SMT8-FT

Manual V1.1

LetRipp II

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Table of Contents: **Page no:**

1. INTRODUCTION 1
2. THE AIM OF THE SMT8-FT 1
3. SMT8-FT VERSIONS 1
4. FEATURES 1
4.1 ANALOG #1 MAP 1
4.2 IGN MAP 2
4.3 INJECTION MAP #1 2
4.4 AFR MODIFICATION 2
4.5 MAP A/B 2
4.6 CALIBRATION 2
4.7 HELP 2
5. GENERAL USE OF THE WINDOWS SOFTWARE 2
5.1 COMMUNICATION WITH THE SMT8-FT 2
6. CONNECTIONS 3
6.1 PIN-OUT TABLE 3
6.2 SPECIFICATIONS 3
6.3 PARAMETERS 4
7. INJECTION MAP #1 (F1) 5
7.1 PURPOSE 5
7.1.1 MAIN (RPM / THROTTLE) MAP 5
7.1.2 ANA SIGNAL TABLE (OPTIONAL) 5
7.1.3 ENGINE TEMPERATURE MAP (OPTIONAL) 5
7.2 COMPLETE CALCULATION 5
8. IGN (IGNITION) MAP (F2) 6
8.1 PURPOSE 6
9. ANALOG #1 MODIFICATION (F3) 6
9.1 USAGE 7
9.2 ASSOCIATED PINS 7
9.3 REQUIREMENTS 7
9.4 MAIN (RPM/THROTTLE) MAP 7
9.5 COMPLETE CALCULATION 8
10. MAP SWITCHING 8
10.1 MECHANICAL SWITCH 8
11. AFR (LAMBDA) MODIFICATIONS 9
11.1 ASSOCIATED PINS 9
11.2 NARROW BAND 10
12. PROTECTION 11
13. PIN OUT BY FUNCTION 13
14. INSTALLATION 14
14.1 MINIMUM INSTALLATION 14
14.2 PRACTICAL STEPS 14
14.3 ADAPTING THE PLUG-AND-PLAY INJECTOR HARNESS 15
15. FULL INSTALLATION 16
15.1 POWERING THE SMT8-FT WITHOUT THE ENGINE RUNNING 16
15.2 RECOMMENDED OPTIONAL WIRING 16
15.2.1 OPTIONAL DEFLECTION (TPS, AMP) INPUT (PIN 11 OF 12) 16
15.2.2 OPTIONAL ENGINE TEMPERATURE INPUT (PIN 9 OF 10) 17
15.2.3 OPTIONAL MAP SWITCHING INPUT (PIN 3 OF 12) 17
16. CALIBRATION 17
17. TUNING 17
17.1 FUEL TUNING 17
17.2 LAMBDA TUNING 18
17.3 ANALOG TUNING 18
17.4 IGNITION TUNING 18
22. FUEL MAP ENTRIES AND THEIR EFFECT 18
22.1 AFR, POWER AND FUEL ECONOMY 18
18. KEYWORDS 19
18.1 ECU 19

18.2 MAPPING 19
18.3 INTERCEPTING 19
18.4 TEE IN 19
18.5 LAMBDA, OXYGEN, AFR 19
18.6 CHIPPING 19
18.7 MAF 19
18.8 MAP 19
18.9 AMP 19
18.10 MAP SWITCHING 19
18.11 PICKUP 20
18.12 FEED-THRU 20
18.13 BALANCED INPUT 20
18.14 MAP SWITCH INPUT 20
18.15 DEFLECTION (THROTTLE/AMP) INPUT 20

Table of Figures: **Page no:**

FIGURE 1. ANALOG 1 WIRING 7
FIGURE 2. WIRING DIAGRAM FOR MECHANICAL SWITCH 9
FIGURE 3. NARROW BAND LAMBDA WIRING 9

1. INTRODUCTION

Welcome to the Digital Data Systems SMT8-FT Technical Manual. The Technical Manual needs to be used in conjunction with the LetRipp II Software User Guide for the operation of the PC.

2. THE AIM OF THE SMT8-FT

The purpose or aim of the SMT8-FT is to provide a fuel-controlling unit with a "Plug-and-Play" facility. The SMT8-FT is slightly more expensive than traditional piggy-back products, but it requires no engineering, no cutting of wires and installs in minutes. In other words, it is GUARANTEED to work!

The SMT8-FT applies to the environmentally conscious installer, who would like to reduce fuel consumption or maximize the best possible fuel consumption in various situations. The SMT8-FT also applies to the "performance" enthusiast, who would like to run his/her engine at the most powerful fuel ratio possible. Equally, the SMT8-FT applies to aftermarket turbo and supercharger installations, which require more fuel under full boost.

In any event, the SMT8-FT simply connects to the fuel-injected petrol engine's injector connectors, and this completes the minimum or basic installation for modifying fuel.

The SMT8-FT has many of the standard SMT8 capabilities, as demanded by our customers. It can also be used for Ethanol (E85).

All SMT8-FT products can be tuned with the LetRipp II Windows Tuning Software.

3. SMT8-FT VERSIONS

The SMT8-FT comes in three versions:

SMT8-FT4	For 4 Cylinder Engines
SMT8-FT6	For 6 Cylinder Engines
SMT8-FT8	For 8 Cylinder Engines

On special request a SMT8-FT2 for 2 cylinders can be supplied.

4. FEATURES

Here is a brief list of the features:

- 1 Map to influence an analog signal: ANA1 MAP
- 1 Map to influence a ignition signal IGN MAP
- 1 Map to tune injection length FUEL MAP
- 1 Map to influence an AFR/Lambda signal AFR MAP
- Two separate tune maps Map switching
- Self supporting Injector connections
- Calibration for AMP, RPM, Engine temperature
- RS232 high speed communication
- Powerful engine protection

4.1 ANALOG #1 MAP

An analog signal is intercepted via the AIN (pin 4/12) to AOUT (pin 10/12) connection. It is mapped via AMP/RPM, Engine temperature, and Analog input for the purpose of altering an analog signal such as AMP at specific engine conditions. The output signal can be limited (high and low) and offset aligned.

4.2 IGN MAP

One ignition signal (CRANK) can be intercepted and mapped via AMP/RPM, Engine temperature, and analog input for the purpose of retarding/advancing the ignition. Notice that the Ignition mapping affects ALL ignition signals (advance/retard). The output signal can be set to maximum advance and retard limits.

4.3 INJECTION MAP #1

This large 16 x 24 point map modifies the injector length. Injection length can be shorter or longer. It has two side maps for engine temperature and Analog tuning.

4.4 AFR MODIFICATION

A large 16 x 24 map allows for the precise AFR (Lambda) signal modification via the AIN (pin 4/12) to the AOUT (pin 10/12). The AFR is mapped via AMP/RPM and Engine temperature. Notice that this map uses the same circuit then the analog modification, so both can't be on simultaneously.

4.5 PROTECTION

The unit has an engine protection module, which can save the engine after a mishap has occurred. In response to an input going out of bounds it can:

- Modify the analog output
- Retard the Ignition
- Cut the ignition signal and/or cut the injection

For each of the above actions several limit parameters are available.

4.5 MAP A/B

The SMT8-FT has two complete maps. That is to say that you can switch between two different tuned maps while driving. It is possible to have one map for fuel-economy, and the other for performance. Or use the maps for different weather conditions. The Maps can be switched from the hardware input (MAPSW). The parameters and calibration are not switched. The maps can be 'locked' in to a fixed position from the PC for tuning and downloading. When the map switching is enabled in the Set points the hard switching (pin 3/12) will no longer function.

4.6 CALIBRATION

The RPM range, AMP sensor and Engine temperature sensor and scales can be calibrated and specified. The Calibration is applicable to both tune maps A/B.

4.7 HELP

Help is available in various forms:

A) Right click on any item and a short explanation is available
B) This TECHNICAL MANUAL
C) The LETRIPP SOFTWARE USER GUIDE
D) Some WINDOWS ITEMS are explained 'ONLINE'

5. GENERAL USE OF THE WINDOWS SOFTWARE

This is explained in the LETRIPP II SOFTWARE USER GUIDE, and covers items like software installation, the use, and features.

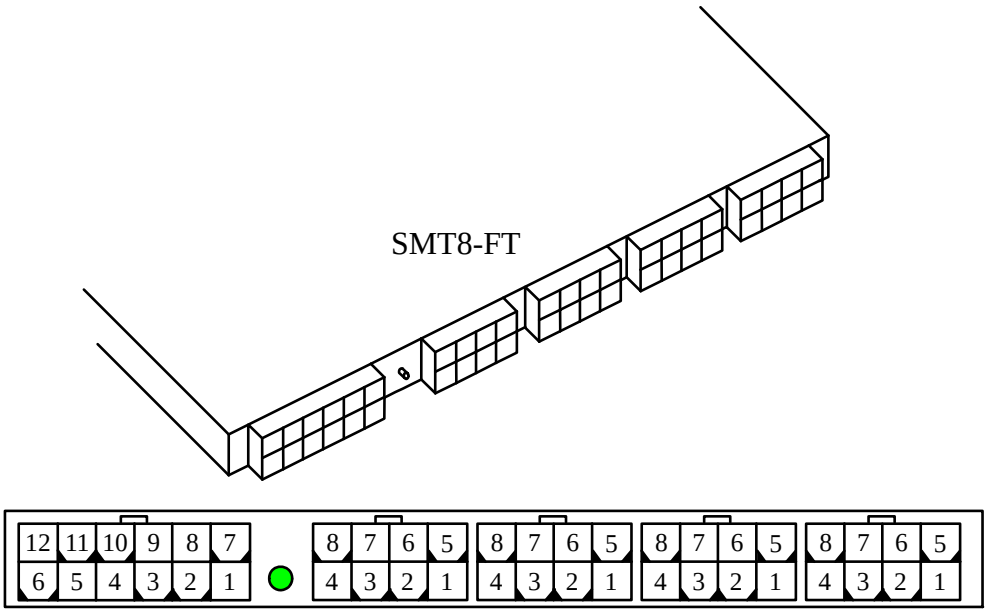
5.1 COMMUNICATION WITH THE SMT8-FT

The SMT8-FT comes with a 115.2KB serial RS232 communication.

6. CONNECTIONS

The SMT8-FT has a 12 pin auxiliary connector and an 8 pin connector for every 2 cylinders.

6.1 PIN-OUT TABLE



SMT8-FT Main Connector (12 Pin Connector)

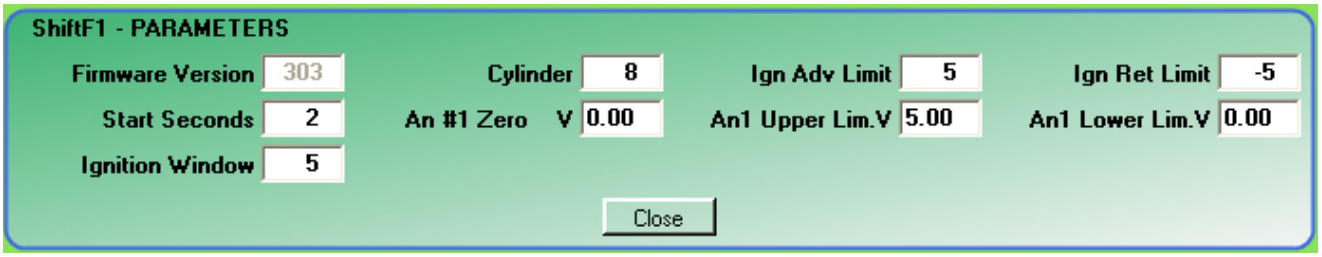
Pin	Signal	Description
1	GROUND	CHASSIS
2	+13V	Switched battery positive
3	MAPSW	Map switching, Open=Map A
4	AIN	Analog/AFR input
5	-CROUT	Negative CRANK timing signal output
6	CRANK	Crank signal input
7	PCTX	Input to the unit, RS232
8	PCRX	Output from the unit, RS232
9	TEMPIN	Engine temperature input
10	AOUT	Analog/AFR output
11	AMPIN	AMP map deflection input
12	+CROUT	Positive Crank timing signal output

6.2 SPECIFICATIONS

Power consumption:	~ 100mA (0,1A)
Power supply voltage:	8 – 36 V
Reverse Polarity Protection:	Yes
Momentary power supply:	up to 40 V, 5 ms
Signal input impedance:	>10 K Ohm
Ignition output Pull up:	2k2 Ohm

Ambient temperature:	Up to 60 deg C (Passenger compartment)
Injector drive:	3 Amp, 13-Ohm injector
Analog output drive 2 x:	0.005 Amp (5mA), 0 - 5volts
Analog input range:	0 - 5 Volts

6.3 PARAMETERS



CYLINDERS:

The Cylinder entry is only necessary when the unit has to calculate the RPM from the injection signal

IGN ADV LIMIT:

This is the maximum total advance the unit will allow for modification. It must be a positive entry

IGN RET LIMIT:

This is the maximum total retard the unit will allow for modification. It can be positive or negative entry

START SECONDS:

The amount of seconds that the unit will wait before beginning any modifications

ANALOG1 ZERO:

This entry off sets the analog output voltage if it is found that the entire fueling range is too rich or too lean

ANALOG1 UPPER LIMIT:

Entering 5 volts, which is the max output voltage, renders the limit useless.
Any other entry prevents the output to exceed the set limit.

ANALOG1 LOWER LIMIT:

The minimum output voltage is zero volts. Any other setting prevents the output from falling below the set limit.

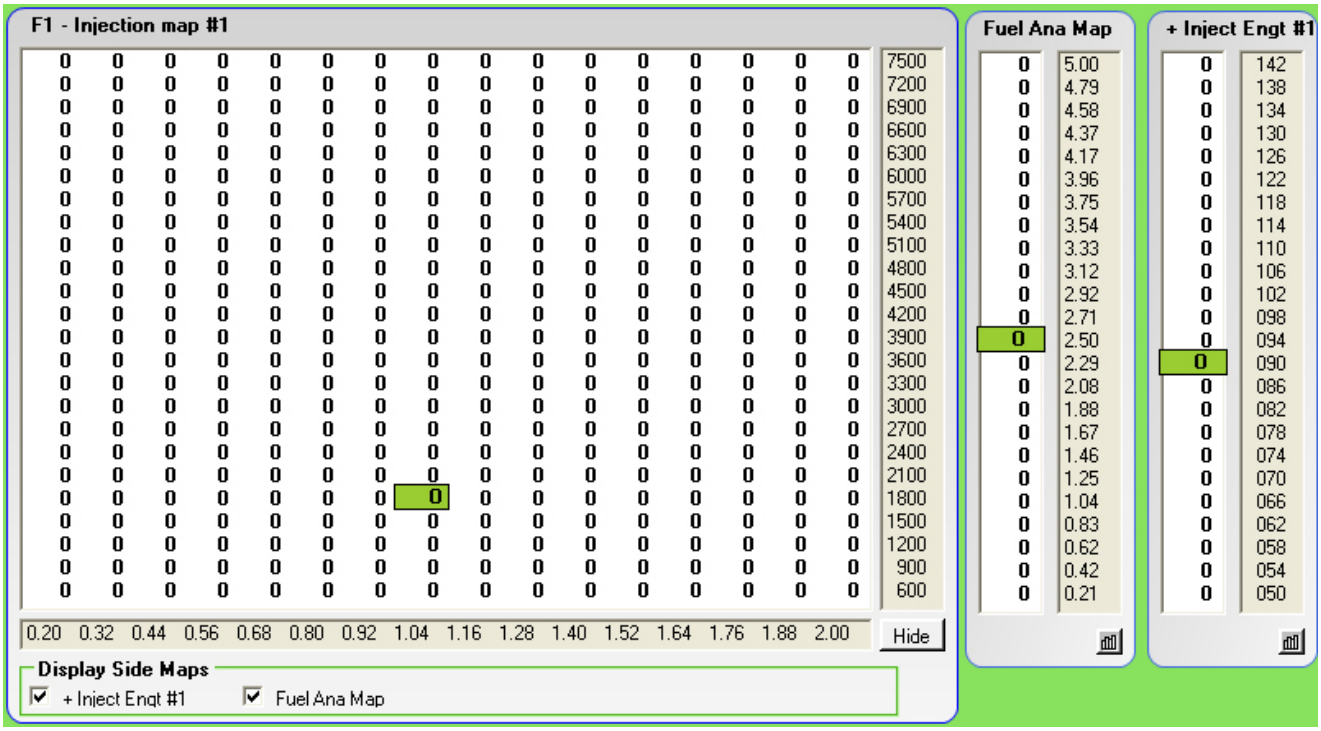
IGNITION WINDOW:

This allows the SMT8-FT to be less sensitive to the incoming ignition/crank signal. A value of –1 will disable the SMT8-FT's error checking of the incoming signal. Typical values of 1 to 10 are normal.

7. INJECTION MAP #1 (F1)

7.1 PURPOSE

This is to allow plug and play tuning of the fuel system



7.1.1 MAIN (RPM / THROTTLE) MAP

Enter a number in the range from 0 to 50% on the main map. This will increase the current injector time by the entered percentage

7.1.2 ANA SIGNAL TABLE (OPTIONAL)

The entry in this map is ADDED to the main fuel map entry in the range from 0 to 50%. The MAP deflection comes from the Ana (IN) pin 4 of the 12-pin connector.

7.1.3 ENGINE TEMPERATURE MAP (OPTIONAL)

The entry in this map is ADDED to the main fuel map entry in the range from 0 to 50%. The MAP deflection comes from the TEMP (IN) pin 9 of the 12-pin connector.

7.2 COMPLETE CALCULATION

OPEN TIME = ECU Injection time
+- MAIN TABLE PERCENTAGE
+- ENGINE TEMP MAP PERCENTAGE
+- ANA MAP PERCENTAGE

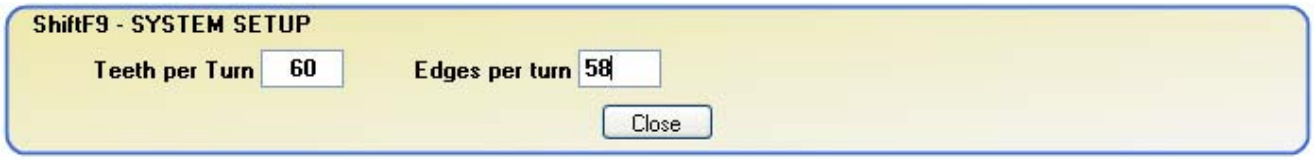
8. IGN (IGNITION) MAP (F2)

8.1 PURPOSE

The ignition angle of an engine can be modified (retarded or advanced) to achieve one of the following effects:

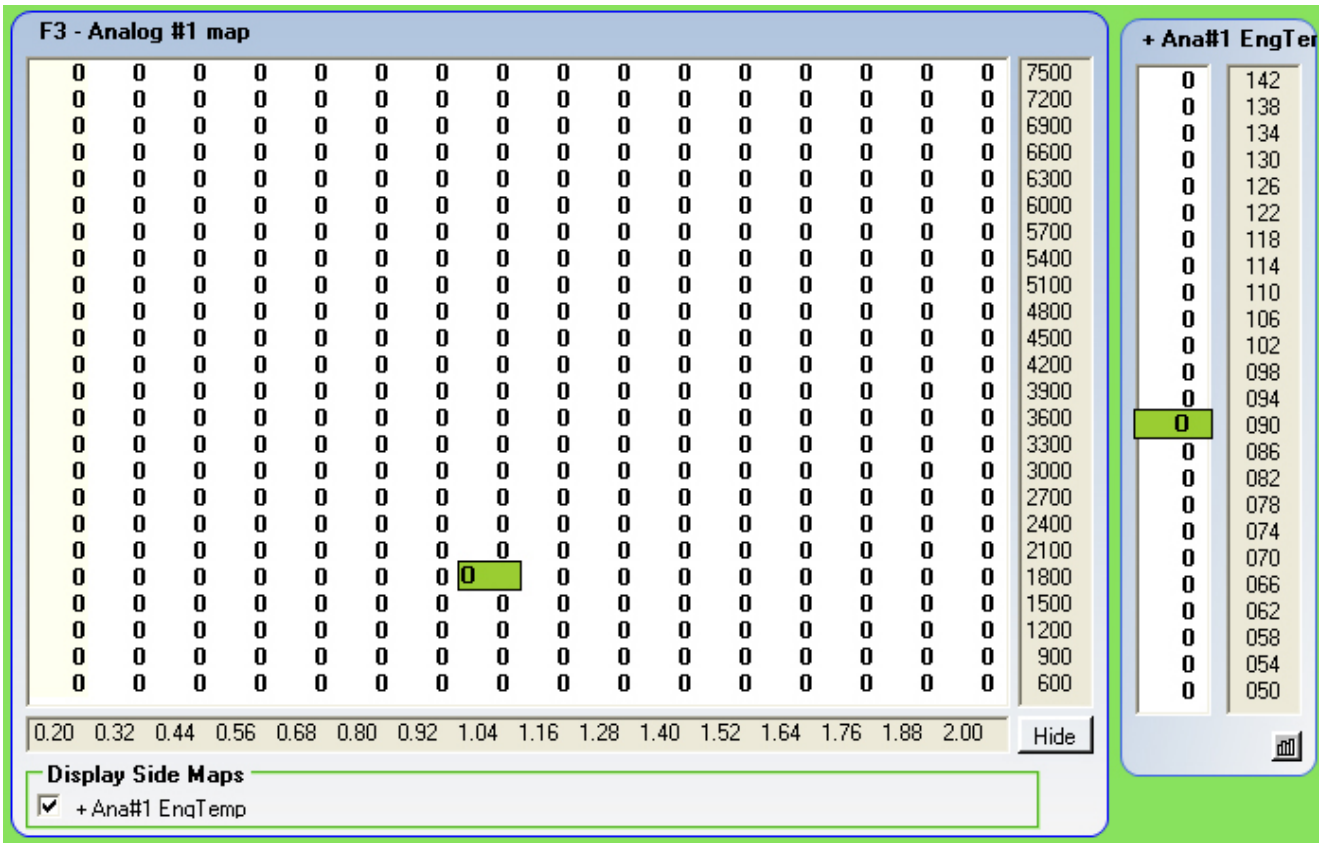
A) More power with high quality fuel (advance).
B) Avoid detonation after a turbo (Supercharger) installation (retard).
C) Retarding for poor quality fuel.

There are numerous other applications, which require better ignition angle control. Ignition control is not successful on engines with active knock sensor control.



9. ANALOG #1 MODIFICATION (F3)

The SMT8-FT ANA1 feature can modify one analog signal, namely AIN and output the mapped signal on AOUT.



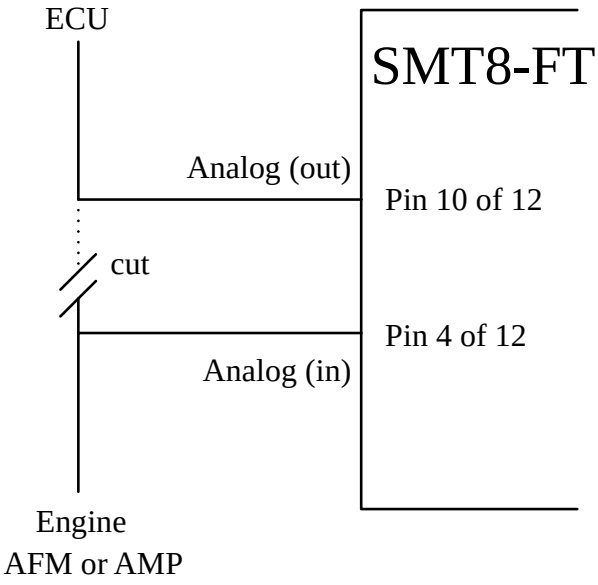


FIGURE 1. ANALOG 1 WIRING

9.1 USAGE

An analog signal is a DC voltage generated from a number of different types of sensors; examples of these are the air flow meter, mass air flow meter (MAF) and pressure transducer (MAP) or temperature transducer.

Most analog signals, with a few exceptions, range from 0 to 5 Volts and are used by the ECU to determine the fuel quantity. By routing the signal through the SMT8-FT the analog voltage is changed, which in turn results in a fuel change. Thus, allowing the car to be tuned. The input to output voltage relationship can be changed at various engine-operating points. This process is called “MAPPING”.

9.2 ASSOCIATED PINS

AIN	Pin 4 of the 12-pin connector
AOUT	Pin 10 of the 12-pin connector

9.3 REQUIREMENTS

1) ANALOG #1 lower limit (Volts):
   This voltage setting prohibits the analog output to go BELOW the limit.
2) ANALOG #1 high limit (Volts):
   This voltage setting prohibits the analog output to go ABOVE the limit
3) Set the analog zero offset compensation

9.4 MAIN (RPM/THROTTLE) MAP

For the RPM to work: Connect CRANK (see: RPM trigger).

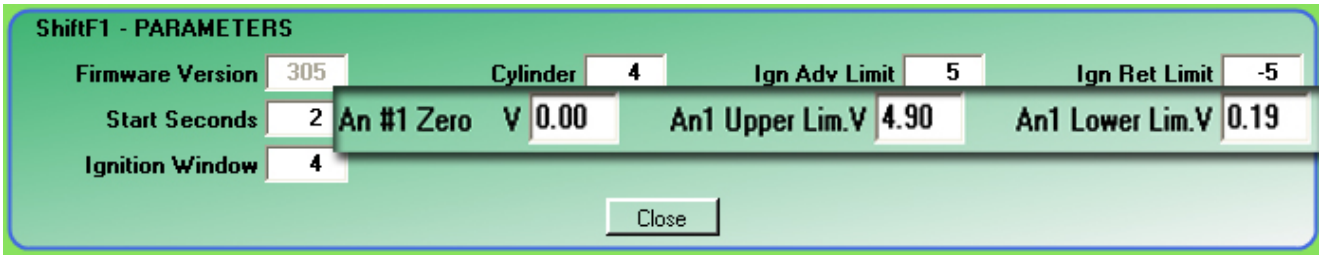
For the Throttle (deflection) to work: Connect pin 11 of the 12-pin connector to the analog deflection signal (normally the throttle position sensor).

All map entries are in counts (without a decimal point) 100 counts entry equals 1.00 Volts.\

9.5 COMPLETE CALCULATION

ANA1OUT = ANA1IN
+- ANA1 MAP
+- AN1 ENGT

The ANA1OUT signal is limited to the low and high limits that are set in the Parameters Map (Shift F1)

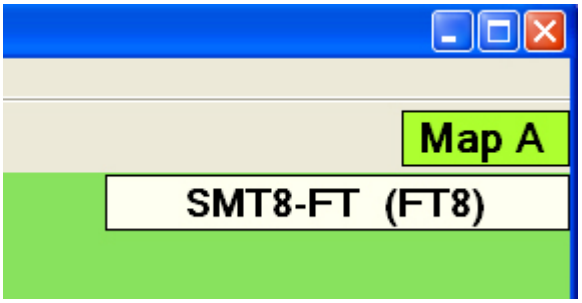


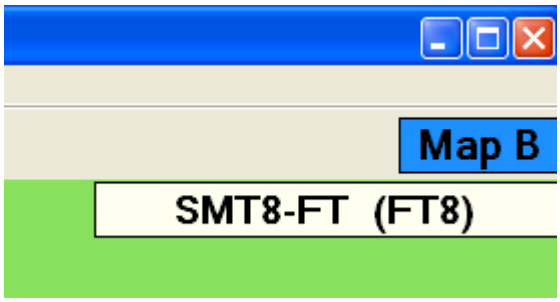
10. MAP SWITCHING

The SMT8-FT comes with two entirely separate tune maps in memory. We call them map “A” and map “B”. The LETRIPP Software displays the present map in the upper right hand corner or in the STATUS display. Two maps are used for:

- Performance versus Economy
- Tested versus un-tested
- Normal versus high altitude
- Good fuel versus bad fuel
- Weather

NOTE: Please make sure that you have a valid tune map in map “B” before you flip the switch.





The two tune maps can be invoked by:

10.1 MECHANICAL SWITCH

There is an option to connect (pin 8/12) an external mechanical switch to the SMT8-FT to enable it to do map switching. Without this mechanical external switch, the unit will default on power up to Map A (open pin). Should the mechanical switch be installed, the unit will power up and run on the map selected. The transition between maps switching is seamless and can be performed while the vehicle is in operation, provided both maps are loaded.

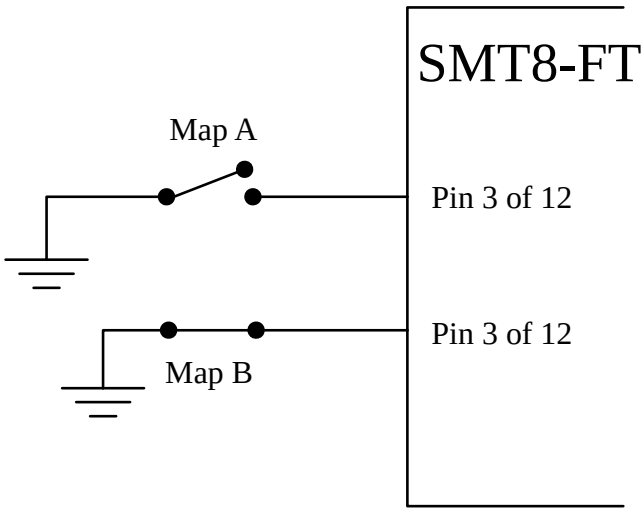


FIGURE 2. WIRING DIAGRAM FOR MECHANICAL SWITCH

11. AFR (LAMBDA) MODIFICATIONS

The purpose of the AFR (Lambda) modification channel is to change the AFR reading the ECU receives from an exhaust sensor. This in turn affects the ECU fuel loop. Thus AFR tuning becomes a powerful tool for fuel modifications.

11.1 ASSOCIATED PINS

AFR (IN) Pin 4 of 12
AFR (OUT) Pin 10 of 12

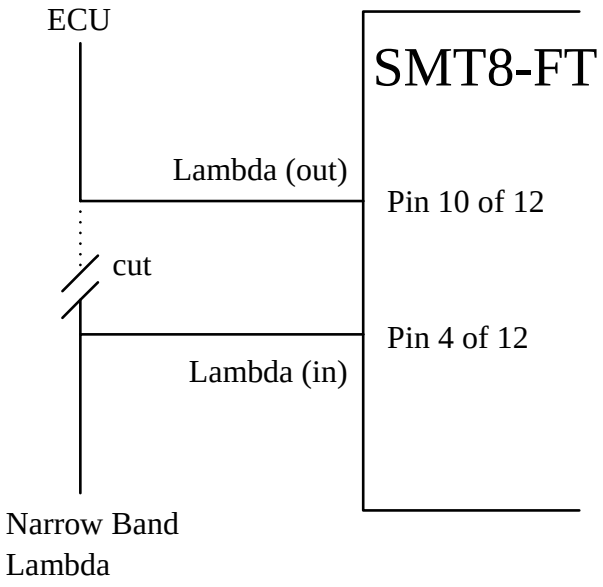
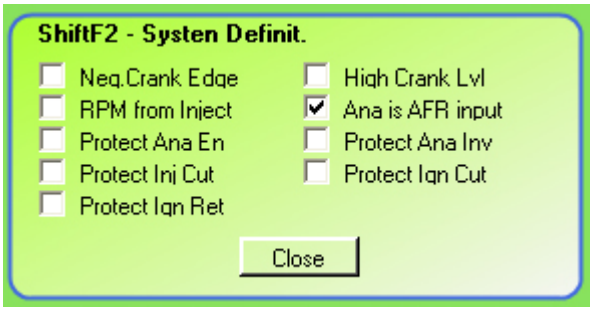
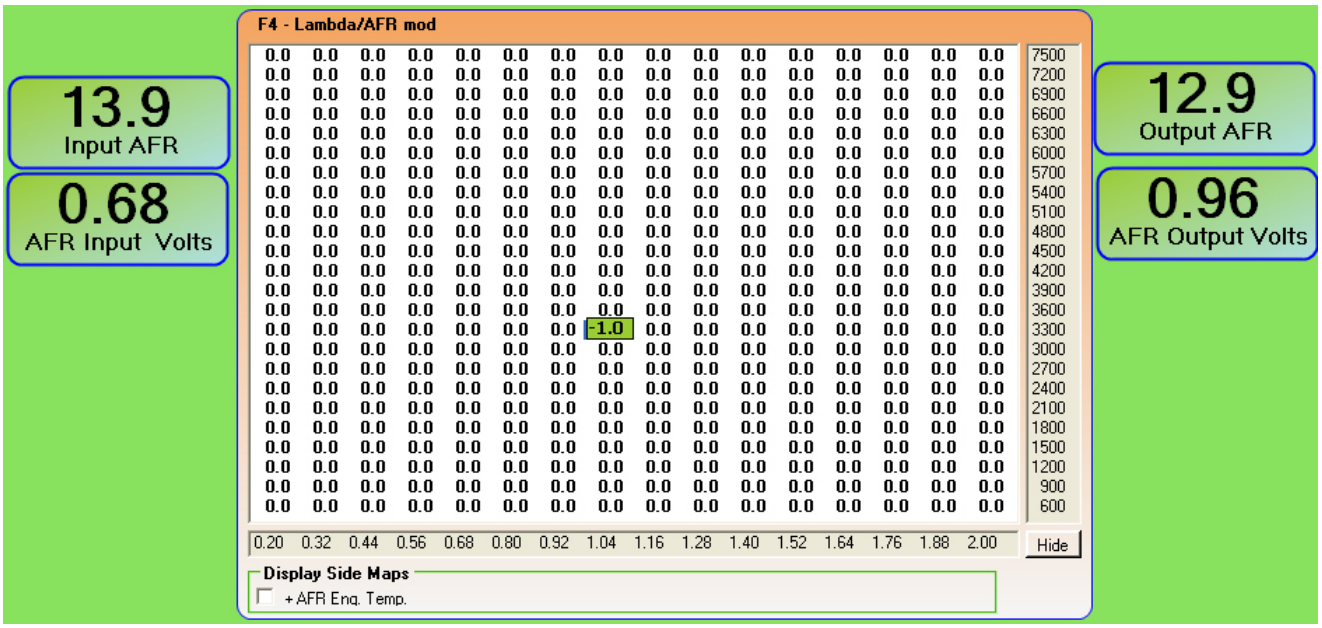


FIGURE 3. NARROW BAND LAMBDA WIRING

11.2 NARROW BAND

The narrow band sensor has an output signal from 0 (lean) to 1Volt (Rich). This signal can be interpreted by the SMT8-FT and it is available for display in AFR or LAMBDA. The signal from the sensor is routed to the AFR (IN) pin and exits the unit by the AFR (OUT) pin. The table entry is in AFR or LAMBDA, depending on the 'Units' choice (Tools).

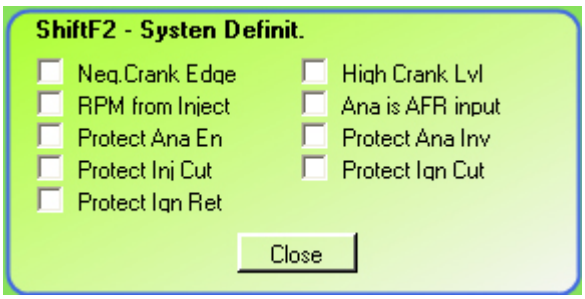




In the above example the input AFR is at 13.9, the modification value that has been entered is –1.0, the result is that the output AFR is now 12.9 this in result causes the closed loop system to begin leaning the mixture out.

11. SYSTEM DEFINITION SETUP

The Unit has a SYSTEM DEFINITION field for ticking item on/off. Following is an explanation of each field.



Neg, Crank edge

This selects the NEGATIVE CRANK edge. Only important when ignition is used.

High Crank Lvl
: This selects a higher crank trigger level. Recommended if the crank signal is noisy.

RPM from Inject
: This instructs the unit to compute the RPM from the injector signal. The RPM will go zero while you are costing downhill.

Ana is AFR input
: The analog input is used for AFR/Lambda measuring. The Analogue map is disabled.

Protect Ana En
: This allows the protection circuit to influence the analog modification.

Protect Ana Inv
: This influences the analogue modification in the opposite direction.

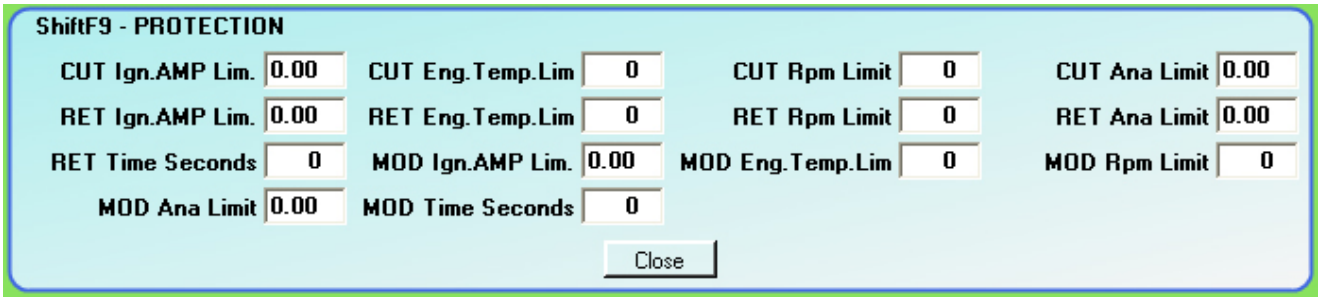
Protect Inj Cut
: This enables the CUTTING of the injector signal once the protection comes on.

Protect Ign Cut
: This enables the CUTTING of the ignition signal when the protection comes on

Protect Ign Ret
: This enables the retardation of the ignition signal when the protection comes on.

12. PROTECTION

The SMT8-FT has a powerful protection circuit. In essence the unit monitors certain INPUT signals and when the specified limits are exceeded it will affect three outputs. The protection limits are visible in CONFIG, PROTECTION PARAMETERS.



The protection is used to save the engine if anything goes wrong. Most of the time the engine was modified and thus is more susceptible to mishaps. Once the protection comes on, that is to say any of the inputs exceeds the specified limit, than it can affect the following outputs, provided you use them.

MODIFY (MOD) the analog output
: This is the most used feature. Take the TPS signal back, over-fuel the engine, or affect the AMP signal.

RETARD (RET) the ignition
: This is also very useful. Make sure you open the ignition retard limit up.

CUT the fuel
: Can be used, but the engine dies until the violated limit returns to normal.

CUT the ignition
: This is a desperate measure! Use with caution! This is seldom done!

All the following items refer to MODIFYING the analog signal.

Mod Amp Limit
: Once the specified AMP signal is exceeded the difference changes the analog circuit proportional.

Mod Engt Limit
: Once the specified temperature is exceeded the difference changes the analog proportional.

Mod RPM Limit
: Once the RPM is exceeded, the difference changes the analog signal proportional.

Mod Ana Limit
: Once the limit is exceeded, the difference changes the analog output signal proportional.

Mod Time
: If any of the above limits is exceeded then the unit waits the specified time in seconds before affecting the analog circuit.

All the following item refer to RETARDING the ignition signal

Ret Amp Limit
: Once the specified AMP limit is exceeded the difference will retard the ignition signal proportional.

Ret Engt Limit
: Once the Engine Temperature is exceeded the difference will retard the ignition signal proportional.

Ret Rpm Limit
: Once the RPM is exceeded the difference will retard the ignition proportional.

Ret Ana Limit
: Once the analogue limit is exceeded the difference will retard the ignition proportional.

Ret Time
: The retarding comes in effect after the specified time in seconds.

All the following items refer to CUTTING the fuel injection or the ignition

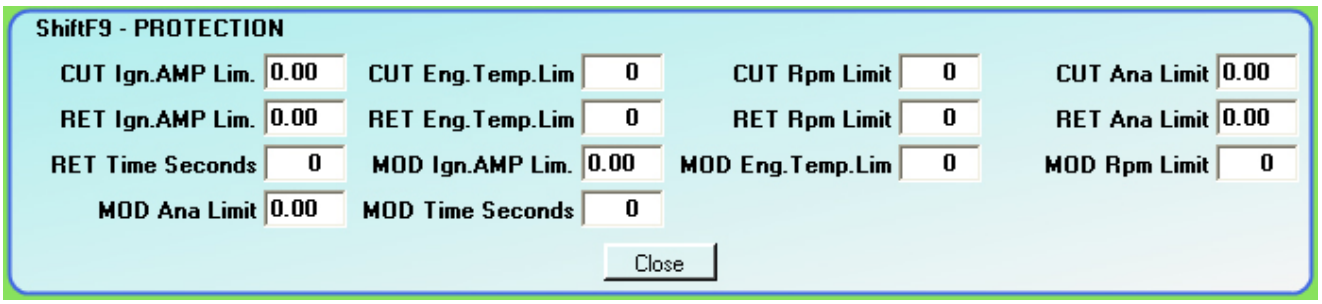
Cut Amp Limit
: Once the specified AMP limit is exceeded the injections are cut.

Cut Engt Limit
: Once the Engine temperature is exceeded the injection is cut.

Cut Rpm Limit
: Once the RPM are exceeded the injection is cut.

Cut Ana Limit:
: Once the analogue limit is exceeded the injection is cut.

NOTE: A ZERO entry in any field disables this field.



The MOD protection works on the Analog 1 and 2. The protection circuit will make the output progressively 0 volts or 5 volts if the programmable limit/s are breeched. Both analog outputs

can be protected. The output can be inverted (Shift F2) which will make the output progressively 0 volts when a limit is reached. The protection is enabled in the Shift F2 map.

All the following items refer to MODIFYING the analog signal.

Mod Amp Limit
: Once the specified AMP signal is exceeded the difference changes the analog circuit proportional.

Mod Engt Limit
: Once the specified temperature is exceeded the difference changes the analog proportional.

Mod RPM Limit
: Once the RPM is exceeded, the difference changes the analog signal proportional.

Mod Ana Limit
: Once the limit is exceeded, the difference changes the analog output signal proportional.

Mod Time
: If any of the above limits is exceeded then the unit waits the specified time in seconds before affecting the analog circuit.

13. PIN OUT BY FUNCTION

POWER

Ground	1-12	
+12V	2-12	

DEFLECTION INPUT

AMPIN	11-12	

CRANK INPUT

Crank	6-12	

CRANK OUTPUT

-CROUT	5-12	
+CROUT	12-12	

ENGINE TEMPERATURE

TEMPIN	9-12	

ANALOG

AIN	4-12	
AOUT	10-12	

MAP SWITCH

MAPSW	3-12	

INJECTOR CONNECTION

IJ2	1-8	4-8
IJ1	3-8	4-8
GND	2-8	
ECU E1	8-8	7-8
ECU E2	5-8	6-8

Note: Injectors IJ1 & 2 SHARE the common wire 4-8!

14. INSTALLATION

The "Minimum Installation" is a good way to start getting acquainted with your SMT8-FT. It is quick, requires very few tools but does not allow you to enjoy the full potential of the product. The SMT8-FT (FT for short), can do so much more, and its power and the benefits to you are unleashed when you connect a few more wires (see the section on the Full Installation.)

14.1 MINIMUM INSTALLATION

This installation is the absolute minimum and will provide you with a "One Dimensional" map with 24-RPM sites spread over the calibrated RPM range. The number of sites on a map is an indication of the amount of tuning that can be done for a specific area, in this case RPM.

14.2 PRACTICAL STEPS

The Minimum Installation has been broken down into 6 (six) practical steps, with photos. These steps cover the installation of the unit into the vehicle and the unit is not connected to a computer. Once the physical installation has been completed the engine will run as before. For the purpose of tuning the engine you need to consult the:

LETRIPP II SOFTWARE GUIDE

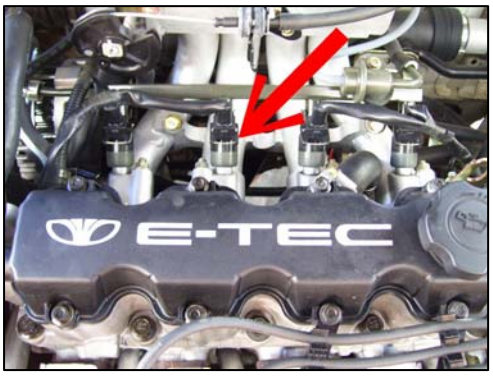
This manual covers all aspects of the PC (Laptop) operation.

STEP 1: FINDING A SUITABLE LOCATION TO MOUNT/INSTALL THE UNIT

a. Find a suitable location for the unit, i.e.:
- Away (or shielded) from hot surfaces
- Within harness reach of the injectors and the vehicle's ECU (Engine Control Unit)
- Protected from water, water spray, or high pressure water cleaning. This is because the unit is not water-resistant or water-proof
- If possible, in a ventilated area

The ideal location would be as close as possible to the battery of the vehicle, in the engine bay. This is the coolest place in an engine. However, you would need to seal the unit in a plastic bag to ensure that the connectors would not get wet.

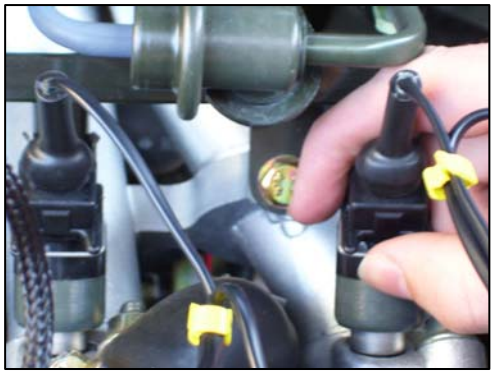
STEP 2: LOCATING THE INJECTORS OF THE ENGINE



a. Look around your vehicle's engine and locate the injectors of the fuel injected petrol engine.
b. Connect the loose wire (ground) of the injector harness(es) to a suitable place on the metallic chassis. This is to GROUND the unit.

STEP 3: CONNECTING THE PLUG-AND-PLAY INJECTOR HARNESS (ES)

a. Remove the existing injector caps/plugs, by unclipping them. As shown in the photo on the left.



b. Using the plug-and-play harness(es) supplied with the FT kit, connect the injector harness to the injectors (if you are installing on a 4-cylinder engine, you'll have two sets of plug-and-play injector harnesses). As shown in the photo on the left.

c. The photograph on the left shows the injector plug of the engine and the harness injector clip.

STEP 4: CONNECTING THE GROUND WIRES

a. Connect the ground wire(s) to a suitable metallic place on the chassis. In the photo on the left, there were two screws in the chassis, which made it easy to attach the lugs to the chassis.

NOTE: If there is no metallic section exposed on your vehicle's chassis, you may need to scratch some of the paint off to expose the metal.

STEP 5: CONNECTING THE HARNESS TO THE UNIT

a. Connect the connector plugs from the harness to the matching connector on the unit. As shown in the photo on the left.

14.3 ADAPTING THE PLUG-AND-PLAY INJECTOR HARNESS

The SMT8-FT plug-and-play injector harness has been manufactured to clip onto Bosch injectors. If you find that your vehicle does not have Bosch injectors, you will need to replace the Bosch injector clips on the SMT8-FT plug-and-play harness, with the applicable injector clips for the injectors in your vehicle.
The polarity of the wires is not important. However, the male/female connectors must not be swapped.

15. FULL INSTALLATION

This section provides information on pin locations for all units, as well as details of wiring in the harness for optional connections.

15.1 POWERING THE SMT8-FT WITHOUT THE ENGINE RUNNING

The SMT8-FT can get operating power from two sources:

1) **From the injectors**
   The injector power may be switched off when the engine is not running.
2) **From the 12 Way connector Pin 2**
   This wire can be connected to any fused 12V power point, which is switched off when the key is removed.

The SMT8-FT will use power sources 1) and 2) above, if available. The pin#2 supply is normally left open, but is very nice to have when you like to 'talk' to the unit without the engine operating or on the workbench.

15.2 RECOMMENDED OPTIONAL WIRING

15.2.1 OPTIONAL DEFLECTION (TPS, AMP) INPUT (PIN 11 OF 12)

Wiring in the deflection can be a little difficult, but is highly recommended. It will provide a "Two Dimensional" map. The difficulty is to find the correct signal wire amongst virtually hundreds of other wires.

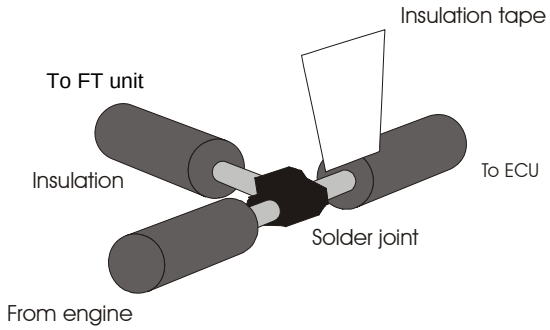
The definition of the deflection signal is: "It changes its voltage in unison to the change of the gas pedal". This can be measured with an ordinary multi-meter.

The deflection signal can be obtained from the TPS, ETC, or AMP, or MAF sensor. The principle is the same: It goes up with increasing engine load.

There are many ways to go about finding the correct deflection wire:

1) Trace the wire (colour) from the TPS sensor to the ECU.
2) Trace the wire from the AMP sensor.
3) Poke a needle into each wire and measure the signal in response to moving the gas pedal.
4) Locate an ECU connector layout from the vehicle manufacturer's service manual.
5) Get help from a qualified vehicle electrician.
6) Ask a friend.

Once the deflection wire has been found, you will then need to TEE the SMT8-FT AMPIN into it with the provided TEE-CONNECTOR. If you prefer to do the connection yourself follow the diagram below:



Try the installation of the deflection wire connection: Once the unit has been powered up, the cursor must move in unison with the gas pedal right to left. See the LetRipp II Windows Software Guide on how to use the software to operate this feature.

Note: If you don't have a multi-meter, you can use the SMT8-FT input and display the result on a PC. The AMPIN input can be connected to any voltage EXCEPT the IGNITION (high tension!) without causing any harm.

15.2.2 OPTIONAL ENGINE TEMPERATURE INPUT (PIN 9 OF 10)

This sort of connection is for the very particular tuner, and when you would like to change the "COLD" behavior of the engine. Locate the engine temperature wire (best done by tracing) and TEE into it with the SMT8-FT's TEMPIN (pin 9-12) on the optional wiring harness. If you don't need the engine temperature, then leave this wire open.

15.2.3 OPTIONAL MAP SWITCHING INPUT (PIN 3 OF 12)

The SMT8-FT has two complete tuning maps.

The second map (Map B) is activated by shorting the MAPSW wire (Pin 3 of 12) to ground. If left open, then Map A is active. This is indicated in the right upper corner of the display in the LetRipp II Windows Tuning Software. This feature is recommended when you experiment with the tuning. It gives you two different choices of tuning while driving the car on the road. An absolute "must" if you would like to do economy tuning.

16. CALIBRATION

This is the process to adapt the SMT8-FT to your engine. It requires that you have the respective input wired to the engine and that you can "exercise" or use the input. The SMT8-FT comes with "PRESET" calibration maps, and you may make use them. But the display they provide may be incorrect for your engine or application. Therefore, calibration will be necessary and it is very easy to calibrate the inputs you use.

The CALIBRATION is performed via CONFIG, then Calibration in the LetRipp II Windows Tuning Software. Please refer to the LetRipp II Software Guide for a detailed explanation.

The following signals can be calibrated:

- RPM
- AMP (Deflection)
- ENGINE TEMPERATURE
- ANALOG INPUT (For side table tuning)

17. TUNING

The SMT8-FT can tune:

- The fuel injectors
- An Analog signal (or AFR signal)
- An Ignition (Crank) signal

Only one process or all of the above may be applicable to you!

17.1 FUEL TUNING

This is the process of changing the amount of fuel your engine gets with the same amount of air. Some or most engines run a closed loop system: it measures the exhaust fumes and adjusts the fuel accordingly. Changing the fuel with the FT will not help in this instance: whatever fuel you put in extra, the stock ECU will take out again because it upsets the exhaust gas. However, and this is important, most closed loop systems stop operating at approximately 2500 RPM. You have to try it!

Most modern engines have a short and long term fuel control loop strategy. This may affect you in a couple of days. This can be found out with an OBD scanner. If you have problems with the fuel tuning you need to look at LAMBDA TUNING or ANALOG TUNING to supplement (or affect) the fuel tuning.

17.2 LAMBDA TUNING

This is a process by which you change the Exhaust gas reading (Lambda) in order to 'fool' the stock ECU in to doing the right thing. There are two ways to look at it:

A) You put more fuel in by other means, and tune the Lambda signal down (leaner) to hide the fact that the ACTUAL mixture is rich.
B) You make the Lambda signal LEANER as it actual is, and the stock ECU puts more fuel in to compensate for it.

Of course, method B) can only adjust by a predefined (?) amount, so you may have to use both methods anyhow.

17.3 ANALOG TUNING

This is a process by which an analogue signal is 'tampered' with in order to prevent the stock ECU from knowing what you have done to the engine. Example: You have increased the manifold pressure and your AMP sensor tops out. Route the AMP sensor signal through the SMT8-FT and limit it! Example: You can get more fuel in to the engine when you 'fool' the MAF sensor. There are many more examples for analogue tuning. However, the SMT8-FT has only one analogue channel. More analogue channels can be found on different SMT8 products. See: www.perfectpower.com

17.4 IGNITION TUNING

Ignition tuning is only recommended on engines with no knock sensors, and only in absolute required circumstances. It is a little tricky to say the least, but otherwise very rewarding if you use good grade fuel. In this method you intercept the crank position sensor signal and play it back to the stock ECU a little later (retard) or a little early (advance). Most people ask: How is advance possible? It is a little complicated. The unit learns the 'wheel pattern' and the can 'anticipate' the next coming signal ahead of time.

22. FUEL MAP ENTRIES AND THEIR EFFECT

When tuning with the LetRipp II a positive number adds and a negative number subtracts fuel as a percentage of the ECU injection length.
Example: Entry of 5, adds 5% fuel.
The Stock injection length can be displayed as well as the injector utilisation.

22.1 AFR, POWER AND FUEL ECONOMY

The AFR (Air Fuel Ratio) is one of the most important measurements in tuning fuel. The SMT8-FT can measure the signal from a NARROW BAND Lambda sensor and interpret it in AFR or Lambda.

AFR and Lambda are often used interchangeably. 1.00 Lambda = 14.7 AFR. Here are some important AFR numbers:

- 14.7 AFR = Normal Operation
- 13.2 – 13.8 AFR = Maximum Power
- 12.2 AFR = Maximum Power for Supercharged or Turbocharged Engines
- 15.5 AFR = Lean, point of Minimum Fuel Consumption

Modern engine technology can change the AFR numbers to a certain degree, but the principle remains: you can run the engine LEAN, but not on full power. Another way of looking at it – "if you want strong horses, you'll need to feed them!"

18. KEYWORDS

18.1 ECU

The computer “box”, which is controlling the engine’s operation

18.2 MAPPING

A process by which, a signal is manipulated via the various tuning maps.

18.3 INTERCEPTING

A wire is cut, and the two ends are “routed” through the SMT8-FT for the purpose of changing the signal.

18.4 TEE IN

A wire from the SMT8-FT is joined to the standard wiring loom. The signal is only read, and no modifications take place.

18.5 LAMBDA, OXYGEN, AFR

A lambda probe, oxygen probe, or AFR sensor all measure the oxygen content in the exhaust pipe. At lambda 1.00 the AFR=14.7 and a narrow band sensor generates a voltage between 0.2 and 0.8 Volts.

18.6 CHIPPING

Traditionally this applies to changing the “chip” of the ECU to provide better performance. When ECU’s started to control the engine it meant changing an EEPROM. The term now also applies to adding a SMT8-FT to the car, without changing any chips or EEPROMS. The SMT8-FT has the advantage over chipping because of the online tune and the retune capability.

18.7 MAF

Mass Air Flow sensor. It could be a device with a “FLAP” or a solid-state “hot wire” sensor. It generates basically an analog output voltage, which increases with higher airflow. Some devices compensate for air temperature (density).

18.8 MAP

Manifold Absolute Pressure. It is a solid-state device with 3 wires and provides an analog output voltage, which increases as the manifold pressure increases. Since it measures the absolute pressure the output voltage DECREASES at idle. We don’t like this term because is also applies to a tuning map.

18.9 AMP

Absolute Manifold Pressure. The same thing as a MAP! We like this term because it can’t be confused with a tuning “map”.

18.10 MAP SWITCHING

All of our units have two tuning maps, which can be switched while driving. There are THREE possible map-switching scenarios.

18.11 PICKUP

It is a sensor, which “picks up” an engine measurement like temperature or crank angle position. The sensor can be a Hall Effect (square wave) or magnetic (sine wave).

18.12 FEED-THRU

A method where a wire is cut and routed through the SMT8-FT for the purpose of modifying the electrical signal.

18.13 BALANCED INPUT

Refers to a magnetic pickup (CRANK/CAM position) where the pickup coil is isolated from ground. If a balanced input is tested with a scope, then both wires have an opposing signal on it. The SMT8-FT has balanced inputs on all three trigger inputs.

18.14 MAP SWITCH INPUT

A switch input when not used defaults to MAP=A.

18.15 DEFLECTION (THROTTLE/AMP) INPUT

It is a tee-in signal in the range from 0 –5Volts. Normally a low voltage refers to a closed throttle or no load. The SMT8-FT uses an AMP signal for deflection, but any other signal can be used on the AMPIN pin 11-12.