24,0	24,0	24,0	28,0	31,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0	29,0
	800	1000	1200	1600	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000

Fig 7.1.1a - Fuel mapping is very simple if you understand how an engine works. We have earlier in this manual gone through how MTune works, see **4.2.3** for more information on how to handle MTune.
Briefly: The blue marker shows where MaxxECU reads data exactly at this moment, while the lambda value is displayed under the cursor so that it exactly at that point you map, easily can read lambda value!

Select multiple cells with either the arrow keys or the mouse cursor. Right-click to change the selected cells.
"+" And "-" keys to increase or decrease the selected cells. Do you want to adjust the cells where the engine works in exactly now you just hold in the "Ctrl" key while you press the "+" or "-", interpolation between the nearest cells will be done automatically.

7.1.2 - Ignition Mapping.

Mapping ignition is what is critical as both too high, or too low ignition can have devastating effects on the engine!
And as we mentioned earlier, the mapping should be done in a test facility, by skilled personnel.



MAP (kPa) 280,0	13,0	13,0	13,0	13,0	13,0	13,0	15,0	15,3	15,7	16,0	16,3	16,7	17,0	17,3	17,7	18,0	18,3	18,7	19,0
260,0	15,0	15,0	15,0	15,0	15,0	15,0	17,0	17,3	17,7	18,0	18,3	18,7	19,0	19,3	19,7	20,0	20,3	20,7	21,0
240,0	15,0	15,0	15,0	15,0	15,0	17,0	19,0	19,3	19,7	20,0	20,3	20,7	21,0	21,3	21,7	22,0	22,3	22,7	23,0
220,0	15,0	15,0	15,0	15,0	15,0	19,0	21,0	21,3	21,7	22,0	22,3	22,7	23,0	23,3	23,7	24,0	24,3	24,7	25,0
200,0	15,0	15,0	15,0	15,0	15,0	21,0	23,0	23,3	23,7	24,0	24,3	24,7	25,0	25,3	25,7	26,0	26,3	26,7	27,0
180,0	15,0	15,0	15,0	15,0	17,0	23,0	25,0	25,3	25,7	26,0	26,3	26,7	27,0	27,3	27,7	28,0	28,3	28,7	29,0
160,0	15,0	15,0	15,0	15,0	19,0	25,0	27,0	27,3	27,7	28,0	28,3	28,7	29,0	29,3	29,7	30,0	30,3	30,7	31,0
140,0	17,0	15,0	15,0	15,0	21,0	27,0	29,0	29,3	29,7	30,0	30,3	30,7	31,0	31,3	31,7	32,0	32,3	32,7	33,0
120,0	22,0	18,0	15,0	15,0	23,0	29,0	31,0	31,3	31,7	32,0	32,3	32,7	33,0	33,3	33,7	34,0	34,3	34,7	35,0
100,0	22,0	18,0	15,0	15,0	25,0	31,0	33,0	33,3	33,7	34,0	34,3	34,7	35,0	35,3	35,7	36,0	36,3	36,7	37,0
80,0	22,0	18,0	15,0	16,0	18,0	32,0	34,0	34,3	34,7	35,0	35,3	35,7	36,0	36,3	36,7	37,0	37,3	37,7	38,0
60,0	22,0	18,0	15,0	16,0	16,0	33,0	35,0	35,3	35,7	36,0	36,3	36,7	37,0	37,3	37,7	38,0	38,3	38,7	39,0
40,0	22,0	18,0	15,0	16,0	16,0	34,0	36,0	36,3	36,7	37,0	37,3	37,7	38,0	38,3	38,7	39,0	39,3	39,7	40,0
20,0	22,0	18,0	15,0	16,0	16,0	35,0	37,0	37,3	37,7	38,0	38,3	38,7	39,0	39,3	39,7	40,0	40,3	40,7	41,0
	800	1000	1200	1600	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000

RPM (rpm)

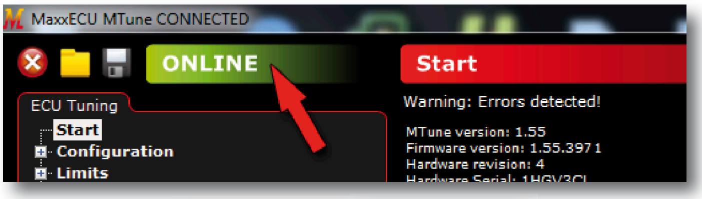
Fig 7.1.2a - The picture above shows an stopped log (red marker) showing Lambda and EGT at the various load points, depending on where in the log one clicked. The blue marker is also at this point, that shows exactly where the engine works in exactly this moment. EGT sensors will also be shown here. Are several EGT plugged in, the highest value is displayed.
All engines require different firing angles at various speeds and loads. Ignition mapping requires experience and access to equipment for measuring engine power differences with the adjustment of the ignition curve.
The basic ignition curve that lies in all MaxxECU units at delivery should serve as the starting tune for most engines.

NOTE!! The ignition curve is only for start-up and transport, it is absolutely forbidden to put on boost and go out on the street and play, it will end up with an expensive lesson!

7.2.1 - Quick tour of installation and engine start.

To start the engine, requires that all engine sensors are plugged in and that all fuel and ignition outputs are tested and working! Check that the fuel pump runs! That you have fuel in the tank, fresh new plugs, oil and water in the engine! We know from experience that everyone is eager to start the brand new machine, and therefore forget important and perhaps sometimes elementary things in order to start an engine in a safe manner!
Take a few extra minutes and go through everything one more time, to avoid costly mishaps!
Bring out the fire extinguisher so it is close at hand!

Fig 7.2.1a - Electrical Wiring and placement of MaxxECU, see chapter **4**.



MaxxECU MTune CONNECTED

ONLINE

Start

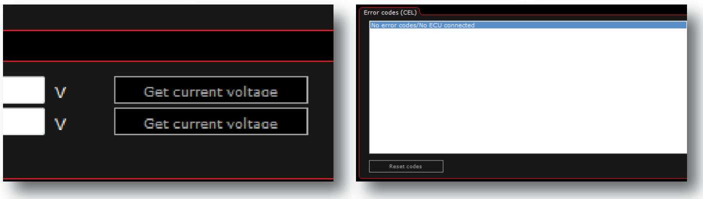
ECU Tuning
- Start
- Configuration
- Limits

Warning: Errors detected!

MTune version: 1.55
Firmware version: 1.55.397 1
Hardware revision: 4
Hardware Serial: 1HGV3CI

Fig 7.2.1b - MTune communication with MaxxECU, se **4.2.2**.

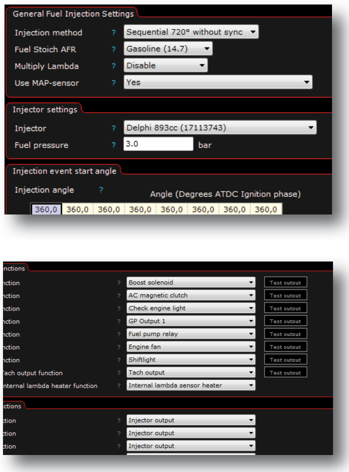
Fig 7.2.1c - Wiring and control of all engine sensors.



V Get current voltage
V Get current voltage

Error codes (CEL)
No error codes/No ECU connected
Reset codes

Fig 7.2.1d - Calibration of TPS (**5.2.2**) and control so no fault codes is stored (**4.3.3**).



General Fuel Injection Settings
- Injection method ? Sequential 720° without sync
- Fuel Stoich AFR ? Gasoline (14.7)
- Multiply Lambda ? Disable
- Use MAP-sensor ? Yes

Injector settings
- Injector ? Delphi 893cc (17113743)
- Fuel pressure ? 3.0 bar

Injection event start angle
- Injection angle ? Angle (Degrees ATDC Ignition phase)

360,0	360,0	360,0	360,0	360,0	360,0	360,0	360,0

nctions
- nction ? Boost solenoid Test output
- nction ? AC magnetic clutch Test output
- nction ? Check engine light Test output
- nction ? GP Output 1 Test output
- nction ? Fuel pump relay Test output
- nction ? Engine fan Test output
- nction ? Shiftlight Test output
- ach output function ? Tach output Test output
- nternal lambda heater function ? Internal lambda sensor heater

ctions
- ction ? Injector output
- ction ? Injector output
- ction ? Injector output

Fig 7.2.1e - Tour in MTunes settings.
- Dwell of ignition coil so nothing burn. Ignition -> Ignition settings.
- Correct ignition systems. Ignition -> Ignition settings.
- Correct fuel injector and fuel type. Fuel -> Fuel Inj General.
- Compensation tables. Fuel -> Prime, Fuel -> Fuel startup / warmup / ase, Fuel -> Fuel IAT trim.
- Reasonable inputs for motor control. Realtime Data -> Engine Control.
- The number of cylinders, firing order, engine volume. Configuration -> Engine settings.
- The type of trigger system. Inputs -> Trigger / Home inputs.

Fig 7.2.1f - Wiring fuel injectors (**6.2.1**) and ignition system. (**6.1.1**). Enable all injector and spark outputs (**6**) and test (**6.0.1**).

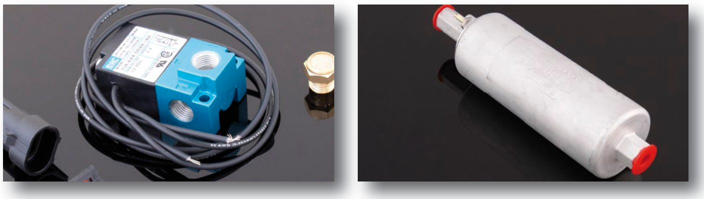


Fig 7.2.1g - Wiring GPO (**6.3.1**).
Boost valve (**6.3.2**), fuel control (**6.3.3**), fan control (**6.3.4**), idle speed control (**6.3.5**), tachometer (**6.3.6**), conecting lamp (**6.3.7**), engine lamp (**6.3.8**), etc. Do not forget to test all GPO outputs (**6**).

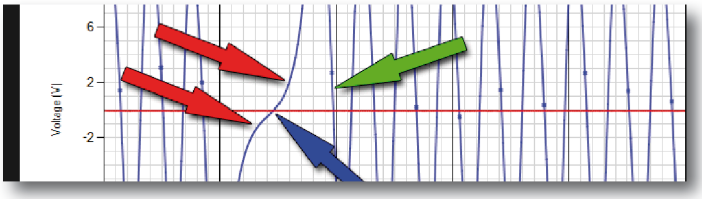


Fig 7.2.1h - Check that the trigger oscilloscope gives a good signal. That MTune get stable and good RPM on the starter engine (150-200rpm) and no error codes occur. Check the ignition lamp on [**5.1.5**].

Fig 7.2.1i - Attempt to start the engine, note to avoid voltage drops below 8v to MaxxECU (communication ceases). Enable logging for future troubleshooting if the engine does not start at this stage.

Fig 7.2.1j - If you've done everything right, your car now runs at idle with a little adjustment assistance in MTune as we have gone through.

Fig 7.2.1k - Go through the car, making it ready for mapping!

Fig 7.2.1l - Tune the engine at your local MaxxECU dealer.

Fig 7.2.1m - After mapping, we ask you to take it easy because the car probably is brand new, has more power than you're used to, and can be a bit difficult to drive before you learned managing the car. Drive safe and good luck!

8 - Troubleshooting.

Communication between MTune and MaxxECU does not work?

Windows recognizes MaxxECU device? (with USB connection, Windows usually "sound" applicable to new installations). Is MTune and its driver installed correctly? Check the Control Panel in Windows so MaxxECU is found. Have really MaxxECU unit +12V and is grounded? MaxxECU has two indicator lights to the left of the USB connection, the green LED glows constantly (even at cranking), extinguishes this light, under start attempt, it will never be able to start!! Check the battery and electrical connections.

None or some spark outputs do not work?

A common problem is that the spark outputs are not activated as spark output. If MaxxECU does not have all switched ignition outputs enabled (Outputs -> Output Config) these outputs will not operate! If the outputs are enabled and after testing (Diagnostics -> Output test) and no spark starting work, check your electrical wiring to the ignition coils and double check if they have built-in stage or not. MaxxECU has no built-in ignition amplifier (due to the risk of interference) as external ignition modules needed. See Chapter **6**.

Injector outputs does not work?

Same as above with the activation of the fuel outputs. Activation must be done in MTune Outputs -> Output config. If the outputs are enabled and tested using Diagnostics -> Output shows that no injection output works, check your electrical connections to the injectors. Try to really see the injector work by plugging the injectors two poles (+12V and ground) and "tap" its connections against external power and listen if the injector actually opens (it should make a click from them when the power source is connected). Make sure to be careful when sparks associated with "tapping" of the cables on the battery may cause ignition of any fuel that may come out of the injector!

Some GPO outputs do not work?

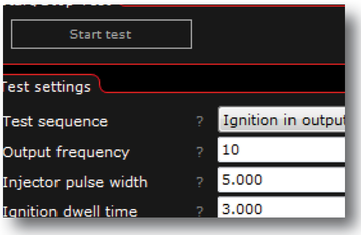
Make sure that the output really is on and double check the wiring. MaxxECU grounds GPO outputs and a relay must be used to power anything that draws more than 1.5A. Use test functions in Outputs -> Output config.

Internal widebandlambda does not work?

Check switch, a common cause is wrongful installation that could cause the sensor "to burn" because MaxxECUs driver is so powerful. Make sure the internal drive is enabled (Inputs -> Lambda sensor is set as "Internal Wideband Controller". GPO 9 is used as "Internal lambda sensor heater" and must be activated to work...

The engine will not start, but spits and sputters?

Check the ignition with timing lamp, and that the injectors and ignition coils are mounted on the right cylinder. The correct firing order in Configuration -> Engine settings. Test outputs of the cylinder arrangement [Fig 6.0.1b]
Always INJ1/IGN1 -> Cylinder 1, INJ2/IGN2 -> Cylinder 2, INJ3/IGN3 -> Cylinder 3 and so on.
The engine can ignite 360degrees off in sequential control, adjust the "Cam signal position" under Inputs -> Trigger / Home inputs and Triggerdecoder.

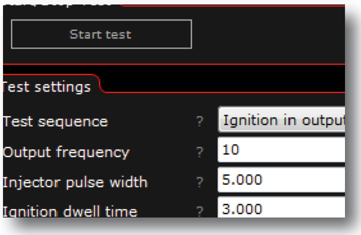


Test settings

Test sequence ? Ignition in output
Output frequency ? 10
Injector pulse width ? 5.000
Ignition dwell time ? 3.000

Engine does not start and MTune can not read any RPM?

If MaxxECU can not read any RPM it's probably because the trigger settings are incorrect, or missing altogether. Read through Chapter **5** of this manual. Check the built-in trigger oscilloscope [**5.1.6**].
Check the voltage from the crank and camshaft sensors and "Trig arm voltage" is set correctly.



Test settings

Test sequence ? Ignition in output
Output frequency ? 10
Injector pulse width ? 5.000
Ignition dwell time ? 3.000

The engine will not start, but stable RPM shows in MTune?

Check that really all outputs are enabled! Configuration -> Engine settings, the section "Testing", "Disabled fuel and ignition" should be set to "No". Test all outputs in Diagnostics -> Output test so the injectors flowing fuel and the ignition works. Do the engine get enough fuel? Check the lambda value in MTune, even if the engine does not start, you can get a fairly good picture of the lambda value if the engine has fuel or not, it should show lambda 1.0 or lower when trying to start.

9 - Extra information.

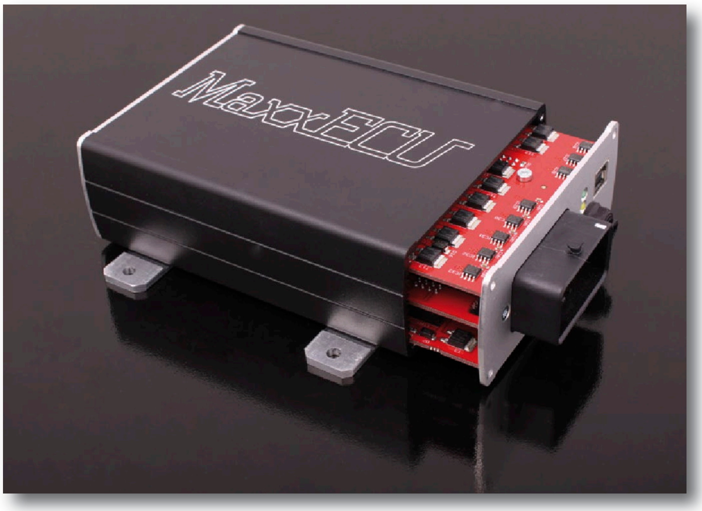
9.1.1 - PID

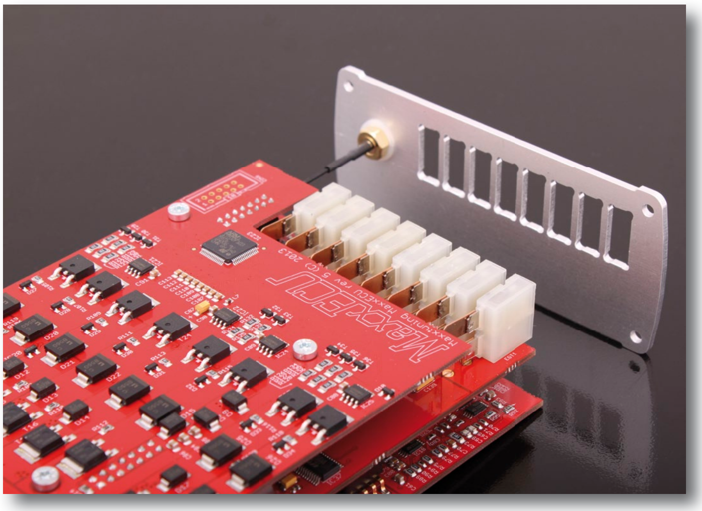
PID is a ' cloosed loop " control algorithm (instructions for solving a task) used to adjust a control value, (eg a idle valve position). In order to process actual values (eg engine speed) to match the desired SHOULD value (eg, idle speed) then adjusts the PID algorithm control value according to these three elements.

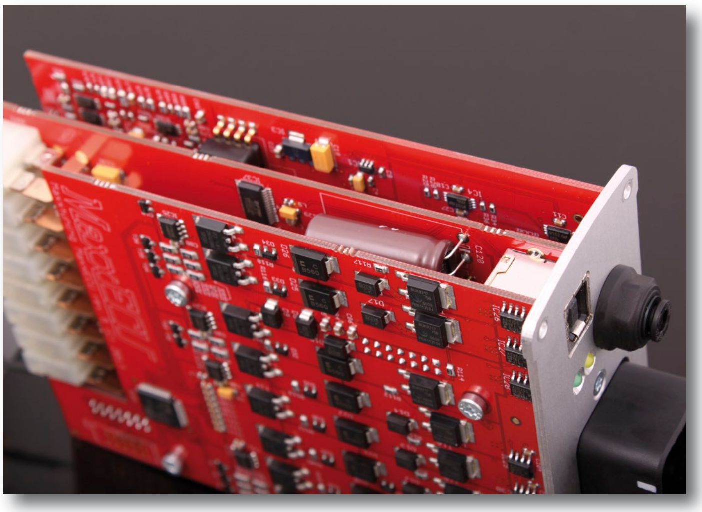
P is the proportional part, is how much SHOULD value deviates from the IS value. Eg when the idle speed is too low, the valve must be very open to compensate for RPM. When the speed is "almost" right to be the control valve just be a little open.
I which is the integral part is how much SHOULD and IS - values differ over time. The longer values differ (large fluctuations), the more increased control value. P portion can not itself reach all the way to the set value in most processes are therefore used in part to adjust the last .
D, the derivative part is how fast SHOULD and IS - values approach each other. If these two values are converging rapidly reduced control value for not SHOULD value should be pushed over .
D suppresses process itself although a high D value may have the opposite effect .

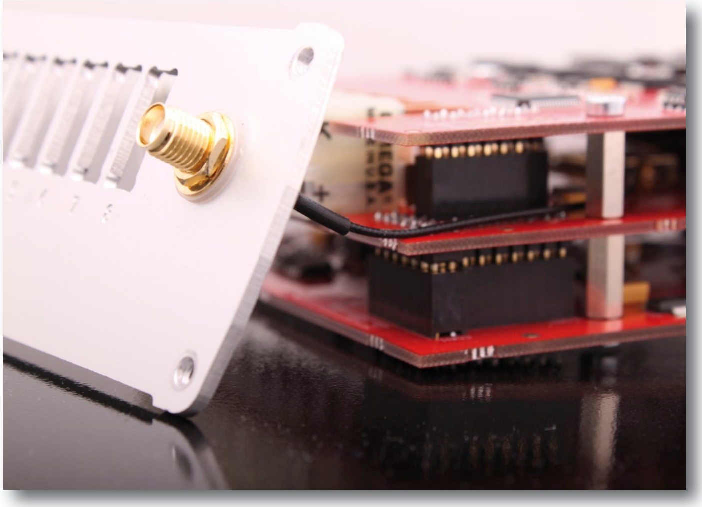
PID control The basic rule for setting:
1. Always start with zero all the values for the control.
2. Increase the **P** value gradually until the desired increase of the control value is achieved and that an oscillation of the control value occurs.
3. Halving the **P** value to half.
4. Try to increase the **I** value slowly until a stable value is reached on the control.
5. Increase the **D**-value in order to increase stability and responsiveness of the control value.

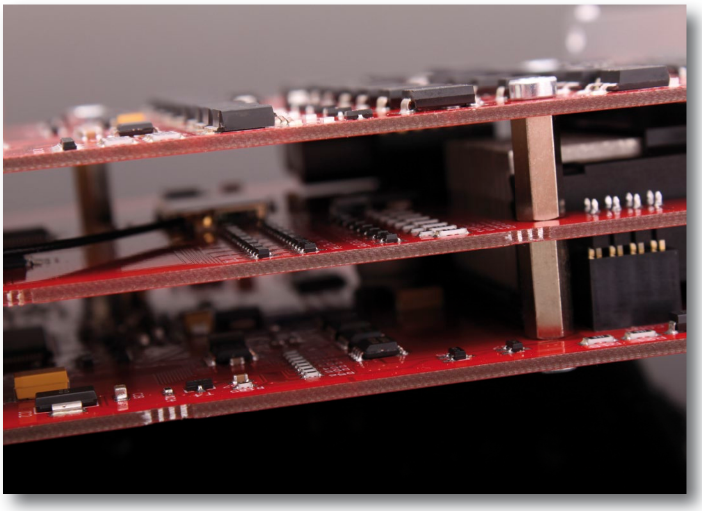
9.2.1 - Led GPO outputs
Sometimes LEDs connected to outputs on MaxxECU units appears low even when the output is off.
This is because MaxxECUs output protection and only affect LEDs.
Remedied by adding a resistor in parallel with the LED, Ex 120ohm between GPO and +12 v.
Maxxtuning AB sends out this free to customers who perceive this as a problem!

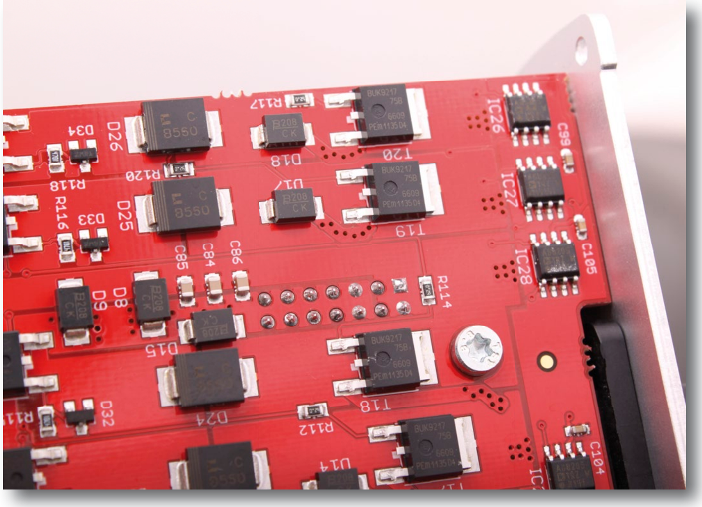

MaxxECU











MaxxECU

10 - Final Words.

We would like to thank you for your confidence in your choice of MaxxECU. We have worked extremely hard, and put a lot of time creating an engine control unit to make it ”a little better”.

In the unlikely encounter of a problem which is considered to be beyond your control, please contact customer support.
You are very welcome to make suggestions on how to improve our product further!

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