**951 DIY TUNING**

The 951 engine management system is not a widely user-understood system. Due to much misunderstandings and lack of basic info, there are many misconceptions about the 951 DME. The purpose of this DIY, is to provide a reference and guide for self-tuning using the freeware program TunerPro. This is not an end-all information source, some topics are summarized and some I might have completely skipped. This DIY is simply to help the average end-user start tuning, and provide good initial direction.

The DME uses three basic sets of maps for its fueling and timing. When the engine is running, the DME is using one of these three sets of maps: Idle, Part-Throttle (PT), and Wide-Open-Throttle (WOT). Which map the DME is using is dictated by external inputs. The idle-contact switch on the Throttle-Position-Sensor (TPS) will force the DME into the idle maps. The ‘full-load’ signal from the KLR will force the DME into the WOT maps. The DME does not receive a TPS angle %. The DME never knows TPS angle. The TPS angle is determined by the KLR. When TPS angle is greater than 60%, the KLR will send the ‘full-load’ signal, forcing the DME to the WOT maps. If neither the idle contact switch nor the ‘full-load’ signal is activated, the DME will utilize the PT maps.

The DME fueling strategy is batch-fire. Batch-fire, all the fuel injectors operate simultaneously. As such, every injector is fired once per revolution. This is an inherent limitation for extremely large injectors (>80lb/hr), due to the inability of large injectors to operate this quickly. Larger injectors are slower to open and close, and will have a hard time firing every revolution. Normal sequential injection only fires injector once per two revolutions, allowing more time for the injector to operate correctly.

Ignition advance is completely controlled by the DME. Using the speed & reference sensors, the DME knows Top-Dead-Center (TDC) and exact crank-angle of the engine at any given time. This information is then used to ignite the air-fuel mixture at the pre-determined advance. This advance is in degrees of crank-angle before TDC, and is expressed in the three ignition timing maps. Timing advance is the signal most important aspect of tuning, and should be well understood before changing. There are many references for ignition timing advance; a quick search on google should reveal hours of reading. The DME does not know which cylinder it is igniting. This is left up to the cap & rotor. The only purpose of the cap & rotor is to direct the ignition signal to the correct cylinder. Unlike older distributer vehicles, the cap & rotor cannot change ignition advance.

In order to tune your 951, you will need the following:

Laptop computer w/ USB port

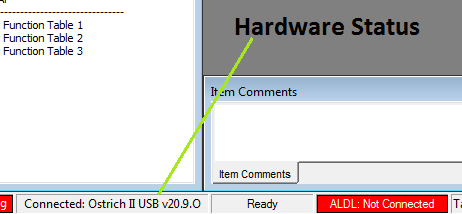
TunerPro 4.14

Ostrich 2.0 (or eprom burner)

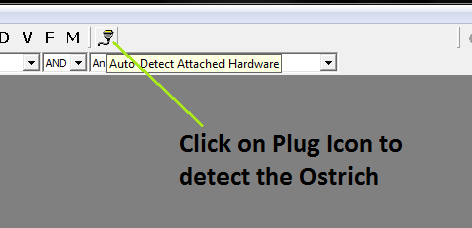
Socket Booster (for the 24pin DME)

First , unzip the bundle to a familiar location, such as the desktop. Next, install the TunerPro software included in this bundle. Follow the prompts and necessary directions. If you are using the Ostrich 2.0, then install the Ostrich 2.0 drivers.

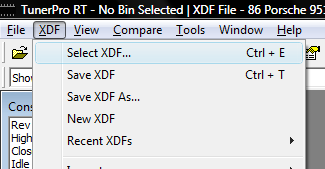
Now plug in the Ostrich to your laptop, start TunerPro and make sure it recognizes the Ostrich. TunerPro outputs its hardware connection status in lower left hand corner:



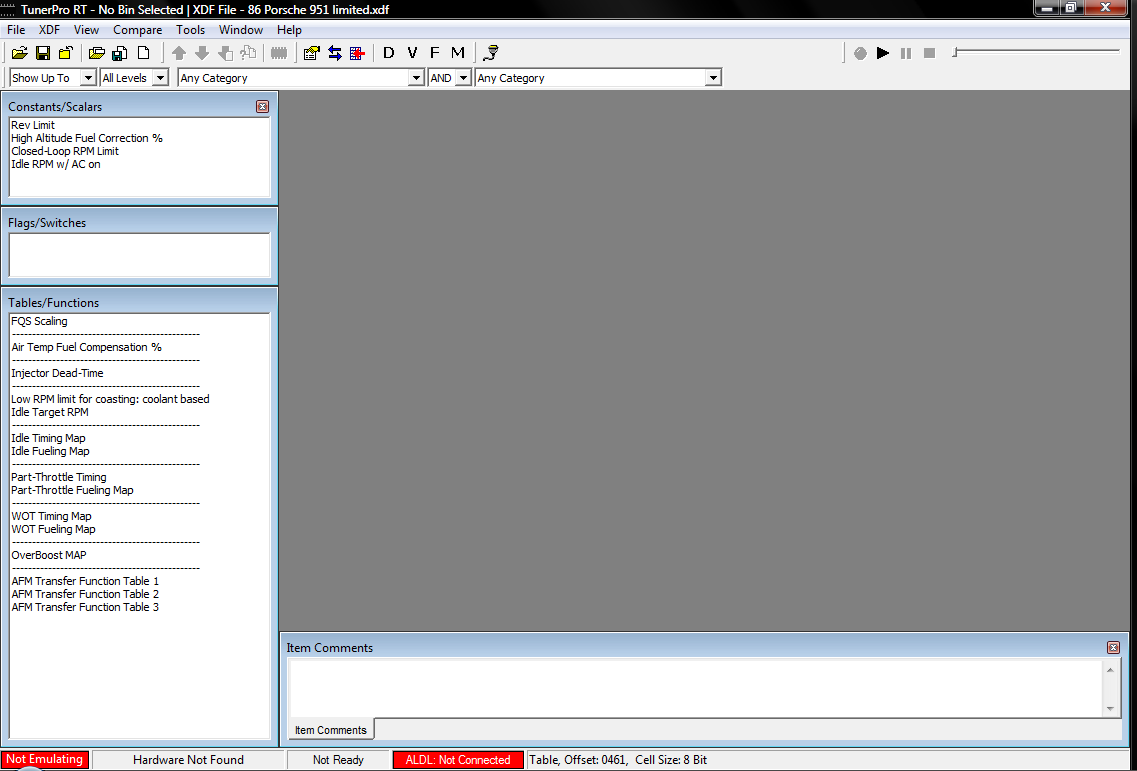
If TunerPro says “hardware not found” and the Ostrich is connected to your computer, then click on the ‘hardware plug’ in the toolbar:



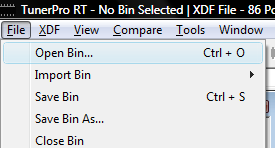
Once your computer and TunerPro recognizes the Ostrich, you need to setup TunerPro for the 951. Included in the bundle are the necessary files. The first is the definition file. This is the file that tells TunerPro how to interpret the values in the 951 binary file. To load this file, press ‘XDF’ next to ‘File’ in the toolbar. Now choose ‘Select XDF’, direct TunerPro to the unzipped bundle.



You should see two XDF files, one for the 24pin DME and the other for the 28pin DME. Select the correct XDF for your application (1986-1987 should be the 24pin, 1988-on should be the 28pin). Your screen should now look like this:

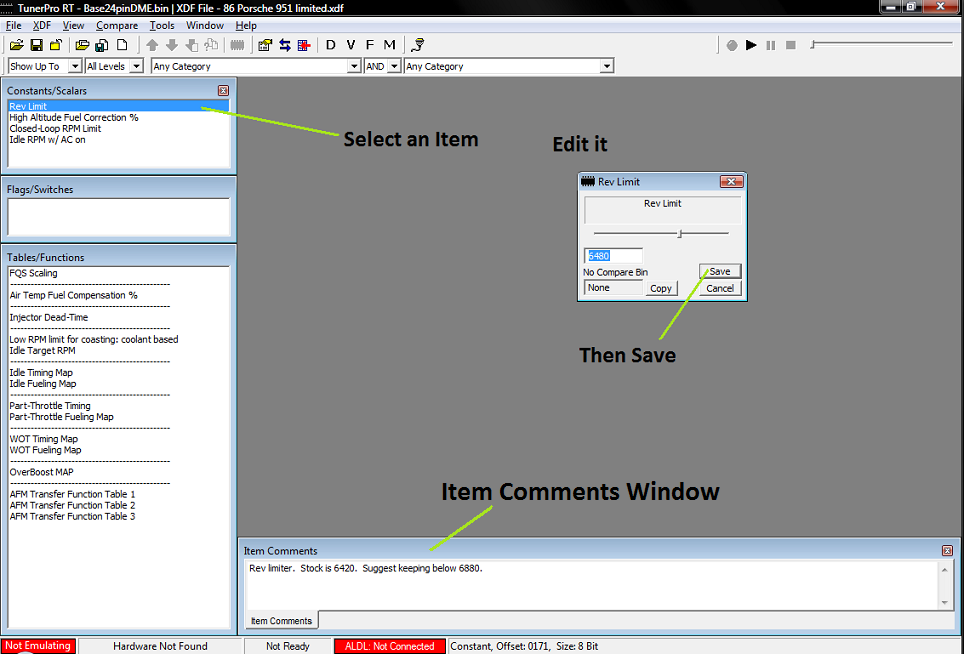


Next we load the 951 binary, or ‘.bin’ file. This is the actual data that the DME uses, and what we will be tuning. Under the ‘File’ menu, select ‘Open Bin’. Now direct TunerPro to the unzipped bundle, and select the correct .bin file.



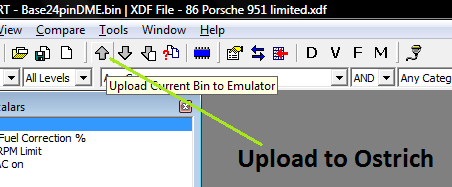
NOTE – only use a 24pin .bin with the 24pin XDF, 28pin .bin with the 28pin XDF!

Check that we have loaded everything correctly by double-clicking on an item in the left.



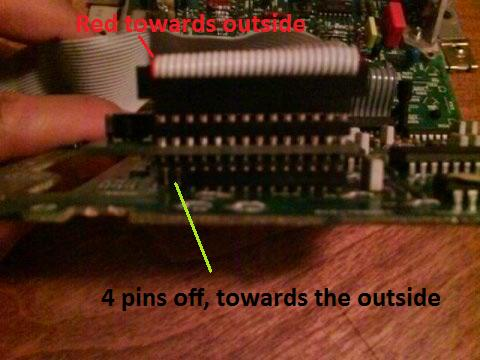
Now, each item has comments, if you do not have a ‘Item Comments’ window, click on ‘View’ then ‘Item Comments’, or press F10.

To change a value, click on the item, change the value, then click ‘save’ in the window. This saves the changes to the .bin. Once you have made any desired changes, save the file by pressing ‘File’, ‘Save Bin’. Then upload the new .bin to the Ostrich. This is done with one click of the ‘upload arrow’:



Note, you do not have to save the .bin before sending it to the Ostrich, but you do have to save any individual value changed for it to have effect.

The Ostrich simply plugs into the factory EPROM socket. The most important thing is to install the Ostrich in the correct direction. The red line on the ribbon cable should be towards the outside of the DME. Furthermore, if you have the 24pin DME, then install the Socket Booster with 4pins off of the EPROM socket.



Make sure you set the Socket Booster to ‘24pin’.

I ground a little bit of the DME case to allow the ribbon cable to pass through. I routed the ribbon cable as shown. This is an easy mod, and should only take a minute on a bench grinder:







If you have changed EPROM chips before, this is extremely similar. For those needing a refresher, included in the bundle is a chip replacement guide as found on the Lindsey Racing web site.

<http://www.lindseyracing.com/LR/Parts/CHIPCHANGE.html>

When tuning, make small changes at a time, and avoid large changes between adjacent cells! DIY tuning can and should be a fun, learning experience. BUT be careful, as you alone are completely responsible for your engines health, I am not responsible for your actions. For the DIY’er, at minimum, I suggest a Wide-Band O2 (WBO2) sensor, and knock counter. A knock counter is less than $20, and will give insight to timing advance. A WBO2 is imperative for proper air-fuel tuning. And at the price of current WBO2s, it would be foolish to not have one.

Finally, my hope is that this DIY will get more people interested in tuning the 951, and provide more knowledge for the average end-user. Building a community of knowledge can only help fellow enthusiasts. Please feel free to contact me via email with any questions, comments or opinions:

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Good luck tuning, and have fun (safely)!

-Joshua Cunningham