

Customized HP Tuners Training Program presented by ERM Performance Tuning

For:

Rev - D 02/21/2017

Newly Added Topics

- **Transmission tuning**
 - Top level descriptions of A4/A6 transmission Editor tables
 - Procedures for tuning shift points, pressures, Torque convertors etc
 - Scanner setup to support tuning
- **Injection Timing**
 - Detailed discussion on the theory of operations relative to PCM control of fuel injection timing
 - Excel calculator to design Boundry, ECT and RPM parameters based on CAM/Fuel Injector speciation's
 - One on One work to calculate your parameters based on current setup
- **Spark and ignition tuning**
 - Detailed discussion on spark advance, theory of operation and tuning approaches
 - One on One interactive discussions on your parameters and adjustments required
 - Special section on Street tuning for MBT and maximum torque settings using Scanner
- **Wideband selection and setup in Scanner**

Formal Curriculum Overview

Introduction -- 10 mins

- Who is ERM Performance Tuning and why are our Interactive, one on one mentoring programs so effective?

Electronic Fuel injection (EFI) basics -- 30--45mins

- Review EFI fundamentals
- Review Fuel System and Injector requirements; NA, SC and TC....match setup to power expectations
- Review fuel line sizes and selections based on horsepower
- Review Cylinder volumetric efficiency ; MAF and VE basics
- Review basic calculations performed by the PCM to calculate airmass, and airflow
- Review Ignition basics and requirements to attain maximum torque/efficiency; the perfect combustion recipe

HP Tuners Startup and Setup -- 30-60 mins

- Short tutorial on the downloading of the VCM Suite program, where to get the links and how to setup Tune and Log File structure for easy retrieval and historical evaluations.
- Walkthrough the VCM Help Suite as well as location of HP Tuners Video Demo's and miscellaneous tutorials
- Beginner's walkthrough of the VCM Editor and Scanner programs; live session revealing the toolbars, icons, their meaning and what they do. When complete will be able to move about both programs, open and close functions/features etc. The follow-on section to this is the Advanced Walkthrough defined below.

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- Wideband Setup tutorial on selection and integration to the VCM Scanner Suite. How to develop custom PID's and validate/adjust offset values -- includes VCM Scanner PRO setup and optional ERG/AC Pressure Sensor integration if you own the VCM Standard Suite. How you can upgrade Standard to Pro....

Mechanical and Engine Sensor Operational Terms and descriptions -- 45-60 mins

- Tutorial on main sensors responsible for providing data to or being managed by the PCM. Includes but not limited to Mass Airflow (MAF), Manifold Absolute Pressure (MAP), Throttle Position Sensor (TPS), Idle Air Control (IAC), Narrow and Wideband O2 Sensors, Knock Sensors, Crank and CAM Position sensors, Injectors and Throttle Bodies (Drive by Cable and Wire).
- 3 ways to measure combustion; Lambda, Equivalence Ratio and Air Fuel Ratio; which is the right choice
- PCM Variants-- Top level overview on each and where they can be found.
- What are Fuel trims, what do they do and how do they do it? Includes a primer on PCM selection of open loop or closed loop control.
- Adaptive Idle -- where the PCM shines at command and control of today's modern engine
- Drive by Cable vs Drive by Wire description and differences

Tuning Strategies -- 1.5 hrs

- What are the different Tuning approaches and which is right (or wrong) for your project(s)
 1. Naturally Aspirated vs Forced Induction
 2. MAF vs Speed Density vs Blended
 3. Open Loop vs Closed Loop; when to take control and when not
 4. Idle Tuning -- Drive by Wire vs Drive by Cable
 5. Scaled tunes -- when you have gone beyond the limits of your PCM.....

Advanced VCM Editor Review -- 2 hrs (or more depending on options selected)

- While Editor is open, navigate through the important tables and discuss each as far as what they do, why they do it and particular tuning applications
- Specific to your PCM/Operating System (standard) or let us know if you want to include multiple versions (option)
- 3.0 Release changes and new feature operation

Advanced VCM Scanner review -- 1.5 hr +

- While Scanner is open, live walk through to develop .cfg, custom PID's, Histograms and Filters; best approach is to hook up to your vehicle and use it for learning specific features and functions.
- Discuss Logging philosophy and what to look at and how for specific tuning procedures; review various PID's, Histograms and .cfgs for each aspect of tuning
- 3.0 Release changes and new feature operation

Tuning Phases -- 3 hrs -- Detailed tutorial on the step by step approach to building a stable and integrated tune from Key on engine off (KOEO) to Wide Open Throttle

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- This section will call upon your strong background relative to the above training (or current understanding) of the sensors, Scanner and Editor operation and is a pre-requisite to this section!
- From Key-on to Cranking to transition to start/run to idle to Cruise (air fuel and spark modeling) to finally Wide Open Throttle....
- Discuss and detail the 7 main tuning steps to develop an integrated tune
 - Key on (Key On Engine Off) -- scanner setups and expectations of initial log. What can we see at this point?
 - Cranking -- that initial 150-250rpm event; associated Editor tables and Scanner requirements
 - Startup -- Transition from crank to run (600+ rpm's); applicable Editor tables and Friction/Startup Scanner recommendations to dial in startup
 - Idle Tuning -- What to log and what to modify in your editor to get Adaptive idle working as designed....
 - Air to Fuel models -- Open/Closed Loop/WOT requirements and differences; what is right for each
 - Spark Modeling -- things to consider when either developing or modifying existing spark tables; limits to be watched for. How to know exactly what you are commanding based on all the various add/subtract tables
 - Wide Open Throttle -- sneak-up on it gracefully

Injectors A-Z -- 20 mins

- Review, in detail, the Editor tables associated with fuel injector tuning data and what they do
- Why is injector data the single most important element of your tune; what to make sure of when specifying injectors or tuning your car with existing injectors
- Where we recommend going for injectors.....and where not!

Adaptive idle Theory of Operation -- 1-1.5 hr

- What is Adaptive idle, when is it activated and how does it work
- The three basic element explained
 - Adaptive Idle Spark control
 - Description and discussion on under/overspeed timing control
 - Tuning tips including Editor/Scanner walk through
 - Scanning .cfg, PID's and Histograms
 - Adaptive Idle Airflow control
 - The P-I-D control system in laymen's terms
 - Tuning tips including Editor/Scanner walk through
 - Scanning .cfg, PID's and Histograms
 - Adaptive Idle RPM control
 - Discussion on developing tune values
 - Tuning tips including Editor/Scanner walk through
 - Scanning .cfg, PID's and Histograms

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- Large CAM tricks and tips
- Gen III vs Gen IV

Question and Answers / Wrap up -- approximately 10 mins at the end of each session

Estimated time -- Complete Tutorial = app 10-15 hrs