User Manual

BC500/1000G3
&
BCLab 3.7

USER MANUAL FOR THE BC-BOX AND BC-LABG3 SOFTWARE V3.7

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MANUAL FOR BC-BOX

ABOUT THE BC SYSTEM

The Civinco series of electronic control boxes - The BC - makes it possible to tune your engine without the need to reprogram the stock ECU (engine control-box). Civinco can offer both tuneable and ready-tuned boxes which gives you the possibility to optimise your engine.

The BC-box is available in four versions:

- BC250 – Ready tuned box for stock cars with 1-5 cylinder engines. Used as an alternative for chips and serial programming. No PC software is supplied with this box.

- BC500 - Tuneable box for cars with 1-5 cylinder engines. Includes PC software enabling full tuning of engine parameters. Tunes fuel, ignition, extra injectors, NOS, shift light, water injection etc.

- BC750 – Ready tuned box for stock cars with 6-10 cylinder engines. Used as an alternative for chips and serial programming. No PC software is supplied with this box.

- BC1000 - Tuneable box for cars with 6-10 cylinder engines. Includes PC software enabling full tuning of engine parameters. Tunes fuel, ignition, extra injectors, NOS, shift light, water injection etc.

The BC-box is connected between the stock ECU and the main harness, or it can be connected directly to sensors, injectors etc. This makes it possible to alter some in- and output signals which is necessary in all electronic tuning. The basic principle is that the BC-box will increase the boost pressure and add more fuel and at the same time "hide" this information from the ECU. In this way the ECU controls the engine during normal operation such as cold-start and idle etc but the BC-box controls the engine at high power. Common to all versions of the BC-box is that all tuning data is stored on a TuneCard (memory card) which is easily exchanged while driving to give the engine different behaviour such as; imobilizer, rpm-limiter, exotic fuels, max fuel efficiency or maximum power.

TuneCard inside the car   *BC1000 with harness for Dodge Viper*

Examples of supported functions:

- Tuning ignition and fuel as function of rpm and boost

- Tuning the boost at the same time as the boost signal is hidden from the ECU

- Activation of nitrous, water injection, extra injectors, shiftlight

- Mass airflow simulation using auxiliary MAP sensor

- Controlling larger than stock fuel injectors

- All tuning data is stored on a Tunecard memorycard (3 cards supplied)

- All tuning is done using the easy-to-use Windows BCLab program

- The BC-box is updated with tuning data using the Tunecards or by directly connecting the BC-box to the PC serial port
- Engine data can be logged and later analysed as graphs in BCLab

- Auxiliary analog, digital and PWM-signals can be used to control or logg extra devices
- Sold as a kit containing; BC-box, wiring, programming cable, bypass connector and an installation CD

ADDITIONS IN GENERATION 3

What's been added in generation 3 is:
- Complete 3D map for fuel and ignition.
  - Chose able size on both maps.
  - Able to choose how close it's between load and rpm cells.
- One extra PWM-output in BC1000G3
- One or two completely tuneable digital outputs to control Vanos, Vtec, gear indicator etc.
- Cold start function for easy tuning of E85.

IMPORTANT

**Civinco are responsible that the engine management system is working
correctly at delivery, presupposed it has been correctly installed.
Civinco offers a 10 year warranty.**

**Civinco does not take responsibility for damage on engine, car
or person in connection to the use of Civinco's system**

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BC250 AND BC750, PRETUNED FOR A SPECIFIC MAKE AND MODEL

The BC250/750 is a new type of tuning box for turbo engines. It's a plug-in type box which is connected to engine sensors and actuators, such as fuel injectors, camshaft sensor, manifold pressure sensor etc.

TuneCard
The BC250/750 can be loaded with different tuning parameters for different situations. The tuning parameters are stored on a memory card, "TuneCard". To switch the tuning just insert the card in the Bc-box. The new card is read in 5 seconds and the new tuning is immediately active. The card can then be removed from the BC-box. The cards can be inserted while the engine is running.
Used as an alternative for tuning chips or serial programming
Simple installation, no need to modify the stock equipment
Plug-in connectors for most sensors/actuators
No need to break the seal on the stock ECU
Simple to build back to stock
The BC-box can be used in another car (may need different tuning)
Delivered with 3 TuneCard: Stock (no tuning), Economy (more power and best mileage) and Sport (maximum power)
Special tuning parameters available, such as: Winter, Super Sport, StreetRace, Imobilizer, RPM-limit etc.

EXAMPLES SUPPORTED BY THE BC250G3

Original 150 hk - BC250 197 hk
- Audi A3 1,8T 2001-2003
- Skoda Octavia 1,8T 2001-2003

Original 150 hk - BC250 197 hk
- Audi A6 1,8T 2001-2003
- VW Passat 1,8T 2001-2003

Original 225 hk - BC250 255 hk
- Audi TT 1,8T 2001-2003

Original 150 hk - BC250 197 hk
- VW Golf 1,8T 2001-2003

Original 193-300 hk - BC250 240-375 hk
- Volvo V70 1997 ->

Original 163-200 hk - BC250 197-240 hk
- Volvo S/V40 2.0T
- Volvo S/V40 T4, 2001 ->

Original 55-75 hk - BC250 62-80 hk
- Smart Pulse/Passion
- Smart Pulse/passion, Fourtwo, Roadster

The BC250/750 is supplied with a car specific electrical harness, installation instructions with pictures and 3 TuneCards with different power levels. Extra blank TuneCards are sold separately.

The BC250 is available for most VAG 1.8Turbo engines 1996-2004 (Audi, VW, Seat, Skoda), Volvo S40&V70 Turbo and the Smart Turbo.

The BC750 is available for the Dodge Viper 1996 and forward

Please refer to our website www.civinco.com for the latest manuals and tuning examples for the specific model.

BC500G2 AND BC1000G2, TUNEABLE PIGGYBACK-BOX WITH PC SOFTWARE

The BC500/1000 differs from the BC250/750 in that they are not optimised for a specific engine but can be used on just about any car/engine. This also includes engines with a larger than stock turbo, or natural aspirated engines with installed turbo or supercharger. In these cases you must be able to tune the relevant tuning parameters yourself using the BCLab software. The electrical harness differs in that it is a more general harness. The harness can be supplied with or without certain plugs, such as injector plugs etc.

BC500/1000 features not available in the BC250/750:

• Activation of nitrous, water injection, extra injectors, gearshift indicator

• Mass airflow simulation using an extra MAP-sensor

• Control larger than stock injectors

• Tuned with the BCLab PC software

• Possibility to log data and afterwards view graphs in Windows

• Up to 16 inputs and 16 outputs

• Extra analog/digital and PWM in/outputs to control or log auxiliary equipment

EXAMPLES OF CARS TUNED WITH THE BC500/1000

Audi S2 - Larger than stock turbo
Audi S4 - Stock
Arctic Cat (snowmobile) – Stock
BMW 3-series E36, E46, E90
Chrysler 300C - Hemi V8 Turbo
Dodge Viper - Supercharger and nitrous
Dodge Viper – Turbo
Dodge SRT10 – Supercharged
Honda Civic CRX 1.6 - Supercharger, racing fuel and nitrous
Honda Civic CRX 1.6 - Turbo
Mazda Miata – Turbo
Mazda Miata - Supercharged
Mitsubishi 3000 GT - Stock
Nissan 300 ZX – Stock
Porsche 944 turbo
Porsche 944 naturally aspirated driven on E85
Skoda Octavia RS - Larger than stock turbo
Subaru Impreza - Larger than stock turbo
Suzuki Hayabusa (MC) - Turbo
Toyota Supra - Single turbo
Toyota Celica - Larger than stock turbo
Toyota MR2 - Stock
Volvo S40 - Turbo
Volvo 740 Turbo - Stock
Volvo 360 – Turbo
Volvo 850 – larger than stock turbo MAF-sim

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VW Golf V6 - Turbo and Mass airflow simulation

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TECH SPECIFICATION OF THE BC500G3

The Box Frontpanel

There are 4 LEDs above the TuneCard slot. These are from the left:
1. Green power - The BC is powered up
2. Red This LED will light up at preselected rpm chosen in BCLab, see section Box settings-"RPM ind"
3. Red Read/Write operation in progress. Also LED for error codes
4. Green steady: TuneCard read/write operation completed. Flashing (two flashes repeatedly): TuneCard read/write operation completed and the slave-PCB data is verified

The button next to the LEDs is used like this:

If the button is held pressed while a TuneCard is inserted the current BC-box data is transferred to the TuneCard, - the TuneCard data is replaced by the data in the BC-box.

In- and outputs

In the BCLab software under section "BC-box settings-Advanced-BC Digital I/O mode" you will enter which main mode to be used and thus also which connector pins to use. You will also under sections Ignition load, Fuel load and PWM load which analog input to use for load measurement and base the tuning on.If the engine has a MAP-sensor you will specify which pin this is connected to. Other engines may be better off basing the tuning on the TP-sensor.

Digital in/outputs

The BC500 has 6 digital in/output-pairs (12 pins), where every input has its associated output. These are called: FuelA-FuelE(5 fuel channels), IgnitionA-IgnitionB (2 Ignition channels) and PWM (1 boost channel). One of the signal-pairs can be used for different functions and cannot be used simultaneously. This is FuelE, IgnitionB and PWM. The reason for organising the in/outputs in pairs is that when connecting a bypass-plug (instead of the BC-box) then all channels will be short-circuited and the signals are unaffected (the engine behaves stock). When the BC-box is connected, the box will modify the signals according to the Tuning parameters and send them to the paired output.

The BC-box can thus be run in different modes where the pins have different functions:
- Mode
  - o 4 Fuel in/out, FuelA-FuelD, pins 15-22
  - o 2 Ignition in/out, IgnitionA-IgnitionB, pins 11-14
  - o Boost control out, PWM_OUT, pin 5
- Mode2 - no longer activated

- Mode3
  - o 5 Fuel in/out, FuelA-FuelE, pins 15-22 & 11-12
  - o 1 Ignition in/out, IgnitionA, pins 13-14
  - o Boost control out, PWM_OUT, pin 5
- Mode4 - no longer activated

- Mode5
  - o 4 Fuel in/out, FuelA-FuelD, pins 15-22
  - o 1 Ignition in/out, IgnitionA, pins 13-14
  - o Boost control in/out, PWM_OUT/IN, pins 11-12

The rpm calculation is **always** based on IgnitionA, this signal can be taken from several places as long as you know how many pulses per rev it has. Both IgnitionA and IgnitionB can be connected to crank/cam signals or ECU signals to the Ignition module. The signals must be of the type 0V to 5-20V. Sometimes it is necessary to use an amplifier to achieve the correct voltage level.

PWM Out

The BC500G3 has one PWM output, PWM_OUT which in mode 1&3 is used to control the boost, but in mode5 can be used for other purposes. In the BC1000G3 there is an extra PWM output that can be tuned depending on rpm or load.

Digital output

The BC500G3 has got one pure digital output, Digital1_OUT. This can for example be used to control:

- Gearshift indicator
- VANOS, VTEC etc.
- Other accessories that you want to activate at a specific rpm or load.

The BC1000G3 has an extra digital output, Digital2_OUT.

Analog in/outputs

The BC has two analog in/output pairs where every input has its associated output. These are called: Analog1 and Analog2. The basic idea with this is to limit the analog sensor signal (rpm dependant)l to a value which represents the stock manifold pressure or Mass airflow. In the BCLab software, you will select which analog sensor signal to base the tuning on. This selection is done at pages: Ignition load, Fuel load and PWM load.

Analog input

The BC has two more analog inputs which are pure inputs, thus the total is 4 analog inputs.
In the BC1000G3 all the in-outputs are doubled

Connector specification

Pin	Color	Name	Pin	Color	Name
1	Black/white	Signal Ground, GND	13	Blue/red	IGNITION_A OUT
2	Gray	5 V OUT	14	Blue/white	IGNITION_A IN
3	Bl/yellow	DIGITAL 1 OUT	15	Green/wht	FUEL_D_OUT
4	Green	ANALOG 4 IN	16	White	FUEL_D_IN
5	Purple	PWM_OUT (boost)	17	Brown/black	FUEL_C_OUT
6	Blue	ANALOG 3 IN	18	Brown/red	FUEL_C_IN
7	Yellow	ANALOG 2 OUT	19	Brown/blue	FUEL_B_OUT
8	Red/green	ANALOG 2 IN	20	Brown/gray	FUEL_B_IN
9	Ye/Gr	ANALOG 1 OUT	21	Brown/ye	FUEL_A_OUT
10	Red/yellow	ANALOG 1 IN	22	Brown/gray	FUEL_A_IN
11	Black/green	IGB_OUT / FI_E_OUT / PWM_OUT	23	Black	Ground_GND
12	Red/white	IGB_IN / FI_E_IN / PWM_IN	24	Red	+12V Power

BC250/500 pinout on the BC-box
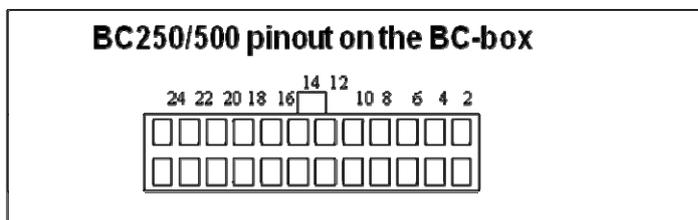
Power connections: Pin 1, 2, 23, 24:

1, 23	Grounding. It's very important to achieve a good solid grounding. Use shortest possible wires and always use both wires.
24	12V power. Connect this to a 12V power source which is switched by the ignition. The current is less than 0.5 Amps.
2	5V output to power auxiliary sensors, max 50mA.

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Fuel injectors: Pins 15, 16, 17, 18, 19, 20, 21, 22:

	The BC250/500 can connect up to 5 injectors (cylinders A-E). You will connect the BC between the ECU and the injector. The in/outputs must be connected in pairs according to: A(22-21), B(20-19), C(18-17), D(16-15), E(12-11).
(12), 16, 18, 20, 22	Fuel signal inputs to the BC-box from the ECU. The fuel signal shall be connected to the BC-box instead of the injector. Pin 11,12 FI_E_IN/OUT is only used on 5cylinder engines (instead of IgnitionB).
(11), 15, 17, 19, 21	Injector driver output from the BC-box. The injectors are connected here instead of to the ECU.

Ignition : Pin 11, 12, 13, 14:

	It's possible to control 2 ignition modules at the same time, IGNITION_A and IGNITION_B with their in- and outputs. If only one ignition channel is required, then IGNITION_B can be used for other purposes such as: a 5th fuel channel or control of the boost valve.
	In many cases there is no need to tune the ignition, in such cases it's sufficient to only sense the rpm. This signal can be from the ignition system, the camsensor or the cranksensor. Depending on the used signal you may have to connect an amplifier to achieve the correct voltage level.
12, 14	Ignition signal inputs to the BC-box from the ECU. The ignition signal shall be connected to the BC-box instead of the ignition module.
11, 13	Ignition outputs from the BC-box to the ignition modules (The BC-box cannot drive ignition coils directly without an ignition module). The ignition modules are connected here instead of to the ECU. They have to be connected input-output for each ignition module as: A(14-13), B(12-11).

Analog signals: pins 4, 6, 8, 10, 7, 9:

10, 8, 6, 4	0-5V analog signals Analog1-4. Normally used for measuring Manifold absolute pressure, Mass airflow, knocksensor, throttle position or temperature.The BC-box can use all these signals to tune fuel, boost, ignition etc. in the BCLab software.
9	Analog1-output, an analog output signal which can be voltage limited. It can be used to hide the high MAP or Mass airflow value from the ECU. The output voltage is the same as the input voltage at pin8(analog1) up to a certain maximum value. Any input above this maximum value will only produce that maximum output value. The maximum value is selected in BCLab at page Analog out-Analog1 out.
7	Analog2-output. This output can be controlled in three ways: The output can be a function of the Analog2 input value. For every input there will be a certain output according to how you have tuned this function in BCLab. The output can be voltage limited in the same manner as analog1. When controlling the boost via PWM_IN/OUT (pins 11,12) this signal can be voltage limited in a smarter way called limit trim.

Driver outputs: pins 3, 5,11:

	The boost valve is controlled by a PWM output. Which pin you use for this is selected in the BCLab-Configurations. The PWM output can also be used to control other devices compatible with the PWM-type output (lamps, valves, motors etc.) The outputs can handle 3 Amps.
11	PWM output. Normally used to control the boostvalve when the ECU boost control signal is connected to the PWM_IN BC-box input.
5	PWM output. Can be used to control the boost valve.
3	Digital output. Can be used to control gearshift indicator, vanos, vtec etc.

PWM input: pin 12:

12	PWM input. Can be used to connect the ECU boost control signal to the BC-box. This is used for logging purposes or when you wish to use the Analog2-out "limit trim" function.

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INSTALLATION

The BC-box can be installed in three different ways.

Example 1: ECU The BC-box is connected directly to injectors, sensors and boost control valve in the engine bay. In this type of installation the BC-box does not tune the ignition. The camsensor signal is used to calculate the rpm. This installation is used with the VAG 1.8T engines, Smart, Volvo and most custom projects.	**Example 2: ECU** The BC-box is connected to the ECU connector or another suitable connector in the stock electrical harness. This installation is used in the Dodge Viper generation 2.	**Example 3:** In those cases where there are no suitable connectors to use we use a general harness without connectors. At suitable places in the stock electrical harness, the stock wires are cut and soldered to the BC harness. This installation is used with the Honda CRX and Mazda Miata.

Installing the BC250 in an Audi TT

Installation of BC in an Audi TT 1.8 Turbo.
Installation time 1.5 hrs.

No	Connection	Type
1-4	Fuel injectors	Plug-in
5	Throttle position sensor	Split connector
6	Boost control	Plug-in
7	Mass airflow sensor	Cable connector
8	Camsensor	Plug in
9	MAP sensor	Cable connector

Check our website www.civinco.com for the latest installation manuals and tuning examples.

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Connector Specification BC1000G3

BCpin			Color	Name	Connect to
Master					
1			white / black	signal GND	Gnd
2			grey	5v out	+5V to sensor supply
3			black / yellow	Digital 1 out	
4			green	analog4 in	
5			violette	PWM1 out	
6			blue	analog3 in MPX	Internal MAP sensor signal
7			yellow	annalog2 out	
8			red / green	analog2 in	
9			yellow / green	analog1 out	
10			red / yellow	analog1 in	
11			black / green	Ign B out / PWM out	
12			red / white	Ign B in / PWM in	
13			blue / red	Ignition A out	
14			blue / white	Ignition A in	
15			green / white	Fuel_D_OUT	Fuel injector
16			white	Fuell_D_IN	ECU output
17			brown / black	Fuel_C_OUT	Fuel injector
18			brown / red	Fuel_C_IN	ECU output
19			brown / blue	Fuel_B_OUT	Fuel injector
20			brown / grey	Fuel_B_IN	ECU output
21			brown / yellow	Fuel_A_OUT	Fuel injector
22			brown / green	Fuel_A_IN	ECU output
23			black	Power GND	Gnd
24			red	12 V Power	+12V, Key switched

BCpin			Color	Name	Connect to
Slave					
1			white / black	signal GND	Gnd
2			grey	5v out	+5V to sensor supply
3			white/yellow	Digital 2 out	
4			orange	analog4 in	
5			white / violette	PWM 2 out	
6				analog 3 in MPX MAP	Internally conn to Master MPX
7				---	
8			brown	analog2 in	
9				---	
10			white / orange	analog1 in	
11					
12					
13			white / red	Ignition A out	
14			white / blue	Ignition A in	
15			green / white	Fuel_H_OUT	Fuel injector
16			white	Fuel_H_IN	ECU output
17			brown / black	Fuel_G_OUT	Fuel injector
18			brown / red	Fuel_G_IN	ECU output
19			brown / blue	Fuel_F_OUT	Fuel injector
20			brown / grey	Fuel_F_IN	ECU output
21			brown / yellow	Fuel_E_OUT	Fuel injector
22			brown / green	Fuel_E_IN	ECU output
23			black	Power GND	Gnd
24			red	12 V Power	

BCLABG3 V 3.7

BCLAB FUNCTIONS IN GENERAL

The PC software BCLab is used to tune the BC500/1000. This software is also available as an upgrade to the BC250/750 which is delivered with ready tuned TuneCards for those users who wish to do their own tuning. In the below simplified example we will assume that we want to increase power by adjusting the maximum boost. The BC500/1000 can just as well be used to tune a car with an aftermarket turbo/supercharger installation. The tuning principles are the same but more tuning parameters may need adjustment.

The basic working principles for the BC-box is to measure the engine rpm, boost pressure, Mass airflow and/or manifold pressure. Depending on the amount of air entering the engine the ECU will supply the correct amount of fuel. When opening the throttle more air will enter the engine and thus the ECU will calculate a higher amount of fuel. Depending on the rpm and airflow the ECU will also calculate the ignition advance.The difference between boost pressure and manifold pressure is that the throttle is between them. When opening the throttle more of the boost pressure will reach the manifold (and engine).

The turbo is capable of generating boost depending on rpm, which in turn determines the airflow into the engine. In order to regulate the boost, the ECU uses a boost control valve to adjust the boost pressure. Close to the turbo there is a boost pressure sensor that sends a feedback signal to the ECU of the actual boost pressure. The ECU "knows" which boost to expect with a given boost control valve position (signal) and also knows the maximum allowable boost.

That's why we must "hide" the real (higher) boost from the ECU.

The BC-box now increases the signal to the boost control valve in order to increase the boost pressure above the stock maximum level. In order to keep the ECU happy we must limit the boost sensor signal to the ECU so that it cannot "see" a higher boost level than stock. The Mass airflow signal to the ECU is limited in the same manner. If the ECU would be allowed to "see" the higher airflow into the engine it would detect an abnormal situation and set a fault light and shut down the engine. Since the engine with the higher boost pressure will see a higher airflow, the BC-box must supply more fuel, adjust the ignition and completely take control of the boost valve.

The amount of fuel is determined by engine rpm and manifold pressure (or Mass airflow). You will tune the fuel for every rpm and every manifold pressure. It's like a grid where the number of cells equals (number of rpm positions)x(number of manifold pressure positions).

For example: we only measure 3 rpm positions: 0-2000, 2001-4000 and 4001-6000. At the same time we only measure 3 manifold pressure positions. This means we must tune 9 different cells in the grid. But the BC actually measures 256x256=65536 cells. Luckily we don't have to tune all of these 65536 cells, the BC will automatically do the calculation for us. Instead we will tune the rpm and airflow separately and the BC-box will calculate all other combinations.

TUNING OF FUEL ENRICHMENT

Manifold pressure	Fuel Enrichment depending on load (load table)	Calculated fuel values depending on boost pressure and rpm.		
2-3 bar	*10 ms*	*Fuel value 7 =10ms*1.0=10ms*	*Fuel value 8 =10ms*1.0=10ms*	*Fuel value 9 =10ms*1.1=11ms*
1-2 bar	*2 ms*	*Fuel value 4 =2ms*1.0=2ms*	*Fuel value 5 =2ms*1.0=2ms*	*Fuel value 6 =2ms*1.1=2.2ms*
0-1 bar	*0 ms*	*Fuel value 1 =0ms*1.0=0ms*	*Fuel value 2 =0ms*1.0=0ms*	*Fuel value 3 =0ms*1.1=0ms*
	More fuel enrichment depending on rpm	**100 %**	**100 %**	**110%**
	rpm	**0-2000 rpm**	**2001-4000 rpm**	**4001-6000 rpm**

FUEL ENRICHMENT

The fuel enrichment is specified as how many ms (1/1000 of a second) the injector pulse is to be extended. A typical injector pulse is 1-20 ms long from idle to full power. This means that 2ms fuel enrichment equals about 10% fuel enrichment at full power.

The first step in fuel tuning is based on manifold pressure. Normally the engine runs well without fuel enrichment up to the manifold pressure the stock engine had. Above this pressure the BC-box must add fuel enrichment.

The next step is to further tune the fuel enrichment depending on rpm. This is tuned as a % value to be multiplied with the prior tuned fuel enrichment. The value 110% will result in 1.10*fuel enrichment (manifold pressure). See page Fuel.

IGNITION RETARD

The ignition is also tuned in the same manner as the fuel enrichment. The normal method is to retard the ignition at certain rpms when the manifold pressure is higher than stock. This is done to reduce the risk of detonation. The first step is to tune the ignition retard in degrees as a function of manifold pressure.

The next step is to further adjust the ignition retard as a % value depending on rpm. The two tuning values are then multiplied for a final ignition retard value. The value 110% will result in 1.10*ignition retard(manifold pressure). See page Ignition

BOOST CONTROL

Tuning of the boost pressure is also done in BCLab, as a function of rpm and a selectable analog input. Usually it's enough to only tune the boost as a function of rpm. In some cases you might want to also tune the boost as a function of throttle position. In this case the boost is reduced when driving at part throttle thus increasing "driveability" without sacrificing top power. The signal to the boostvalve is of the PWM type which can have a value of 0-100%. Every % value will result in a specific boost pressure depending on the enginetype, rpm, turbosize etc. To achieve a more stable boost pressure the pressure sensor sends a feedback signal to the BC-box which can regulate the desired boost.

The first step in tuning boost is to set all tuning as a function of manifold pressure to 100%. Then you will tune the boost as a function of rpm, this tuning is also done as a % value. The two % values are then multiplied to form a final value sent to the boost valve.
50% x 50% = 25%
50% x 150% = 75%
200% x 50% = 100%
150% x 100% = 100% (The result can never exceed 100%)

See page PWM/Boost

SIGNAL LIMITING

In order to make the ECU accept the increased boost pressure, the BC-box will limit the pressure sensor signal so that the ECU will never "see" more than stock boost. The Mass airflow is limited in the same manner.

See page Analog out

PAGE - GENERAL
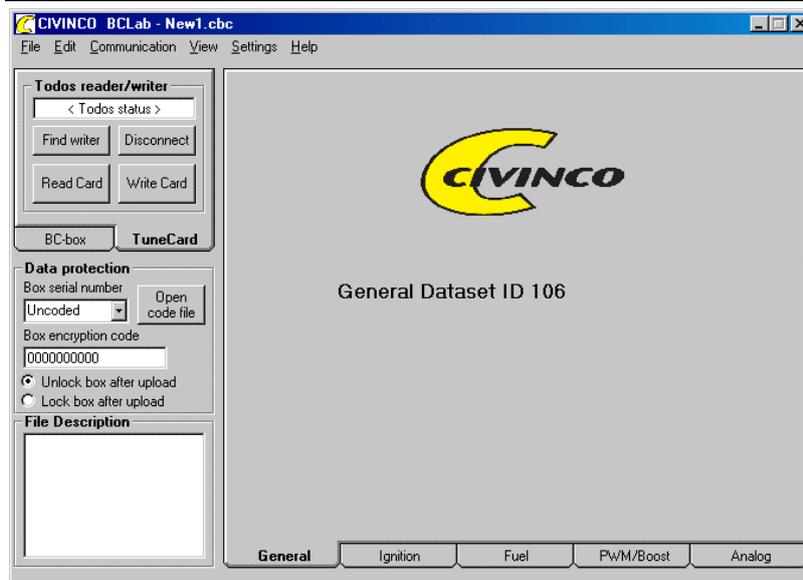
DATA PROTECTION:

The BC-box can be delivered locked or unlocked. The BC500/1000 are delivered unlocked while the BC250/750 are delivered locked. In order to use the BCLab software with your BC-box it must be unlocked or that you have access to the correct code. All boxes with their associated TuneCards have a unique serialno and a unique code.With access to the correct code you can unlock your box and adjust the tuning. The code is also required when reading a locked TuneCard into the BCLab software.

A locked box means that you can only use a TuneCard which is encrypted for this specific BC-box or that the box is unlocked via the serial port with the correct code.

An unlocked box will read all non-encrypted TuneCards with the correct Dataset-ID and also all TuneCards that are encrypted for that specific box.

Lock/Unlock the Bc-box or TuneCard
Before unlocking the BC-box you must enter the correct box serialno and the correct 10-digit code. If you have received your code in a codefile you can use this by klicking "Open code file".
* If you chose "Unlock after upload" the box will be left unlocked after updating the tuning in the box or on the TuneCard.
* If you chose "Lock after upload" then the box/TuneCard will be left locked.

Why lock or unlock the BC-box?
If you wish to share your tuning with friends you must work with unlocked box and TuneCards.
If you wish to keep your tuning to yourself, then you must lock the box. Thus you will never risk anyone else to see or use your tuning. You can also be safe that nobody can insert a TuneCard in your box and alter the tuning or start the car (Antitheft).

Summary
* Non-encrypted TuneCards can only write to unlocked boxes.
* Non-encrypted Tunecards can lock all unlocked boxes.
* Encrypted TuneCards with the correct 10-digit code can write to both locked/unlocked boxes.
* Encrypted TuneCards with incorrect code cannot write to the box.
* Encrypted TuneCards can only lock/unlock a box with the correct code.

CHIPDRIVE STATUS / USB STATUS / BC-BOX AS TUNECARD READER STATUS

There are three ways to communicate with your box or TuneCards. In the upper left corner you will see the chosen communication mode. You may switch between these in the menu Edit-Toggle Interface or by pressing Ctrl+T.

- RS-232 serial communication between PC and BC-box

- Chipdrive connected to the PC that read/writes TuneCards

- Use of the BC-box as a TuneCard reader when BC-box is connected via RS232

Direct communication with the box

Handles the USB- communication with the BC500/1000.

Write -   **Saves the BCLab current tuning to the BC-box**
Verify -   **Verifies that the BC-box tuning is the same as the BCLab tuning**
Read -   **Reads the BC-box tuning and displays them in BCLab**
Info -   **Reads some general information from the BC-box**

Chipdrive reader

Handles TuneCard readers if it's connected to the PC. Currently supported readers are Chipdrive or Todos.

Find Reader - **The program tests the connection with the Chipdrive reader**
Write Card -   **Saves the BCLab current tuning to the TuneCard**
Read Card -   **Reads the TuneCard tuning and displays them in BCLab**

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BC-box as TuneCard writer

Used when you want your PC-connected BC-box to read a TuneCard. This makes it possible to write TuneCards without the Chipdrive.

Check - **The program tests that the BC-box works as a TuneCard reader**
Write - **Saves the BCLab current tuning to the TuneCard inserted in the BC-box**

NB! When you put a TuneCard in the box it reads the current tuning to the TuneCard which might change the engine settings.

FILE DESCRIPTION

This area in the lower left corner can be used to write text to describe the new settings. The text is saved at the same time as you save the settings to the hard drive. They are not saved to the TuneCard or when you write to the box.

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USE OF ALL PAGES WITH TABLES

Table Control

All BCLab pages that have tuning tables also have a "Table Control" box or a "3D Table Control". This is used to easily adjust the tuning values in the table. You can also use this to edit several tuning values at the same time by marking the desired values. (to mark all table values klick on "Deg" or "%" in the upper right corner).

- "+" increase the selected values 1 step
- "-" decrease the selected values 1 step
- increase slope of the selected values to the right
- decrease slope of the selected values to the right
- decrease slope of the selected values to the left
- increase slope of the selected values to the left
- decrease slope of the selected values in the bottom
- increase slope of the selected values in the bottom
- decrease slope of the selected values in the top
- increase slope of the selected values in the top
- "Scale%" Scales the marked values with the selected % value
- "Set to" Sets the marked values to the selected value.
- "min", "max" Informs the user of the possible values in this table

You can also mark a cell and enter the value directly into the box without using the commands above.

Smoothen data
There are two functions that evens out the values between cells, e.g. to get rid of the "highs and lows". You can smoothen the cells both vertically and horizontally.

- **Smoothen Rows**
  If you have values on the first and last row and want to fill the rows evenly in between then you can mark the area and click "Smoothen rows"

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	0	500	1000	1500
0,13	2,02	2,02	2,02	2,02
0,21	2,02	2,02	2,02	2,02
0,29	2,02	2,02	2,02	2,02
0,36	2,02	2,02	2,02	2,02
0,44	2,02	2,02	2,02	2,02
0,52	2,02	2,02	2,02	2,02
0,60	10,0	10,0	10,0	10,0

becomes

	0	500	1000	1500
0,13	2,02	2,02	2,02	2,02
0,21	3,1	3,1	3,1	3,1
0,29	4,5	4,5	4,5	4,5
0,36	5,8	5,8	5,8	5,8
0,44	7,2	7,2	7,2	7,2
0,52	8,6	8,6	8,6	8,6
0,60	10,0	10,0	10,0	10,0

- **Smoothen Columns**
  If you have values on the first and last column and want to fill the cells in between you can mark the area and click "Smoothen columns"

	0	500	1000	1500
0,13	0,0	0,0	0,0	10,0
0,21	0,0	0,0	0,0	10,0
0,29	0,0	0,0	0,0	10,0
0,36	0,0	0,0	0,0	10,0
0,44	0,0	0,0	0,0	10,0
0,52	0,0	0,0	0,0	10,0
0,60	0,0	0,0	0,0	10,0

becomes

	0	500	1000	1500
0,13	0,0	3,3	6,7	10,0
0,21	0,0	3,3	6,7	10,0
0,29	0,0	3,3	6,7	10,0
0,36	0,0	3,3	6,7	10,0
0,44	0,0	3,3	6,7	10,0
0,52	0,0	3,3	6,7	10,0
0,60	0,0	3,3	6,7	10,0

PAGE – IGNITION

For a better understanding of the tuning principles see chapter Ignition retard

IGNITION
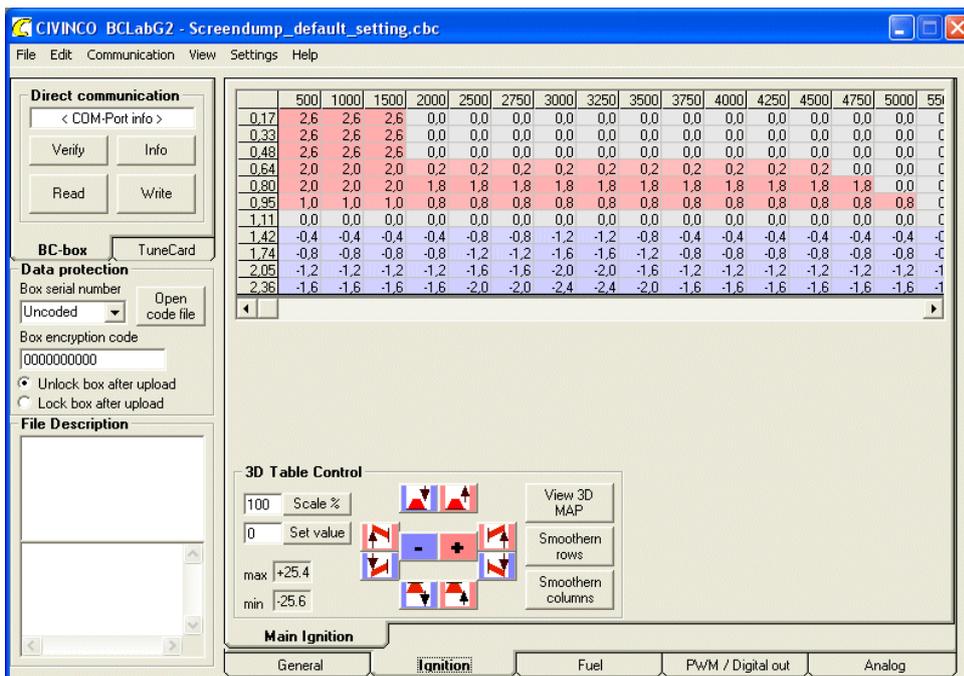
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RPM and load resolution (number of cells)

You can adjust how many cells and what values the different axles should be. These settings are done in – Settings – Ignition maps

The value shown in the left column depends on what kind of sensor you choose in "Used Analog Sensor".

Adjust Ignition

Negative values equals retarded ignition (delayed ignition).
Positive values equals advanced ignition. The BC-box can only advance ignition under certain circumstances.

Civinco can to date advance the ignition in the following cases:
- Dodge Viper, all three generations. This is due to the crank and cam signals are of the digital type (non inductive) and have a special pattern. Inductive sensors will need a special amplifier.

- All engines with distributor and an external ignition amplifier where the ignition pulses are symmetrical with the rpm (2 times/revolution in a 4 cylinder engine)

- Inductive sensors will need a special amplifier.

Civinco can to date retard the ignition in the following cases:
- When the ECU ignition signal is low voltage (0-12V or 0-5V and does not drive the ignition coil directly). The BC-box can retard two ignition channels simultaneously (4 channels with the BC1000).

- When the crank and camsignals are of the digital type, max 0-15V (non inductive), with a dutycycle between 40-60% and max 2.5kHz at max rpm (equals 24 teeth at 6000rpm). Shortest pulselength is 100us. Inductive sensors will need a special amplifier.

The ignition functions are continuously improved, call for the latest info.

View 3D MAP

Opens a window to view a 3D graph over actual ignition timing.

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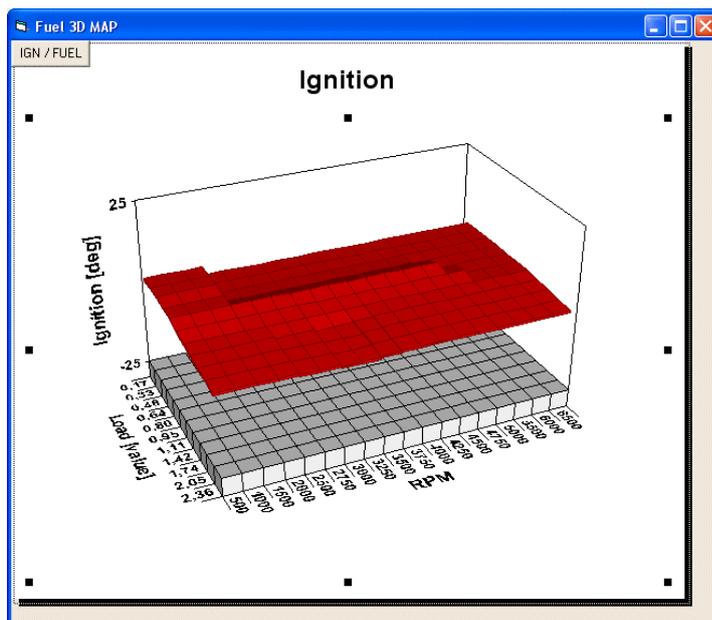
PAGE - FUEL

For a better understanding of the tuning principles see chapter <u>Fuel enrichment</u>

FUEL
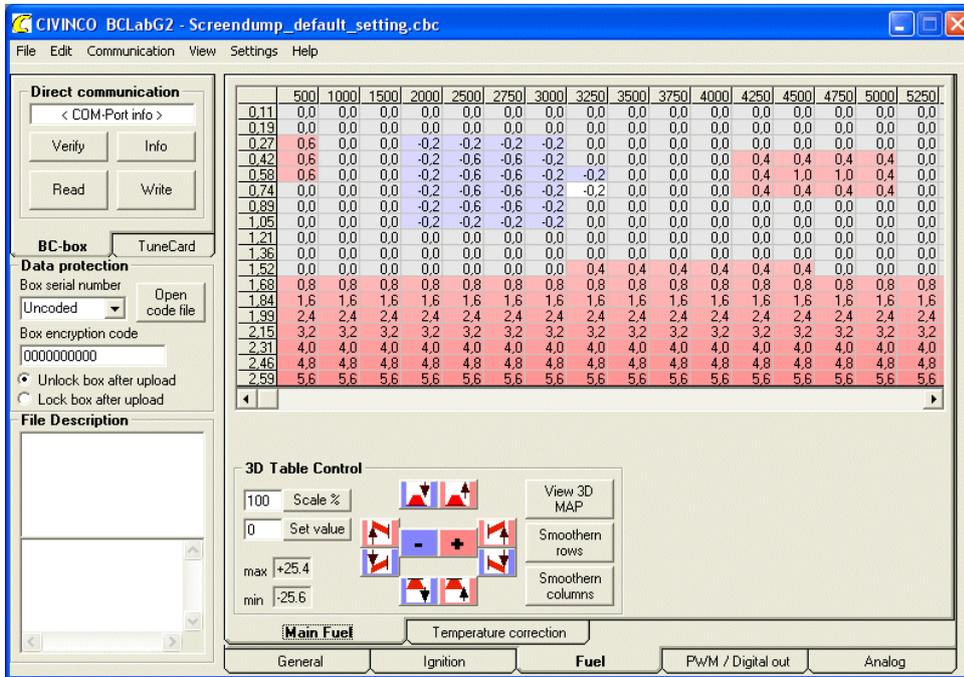
You set for how long the fuel pulse is extended or shortened (in milliseconds) depending on the input signal and the rpm.

RPM and load resolution (number of cells)

You can adjust how many cells and what values the different axles should be. These settings are done in – Settings – Fuel maps

View 3D MAP

Opens a window to view a 3D graph over actual fuel settings.
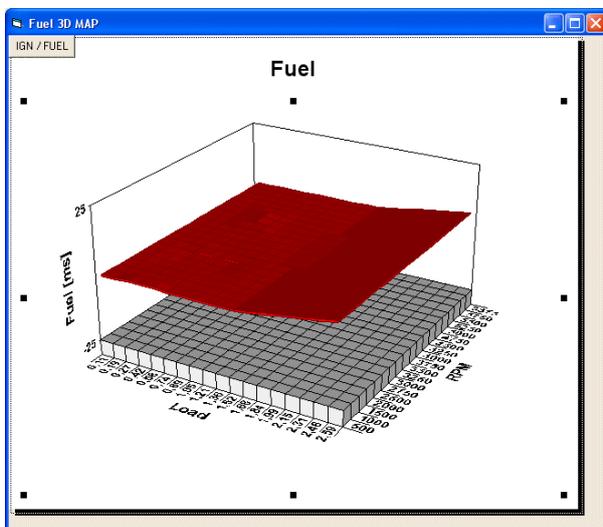
IAT COMPENSATION
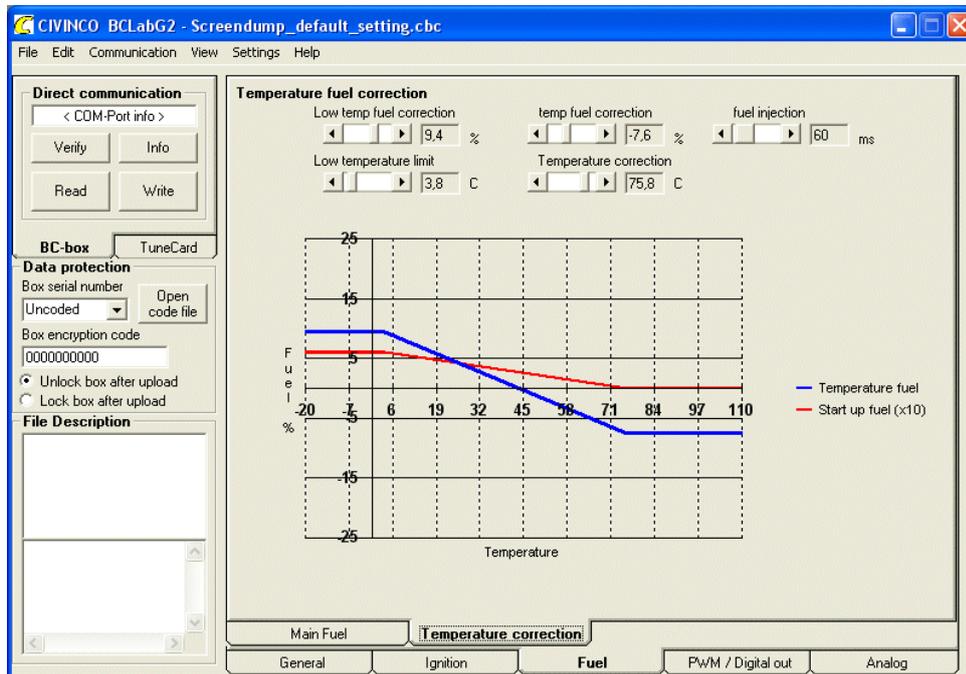
Fuel temperature correction

In some cases there's a need for more or less fuel depending on the intake air temperature. With this function you set how much longer /shorter the fuel pulse should be when the engine temperature is low (low temperature limit) or high (High temperature limit)
The BC-system needs to be connected to an IAT sensor.

Fuel injection, start up fuel

In some cases you have a need to give lots of extra fuel during start-up when it's cold outside, mostly if your engine runs on ethanol, E85.
With this function you can set how long the fuel pulse should be while cranking and the engine is cold (low temperature limit). This fuel pulse gets shorter and shorter depending on how warm the engine is at start-up. If the engine has reached "High temperature limit" there will be no start-up fuel.

The BC-system needs to be connected to water coolant temperature.

PAGE – PWM / DIGITAL OUT

For better understanding of the principles of tuning refer to chapter Boost control.

PWM SIGNALS

PWM is short for Pulse Width Modulation. This method can be considered equivalent to an analog output voltage and is used for controlling devices (valves, motors etc.) that require somewhat higher power. In real life the signal is actually a switched on/off type 12V signal. The switching occurs very quickly and is thus "smoothened out". If the signal is on and off the same amount of time then the result will be equivalent of a 6V output. The PWM output is specified in % where the equal on - equal off means 50%.

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The BC-box output will ground the output when active. This means that the controlled device must be 12V supplied by other means. The value 100% means that the device is grounded all the time (active all the time) and 0% means no grounding (non active). The BC-box PWM output has a frequency of 38.6 Hz.
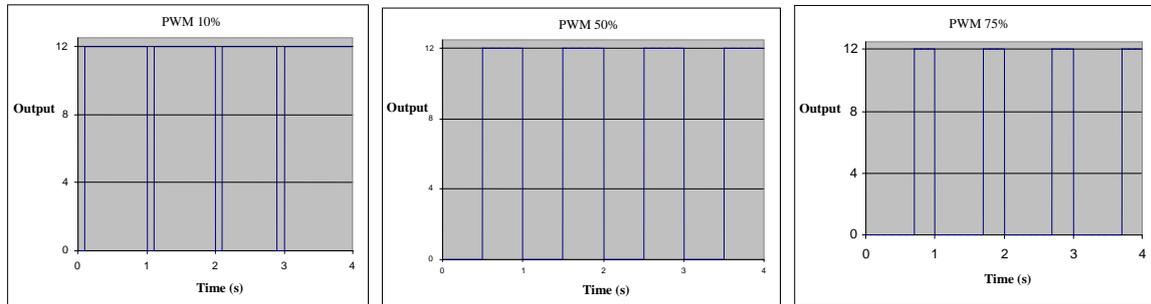
The BC-box can use the PWM output to control:
- Boost valve
- VTEC (variable camshaft)
- Nitrous
- Water injection
- Gearshift indication

Normally the PWM uses pin 11 for boost control

PWM1 LOAD

Base PWM Load on:

Determines which analog input to base the calculation of PWM output. The table values (0-100%) determines the PWM output duty cycle value in percentage as a function of the selected analog input. The PWM output is also controlled by the "PWM RPM" table. The "PWM Load" value is multiplied with the "PWM RPM" value to form the final PWM output value.
Examples:
50% x 50% = 25%
50% x 150% = 75%
Boost pressure is normally controlled by throttle position so that the pressure is low when you push gently on the accelerator. This makes it easier to create a fuel-efficient setting.

Run PWM as on/off switch

By selecting this option the PWM output is forced active (0V, grounded) as soon as the calculated PWM value is above 50%. The function of the output then resembles an on/off switch. It can be used to turn on/off lamps, relays etc.
Example:
Set the entire PWM Load table to 100% (no load influence)
Set the PWM RPM table at 0% up to 6500 rpm and at 100% above this rpm.
This results in PWM_Out is off up to 6500 rpm, and on above 6500rpm. If you connect a lamp between 12V and PWM_Out you now have an rpm-indicator lamp.

PWM1 RPM
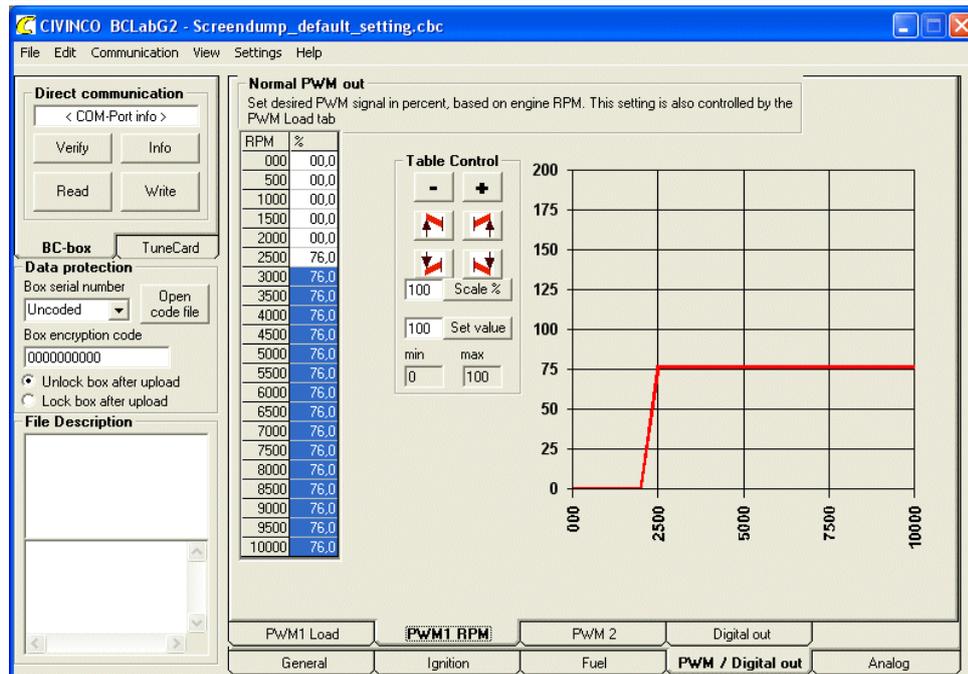
The value 0-100% determines the PWM signals duty cycle in percentage depending on rpm.
If you choose to control a boost control valve then every PWM-value corresponds to a specific boost. The boost for the different values differs and needs testing to be determined.

The PWM signal is also controlled from "PWM Load". See page Run PWM as on/off switch.

PWM RPM with Boost control
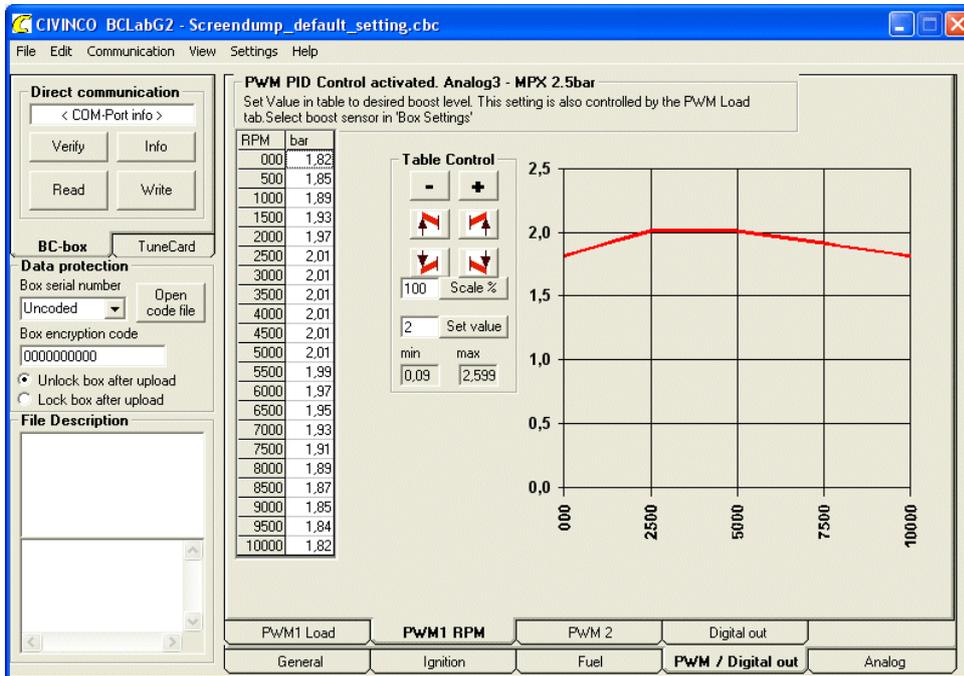
If you chose PID-regulation of boost, you will specify desired boost at every rpm.

3D MAP FOR PWM
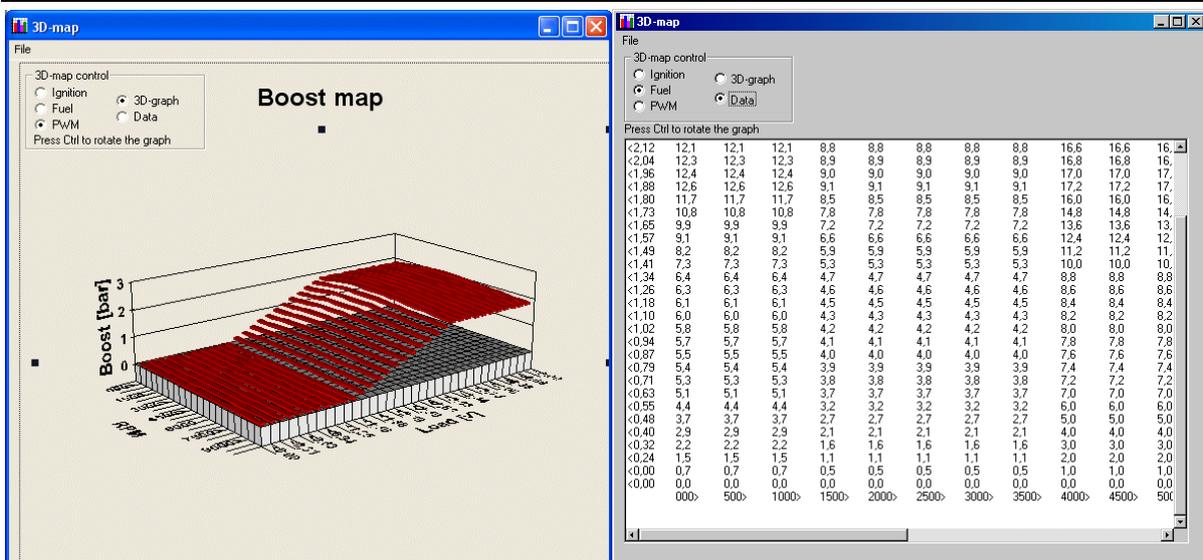
While tuning PWM1 in BCLab you want to look at both rpm and load. You can also view the complete 3D Map for boost pressure. The data is also shown as values in a text window.

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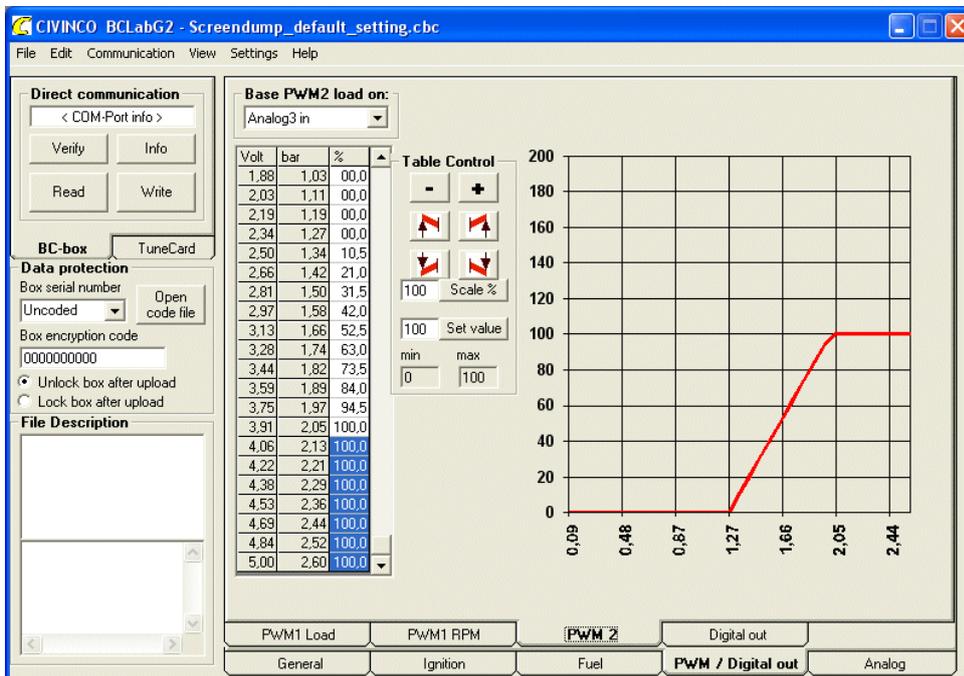
PWM2

The BC1000G3 also has a PWM2 in the slave connector pin no 5 which can be separately tuned depending on load or rpm.

DIGITAL OUTPUT 1&2
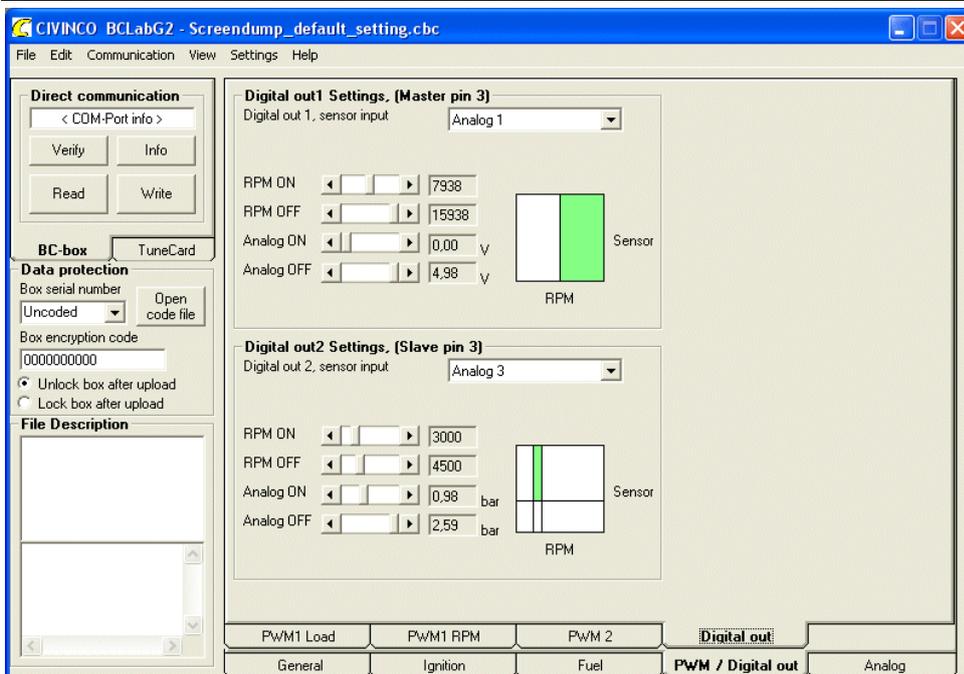
There is one digital output in the master and one in the slave which can be turned on and off depending rpm and an optional analog input. The output is grounded when it's turned on. This means that you connect +12V separately from the battery or ignition key to whatever you would like to control (relay, light etc).

RPM On   At what rpm the output should be turned on.
RPM Off   At what rpm the output should be turned off again.
Analog On   At what analog signal the output should be turned on.
Analog Off   At what analog signal the output should be turned of again.
The green area in the box next to each control shows when the output is turned on.

PAGE - ANALOG OUT

For a better understanding of the tuning principles see chapter Signal limiting.

ANALOG1 OUT
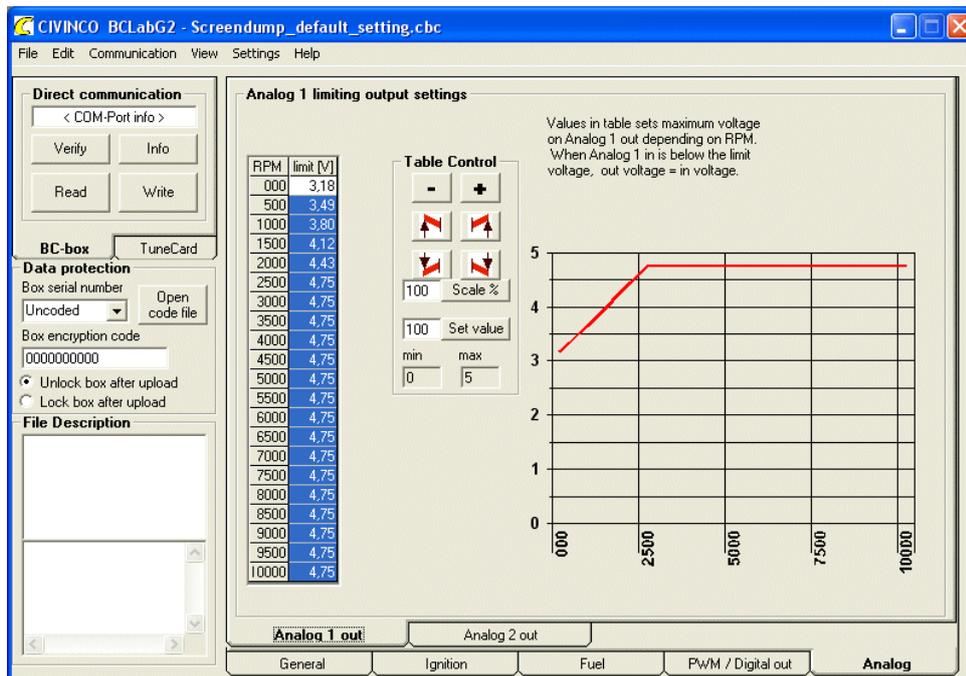
The table values (0-5V) determine the maximum analog1 output signal voltage depending on rpm. Below this maximum value the output is the same as the input voltage.

ANALOG2 OUT
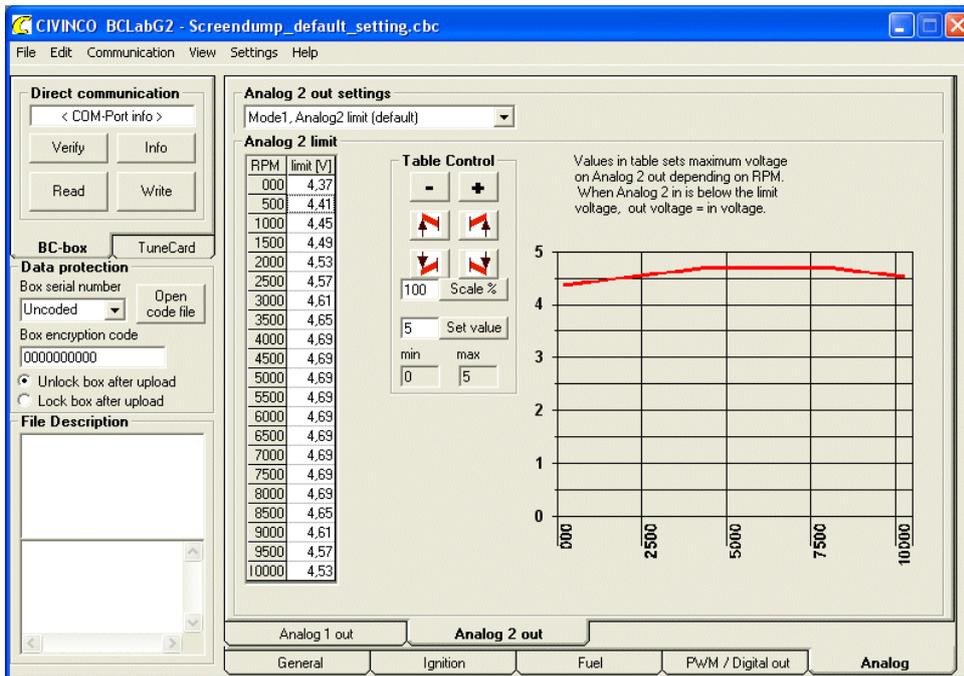
Analog 2 out settings

The analog2 output can be run in 4 modes.

Mode1, Analog 2 limit

Sensor limiting in the same manner as Analog 1.

Mode2, Function of analog2 input

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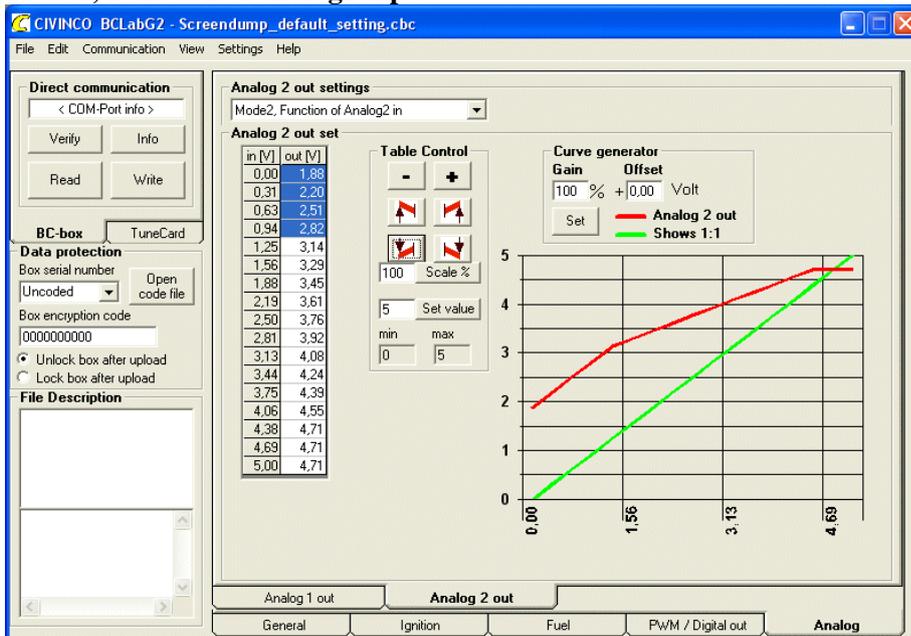
Analog2 output is calculated as a function of Analog2 input. The relevant output values are specified in this table.

The values in the table can quickly be entered using the Gain and Offset function. The values in the table will be automatically calculated as:

Table value=Offset+[Input]*Gain

Mode3, Analog2 limit trim

Same function as Mode1, but with the addition of "limit trim". This function varies the limited signal to the ECU in a special fashion. This is necessary with the VAG 1.8T engines as the ECU will detect a fault condition if it tries to regulate the boost but nothing happens (due to sensor limiting). In this mode the BC-box will detect the ECU trying to regulate boost and adjust the limited signal enough to make the ECU think it is actually regulating boost. This only works when connecting the boost pressure feedback signal to the IGB_IN pin.

Mode4, Boost activated AN2 output
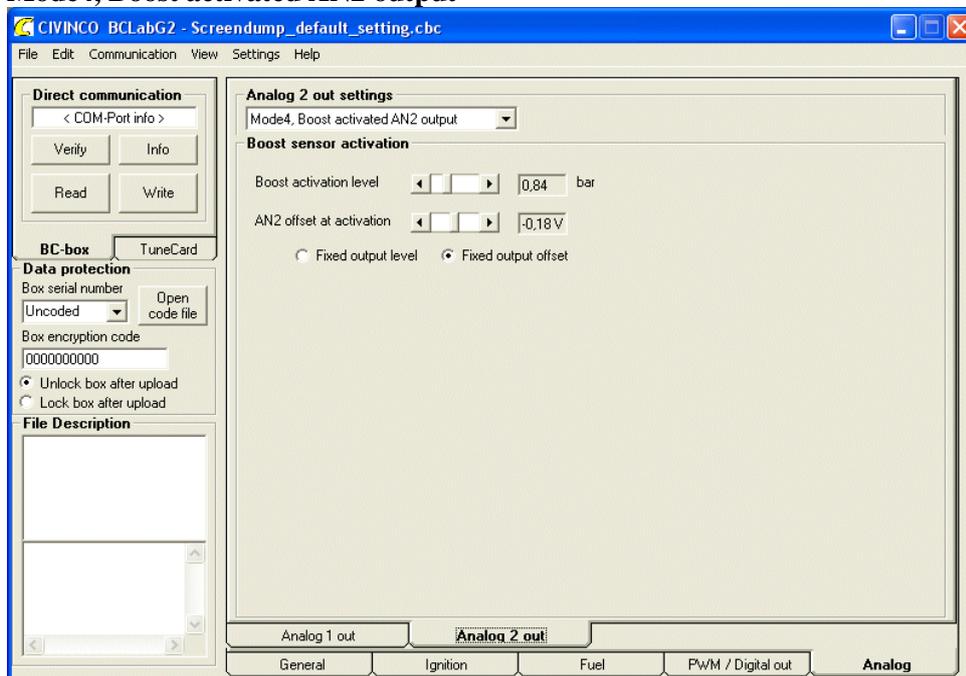
This can control Analog2 out when you exceed a certain boost pressure (or any other analog input signal). There are two options:

- Analog2 out is set to a certain value.
    This is often used to tweak the AFR signal by connecting a resistance between Analog2 out and the AFR signal.
- Analog2 should be the value 1, add or subtract a certain voltage to the Analog2 input. This function is used when you want to offset the AFR signal with a specific voltage at a specific boost pressure.

Mass airflow simulation

When using mass airflow simulation the Analog1 table is used to specify the Mass airflow simulation. For every individual engine you must specify/tune which output signal to be generated based on rpm and manifold pressure. The BC-box automatically calculates the product of rpm*(A/D-conversion of MAP sensor)*32. Depending on this product the BC-box reads the table and finds the correct voltage to be used as Mass airflow simulation signal.
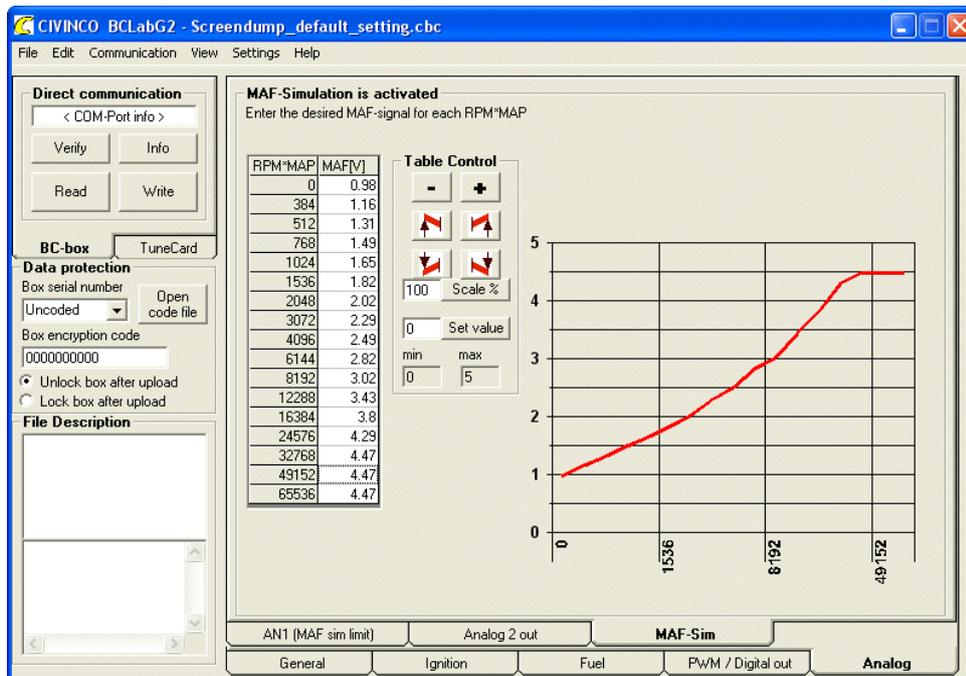
Example:
Rpm: 3500 (3.5krpm)
MAP: 2.44 volt at MAP sensor
Product: 3.5*2.45*1632=13994
Mass airflow sim signal: 3.43V (Closest table value is 12288)

Mass airflow simulation limit

In some cases you have to limit the simulated signal on a specific rpm and hide it from the ECU, even though the calculated mass airflow is higher. This limit is set in the table below.
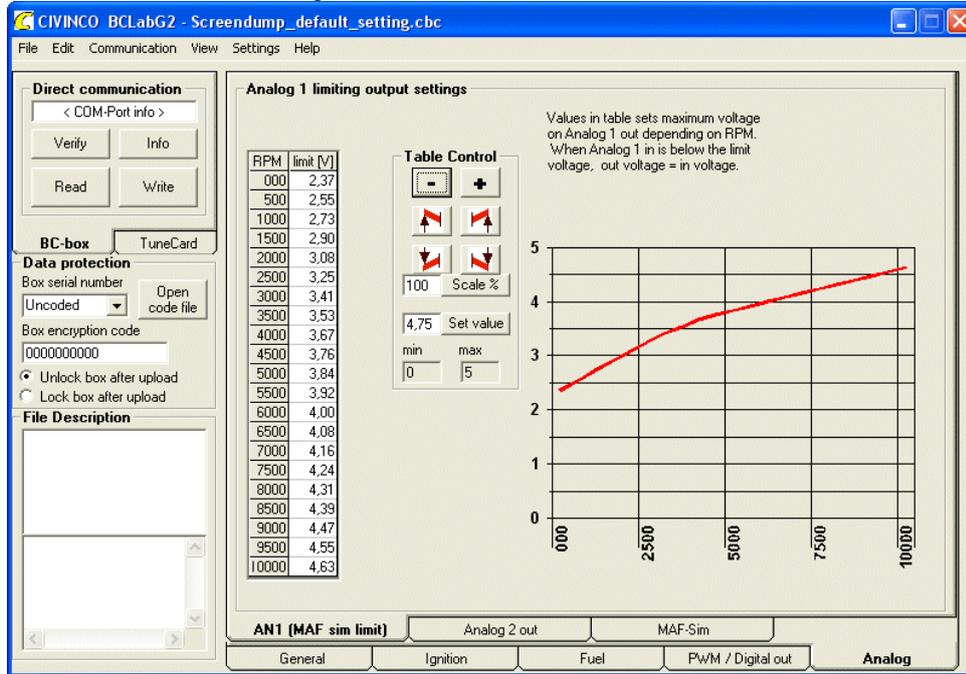
MAIN MENU – FILE

Open
Opens a TuneCard tuning file which is previously saved on disk. The files are denoted .cbc files.

Save
Saves the current BCLab settings to the presently open TuneCard file

Save As
Saves the current BCLab settings to a TuneCard file with a new name

Exit
Exits BCLab

MAIN MENU – EDIT

Undo
Undoes the latest pressed button

Redo
Redoes the latest "Undo"

MAIN MENU – COMMUNICATION
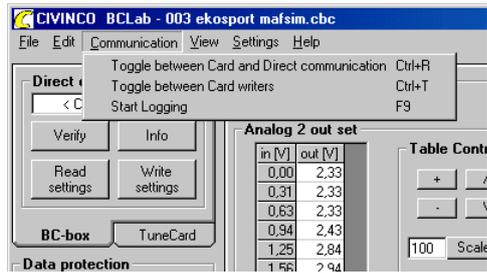
For more details, see page General/Chipdrive status

Toggle between Card and Direct communication (Ctrl+R)
Toggles between communication with the BC-box and the TuneCard . Same as klicking on page "BC-box" or "TuneCard".

Toggle between Card writers (Ctrl+T)
Toggles between different card readers. Supported readers are Chipdrive, Todos and the use of the BC-box as a card reader.

Start Logging
Starts logging without opening the log window.

MAIN MENU – VIEW

LOG WINDOW

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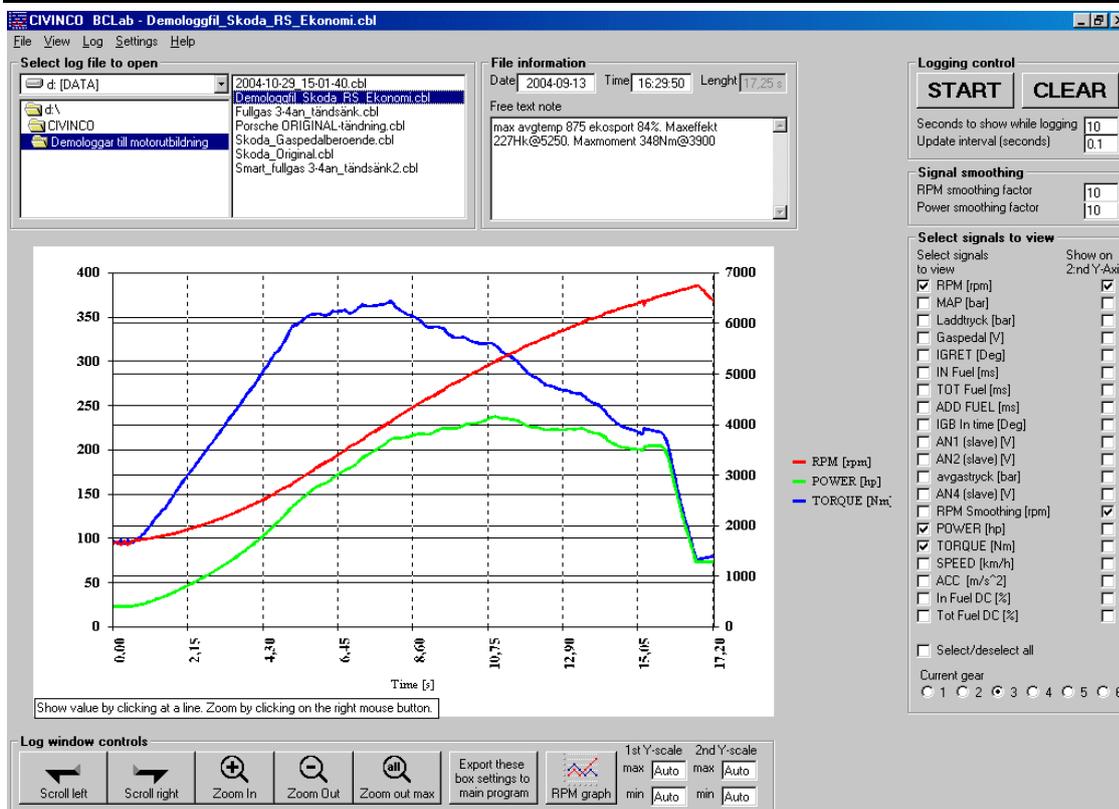
The BCLab software can log all signals connected to the BC-box in realtime with 20Hz sampling frequency. BCLab can also use these signals to calculate secondary values such as:

- Engine power
- Engine torque
- Speed
- Acceleration
- Duty Cycle of stock fuel pulse and BC-box fuel pulse (used to detect 100% fuel situation)

BCLab shows all data in the logging graph. You may also save the data to disk for later viewing. Some of the possible settings: Name all signals, many typical sensors to choose from, metric or US units, gearing at all gears, etc.

Select log file to open

Double click on a saved log file to open it. Same function in File/Open. If single clicking on the file you will see a preview on the comments on this log file, date and size. This will not open the file.

File information

At all logging the time and date will automatically be added to the file. You may also write your own comments about this logrun in the "Free text note".

Logging

Starts, stops and erases the logging. Make sure your BC-box is connected via RS232.
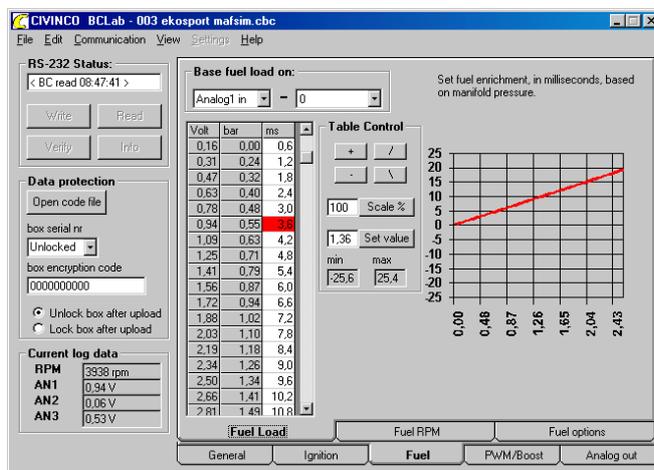
The log data is also shown in a realtime graph. A red marker shows the currently active tuning cell in the load/rpm tables. This marker will enable you to quickly see where in the table the BC-box is working. This will speed up the tuning process.

Seconds to show while logging
Specifies how many seconds of logging data are to be shown on the screen. If you have a slow computer you can decrease this value for proper function. Normally we set this to 5-10 seconds.

Update interval
This specifies how often the live graph is updated while logging. If you have a slow computer you may need to increase this value. Normally we set this value to 0.1-1 second.

Chart scale options

Sets the min and max displayed values on the Y-axis in the graph. If selected to Auto the program will adjust this as necessary.

Select signals to view

You will select the desired signals to view in the graph.

You can also choose if the signal is to be displayed on the 1st or 2nd Y-axis. This is practical if displaying two signals which differ a lot in magnitude, which might otherwise make them difficult to see in the graph. Normally we set the rpm to be displayed on the 2nd Y-axis while all other signals are displayed on the 1st Y-axis. This is because the rpm value is often much larger than the rest of the signals.

Chart controls

Scroll left

Moves the graph to display earlier values (more to the left)

Scroll right

Moves the graph to display later values (more to the right)

Zoom in

Zooms in on the graph. Doubles the magnification

Zoom out

Zooms out on the graph. Haves the magnification

Zoom all

Zooms out on the graph so the whole graph is displayed

Redraw

Redraws the graph

Specific values in the graph

To see the value of a specific point in the graph you can click on it. To move the cursor right or left you can use "Page up" or "Page down".

Export these settings to box

If you have opened an old log file which has the tuning data saved in the log file, you can transfer these tuning data to BCLab by clicking this button. This means that you can see the tuning used by the BC-box when the logging was performed. This is useful if you find an old log file where the engine ran very well and want to use these tuning data again.

Refer to chapter BC Log settings for more info on logging setup.

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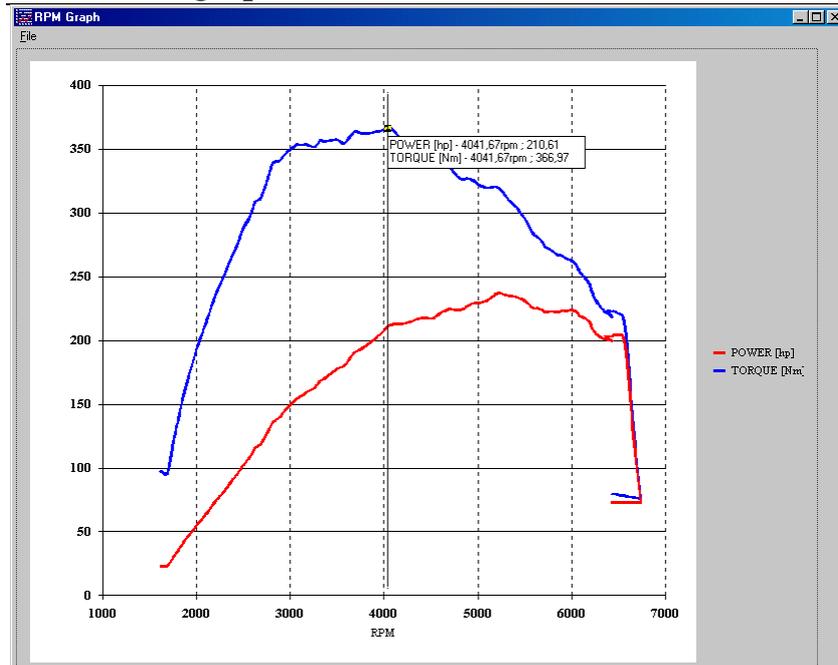
Show RPM graph

RPM graph shows the same values as the normal log window but the rpm is displayed on the x-axis. This function is good when you want to analyze how different logged values vary depending on rpm. Normally you use this for engine power, engine torque, Oxygen sensor etc.

Main menu File

Open
Opens a log file containing saved setups. These files are denoted .cbl files.

Save
Saves the current log file

Save As
Saves the current log file with a new name

Export log data
Saves the current log data shown in the log window, either as a picture or as a text file which can be opened in Excel.
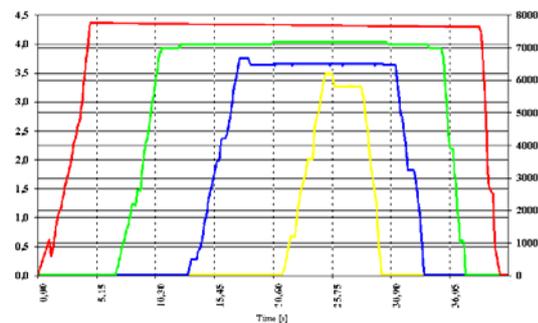
Log window exported as a picture   *Log data exported to Excel*

MAIN MENU – SETTINGS

BCLAB SETTINGS
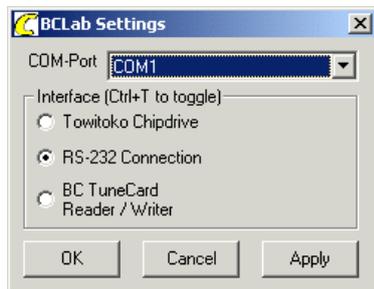
Com-port

Use this to select the PC comport used to connect to the BC-box

Interface

Use this to select one of three ways to communicate with your BC-box and TuneCards.
Also refer to page General/Chipdrive status

BC-BOX SETTINGS

Standard
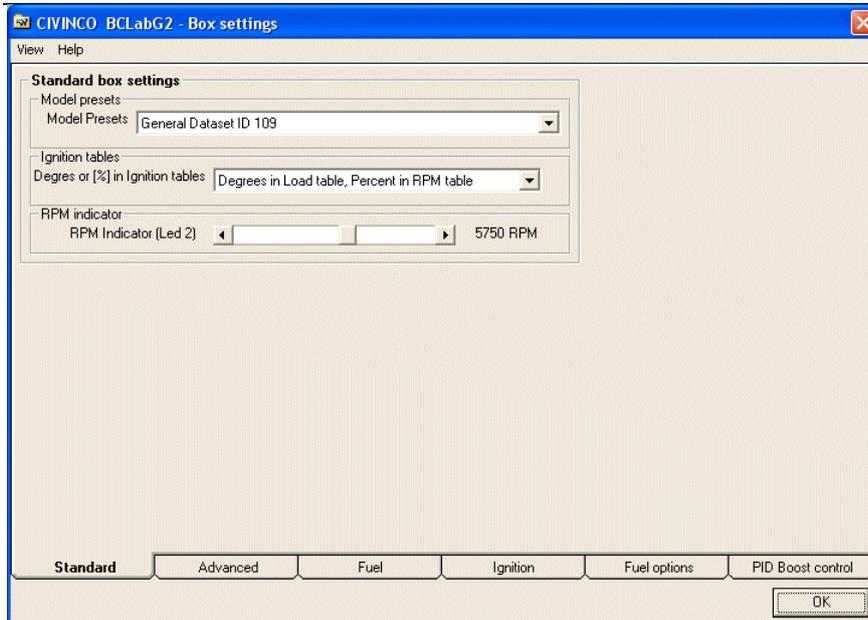
Model preset
Dataset is a basic setup of the BCLab software in order to determine which functions, controls, menus and tables are to be available. This is to simplify for the user and not show more controls than necessary.

Dataset ID
This is an identification number (103-106) which specifies which type of TuneCard is used. This is also co-ordinated with the BC-box firmware version. It's not possible to use different Dataset ID in the BC-box and on the TuneCard.

Swap degrees and percent in ignition table
This gives you the option of switching the load and rpm-table units (degrees and %). This the individual tuners taste that determines what is best to use. It only has relevance if you intend to tune the ignition.

Fuel RPM Table Precision
This gives you the option of increasing the number of fuel rpm cells to tune (every 250rpm). In this case it will not be possible to use the Analog2 output.

RPM ind (LED2)
Use this to select the rpm at which the red LED on the front panel will light up.

Advanced
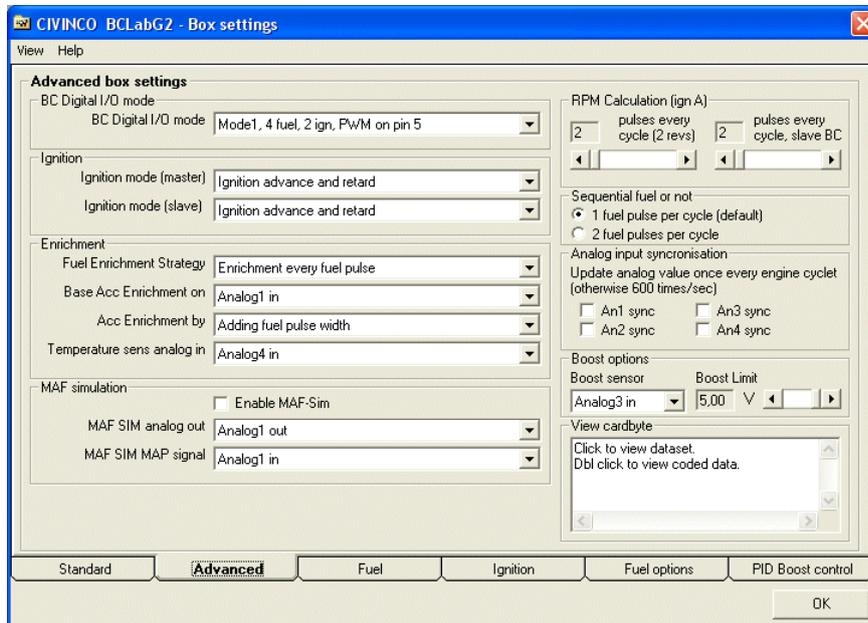
Enable By Pass mode
Used to let all input signals pass through the BC-box without being altered. This will be the same as using the mechanical bypass plug.
This only works in the following case:
- Boost control must be connected to PWM In/Out pins 11-12 and be run in Mode5
- The use of Dataset ID 106 or higher

What actually happens is that all tables are zeroed, the PID regulation is deactivated and the program runs in mode1. This means that all signals will pass through the BC-box without being altered.

BC digital i/o mode
This is where the main mode of operation is determined and which connector pins are used for what. At the pages Ignition load, Fuel load and PWM load you will specify which analog input to be used to measure load or to base the tuning on. If the engine has a MAP sensor, you will specify which pin this is connected to, other engines may want to base the tuning on the throttle position.

Digital in and outputs
The BC500 has 6 digital in/output-pairs (12 pins), where every input has its associated output. These are called: FuelA-FuelE(5 fuel channels), IgnitionA-IgnitionB (2 Ignition channels) and PWM (1 boost channel). One of the signal-pairs can be used for different functions and cannot be used simultaneously. This is FuelE, IgnitionB and PWM. The reason for organising the in/outputs in pairs is that when connecting a bypass-plug (instead of the BC-box) then all channels will be short-circuited and the signals are unaffected (the engine behaves stock). When the BC-box is connected, the box will modify the signals according to the Tuning parameters and send them to the paired output.

BC digital i/o modes
The BC-box can thus be run in different modes where the pins have different functions:
- Mode1
  - 4 Fuel in/out, FuelA-FuelD, pins 15-22
  - 2 Ignition in/out, IgnitionA-IgnitionB, pins 11-14
  - Boost control out, PWM_OUT, pin 5

- Mode2, no longer activated
- Mode3
    - 5 Fuel in/out, FuelA-FuelE, pins 15-22 & 11-12
    - 1 Ignition in/out, IgnitionA, pins 13-14
    - Boost control out, PWM_OUT, pin 5
- Mode4, no longer activated
- Mode5
    - 4 Fuel in/out, FuelA-FuelD, pins 15-22
    - 1 Ignition in/out, IgnitionA, pins 13-14
    - Boost control in/out, PWM_OUT/IN, pins 11-12

Digital out
The BC500 has one pure digital output, PWM_OUT which in mode1&3 is used to control the boost, but in mode5 can be used for other purposes.

Analog in and outputs
The BC has two analog in/output pairs where every input has its associated output. These are called: Analog1 and Analog2. The basic idea with this is to limit the analog sensor signal (rpm dependant)l to a value which represents the stock manifold pressure or Mass airflow. In the BCLab software, you will select which analog sensor signal to base the tuning on. This selection is done at pages: Ignition load, Fuel load and PWM load.

Analog input
The BC has one more analog input which is a pure input, thus the total is 3 analog inputs.

Ign RPM Table Precision
Used to set the precision in the ignition rpm table.
Low equals values from -200 to +198
High equals values from -100 to +99

Ignition Mode master
Setting used to specify if the ignition can only be retarded or both retarded and advanced
Refer to Page Ignition for more info on this subject.

Ignition Mode slave
Setting used to specify if the ignition can only be retarded or both retarded and advanced
The slave setting is only relevant with the BC1000. This BC-box has two PCB cards where one is the master and the other the slave.

Fuel enrichment strategy
Setting to specify how the acceleration fuel enrichment pulse are to be applied; Add acc pulse to all fuel pulses or only to one fuelpulse per engine cycle. If choosing add to all fuel pulses, sometimes this will result in too much fuel as the ECU sometimes generates more than one fuelpulse per engine cycle, typically during acceleration.

Base Acceleration Enrichment on
Selects the analog input to base the BC-box generated acceleration fuel enrichment on(in the case such is used).

Acceleration Enrichment performed by
Selects if the acc fuel pulse are to be generated by quickly increase the MAP sensor signal (and thus tricking the ECU to generate the acc pulses) or by letting the BC-box generate the acc pulses.

Enrichment
When MAF simulation is active you have to control acceleration fuel enrichment. This is done by setting which sensor the enrichment is based on. In this case it would be Analog3, which is the accelerator pedal.

Enable MAFSIM

This activates the Mass airflow simulation. When the engine has a stock Mass airflow sensor this can be removed and the signal to the ECU is generated by the BC-box with the help of an internal MAP sensor. This deactivates all other previous tuning for Analog1/2 output.

MAF SIM analog out

Selects which analog output is to generate the simulated Mass airflow signal. This signal must then be connected to the ECU.

MAF SIM MAP signal

Selects which analog input is used to measure the MAP signal. The internal MAP sensor is always connected to Analog3.

MAF SIM limit

Indicates if the simulated MAF-signal should be limited. If this would be the case the MAF-SIM limit table is used. This also makes the Analog2-table inactive.

RPM Calculation

The BC-box **always** uses IgnitionA to calculate the rpm. The signal can be from various sources though as long as we know how many pulses per rev is generated. Both IgnitionA and IgnitionB can be connected to cam and cranksignals or the ECU driver signals to the ignition module. It's important that the signals are of 0V to 5-20V type. Some signals are too weak and must use an amplifier to achieve this voltage level.
To get the correct rpm calculation you must specify how many pulses per engine cycle (not engine revs) are present at IgnitionA. If a slave is connected (BC1000) then the correct value must be entered in the right control as well.

Analog input settings

Specifies if any analog input channel is to be measured synchronised with the engine cycle. Sometimes it's an advantage to synchronise the MAP sensor as this can otherwise be somewhat unstable. This can be a disadvantage for amongst others the ignition adjustment.

Boost options

Here you can select which analog input channel measures the boost. Normally this is the same as the MAP sensor (if installed). "Boost limit" is a safety feature where you can set a voltage level (corresponding to a certain boost level) above which the BC-box tries to reduce the boost to the base level and at the same time releases all sensor limiting to allow the ECU to perform its own safety features.

View cardbyte

Can be used as an advanced debugger tool where you can view all tuning on the TuneCard.
We do recommend that you rather use the Setting viewer for this purpose.

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43 (54)
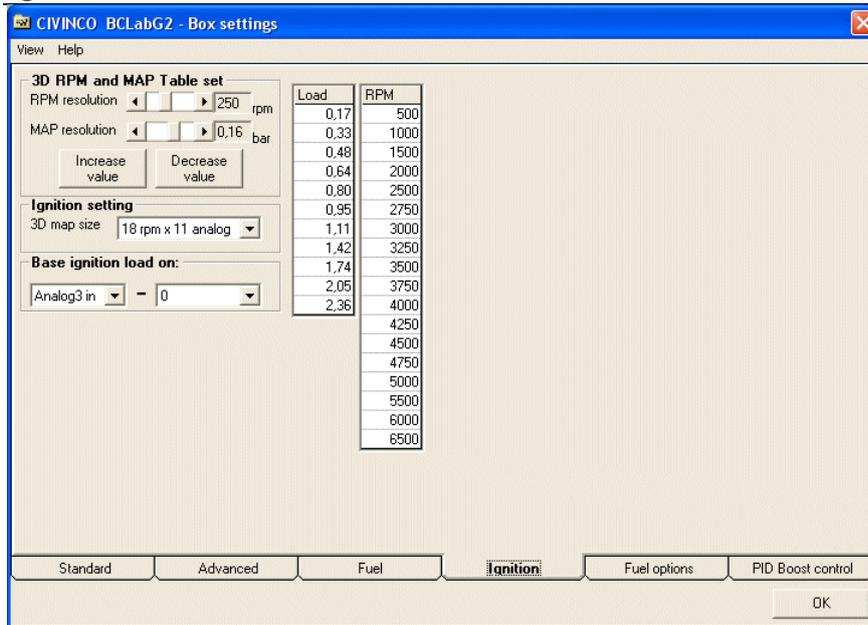
Ignition

3D ignition map size
Choose map size (number of cells in the ignition map)
- 18 rpm x 11 load
- 15 rpm x 13 load
- 11 rpm x 18 load

Base ignition load on:
Determines which analog input should be used to calculate ignition. "AnalogX in minus AnalogY in" is used to base the calculation on the difference between two signals. A common example is to use Analog1_in – Analog1_out, if this is the MAP signal, and limit the output to the ECU. If the signals aren't limited the output signal is the same as the input signal, the difference is then 0V. If you at a specific moment limit the signal from 4.5V to 3.5V the difference is 1V, you can then retard the ignition even more because the ECU can't see the real signal.

Table control
You are free to select RPM and load points for the fuel map. Select which cells to modify and press desired button.
Increase
Increases selected cell. All the cells below automatically changes as well.
Decrease
Decreases selected cell. All the cells below automatically changes as well.
Insert row
Inserts a new row to make more tuning points in a specific area. This removes the last cell.

Convert map to new axis
If you've already done a tuning map it's still possible to convert the map to a different number of cells or area of measurement. See page Fuel settings for more information.

Fuel
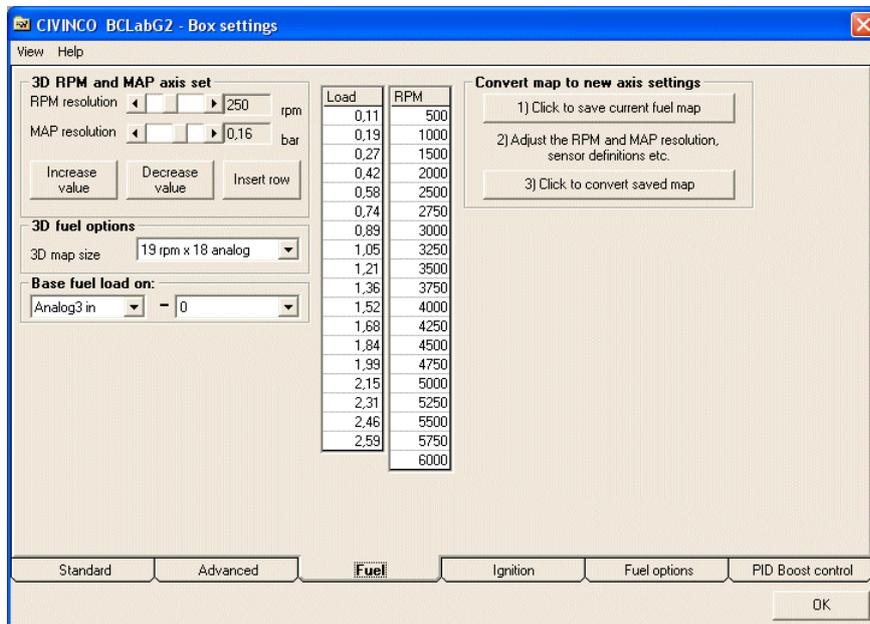
Base fuel load on:
Determines which analog input should be used to calculate fuel enrichment. "AnalogX in minus AnalogY in" is used to base the calculation on the difference between two signals. A common example is to use Analog1_in – Analog1_out, if this is the MAP signal, and limit the output to the ECU. If the signals aren't limited the output signal is the same as the input signal, the difference is then 0V. If you at a specific moment limit the signal from 4.5V to 3.5V the difference is 1V, you can then give fuel enrichment proportional to the difference. The ECU doesn't see the pressure difference and because of this can't compensate the fuel.

3D fuel options
3D map size
This is where you set how large the main fuel map should be.

Table control
You are free to select RPM and load points for the fuel map. Select which cells to modify and press desired button.
Increase
Increases selected cell. All the cells below automatically changes as well.
Decrease
Decreases selected cell. All the cells below automatically changes as well.
Insert row
Inserts a new row to make more tuning points in a specific area. This removes the last cell.

Convert map to new axis
If you've already done a tuning map it's still possible to convert the map to a different number of cells or area of measurement.
1) Start off by saving current map by clicking "Save current map". The current map is then saved in a new window
2) You can now change all the settings. (Change size, which rpm and load should be on the different axis, change MAP sensor etc)
3) Click "Convert saved map" and BCLab automatically converts the map and adjusts all the fuel cells.

Carefully check that the map was converted the way you intended. If you convert a map from 0-8000 rpm and decrease it to 0-5000 rpm the values are converted correctly. If you convert a map from 0-5000 rpm and increase it to 0-8000 rpm the BCLab converts the area 5000-8000 rpm with the same values that you had at 5000 rpm. This is the best guess the program is able to do.

Fuel options
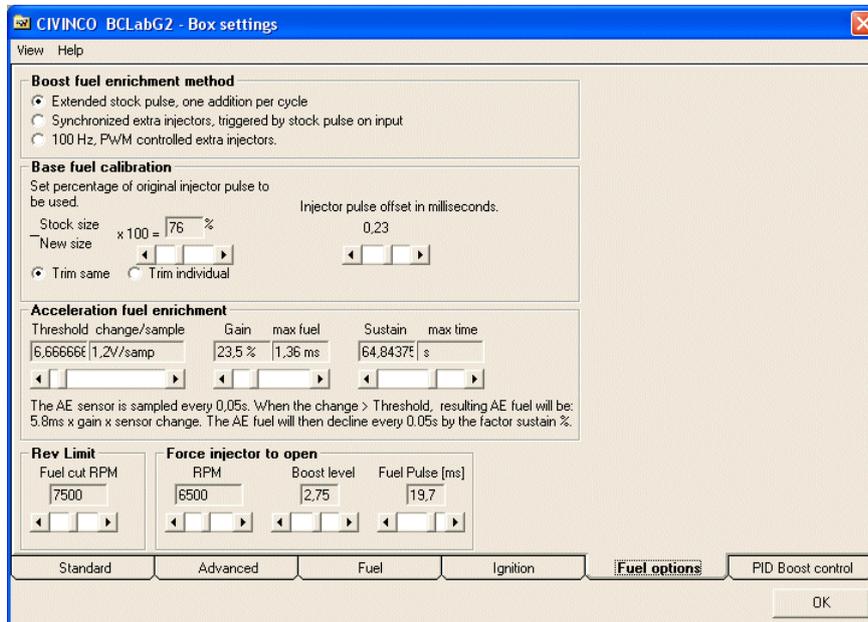
Boost fuel enrichment method

Extended stock pulse
Enriches the fuel by extending the stock fuel pulse. This is the most common method.

Synchronized extra injector
When you use extra injectors to supply the fuel enrichment.

100 Hz PWM
Used when you don't want to synchronise the fuel enrichment with the rpm, but only "spray" fuel enrichment. This is not a method we normally recommend, it's normally better to use the "synchronised extra injector method".

Base fuel Calibration:

There is a possibility to compensate if you have mounted larger injectors than stock. You can both compensate for different size and different start delay times (percent and offset). You can even make the adjustment individually for each injector. Click "Trim individual" if you need to adjust individual cylinders fuel supply.

Injector size
Specifies stock injector size in relation to the new injector size. If you have doubled the size of the new injector the % value is 50%. This means that the BC-system shorten all the stock pulses to half, to compensate for the double size injectors.

Injector offset
The offset value is a measure of how fast the new injector will open and close in relation to the stock one. This is most noticeable at low load (idle) when the injectors have a short pulse. If you know the exact specs of the stock and new injectors it's possible to calculate the offset but this is seldom the case. You are left to test this at idle to find the correct value. You can start by selecting 0 ms. It also compensates for the fact that if you half the injector pulses, the idle pulses may be below the time where the injector shoots fuel at all (typically 1 ms)

How to tune the Injector size and offset

First you specify the injector size relation. This will then make sure you have the "big picture" correct. This will make the engine run correctly on high load and at long fuel pulses.

When you have the right fuel for full load, quite often the pulses on idle will be overcompensated so you have to add some offset fuel. Normally an injector starts to give fuel for pulses over 1 ms, so at 2 ms fuel pulses, the engine actually only get 1 ms fuel. If the stock idle pulses are 2 ms and you halve it with the injector size compensation, the engine will not get any fuel with only 1 ms pulses. By adding some offset (0.5ms in this case with double size injectors) you will be back on same idle fuel as before. These 0.5 ms will not affect the full load so much. Theoretically about 0.5/20=2.5%

Acceleration fuel enrichment:

The BC-box can also add acceleration fuel when performing a quick acceleration. This function is based on an analog input, usually the throttle position. The BC-box measures the throttle position 20 times per second and can then compare the current position with the last one and thus detect a rapid throttle movement. Which sensor to use and which strategy to use is selected in Box-settings, Enrichment.

The acceleration fuel enrichment is controlled by three parameters, Gain, Threshold and Sustain. The actual result will be extended fuel pulse in ms or a voltage increase for the Mass airflow simulation, depending on the chosen strategy.

Gain determines the fuel pulse at a certain throttle movement according to : Acc pulse=Gain*[currentTPS-lastTPS]. This means that a larger Gain will result in a longer acc pulse.

Threshold determines the minimum throttle change to result in any acc pulse. If you select this value to 255 there will never be any acc pulses.

Sustain determines for how long the acc pulse will remain. If the BC-box detected an acceleration situation and calculated the first acc pulse to be 1 ms, then the next acc pulse will be 1 ms multiplied by the sustain value. So if Sustain is 50% the next acc pulse will be 0.5 ms, then 0.25 ms and so on. The Sustain value 255 equals 100% and 0 equals 0%. The value 0 means that only one acc pulse per event is generated.

Rev Limit:

Fuel cut

Select an rpm when all fuel is cut off.

RPM to allow open injectors & Boost level to open injectors

It's possible to force the injectors fully open when reaching a certain boost and at the same time be above a certain rpm. This is used to supply the maximum possible fuel.

PID BOOST CONTROL
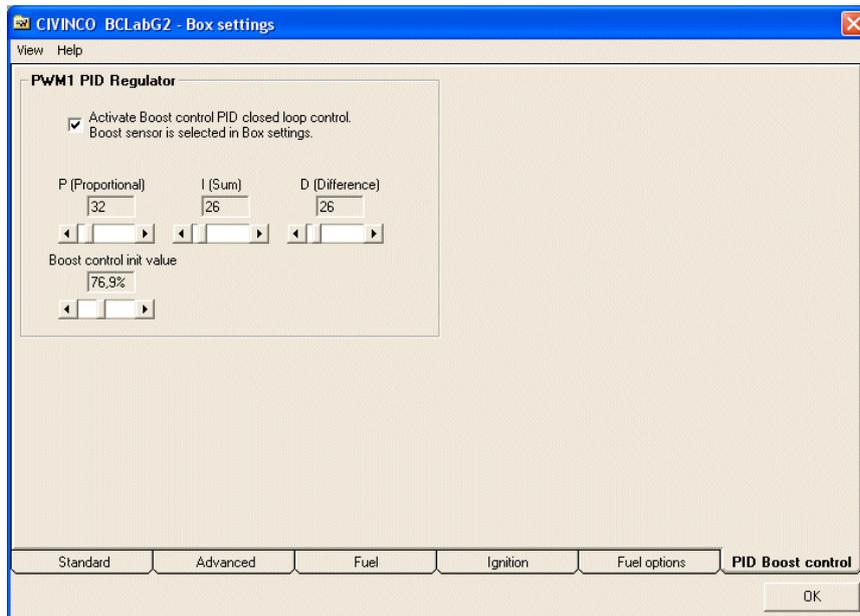
Sometimes you may want to use feedback information to regulate the boost pressure. This is done with an advanced PID-regulation algorithm that controls the boost valve output signal depending on the boost pressure feedback signal.

The BC-box measures the current boost feedback signal and compares this with the desired (tuned) boost level. If they are not the same there is an error present. If you open the throttle and the desired boost level rises then the regulating algorithm controls in which way that boost level is reached. If the boost level is to small the signal to the boost valve will increase a bit and vice versa at too high boost (called Gain or P-factor). If there has been an error for a longer time the boost valve output will increase a bit faster (Integration or I-factor). If the boost level changes rapidly the signal must be dampened in order for the boost not to pass the desired level. (Derivation or D-factor).

PWM output=Error*P + Long time error*I + Rate of change*D
The use of this function calls for knowledge in regulation theory and is not further addressed in this manual. More information and a manual are available from Civinco.

See page PWM RPM for more info on how to enter values in the PWM_RPM table when using PID-regulation.

BC LOG SETTINGS
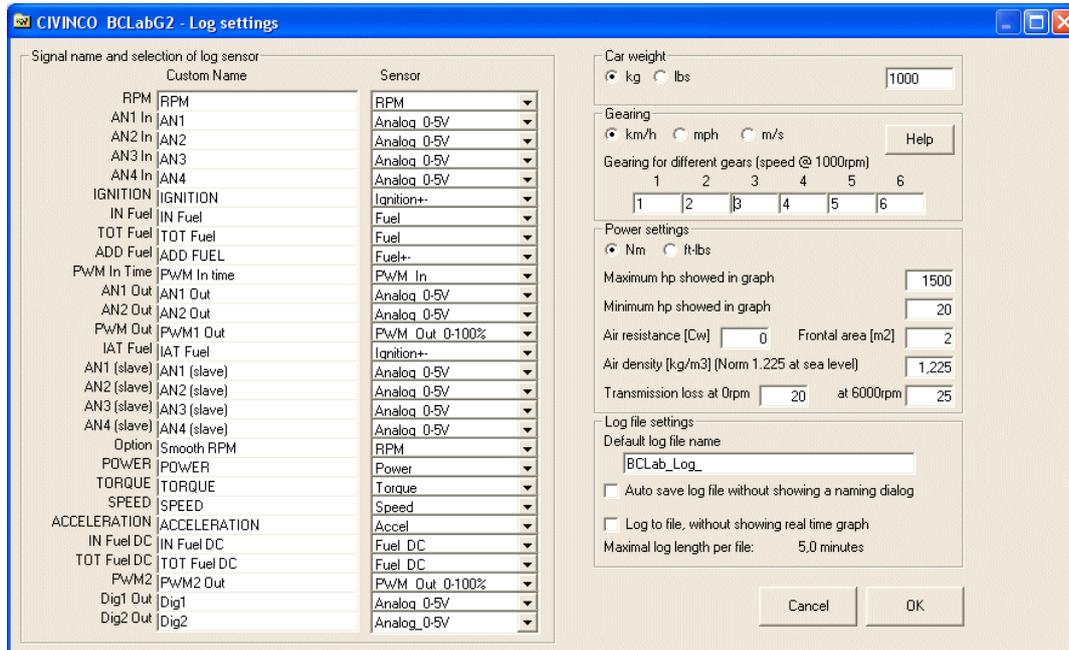
Signal name and selection of log sensor

Normally the BCLab software will log 20 different signals. These signals have different basenames which you can see in the left column. In the second column you can chose your own names for the same signals. If you know the type of sensor the signals are you can specify this and the graphs will present the correct actual values. Also refer to Sensor specification for more info on this subject

Car setting

Set the vehicle weight. Used in calculation of engine power.

Gearing calculator

You can write the cars gear ratio directly in the box "Gearing". If you don't have access to this the program can calculate it for you. Specify rpm, speed and gear and click "Calculate gearing" and the program calculates your gear ratio on that gear. This matters when you calculate engine power and speed. The graph values are only correct for the calculated gear.
You can choose which gear you want the program to use during engine power calculation in the log window.

Other settings

Autosave
Selected if you wish the program to automatically save the log file after a log run. The name will be generated with date, time and the name selected in the lower textbox.

Default settings in log file
This gives you the possibility to chose the default log settings when starting the BCLab software. It is controlled by the file Default_Logg_Settings.cbl which is located in the same folder as the BCLab program was installed in. This file is opened every time the BCLab is started. You can open this file as any other log file. Do the desired changes and save again.

Import default log sensors
If you open an old log file that doesn't have all the new log sensor definitions, you can set all the missing sensor definitions to the open log file.

Engine Power settings

In order for the power to be exactly calculated you need to know the exact weight of the car, the air resistance, gear ratio, the transmission losses and you must drive on a flat surface. On the other hand if you compare two log runs where you drove on the same road you can see which of the runs that gave the best power. You will also see this from the graph where you can measure the time between two rpms.

Minimum/Maximum levels

Here you can specify between which power levels to show the graph. This is used to avoid strange power values for example when the rpm decreases (which mathematically equals negative power).

Air resistance

If you know the cars air resistance (Cw) and cross section area you can use this to compensate the calculated power. These values are often found in the cars manual or repair handbook. A typical Cw value are between 0.3 to 0.35. A midsize car often has a cross section area of about 2 m².

(The actual formula is $F=k*V$ & $P=F*V=>P=k*V^2$)

You can approximate your cars air resistance from the top speed and top power according to the formula: Air_resistance=Maxpower/(Maxspeed/3.6)^2. Power in W speed in km/h.

BC SENSOR VIEWER

In [V]	In [%]	In [A/D]	Out [bar]
0,00	00,0	0	0,09
0,16	03,1	8	0,17
0,31	06,3	16	0,24
0,47	09,4	24	0,32
0,63	12,5	32	0,4
0,78	15,7	40	0,48
0,94	18,8	48	0,56
1,10	22,0	56	0,64
1,25	25,1	64	0,71
1,41	28,2	72	0,79
1,57	31,4	80	0,87
1,73	34,5	88	0,95
1,88	37,6	96	1,03
2,04	40,8	104	1,11
2,20	43,9	112	1,19
2,35	47,1	120	1,26
2,51	50,2	128	1,34
2,67	53,3	136	1,42
2,82	56,5	144	1,5
2,98	59,6	152	1,58
3,14	62,7	160	1,66
3,29	65,9	168	1,73
3,45	69,0	176	1,81
3,61	72,2	184	1,89
3,76	75,3	192	1,97
3,92	78,4	200	2,05
4,08	81,6	208	2,13
4,24	84,7	216	2,21
4,39	87,8	224	2,28
4,55	91,0	232	2,36
4,71	94,1	240	2,44
4,86	97,3	248	2,52
5,00	100,0	255,0	2,59

In this section you can view, set and save all the sensor settings. Both log sensors and tuning sensors. There are three types of sensors; Linear and table entered.

Linear – Saved as a straight line that translates the voltage to a certain value.

Linear 2 –complement – Saved as a straight line but adapted to also be able to send negative numbers from the box to the computer. Typically used for ignition.

Table sensors – Saved in a 33 row table with 0.16V between the rows. You can change the data for every voltage which makes it possible to have nonlinear sensors such as temperature sensors etc.

If you know the voltage at various actual sensor values, this can be used in the program to display the actual sensor values(pressure, speed, gear etc) instead of the voltage.

Open sensor definition
You can open an already saved tuning or log sensor.

Save as new sensor
If you have redefined or created a new sensor this is where you save it. NB! If you save the new sensor with a name from the list the old sensor definition will be changed.

Choose what kind of sensor you've created and fill in the right box.

At last you choose if the sensor is tuning sensor, log sensor or both.

The sensors used for tuning are saved in the ".ini" file and should be in the catalogue where you installed the program.
The log sensors are saved in each log file (xxx.cbl) and you choose where you want them on your hard drive. The sensors that are always there when you start the program are saved in a "default_log_settings.cbl" file and should be in the catalogue where you installed the program.

Sensor tester
A calculator for testing sensors by giving it a voltage or a desired data and calculate the other unit.

Linear control
To create or modify a linear or a linear 2-complement sensor you set two values along the line.

Table control
If you're using a table sensor this function helps you to freely modify all the values in the table. You're also able to modify the table by entering the values directly in the table.

Used Analog Sensor
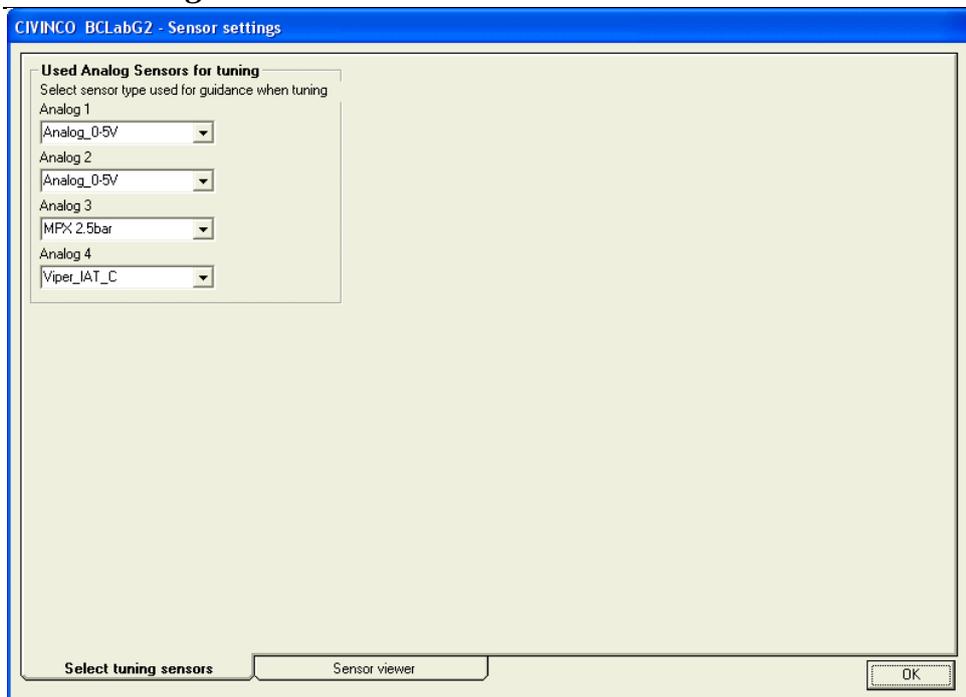
You can connect many different sensors and transmitters to the BC-box. Usually these are the cars original sensors. The sensor definitions translate the voltage to the accurate unit that the sensors are supposed to measure e.g. temperature or pressure.

Used Analog Sensors for tuning
Choose what kind of sensor you connect to each of the analog inputs.

MAIN MENU – HELP

Go to Civinco
Opens the Civinco website, www.civinco.com
Help file
Opens the help file
About
Displays the current BCLab version no.

SHORTCUTS

Ctrl+O   Open file
Ctrl+S   Save file
Ctrl+Q   Exit program

Ctrl+Z   Undo
Ctrl+Y   Redo
Ctrl+M   Read TuneCard
Ctrl+R   Write to TuneCard
Ctrl+E   Read from BC-box
Ctrl+W   Verify settings
Ctrl+T   Write to BC-box

F1   Help
F2   Box settings
F3   BCLab settings
F4   Log settings
F5   Sensor settings
F6   3D-view
F7   Main Window
F8   Log Window
F9   Start log
F10
F11   Redraw
F12   Setting summary

FILE FORMAT

.cbc   File containing tuning data (BC-box settings)
.cbl   Logging file containing log data, log settings and sometimes tuning data
.bcc   File containing the code to your BC-box.
.rtf   Rich text format. BCLab can export the settings to this format.
.csv   File containing exported log data. This file can be opened in e.g. Excel.
.bmp   File containing exported log data saved as an image.
BCLab.ini   Contains settings for BC-Lab. If this is damaged you will not be able to run the program.
BCLab_Default_Log_Settings.cbl   Contains settings for BC-Lab logging.

WORDLIST AND DEFINITIONS

Load	Denotes how much torque the engine is trying to produce. Can be measured in different ways; throttle position, manifold pressure or Mass airflow. This is the signal we use for tuning.
Piggy back	A box connected between the ECU and the engine.
Chipping	Tuning an engine by replacing the ECU memory or processor.
Serial programming	Reprogramming the ECU memory via the PC
2.5D	Civinco does not use a full 3D mapping, we call ours 2.5D. This means that the tuning process becomes easier since you don't have to tune all of the grid cells.
MAF	Mass Air Flow, the amount of air entering the engine.
MAP	Manifold Absolute Pressure, the pressure in the intake manifold.
SmartCard	Any plastic memory card, such as: phonecard, bankcard, TuneCard
TuneCardTM	The tuning cards used by BCLab to save tuning data
Chipdrive	One make of smartcard reader on the market. Presently the only one supported by BCLab
Boost pressure	Different denotations. Either the pressure generated by the turbo (measured at the turbo) or the pressure reaching the intake manifold, the same as the manifold pressure.
Manifold pressure	The pressure in the intake manifold as measured by the MAP sensor.
RPM	Revolutions per minute
ms	Millisecond (1/1000th of a second)

2.5D

One table for load and one for RPM. This is then by the program automatically recalculated as a 3D map. Civinco call this system 2.5D. This means that the user does not have to enter the right data for all the tuning points in a RPM x Load matrix. Instead the user only have to enter values for RPM and Load separately.

Simplified example

MAP	Fuel depending on Load	Calculated 2.5D values		
2-3 bar	10 ms	10ms*1.0=10ms	10ms*1.0=10ms	10ms*1.1=11ms
1-2 bar	2 ms	2ms*1.0=2ms	2ms*1.0=2ms	2ms*1.1=2.2ms
0-1 bar	0 ms	0ms*1.0=0ms	0ms*1.0=0ms	0ms*1.1=0ms
	Fuel depending on RPM	100 %	100 %	110%
	RPM	0-2000 rpm	2001-4000rpm	4001-6000 rpm

FAQ

How is the insurance affected?
When tuning your car you must according to regulations type certify your car and notify your insurance company.

How is the engine affected by the increased power?
Most car manufacturers equip their cars with the exact same engine but with different power levels. The only thing that differs is the ECU software. If you increase the power in your car to the level that the manufacturer already has in another model, you will be well with margins. The factor mostly affecting engine wear is your driving style, and usually anyone interested in engine tuning will usually drive a bit tougher...

What does the manufacturer say about engine guarantee?

Most manufacturers will naturally deny all responsibility when an engine is modified. The engine guarantee is usually only valid a couple of years so this is not a big problem.

Installing the BCLab software

Put the CD in your computer and start the installation by double clicking the file setup.exe. Then just follow the instructions.

If you have downloaded the file from www.civinco.com then you must first unzip the downloaded file using winzip. This program is available at www.winzip.com

Upgrading the BCLab software

Upgrades are available at www.civinco.com Download and follow the instructions.

Updating the BC-box

Civinco will notify if there is an update available for your box. Presently the box must be sent to Civinco to perform the update.

Upgrading the BC-box

You may upgrade your BC250/750 to be tunable i.e. BC500/1000.

You may also upgrade your box to handle Mass airflow simulation.

In both cases the box must be sent to Civinco for upgrading.

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