# Emtron Boost Control Introduction……

Production based vehicles often produce more power than what we used to run in dedicated drag race vehicles. Due to advances in engine design and turbocharger technology, high horsepower levels are easily attained. Not so easy is how to tame this new found power. I have spent a lot of years trying to "tame the beast" of boost so to speak in many forms of motorsport.

 If you look through the Emtune software and open the Boost Control section (by enabling the function in the config view), you will find more tables, target offsets and compensations are available than many aftermarket engine management systems in the past have used to manage the whole engine.

As an introduction, the below log shows the basic core of Emtron boost control. A Classic PID based system is employed. A common issue with PID based boost control systems is that gain settings tend to only work well under one given condition and not so well under others. We have addressed this by implementing 3D tables to manage the Proportional, Derivative and Integral settings. While this can take longer to set up you will find an overall better control by taking the time to get these tables tuned well. The KV8sample cal is issued with base 2D table settings to get you going.

Default Boost Control Log page :
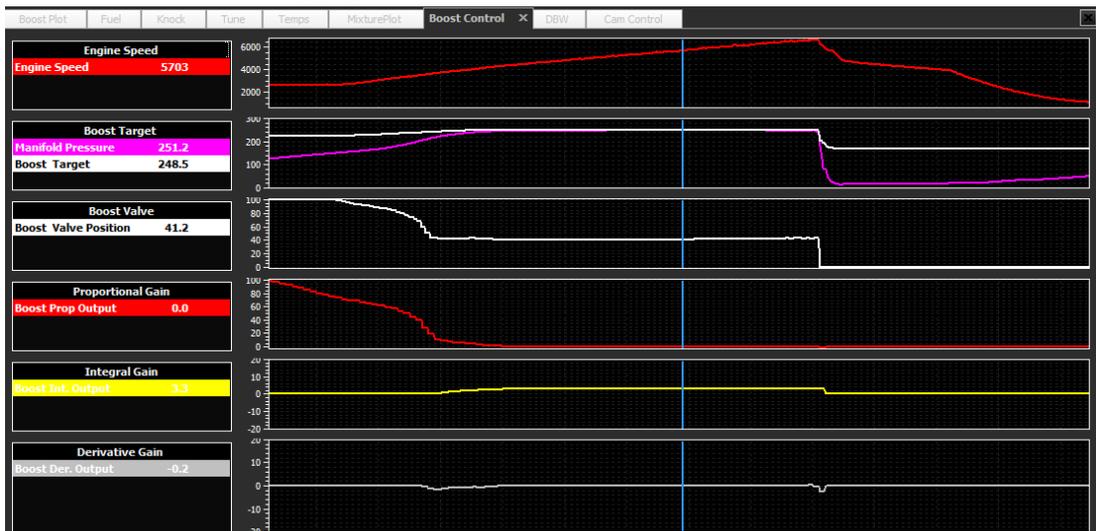
For best results the user should run the boost control system in open loop mode and populate the "Initial Position Table" as pictured below :

Initial Position Table (%DC)

Boost Target (kPa) \ Engine Speed (RPM)	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
125.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
150.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
175.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
200.0	40.0	40.0	40.0	40.0	40.0	40.0	38.5	38.5	38.5	40.0	40.0	40.0	40.0	40.0
220.0	45.0	45.0	45.0	45.0	45.0	45.0	41.5	41.5	41.5	45.0	45.0	45.0	45.0	45.0
240.0	50.0	50.0	50.0	50.0	50.0	50.0	45.0	45.0	45.0	50.0	50.0	50.0	50.0	50.0
250.0	60.0	60.0	60.0	60.0	60.0	58.0	55.0	55.0	55.0	57.0	60.0	60.0	60.0	60.0
260.0	65.0	65.0	65.0	65.0	65.0	63.0	60.0	60.0	60.0	62.0	65.0	65.0	65.0	65.0
280.0	70.0	70.0	70.0	70.0	70.0	68.0	65.0	65.0	65.0	67.0	70.0	70.0	70.0	70.0
300.0	71.5	71.5	71.5	71.5	71.5	69.5	66.5	66.5	66.5	68.5	71.5	71.5	71.5	71.5
320.0	73.5	73.5	73.5	73.5	73.5	71.5	68.5	68.5	68.5	70.5	73.5	73.5	73.5	73.5
360.0	75.0	75.0	75.0	75.0	75.0	73.0	70.0	70.0	70.0	72.0	75.0	75.0	75.0	75.0

Generally the easiest way is to enter 0 zeros in the table and test the base boost level the engine will produce. This will be the minimum boost target this system can run. Increase the duty value until the boost closely matches the boost target entered in the Y-axis. This will be the feed forward value for the PID controller. In many cases the increase in duty will become proportional or linear hence allowing one to predict the values to be entered in the table. It can be straight forward to extrapolate values for the boost target when the system is proportional. It is important to know that the better this table is configured the better the whole system will work.

Below is also some PID setup parameters. These are provided with the KV8 sample cal file and should work well for most systems.

Boost PID Setup

Parameter	Value
Control Rate	15 Hz
Boost Deadband +/-	2.0 kPa
Input Filter	5
Target Filter	5

Once you have control of the boost, next will be to use some imagination and tune the tables under any number of conditions available to the ECU. Common target offsets are "Engine Temp" "Air Temp" and

"Gear Target". These should not be confused with "Compensation Tables" which are provided to feed forward better values to the output duty cycle. They are here to provide an actual target boost change or offset. 3 x 3D User Target Offset Tables are also provided. These will allow you to offset the boost from whatever the main target is. For more enthusiastic settings you can enable 3 Boost Tables and control them through a Z-axis or even a Cal Slot control can be used to switch to different tables based on what Cal Slot is selected. This will give a true multi dimension boost mapping program to ensure the correct power is always delivered.