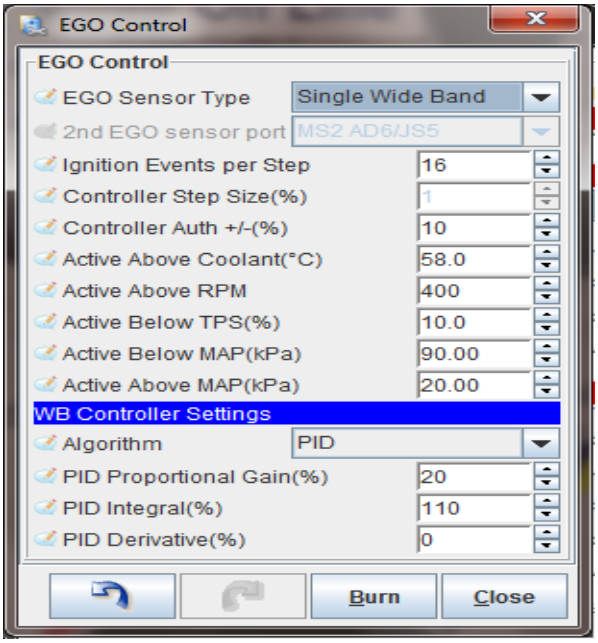
Lambda Sensor Settings

The MS ECUs can read from either a narrow band lambda (0-1V usually) or from the controller of a wideband lambda (0-5V usually). A wideband lambda sensor needs a controller to drive the sensor and to give an output that's suitable for the MS ECU. Most sensors are narrow band and they only tell the ECU that the mixture is rich or lean of stoichiometric (14.7 Air:Fuel Ratio). If you have bought a wideband lambda then the controller tells the ECU the whole range of AFR, so it is by far a more accurate way of tuning, especially for power. These can usually be programmed so the output voltage can mean different values. I like to see them set for 0-5V 10-20AFR as this gives the used AFR range over the maximum range on the output voltage, therefore it should be the best resolution.

In Tuner Studio go to **Exhaust Gas Settings** or **EGO Control:**



EGO Sensor Type : Narrow Band or a Wideband. A wideband's output works in the reverse to a narrow band, hence why you need to tell the MS which one you have.

EGO Switch Point: This is to tell the MS ECU what voltage stoichiometric (14.7AFR) is from the sensor you are using. It is 0.5V on a narrow band.

Ignition Events per Step: set this to a value that would switch about 4x a second at your average cruising speed.

4 cylinder assume 3500rpm cruise set Ignition Events per Step to : 29

6 cylinder assume 2500rpm cruise set Ignition Events per Step to : 31

8 cylinder assume 2000rpm cruise set Ignition Events per Step to : 33

You can calculate your:

O_2 adjustments per second = ((rpm/120) * cylinders) / ignition events per step

> Please Note:
> If you decide to run without a lambda sensor (either you remove it after tuning or your tuning on a rolling road without a sensor) then set the **Controller Step Size** to ZERO!!

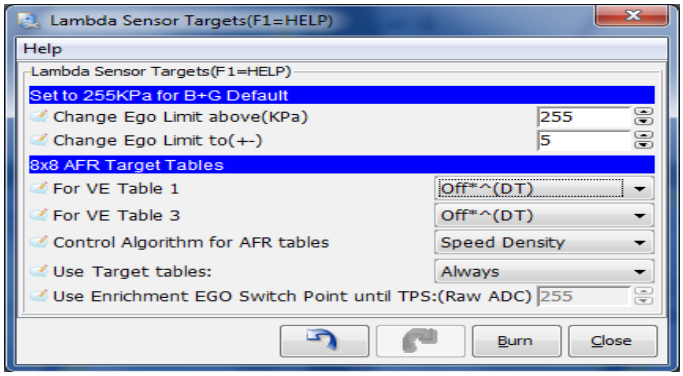
Controller Step Size: This is how much the ECU will adjust the fueling by, so if the engine is leaner than the target point it will add 1% to the fueling table. If it is rich it will decrease fueling by 1%. It then waits for the Ignition Events timer before doing the same again.

Controller Authority: This is the maximum the ECU is allowed to adjust the fueling in either direction (Lean or Richen)

MS2- Extra and MS3 has the option for the control **Algorithm** which can be **Simple or PID. Simple** is where the ECU looks at the target AFR and compares it to the actual value. If its lean it adds the value you set in **Controller Step size** to the fueling, if its rich it subracts the same value from the fueling. This means its constantly chasing the target AFR in steps up to the **Controller Authority %. PID (Proportianal Integral Derivitive)** is a control method widely used in industry to control systems in a closed loop setup. It starts by calculating an error between its current position and the target position, in this case the AFR target value and current value. There are 3 parts to the control system:
P (Proportianal Gain): Determins the reaction to the current error calculated.
I (Integral Gain): Determins the reaction based on previous calculations.
D (Derivitive Gain): Alters the reaction based on how much the error has changed.

A bit of trial and error is needed here, but generally 10-20% is good in Proportianal, 60-110% is good in Intergral and I leave the Derivitaive at Zero.

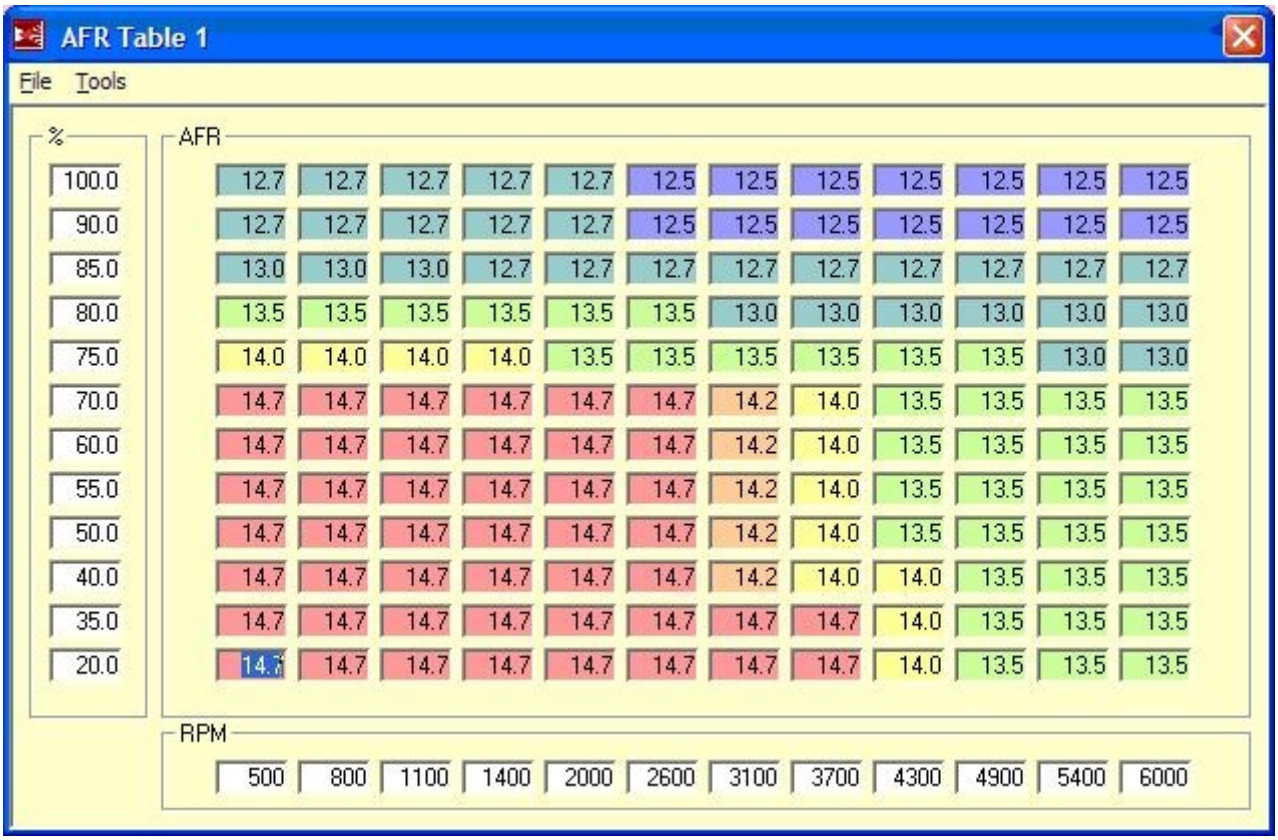
In **MS1-Extra** there is also a function to change the facility to change the EGO Authority limit when above a certain KPa (boost) value. This is mainly for boosted engines when the lambda could be reading slowly and you don't want the EGO to correct by as much as it can when cruising. In this box you will also find the Target Table selection. If using a wideband then select **For VE Table 1 as ON,** this will enable the target AFR table, so you can get the ECU to aim for different AFRs depending on load, etc.
The **Control Algorithm for AFR Tables** needs to be set the same as your Constants page (Speed Density for MAP or Alpha_N for TPS based setups)



If using a **Narrow Band** sensor, these usually have 1-4 wires, the heated versions are the better ones to use. A narrow band sensor will give an output of 0.5V when the mixture is at stoichiometric (14.7AFR), this is the most efficient mixture for cruising so should be used as the EGO Switch Point in the Exhaust Gas Settings.

If you're using a **Wide Band** lambda sensor and controller then the ECU can correct the mixture at various loads using an AFR Target Table. These tables can be set for use in **Lambda AFR Settings** for MS1-Extra, in MS2-Extra and MS3 ECUs they are automatically used when you tell it you have a WideBand lambda.

If you chose not to use the AFR table in MS1-Extra, then simply find out the sensors output at stoichiometric (14.7) and put this in the EGO Switch Point and ensure you select Wide Band rather than Narrow Band!!!



MegaTune Settings

MS1-Extra -- MS2-Extra and MS3

MS1-Extra:

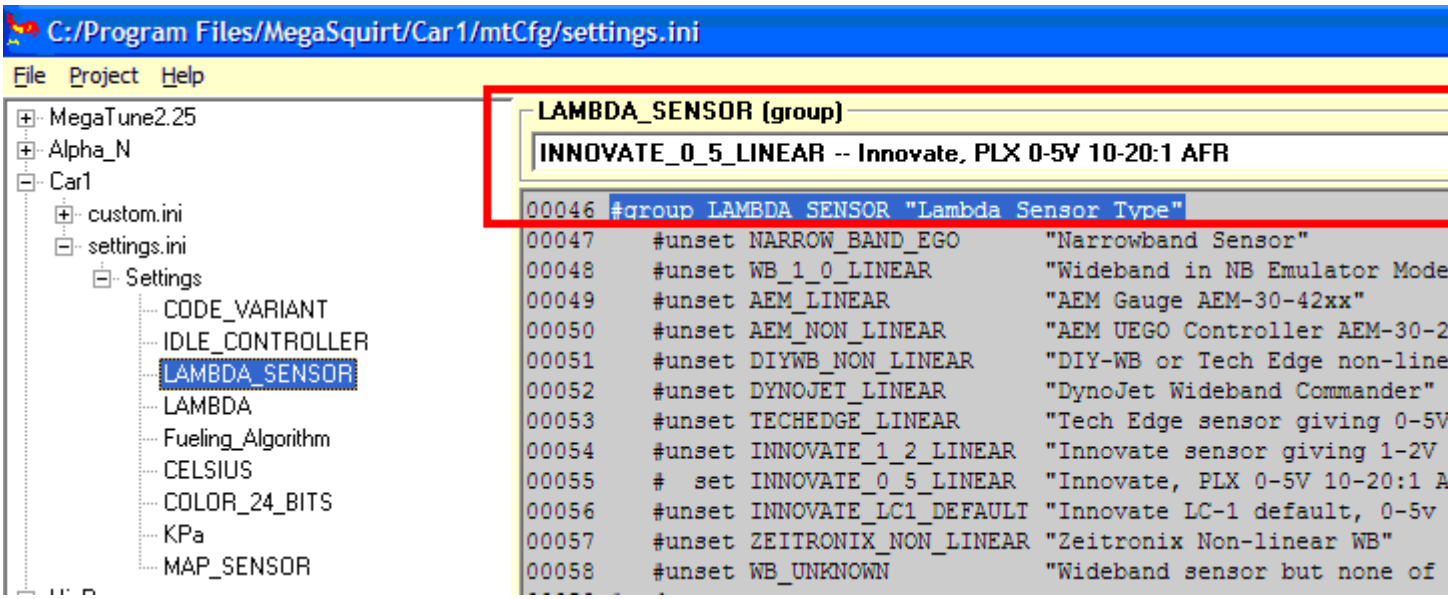
If using **Tuner Studio** then you can select the lambda sensor your using in the **Project Properies**.

In order for the MegaTune software to be able to distinguish between what wideband sensor you are using, and therefore tell what the output voltage means. To do this use the MegaTune installer on the CD I provide or the installer on my downaloads page. You can select either a LC-1 or Techedge wideband during the install, but if your using another type of sensor or you didn't use the installer then you'll need to use the Configurator within MegaTune. To do this run MegaTune and select:

File - Configurator

Then select

Car1 - Settings.ini - Settings - Lambda Sensor



Now select your WideBand Lambda sensor from the list highlighted in RED here. Save and exit the program. The next time MegaTune is opened it will work for your lambda sensor

MS2-Extra and MS3:

If you are using a wideband lambda sensor in MS2-Extra or MS3 then you'll need to set the ECU up for that sensor. This is easilly done by going into Tuner Studio and selecting Tools - Calibrate AFR Table. With the MS ECU powered up and on-line select your wideband sensor from the list and click OK