Setting transient throttle settings on the MX-5 Mazda Miata using an Adaptronic.

BOUNDARY ENGINEERING

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This is a tutorial on the setup of the MAP prediction transient throttle method. It is far superior to the standard method is the preferred way to get at maximum transient throttle performance.

Basic Terms:

MAP: The manifold absolute pressure (MAP) sensor tells the computer how much pressure/air flow is entering your engine. This sensor is the direct replacement of the mass air flow sensor (MAF) on the Mazda Miata.

TPS: The throttle position sensor tells the computer how far the throttle is open. It is the basis for most of the transient throttle fuel correction actions.

Transient throttle: This is a condition that occurs when you first push the throttle in. The reason it is different from the normal tuning map is because it takes some fractions of a second for the MAP sensor to pickup and send back to the computer that there has been a change in the airflow of the engine. So your motor will momentarily go lean, and cause a pause before it revs up. This is the lean tip in, or hesitation you feel when the transient throttle is not setup properly.

MAP Prediction mode: This new tuning system which was implemented in WARI 1.13. This new transient tuning system looks at both throttle position (TPS) and MAP to understand how much fuel to inject. Unlike the MAP sensor which takes some time to update, the TPS sensor is always 100% real time. It's a lot like using a MAP X TPS tuning mode where the computer uses both MAP and throttle position to calculate the fuel needed to maintain an AFR and spark advance for optimum performance. It is also a lot simpler to do though, and you don't loose an additional 3D map on the adaptronic by tuning this way.

Asynchronous pulse: This is a pulse like a power jet, or an accelerator pump to get the motor moving at the very start of transient operation.

Setup options in software:

Map Prediction method check box: This box enables the MAP prediction mode, and must be checked to access the rest of the settings below. It is located on the corrections tab of WARI version 1.13 and higher.

Asynch gain %: This is a value that triggers the asynchronous pulse. The value is based on both how fast and how much throttle rotation needs to happen to activate, and size the additional fuel squirt. Decreasing this value increases the amount of fuel injected. Increasing this value decreases the amount of fuel injected.

Normal values 1-30

Predicted MAP table: This is the MAP that is setup specifically by you for your vehicle so that the computer can understand how much fuel to inject in a transient throttle condition. This is only reachable once the MAP prediction method is checked.

Normal values vary greatly between supercharged, turbocharged, and N/A vehicles.

Transition time from predicted MAP to sensor MAP: This is the amount of time in us*10 that the ECU is supposed to use the predicted map table. This is only reachable once the MAP prediction method is checked.

Normal values: 100-300

System Description:

The MAP prediction system uses a table and a delay time to calculate approximate fuel demands. Once you set the table, the computer knows approximately how much air is going into the motor based on the TPS reading regardless of the lagging MAP sensor. Besides the table there is also a delay time that tells the computer how long to wait before believing the MAP sensor is accurate. With this table and the delay value the computer can very precisely understand how much fuel to inject in any throttle modulation.

Setting up the system:

The map prediction system relies on a solid fuel table to predict the amount of fuel necessary. If the fuel table is very poorly tuned then the transients will get a lot better once the tune is correct. If you do the entire transient setup and the system still does not work well then you more than likely have a problem with the fuel table still, and not the transient throttle setup.

Step One: To setup the transient map is very simple for the first few cells. Open up the WARI gauges window located under windows at the very top, and then gauges. Then open the MAP prediction table. Open the throttle up to 1% and let the rpm's stabilize. Then write in the MAP value displayed from the gauges window for the RPM the vehicle revs to and the 1% throttle site for the map prediction table. For example, if at 1% throttle the vehicle revs to 1200 RPM then write the KPa from the gauges window as 1% and 1000 RPM. Then do it again but this time going to 2%. Let the engine stabilize its RPM and write down the KPa for that cell in the MAP prediction table. Continue to do this until you become uncomfortable letting the engine free rev too high.

Step Two: To setup the other cells you have to be under load to reach them and read them. What I would recommend is finding someone who can do this while you find either some hills, a dyno, or use the E-brake to generate the load that puts you at say 50% and 1000RPM. Alternatively you could simply do a little math or take some guesses at it. If you guess a little high it will simply be slightly rich, guessing lean can give you misfire though, so a little too much is better than too little.

Step three: The next step is to set the delay for the MAP prediction to a level which completely eliminates the stutter or hesitation. This must be done by feel. Change the delay, snap the throttle open, and see if there is hesitation. If hesitation remains snap it open again. The normal values stated above assumed the MAP was located at the throttle body on a short length of rubber hose. If the MAP is not at the throttle body the values maybe substantially different than the normal values of 100-300.

Step four: If there is still an initial very short pause in response after setting this up, and you know the fuel map is well tuned then you should adjust the asynch gain % value. Smaller values mean larger fuel amounts. So if the car is going lean, decrease this value until the hesitation goes away or to a maximum of 1. Setting this value to zero automatically sets it at 30% as that is the default value. If it's going rich increase the value until the condition goes away.

This concludes the tutorial. Your vehicle should rip through the RPM's flawlessly now!