

Matrix MAP Tuning

This tuning mode is the most popular Dyno tune method. It is easy because the Dyno locks the RPM's to a specific load site and the tuner can move the load through the other axis. Then he tunes specific intervals. The ECU will then interpolate points in-between his tuning points and get fuel and time accurate and smooth. Note that this mode is not available in Novice mode. See the Tips and Hotkeys section to understand how to manipulate all the data values.

Matrix tuning Pallet

	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
2.5	15.7	15.7	15.7	15.7	15.7	16.1	16.5	16.9	17.3	17.7	18.1	18.5	18.9	19.3	19.8	19.9
2.3	15	15	15	15	15	15.3	15.6	15.9	16.2	16.5	16.8	17.1	17.4	17.7	18	18.1
2.2	14.3	14.3	14.3	14.3	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.4
2.0	12.7	12.7	12.7	12.7	12.7	13.1	13.3	13.6	13.5	13.8	13.9	14.1	14.2	14.3	14.4	14.6
1.8	11.8	11.8	11.8	11.8	11.8	11.9	12	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9
1.7	10.7	10.7	10.7	10.7	10.7	10.8	10.9	11	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8
1.5	9.9	9.9	9.9	9.9	9.9	10	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11
1.3	9.1	9.1	9.1	9.1	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10	10.1	10.2
1.2	8.4	8.4	8.4	8.4	8.4	8.5	8.6	8.7	8.8	8.9	9	9.1	9.2	9.3	9.4	9.5
1.0	7.5	7.5	7.5	7.5	7.5	7.6	7.7	7.8	7.9	8	8.1	8.2	8.3	8.4	8.5	8.6
0.8	6.7	6.7	6.7	6.7	6.7	6.8	6.9	7	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8
0.7	5.7	5.7	5.7	5.7	5.7	5.8	5.9	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8
0.5	4.5	4.5	4.5	4.5	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.3	5.4	5.4	5.4
0.3	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.9	3.9	4	4	4.1	4.1	4.2	4.2
0.2	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
0.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8

This pallet is tuned in a 16x16 matrix. The MAP load range is on the vertical Y-axis and the RPM value is on the horizontal X-axis. The range will scale according to MAP sensor setting and the RPM Increment setting.

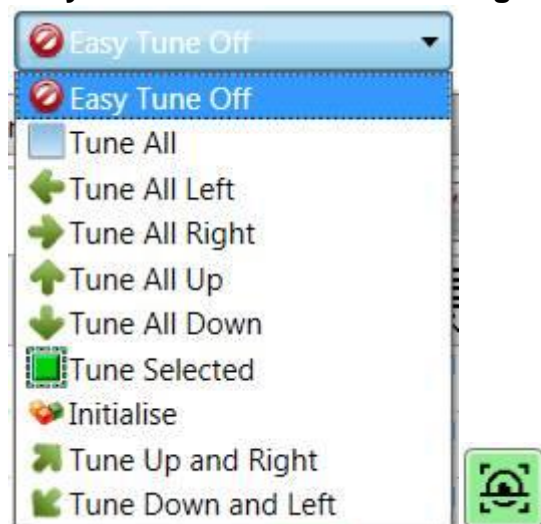
RPM Increment

A Popular value is 500 RPM per column then it will end at 7500 RPM. Should the RPM's go higher than the right column, the ECU will keep that column value The load however will still increase on that last line.

Fuel Ratio Fuel Offset

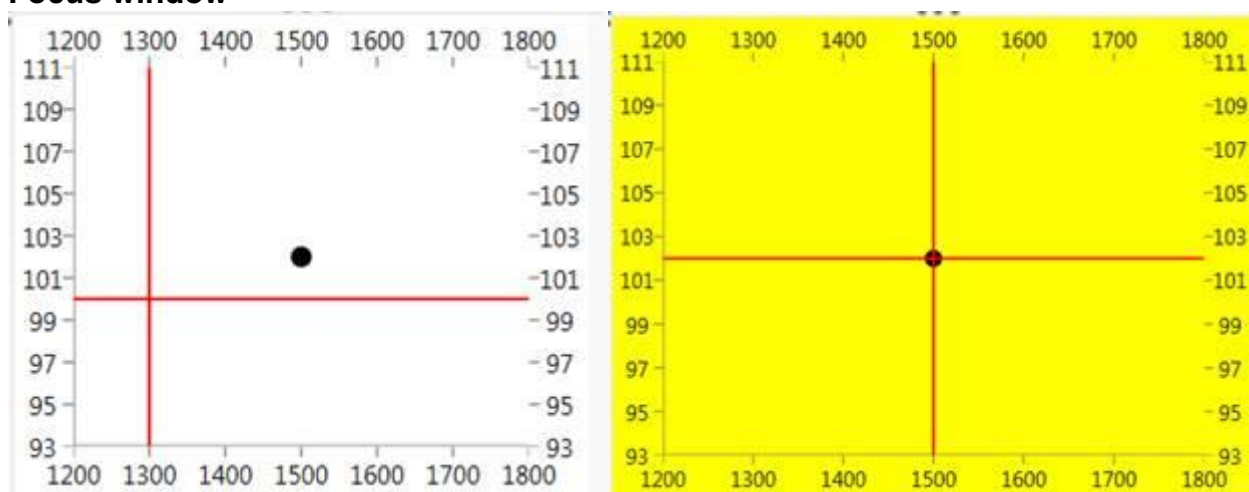
Always start to tune with Ratio 100% and offset 0. If you add an offset remember it will be added to all your fuel values.

Easy tune and Real-time tracking



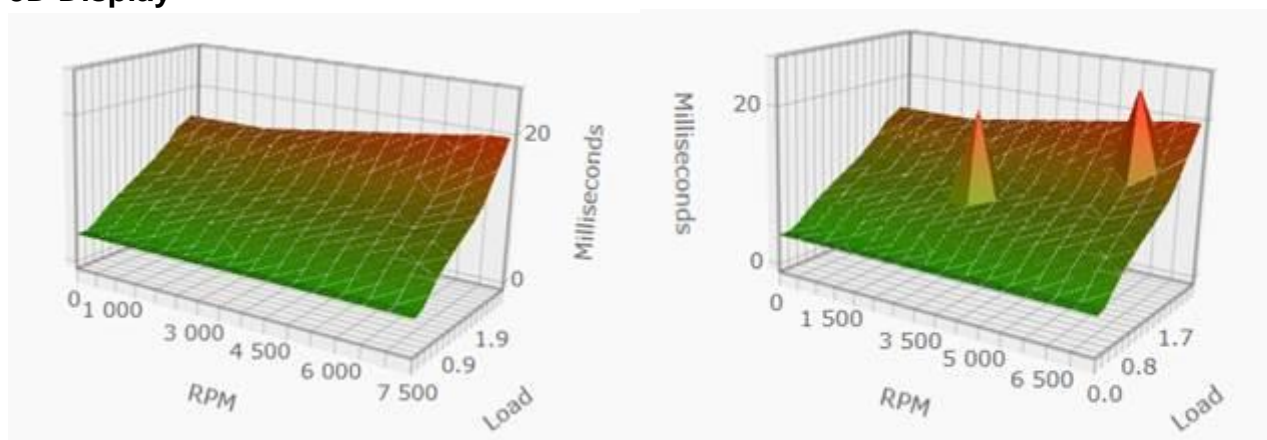
Easy tune and real time tracking are very useful tuning tools in this tuning pallet. It assists the tuner to tune where the load and RPM is without moving the tuning block with the arrows.

Focus window



The focus window guides the tuner to the centre of the block so that his tuning is accurate. Otherwise he will tune the wrong values in the active block. He will need to fine adjust the Dyno RPM's and adjust the load with his foot till the window turns yellow.

3D Display

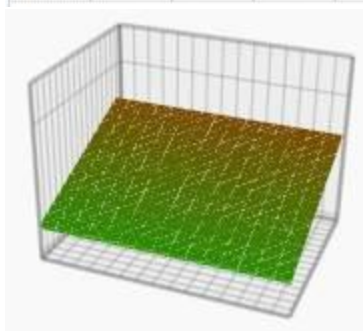


The 3D window is a representation of the actual map. This is handy to see if there are irregularities in a block.

Tuning Preparation

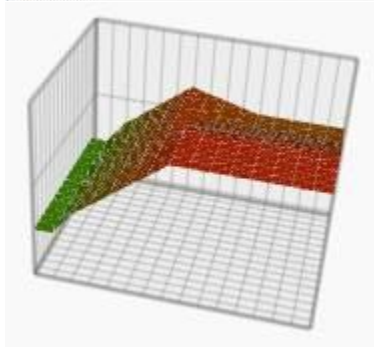
See **Settings Before Tuning**, before you begin. If you have a start-up map it would make starting and idling easier to begin with. If not, set easy tune to Initialise and make the whole pallet 4ms. Then on the load rows increase the fuel gradually to 14ms max. It is a base map and will get you started. For a turbo engine with larger injectors start with smaller values and end with higher values. A turbo engine's injectors has to work over a wider range to cater for the higher fuel demand. See the pallet below.

	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
2.5	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
2.3	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
2.2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
2.0	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3
1.8	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
1.7	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
1.5	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
1.3	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
1.2	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
1.0	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
0.8	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
0.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
0.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
0.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
0.2	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
0.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0



Set a base timing map of min 10 degrees and max 32 degrees. If it is a turbo engine you may need to decrease the load timing. See the pallet below:

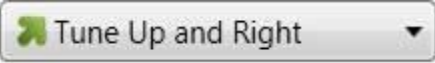

	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
2.5	10	10	15	18	21	24	27	26	25	24	23	23	23	23	23	23
2.3	10	10	15	18	21	24	27	26	25	24	23	23	23	23	23	23
2.2	10	10	15	18	21	24	27	26	25	24	23	23	23	23	23	23
2.0	10	10	15	18	21	24	27	26	25	24	24	24	24	24	24	24
1.8	10	10	15	18	21	24	27	26	25	25	25	25	25	25	25	25
1.7	10	10	15	18	21	24	27	26	26	26	26	26	26	26	26	26
1.5	10	10	15	18	21	24	27	27	27	27	27	27	27	27	27	27
1.3	10	10	15	18	21	24	27	28	28	28	28	28	28	28	28	28
1.2	10	10	15	18	21	24	27	29	29	29	29	29	29	29	29	29
1.0	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.8	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.7	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.5	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.3	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.2	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.0	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30



Tuning

To tune an engine from scratch you need to adjust fuel then timing then fuel again and then timing again. Fuel has a big influence on AFR and power while timing has a smaller influence on AFR and power. But they do have an effect on each other. When you tune fuel listen for detonation. If you have knock ears or some indication, it will be helpful. If at any time you hear detonation, back off and reduce the timing with 3 degrees in that field. Also look at Water Temperature not to damage the engine. Start with an engine on working temperature. Remember air and water temperature can alter your AFR settings, so keep a constant flow of cool air on the air filter.

0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500
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Start as close to idle as possible. In this case 1000RPM's. Start with idle AFR at no load. Now set auto tune to . That is the direction of tuning. Put Real-Time tuning on . Your engine should idle at around 0.2 bar to 0.3 bar vacuum so adjust from there.

0.5	6.0	6.0	6.0	6.0	6.0	6
0.3	5.3	5.3	5.3	5.3	5.3	5
0.2	4.6	4.6	4.6	4.6	4.6	4
0.0	4.0	4.0	4.0	4.0	4.0	4
	0	500	1000	1500	2000	2500

Tune low loads for lean AFR and then go richer as load increases. This manual will only explain basics of tuning. Now increase the load with the throttle to 0.3 until the focus window is yellow. Some dyno's may "Creep" as load increases so you may need to do adjustments. Increase the value till the right AFR is reached. Then go to 0.3 and so on. Remember at 1000 RPM the engine may not get top maximum boost range. Tune as far as is possible. Later you can predict sensible values for that part of the Matrix.

Remember at high boost detonation or timing this may start to play a big role. Some tuners will stay at 1000 RPM and do timing first. The reason is the tune up and right will also set timing more realistic for the next fuel load. It will save on repetitive tuning later. So for this section we will do timing next.

0.5	10	10	15	18	21
0.3	10	10	15	18	21
0.2	10	10	15	18	21
0.0	10	10	15	18	21
	0	500	1000	1500	2000

Adjust the timing and look at the power reading on the Dyno. Usually maximum power is 2 to 3 degrees before detonation. The power tends to level out in that region. So the trick is to find the avalanche where power breaks off, then you should be safe. If you hear detonation back off, reduce the timing 3 degrees. Now increase the load with the throttle to 0.3 until the focus window is yellow. Do the same as the previous block. You should see that the timing increase to 1 bar and then reduces again with high boost pressures. Again at high load on this low RPM the turbo may not reach high boost pressure.

Now release the throttle and set the Dyno on 1500 RPM. start with 0.2 bar load again on the fuel Matrix and repeat the previous exercise. Then go to Timing Matrix and do the same. Then next RPM column and so forth.

All that remain now is the space outside where the Dyno cannot reach. This is the load rows below idle vacuum and RPM columns lower than idle.

The load rows below idle vacuum can only be reached when the RPM's are high and you back off the throttle like on a downhill or decelerating stage. On the Dyno you can accelerate and release the throttle and look closely where the vacuum and RPM crossing point is at. Then decide on how you want it to give it fuel and timing. You won't be able to hold the focus window on yellow so make adjustments and try and see if your measurements improve. Here are some guidelines.

On timing give the lower Load rows on the high RPM side more timing than usual. Fuel will be lean due to low compression and it could be ignited earlier.

0.2	10	10	15	18	21	24	27	30	30	30	30	30	30	30	30	30
0.0	10	10	15	18	23	29	34	38	38	38	38	38	38	38	38	38
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500

On the RPM columns make the whole row 10 degrees which is your cranking timing. This will ensure the engine starts easy without kick back on the starter.

0.7	10	10	15	18
0.5	10	10	15	18
0.3	10	10	15	18
0.2	10	10	15	18
0.0	10	10	15	18
	0	500	1000	1500

On the fuelling rows side try and tune it close to correct value when you release the throttle. The reason is the interpolation will still calculate fuel. Don't use this as the **Fuel Economy Cut-off** feature.

0.2	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
0.0	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500

On the fuelling column side use this as your cranking fuel. When the engine cranks it will use the block where the load is at. It will be compensated with the water temperature graph for cold starting.