

Use of inductive injectors Driver DMg06

Release: V1.00 – 31/01/2014

<http://www.skynam.com>



machine management

Use of inductive injectors Driver DMg06

Skynam reserves the right to make changes, corrections, modifications, improvements, to this document, to products and to the services which he describes, at any time and without notice preliminary.

No part of the documents may be reproduced or transferred, whatever the reason or the means used, whether mechanical or electronic, without prior authorisation from Skynam.

Skynam's general sales conditions are fully applicable.

WINDOWS is a Microsoft Corporation registered trademark

The WINDOWS logo is a™ Microsoft Corporation trade mark.

THIS DEVICE DELIVERS HIGH TENSIONS UNDER STRONG INTENSITIES:

- IT IS FORBIDDEN TO OPEN IT.

- IT IS FORBIDDEN TO MANIPULATE THE HOUSING AND ITS CONNECTIONS DURING ITS WORKING OR IN THE 3 MINUTES WHICH FOLLOW ITS SWITCH OFF.

THE HOUSING OF THIS DEVICE CAN OVERTAKE 100°C:

- PRECAUTIONS MUST BE TAKEN WHEN INSTALLATING IT, AND WHEN MANIPULATING IT AFTER USE.



**DANGER OF DEATH,
OF FIRE AND BURN**

CARES OF USE

Some inductive injectors require a very specific command to be able to be opened and be maintained opened.

This command consists of two parts:

- the Peak part, with a first phase of attack during which a high tension (up to 65 volts) is continuously applied until obtaining a current of strong intensity (being able to exceed 20 amperes), then the second phase of Peak withstand by switching of the high tension to keep the Peak current.

This Peak part being necessary to obtain a very fast opening of the injector,

- the Hold part, during which the tension is supplied by the 12 volts battery power supply of the engine, with a current regulation by switching the power supply battery, to maintain the opening of the injector without damaging it.

These injectors are:

- common rail inductive diesel injectors,
- diesel pump injectors,
- injectors for gasoline direct injection,
- Other injectors, generally low impedance not allowing a usual On-OFF command.

The Driver DMg06 is capable of supplying this type of commands by generating the high tension of the peak thanks to a switching mode power supply located in its housing.

A capacitor of strong capacity being integrated into the switching mode power supply, the high tension can remain much later the complete switch off of the Driver.

AT THE RISK OF DEATH:

IT IS FORBIDDEN TO OPEN THE HOUSING.

IT IS FORBIDDEN TO MANIPULATE THE DRIVER OR THE CONNECTIONS OF ITS LOOM IN THE 3 MINUTES WHICH FOLLOW ITS COMPLETE SWITCH OFF.

The strong power delivered in case of extensive use (high engine rpm and important number of injections by engine cycle, high tension of injectors) provokes a strong rise of the internal temperature.

The housing of the Driver being used to dissipate this temperature, it can reach temperatures higher than 100 °C

AT THE RISK OF FIRE OR OF BURNS:

IT IS NECESSARY TO TAKE THUS NOT ONLY PRECAUTIONS OF INSTALLATION OF THE DEVICE IN THE VEHICLE REGARDING THE INFLAMMATION OF MATERIALS POSITIONED NEAR THE HOUSING AND TO ITS VENTILATION, BUT ALSO NOT TO TOUCH THE HOUSING DURING OR AFTER THE USE AT THE RISK OF SERIOUS BURNS.

OVERVIEWS

I) WINJALL SOFTWARE FOR ECUs TUNING :

The DMg06 Driver tuning pack is supplied with accompanying of the program Winjall. It is subjected to the same rules of use and license.

The Winjall program requires a license of use. In its complete shape, this license is established by a file license and a material dongle key

To make access to Commander ECUs easier, this pack contains a licence made of one single file, without a dongle.

This licence gives you access to the main tuning functions for Commander ECUs.

However, to have access to the complete features, it is necessary to obtain with the Company Skynam a complete license.

Though it is possible to make copies of the Winjall software distributed in this pack, you have to comply with the regulations for use and the licence you have accepted when installing it on your computer.

II) TUNING PACK DOCUMENTATION:

This documentation version has been specifically upgraded for the Tuneware DMg06 versions distributed from January 31st, 2014, notably:

- engine: version 1.00

These Tuneware versions only work with the Winjall V6.20 version or a later one, which also requires a XP SP3, 7 or any later version of the Windows operating system of the Microsoft Corporation.

III) WARNING:

The DMg06 Drivers are meant for racing cars, boats or bikes and not for any other purpose. Remember it mustn't be used on open roads, as it does not comply with road regulations.

PRESENTATION OF THE DRIVER DMg06

DMg06 is an ECU specifically dedicated to the command of inductive injectors requiring a Peak and Hold command with a high tension and a strong current of Peak, and a regulated current of Hold. Its management software 'Engine' is made to manage this type of injectors on diesel engines and gasoline, the most common application of use of injectors, although inductive injectors with specific command can be used to inject some other products than fuel and somewhere else than in an engine. In that case, contact Skynam to get operation softwares other than those dedicated to the engine management.

The Driver DMg06 is intended to be only piloted by the Skynam ECUs of engine management like the Commander. If it is not piloted by a Commander and if it is not connected with it by CAN-BUS, this Driver cannot work.

If you have to use a Driver with an ECU other than Skynam Commander ECUs, it is necessary to use a Driver DMS06 and not this Driver DMg06.

I) GENERAL CHARACTERISTICS:

ELECTRICAL CHARACTERISTICS

Power supply from 8 volts to 18 volts DC.

- a power supply by after key +battery
- a power supply by permanent + battery

Separated power supply and power ground

Consumption minimum while operating at 13 volts: 460 milliamperes,

Consumption on stop: 0 milliamperes,

Limit of maximal consumption: 13 amperes

TEMPERATURE CHARACTERISTICS

In operation, -40 ° to +65 °.

SEALING CHARACTERISTICS

IP 67 (on require).

II) OPERATION CHARACTERISTICS:

INJECTORS COMMAND

6 channels of injectors commands

Inputs commands by the ground, 1 KOhm pull-up resistor to +12V After Key integrated into the Driver.

Response time: 2 μ s

Injection covering of a channel on the other one (between cylinders) allowed

Programmable peak tension from 20 volts to 65 volts

Duration of peak attack from 50 microseconds to 1000 microseconds

Peak withstand current by adjustable switching

Hold current adjustable from 1 to 16 amperes

Maximum number of injections for all channels cumulated: depends on the current and on the duration of the peak and of the on-board tension (battery):

At on-board tension 13.5 volts, for standard diesel inductive injectors: 42000 injections / mn

- corresponds to a maximum 6900 rpm, 6 cylinders, 2 injections per cylinder

- corresponds to a maximum 10350 rpm, 4 cylinders, 2 injections per cylinder

Maximum consecutive time allowed at the maximum tension command, starting at an internal temperature of 20 °C

- at 42000 injections / mn : 3 mn
- at 30000 injections / mn : 6 mn
- at 18000 injections / mn : not limited

COMMUNICATIONS

One WinjNet CAN-BUS

- Tunings, calibration and control by protocol WinjNet (™ Skynam).
- Master / slave communication with Commander ECUs.
- The 120 Ohms resistor not integrated.

DIAGNOSTIC LED OF THE ECU OPERATION

A diagnostic LED indicates the major errors of the operation of the ECU.

III) CONFIGURATION OF THE OPERATION:

DIAGNOSTIC OF THE INJECTORS COMMANDS

Engine management diagnostic transmitted by CAN to the Commander ECU

Control of the working injector by injector

- transmission of the operation status injector by injector
- transmission of the operation status of the internal high tension
- transmission of the used ratio of the total power available
- transmission of the level of the internal high tension
- transmission of the target level of the internal high tension

INSTALLATION OF DRIVER DMg06

These installation recommendations are simple but very important.

I) ELECTRICAL INSTALLATION :

When the engine is running, make sure that the driver is properly powered and that on-board tension (battery) at the input of the driver voltage is 13.7 volts.

The wiring of the grounds between the driver, the engine block and the battery must be impeccable, the resistance must be at most 0.1 Ohm taking account of the heel resistance of your multimeter (consult the installation instructions of the engine management ECU).

If the voltage is lower, the driver must provide more effort to open the injectors and heats up much more.

If the quality of the grounds is bad, the driver can be destroyed.

II) MECHANICAL INSTALLATION :

The driver must be installed in a vehicle area as cool and ventilated as possible, far from the exhaust heating.

Maximum ambient heat in the area in which the driver must be installed is 60 degrees.

Very often, in the series vehicles, the diesel engine management electronic is installed behind a headlight, taking advantage of the circulation of fresh air, but protected from the weather.

In competition, it may be more difficult to protect the electronics from the weather if it is placed in a cool and well-ventilated area under the engine bonnet.

LOOM

J56		FUNCTION	COMMENTARY	CHARACTERISTICS
1	OUT	INJECTION A +	1st injected cylindre	Peak et Hold injecteur positive command
2	OUT	INJECTION A -	Injecteur A return	Peak et Hold injecteur negative command
3	OUT	INJECTION B +	2nd injected cylindre	Peak et Hold injecteur positive command
4	OUT	INJECTION B -	Injecteur B return	Peak et Hold injecteur negative command
5	OUT	INJECTION C +	3nd injected cylindre	Peak et Hold injecteur positive command
6	OUT	INJECTION C -	Injecteur C return	Peak et Hold injecteur negative command
7	OUT	INJECTION D +	4th injected cylindre	Peak et Hold injecteur positive command
8	OUT	INJECTION D -	Injecteur D return	Peak et Hold injecteur negative command
9	OUT	INJECTION E +	5th injected cylindre	Peak et Hold injecteur positive command
10	OUT	INJECTION E -	Injecteur E return	Peak et Hold injecteur negative command
11	OUT	INJECTION F +	6th injected cylindre	Peak et Hold injecteur positive command
12	OUT	INJECTION F -	Injecteur F return	Peak et Hold injecteur negative command
13	OUT	LED DIAG-ALARM	LED command	10 milliamperes
14	CAN	CAN1_H	CAN WinjNet	Without integrated 120 Ohms resistor
15	IN	INJECTION A SIGNAL INPUT	Injection input A - ground signal	internal pull-up to +15, consumes 15 mA
16	IN	INJECTION B SIGNAL INPUT	Injection input B - ground signal	internal pull-up to +15, consumes 15 mA
17	IN	INJECTION C SIGNAL INPUT	Injection input C - ground signal	internal pull-up to +15, consumes 15 mA
18	POW.SUP	PERMANENT POWER SUPPLY+ 3	Permanent 12 volts power supply	8-18 volts
19	POW.SUP	AFTER KEY POWER SUPPLY + 1	12 volts after key power supply	8-18 volts
20	POW.SUP	AFTER KEY POWER SUPPLY + 1	12 volts after key power supply	8-18 volts
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42	CAN	CAN1_L	CAN WinjNet	Without integrated 120 Ohms resistor
43	IN	INJECTION D SIGNAL INPUT	Injection input D - ground signal	internal pull-up to +15, consumes 15 mA
44	IN	INJECTION E SIGNAL INPUT	Injection input E - ground signal	internal pull-up to +15, consumes 15 mA
45	IN	INJECTION F SIGNAL INPUT	Injection input F - ground signal	internal pull-up to +15, consumes 15 mA
46	GROUND	ENGINE GROUND ECU SUPPLY	Ground supply for ECU	
47	GROUND	POWER GROUND ENGINE	Ground input for power commands	
48	GROUND	POWER GROUND ENGINE	Ground input for power commands	
49				
50				
51				
52				
53				
54				
55				
56				

DIAGNOSTIC LED

The inductive injectors Driver DMg06 is provided of a red diagnostic LED to indicate major errors without the necessity to connect a PC or a data recording.

BLINKING 8 HZ

This blinking 8 times per second (very fast) indicates that the memory of the ECU is damaged, no working of injector is allowed: it is necessary to ask the device maintenance by the Skynam Company.

BLINKING 4 HZ

This blinking 4 times per second (fast) occurs when the ECU backs up data or softwares in its memory,

- or during the update of the machine,
- or a very short time in the ECU switch off.

You should not remove the permanent power supply or disconnect the ECU from the loom during this state.

BLINKING 2 HZ

This blinking twice per second (medium) occurs when the software application (command of injectors) cannot work:

- or because it is not loaded in the ECU,
- or because it was damaged.
- or because its data of calibration are incorrect (damaged or unusable),

BLINKING 1 HZ

This blinking 1 time per second (slow) occurs when the CAN-BUS does not work correctly:

- if there is no 120 Ohms resistor between the CAN_L and CAN-H lines.

Even in the case where CAN-BUS function must not be used and is not connected to a functional CAN-BUS (which would supply the necessary 120 ohms resistors), it is necessary to install this resistor at the CAN_L and CAN-H terminals of the Driver.

- if the internal components of the CAN-BUS management are damaged.
- if the CAN-BUS is in short circuit, either directly between its terminals, or by a damaged node (other transmitter).

- if the application software waits for necessary data for its operation, normally transmitted by the CAN-BUS, and if these data are not received.

This defect does not prevent the piloting of injectors in the external version (commanded by other types of ECUs of engine management than Skynam ECUs), but does not allow the working in the internal version (command by the Skynam engine management ECUs)

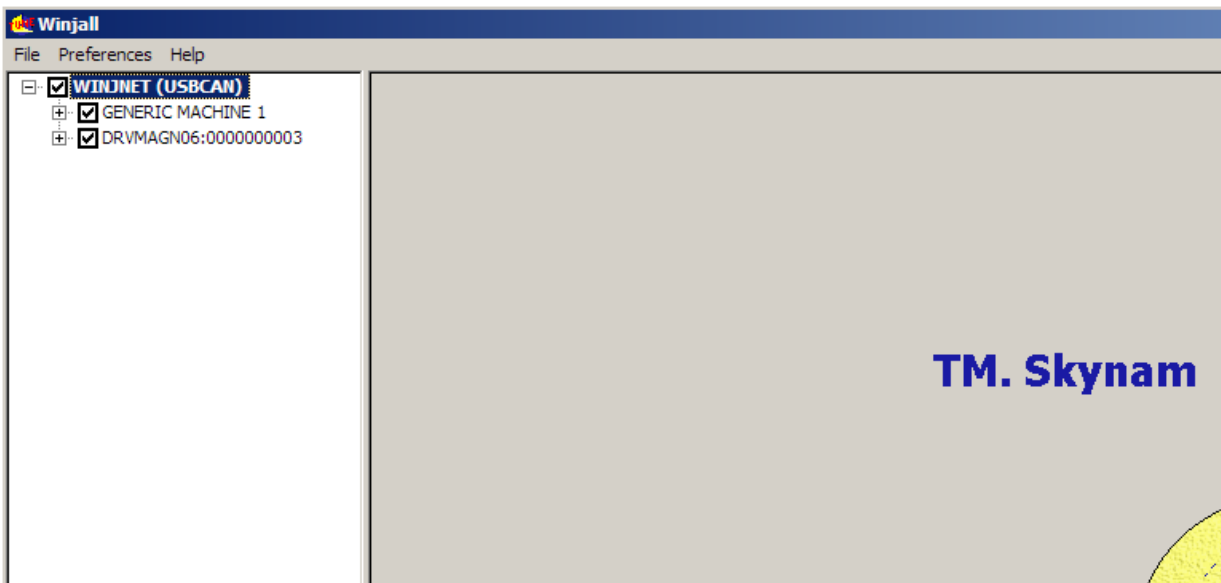
SUMMARY OF THE USE OF WINJALL

For an exhaustive explanation of use of the software Winjall, consult the file 'Winjall User's manual'.

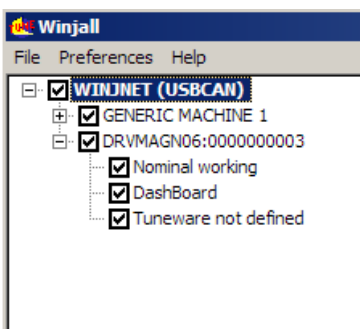
- 1) Connect the USB-CAN interface between the PC and the CAN connector of the Driver
- 2) launch Winjall

Note: the Driver can have been switch on before or after the Winjall software launch

Once Winjall launched and the Driver are switched on:



Click on it [+] in front of the name of the Driver DRVMAGN06:000 to expand the tunings



There are 3 possible pop-up menus on a machine in the machines tree:

- the Machine menu, by a right click on the name of the machine.
- the State menu, by a right click on the State of the machine (Nominal working, or other)
- the Tuneware menu, by a right click on the name of Tuneware (or Tuneware not defined if no

Tuneware is opened)

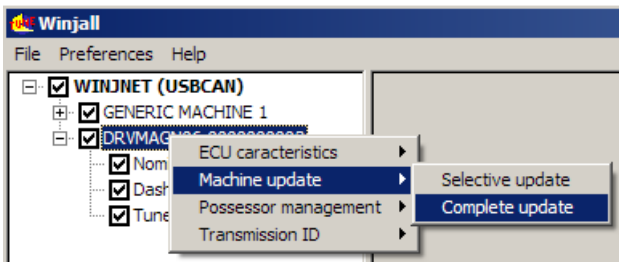
Each of these menus concerns functions of different level in the machine.

UPDATE OF THE MACHINE

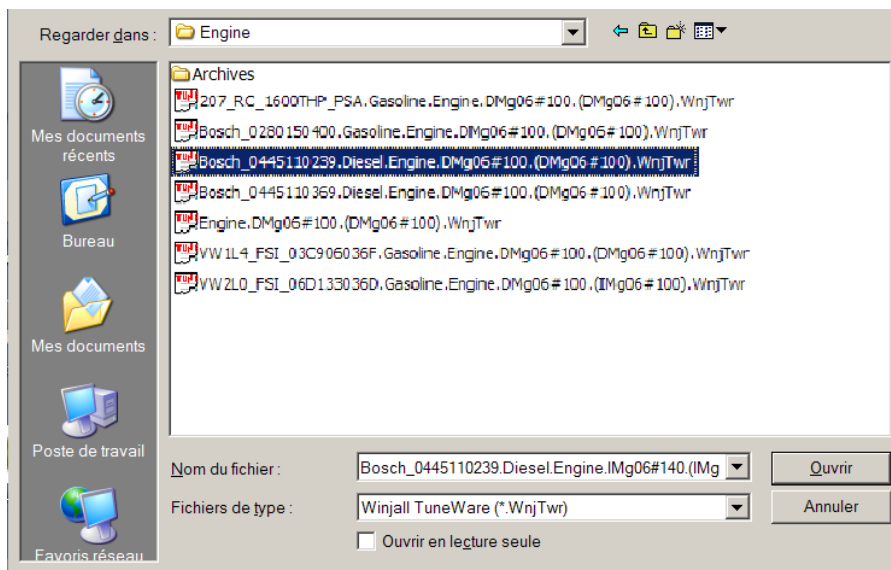
This operation allows to load a new software into the machine (what is different to simply change the tuning data)

1) Verify that the line of Tuneware of the machine is 'Tuneware not defined'. Otherwise, Double on click the Tuneware name to close it.

2) Right click on the name of the machine then select Machine update / complete update.

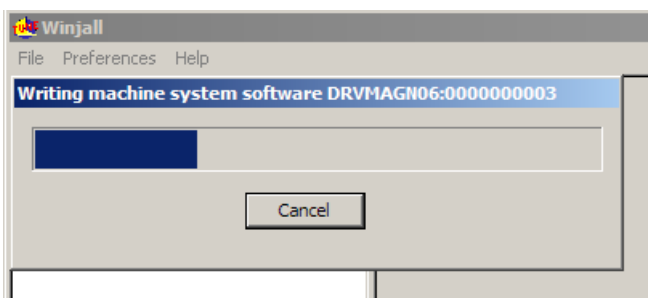


Select specific Tuneware of the machine to be load



Let the load be made: 3 phases

- system load
- application software load
- application data load



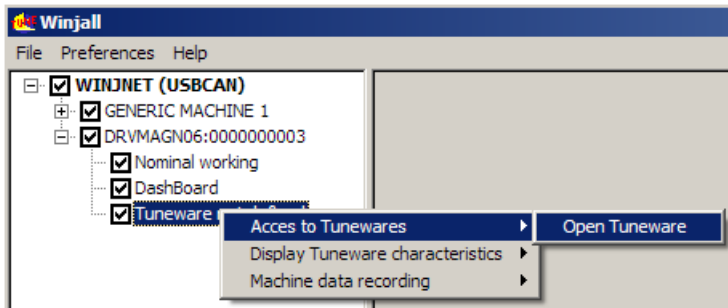
ACCESS TO THE TUNING OF THE MACHINE

Before being able to access the tunings and the displays of the machine, it is necessary to open a Tuneware corresponding to the type of software which we loaded in it.

Tuneware is a file in which the totality of the data necessary for the ECU where grouped together in a single set. It consists:

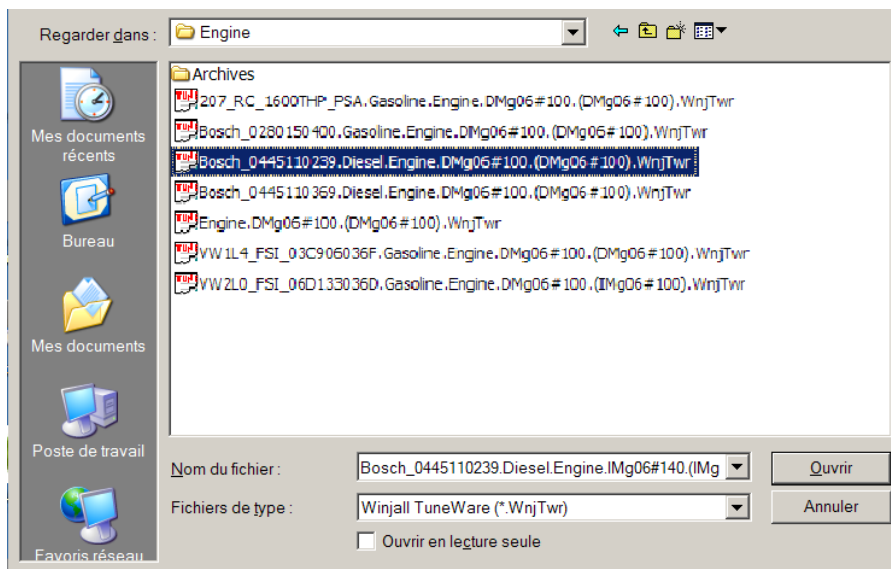
- of the description of the ECU operation, used by Winjall.
- of the system software which allows your ECU to make automatically its measurements, to pilot its outputs or to communicate with your PC.
- of the application software which tells it how it has to calculate and what it has to make with its measurements and its commands to pilot a device (an engine for example).
- of all the tunings (calibrations, maps, etc.) necessary for the working, specific to this device.

1) We open Tuneware by the menu Tuneware:



or more simply by double clicking the line 'Tuneware not defined'

Choose then the Tuneware to open:

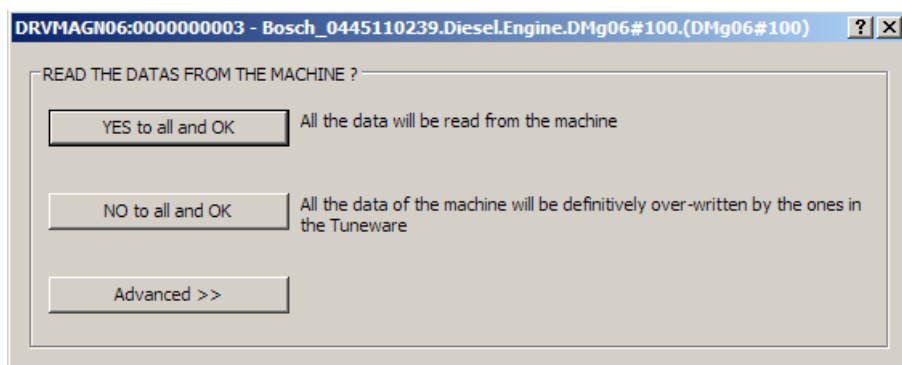


At the opening of Tuneware, Winjall has to synchronize with the machine: 2 solutions:

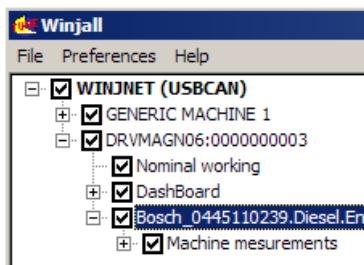
- send the data of opened Tuneware to the machine
- Get back the data from the machine in the opened Tuneware

Generally, we choose to get back the data from the machine, and at the contrary we risk to erase the tunings of the machine with that ones of Tuneware opened with Winjall

To the question ' READ DATA IN THE MACHINE ', we shall answer by clicking the button [Yes for all and OK]

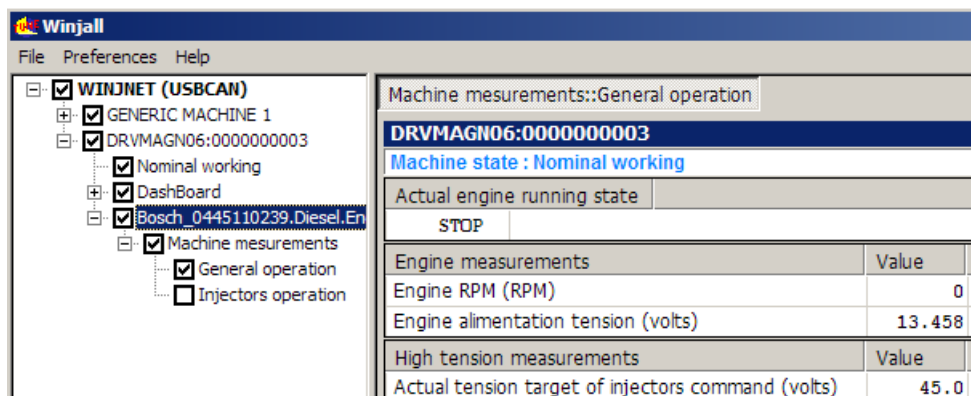


Once the Tuneware is opened, its name is displayed on the line 'Tuneware of the machine'.



To access the special functions of tuning, we shall use the pop-up State menu.

To access displays and map tunings, expand the functions by clicking on [+] in front of lines, and check the box in front of the line of the desired page.



If we open several pages, we toggle between the one to the other one with [ALT] [TAB] at the keyboard, or by clicking with the mouse in the tab at the top of the page.

CHECK OF THE CAN-BUS CONNECTION TO THE COMMANDER

The Driver has to receive data from the Commander ECU which pilots it by the CAN-BUS.
If he does not receive the data, it cannot work.

When the Driver and its Commander are switched on, the Winjall software displays in the page 'Machine measurements' the State of general working.

The value of the line 'State data of the piloting ECU' has to be 'received'.

General functioning state		
Injections	enabled	
Data in injectors driver	valid	
State data from management ECU	completed	
High tension state	nominal	
High tension measurements		
	Value	State
Actual tension target of injectors command (V)	45.0	The user command tension target can be modified by the driver on some exception condition.
Internal high tension (volts)	46.4	Internal high tension alimentation, base of injectors commands
Alimentation power use ratio	0.165496	Give the use coefficient of the high tension power according to the allowable power of the injector.

CONFIGURATION OF THE INJECTORS COMMAND

The injectors command is configurable so as to adapt itself to the needs of specific injectors which you have to pilot.

This command consists of two main parts

1) The Peak which delivers a high tension under a high current, but which lasts only some hundreds of microseconds. This Peak part is necessary to obtain a very fast opening of the injector. It is itself composed of 2 phases:

- the attack during which a high tension (up to 65 volts) is continuously applied until obtaining of a current of strong intensity (being able to exceed 20 amperes),

- the withstand with a switching of the high tension is made to keep the Peak current.

2) The Hold, during which the tension is supplied by the 12 volts battery power supply of the engine, with a current regulation by witching the battery power supply, to maintain the opening of the injector without damaging it with an excessive rise of the temperature of its coil.

I) HARDWARE OF MEASUREMENT AND PREPARATION:

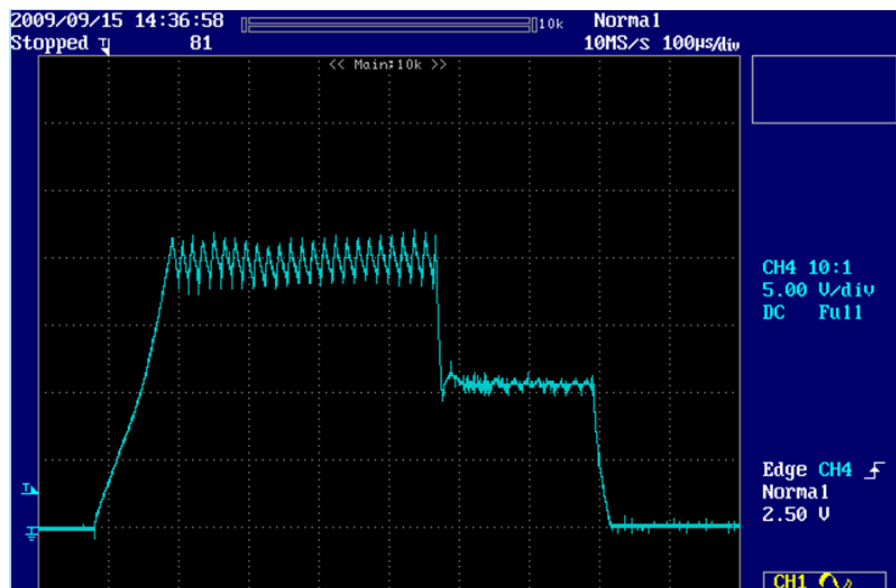
To be able to make the configuration of the injectors command, it is necessary that you dispose of the material of measure:

- an oscilloscope
- a current sensor

The current sensor will be positioned around one of the command wires of the injector.

Put on the injector stroke by stroke between every attempt of regulation.

Here is the general shape of the current that you have to obtain when the command will be well configured:



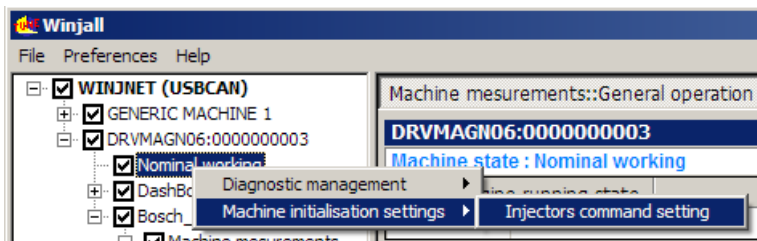
We distinguish the attack there during which the current quickly goes up in some dozens of microseconds, and a first level of switching regulation, the withstand. Then the Hold is the second level of regulation, lower.

In this example, the current is 5 amperes by division:

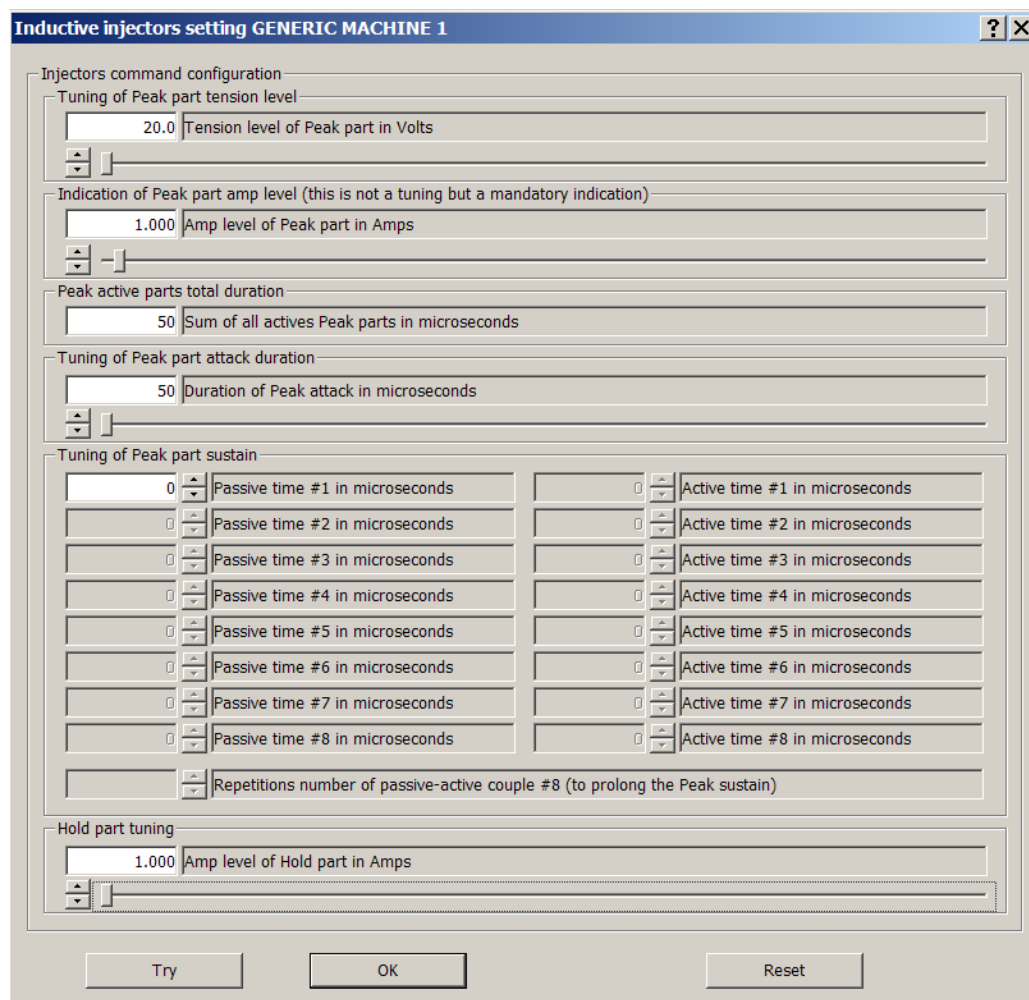
The Peak produces a 20 amperes current (under 45 volts) during 450 microseconds, and the Hold a 12 amperes current (under 13 volts).

II) FUNCTION OF CALIBRATION:

This function is launched in the pop-up State menu:

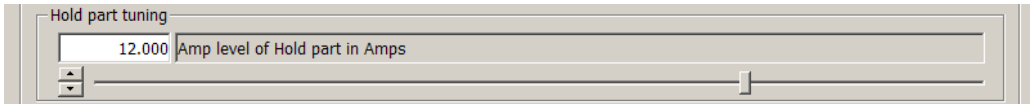


It consists of several parts:



III) REGULATION OF THE HOLD PART:

It is the simplest part. It is enough to tune the level of current which we want to obtain, by means of the slider to approach the value, and the spin to precise.



We can refine this value during the tests of the Peak part, the given value being only indicative.

IV) REGULATION OF THE PEAK:

As the Peak consists of two phases, the attack and withstand, each of these phases possesses its own parameters.

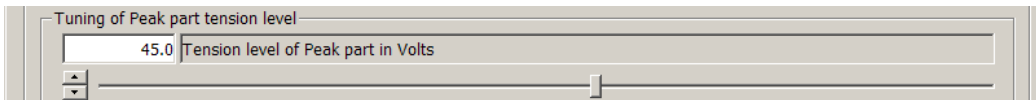
TUNING OF THE ATTACK OF THE PEAK

The technical characteristics of your injector will indicate you the level of tension and under which the Peak must be made.

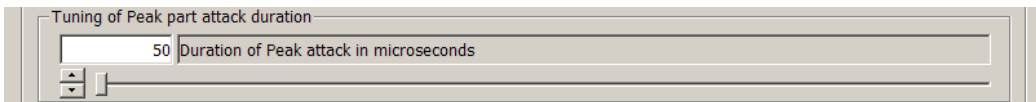
For example, for common rail diesel injectors (inductive), the tension of the Peak is 45 volts and the current 20 amperes.

These two characteristics will be positioned with both parameters:

- level of tension of the Peak: we position it to 45 volts.



- the level of current will be adjusted by lengthening more or less the duration of the attack of the Peak: we begin with a low duration which we shall increase try after try to reach the level of the desired attack current.

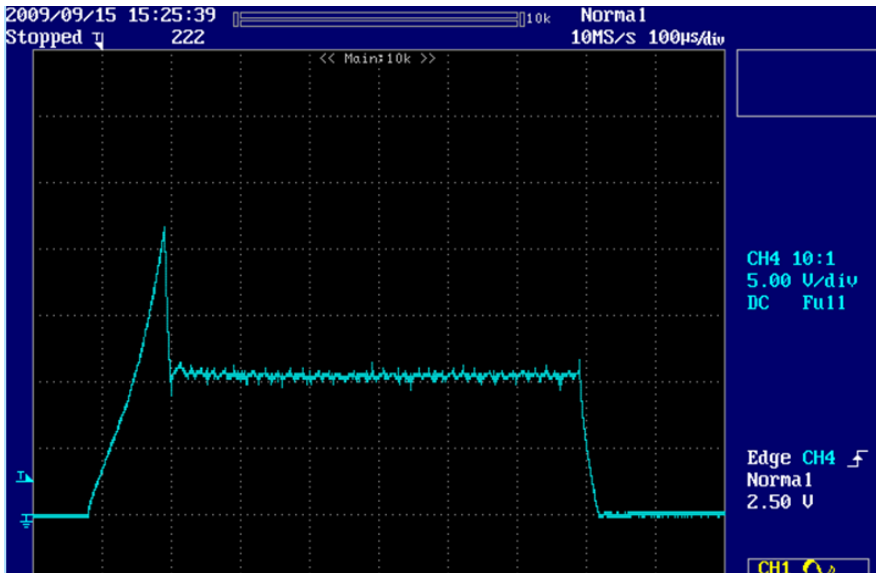


Once positioned these two values, press on the button 'TRY', what sends the data to the Driver.



We make the injector work one shot while showing the current on the oscilloscope.

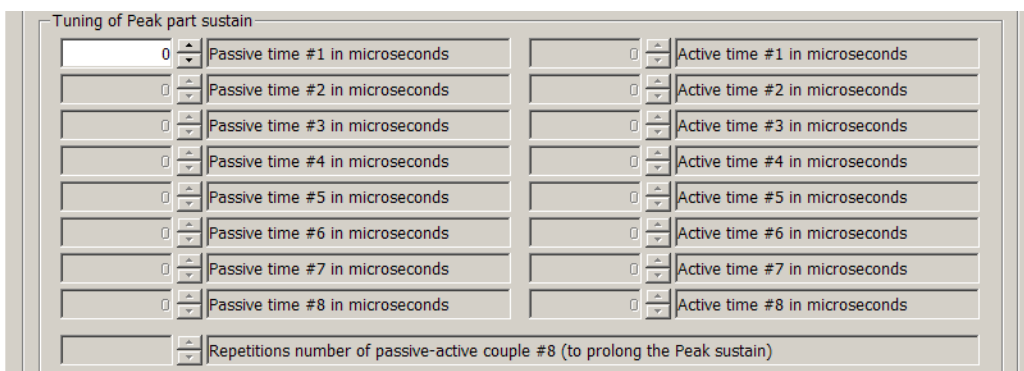
If the current does not go up enough, increase the duration of the attack, click on 'TRY' and make a command shot of the injector.



TUNING OF THE PEAK WITHSTAND

Once obtained the desired level of current, it is necessary to maintain it at this level by a switching of current.

This switching is constituted by a succession of cycles, every cycle consisting of passive time and of active time.



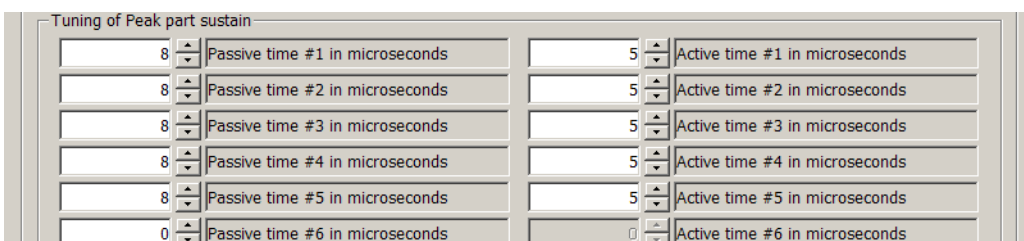
To allow a couple, position its passive time in a value higher than 0 microseconds.

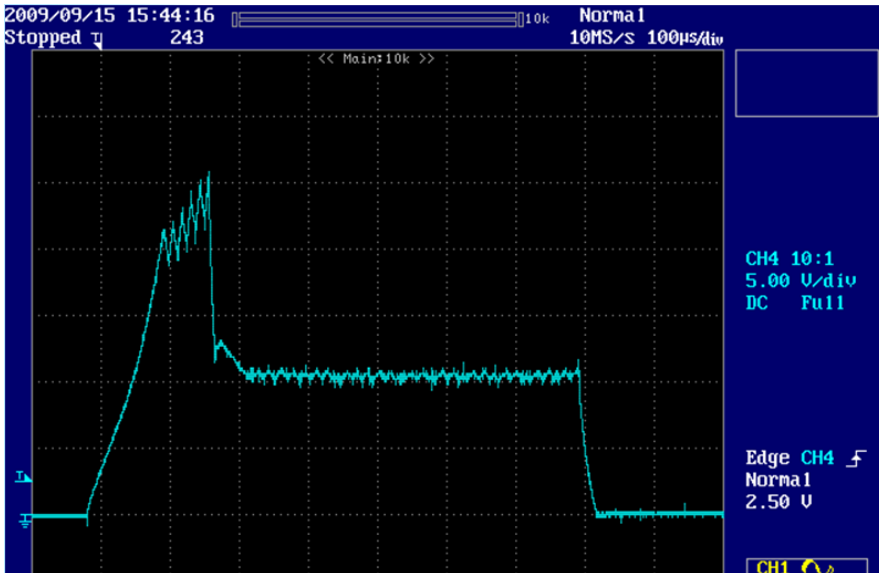
You can then position the duration of its active time, and the next couple is ready to be positioned (it is ungrayed and its passive time is set to 0).

As a rule of thumb, the passive times have generally a duration around 10 microseconds, the active times around 5.

If the passive time lasts too much time, the current drops too much and a long active time will be needed to go back up, provoking a too much jerky switching.

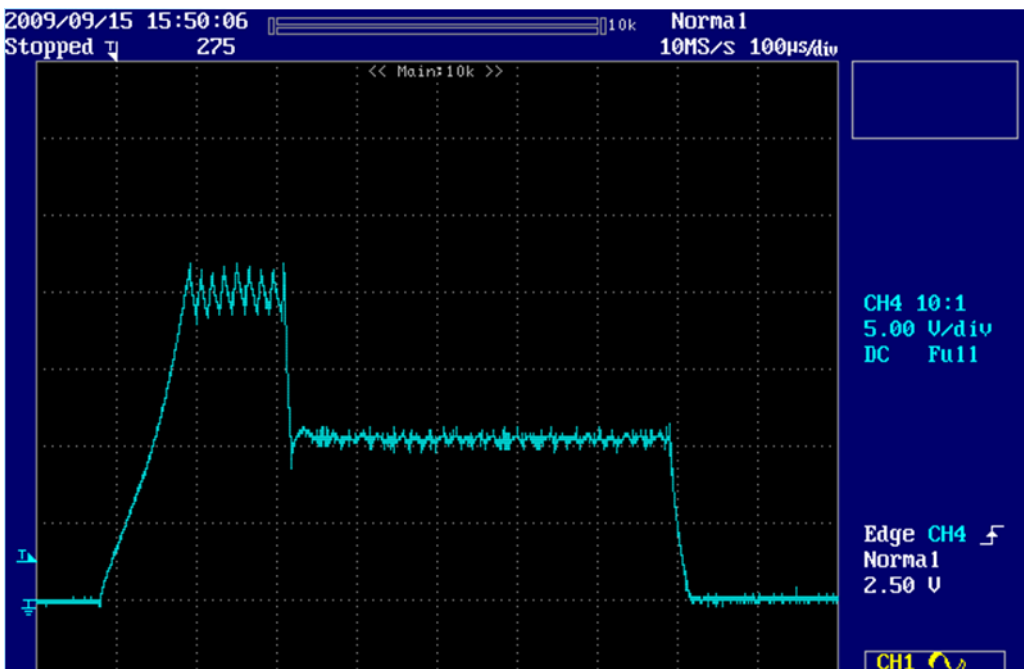
Position some 4 or 5 cycles, then make an try (do not forget to press on the button 'TRY' before launching the injector. It sends the made tuning to the Driver).





In this try, the current increases: the passive times are too short and the active times too long. After some tries, the withstand of the current is obtained.

Tuning of Peak part sustain			
10	Passive time #1 in microseconds	4	Active time #1 in microseconds
10	Passive time #2 in microseconds	4	Active time #2 in microseconds
11	Passive time #3 in microseconds	4	Active time #3 in microseconds
12	Passive time #4 in microseconds	4	Active time #4 in microseconds
12	Passive time #5 in microseconds	3	Active time #5 in microseconds
12	Passive time #6 in microseconds	3	Active time #6 in microseconds
12	Passive time #7 in microseconds	3	Active time #7 in microseconds
12	Passive time #8 in microseconds	3	Active time #8 in microseconds
0	Repetitions number of passive-active couple #8 (to prolong the Peak sustain)		

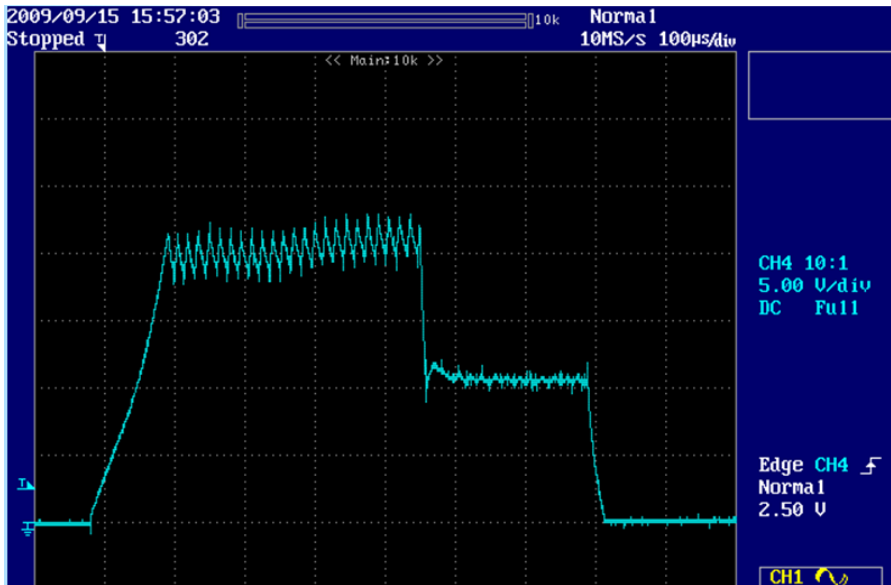


CONTINUATION OF THE SUPPORT OF THE CALL(APPEAL)

We used all the switching cycles of the withstand, and we want to prolong the Peak up to 450 microseconds: We are going to use the tuning of the number of reiterations of the last couple:

12	Passive time #8 in microseconds	3	Active time #8 in microseconds
16	Repetitions number of passive-active couple #8 (to prolong the Peak sustain)		

Here, the last couple is 16 times repeated.



during the reiterations, the current goes back up a little: a last retouch is necessary: the passive time of the couple #8 (the one which is repeated) will be slightly increased from 12 to 13, and the desired result is obtained (oscillogramme presented at the beginning of chapter).

Tuning of Peak part sustain			
10	Passive time #1 in microseconds	4	Active time #1 in microseconds
10	Passive time #2 in microseconds	4	Active time #2 in microseconds
11	Passive time #3 in microseconds	4	Active time #3 in microseconds
12	Passive time #4 in microseconds	4	Active time #4 in microseconds
12	Passive time #5 in microseconds	3	Active time #5 in microseconds
12	Passive time #6 in microseconds	3	Active time #6 in microseconds
12	Passive time #7 in microseconds	3	Active time #7 in microseconds
13	Passive time #8 in microseconds	3	Active time #8 in microseconds
16	Repetitions number of passive-active couple #8 (to prolong the Peak sustain)		

INDICATION OF THE LEVEL OF PEAK INTENSITY

The Driver needs that we indicate it the level of intensity to which we positioned the peak:

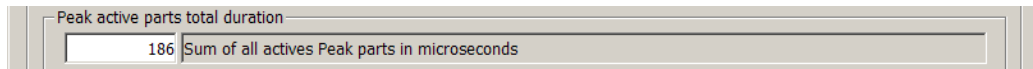
Indication of Peak part amp level (this is not a tuning but a mandatory indication)	
21.000	Amp level of Peak part in Amps

This level is the maxi level obtained during the peak switchings.
This indication is very important: although it does not influence directly the piloting of the injectors command, it must be however precisely indicated because it is used by the Driver to calculate the power continuously given by the high tension power supply.
 This calculation made by the Driver allows it to limit the power in case of exception, if the battery tension is too low or if the number of injections per second is too high.
 Indicating a too low value of Peak intensity risks to destroy the Driver.
 Indicating a too high value of Peak intensity will limit the use of the Driver in a useless way.

LIMITATION OF THE ACTIVE PARTS OF THE PEAK

The Driver does not accept that the sum of all the active parts of the peak exceeds 1000 microseconds. This sum consists of the duration of the attack, more the duration of the active parts of the switching cycles of the peak withstand.

This sum is given in the window

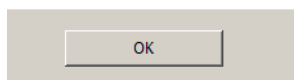


This value corresponds to our regulation example above: for a total peak duration of the 450 microsecond, the active parts are only 186 microseconds.

If you make a regulation which exceeds these 1000 microseconds, the window lights in red, and the press on buttons 'TRY' or 'OK' is refused.

FINAL VALIDATION

When you get the desired working of the injector, press on the 'OK' button. It sends a last time your tuning to the Driver and goes out of the tuning function.



RETURN TO THE LAST VALIDATION

If you wish to return to the tuning that the Driver had **at the moment you entered the function** of tuning of the injector command, use the 'RESET' button.



INTERNAL REGULATION OF TENSION OF INJECTORS COMMAND

The Driver controls internally that the instantaneous number of injections is not too important for the power capacity of its internal high tension power supply.

I) SOFTWARE REGULATION:

The Winjall software displays in pages 'Machine measurements' and 'Injectors commands tension regulation' the variable giving the immediate ratio of use of the Driver 'Ratio of injectors use'.

General fonctionment state		
Injections	enabled	
Data in injectors driver	valid	
State data from management ECU	completed	
High tension state	nominal	

High tension measurements	Value	State
Actual tension target of injectors command (v)	45.0	The user command tension target can be modified by the driver on some exception condition
Internal high tension (volts)	46.4	Internal high tension alimentation, base of injectors commands
Alimentation power use ratio	0.165496	Give the use coefficient of the high tension power according to the allowable power of the inje

This ratio is calculated according to the immediate power use compared with the maximal power which can deliver the internal high tension power supply.

The immediate used power depends

- of the total number of injections per second, for all the used injectors
- of the value of the internal high tension used to generate the tension of injectors command
- of the intensity supplied during every command of opening of injectors

The intensity supplied in every opening of injector is the information of the level of intensity of the Peak which was given during the tuning of the injector command (see previous chapter).

As long as the ratio of used power is lower or equal to 1, the Driver agrees to pilot the Peak of injectors commands with the tension asked by the target.

If this ratio exceeds 1, the internal high tension power supply requires to be protected: the software of the Driver

- decreases the target peak tension of injectors command until return to a ratio 1,
- sends to Winjall and the Commander which pilots it the new value of target, the new value of internal high tension and the state of the high tension 'OVERLOADED',

If the number of injections per second decreases, by decreasing the engine rpm or the number of injections by cycle, and if the ratio of use of injectors becomes again lower or an equal to 1 without internal regulation, the software of the Driver

- sends to Winjall and the Commander which pilots it the 'NOMINAL' state of the high tension,

II) HARDWARE REGULATION:

If the use of the Driver is highly extensive (ratio of use of injectors very close to 1) in a continuous way and a long time (about 20 minutes), the internal temperature of the switching power supply increases too much and a protection by overshoot of temperature is generated: during some seconds, the time the temperature gets down again, the high tension power supply is stopped.

The software of the Driver sends then to Winjall and to the Commander which pilots it an information of error of high tension state:

- The high tension State of the pages of Measures information in Winjall switches to 'Blocked'.

This protection occurs only well beyond the real possibilities of working of an engine, because to reach it, we have to maintain the Driver in its limit during a very long time:

Number of injections average maxi any channels(ways) accumulated for an injector common rail standard diesel: 42000 injections / mn

- corresponds to a maximum 6900 rpm, 6 cylinders, 2 injections by cylinder
- corresponds to a maximum 10350 rpm, 4 cylinders, 2 injections by cylinder

If a so extensive use was necessary, it is necessary to use two Drivers by distributing on each half of the injector commands.