

# **Spitronics ECU - Narrowband Fuel Tuning Method - Guide**

## **1. Overview**

This tuning method was developed for installers and enthusiasts who do not have access to a wideband lambda sensor.

The objective is to create a safe, reliable and driveable fuel map using a standard narrowband oxygen sensor before adding power enrichment for higher load conditions.

This method is particularly suitable for:

- Daily driven vehicles
- Budget installations
- Rural installations
- First-time tuners
- Remote support applications

This method is not recommended for:

- Competition engines
- High boost turbocharged engines
- Engines operating continuously at maximum load

A wideband lambda sensor is always recommended when available, but many vehicles can be tuned successfully using this method.

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## **2. Understanding the Narrowband Sensor**

A narrowband oxygen sensor is designed to operate around the stoichiometric air-fuel ratio of petrol.

For petrol engines:

- Stoichiometric AFR = 14.7:1

The sensor cannot accurately indicate the actual AFR value.

It can only indicate whether the mixture is:

- Richer than stoichiometric
- Leaner than stoichiometric

Because of this limitation, narrowband sensors are excellent for:

- Idle tuning
- Cruise tuning
- Economy tuning

They are not suitable for determining maximum power AFR.

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### **3. Why Tune to Stoichiometric First?**

Many tuners immediately attempt to tune for power. This often creates an unstable fuel map and makes fault finding difficult.

Instead:

1. Create a complete stoichiometric fuel map.
2. Verify smooth engine operation.
3. Add power enrichment afterwards.

Advantages:

- Easier tuning process
- Better fuel economy
- Improved drivability
- Easier troubleshooting
- Reduced risk of major fuel map errors

At this stage the engine may not produce maximum power, but it should operate consistently and safely.

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### **4. Requirements**

#### **Mandatory**

- MAP Sensor
- TPS Sensor
- Water Temperature Sensor
- Narrowband Oxygen Sensor

#### **Recommended**

- Air Temperature Sensor
  - Data Logger
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### **5. Method 1 - Correcting an Existing Fuel Map**

This method is suitable when a fuel map already exists from:

- A similar engine
- A previous dyno tune
- A supplied startup map

#### **Procedure**

1. Warm the engine fully.
2. Verify stable idle operation.
3. Drive at a steady cruise speed.
4. Adjust Fuel Ratio until the narrowband sensor switches correctly around stoichiometric.
5. Test the vehicle under different driving conditions.
6. Correct any lean operating areas immediately.
7. Re-adjust idle and acceleration enrichment if required.

**Important**

Never continue testing if the engine shows signs of running lean under load.  
The narrowband sensor cannot indicate how lean the engine is.  
Engine damage can occur very quickly under heavy load conditions.

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**6. Method 2 - Building a Fuel Map from Scratch**

For this method the Matrix MAP Fuel Tuning strategy is strongly recommended.

This allows the Data Logger to identify the exact fuel cells that require adjustment.

**Procedure**

1. Warm the engine fully.
2. Tune idle first.
3. Drive through normal operating conditions.
4. Use the narrowband sensor to determine rich or lean conditions.
5. Adjust the corresponding fuel cells.
6. Repeat until all commonly used operating areas switch around stoichiometric.
7. Use the Data Logger replay function to identify cells requiring further adjustment.

The objective is not maximum power.

The objective is a stable fuel map that operates correctly throughout the normal driving range.

**Important**

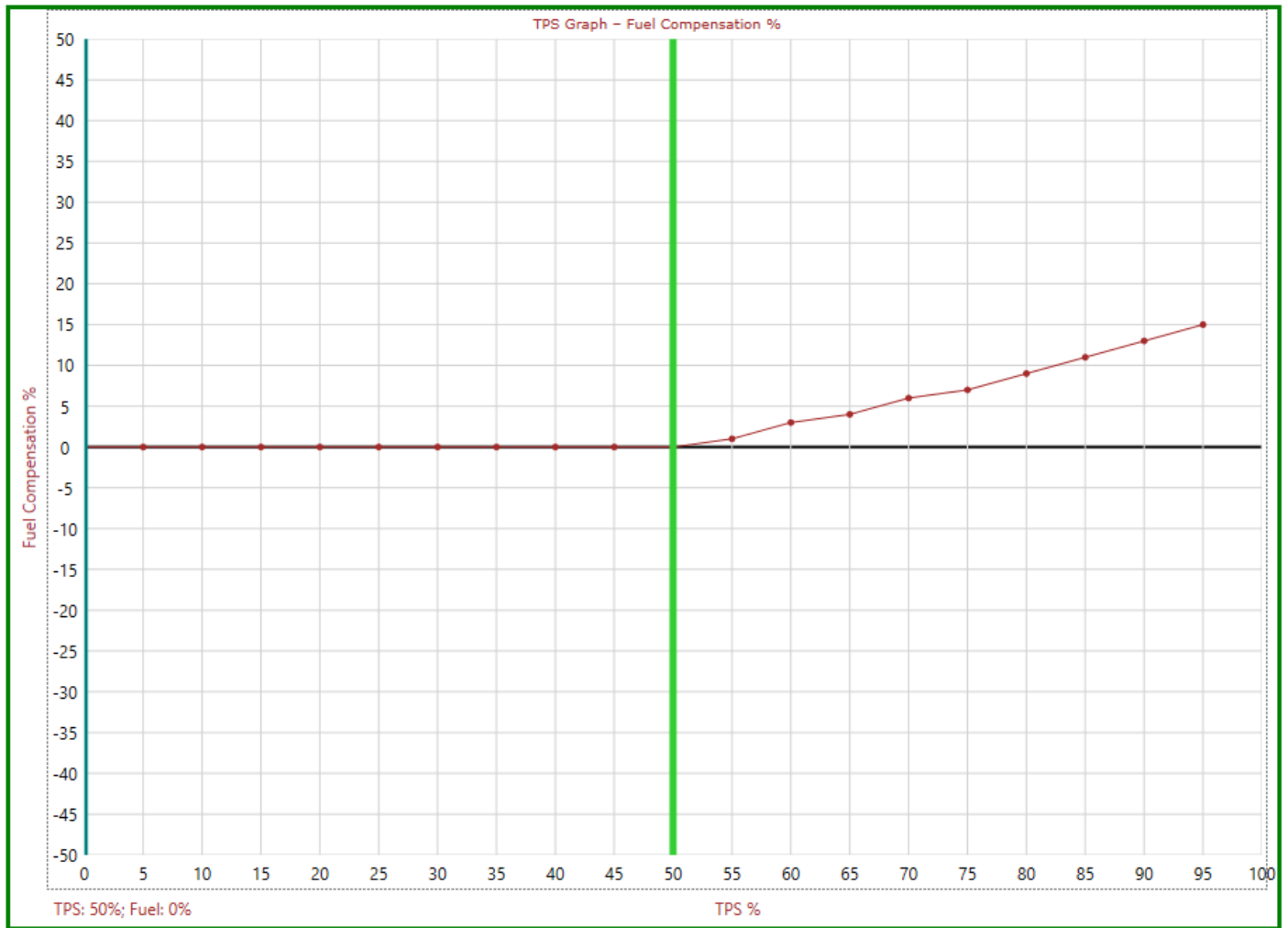
Never continue testing if the engine shows signs of running lean under load.  
The narrowband sensor cannot indicate how lean the engine is.  
Engine damage can occur very quickly under heavy load conditions.

For additional information refer to:  
Spitronics ECU - Data Logging - Guide

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## 7. Adding Power Enrichment

Once the base map is complete, power enrichment can be added using the TPS Fuel Compensation graph.



This graph adds fuel as throttle opening increases.

Typical uses include:

- Full throttle enrichment
- Engine cooling
- Detonation protection
- Improved torque

The exact values vary between engines.

Start conservatively and increase enrichment gradually.

### Practical Tuning Tip

Because a narrowband sensor cannot indicate power AFR, performance testing can be used as a guide.

Examples:

- Acceleration time
- Hill climb performance
- Vehicle response

If performance times improves after a small enrichment increase, you are moving in the correct direction.

If performance becomes worse, excessive fuel may be reducing power.

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## **8. Why This Method Works**

Once the stoichiometric fuel map has been created, the overall shape of the engine's fuel requirements is already correct.

The TPS Fuel Compensation graph then provides additional fuel only when required.

Benefits:

- Simple tuning process
- Reduced tuning time
- Consistent drivability
- Easy future adjustments

Instead of modifying hundreds of fuel cells individually, enrichment can be added using a single graph.

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## **9. Limitations**

This method does not replace proper wideband tuning.

A wideband lambda sensor is recommended when:

- Maximum power is required
  - Turbocharged engines are used
  - Competition engines are tuned
  - Alternative fuels are used
  - Injector sizing is unknown
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## **10. Final Notes**

The objective of this method is not maximum power.

The objective is to create a safe, reliable and driveable fuel map using equipment that is readily available.

For many daily driven vehicles this method produces excellent real-world results while keeping the tuning process simple and accessible.

Where maximum performance is required, a wideband lambda sensor and data logging should always be used to verify the final fuel mixture.