

# TUNER'S MANUAL

**Perfect  
Power**



**SMART TUNER**

Product Marketing

by:

**Digital**

TECHNOLOGY (pty) Ltd

# SMT TUNER'S MANUAL

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# 1. RECEIVING YOUR SMT

This manual applies to SMT-PRO, AONI, ADV and SMT-UNI.

Welcome to the world of **SMT (SMART TUNER)**. The SMT kit comprises of the unit with wires attached and a wiring diagram for your particular application. This manual runs through how to wire up and tune your engine successfully. It also lists features and limitations on the SMT.

The SMT is an aftermarket product that can tune fuel and ignition on any fuel injected engine, by changing the signals going to and from your engine. (such as your airflow meter or manifold pressure sensors). The SMT enhances fuel economy and performance. It can also- be used to tune all minor modifications and factory fitted turbo applications. You can remove road speed governor and lambda sensors for optimizing efficiency.

Once fully installed and running the SMT will now allow you full access to your engine. Although the SMT can re-tune your engine it has some limitations.

The SMT cannot:

1. The SMT-PRO, ADV cannot drive a stand alone injector, but the SMT-UNI can.
2. Be used as a stand alone injection system.
3. Be used as a stand alone ignition system.
4. Drive any kind of ignition driver or igniter.

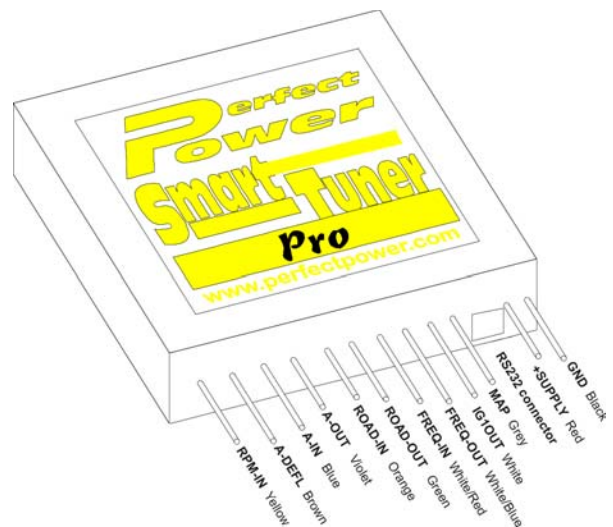
For any of the above mentioned applications. Perfect Power has a variety of other Products to handle these applications.

## 2. FEATURES

- Small and easy to use
- Removes road speed governors
- Tunes fuel on Engines with:
  - Lambda sensors
  - Air flow meters
  - Air mass meters
  - Manifold pressure sensors
  - Frequency based airflow meters or map sensors
  - Current based map sensors / air flow meters
- Ignition on all engines with:
  - Hall effect sensors
  - Optional sensors
  - Missing tooth applications
  - Cam and crank shaft inputs
- Can be used to remove airflow meter or map sensors.
- Can be used as a voltage clamp for certain applications
- Can adjust your tuning range
- Can adjust your tuning throttle / calibration range
- 
- Also are:
  - Adjustable RPM steps
  - Throttle steps
  - The coarseness of tuning numbers
  - Road speed frequency

## Differences between: The units

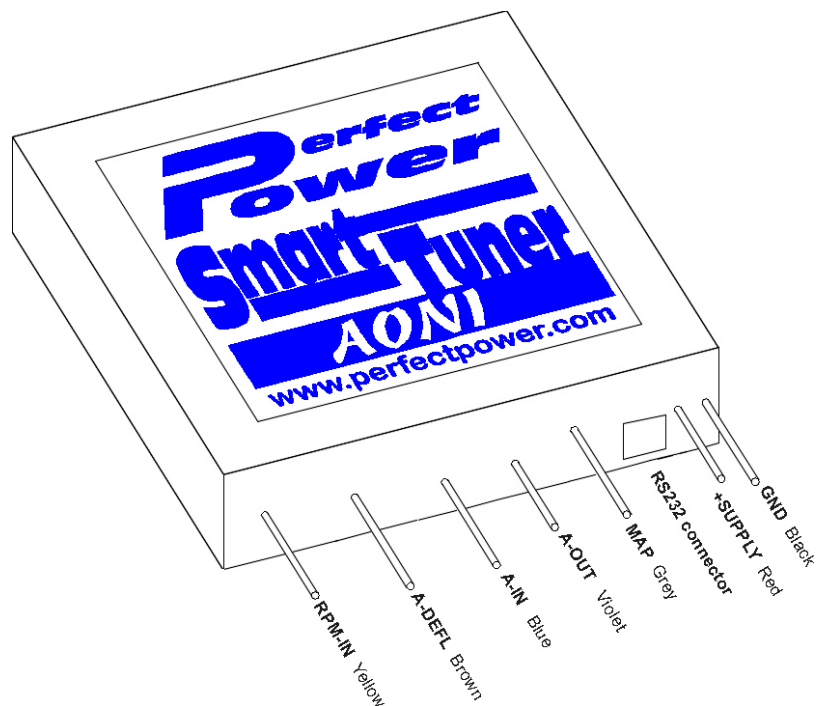
**PRO -** The PRO - SMT has a frequency input for airflow meters or map sensors that work with frequency. The PRO - SMT can also do ignition and road speed governors.



### **ADVANCE -**

The ADVANCE - SMT has an analog input for voltage airflow meters or map sensors. It can do missing teeth applications, advance as well as retard and road speed governors.

**AONI -** The AONI - SMT  
One fuel input / output for  
Analog tuning.



### 3. TOOLS REQUIRED

- A wiring diagram of the engine you are planning to install the SMT on
- Soldering iron
- Wire cutters
- Heatshrink or insulation tape
- Maybe some spanners or screw drivers to gain access to your ECU

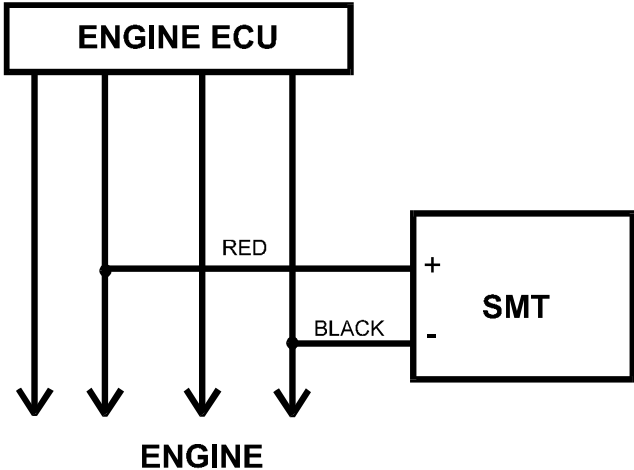
By following your diagram, you will have no problem to install the SMT. All wires on the SMT are colour coded to help with installation. The wiring diagram supplied will state, make, model and position of the ECU for your particular application for easy installation.

Product	PRO	ADV	AONI
Signal			
GND	Black	Black	Black
+12	Red	Red	Red
Ana_defl	brown	brown	brown
Ig1in (+defl)	yellow	yellow	yellow
Road_in	orange	orange	orange
Road_out	green	green	green
Analog_in	blue	blue	blue
Analog_out	violet	violet	violet
MAP	grey	grey	grey
Ig1out	white	white	
Ign_bout	-	pink	
Ign_pout	-	grey/black	
Ig2in,Freqin	white/red	white/red	
Ig2out,Freqout	white/blue	white/blue	
Pullup 4k7	blue/black	blue/black	
IG1P			
IG2P			
BOP1			

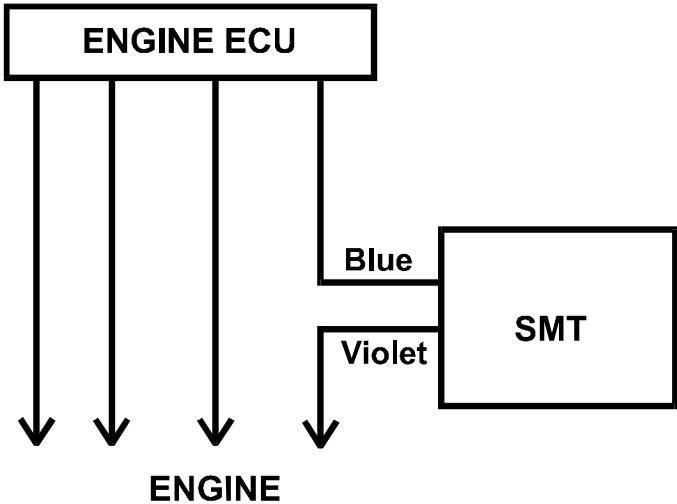
Note: The ADV & SUPER use the same hardware, but different software. The wires in brackets may be provided, but have no function. Note: The AONI does not use the ignition map. Note: The UNI can switch the functionality of inputs and outputs according to the selected operation. The UNI will replace all other units in April 2001. New colours and wiring will be supplied.

Some wires supplied only have to be teed into.

Example:



While others have to be cut and soldered onto wires supplied in the SMT harness.



## 4. INSTALLATION & WIRING

On location of your engines ECU you will see a whole selection of wires with various colours and thickness.

**PLEASE NOTE:** If the diagram supplied in your kit does not match your engines ECU, please contact your nearest Perfect Power branch.

**DO NOT CONTINUE TO INSTALL WITHOUT PROPER GUIDANCE OR SUPERVISION FROM A TRAINED SMT USER, OR YOUR NEAREST DEALER.**

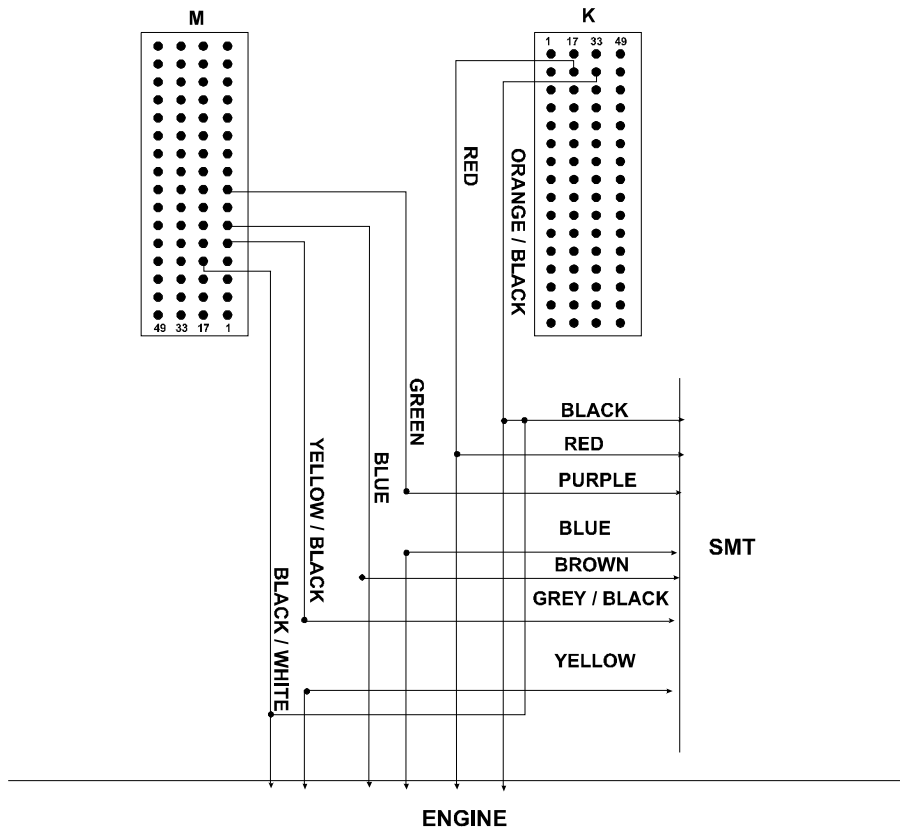
On completion of wiring your SMT, the unit must be safely tucked away.

1. Ensuring that no wires can wear through or short out.
2. No strain must be placed on wires, e.g.: Unit must not hang on wires supplied.
3. No exposure to direct weather conditions i.e.: rain, snow, and direct sunlight.
4. SMT must be placed within the driver's compartment (not engine bay!)



## WIRING UP:

The SMT is supplied with a wiring diagram for your particular application. Here is a sample of a diagram for a Daewoo Lanos:



### Daewoo Lanos 14I

Position of ECU – Engine Bay, against the firewall.

SMT Unit – Advance 1

## 5. LOADING SOFTWARE

SMT software is available on the Internet free of charge. To install your SMT software correctly, follow these steps:

1. Go directly to the SMT Website page:  
<http://www.perfectpower.com/downloads.htm>
2. Look for the link that says software. Click on this link. The link will immediately open up another windows screen, which will ask you if you want to save the file. Click on yes to save the file.
3. It will then ask you where you want to save this file. Save this file either onto your stifty disk (A:/) or onto your harddrive (C:/). Once you have done this. Exit out of the Internet.
4. Then go into the directory where you saved the file either A:/ or C:/, and find the file.
5. The file has been zipped and you therefore have to unzip the file using Winzip, which is a windows program, which can be downloaded from the Internet. (Please note the link to Winzip on the SMT Webpage.)
6. To unzip the file, follow the instructions that appear on your screen, make sure you unzip the file, either to you're A:/ drive (stifty disk) or C:/ drive (harddisk) where ever you want this file to be saved. The program will then unzip the file.
7. You will then notice that the unzipped file contains a whole lot of program files.
8. To use the program you need to follow the instructions in the DOS Software Manual or the Windows Software Manual. Depending on which version you have downloaded.

## **6. DIFFERENT TYPES OF EXHAUST GAS ANALYZERS**

### **6.1 WHAT IS A LAMBDA?**

Lambda is a reading that represents the amount of oxygen in the exhaust. Lambda 1 is normally the best your engine you will ever get. This is normally the way modern manufactures tune their engines under cruising, but with different altitudes and weather conditions around the world. Lambda can be improved. Tuning your engine to lambda under cruising will normally give you the best fuel consumption. Tuning for lambda under full throttle is normally a bit on the lean side.

### **6.2 WHAT ARE CO's -?**

CO's is also a reading used for tuning, although not used much anymore because of the delay in the readings, it is still a very reliable way of tuning. CO's stand for carbon monoxide, this is a percentage value of carbon monoxide versus oxygen in the exhaust. The richer the engine the higher the value and vice versa.

### **6.3 WHAT ARE HYDROCARBONS**

Hydrocarbons are a value measuring the amount of unburned fuel in the exhaust. This is measured in parts per thousand, the higher this number the more unburned fuel there is in the exhaust. The standard in cruising is to have this number as low as possible to get the best fuel consumption and the lowest emission. The lower the number means that you are burning more and more of the fuel in the engine.

## 7. TUNING

Tuning of engines means changing its operating parameters to achieve a desired effect. It also means that everyone of us desires something different. It may be economy, it may be "smoothness", it may be power increase, it may be what ever you like.

In all cases you are best advised to "measure" the "uncorrected" performance of your engine first and then tune it, and measure the corrected performance afterwards. The measurement of engine parameters presents a small problem. It is normally done by experts with the correct instrumentation and experience. However, with time and the inclination to learn more about engines in general, everyone can tune (or learn to tune) an engine with a SMT product.

### BASIC REQUIREMENTS:

- A friendly garage with a dyno
- A lambda (oxygen) analyzer
- A long road, friendly police department, and time

### 7.1 TUNING FUEL

This is easy. A zero in a fuel map means NO CHANGE. You can enter numbers from -99 to +99, which makes the fuel proportional less, or more. It may be the opposite, which depends on your engine. The exact relationship of the number to the amount of fuel you changed is not "fixed", it varies from engine to engine. Tuning fuel is best done with an exhaust gas analyzer (CO, LAMBDA, OXYGEN), but it may be attempted" on the road without any instrumentation. It is best done on a dyno, holding your engine at the desired RPM and load.

Make some changes and watch the result. Repeat the process at other required operating points of the engine. Then fill in the rest of the graph by hand. Confirm your tuning process with the "before" and "after" measurements.

Your nearest SMT dealer will be able to assist you, and advise you accordingly.

## 7.2 TUNING IGNITION

This is more complex. Fuel and ignition are inter-related. Some facts complicate the tuning effort:

1. Leaner mixtures require longer to ignite (advance)
2. Leaner mixtures result in higher temperatures, and promote "knocking"
3. A knock-sensor may frustrate your ignition tuning
4. Best power is made with advanced ignition, just before knocking (pinging)
5. The fuel used is very important
6. The atmospheric conditions play a roll

We strongly advise that the ignition tuning should be done by experts, on a dyno, with fuel and ignition analyzers. A zero number in the fuel graph means no change. To be technical correct, it means a "very small" change, normally less than 1 degree. A positive number ADVANCES, a negative number "RETARDS". The number you enter means a "CHANGE" in degrees from the present ignition angle. It is true that "power" and "economy" can be achieved with ignition tuning, but it is equally true that the process is complicated, and sometimes frustrating, and may be impossible. Do not over-advance: this can cause damage to your engine or engine failure. Do not lean engines out at full power!

We do not like to discourage the enthusiast, we have tuned ignition "on the road" so to speak. But the process is time consuming, and best done on a dyno by experts.

**DEPENDING ON WHICH UNIT YOU HAVE. YOU MAY BE ABLE TO RETARD OR ADVANCE. REFER TO SECTION 2. (FEATURES) IN THIS MANUAL TO SEE DIFFERENT UNITS.**

### 7.3 TUNING FOR POWER

The only way to see the difference in power with the changes you are making is on a dyno. Tuning for power would be mainly in full throttle applications, whilst holding your engine at the desired rpm (the only desired throttle position here would be foot flat.) Tune fuel first till the changes that you make, make no further difference to the power, then tune ignition either by manually switching screens and punching in the number or just by pushing the F8 and F9 keys.

**NOTE** - You do not have to be on the ignition or fuel screens to make changes to these maps. This can only be done by using the F6 and F7 keys for the fuel and the F8 and F9 keys for the ignition. If you are manually punching in the numbers you must be on the desired screen and the flashing cursor must be at the spot where you are tuning.

Adjusting the ignition may also result in changing your fuelling at that point, by using the F6 and F7 keys this can be quickly overcome.

**NOTE** - This is a time consuming process and in the higher rpm settings one must watch the temperature of the engine. Failure to do so could result in engine failure.

Tune the entire rpm range to achieve the best results. Some engines may give no extra power at all unless modified in some way.

### 7.4 TUNING FOR ECONOMY

**NOTE** - Tuning for economy should be done on a dyno to maintain constant temperatures and to have the proper control and monitoring of the engine. This should also be done under supervision of a trained and skilled tuner.

This section mainly applies to the enthusiast who wants to play with the settings and see what difference he can make on his own.

Tuning for economy can be done on the open road with the right equipment, although it is a very time consuming process. Also since the temperatures are always changing as a result of traffic, the engine air temp does not remain constant. The chances of you mapping the engine to perfection will take you some time.

**HOWEVER, FOR THE MORE PERSISTANT** - a portable lambda scanner or co analyzer can be used here. Keep the car at the speed that you would normally cruise at, monitor where your highlighted cursor is using the quick tuning keys F6 and F7 to tune the fuel. Adjust your engine to your desired settings. Repeat these procedures right through the cruising range. Special caution must be taken not to make the full throttle to lean as this could cause damage to the engine. On the road it will be quite difficult to hold the throttle at the desired open position. On the dyno this can be done exactly, but on the road this is what we call "fun".

## 7.5 WHY CHANGE RPM SCALE AND THROTTLE DEFLECTION?

On certain modified engines (e.g.: track race engines) the engine would hardly ever be tuned in the lower rev ranges. So to make your higher rpm setting finer, you can change your rpm scale.

**NOTE:** To change your rpm scale, refer to DOS Software manual or Windows software manual.

Also the same idea would go for throttle calibration. On some engines eg: track race engines, lower throttle settings would rarely be used. You can set your throttle range so that the cursor stays in the column zero until half throttle is seen. After that you have the entire screen for the rest of the throttle range, making the tuning finer. The same can be done for tuning for economy by adjusting your throttle deflection to lower settings. So as to see only half throttle across the entire screen, making tuning finer.