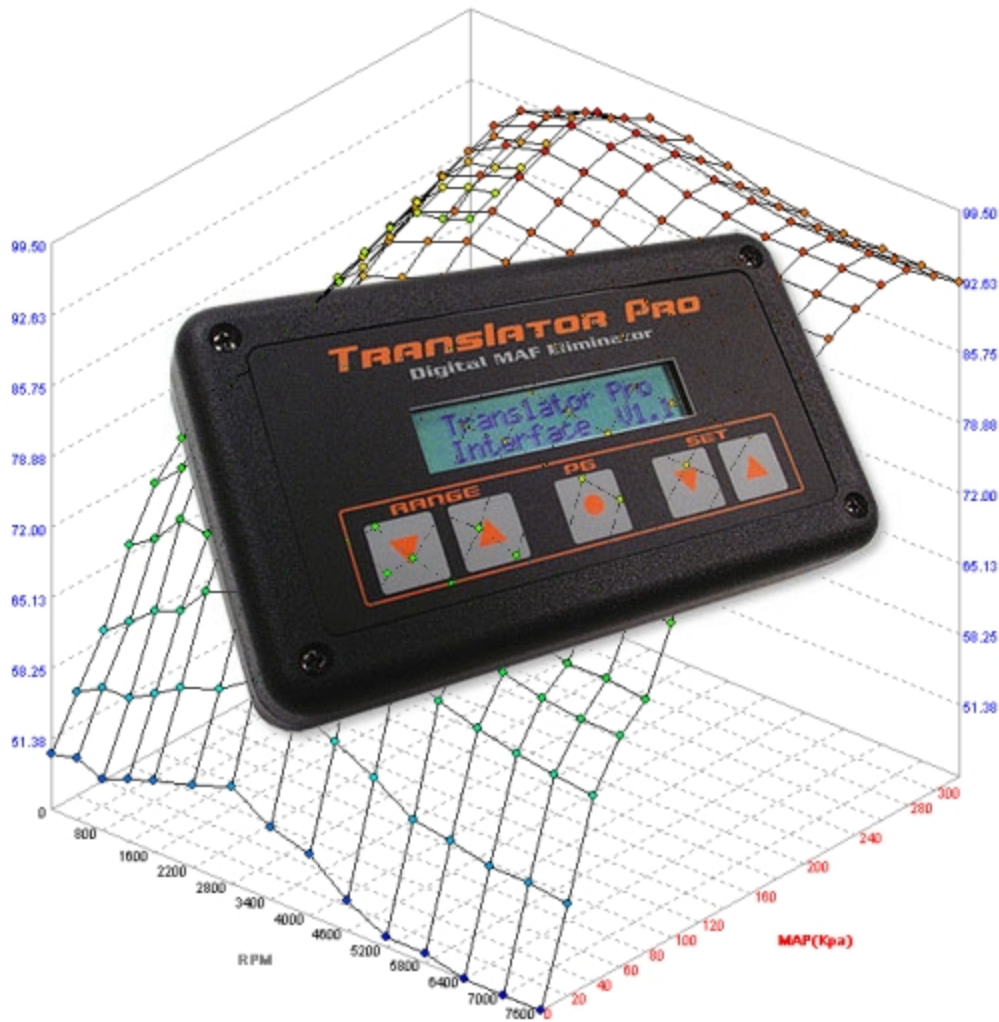
Translator Pro



Translator Pro version 5

Table of Contents

Kit Contents:

The Translator Pro kit is shipped with the following items.

- Translator Pro unit
- Standard splice harness, 10 pin
- Standard splice harness, 6 pin
- Serial cable for programming, tuning, and logging
- CD ROM containing documentation, and software
- Splice and tap connectors
- Manual

Available Accessories and Options:

- Boost Control Solenoid
- Boost Control harness (Plug-and-play and splice-in)
- MAP (Manifold Absolute Pressure) sensor
- IAT (Intake Air Temperature) sensor
- Speed Density harness (Plug-and-play and vehicle specific)
- EGT (Exhaust Gas Temperature) amplifier
- Accessory power pack (offline power supply, 120VAC)

Introduction:

The Translator Pro is a powerful electronic module that allows the user to tune the engine performance of a modern fuel-injected vehicle. The unit is configurable for many different types of vehicles. Using its various operational modes, the user can adjust fuel delivery, control turbo boost pressure, and other operating parameters to extract more performance from their vehicles' engine.

Warning: The Translator Pro is a powerful tool for adjusting the operation of the engine. It is possible to mis-adjust the settings and cause damage to the engine. Please read and understand this entire guide before attempting to install and use the Translator Pro. Adjustments should be made in small increments with continuous testing to ensure the engine is operating within its mechanical limits.

The primary function of the Translator Pro is to allow the user to adjust the air-fuel ratio of their engine. This is accomplished by adjusting the amount of airflow the Engine Computer Module (ECM) or Engine Control Unit (ECU) perceives is entering the engine. If the ECM/ECU senses less airflow is entering the engine, it will command less fuel be injected into the engine, thus making the Air/Fuel ratio "leaner". If the airflow signal is reduced by 1%, the resultant fuel delivery will be less by 1%. For example, an engine is consuming 100 grams of air per second, and the ECU is delivering fuel for 12:1 Air/Fuel Ratio (AFR). If the airflow signal to the ECU is reduced to 95 grams per second (5%), the ECU will deliver fuel for this amount of air. The resulting AFR will be 12.6:1 (5% leaner).
The Translator Pro is also a very powerful Electronic Boost Controller, when the optional High Boost Solenoid and harness is utilized. The

Translator Pro can even be configured to run two different boost pressures, selectable by wiring a simple switch to the unit.

Main Airflow Modes

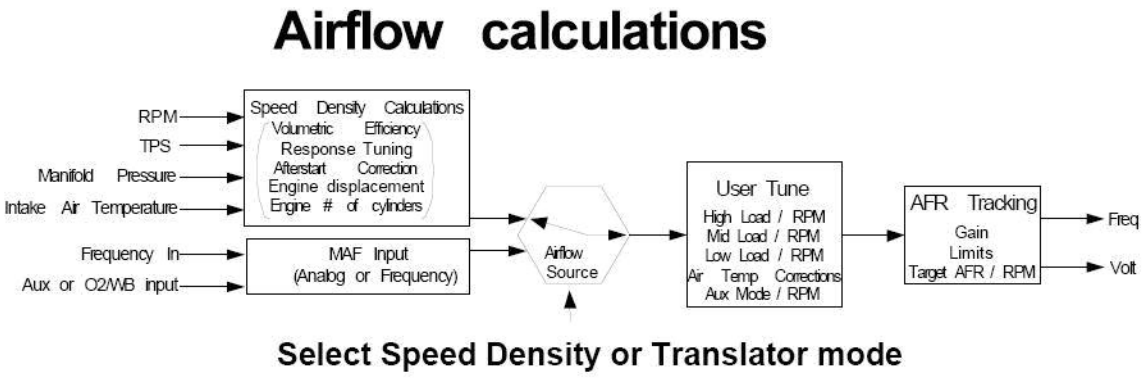
The Translator Pro sends airflow information in the form of an electrical signal (voltage or pulse frequency) to the ECU. Frequency signals are sent on the green, “frequency out” wire of the 10 pin harness. Voltage signals are sent on the Brown (V Out 1) or the Gray (V out 2) wires of the 10 pin Main harness.

Speed Density Mode (MAF Eliminator)

The Translator Pro serves to replace the airflow sensing hardware on the vehicle. The unit uses a sophisticated Speed Density algorithm to calculate engine airflow based on external sensors. This airflow calculation is used to synthesize a signal to send to the ECM/ECU, and the vehicle's original airflow sensor can be removed.

Translator Mode

The Translator Pro can be used to adapt a different airflow sensor to a vehicle. A large, high performance MAF (Mass Airflow) sensor can be installed on a vehicle not originally equipped with one, in order to increase performance. The Translator Pro can be used to install a high flow MAF on cars originally equipped with small, restrictive Karman Vortex or mechanical/flap airflow meters. Examples include using a GM LS1 or LS6 MAF on a Toyota Supra, Mitsubishi Eclipse, or Ford SVO Mustang. The Translator Pro can also be used to adjust the signals from the vehicles originally installed airflow sensor, in order to tune the vehicles performance.



Installation Details

This section contains installation details that are not specific to any particular vehicle. Please refer to the appendix and other installation diagrams contained on the CD included in the Translator Pro kit. Harness connections are referred to by connector designation M, S, E, (Main, Sensor, and Expansion) and pin number. For example the +12V main power input is connected to the pink wire at M5, Ground at M10. In this manual, "TAP" means to connect to a harness wire without cutting it. Splice means to cut a harness wire and connect Translator Pro wires to the cut ends.

Wire Splicing and Tapping information

The Translator Pro is installed by connecting wires into the vehicle's wiring harness. Good connections are absolutely necessary for proper, reliable operation. A loose or intermittent connection could cause improper fuel delivery at full throttle resulting in engine damage. Squeeze style tap connectors are included in the kit due to their popularity, but are not the most reliable means of connection. To use the squeeze style properly they must be installed firmly. Regular slip-joint pliers are best for this. If there is doubt about the users ability to install the squeeze taps properly, or the wiring area is subject to vibration, soldering the connections is recommended.

The pink spade connectors included in the kit are of the best quality and will provide good reliability when properly crimped. Inexpensive crimpers may not crimp firmly enough. Tug on the crimped connection to ensure there is no looseness and the wire does not pull out. When in doubt, solder the connections.

For additional details on soldering the connections, refer to this guide:

http://www.mmxpress.com/technical/connections.htm

Speed Density Installation

Using a Speed Density (SD) harness, install and connect the Manifold Air Pressure (MAP) sensor, typically a 3Bar, and Intake Air Temp (IAT) sensor. The MAP sensor reads manifold pressure, which the Translator Pro uses in for SD conversion, response fueling, boost control, and also for its load based tuning points. The MAP sensor needs to be installed using a piece of vacuum hose connected to the intake manifold plenum. The MAP sensor must read vacuum in order to properly control fueling at idle and part throttle. The IAT sensor should be installed so that its sensing element can read the temperature of the air entering the engine. On turbocharged vehicles this is usually the pipe that leads from the intercooler to the throttle body. The sensor can be installed in the intake manifold, but the possibility of "heat soak" is increased.
Remove the AFM/MAF sensor from the vehicle and install an air filter on the inlet duct. If the vehicle specific harness is being used, refer to those instructions for wiring details. Otherwise use a universal Speed Density harness or wire the sensor directly to the splice harness included with the Translator Pro kit. Install the Translator Pro wiring, splicing in the MAF signal wire so the Translator Pro can alter

its signal. If the original AFM/MAF had extra signals, such as IAT or Barometric pressure, wire the analog outputs to those ECU wires so the Translator Pro can generate those signals. Tap the TPS and RPM signals.

Translator Mode Installation

Remove the vehicle's original AFM/MAF and install the upgraded MAF. If a plug-and-play harness is available, follow the instructions specific for it. Otherwise wire the new MAF such that the signals use the original vehicle wiring. Install the Translator Pro wiring, splicing it to the MAF signal wire so the Translator Pro can alter its signal. If the original AFM/MAF had extra signals, wire the analog outputs to those ECU wires so the Translator Pro can generate those signals. Tap the TPS and RPM signals.

Using the Keypad

The Translator Pro is equipped with a 5-key keypad and LCD to allow the user to make tuning adjustments to the unit without needing a laptop computer or other external device. Most tunable parameters are accessible from the keypad. There are 3 main sets of data that are manipulated with the keypad: page, range, and setting. The page is selected by holding the "PG" (page) key, then pressing either RangeUp or RangeDn to select the desired page. The page description is displayed while "PG" is depressed. On any page, the RangeUp and RangeDn select the range to be adjusted, SetUp and SetDn change the setting of that range.

For example, to adjust the airflow (and consequentially the air/fuel ratio) at idle, select the AF Lo page by holding "PG" and using RangeUp or RangeDn to select the Airflow Low page. Then use the RangeUp or RangeDn key to select the RPM range that is closest to idle speed. Then use the SetUp or SetDn keys to adjust the setting.

The Config and Setup pages are used to configure the unit for vehicle specifics and airflow mode.

Translator Pro Pages

Use these pages to set the operating modes for your specific vehicle configuration

Config Select: Set the unit for the vehicle and sensor connected
System Setup: Settings related to the selected configurations
Boost Control: Settings using the boost control output, if the optional Boost Solenoid and harness connector is installed.
AFR Tracking: Settings using WBO2 Closed-Loop feedback, under WOT conditions.
Air Temp: User AF tune vs. IAT, this adjustment is in addition to the normal compensation.
Aux Trig: User AF tune that is activated when the AUX input is activated.
AF Hi: High load AF tune vs. RPM.
AF Mid: Mid load AF tune vs. RPM.
AF Low: Low load AF tune vs. RPM.
Response: Adjustments for response to changes in MAP and TPS (tip-in). This affects Speed Density and Translator mode (Translator mode

response settings are only active when Translator mode with Response is selected for Airflow source).
Sensor Monitor: Display operating and tuning parameters.
Spark WOT: Adjust WOT (Wide Open Throttle) spark advance (not all vehicles)
Spark Aux: Adjust WOT (Wide Open Throttle) spark advance when AUX mode is activated (not all vehicles)
PT Tracking: Settings using WBO2 Closed-Loop feedback, under Part Throttle and Idle conditions. ***The ECM/ECU must be in open-loop in order for Part Throttle Tracking to operate correctly, see PTT section***

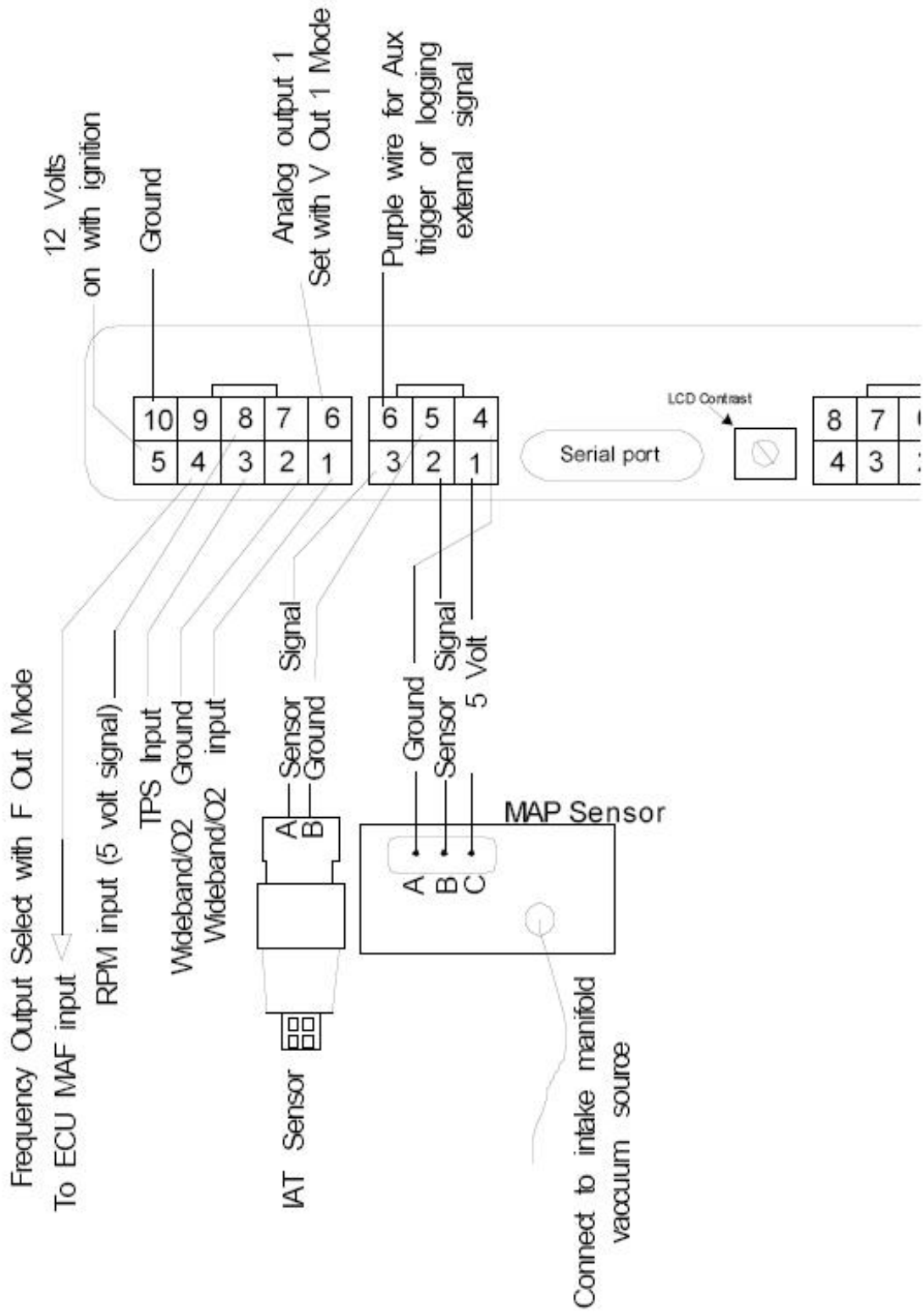
Speed Density Mode Setup

The Translator Pro is a high-tech engine tuning device that fills the technology gap between the popular but simple piggyback tuning devices and the full-blown, expensive standalone engine management systems. The Translator Pro uses sophisticated computations to determine engine airflow, thus relieving the user of the daunting task of completely mapping the engine s operation. Once the initial setup is complete, there is usually little tuning required to attain smooth operation and drivability.

The Engine Control Module (ECM) or Engine Control Unit (ECU) in a vehicle is a small computer unit responsible for calculating how much is injected in the engine. The fuel is injected to match the air flowing into the engine. The Translator Pro, like traditional "piggyback" controllers allows the user to adjust the airflow measurement, thus changing how much fuel the ECM/ECU injects into the engine. This is how the user "tunes" the engine. The Translator Pro is unique in that it allows the user to remove the air measurement devices (MAS, MAF, VAF, AFM, ect) from the engine and use a *speed density* calculated signal to replace it. In high performance engine applications this has many advantages and added flexibility.

To enable Speed Density mode enter the engine and sensor parameters in the Config and Setup pages. The Translator Pro uses the engine parameters to calculate the airflow. Then set **Airfl Srce** (Airflow Source) to **Speed Density** or **Spd Dens. no tmp** so the Translator Pro will calculate airflow via the speed density algorithm. Use **Speed Density** if the ECU is not getting temperature information via another signal. Use **Spd Dens. no tmp** if the ECU is receiving air temperature information and will compensate its fuel delivery. Some vehicles have airflow sensors with other functions or signals. These other signals are typically barometric pressure and Air Temperature. These MAF sensors are actually "Air Volume" sensors, and the ECU uses the temperature and pressure data to calculate the airflow mass. When using a calculated airflow mass (speed density) the air temp and baro signals must be kept constant to prevent double-compensation. These other signals can be simulated by the Translator Pro, using the VOut 1 and VOut 2 signals. Set the VOut 1 and 2 modes to **Set max setting** in the Config page, and set the output voltages to normal levels in the Setup page. If the vehicle ECU requires a voltage MAF (Ford, Porsche, some Toyota, ect) connect one of the V Outs to the ECU MAF input and configure corresponding V Out mode for the correct analog MAF signal calibration.

Speed Density Standard Connections

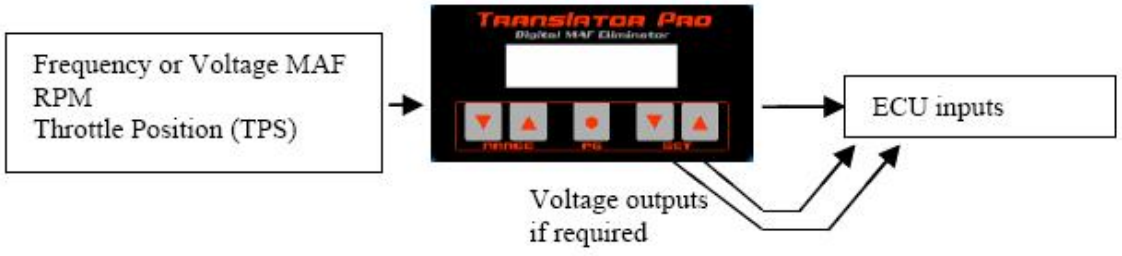


Translator Mode Setup

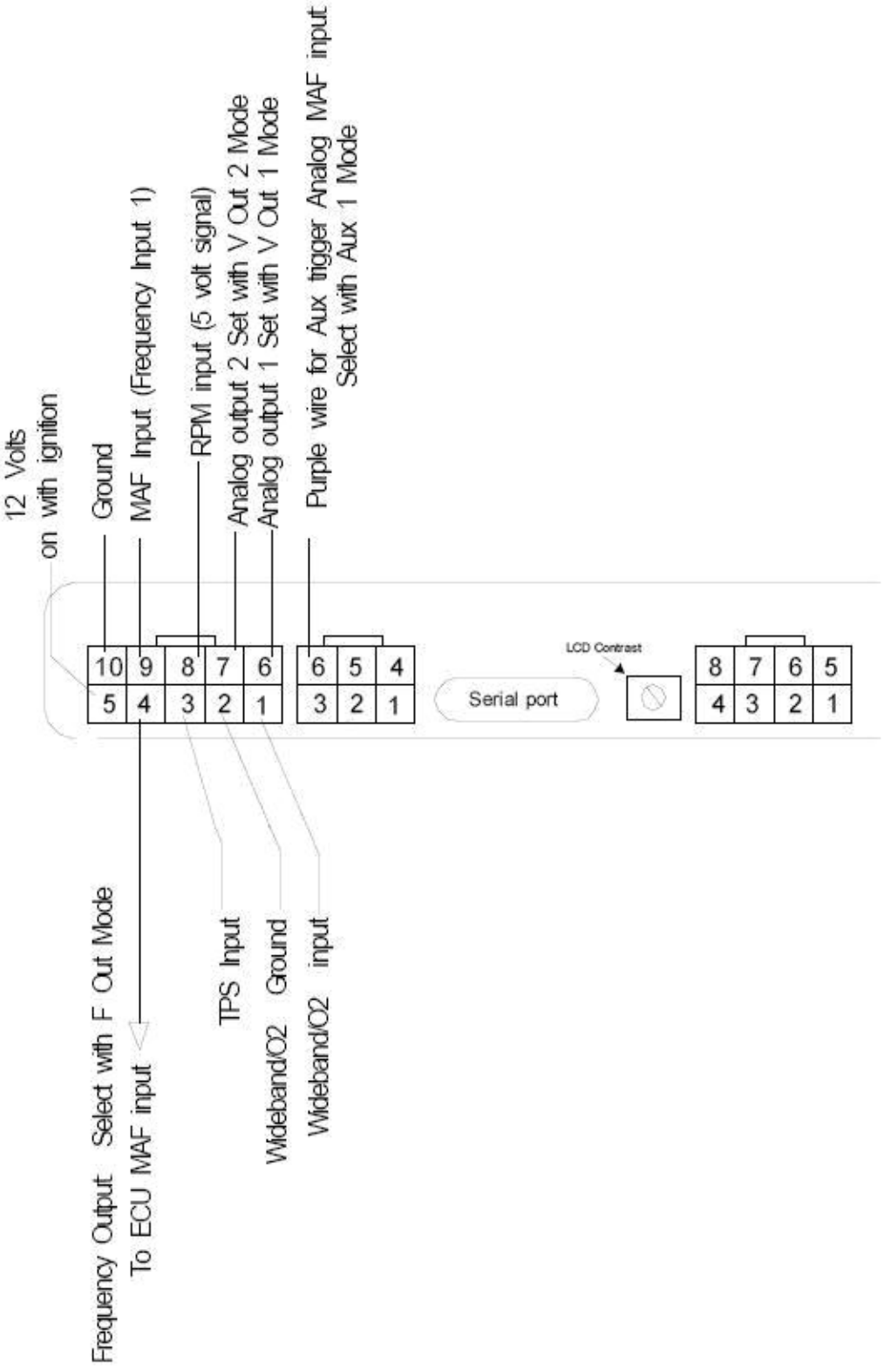
In Translator Mode a vehicle can be equipped with a larger high performance MAF than was originally installed. The new MAF is installed and wired to the Frequency Input (for GM style frequency MAFs) or to the AUX input (for Ford style voltage MAFs). To enable Translator Mode, the F In Mode (for Frequency MAFs) or the AUX 1 mode are set to the proper settings for the new MAF. The F out Mode or V out mode is set to match the vehicle, so the airflow output signal scaling will match the vehicle. Then set **Airfl Srce** (Airflow Source) to either **MAF Translator**, **MAF Trans. w/ VE**, **Xltor w Response**, or **Xltor VE Response** so the Translator Pro will use the MAF sensor input as the signal source.

Note: using **MAF Trans. w/ VE** or **Xltor VE Response** requires a custom VE table for proper operation. Using **Xltor w Response** or **Xltor VE Response** incorporates the User-defined response settings. Multiple mode choices allows for greater flexibility when using the Translator Pro in Translator Mode.

Some vehicles have MAF sensors with other functions or signals. These other signals are typically Barometric pressure and Air Temperature. These MAF sensors are actually "Air Volume" sensors, and the ECU requires the temperature and pressure in order to calculate the airflow mass. When using a true MAF sensor, the air temp and baro signals must be kept constant to prevent double-compensation. These other sensors can be simulated by the Translator Pro, using the VOut 1 and VOut 2 signals. Set the VOut 1 and 2 modes to **Set max setting** in the Config page, and set the output voltages to normal levels in the Setup page.



Translator Mode Standard Connections



Parameter setting details for all pages:

Config:

Vehicle Select: Select 1 if unit is wired to stay on for 10 seconds after key-off (Mitsubishi)

# of Cyl: Set to the number of cylinders of the engine (exception: 96+ LT1, LS1 set to 4)

Displ: Displacement in Liters

Airfl Srce: Source for airflow to output signal

Speed Density	-Speed Density with temperature compensation
Spd Dens. no tmp	-Speed Density without temperature compensation
Spd Dens. Hybrid	-Speed Density using TPS signal as VE MAP pointer
Spd Dn Hyb, no T	-Speed Density using TPS signal as VE MAP pointer, without temperature compensation
SD User-Axis	-Speed Density using User-Defined VE MAP Axis
SD no T, UserAxs	-Speed Density using User-Defined VE MAP Axis, without temperature compensation
MAF Translator	-AFM/MAF input with UserTunes
MAF Trans. w/ VE	-AFM/MAF input with UserTunes and VE MAP
Xltor w Response	-AFM/MAF input with UserTunes and Response settings
Xltor VE Response	-AFM/MAF input with UserTunes, Response, and VE MAP

MAP Source: Select type of MAP sensor

0 –GM 3 bar sensor	3 –GM 2 bar sensor
1 –AEM 3.5 bar sensor	4 –Motorola 2.5 bar sensor
2 –AEM 5 bar sensor	

Load Source: Used to select the load axis for the User Tunes

Use MAP	Enables pressure based selectable load points for the User Tunes
Use TPS	TPS is looked up based on voltage and will look like a 3 bar MAP sensor when viewing the Ld parameter on the LCD. In this mode, the default settings for the load points are the same as MAP mode
Use MAF/RPM	Airflow based load calculation that is scaled to closely match a 3 bar MAP sensor. For utilizing a load based User Tune points when in Translator mode

Baro Mode: Select Barometric Pressure mode

(0) –No BARO mode, use Sealevel value to calculate boost, no fuel change

(1) -Detect Baro at key-on, use to calculate boost, no fuel calculation change.

F-Out mode: Select function and scaling of the Frequency output

0 –Off	8 –GN (Extreme and Extender Pro)
1 -1G DSM	9 –GN (Extender chips)
2 –EVO-8/9 and 3G Eclipse	10 –GN (Commander chips)
3 -2G DSM and 3000GT/Stealth	11 –GN (Stock style)
4 –Supra MK-III	12 –LT1 (3” MAF) Impala SS, and passenger car
5 –LS1 Aluminum MAF, F-Body	13 –LT1 (3.5” MAF) LT1 and LT4 F and Y body cars
6 –LS1 Truck	30 –Ford BAP sensor signal, fixed at sealevel setting
7 –LS1 (future application)	

V-Out1 mde: Select function and scaling of Volt Out 1
V-Out2 mde: Select function and scaling of Volt Out 2

0 -Set max setting	-Use Volt Max in Setup page
1 -Spark Control	-WOT Spark control signal for GN and DSM
2 -MAP: 3 Bar GM	-3bar MAP sensor simulation
3 -MAP: 2 Bar GM	-2bar MAP sensor simulation
4 -MAP: 1 Bar GM	-1bar MAP sensor simulation
6 -IAT: Mitsubishi	-Mitsubishi air temperature sensor simulation
8 -TPS: Enhanced	-TPS Enhanced output
10 -MAF: Supra MK-IV	-Toyota Supra MK-IV MAF ouput
11 -MAF: Cobra	-Ford Cobra (24lb) MAF output
12 -MAF:Cobra (62lb)	-Ford Cobra (62lb) MAF output
13 -MAF: LA3 VAF	-Ford SVO/Merkur VAF output
14 -MAF: GM TPI	-GM Tuned Port Injection MAF output
15 -MAF: Sub Legacy	-Subaru Legacy MAF output
16 -MAF: Porsche 911	-Porsche 911 VAF output
17 -MAF: Toyota VAF	-Toyota VAF output
18 -MAF: Nissan SR20	-Nissan SR20DET MAF output
19 -MAF: Alpha Romeo	-Alpha Romeo MAF output
20 -MAF: Mazda VAF	-Mazda VAF output
21 -MAF: User Loaded	-Use the User-Loaded MAF output
22 -MAF: QR25 rev1	-QR25 MAF output, reversion 1
23 -MAF: Hyundai Tib	-Hyundai Tiburon MAF output
30 -CF%: Corrct Fact	-Loggable Correction Factor output for the PowerLogger
31 -VE%: Volum. Effc	-Loggable Volumetric Efficiency output for the PowerLogger
32 -Boost Duty Cycle	-Loggable Boost Solenoid Duty Cycle output for the PowerLogger

AFR Source: Select scaling of wideband input

None	Zeitronix ZT2
LC1	Dynojet
LM1	AEM interface
5v AEM Gauge	DIY-WB
TechEdge 2B0	

F-In Mode: Select scaling of Frequency Input (Prescaler setting)

0 –Frequency input, no scaling (OFF); Porsche knock input	6 -85mm GM MAF, with screen (ON)
1 -3″ GM MAF (ON)	7 -3.5″ GM LT1 MAF (ON)
2 -3.5″ GM MAF (ON)	20 –Timing Monitor Mode for Supra (OFF)
3 -85mm GM MAF, no screen (ON)	21 –Timing Monitor Mode for Turbo Buick GN (OFF)
4 –Extreme GM MAF (ON)	22 –Timing Monitor Mode for 3000GT/Stealth (OFF)
5 –Buick GN Translator output, Extreme mode (OFF)	23 –Timing Monitor Mode for DSM and EVO (OFF)

The Prescaler is the config jumper inside the unit, ON is the left 2 pins, OFF is the right 2 pins. Position the jumper according to the above chart.

Aux1 Mode: Determines function of Aux input wire.
(Sensor Harness, pin 6, purple wire)

0 –AUX triggering disabled
1 –AUX triggering activated by applying voltage to the AUX wire
2 –AUX triggering activated by grounding the AUX wire
3 –AUX trigger is activated at all times
10 –Applying voltage enables Boost AUX settings
11 –Grounding enable Boost AUX settings
21 –Read Analog AFM/MAF on AUX. User-Defined AFM/MAF
22 –Read Analog MAF on AUX trigger wire. Mustang Cobra (24lb)
23 –Read Analog MAF on AUX trigger wire. Mustang Cobra (62lb)
24 -Read Analog MAF on AUX trigger wire. LA3 VAF
25 -Read Analog MAF on AUX trigger wire. GM TPI
26 -Read Analog MAF on AUX trigger wire. Subaru Legacy
27 –Read Analog AFM on AUX trigger wire. Porsche 911 AFM
28 -Read Analog MAF on AUX trigger wire. Toyota VAF
29 -Read Analog MAF on AUX trigger wire. Nissan SR20 MAF
30 -Read Analog MAF on AUX trigger wire. Alpha Romeo
31 -Read Analog MAF on AUX trigger wire. Mazda VAF
32 -Read Analog MAF on AUX trigger wire. QR25
33 -Read Analog MAF on AUX trigger wire. Hyundai Tiburon
35 –Read EGT signal on AUX wire, AUX trigger function remains off

F Out Max: Set for the maximum frequency that will be sent out the MAF output. Can be used to prevent fuel-cut, or intentionally lean out the top end. Set to 0 to disable frequency limiting.

Setup:

Mainscale: Adjusts the entire fueling range by the same %.
V-Out1 Max: Limits the V-Out1 voltage output
V-Out2 Max: Limits the V-Out2 voltage output
Afterstart: Enrichment for the first few minutes of engine run time.
Lo Load Pt: KPA for the Lo Load User tunes (default is 36).
Mid Load Pt: KPA for the Mid Load User tunes (default is 100).
Hi Load Pt: KPA for the Hi Load User tunes (default is 143).
Tm Base: Adjustable in degrees to match the Timing Monitor reading to actual
Tm Correct: Adjust to make the Timing Monitor match both low and high RPM
AF TrDelay: Adjustable delay of 0-25.5 seconds that AFR tracking waits after enabled, before it begins to correct

Boost Control

The Translator Pro can control turbocharger boost pressure when the optional boost solenoid is installed. See the separate section on Boost Control.

WOT AFR Tracking

The AFR Tracking page is used to control how the Translator Pro self-adjusts to maintain a desired AFR at WOT. The Translator Pro does not self-tune, but will correct its output while at WOT to attempt to achieve a desired AFR. See the separate section on AFR Tracking.

Air Temp

Air temp correction, setting is added to the regular system tune value. Note this adjustment is in addition to the Speed Density algorithms temperature compensation. Additional adjustment can be required to adjust for atomization characteristics of injectors, or heat-soak conditions.

Aux Triggered

At each RPM point, the set tune percent is added to the High Load user tune when the Aux Trigger input is activated.

Tune High
Tune Mid
Tune Low

User tune values, load points are determined in the Setup page. These settings are blended between RPM and load points and then added to the System Scale, Air Temp, and Aux Trigger settings

Tune Response

The response page in the Translator Pro is for adjusting the unit to add a small burst of extra fuel when the throttle is opened. Anyone who has tuned a carburetor would call this an "accelerator pump", and its operation is similar. The Response tuning affects Speed Density and Translator mode, when Translator with Response is selected..

Sensor Monitor

Displays various sensor and system signal values. Range buttons select the 2 left displays, Set buttons select the right 2 displays. The TOP RIGHT displayed value appears on all other tuning pages. If the Top Left and 2 bottom displays are all set to the same parameter, the bottom display becomes a bargraph display for that value.

RPM	Engine RPM	O2	O2/Wideband input voltage
MP	Manifold Absolute Pressure (KPA)	FE	Flow Error, depends on mode
DC	Density compensation, % correction from air temperature (Speed Density mode)	ASC	Afterstart compensation %
AFL	Airflow, Grams/sec (Speed Density mode)	AFR	Air Fuel Ratio if wideband O2 connected
AFI	Airflow input (Translator mode)	CF	AFR tracking Correction Factor %
VE	Volumetric Efficiency (Speed Density mode)	TAF	Target AirFuel Ratio for AFR tracking
Cel	Active Cell in VE table (1-255)	Spk	Spark Advance desired (GN/DSM)
FI	Frequency Input (Hz)	BA	Barometer, read at key-on if enabled
FO	Frequency Output(Hz)	BP	Boost Pressure (+/- psi)
UT	User Tune, the total of the tune and mainscale	Ax1	Aux input #1 voltage (purple wire, 6 pin connector)
TPS	Throttle Position Sensor 0-5 volts	Ax2	Aux input #2 voltage (orange wire, 10 pin connector)
BD	Boost solenoid Dutycycle	TM	Timing Monitor (Degrees)
MT	Manifold Temperature (IAT)(degrees F)	Rs	Response Fuel

LD	Engine load	EGT	32-1800 degrees F (when using EGT accessory, wired to AUX input)
VE	Engine Volumetric Efficiency in %	Vo1	Volts out on Vout1
Me	MAP enrichment	Vo2	Volts out on Vout2
Cnt	Knock Counter for Porsche 944 Turbo.		

Spark WOT

At each RPM point, the Spark advance that is programmed is what the vehicle ECU will run once boost is over approximately 6 psi. This feature on works on vehicles specifically set up for Remote Spark Advance Control. Currently this is only DSMChips equipped cars with this feature activated, Buick GN's running the Extender Pro chips, Mk-III Supras, and 3000GT/Stealths.

Spark AUX

The spark advance programmed into this page will be used instead of the WOT Spark if the Aux input is triggered. (DSMChips equipped cars with this feature activated, Buick GN's running the Extender Pro chips, Mk-III Supras, and 3000GT/Stealths)

Part Throttle Tracking

The Part Throttle Tracking (PTT) page is used to control how the Translator Pro self-adjusts to maintain a desired AFR in Part Throttle & Idle conditions. The Translator Pro does not self-tune, but will correct its output while at Part Throttle & Idle. See the separate section on Part Throttle Tracking.

Tuning with the Translator Pro

Generally, once the Translator Pro is properly configured, the engine should start and run. Then the next step is tuning. "Tuning" is the term used to describe adjusting the fuel delivery and spark advance (as well as other items) for best operation of the engine and vehicle.

Tuning is accomplished using the Translator Pro keypad. The Air/Fuel ratio (AFR) is adjusted in the low/mid/high load tuning pages. "Load" refers to how hard the engine is working at a certain RPM. Low load means light throttle operation, idle, and steady speed driving. Mid load refers to easy acceleration at moderate throttle. High load refers to heavy throttle acceleration. Tuning is identical for both modes, Speed Density and Translator.

The AFR tuning is the sum of the Mainscale, low/mid/hi/aux User Tune, and Air Temp tune settings. This total can be viewed on the Sensor Monitor page as UT (User Tune). Adjust the Mainscale initially for the best compromise between idle and part throttle driving. This sets the tune "close". Then use the low load page to adjust the tune at idle and light throttle driving. The mid load adjustments should be set for proper AFR for moderate acceleration. The mid load settings at 800 to 1200 RPM also affect "tip-in" smoothness. Hi load adjustments are used to adjust the AFR for WOT operation.

Open Loop vs. Closed Loop

Modern engine control systems operate in "closed-loop" during part throttle and idle operations. During close-loop the ECU measures the signal from the Oxygen Sensor, mounted in the exhaust system, and makes internal fuel delivery corrections to maintain 14.7:1 AFR. Adjusting the Translator Pro when the ECU is operating closed loop will only temporarily affect the AFR, since the ECU will attempt to re-correct back to 14.7:1. To properly tune part throttle, the factory ECU needs to be in “Open-Loop”, and allow you to adjust the idle/part-throttle tunes. During warm-up and WOT operation the ECU operates in "open-loop" mode, and tuning changes directly affect the AFR. Refer to the technical documentation specific to your vehicle for more details.

Response tuning

Fuel Enrichment: The response page in the Translator Pro is for adjusting the unit to add a small burst of extra fuel when the throttle is opened. Anyone who has tuned a carburetor would call this an "accelerator pump", and its operation is similar. The Response tuning only affects *Speed Density mode* and Translator modes with response selected. This response is for improved drive-ability and transitions. Also included in the response page is the settings for Drop Throttle tuning. Drop Throttle adjustments are in place to assist response fueling when letting off the throttle. This assists for over-rich deceleration conditions.

The T-Pro has two main inputs to the response adjustments. ***TPS*** and ***MAP***. When the throttle is opened quickly (or even slowly) the TPS signal changes because the sensor is physically connected to the throttle. The MAP signal changes because the vacuum in the intake manifold drops or boost increases. When this happens, the airflow signal to the ECU must be increased slightly for a short period of time to prevent hesitations or stumbles. Make sure you look at all the

settings during setup/troubleshooting.

TPS:

These settings are solely based off your **T**hrottle **P**osition **S**ensor. TPS response settings will be sufficient for the majority of vehicles. TPS response is also the quickest of the response types. And as such, has the most user adjustability. The three TPS based parameters are:

TPS Enrichment: This first parameter defines the amount of fuel delivery added in relation to TPS opening change. This higher the number the more enrichment fuel. It is best to use the minimal enrichment needed to obtain good drive-ability.

TPS Decay: This parameter is a modifier for TPS Enrichment. Decay defines the speed that TPS Enrichment is removed, the higher the number the faster the decay.

TPS MAP Max: This defines the upper limit for the application of TPS Response fueling. Above this MAP value no TPS Response fueling is allowed.

Throttle Body Size: is a scaler for TPS enrichments, our second modifier. This adjustment allows users to fine-tune the TPS response settings. The higher the number shifts enrichment to lower throttle openings (range of 0-9). Larger throttle bodies typically need more enrichment at lower TPS positions. Use TB Size, to shift enrichment to smaller or larger TPS changes.

MAP:

MAP response is calculated based on changes in the MAP sensor. The gain is a blend of the MAP enrichment and boost enrichment. The enrichment factor is a blend of MAP and Boost settings depending on TPS position. The MAP Enrichment decay time is static. If the MAP is not increasing, then the enrichment decays to zero. It is best to use the minimal enrichment needed to obtain good drive-ability.

MAP Enrichment: This first parameter defines the amount of fuel delivery added in relation to manifold pressure increase. The higher the number the more enrichment fuel.

MAP Enrichment can be especially useful for load changes without a TPS change, such as going up hills. MAP Enrichment can also be used to complement/continue the TPS Enrichment spike, as the MAP Enrichment is slower.

Boost Enrichment: This enrichment is the similar to MAP Enrichment, but is used for TPS values over 1.5 volts. The idea is when the throttle is open, the entire intake plumbing system is filling, causing the need for a large AFM/MAF signal spike. This modifier is added to both the TPS and MAP based enrichments. This higher the number the more enrichment fuel

MAP TPS Min: This defines the lower limit for the application of MAP Response fueling. Below this TPS value no MAP Response fueling is allowed. This is used to keep MAP Response fueling from occurring during idle situations.

MAP RPM Min: This defines the lower limit for the application of MAP Response fueling. Below this RPM no MAP Response fueling is allowed. This is also used to keep MAP Response fueling from occurring during idle situations.

MAF/AFM Limiter:

The MAF/AFM Limiter **limits** the calculated airflow signal sent to the ECU when you drop the throttle for a limited amount of time.

The purpose of the limiter is to prevent an overly rich condition when letting off the throttle. This helps prevents CELs and improves transitions back into throttle.

When above RPM and TPS settings, this feature "arms", then when the throttle drops under the **MAF Limit TPS Threshold** setting, the calculated airflow is limited to a value set by the **MAF Limit** + **MAF Limit / KRPM**. The airflow is limited for a maximum time set by the **MAF Limit Time** setting.
MAF Limit TPS Threshold: Below this TPS voltage, AFM/MAF limiting is active. This should be set slightly higher then your idle TPS values.
MAF Limit: Base AFM/MAF limit in Grams/sec.
MAF Limit / KRPM: AFM/MAF limit in g/s per 1000rpm. If set to 10, the airflow will be limited to 10 at 1000rpm, 20 at 2000rpm, ect. Set this to 2.5 to start with. This is added to the Base number set by the **MAF Limit** setting.
MAF Limit RPM Min: The lower limit in RPM for the limiter to function. This is utilized to prevent droops and stalls.
MAF Limit Time: Max number of seconds the limiter will stay active. Use the minimum time necessary.

WOT AFR Tracking

The Translator Pro can adjust WOT AFR to a desired setting using feedback from a WideBand O2 sensor/controller. Install the wideband sensor in the exhaust following the manufacturer's instructions. Connect the Translator Pro wideband/O2 input to the analog output of the wideband unit. Connect the Translator Pro wideband/O2 sensing ground wire to the wideband ground. (use the "analog ground" if the wideband has one, or connect to the wideband main ground, close to the unit) The wideband/O2 sensing ground must be connected or the wideband signal will not be measured correctly. The wideband input on the Translator Pro is a "differential input" and measures the difference between the input and the sensing ground. Set the AFR Source in the Config page to match the wideband unit installed. Setup or program the wideband unit if required.

When the wideband unit is installed and operating the analog voltage can be monitored on the O2 parameter of the Sensor Monitor page, and the AFR is also viewable. Ensure the AFR displayed matches the wideband unit

The AFR tracking page is adjusted for WOT AFR control as follows.
Min TPS: TPS above which the AFR tracking is enabled. This should be set for moderate throttle or above.
Min RPM: RPM above which the AFR tracking is enabled. This should be set to the lowest RPM that the turbo makes positive pressure.
Min MAP: Manifold pressure above which AFR tracking is enabled.
Lean Limit: The maximum % that the system will lean out to maintain the desired A/F. It is advisable to set this around 10%, so the AFR will not go incredibly lean if there is a problem with the wideband unit.
Rich Limit: The maximum % that the system will richen up to maintain the desired A/F. This can be fairly high (25%) to help protect the engine in case of a fuel system partial failure.
Gain: The speed that the system will try to maintain the desired A/F ratio. Start with 5, and test the operation of the tracking. Setting this too high will result in unstable AFR and a system that "oscillates".
AFR 2000R ... AFR 8000R Desired A/F Ratio at each RPM from 2000 RPM to 8000. Here is an example AFR table:

2000RPM	3000RPM	4000RPM	5000RPM	6000RPM	7000RPM	8000RPM
12.0	11.5	11.5	11.5	11.5	11.5	11.5

Aux% -Percentage of change to target AFR when Aux is activated (there is a "AF Trk Dly" parameter on the Setup page which controls a delay from when the enabling conditions are true to when AFR tracking begins.

Part-Throttle AFR Tracking

Closed Loop: In closed loop operation the ECU uses the oxygen sensor as a feedback loop in order to adjust the fuel mixture. This gives the name 'closed-loop' from the closed feedback loop. In closed loop operation the ECU uses the oxygen sensor to tell if the fuel mixture is rich or lean. To force most vehicles into 'open-loop', simply disconnect the factory O2 sensor.

Part **T**hrottle **T**racking: Under defined conditions, the Translator Pro uses input from a wide-band O2 sensor, to attempt to achieve a user defined target air/fuel mixture.

The Translator Pro has three separate part throttle tracking abilities: **Idle**, **Cruise**, and **Lean**. Even though the three are separate, the parameters for one define the limits of the others. Make sure you look at all the settings during setup/troubleshooting.

******In order for Part-Throttle Tracking to function correctly, the factory ECU must be in open-loop******

Idle:

Idle is usually around 14.7:1 for emissions, fuel consumption and idle quality reasons. However some vehicles with large overlap camshafts might require a richer mixture due to intake charge dilution. Others can benefit from running leaner then 14.7:1 in fuel savings (minimal however). There are three parameters that have to be met in order for the T-Pro to enter PTT Idle:

Enable Delay/Afterstart: The T-Pro has to be operating (engine running) for the minimum time set by the ***Enable Delay*** setting in order for ANY part-throttle tracking to be activated.

Idle Throttle Position Sensor: This is an adjustment in voltage increments. This voltage represents the upper limit for acceptable idle TPS voltage. As long as the TPS voltage is below this definition, then the idle TPS parameter is met. This needs to be adjusted to slightly above your normal idle TPS voltage. e.g. TPS voltage @ idle = .48v, then set PTT Idle TPS to .54

Idle RPM: Represents the upper limit of acceptable idle RPM. This should be adjusted above the cold-start idle. Some engines may require a larger threshold of RPM.

Idle AFR: Desired AFR for idle tracking. Once these three parameters have been met, then the T-Pro will attempt to correct to your target Air/Fuel. Set accordingly.

Cruise:

Cruise generally represents a low-mid load, low-mid rpm conditions. It is in this duty that T-Pro can correct a/f over a large range of engine operation. Factory cars target high 13:1 - 14.7:1 under normal cruise operation.

Enable Delay/Afterstart: The T-Pro has to be operating (engine running)

for the minimum time set by the ***Enable Delay*** setting in order for ANY part-throttle tracking to be activated.
PTT Idle: If the T-Pro is currently Idle tracking, then Cruise tracking is disabled.
Cruise Throttle Position Sensor: This is an adjustment in voltage increments. This voltage represents the upper limit for acceptable Cruise/Lean TPS voltage. As long as the TPS voltage is below this definition, then the Cruise/Lean TPS parameter is met. This should be set high enough to allow for 'normal' cruise throttle modulation. 25% of your WOT TPS voltage is a good place to start.
Cruise RPM: Represents the upper limit of acceptable Cruise/Lean RPM. This should be adjusted to allow for normal rpm driving. Set this high enough to allow for constant highway operation.
Cruise Load: This is the highest load, in KPA, acceptable for Cruise conditions. Cruise Load should be close to your Mid Load Tune Point for a good starting point.
****Lean Load**** If the Lean Load parameter is lower than Cruise Load. Then the actual engine manifold pressure MUST be above the Lean Load parameter in order for Cruise tracking to operate.
Cruise AFR: Once these six parameters have been met, then the T-Pro will attempt to correct to your target Air/Fuel. The target A/F is defined by the PTT Cruise A/F ratio definition. Set accordingly.

Lean:

Part Throttle Tracking Lean adds further functionality and flexibility to the T-Pro. PTT Lean is very closely related to PTT Cruise, and as such, uses some of the PTT Cruise's user-defined parameters. PTT Lean can be used to complement either PTT Cruise or function as PTT Idle. Many cars can run leaner then 14.7:1 under low load conditions with minimal power loss, for a fuel consumption benefits (NOX emissions increase however). Adding yet another step to the T-Pro PTT abilities. There is seven possible parameters for PTT Lean:
Enable Delay/Afterstart: The T-Pro has to be operating (engine running) for the minimum time set by the ***Enable Delay*** setting in order for ANY part-throttle tracking to be activated.
PTT Idle: If the T-Pro is currently Idle tracking, then Lean tracking is disabled.
PTT Cruise: If the T-Pro is currently Cruise tracking, then Lean tracking is disabled.
Cruise Throttle Position Sensor: This is a shared definition by both Lean and Cruise modes. This voltage represents the upper limit for acceptable Cruise/Lean TPS voltage. As long as the TPS voltage is below this definition, then the Cruise/Lean TPS parameter is met. This should be set high enough to allow for 'normal' cruise throttle modulation. 50% of your WOT TPS voltage is a good place to start.
Cruise RPM: Represents the upper limit of acceptable Cruise/Lean RPM. This should be adjusted to allow for normal rpm driving. Set this high enough to allow for constant highway operation.
Lean Load: This is the highest load, in KPA, acceptable for Lean conditions. This definition characterizes how PTT Lean operates, idle or cruise.

A. **Idle**. PTT Lean can be used as an idle control if PTT Idle is disabled. PTT Lean should only be set high enough to allow for engine manifold pressure variations @ idle.
B. **Cruise**. PTT Lean if set different then Cruise Load can be used to run a different Air/Fuel mixture then normal PTT Cruise operation.

Lean Delay: This is the time delay, in seconds, before the T-Pro begins tracking after all other parameters have been met.

Once these seven parameters have been met, then the T-Pro will attempt to correct to your target Air/Fuel. The target A/F is defined by the PTT Lean A/F ratio definition. Set accordingly. Part Throttle tracking that is set leaner then 14.7:1 is typically referred to as “lean-cruise” or “lean-burn”.

Part Throttle Tracking Gain: This PTT parameter effects all three tracking operations (idle, cruise & lean). Gain is the speed (max of #4) that the system will try to maintain the desired A/F ratio. Start with 1 and test the operation of the tracking. Setting this too high will result in unstable AFR and a system that oscillates.

Enable Delay: The last PTT parameter effects how long the Translator Pro will wait upon startup before it begins Part-Throttle Tracking. 100 means 100% of the usual, non-adjustable delay time, which is typically 5 minutes at idle, 2 minutes driving, much less if there is any WOT’s.

Boost Control

The Translator Pro controls turbocharger boost pressure by operating the factory or Boost solenoid with a "Dutycycle", which is the ratio of the time the solenoid is energized, to the time it is off. 100% Dutycycle means the solenoid is full on. 50% Dutycycle means the solenoid is being turned on and off with equal timing. 10% Dutycycle means that the solenoid is on briefly, then off for much longer.

The Translator Pro controls boost as follows: During normal driving the solenoid is not activated. When the Throttle and RPM thresholds are exceeded, Spool mode is activated, and the solenoid is fully energized (100% Dutycycle) which prevents any pressure from passing thru the solenoid and causes the turbo to spool as quickly as possible. Once the boost pressure exceeds "**PSI Start**" the solenoid is operated at the "**Start DC%**". If the boost pressure exceeds the desired target boost "**PSI Set**" (or "**PSI Aux**" if the Aux input is activated) the solenoid Dutycycle is reduced at a rate determined by the "**Gain**" setting. The solenoid Dutycycle will only be increased to raise the boost if the throttle position exceeds "**TPS Start**"

Installation:

The boost solenoid is plumbed into the signal line going to the turbocharger wastegate. This allows the Translator Pro to modify the pressure signal that goes to the wastegate, allowing control to regulate the boost pressure. By reducing the pressure signal that the wastegate receives, the boost pressure is increased until the reduced pressure is equal to the original unreduced pressure. For example, if the "base boost" is 10psi with the wastegate receiving a pressure signal directly from the turbo/intake plumbing, reducing the wastegate pressure signal by 50% will raise the boost pressure to 20 psi, since the wastegate is still receiving its designed 10 psi. Note: this example ignores many other factors that affect boost like pressure leaks, exhaust backpressure, stock wastegates that don’t have enough spring pressure, turbos that are incapable of delivering enough airflow to support desired boost, etc.

The solenoid has 3 "ports", 2 ports have hose nipples and are connected in-line with the pressure signal to the wastegate. The third port has a muffler/filter to keep contaminants out of the solenoid. Connect the ports as follows:
EXH: This port receives the pressure signal from the intake plumbing, the signal it receives must be tapped from between the turbo compressor housing and the throttle blade. Typically use the factory banjo bolt on the intercooler pipe pre-throttle body. (size reducer may be necessary)
OUT: This port goes to the wastagate actuator.
IN: This port receives the muffler/filter. (don't block/plug this port)

Warning: Tie-wrap or clamp all hose connections, if a hose comes loose, an overboost will occur.

The Translator Pro can control the boost pressure to a desired setting as long as a MAP sensor is connected to the unit

TPS Spool: Throttle sensor voltage to enable Boost Control. Usually adjusted to 1.25 -2.5 volts. Lower settings can improve spool-up time. Higher settings can reduce part throttle surge. It should be set higher than typical cruising TPS voltages.
RPM Spool: Engine RPM to enable Boost Control. Set higher than typical cruising RPM.
TPS Start: Once Boost control has started, TPS must exceed this for the system to increase solenoid duty cycle. Set this to about 80% throttle. If it is set too low, the Translator Pro will attempt to raise the boost pressure as the driver "backs out" of the throttle. If the driver were to floor the throttle again a boost spike could occur.
PSI Start: Boost pressure at which the system changes from Spool mode (solenoid full on) to Start mode. Set this half way between the base boost of the vehicle and the desired boost. If boost overshoots are excessive, reduce this setting. If boost overshoot is desired, set this closer to the target boost.
The secondary usage for PSI start is to output an activation signal on pin 4 on the 8-Pin harness to turn on a second fuel pump. When ***PSI Start*** is exceeded, then pin outputs a 12volt signal.
DC% Start: The Solenoid Dutycycle that is set when spool mode completes. The approximate setting to start with is(1-(base boost/target boost))*100. First tests should start with about half of this. Example, base pressure = 10 psi, target boost = 18 psi. Estimated Dutycycle =(1-(10/18)) * 100 = 44%. So start at 22% for initial testing.
PSI Set: Boost Pressure the system will try to maintain.
PSI Aux: Boost Pressure the system will try to maintain when the Aux trigger input is activated.
Gain: How fast the system will change the solenoid dutycycle to try to adjust the boost. Set this only high enough to achieve good boost control. Too much gain will cause the boost to surge/oscillate. Setting the Gain to 0.0 will prevent the system from adjusting the solenoid to control boost.
DC% Aux: The Solenoid dutycycle that is set when spool mode completes and Aux mode is activated.
Max RPM: The Max RPM the unit will control boost. Above this RPM, the solenoid will deactivate resulting in lower boost.

TunerPro RT for tuning and logging (overview):

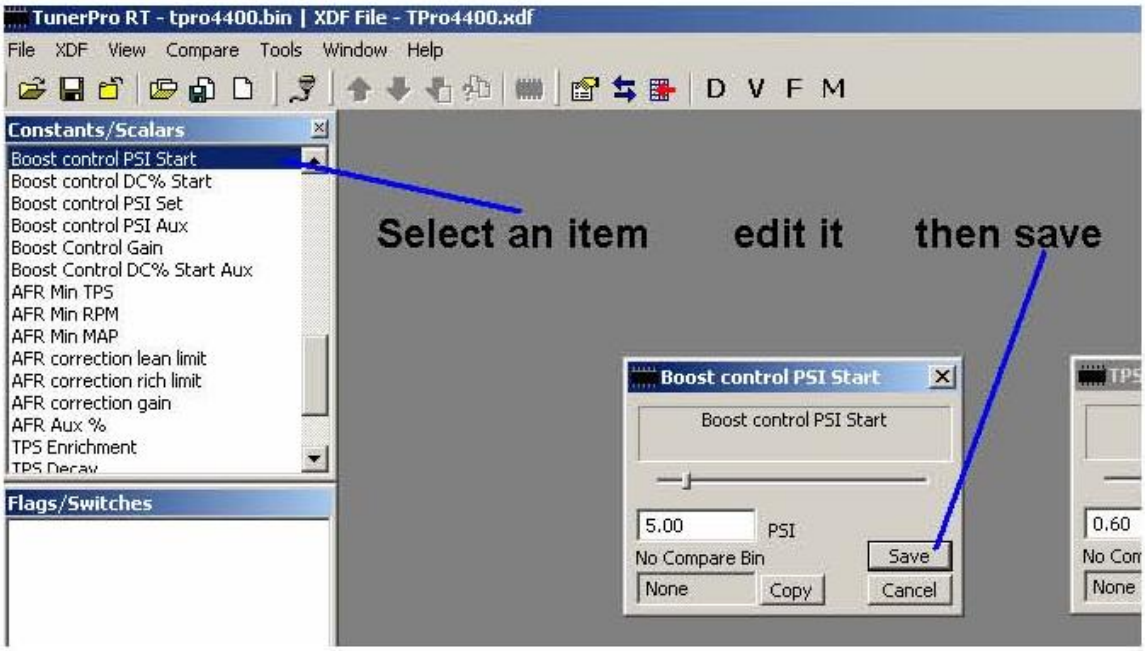
The Translator Pro kit contains a CD ROM with additional documentation details and the TunerPro RT software. TunerPro RT requires 32 bit Windows, Windows 98 or later. TunerPro RT can be used to upload tune files into the Translator Pro, or download your tune data for saving and sharing. To install TunerPro RT, copy the installation "Setup" file to your hard disk (in most versions of Windows, you can simply drag it onto the "desktop"). Double click on the Icon and install the software using all of the default settings. This will install TunerPro RT into C:\Program Files\TunerPro RT. This is the base directory/folder. Most of the settings that control TunerPro RT are preset in the version distributed with the Translator Pro. So only those operations required to use this version are included here.

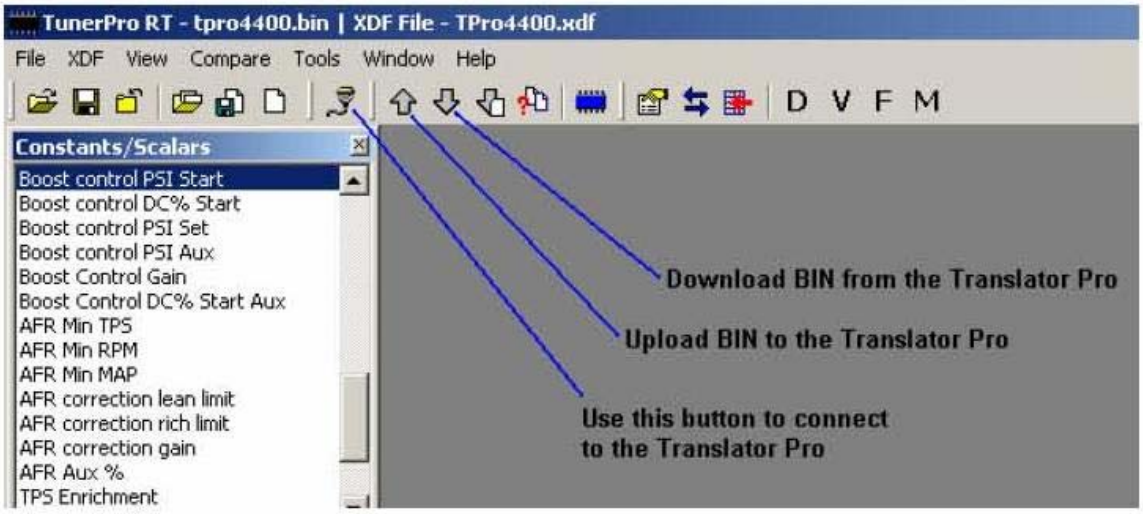
The Translator Pro must be powered in order to communicate with TunerPro RT. An accessory power pack is available to power the Translator Pro when not installed in the vehicle.

To upload and download the tuning data, called BIN files, do the following:

- Use the XDF menu to select the correct XDF file, located in the bin definitions directory/folder. For Translator Pro version 5.0, use TPRO500.xdf. This will provide TunerPro with the data necessary to properly display the tuning data in the BIN file.
- Use the file menu to select the correct BIN file, located in the bins directory/folder. The BIN file contains the tuning data.

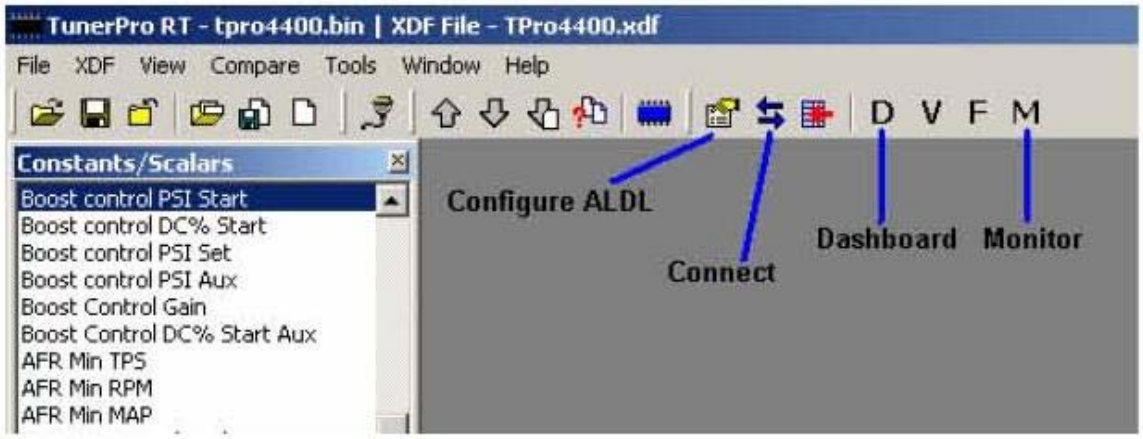
Once you have made a change to a tune setting, be sure to Save or Save As the BIN file. Then the BIN must be Uploaded to the Translator Pro. Changes made in the computer are not automatically transferred to the Translator Pro (unless in Emulating mode, an advanced topic, not covered here)



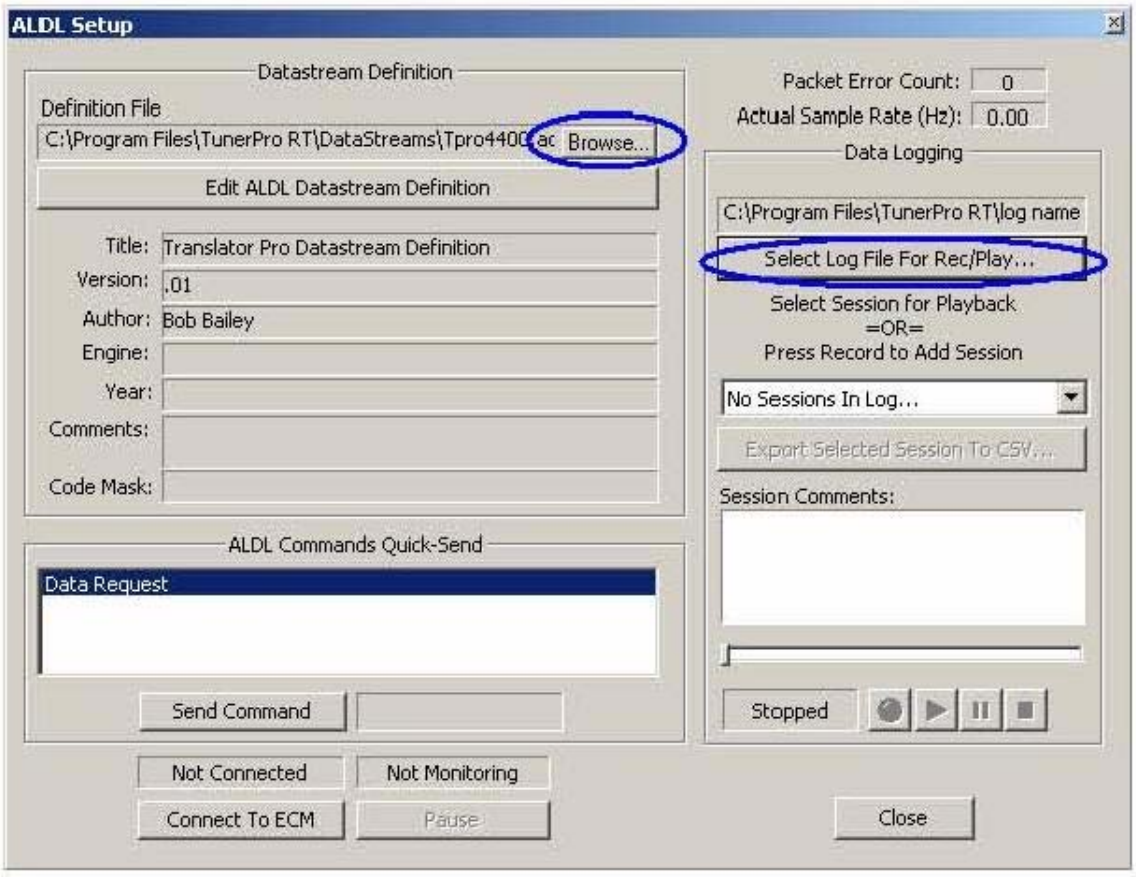


To log with TunerPro configure the software as follows.

- Use the Configure ALDL button to open the Configure window.



- Select an ADS file from the datastreams folder. The filenames should match the XDF file. If a XDF ADS mismatch error is displayed, it is still ok to continue.
- Select a filename to save the logged data to. If one does not yet exist, enter a new filename and click Open, then confirm (Y) to create a new file.
- Close the config window.
- Click the Connect button.
- Click the M for monitor traces, D for dashboard display.
- Right clicking on a logging area allows selection of available data for that display area.



- To record a log, click the red circle, stop recording by clicking the black square, and enter session comments. Each time a log is recorded it is stored as a session in the logfile.

Updating the Translator Pro software

The update procedure requires 32 bit Windows, Windows 98 or later. Utilize the supplied TPCU program makes it very simple to update the Translator Pro with new firmware and .bins.

To update the T-Pro, connect it to your computer. Run the supplied TPCU program. The program requires no installation, to remove it just delete it. It carries the update.exe program internally and will copy them to the folder where you put TPCU. The easiest thing to do is put TPCU on the desktop.
TPCU will detect which ports are available on your computer, so you can select the port with the drop-down box. Hold the left-two buttons on the Translator Pro while powering the unit. Then click “Update”, choose the .S19 file you want, and follow the directions on screen to update the T-Pro!

Speed Density Algorithm

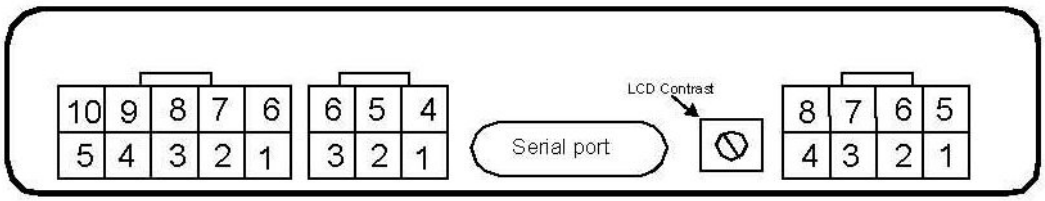
Speed Density calculates engine airflow as follows. Consider a theoretical "4Liter" engine for the following explanation. The engine can be thought of as a pump that, at 100% efficiency, will move 4 liters of material from its inlet to its outlet every 2 revolutions of the crankshaft. At idle the efficiency is mainly controlled by the throttle blade and somewhat by the camshaft/valve timing. At heavier throttle the efficiency is mainly affected by the camshaft, valve timing and mechanical efficiencies of its construction. The material that is being moved by the pump is air of varying pressure and temperature. Since we can measure the pressure and temperature of the air entering this engine, we can calculate the air being pumped through if we know the efficiency. This efficiency is known as the "Volumetric Efficiency" and is the main tuning element of the Translator Pro's Speed Density algorithm. The Translator Pro then uses the calculated airflow number to generate an airflow signal to send to the ECM/ECU. The ECM/ECU is unaware that the air measurement is coming from the Translator Pro instead of the original measurement device, and will deliver fuel based on the new airflow signal.

Volumetric Efficiency (VE) is the main "tuning" element in the Speed Density system. VE is generally around 45 to 55 percent at idle. At mid and heavy throttle the VE is highest (85 to 95%) at peak torque RPM. VE tends to fall at high boost and RPM on turbocharged vehicles due to turbo backpressure. On the Translator Pro, the VE table is preprogrammed, but can be easily changed using the PC interface program, TunerPro RT. The default VE table is close enough for most applications and the keypad tuning methods can be used to fine-tune the system.

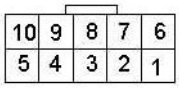
Glossary:

AFR	Air Fuel Ratio
WOT	Wide Open Throttle
ECU	Engine Control Unit
ECM	Engine Control Module
VE	Volumetric Efficiency
TPS	Throttle Position Sensor
MAF	Mass Airflow Sensor
AFM	Airflow Meter
IAT	Intake Air Temperature
RPM	Revolutions Per Minute
UT	User Tune
MAP	Manifold Absolute Pressure
OEM	Original Equipment Manufacturer

Translator Pro Harness Connector Details

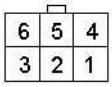


Main (10 pin) Harness



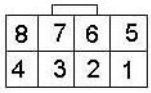
1 ——— Orange – O2/wideband input.
2 ——— Purple – O2/wideband sensing ground
3 ——— Blue – TPS input
4 ——— Green – MAF/Frequency signal output
5 ——— Pink – +12 volts ignition power
6 ——— Brown – Voltage signal output #1
7 ——— Gray – Voltage signal output #2
8 ——— White – RPM signal input
9 ——— Yellow – MAF / Frequency signal input
10 ——— Black – Ground

Sensor (6 pin) Harness



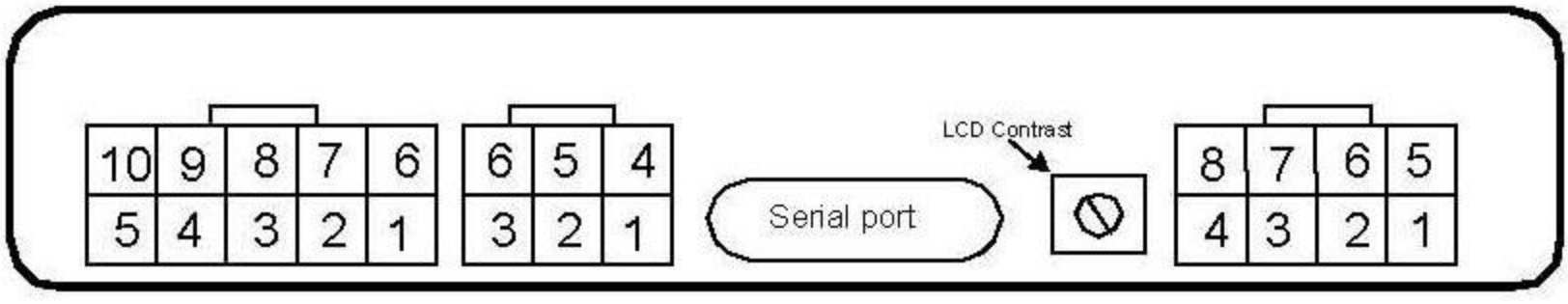
1 ——— Red – 5 Volts to power the MAP sensor
2 ——— Green – MAP Sensor Signal
3 ——— Brown – Air Temperature Sensor signal
4 ——— Black – Ground
5 ——— Black – Ground
6 ——— Purple – Aux activation

Expansion (8 pin) Harness

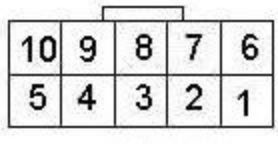


1 ———
2 ———
3 ———
4 ———
5 ———
6 ———
7 ——— Pink – +12 volts out to Boost Solenoid
8 ——— Purple – Boost Solenoid control signal

Translator Pro Harness Connector Details



Main (10 pin) Harness



1 — Orange – O2/wideband input.
2 — Purple – O2/wideband sensing ground
3 — Blue – TPS input
4 — Green – MAF/Frequency signal output
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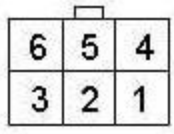
6 — Brown – Voltage signal output #1
7 — Gray – Voltage signal output #2
8 — White – RPM signal input
9 — Yellow – MAF / Frequency signal input
10 — Black – Ground

Sensor (6 pin) Harness



1 — Red – 5 Volts to power the MAP sensor
2 — Green – MAP Sensor Signal
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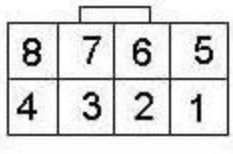
4 — Black – Ground
5 — Black – Ground
6 — Purple – Aux activation

Expansion (8 pin) Harness



1 —
2 —
3 — Gray - Timing control signal output
4 — Secondary fuel pump activation signal
5 —
6 —
7 — Pink – +12 volts out to Boost Solenoid
8 — Purple – Boost Solenoid control signal