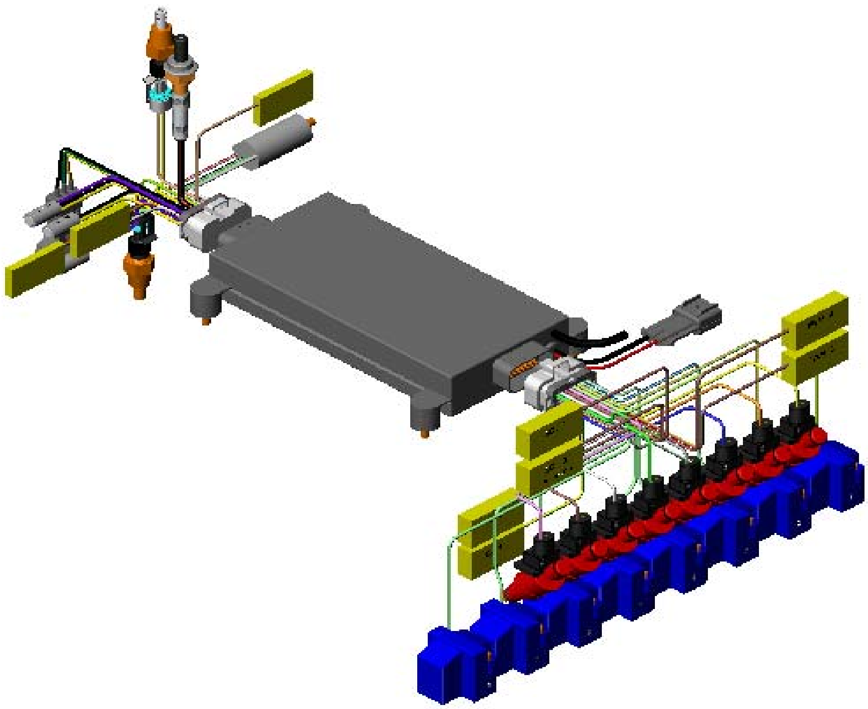

ECU-882-C

TUNING MANUAL

ECU-882-VW users should ignore sections describing idle control and ignition control

Context

A. Introduction

B. Installation Considerations

C. **Tuning Philosophy**

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A. Introduction

The ECU-882-C " Electronic Control Unit " is a highly advanced DSP based engine management system. When tuned properly it will provide highly refined and advanced fuel and ignition control over a wide variety of engine configurations. Though its electronic control is highly advanced, tuning the " 882 " can be relatively simple to configure and tune for great results, quickly. There is certain methodology and considerations that should be used when tuning a fuel and ignition management system. This document has been created not as a step-by-step tuning manual, but to address some frequently asked questions about tuning as well as giving an overall idea or understanding as to how tuning the ECU should be approached.
*****Important – this tuning manual should be used in conjunction with the ECU-882-X ECU manual, both documents address different aspects of the product and thus should be used in tandem*****

B. Installation Options

Sensor Requirements

The ECU-882-C ECU requires certain and specific inputs in order to measure and manage different engine function including fuel injection, ignition timing and idle control. If the sensors used do not have the same calibration as the ECU, then the measurement will be incorrect. Below is a list of inputs and their requirements:

Water Temperature: The water temp sensor should be a GM specification or what is provided by your dealer. Resistance should be 2700ohm @ 25° C or room temperature. The sensor should be installed in the cylinder head water jacket return " to the cooler" area as an accurate gauge of engine temperature.

Air Temperature: The air temp sensor should be a GM specification or what is provided by your dealer. Resistance should be 2700ohm @ 25° C or room temperature. The sensor should be installed after the intercooler in turbo charged application or after the air filter in the intake system in normally aspirated applications.

Throttle Position: Any standard 3-wire TPS will work with the " 882" system and should be wired as according to the connector wiring pin-out chart. The two outside pins will determine if the TPS reads from closed to open, or from open to closed. The sensor should be wired to reflect a closed position at idle and an open position at WOT (wide-open throttle). Not all sensors will register across the full range of the TPS matrix, this is normal however and each TPS will require relative programming of the matrix to correspond with the actual throttle body position. For example, some sensors will register only 70% at full throttle position. Thus, when TPS programming is done, the 70% value should equate to full throttle. Though the smaller range a TPS spans will mean less tuning resolution for the TPS programming - typically a minimum of 3-4 cell range will ensure plenty of resolution to take advantage of the TPS programming function. TPS Blend is intended for idle and part throttle fuel mapping only, especially in applications with abnormally low vacuum (more than 80kpa at idle for example).

Oxygen Sensor: Standard narrow-band or wide-band (0-1v) sensors should be used with the " 882 " system. Though a 1-wire or 3-wire sensor can technically be used, it is highly recommended that a 4-wire sensor be used for the highest accuracy and most reliable signal. Though the narrow band sensors can be considered more inaccurate when compared to the wide-band (0-5v) sensor, it will provide a very good feedback loop for tuning and closed loop operation. The sensor should be placed relatively close to the exhaust source, typically after the exhaust manifold and turbo (if used). If a location further down the exhaust is required, the use of a heated 4-wire sensor will ensure that the sensor is properly heated for an accurate signal. With the advent of affordable Wide Band O2 kits, Wide Band accuracy can now be implemented with any of the systems. If the kit you have provides a "translated 0-1v output" such as those provided by www.innovativemotorsports.com , this can be fed directly into the ECU to replace the narrowband 0-1v input.

Timing Phase Angle Reference (TRGIDX): The " 882-C " systems can use one TDC timing reference for camshaft position. Though this signal is not required for proper sequential function, for true valve-timed sequential function this timing reference should be used for waste spark. Coil on plug systems can determine phase, when the engine starts. Thus the user can calculate individual fuel injector activation based on a camshaft trigger reference. Any proper hall-sender will trigger off a steel pin mounted in the cam gear pulley or even off of a camshaft lobe for example. This is a 5v output.
The " C " system is degree based, thus injector firing can be determined in degrees from TDC. Thus, the only need for the timing reference is for starting, the TRGIDX lets the ECU know which TDC cycle is the compression stroke, not exhaust. This input can be deleted, however, as the ECU has an 80+% chance of determining this on its own. A backfire will result in the occasion that it does not find the correct cycle, the ECU should simply be powered down and back up and another attempt will likely result in a start. Once the ECU determines the proper cycle, this input is no longer used until the next starting.

D. RPM Reference (VRA/TRA):

The Stage " 882 " stage XX ECU will trigger off most factory type distributor hall senders. Proper function will depend on the correct number of trigger-windows (one for each cylinder typically) and the proper rotor phase angle in relation to hall sender. In order to determine this, the hall sender should be lined up with the leading edge of the trigger window (as it transitions from steel to air) as the rotor is lined up with the contact trigger in the distributor cap. Typically this can be adjusted by moving the rotor in relation to the hall sender in most application. This may require re-keying the distributor rotor onto the shaft of the distributor, or re-bonding the rotor onto the shaft in the correct position.
The unit can also be triggered off of pins on a camshaft reference wheel. Pins (one for each cylinder typically) can be mounted in the cam-gear, for example, as in the timing reference signal. Unless a proper RPM signal can be established, the ECU will not inject the correct amount of fuel or activate the fuel pump trigger, etc. A distributor with vacuum and mechanical advance can be used when the V. R. sensor inside is calibrated, then the jumpers set inside the " 882 " box. # J-4 & J-3

The ECU-882-C ECU requires a crankshaft mounted toothed wheel to trigger RPM. Due to newer factory Audi applications running a 60-tooth wheel, the current " C " box is compatible with a 60-tooth wheel, actually 58 teeth, more applications will be developed in the future. 2 missing teeth tell the ECU that TDC is coming, the # of teeth between TDC and the missing teeth is configurable inside the ECU. The " C " ECU will run either a Hall sender or VR sender, to determine which sensor should be used, contact the dealer or specify at the time of order. (Jumper setting) Mounting of either sensor is critical, and should meet the following criterion:

- The mounting bracket must be VERY rigid, if it is moveable by force of the hand, then the bracket should be strengthened.
- The air gap target range for hall senders should be in .02 to .04", for VR senders should be approximately .05". When using a VR sensor, if a miss or backfire is detected, the airgap may be too small, or the missing teeth may not be low enough, contact your dealer for technical advice.
- Runout for the toothed wheel should be less than .002", excessive runout will cause the ECU to loose its reference and may result in a backfire miss or complete loss of spark.
- Wheel material should be magnetic steel and very rigidly mounted.
- Hall or VR sensor wiring must be shielded and routed away from any injector, coil, or alternator wiring.
- Internal jumpers MUST BE CORRECT (J-3 & J-4) when using a VR sensor as opposed to Hall Sensor, ensure that both jumpers are changed, and that any board protective coating is removed from the board pins with a solvent on a rag. The ECU cover must first be removed to access the jumpers.

Output Component Requirements

The ECU creates electronic output signals to several components. To ensure proper operation, these components should be of the proper specification:

Electronic Injectors: For proper operation all Electronic "solenoid style" injectors can be used. These should measure approximately from 1-14 ohms. Sizing should be determined by the user or with the assistance of your dealer.

Idle Air Control Motor: For proper operation the user should source the dealer specified IAC. Though this IAC appears to be standard "GM", there are many different units with different pin-outs. To avoid confusion and mis-operation the proper unit should be sourced from your dealer.

Fuel Pump Relay Trigger: The unit will trigger ground to any standard 12v relay. The fuel pump should always be triggered via a relay, as the output has not been designed to support the amperage required by a high output fuel pump.

Other Component Installation Considerations

Fuel Pressure Regulator: Any manifold referenced fuel pump regulator can be used to regulate pressure to a minimum of 3 Bar or 40-45psi. An adjustable regulator is recommended, though not required, for an added level of tune-ability.

Fuel Pump: There are many considerations for the system fuel pump. Typically a fuel pump provided originally on a Bosch CIS (Continuous Injection System) will provide good flow at the lower EFI pressures. These pumps came OEM on many VW, Audi and other European cars. To determine proper fuel pump capacity fuel pressure should be monitored under max output. There are also many aftermarket options as well.

Boost Control: Boost can be controlled by manually manipulating the pressure signal to the wastegate or by using an outside electronic boost controller. Currently the ECU will control boost pressure to a wastegate via one of the GPO channels (General Purpose Output). Many different strategies can be applied, but most will involve pulsing a frequency valve to bleed or modify the wastegate pressure signal. This can be mapped via a GPO using various parameters. NOTE: If the range of the frequency valve is very limited using the GPO output, insert a 50-100V, 3-5 amp Diode across the solenoid terminals to increase its effective range. The Cathode should go to the Power side, the Anode going to the ground side (ECU output)

Tachometer: A standard tachometer output, high side, is provided in the ECU that can be connected to the factory or aftermarket tachometer input.

Ignition Coil: Most factory type and aftermarket ignition coils can be used with the ECU since the ignition output is configurable. If there is any concern with coil compatibility, any of the standard MSD coils will work well such as the MSD-8203. Very high boosted application will require the highest quality coil available, experimenting with some different models will prove the best results.
For the “ C “ system, most factory type coils can be used, all 2-wire coils are compatible, most 3-wire will be, that have a ground. Most 4-wire coils may not be compatible as they may contain an integral driver, contact your dealer. The ECU-882-TTL-X box, can then be used, ask for assistance.

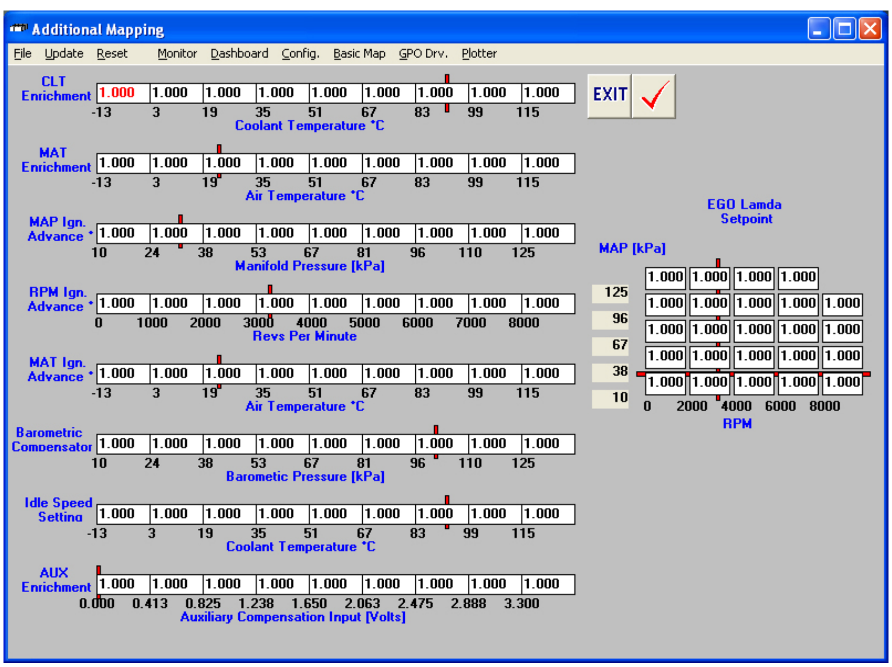
Ignition Components: Standard factory type or aftermarket replacement part will work well in distributor and spark components.

C. **Tuning Philosophy**

Every ECU is provided with a sample map that should get the motor fired on more or less the first try. If all inputs are provided properly getting a motor to fire should be quite simple. Every motor and application are different, however, and require specific and precise tuning. This section will attempt to outline the basic steps and methodology behind tuning the ECU. It needs to be emphasized, however, that each user needs to interact with the software, over time, to gain a more intimate understanding of the effect of different inputs the many tuning fields that the “ 882 “ software interface provides. Tuning an engine is much like playing a musical instrument, no written document can give simple steps that guarantee ability - only practice will make perfect!

Initial Adjustments: Before any tuning is attempted, closed loop programming should be disabled, this can be done in the Dashboard window or by entering a 0 for EGO loop activation in the Configuration window. In order to estimate current air/fuel ratio the “Cur Lamda” value in either the Dashboard or Basic Map should be referenced. Generally, values of .85 are very rich and values of 1.0 are very lean. Generally, using a narrow band O2 sensor, values in the .9-.95 will be best for idle and part throttle, and .84-.9 for WOT.

Before attempting to start the car, ensure your computer is communicating with the ECU. Though each ECU comes with a sample map, certain fields may need to be modified according to the installation. One of the primary adjustments may relate to ignition timing. Preferably set the ignition distributor to TDC or 0 degrees of advance. Stock settings can be used as well, but in the case the distributor does not use any mechanical advance or retard, 0 degrees will be best until the motor can be started and timing set dynamically with the motor running. If in the case that a significant of timing advance exists, timing retard can be entered into the 0-1000 RPM field of the timing retard field in Additional Map, shown below, which will be interpolated across the range between the value entered and the 0 in the 1000-2000 field:



Screen Shot A

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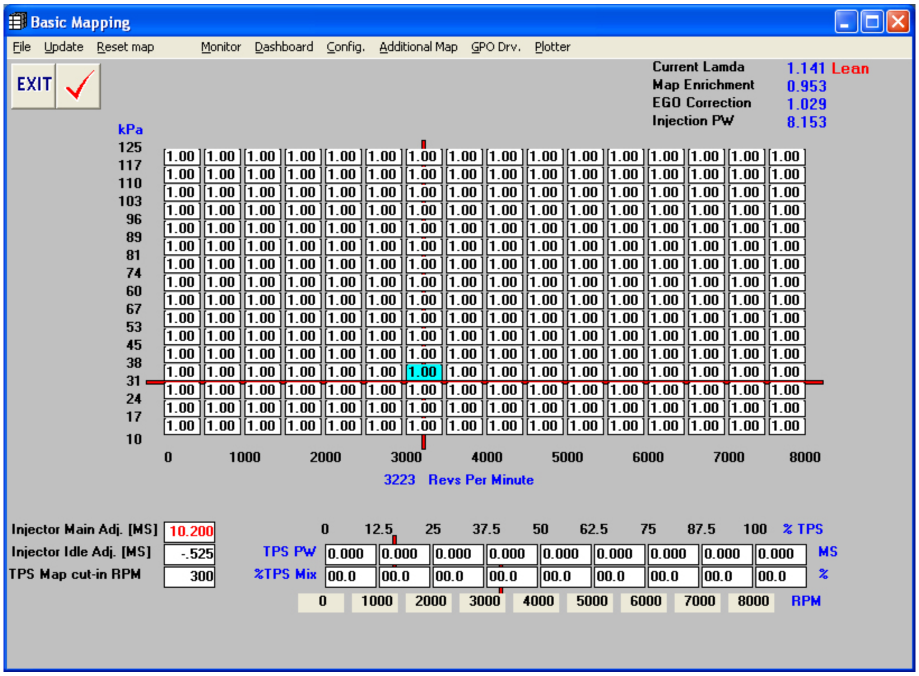
Getting the motor started: This is the first tuning step. A fully charged battery is important and proper wiring and installation of the unit is implied. If the motor cranks but will not start, it likely needs more fuel. The two main fueling parameters for the ECU are the Injector Scaler and Offset, seen in the page view below:

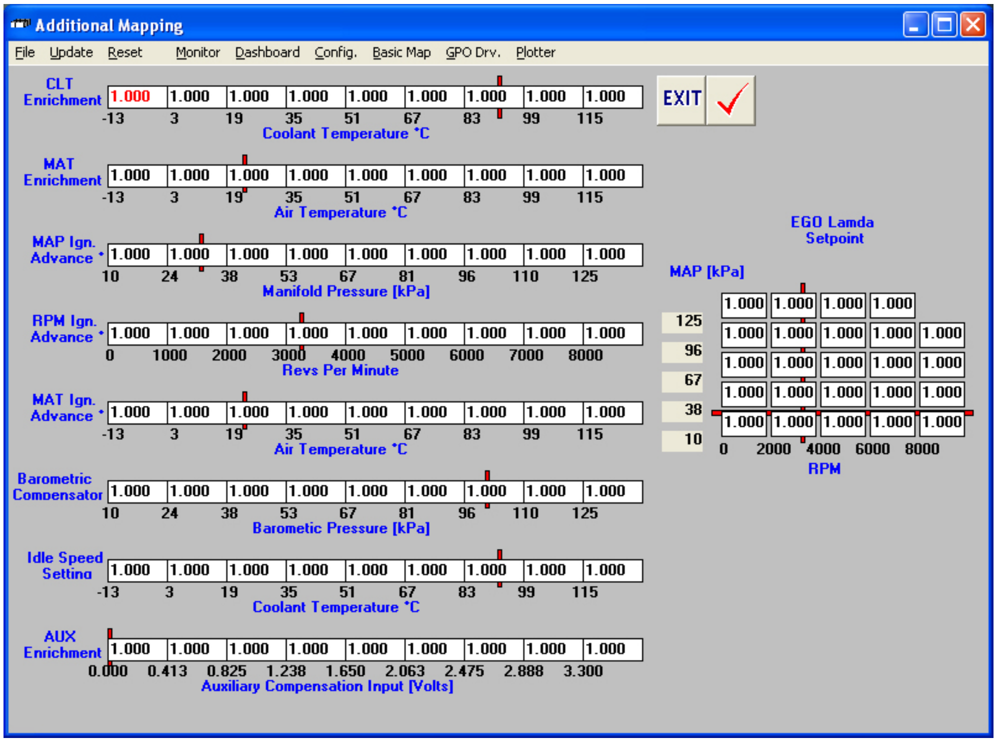


Screen Shot B

The injector scaler is the main fueling parameter for the ECU, and determines the base maximum pulsewidth (PW) at the maximum MAP pressure. Thus, is 10.2 is entered as the scaler value, the base MAP based PW will be 10.2 at 255 kPa (for the 2.5BAR ECU). If more fuel is needed to start the car, slowly increase the scalar value until the motor starts to catch and starts. Once the motor is running, the offset value can be manipulated to create a more stable idle for the time being. The offset value is usually considered a trim adjustment, similar to the idle and progression circuit in a carbureted engine. This parameter is typically near zero, or even slightly negative in many medium performance applications. In higher performance applications, where the idle manifold vacuum is low, this parameter can be somewhat more negative, where the calculated pulse width at idle is too high due to higher manifold pressure (poor vacuum). The negative Injector Offset parameter subtracts “if negative” from the basic pulse width so that the resultant pulse width is what is needed to control the engine. Usually a value greater than .5 in the offset field indicates that the overall scaler # is off and should be increased to deliver more fuel at all rpm and MAP levels. Generally a Lambda of .9-.95 is required to achieve a good idle.

Getting the motor running through the RPM range: Once the motor is at normal running temps, and a stable idle has been achieved, attempt to run the motor in gear, additional adjustments to the Scaler can be made to get good fueling throughout the RPM range. Keep all the values in the large kPa x RPM field 1.0 for now, as they should only be used for fine-tuning in the later stages. Once the motor runs acceptably through the lower RPM range at lighter loads, slowly the scalar can be continually adjusted for higher RPM and full load conditions.

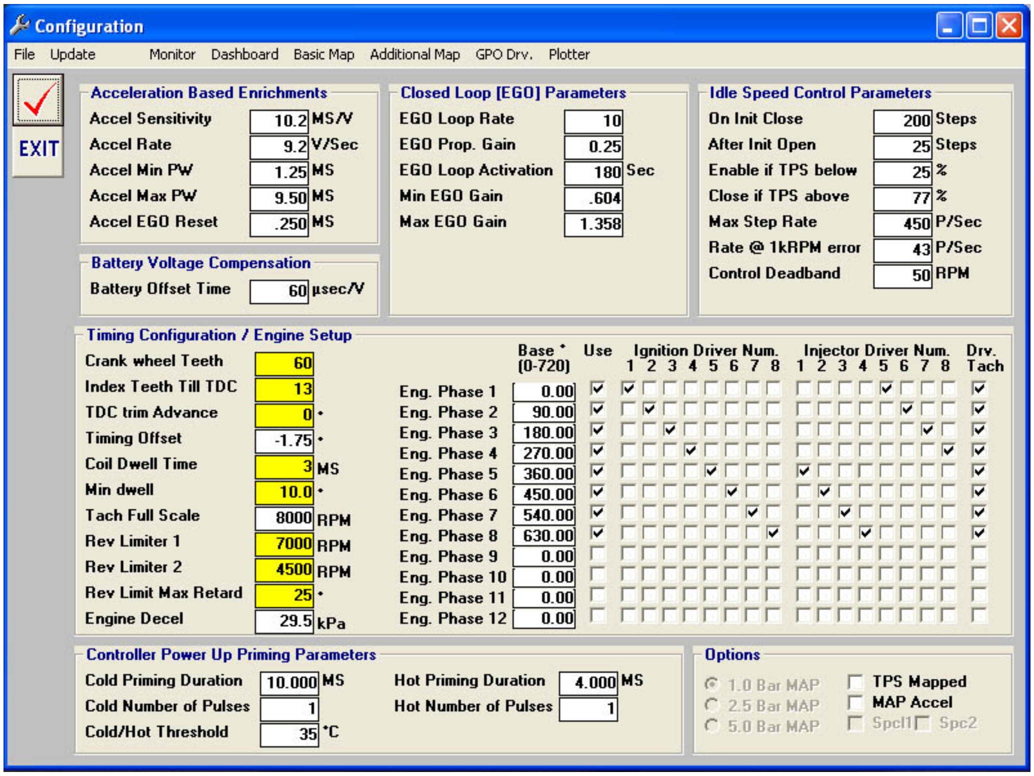
Tuning for WOT and full load: At this point, its wise to find a long stretch of road or a rolling road dyno for these stages of tuning. If on the road, often a long, uphill stretch of road can help in loading up the motor while keeping speeds down. Again, carefully throttle into WOT and build up load and power to the peak. Carefully observe the EGO, most turbocharged applications should tune for an EGO of .88 to .90, this correlates to approximately a 12:1 air fuel ratio. The main fueling parameter for WOT max power should be the Scaler value. Once full power fueling is set, then part throttle, light load and idle mixtures can continue to be fine-tuned.



Screen Shot C

Ignition timing considerations: During this time its important to consider ignition timing as well. Generally ignition timing can be advanced at idle and light load conditions, and retarded at higher RPM and full load conditions. Up to 30-40d of advance under light load conditions will give excellent fuel mileage and smooth running.

Notice that 20 degrees of initial retard can be entered in the RPM Ign Retard 0-1000 field to enable smooth starting. This is interpolated across the fields however, so that at an idle of about 900 RPM, the amount of retard is much less that 20 degrees, in actuality its calculated to only 2 or 3 degrees. This is because the 20 degrees of retard is applied at only 0 RPM and interpolated to the value in the field above it (1000-2000) which is 0. This strategy can be used in all the ignition timing fields to produce a smooth timing curve that can anticipate full load conditions while providing excellent response, smoothness and efficiency at low load conditions. For example at 2000 RPM with a light load 40 kPa the full 35 degrees of advance is applied, but under full load higher RPM conditions a full 15 degrees of retard is applied. Generally high output turbocharged engines will run well on low octane fuel with somewhere under 15-20 degrees of advance.



Screen Shot D

Running the " C " system will also require trimming off any ignition error. By clicking the "Set timing to 0" field in the Dashboard, a timing light can be used to determine the actual timing error between what the ECU is calculating and what the motor is actually getting. This can effectively be reduced to ¼ degree or less.
Also, the configuration of the ignition drivers must be set up to ensure the right coil fires on the right cylinder at the right time. This is done by determining engine phase degree timing and correlating this to the proper ignition driver. The above example shows a typical 8 cylinder, with injection firing 360 Deg off from ignition. Using the Base degree individual cylinder timing trim can easily be accomplished as well by adding or taking away degree timing from each phase. Because the ECU can be set up with "virtual phases", and the ECU determines RPM by the # of active phases, driver tach check marks are provided to ensure accurate RPM readings.

Other Configuration Considerations

Rev-Limiter: "C" ECU's include a highly advanced rev-limiting circuitry to ensure safe, precise limiting of RPM. The Rev-Limiter is a "dual stage" configuration, first pulling out a pre-programmed about of timing, then shutting off fuel and spark once timing retard has been realized. Though there are 2 Rev-Limiters included in the Configuration screen, Rev-Limiter 2 should be used to limit maximum engine RPM due to the electronic design of the circuit. The first stage is timing retard, typically all that is needed to suppress the torque output of most motors is bringing timing back to after 30 degrees. Thus, if 20d of advance exist at full load and RPM, then –50 degrees for the Rev-Limiter will be enough to slow the motor down before the second stage fuel cut of the Rev-Limiter is realized.

The second stage of the Limiter is a fuel and ignition cut, which shuts off power to the injectors and coils - which prevents any fuel/spark from taking place.

The rpm window in which first the timing retard is applied, then the fuel cut, is determined by the formula below, and is dependent on the full scale tach being used:

soft_rev_rpm_start = rev_limit value entered
RPM_FS=Full Scale Tach RPM
soft_rev_rpm_end = rev_limit + (.032 * RPM_FS)
hard_rev_rpm = rev_limit + (.04 * RPM_FS)

Thus, the timing retard will be manifest over a range of rpm up until the fuel/coil cut. For example, using round numbers, if a tach full-scale of 10000 and a rev limit of 8000 are entered, the soft rev limit begins from 8000 rpm to 8320, with the hard cut at 8400.

Also, it is important to note that for proper max RPM rev-limit function, both Rev Limiter 1 and 2 should be entered as the same value, unless Anti-Lag/Launch Control is being used (described below).

Launch Control and Anti-Lag: "C" ECU's also provide the option of a second rev-Limiter, (Limiter 1) which, when used in conjunction to the Aux. Input, can limit engine timing and rpm to serve the purpose of Launch Control and Turbo Anti-Lag strategies.

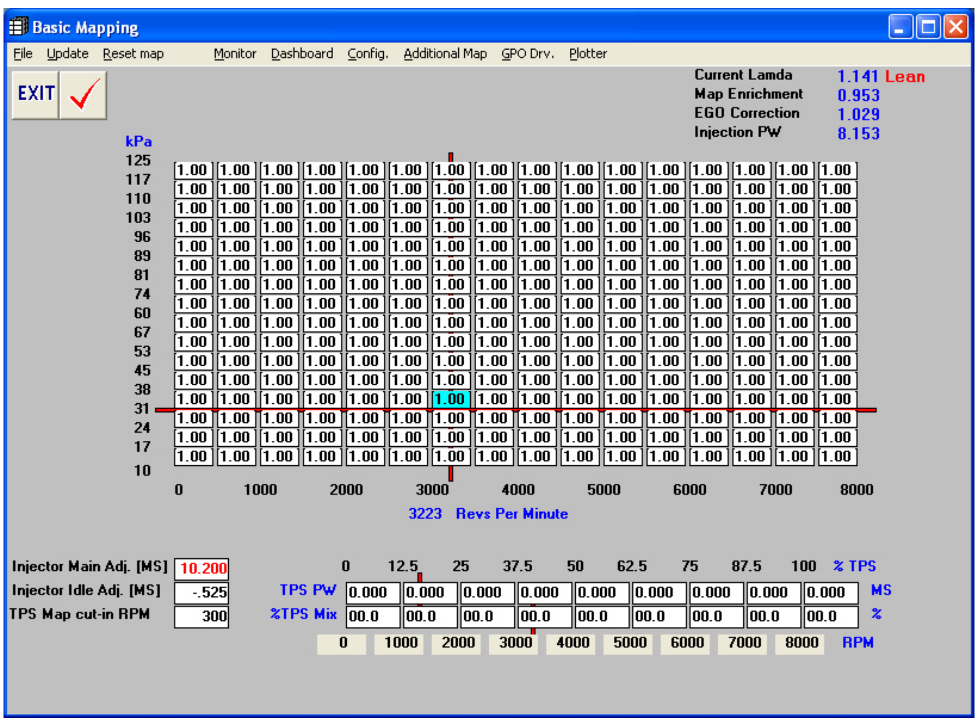
To properly activate Rev Limiter 1 for the function of Launch Control/Anti-Lag, the full voltage of 3.3/5v (depending on the ECU manufacturing date) should be fed to the Aux. Input, activating Rev Limiter 2 as the main engine speed limiter. Thus, Rev-Limiter 1 will be activated when voltage is cut (using a switch to break the circuit) below 1.67v, allowing Rev-Limiter 1 to be programmed with a lower RPM setting for the use of the above function.

Whenever ignition timing is retarded past a certain point, the engine will no longer have the ability to accelerate; this serves the purpose of holding engine rpm and load well. ***Launch Control*** can be facilitated for the purpose of holding engine rpm at a set rpm point - drag racing, for example, where a set rpm launch point is helpful. The Aux. Input can be brought to below 1.67v by using a grounded switch when fed by ECU sensor (CLT, TPS, etc) 3.3v output into the Aux. circuit. Remember that the fuel mixture may also be changed in accordance with the value placed in the appropriate cell. This switch can be placed on a steering wheel button, the clutch pedal, 1^{st}-gear shift position, etc. NOTE – a 10k resistor should be used inline from the voltage source to the Aux. Input if it is taken to ground to reduce voltage, ensure this is wired properly to prevent damage to the ECU. ***Anti-Lag*** can be facilitated in a similar means to launch control, in fact it can be the same exact setting, the idea is to pull timing back under WOT so that max. fuel and air can be pumped through the motor while reducing torque to much lower levels. For example when entering a turn, typically in a turbo car the driver would lift off the throttle until the apex of the turn is reached, at which point WOT would be applied, the turbo would spool, and the engine would accelerate out of the turn. Using Anti-lag, instead of lifting when entering the turn, the 1st Rev-Limiter can be applied via push button on the steering wheel so that the turbo never spools down. WOT is held until the apex, at which point the 1st Rev-Limiter is de-activated, ignition timing is restored, and thus engine power. The turbo never stops spooling and turbo lag problems are eliminated. This is essentially an electronic way to left foot brake to keep the turbo spooled.

Cold/Hot Start Tuning: This is adjusted in the Configuration window, pulses of a set PW and number can be programmed. These parameters should only be tuned when cold or hot starting. Typically it takes quite a bit of fuel to get a motor started, don't be afraid to use a lot of fuel here if necessary (5 pulsed of 9.0 for example).

Cold Running Tuning: The main parameters for adjustment for cold start tuning are the CLT Enrichment in the Additional Mapping field. A cold motor needs more fuel to overcome fuel condensation on cold metal surfaces and cold, high viscosity oil. These parameters should be tuned during the relevant temperature range. MAT (Manifold Air Temp) calculations should be made for ambient running conditions but not so much for "cold starting" fueling.

Tuning with Throttle Position: The " 882 " software allows tuning for throttle position as part of the "PW mix". Tuning using throttle position is accomplished through the TPS matrix at the bottom of the Basic Map Window. This matrix allows a calculated PW value to "offset" the main PW calculated value. Two parameters interact to create this calculation, the TPS PW and the % TPS Mix. Thus, if at idle there is a need to lean out the fueling, and the existing PW is 1.6, this value can be offset with the strategy in Screen Shot E below:

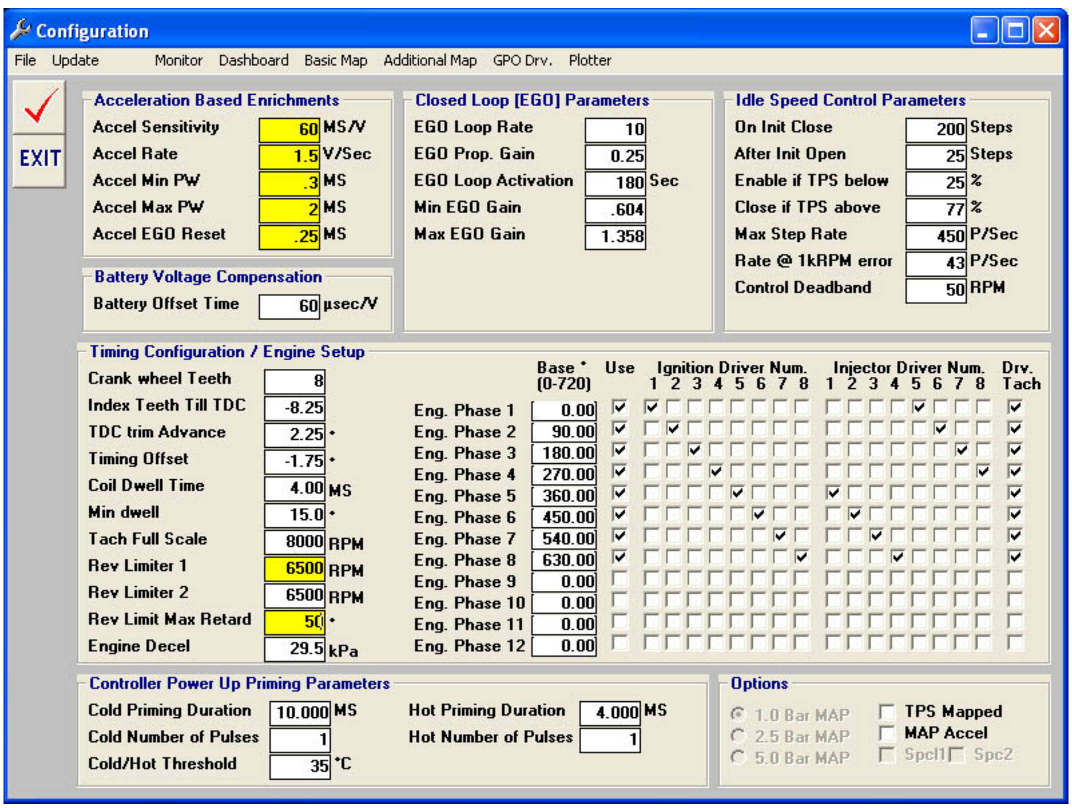


Screen Shot E

Thus, the 1.0 in the 0-1000 RPM range will offset the calculated 1.6 by mixing in 1.0 MS with 1.6 at a mix of 30%. The resulting pulsewidth will end up approximately a 1.55, which may be just the right amount of fuel for the idle condition being tuned for.

Generally the TPS matrix should only be tuned to address part throttle and lighter load conditions. Notice in the above matrix how the percent and PW values taper off into the higher RPM to the effect of 3% at 5-6000 RPM and 0% thereafter. Again, WOT tuning should be accomplished solely with the Injector Scaler field. One thing to be careful of, if the motor RPM are at 1500 per se, but WOT is engaged, the TPS PW will engage a higher value in the 75-87.5% range. If a large PW value of say 9.0 was in that field as opposed to the 3.0, the 9.0 would be mixed at a % of 35, which would flood the motor with too much fuel and cause a bog. Thus, the strategy should show a taper off into higher RPM and load conditions to prevent driveability problems as described. Initially tuning should be done with all zeros in the TPS matrix, and once base tuning is accomplished slowly integrated to fine tune idle and part throttle fueling conditions. The TPS blend table may not be used in motors with strong vacuum at idle and part throttle conditions, which respond very well to MAP Matrix tuning only.

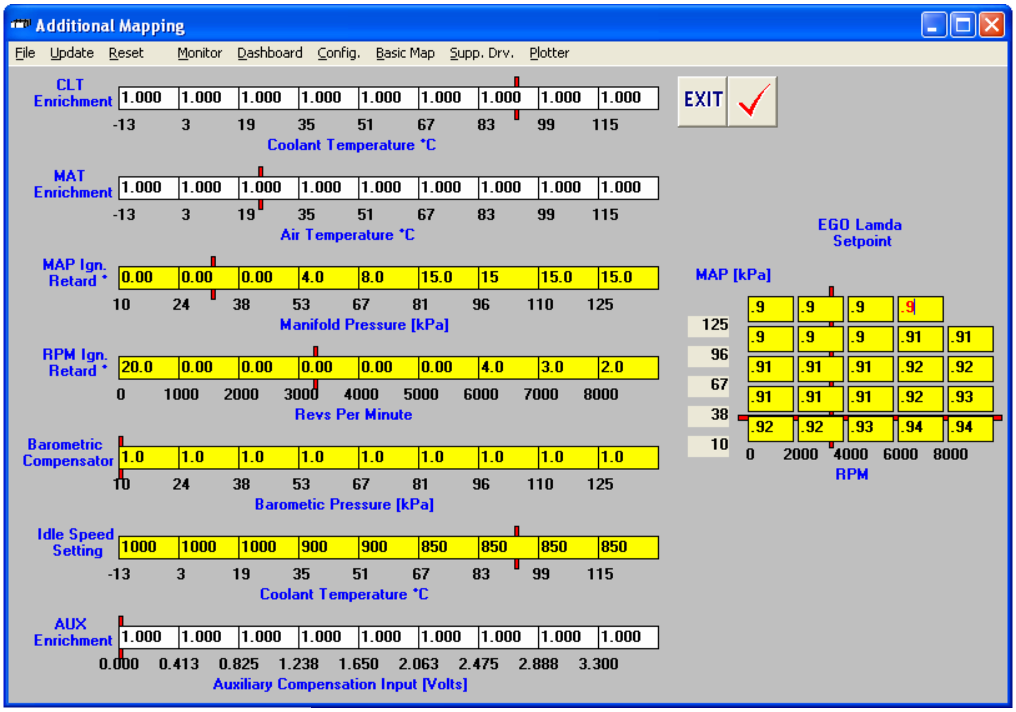
Acceleration Enrichment: When the throttle is quickly engaged the motor is challenged to accelerate as a large amount of air enters the intake manifold. Thus, a corresponding amount of fuel must be injected to feed this demand. Acceleration enrichment is tuned in the Configuration window. The 5 fields determine the acceleration fuel PW, and are described in the ECU Manual. See the strategy Screen Shot F below:



Screen Shot F

Careful tuning of these parameters will ensure fast engine response to acceleration conditions and smooth driveability.

Tuning with Closed Loop [EGO] Parameters – Closed loop parameters are set in the Configuration Window as seen below is Screen Shot F. Tuning for the closed loop programming is done in the Additional Map window. The desired EGO value is entered into the matrix based on MAP and RPM. The closed loop tuning parameters should be integrated once a good base tuning map has been created, or in other words, the best possible parameters for engine running, excluding the involvement of the Closed Loop programming. In the ideal tuning situation, the ECU would function without the assistance of the closed loop programming. In order to program a good performing



Screen Shot G

motor in as many varied conditions as possible, the base tuning maps must be complete and compensate as well as possible without the involvement of closed loop. Once this kind of map has been created, then and only then should the Closed Loop Parameters be integrated to compensate for the conditions that were not addressable with the base maps. All initial tuning should be done with a 0 in the EGO Loop Activation field to disable EGO correction. Once EGO correction is activated, the Min and Max EGO Gain measurements should be help to a range of 10% on either side. In other words, the Min EGO gain should be held to .9 and Max to 1.1. If the EGO correction does not perform well with these parameters, then the base tuning maps likely need further adjustment. This is a good tuning benchmark to maintain.

Tuning with the Basic Mapping MAP x RPM Matrix – (see Screen Shot E) The MAP x RPM matrix is the second most important tuning parameter after the Scaler and Offset inputs. This matrix allows fine-tuning of the fuel curve based on precise and narrow pressure and engine speed points. Values across the matrix are interpolated between cells (not stair-stepped as it appears) and have a percentage influence over the final PW calculation. Thus if a .95 is entered into a particular cell, as the engine speed an manifold pressure reference lines intersect in that cell the .95 value will be interpolated (as a percentage calculation) with the values of the cells around it to effect a leaner PW calculation. Conversely, if a 1.05 were entered it would interpolate into a richer calculation. Thus, if specific tuning points are either lean or rich after the best Scaler and offset inputs, this matrix can be used to address those narrow ranges of fueling. All initial scaler and offset tuning should be done with the matrix values at 1.0. A good tuning benchmark should be to keep values in these cells between .8 and 1.2, and 1.0 at WOT, full power.

Tuning Idle Air Control- The ECU uses a "GM Style" idle air motor. This is a stepper motor and controls the throttle-body-bypass of air by stepping a plunger in small increments, thus giving it great accuracy and control. If tuned properly the ECU will control this motor as accurately as any factory type system. IAC Parameter explanations below (see Screen Shot F for sample settings):

On Init Close: The IAC will close this many steps on startup. This value should be more than the After Init Open parameter. Should also be less that 250 because the IAC stepper only seems to have 200 to 300 total steps from closed to open. This parameter ensures the IAC is fully closed upon startup and gives a repeatable reference point for the IAC to work off of.

After Init Open: This is the target IAC position to start the car. The IAC will open this many steps. This will depend on your throttle stop setting, the lower the throttle-stop-idle setting you have the more steps will need to be opened to enable the proper idle speed. It is generally recommended that the throttle stop be set to give good idle speed with an After Init Open value of about 100.

Enable if TPS Below: The IAC is only adjusted when the throttle is closed. It detects that the throttle is closed when the TPS value is less than this parameter. If the closed throttle reading "on the monitor" says 15%, set the Enable if TPS Below to 17% or so. Do not make this value too close to the TPS closed point or temperature or small mechanical changes will haunt idle performance. Set to 0% if it's desired to disable the IAC adjustment.

Close if TPS is Above: The IAC will quickly and automatically close if the TPS goes above this value. This will keep ensure from loosing boost out of the IAC. When the TPS drops below the "Enable if TPS Below" value, the IAC will reopen to the "After Init Open" position, and idle will resume. Set to 101% to disable IAC closure, like if there are problems with stalling on throttle closure. Generally on boosted motors this value should be set close to 40% or the throttle point where real boost begins to build.

Max Step Rate: This sets the speed at which the IAC is stepped when during Init, and sets the max rate that it will ever be allowed to step. Generally most IACs won't move properly for values above 500 "Hz", so be careful. This value shouldn't be set too close to the IACs capabilities because it may not work at higher temperatures or under some boost conditions when the IAC is loaded more.

Rate at 1K error: This sets the speed that the stepper will move as a function of the error between the actual engine speed, and the speed set point table in Additional Mapping. Any value in here is generally fine since the ECU will never try to move the IAC faster than the Max Step Rate value. This parameter controls how the idle stability versus correction speed compromise is made. If the value is too high, the idle will oscillate or bounce, too low and the engine speed adjustments may be sluggish or stall the engine before the adjustments can be carried out. Start with small numbers 20 or so, then move up to higher values until there are stability problems, then divide the number by 2.

Control Deadband: This sets the minimum error in RPM that must exist in order for adjustment to be performed. Setting it to 50 with a RPM set point of 1000 would disable IAC corrections from 950 to 1050 RPM. If this value is set too low, the idle might oscillate - also the IAC may overheat if it is continuously adjusted when with only trivial errors in idle speed

Speed Set Point Temperature table: (see Screen Shot C) This is set in the 2D-map screen under the Additional Mapping Window. This matrix is quite straightforward, idle speed is set according to water temperature. Colder temperatures may require a higher idle speed and can be entered here.

Conclusion

This concludes the ECU-882 ECU tuning manual. You should have been given a better idea at how to approach the overall tuning effort required to create a smooth running, powerful and responsive motor. No manual can replace cause and effect tuning experience, so don't be afraid to try different tuning values and strategies. By keeping many different maps saved this can be done easily and safely.

It is important to remember that no factory system will give the flexibility of tuning like the " 882" ECU will, and excellent results will await the patient and perceptive tuner. This ECU can fuel and time any engine up past 20k rpm, it is immensely capable, as you will be with some experience and increased knowledge. The important thing to remember is that all tuning experiences, good and bad, will add to your knowledge and experience base - us this to improve your tuning aptitude, and enjoy the learning process!

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