EEC Tuning Beginners Guide

This guide aims to explain some of the basic knowledge and terminology involved in tuning Ford EEC equipped vehicles such as the EA, EB, ED, EF, EL Falcon.

In order to start tuning your car, you will need some tools:

- A J3 Chip & Programmer; see Products @ T.I. Performance website
- A TechEdge 2J9 Wideband O2 Data Logger or similar to log RPM, MAP or MAF, and AFR/Lambda as a minimum. See Products @ T.I. Performance website for other options including Full House Upgrade kits containing the Programmer and Wideband if you already have a chip.
- A binary and definition for your ECU from the site (see below table for applications if you have not ordered a tune from us).
- This beginners guide!

Please ensure you have read and followed the J3 Chip Installation Instructions & J3 Programmer Instructions before reading this guide.

Terminology

The following section shows some basic EEC terminology used throughout the site and remaining documentation.

Term	Comment
Binary (bin)	The raw code dump from an EEC, i.e. the actual ROM contents that the ECU runs. Much like the OS on your PC, it tells the computer what to do. These correspond to a particular vehicle and transmission combination (eg. 4DBG.bin).
Definition (def)	The file which defines where the editable tables are located inside the binary. In our case, these are the TunerPro .XDF files (eg. HWAD3.xdf). These are specific to a group of bins, and it is **very** important to get the right one!
Strategy	The version of code used in a binary (eg. HWAD3)
TunerPro	The software used to make changes to (tune) the binary files
J3 Chip	The chip used to override the factory calibration with one of your choice, installed on the J3 service port on the bottom of the EEC
KAM	Keep Alive Memory. Used inside the EEC to store short and long term fuel trims found using the adaptive learning programming

Application Charts

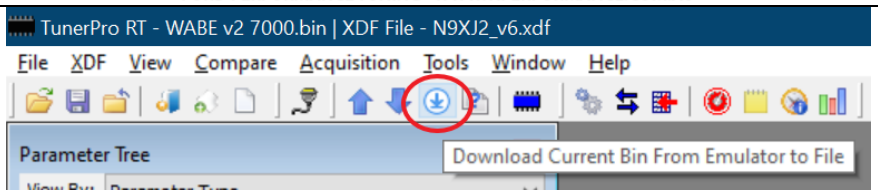
The Application Charts at http://www.tiperformance.com.au/library/tuning-files/ are used to select the right bin/def combination for a particular model EEC. Note that choosing the wrong definition (xdf) for the bin will result in TunerPro showing incorrect values, a corrupt binary and an improperly running car.

Notes:

- The most up to date source of this information is **always** http://www.tiperformance.com.au/library/. These files get updated from time to time so it pays to check back to get the latest features.
- EL ECUs can be used in EA-ED vehicles (smartlock can be disabled using the chip). This is the best option for tuning an EA-ED Falcon 6 Cylinder. See the Installing EL ECU into EA-ED guide for more info.
- Some (EB2 onwards) V8 ECUs will **severely** limit engine power via Torque Truncation if an Auto ECU or bin is used in with a manual transmission. This is because without a frequency signal from the Auto TCM, the ECU assumes the transmission is in Reverse and limits power accordingly. Using a Manual bin / chip will avoid this issue and restore full power.

Downloading the tune off a Chip

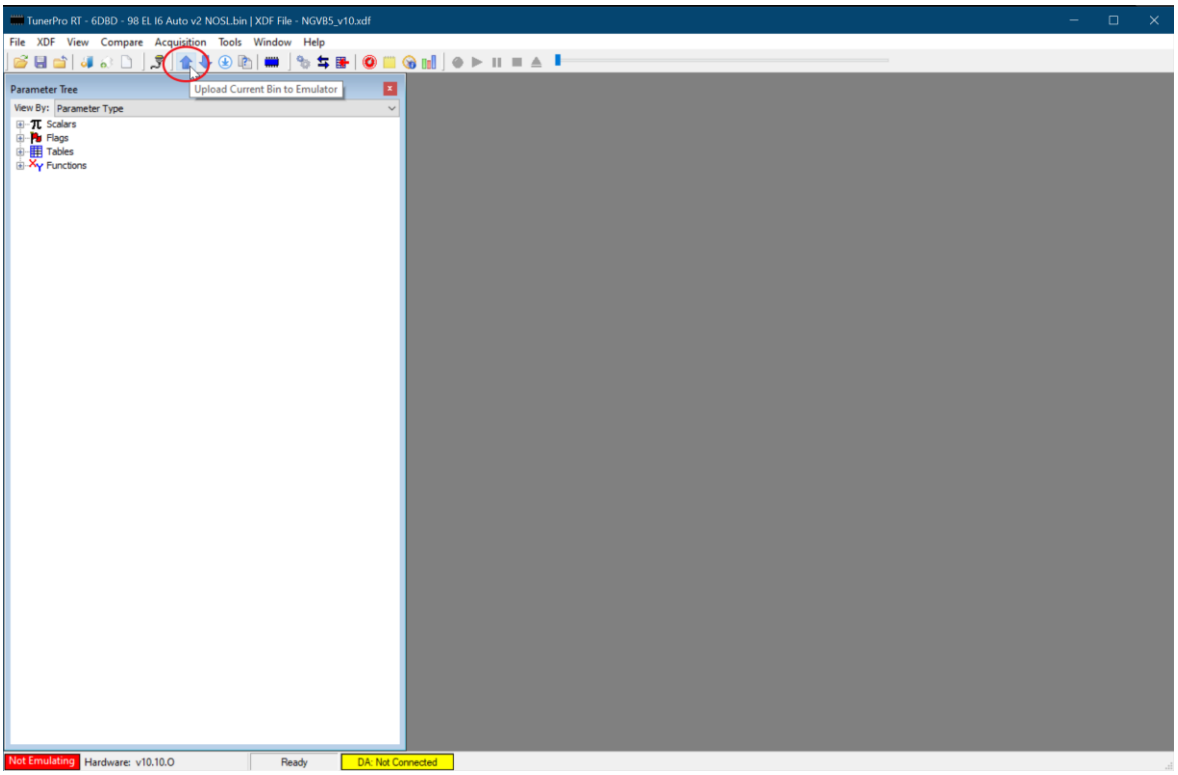
If you've purchased a Programmer to tune an existing chip, or a kit containing both, you may want to download the file off the chip to start from. Do this by opening the correct .xdf for your vehicle/trans, then hitting the download button in TunerPro.



Programming a Chip

To test that the chip and programmer are functioning correctly, you should upload and verify a binary to the chip in order to make sure it works in the car. If you have not purchased a Custom Tune with your order, you can download a stock bin/definition combination to suit your programmer and vehicle from http://www.tiperformance.com.au/library/tuning-files/.

Open your bin and definition (xdf) in TunerPro RT. On the TunerPro menu bar select Tools, Emulation and Upload bin to Emulator (or press the Up button on the toolbar).



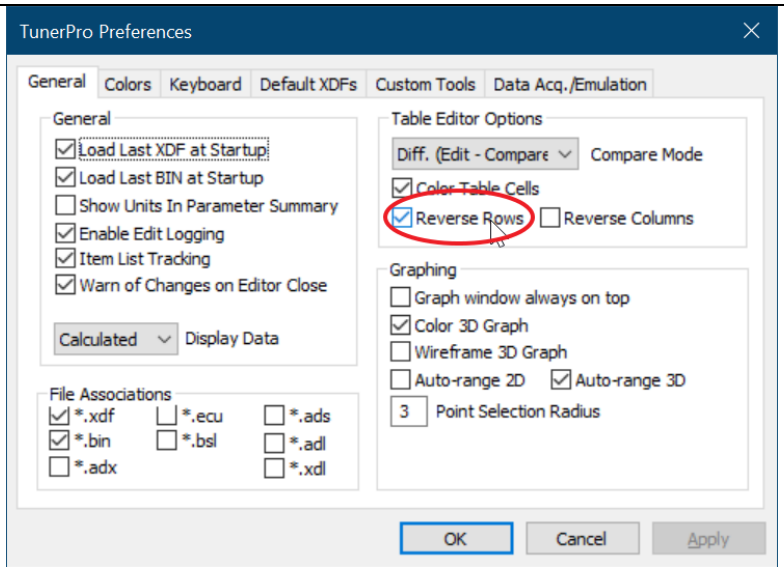
When uploading, TunerPro will show the status of the operation in the bottom status bar. At the end of this process you will see an “Upload successful” or “Upload failed” message. Always verify the upload, to ensure the burn reads correctly. To do this, go to Tools, Emulation and Verify EMU ram against current Bin. If you see “Verify success” it worked; if it fails, double check your connections and ensure the interconnect cable is firmly seated before trying again. Remember, the chip must be removed from the ECU to program it.

You are now ready to fit the chip to the car. To install the chip into a car, follow the “Installing a J3 Chip” guide at https://www.tiperformance.com.au/library/diy-guides/. NB: If you are changing strategies, it is a good practice to clear the KAM memory in the ECU by disconnecting the battery for 10 minutes. This is only needed on the first time install.

Configuring TunerPro

If you are using TunerPro 5, a major change was made to the way tables are displayed. To ensure the display shows rows in ascending order (ie. Top row is highest load), do the following:

- Go to Tools, Preferences
- Tick Reverse Rows



Now you will find the bottom of tables representing low end vacuum and spark, and the top of the tables representing the top end.

Preparing to Custom Tune your Binary

Now that you have verified the hardware is working correctly, you are at the stage where you can start modify your bin to suit your vehicle modifications. You should have already selected a working Bin/definition combination for your car, as mentioned above. Use the tips below to get started on tuning.

- Ensure the vehicle is free from mechanical issues before attempting to tune it. Ensure all sensors are working correctly. Remember, garbage in, garbage out. You will chase your tail if you attempt to tune around a mechanical issue.
- Always start out by burning a stock bin to a chip and ensuring the vehicle runs on that code before doing any tuning. You want to base any tuning on a dyno or from a datalog using the same base bin you will run on the chip, not the factory or any other bin.
- **Always** reset the ECU (by unplugging it for 1 min) when changing the binary/strategy or making any other changes to the fuel system (regulators, injectors, etc). This resets the KAM fuel trim values to ensure any tuning is not affected by previous adaptive learning trims.
- **Disconnect** the O2 sensor (or nbsim if you are using a Wideband) from the ECU when logging and tuning. This avoids fuel trims or closed loop impacting your results.
- Use the TunerPro 'Setup Compare Bins' function to load the stock bin for your current tune file. Then you can use the compare buttons in all TunerPro dialogs to view the stock values for each table, copy stock values, view the difference, etc. etc.
- Read Tom Cloud's EEC Tech Notes from http://www.tiperformance.com.au/library/reference-material/ to understand more about the basic modes of EEC operation (i.e. start-up, warm-up, closed loop, WOT) and when which tables are used when.
- Definition creation is a very time-consuming process requiring many hours and hours of work. If you find errors, or new switches, scalars or tables for the definition, please email the authors to have them added.

Common Tables/Parameters

Table	Comment
Fuel	
Volumetric Efficiency (VE)	Used in fuel calculations to determine how efficient the engine is (and hence how much fuel is required). This table is KEY in tuning ANY SD based engine management system. Be aware that the EEC measures Vacuum in units relative to absolute vacuum (inHG**a**). This means that 30inHGa is actually 0inHG (WOT), and 0inHGa is 30inHG (Full Vacuum).
MAF Transfer	Used for fuel calculations on V8 ECUs. Enables the ECU to calculate the fuel required for a measured volume of air going into the engine.
General	
Idle	Very obvious here. Be careful; large changes to base idle (850rpm+) seem to affect the

	Dashpot function in Auto models (ISC remains open during coast). This may be tuned out through modifying the Dashpot table itself, YYMV.
Rev Limiter	Pretty simple!
Speed Limiter	Set to 255 to disable.
Spark (I6)	
Spark MBT	Spark Maximum Brake Torque. The spark value giving the greatest torque on a stock engine (supposedly). This is lower than the bdln knock table where the engine responded better to less timing.
Spark Bdln Knock	Spark Borderline Knock. The spark value at the threshold of knock on a stock engine (supposedly).
Spark xxx MPG	MPG tables are used in 'cruise' mode; this is activated after a threshold time (~10s) at a constant throttle above a certain road speed (~80km/h).
Spark (V8)	
WOT Spark adder for RPM	Spark used at WOT conditions only
Spark Base, Sea Level, Altitude	Spark used for other throttle conditions, depending on altitude.

Tuning Details

This section became so large, we decided to split it into separate documents!

- See the Speed Density EEC Tuning Guide for a detailed explanation on tuning SD based (I6) EECs.
- See the MAF EEC Tuning Guide for a detailed explanation on tuning MAF based (V8) EECs.

Troubleshooting

- If you find the car idling oddly (low or high RPM; a bit rough), and the fuel pump is running constantly with the Key On and Engine Off, you have probably managed to get the car into Limp Home Mode. The following are some common causes of this problem:
  - **Corrupt binary**. Ensure you are using a correct bin file for your engine/trans/ECU
  - **Failed Chip burn**. Do a verify in TunerPro to ensure the burn was successful
  - **Dirty J3 Port or mis-seated Chip**. Double check your installation of the J3 chip.
  - **Faulty ECU.** Try without the chip to see if you have the same problem. If it persists with no chip you may have a faulty ECU

Good Luck

If you find this guide useful or have any suggestions please contact us.

Happy Tuning!

Jason Bolger