



BC500 - Volvo 850 INSTALLATION GUIDE



Civinco is a Swedish based company that makes a very interesting piggyback that we now sell. The BC500 is a piggyback designed to integrate seamlessly with the harder to tune front wheel drive Volvos. Currently we are focused on M4.X controlled cars but Civinco has had great success with ME7 cars (and numerous other brands).

What makes Civinco so unique in our minds is the way in which it works. Many piggybacks simply alter MAF values to the ECU in order to "trick" the computer into changing the Air Fuel values of the motor. The problem is, (even more so on turbo cars) that the typical approach goes something like this: Install bigger injectors, use an AFC type device (MAF altering only) to scale the MAF input down ie lean the motor out. The problem is, your fighting a double edged blade. As you "lower" the MAF values, the ECU typically advances ignition timing. Not a good thing for forced induction applications.



What makes Civinco different is, it thinks more like a complete stand alone fuel system. It takes the signals that were originally going to the coil and fuel injectors, and sends those to the Civinco ECU. Then YOU tell the ECU exactly what values to send out to the injectors or coil. The main advantage in this is it allows the ECU to control all of its mundane functions (idle, warm up, start up, cruise, light throttle, AC function ect ect) while giving you *complete* control over injection and timing values when you want.

On top of this, Civinco is capable of clamping the MAF signal to the ECU, using MAP (MAF elimination), overriding fuel and spark cuts and installing larger injectors (can scale down over a 100% larger injectors to send the correct duty cycle to the injectors) is easier than ever. Not to mention sequential fuel control.

Other features include PWM outputs (control boost, water injector, NOS or anything PWM), and analog outputs (Shift lights, RPM window switches ect). When setup for an I5 you are limited to 1 PWM and 1 analog output.

Lastly, Civinco saves its maps to smart media cards and provides 3 cards with the box. This allows you to create 3 separate maps that you can plug in at will (valet mode, race gas and pump gas for instance). Obviously more cards can be bought for more maps. Unlike some other brands the software *IS* included allowing the owner of the vehicle to tune it themselves.

The way we believe is best to use the BC500's outputs is to use the PWM for water injection control and the analog output for an RPM window switch/shift light. We prefer to use an external electronic boost controller for a couple of reasons. Since you can't just turn a knob to change the boost via Civinco, it is easier and more flexible to use one of the many aftermarket electronic boost controllers. By saving the PWM output for something like water injection, once dialed in, H2O injection is not something that you will need or want to adjust constantly.

Early test have shown fantastic results using Civinco.



While Civinco is mostly a plug and play system, it is not a system that comes preloaded with any "maps". There are a few requirements to using Civinco. The first is you ABSOLUTELY must have your own Wideband O2 system on board. You can choose from Innovate's barebones LC1 controller to just about any system on the market. The only requirement is it MUST have programmable outputs (every system on the market that I can think of has this).

The main reason you need to do this is two fold. First you must have a way to monitor AFR values at all times (suggested for any modified turbocharged car). Secondly, you can use the output to connect to Civinco and datalog AFR with all the important values you need to tune with.

That being said, the average enthusiast should not be scared of Civinco. Between our own customer support, other members using Civinco and local dyno shops who have had experience using similar products you shouldn't have any issues getting your car tuned. While we have been sharing maps with each other, the one resounding fact we have found is each car is so completely different in tuning, that you are best starting off fresh.

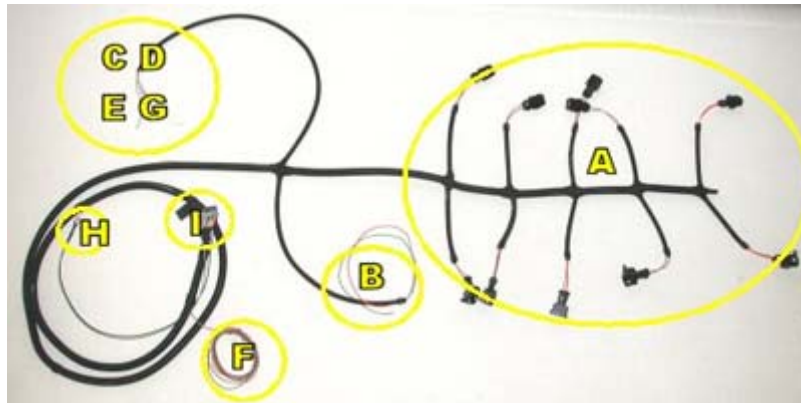
Scared yet? You shouldn't be.

Installation

When you receive your Civinco you will get a package full of parts. These will include:



ECU and Sim Cards (the cell phone gives good perspective of the over all size of the ECU. The sim cards are about the size of a credit card)



and the wiring harness. This is the typical 850 wiring harness and breaks down like follows:
 (A) Fuel injectors B) MAF-sensor C) Our 2.5 bar MAP sensor (not visible in this picture) D) Connection to igniter E) & F) AUX1-2 (lambda, throttle, etc) G) Electronic boost control valve H) Grounding

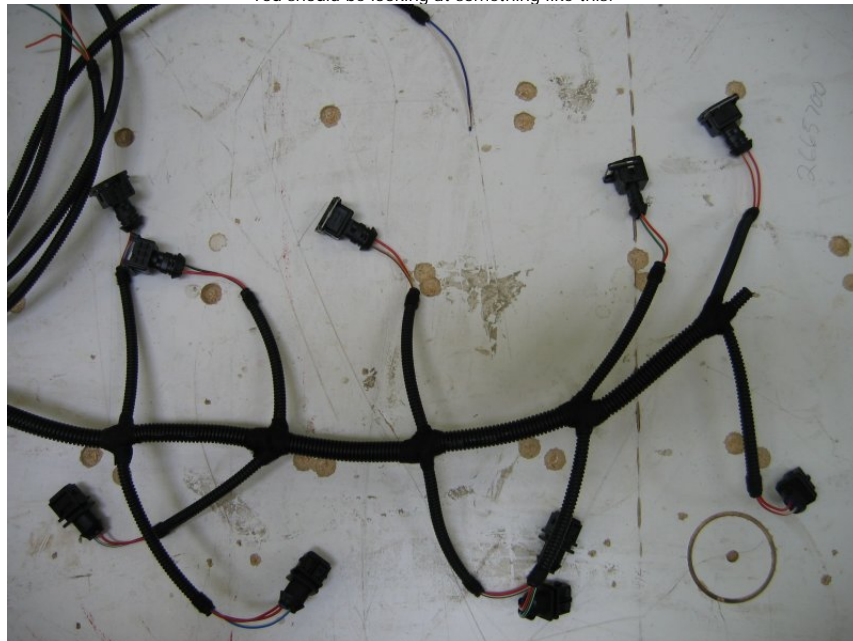
There should also be a CDROM included with the software, wiring pinouts and some examples saved on it. If not (or if you lose it) all of the same files are on our [website](#).

When starting on the installation you will need a few tools. While each car varies a bit, you will need to remove the fuel rail cover (it just unsnaps, but if you have a "RIP" kit then you might need to remove the plumbing to gain access) and gain access to the MAF and Ignitor wiring. This often requires the removal of the airbox also.

Lastly you WILL need a set of wire cutters/crimpers to perform the 2 required splices.

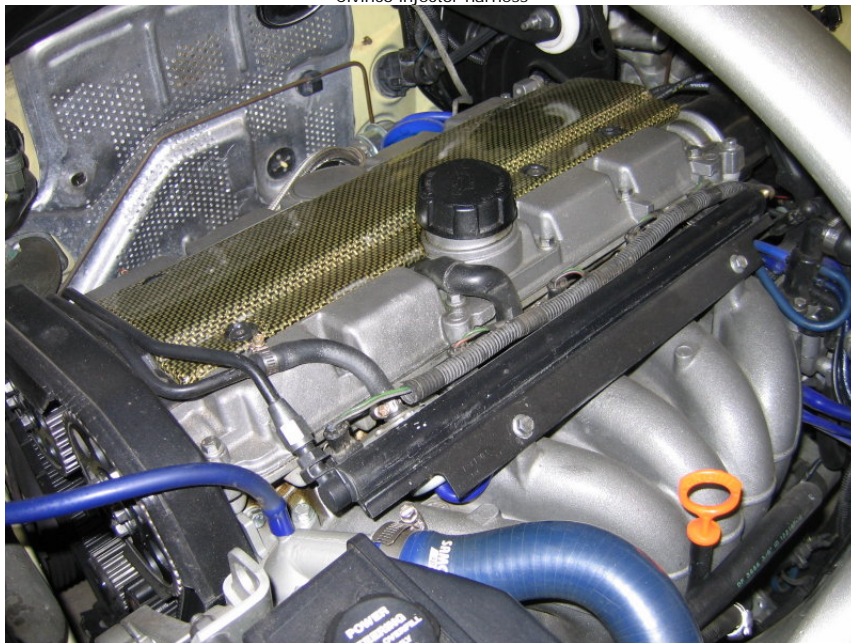
Starting with the easiest part of the installation is the fuel injectors. Since this is purely plug and play you simply remove the fuel rail cover and unplug the injectors. Double check your [wiring pinout](#) and make sure you have Fuel A connected to the #1 injector. On the harness this will be the "Injectors" closest to the end of the harness 99.999% of the time. Once again, take the time to double check.

You should be looking at something like this:

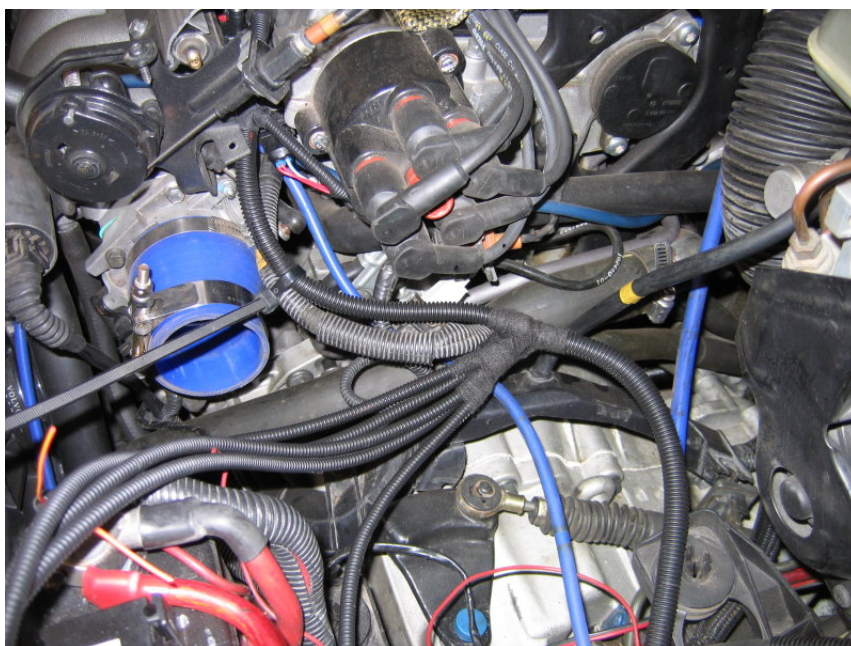




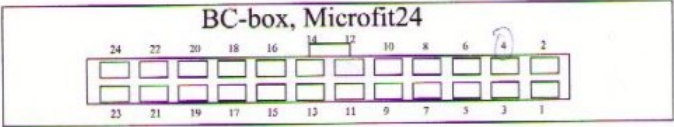
Civinco injector harness



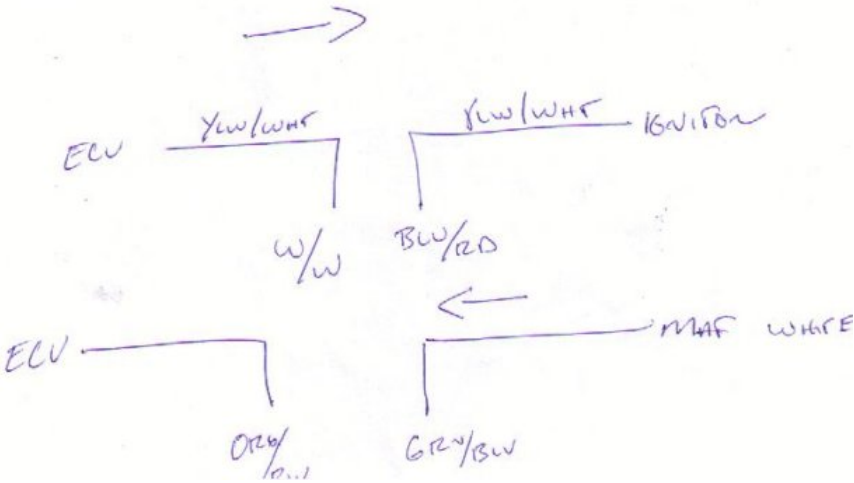
unplug the stock injector connections and plug civinco in. The other side of the harness plugs right back into the stock injector harness. When your finished you can put the fuel rail cover back on and you can ziptie Civinco's harness to the OEM harness like so



On to the slightly tougher parts. Here is the wiring pinout with a rough (I mean rough) diagram of the next two connections scribbled on.



Microfit connector BC500 Volvo 5-cyl			
1	black/green	GND	Connect to Chassi
2	grey	5v out	Connected to MAP sensor
3			
4			
5	violet	PWM	Connect to Boost control valve
6	green/red	ANALOG3 IN	Connected to MAP sensor
7	orange/blue	ANALOG 2 OUT	MAF signal to ECU
8	green/blue	ANALOG 2 IN	From MAF sensor
9	orange	ANALOG1 OUT	
10	green	ANALOG1 IN	
11	blue/yellow	FUEL E OUT	To fuel injector
12	blue/white	FUEL E IN	From ECU fuel signal
13	blue/red	IGNITION OUT	To external igniter
14	white	IGNITION IN	From ECU igniter signal
15	gul/svart	FUEL D OUT	To fuel injector
16	vit/svart	FUEL D IN	From ECU fuel signal
17	gul/brun	FUEL C OUT	To fuel injector
18	vit/brun	FUEL C IN	From ECU fuel signal
19	gul/grön	FUEL B OUT	To fuel injector
20	vit/grön	FUEL B IN	From ECU fuel signal
21	gul/röd	FUEL A OUT	To fuel injector
22	vit/röd	FUEL A IN	From ECU fuel signal
23	svart	GND POWER	Connect to Chassi
24	röd	+12Vin	Connect to +12V



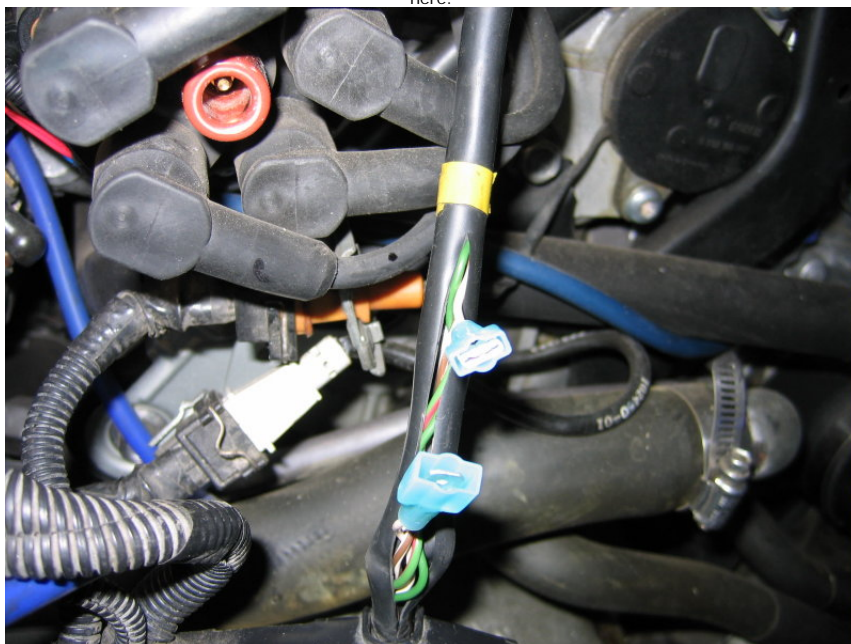
Note, the arrows describe which way information flows through the wire.

MAF

If you pull back the rubber boot on the MAF sensor you will see 4 wires.



The far "left" wire is a solid white wire. This is the wire you will want to tap. While you can tap the wire at any point in the harness I chose to do it here:



There are a few things I want to point out. I HIGHLY recommend you use insulated spade connectors. If you notice, the way I installed mine allows me to simply plug the 2 connectors back into themselves should you ever need to remove civinco. Also, this will NOT allow you to hook up Civinco backwards should you have to temporarily unhook the harness.

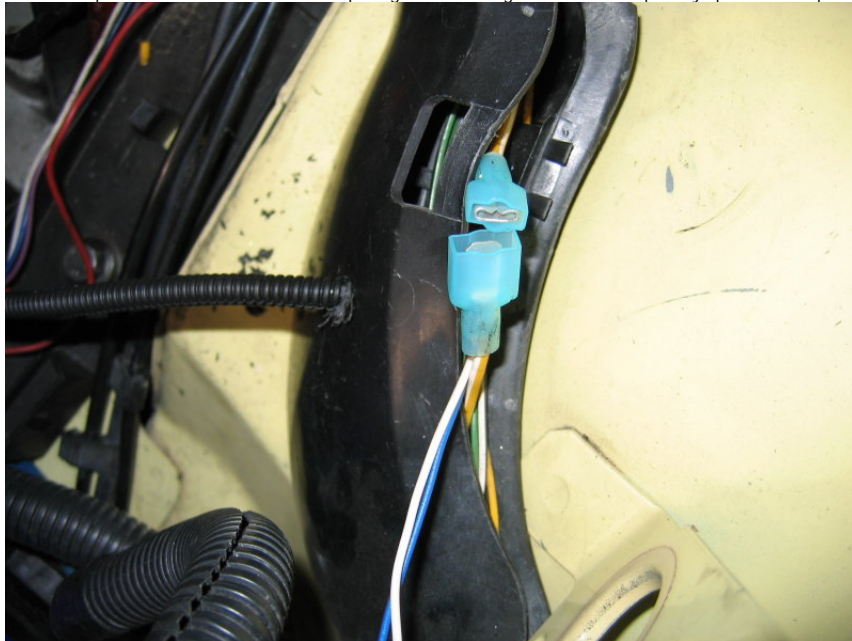
Once again, double checking your wiring diagram (to insure no wire color changes) you should be able to hook it up like the above diagram.

Ignitor

One last wire tap to make. If you peel back the rubber boot at the powerstage for the coil you will see this:



The Yellow/White striped wire is the one we will be splicing into. Once again I decided to put my splice a bit "upstream" here:

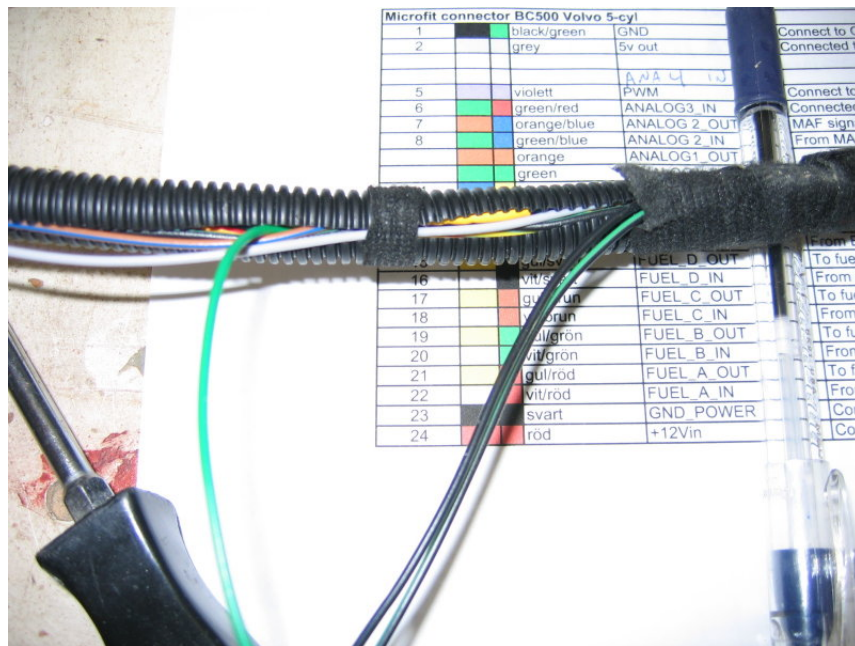


Follow the same suggestions as the MAF wire tap and you will be in good shape.

Accessories / G2

There are a couple extra circuit options. You have a PWM output and ANA1 OUT. What you do with these are strictly up to you. ANA1 IN though should absolutely be hooked up to your Wideband output.

Another suggestion is to pull the ANA1 IN wire back through the wiring harness and have it come out with the ground wires like so:



The main reason I did this is because it will make it easier to connect to my Widebands output.

There are a couple other notes: PWM output is a grounding output and ANA1 out is a 5v output.

For G2 users: You now have an ANA4 input. Use this by installing a common GM Intake Air Temp sensor. (GM PN 25036751). Be sure to get the pigtail for it (also usually a stocked item). The pigtail will have 2 wires, connect one to the ANA4 IN wire, ground the other side. This will allow for IAT based fuel corrections in the new G2 boxes (as well as datalogging).

Now that the hard part is done, all you need to do is feed the harness through the firewall and find a suitable mounting location for the ECU. Most users find firewall pass throughs on either the driver or passenger side. Another viable option is under the fusebox (not really recommended but works ok). I personally drilled and installed a larger grommet to feed the assortment of extra gauges and other things through the firewall. Once you've wired in the harness and grounded it, you should be ready to power up civinco for the first time.

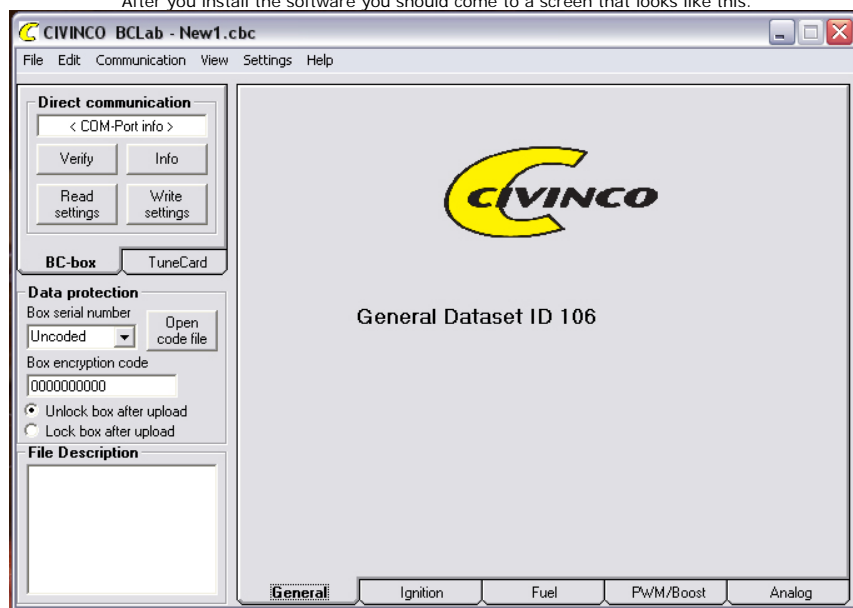
Software, first time startup

So if you haven't already loaded the software now is the time to. DO NOT START THE CAR UNTIL YOU HAVE LOADED THE CORRECT SETTINGS.

If you lost the CD you can download the software here: [G1](#) and [G2 users here](#)

You will also need to download the [default file here](#)

After you install the software you should come to a screen that looks like this.



Make sure that the "BC-Box" tab is clicked on the left.



Open the default file through BCLab. After you do go to "Settings" then choose "Box Settings". You should see a screen that looks like so:

The screenshot shows the 'CIVINCO BCLab - Box settings' window. It has a menu bar with 'View' and 'Help'. The window is divided into several sections:

- Standard box settings:**
 - Model presets: General Dataset ID 106
 - Ignition tables: Degrees or [%] in Ignition tables (Degrees in Load table, Percent in RPM table)
 - Fuel RPM table resolution: 500 RPM, default (250 RPM, disables Analog2 out)
 - RPM indicator: RPM Indicator (Led 2) (4 to 4000 RPM)
- Advanced box settings:**
 - BC Digital I/O mode: BY PASS MODE (This will clear all settings! Only possible if Boost control connected to IGNB). BC Digital I/O mode: Mode3, 5 fuel, 1 ign. IgnB as fuelE
 - RPM Calculation (ign A): 5 pulses every cycle (2 revs), 2 pulses every cycle, slave BC
 - Analog input synchronisation: Update A/D value once every engine cycle, synchronized with crankshaft (otherwise 600 Hz without sync). An1 sync, An2 sync, An3 sync (checked)
 - Boost options: Boost sensor: Analog3 in, Boost Limit: 5.00 Volt
 - View cardbyte: Click to view dataset, Dbl click to view coded data.
- Ignition:**
 - Ign RPM Table Precision: Low, Default (+25 deg or +200%)
 - Ignition mode (master): Ignition retard only
 - Ignition mode (slave): Ignition retard only
- Enrichment:**
 - Fuel Enrichment Strategy: Enrichment every fuel pulse
 - Base Acc Enrichment on: Analog3 in
 - Acc Enrichment by: Adding fuel pulse width
- MAF simulation:**
 - Enable MAF-Sim (disables normal An1 out)
 - MAF SIM analog out: Analog2 out
 - MAF SIM MAP signal: Analog3 in
 - MAF SIM limit: No MAF SIM limit

Be SURE to confirm that the settings match.

There is 1 more setting to double check. Go to "Settings" and then "Sensor Settings". Confirm yours is set like follows (NOTE: G1 users will not have an ANA4 option)

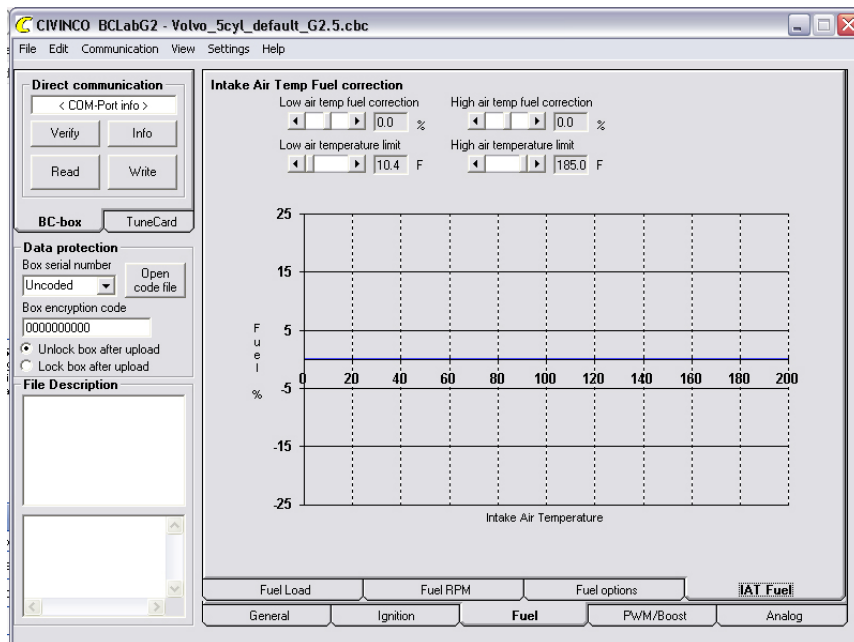
The screenshot shows the 'CIVINCO BCLabG2 - Sensor settings' window. It has a menu bar with 'File', 'Edit', 'Com', and 'Help'. The window is divided into several sections:

- Used Analog Sensor:**
 - Select sensor type used for guidance when tuning
 - Analog 1: Analog_0-5V
 - Analog 2: Analog_0-5V
 - Analog 3: MPX 2.5bar
 - Analog 4: Viper_IAT_F
- Sensor viewer:**
 - Sensor selector: Smart_throttle, Tab
 - Sensor unit: In signal unit: Digits: 1
 - Signal converter: In: 0 Out: 0
 - Calculate in signal
 - Calculate out signal
- Graph:** A graph showing the relationship between 'in signal' (0.00 to 5.00) and 'out' (0 to 100). The curve is a red line that starts at (0,0) and rises steeply, then levels off towards 100.
- Table:** A table with 4 columns: Row, In, In, Out. The data is as follows:

Row	In	In	Out
(no)	(Pull)	(%)	(%)
0	0.00	00.0	0
1	0.16	03.1	0
2	0.31	06.3	0
3	0.47	09.4	0
4	0.63	12.5	7.3
5	0.78	15.6	21.8
6	0.94	18.8	36.4
7	1.09	21.9	50.9
8	1.25	25.0	65.5
9	1.41	28.1	80
10	1.56	31.3	94.5
11	1.72	34.4	100
12	1.88	37.5	100
13	2.03	40.6	100
14	2.19	43.8	100
15	2.34	46.9	100
16	2.50	50.0	100
17	2.66	53.1	100
18	2.81	56.3	100
19	2.97	59.4	100
20	3.13	62.5	100
21	3.28	65.6	100
22	3.44	68.8	100
23	3.59	71.9	100
24	3.75	75.0	100
25	3.91	78.1	100
26	4.06	81.3	100
27	4.22	84.4	100
28	4.38	87.5	100
29	4.53	90.6	100
30	4.69	93.8	100
31	4.84	96.9	100
32	5.00	100.0	100

G2 USERS ONLY

If you click on the "Fuel" tab, then "IAT FUEL" Make sure that all the corrections are set like below. We have found that sometimes upon initial loading that the values are skewed.



Burning the map

Now that you have the software and default file loaded on your computer, it's time to burn the map into Civinco. For your initial tuning I highly suggest you burn your maps into Civinco.

With the "BC-Box" tab selected you should see 4 options:

Verify: Click this to verify your connection. If you can not connect hit F3 and change your COM port till you can connect. (NOTE, the ignition must be in the "run" position for Civinco to be powered).

Info: Click to find information about file type loaded.

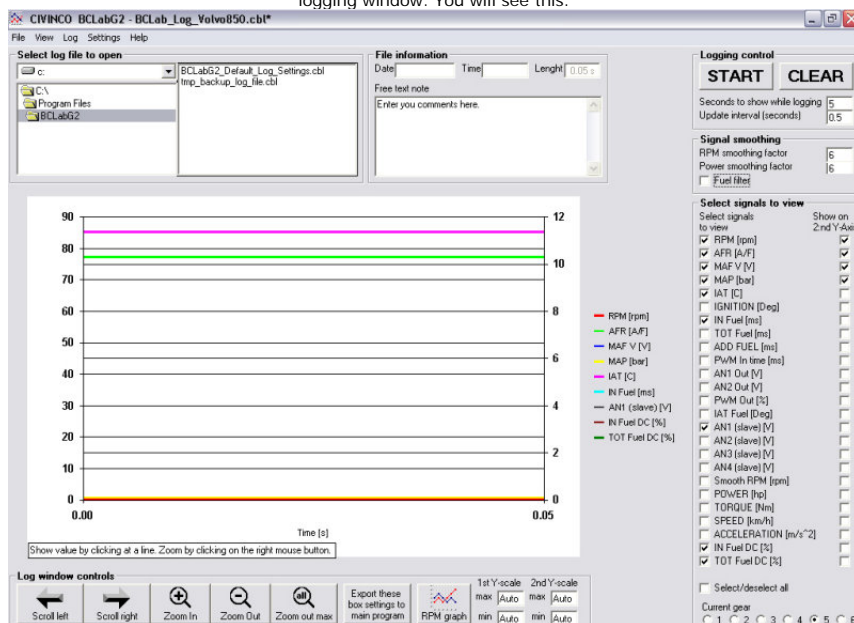
Read: Click to upload the stored map in Civinco to your PC

Write: Click to write the map on your PC to Civinco.

Once you have the default file loaded, and written to Civinco's ECU you should be able to start the car with out any problems. If you have any issues TRIPLE check your settings.

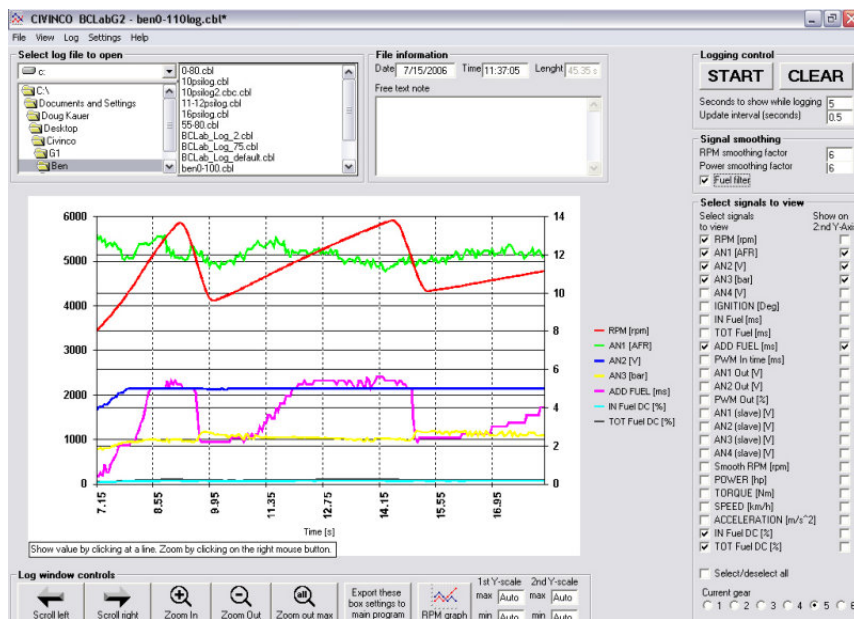
Logging

Since you need to know where you are before you can start tuning, I suggest starting off by making a datalog. Hit "F8" to quickly jump to the logging window. You will see this:

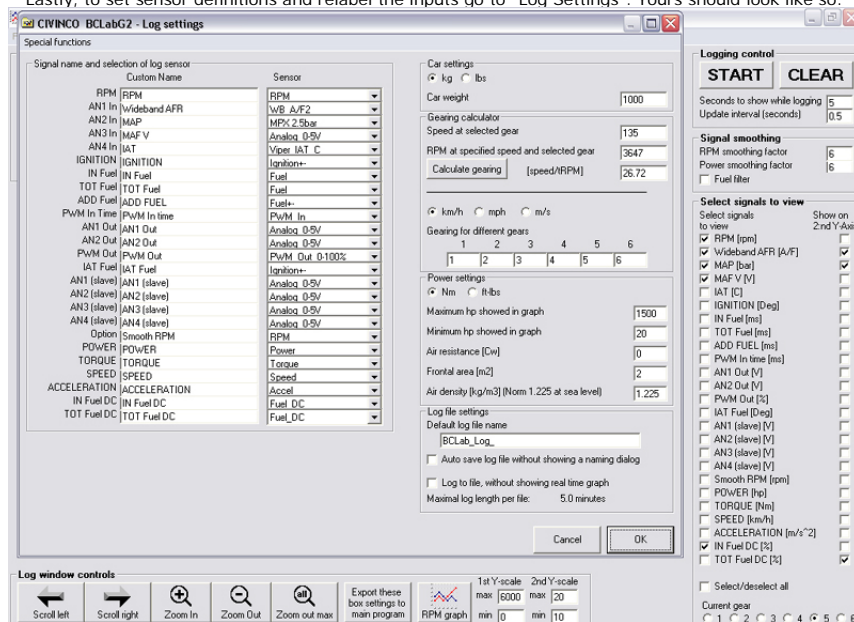


Its pretty much self explanatory. Hit "Start" to start logging, hit it again to stop.

The typical datalog looks this:



Lastly, to set sensor definitions and relabel the inputs go to "Log Settings". Yours should look like so:



Tuning

[The Roe manual](#) gives the best advice for tuning. In all honesty, the best way to learn to tune it is through trial in error. With a wideband and boost set to a reasonable level (1bar, or 2.0bar atmospheric) these motors are pretty forgiving. The best suggestion is to share maps with each other for advice or send datalogs and maps back to us for tuning suggestions. Once you see how the maps change aspects of how the car performs you will start seeing a clearer picture of how everything works.

Hopefully everyone will find this useful. Please feel free to contact us for more information or suggestions for things to add.

Doug @ RKautotechnik