

# **TuneBoy *Live* Maps User Guide Mitsubishi Software V4.0**



## **CAUTION**



**All TuneBoy products are powerful tools that enable the user to change nearly all aspects of the program encoded into the motorcycle's ECU (Engine Control Unit). We cannot be held responsible for any direct or consequential damage to the motorcycle or any third party as a result of making any changes to the ECU programming. To the fullest extent permitted by law, TuneBoy Pty Ltd will be under no liability to the Customer whatsoever for any injury, death, damage or direct or indirect or consequential loss (including without limitation, pure economic loss, loss of profits, loss of business, loss of use, loss of data, computer downtime, depletion of goodwill, business interruption, increased purchasing or servicing costs, loss of opportunity, loss of contracts and like loss) howsoever caused or arising out of or in connection with:**

- **the sale or supply of any TuneBoy product,**
- **any statement made or not made or advice given or not given by or on behalf of TuneBoy, including as to compliance with legislation or regulation,**
- **use or misuse of any TuneBoy product,**
- **Any use made or resale or on-supply of any TuneBoy product.**

**This software and equipment is provided for use in closed course racing. Use of this software and equipment to modify mapping may violate local laws and EPA regulations. This is not for road use.**

**The TuneBoy product reprograms the original ECU of the motorcycle. Any use of a TuneBoy product may invalidate a motorcycle's warranty.**

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# INTRODUCTION

There are two softwares from TuneBoy specifically for the Mitsubishi ECU of the Diavel, Panigale and MTS 1200.

- The **FlashMitsubishi** software is used to load maps and trim files into the permanent flash memory of the ECU.
- The **TuneBoyTrim** software is used to adjust the temporary copy of the trim tables. This is also used for data-logging and processing data-log files.

## 1. MAP FEATURES

Several new features have been added to the *Live* TuneBoy maps for the Diavel, Panigale and MTS 1200. The *Live* maps allow real-time tuning on a dyno. These include the following:

1. Real-time adjustment of fuel and ignition trims while the motor is running,
2. Auto-tuning in conjunction with Innovate LC-1 or LC-2 wideband O2 sensors (available from our website),
3. Electronic cruise control,
4. Quick shifter (strain gauge type) for clutchless up and down shifting.
5. Shift light function,
6. Map switching. The ECU can be loaded with up to 3 different trim maps. The rider can switch between trim files based on riding needs.

The fuel and ignition trim maps have 24 RPM points and 12 throttle position or manifold pressure points.

The cruise control uses a PID control loop to control the speed of the motorcycle. This is the same as most automotive cruise control systems and this can control speed to within 3kph over almost any road conditions.

Quick Shifter function allows clutchless full throttle up-shifts and an auto blip function for clutchless down-shifts. This requires a strain gauge quick shifter (available from our website).

Shift light function allows you to connect a bright shift light to the O2 sensor plug. The ECU code has been changed so it will turn the light on at set points for each gear.

## 2. MAP TYPES



### CAUTION

#### **DIAVEL -**

For the Diavel it is very important that you use the correct map for your region. The Diavel has different maps for the USA, Japan and others (EU, AU, SA, NZ).

Using the USA map for a bike in a different region will prevent some functions from working correctly.

For example: the USA Diavel map will make the indicators activate instead of the brake light when the brakes are applied. This will also prevent the cruise control from turning off when brakes are applied. For the Diavel Strada you should use the EU mapping. Make sure you check that the indicators and brake lights work correctly after the tune is installed.

#### **DIAVEL MY 2014 Dual Spark Models -**

The 2014 Dual Spark Diavel also has different maps to the 2011-2014 Diavel and Diavel Strada. Care must be taken to use the correct map for your model.

#### **MULTISTRADA 1200 MY 2013 and 2014 Dual Spark Models -**

The 2013 Multistrada also has different maps to the 2012-2012 Multistrada. Care must be taken to use the correct map for your model.

### 2.1 Cruise-ONLY Maps:

- This map type simply adds the electronic cruise control without changing any other aspect of the mapping.
- This map does not turn off the O2 sensors on the bike.
- This map type does not support the speed 'nudge up/down' buttons as these require use of the O2 sensor plug.
- This map type does not support the Quick Shifter as this requires use of the O2 sensor plug.
- This map type does not support the Shift Light function as this requires use of the O2 sensor plug.
- You cannot apply any trim tables to this type of map.

These maps have a name ending with **CruiseOnly\_V4\_Tune.dat**.

### 2.2 Tuning Maps:

- Tuning maps allow real time adjustments to be made for fuel and ignition.
- Trim maps can be applied to this type of map.
- The tuning map supports the Quick Shifter and Shift light.

- Tuning maps do not have cruise control.

These maps have a name ending in **Tuning\_V4\_MSTune.dat**.

### **2.3 Cruise Control and Tuning Map:**

- These maps allow real-time (*Live*) tuning of the fuel and ignition maps.
- You can load trim maps into this type of map.
- This map type can do everything the tuning map can do with the addition of the Cruise Control function

These maps have a name ending with **CruiseAndTuning\_V4\_MSTune.dat**.

### **2.4 Standard Maps**

- This is a completely standard map. No modifications have been made to this map.
- This map is to return your bike to a completely standard state of tune.

These maps have a name ending with STD\_Tune.dat.

**N.B.** Some maps may also have a country designation in their name.

EU – Europe/Australia/New Zealand/South Africa

JP – Japan

US – USA (Diavel Only)

The difference between the EU and US map is the way the rear indicators work. On the US model Diavel the brake light is also used as the indicator, the left side of the brake light blinks for left turn and the right side blinks for right turn. On the EU model Diavel the rear direction indicator uses an amber light for each side.

### **3. SET-UP**

The first step is to install the software on your PC. If the setup program does not start when you put the CD in your CD drive you should open Windows file explorer and run the setup.exe program from the root of the CD drive.

We recommend accepting the default settings as these will help with any problem solving if you have to contact support.

Once the TuneBoy software is installed you should run the LogWorks3Setup.exe from the root of the CD. This will install the drivers for the WB-01 device if you need to connect this to the PC using a USB cable.

If you are only connecting to the PC using WiFi this step is not required. However, when data-logging on the Diavel it is recommended that you always connect using WiFi. Connecting the USB cable between the PC and the bike allows the electrical noise from the bike to upset the USB port. Flashing the ECU should be done via USB as this will be faster than WiFi. This is because the WiFi introduces delays that can cause slow the flash process down.

#### **Windows 8.1**

With Windows 8.1 Microsoft removed ad hoc WiFi network support from the networks list (right side of task bar). This makes it hard to connect wirelessly to the WB-01.

To help with this we have included a program on the CD called WB01\_Find.

Connect the WB-01 to the PC using USB. Make sure the MTS light is flashing and the power light is on. Run the WB01\_Find program and click "Search for WB-01". You should see a message saying the TUNEBOY device has been found then another message saying the network profile has been created.

Once this has been completed the flash and trim programs will be able to connect to the WB-01.

### **4. INSTALLING THE FIRST MAP**

#### **4.1 Getting Started:**

The first time you load a map into your bike you will have to do several steps. These require a connection to the internet and the user ID and password you received when you purchased the software.

The User ID and password are required to unlock the ECU. This will have been emailed to you when you purchased your Kit.

1. Connect the WB-01 to the diagnostic connector on your motorcycle. This is located under the seat.

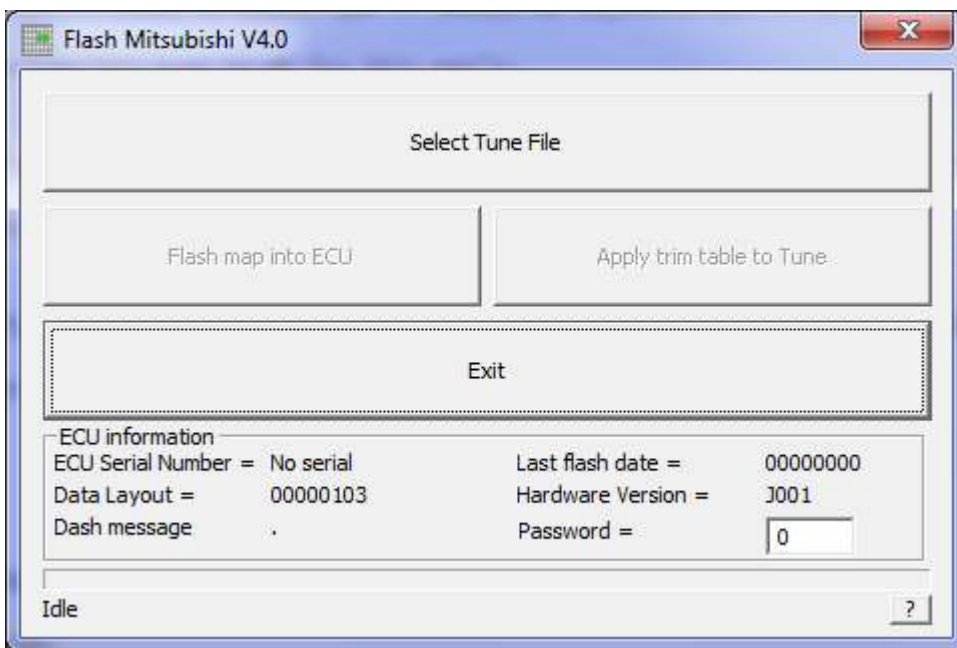
2. Connect the WiFi on your PC to the WB-01 or plug the USB cable between the WB-01 and PC. If you are using the USB cable you should have installed the drivers for the WB-01 as part of the LogWorks install.

When connecting via WiFi, you will see a WiFi network with TUNEBOY\_nnnn where nnnn is a number unique to your WB-01.

If you are using Windows 8.1 you don't need to connect the WiFi if you have run the WB01\_Find.

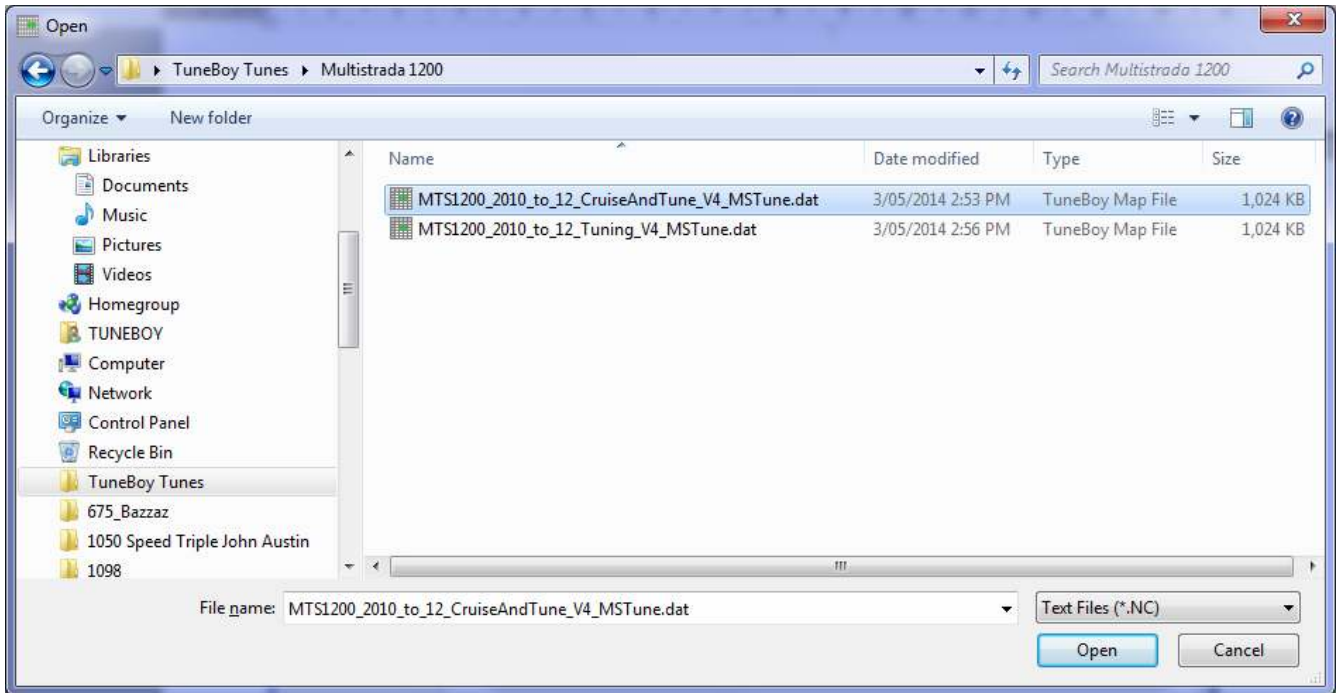
3. Turn the motorcycle ignition ON and start the FlashMitsubishi program on your PC.

You should see the following window displayed:

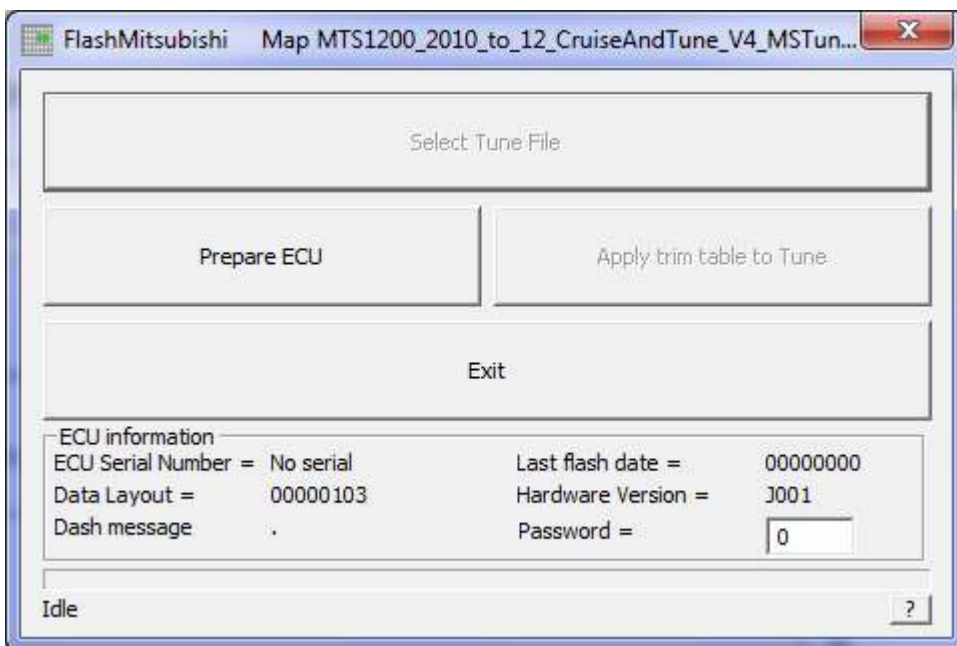


4. Click the "Select Tune File" button to select an initial tune file to load into the ECU.

The following screen is shown to select the tune file:

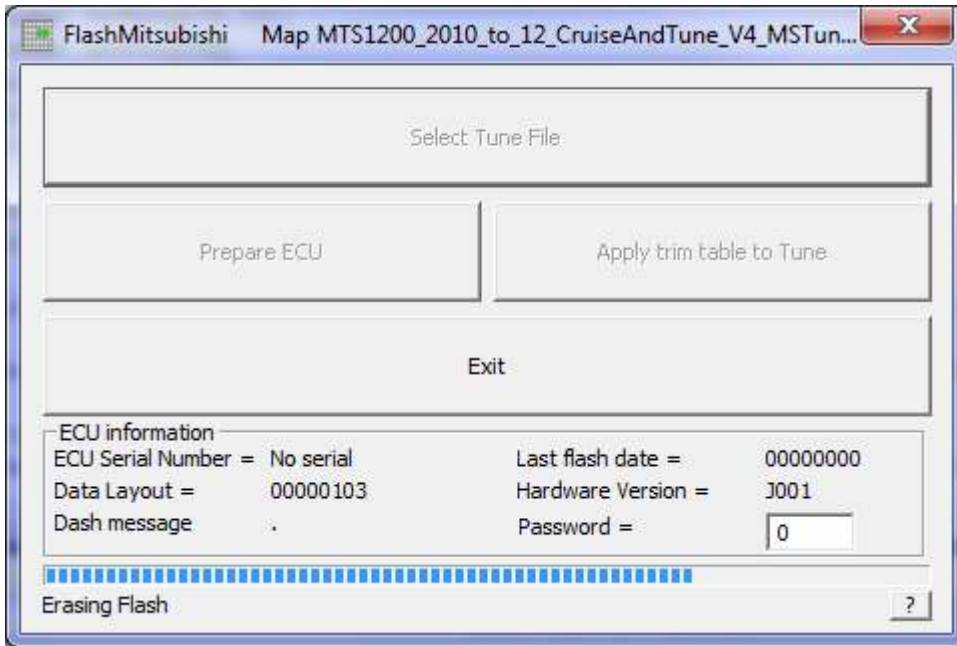


Once you have selected a tune file the following screen is displayed:



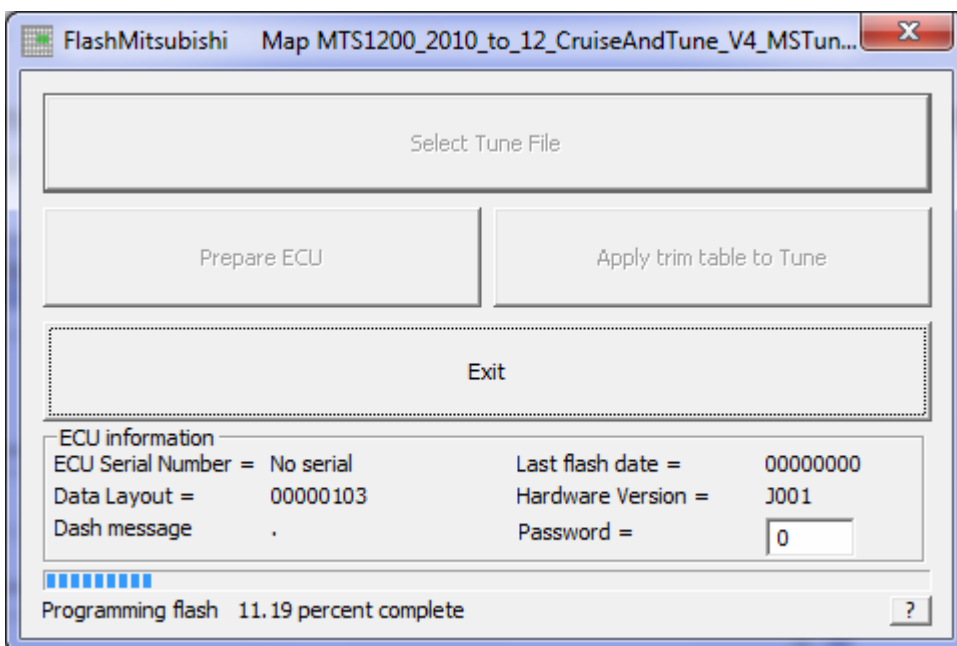
- Click the "Prepare ECU" button and the program will first erase the flash memory in the ECU then start a download to the ECU. The message "Erasing Flash" will be shown and the progress bar will move from right to left as is shown in the next screen shot:





Note: If the message still has "Idle" displayed you should close the program and repeat this step.

Once the flash memory is erased the screen will show the percentage data transfer and the progress bar will move from left to right as is shown in the following screen shot:



If the "percentage complete" stops incrementing before you get to 100 % you should repeat the process. If this happens more than once you should repeat this step using the USB cable instead of a WiFi connection to the WB-01.

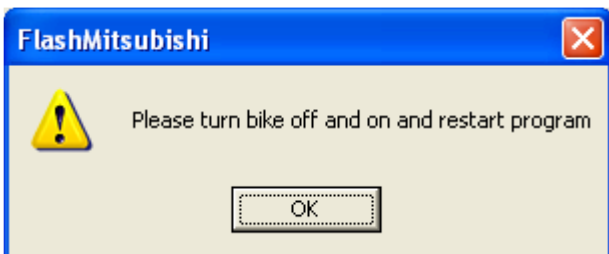
Once the download is complete the following message will be displayed:



6. At this point you click "OK" and then click "Exit" on the main screen.

7. Start the FlashMitsubishi program again.

A pop-up screen will now be displayed asking you to turn the bike off and on **again**.

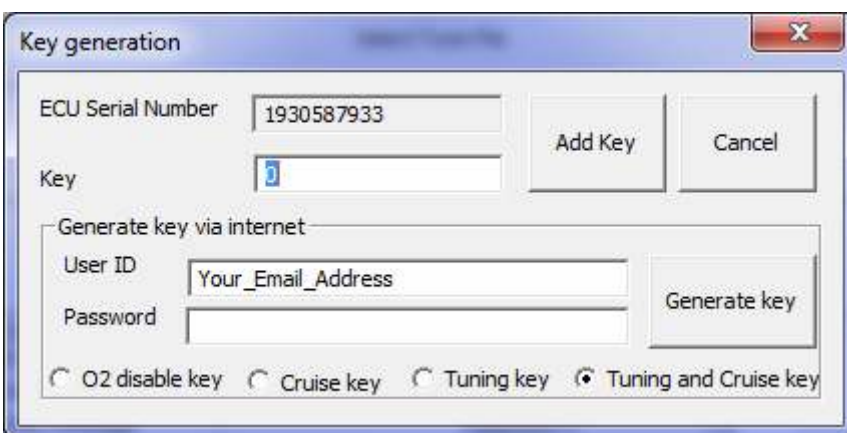


8. Click "OK" and then click "Exit" to close the FlashMitsubishi program.

9. Turn the motorcycle off and on again, **waiting 30 seconds** between turning the motorcycle off and turning it on again.

10. Start the FlashMitsubishi program again.

The following screen should be displayed. The ECU serial number displayed will be unique to your motorcycle:



11. Click the "**Cancel**" button and exit the program.

12. Turn the motorcycle off and disconnect the WB-01 from the motorcycle.

Make sure your PC has connection to the internet. The next step does not require a connection to the motorcycle.

14. Start the "FlashMitsubishi" program again. If the pop-up screen appears with the message "Do you want to connect WiFi to TuneBoy WB-01" you should click the **No** button. Now the "Key Generation" pop-up screen shown above will be displayed again.
15. Enter your user ID and password and click the "Generate key" button.

The user ID should be the email address used when you purchased the product. The password will have been sent to you in an email.

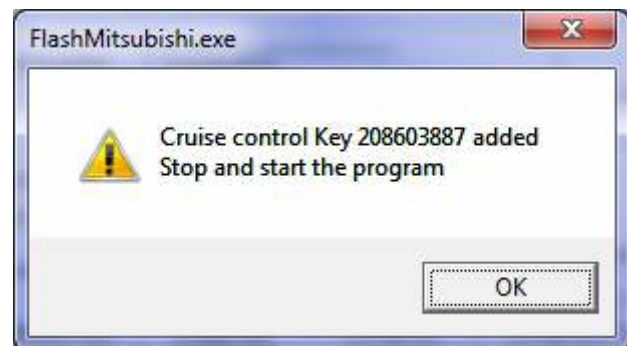
### **Note - Key Types**

Make sure you have the correct type of key selected. By default this screen has the full Cruise Control and Tuning key selected. If you have purchased a tuning key, cruise only, or O2 sensor disable key you should change the selection to reflect the type of key that you have purchased.

The option for different key types is intended for dyno shops and dealers. If you are a customer working on your own bike you will most likely have the Tuning and Cruise key.

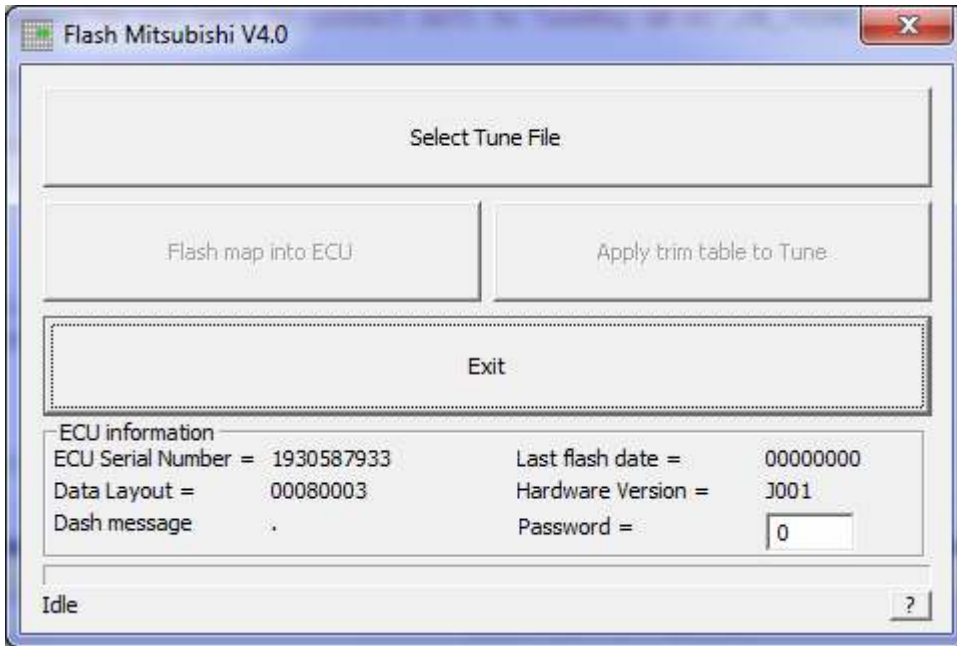
You will now get a pop-up message as per the screen shot below:

- 16. Take note of the key number that is displayed. You will need this if you need to install the software on another PC or if you have to re-install the software.**



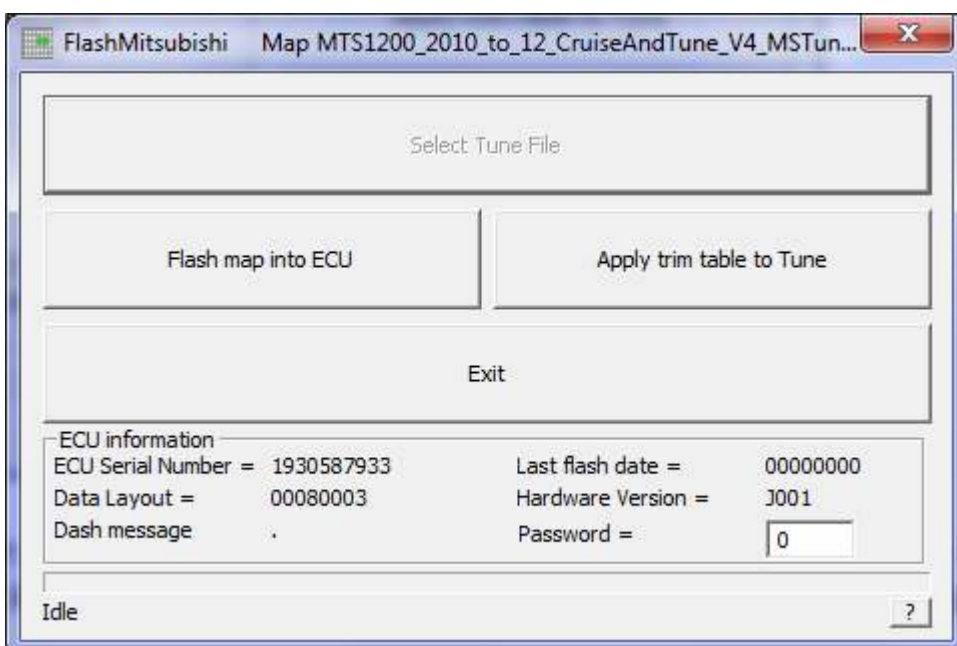
17. Stop the FlashMitsubishi program and reconnect the WB-01 to the motorcycle and to the PC.
18. Turn the motorcycle on and start the FlashMitsubishi program again. This time you will see a serial number but you will not be prompted for a key. This shows that the key has been added to the registry on your PC.

The following screen will be displayed:



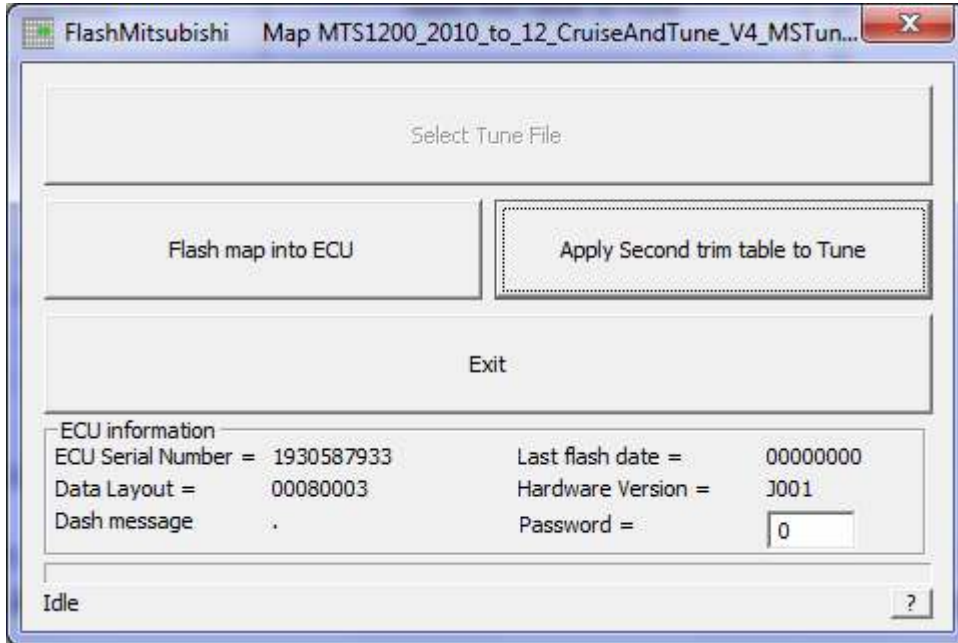
19. Click "Select Tune File" and select the tune file you want to load into the ECU.
- If you have an **O2 Disable key** you can only download maps to disable the O2 sensor function.
  - If you have a **Cruise Control only key** you can only download the CruiseOnly maps.
  - If you have a **Tuning key** you can download the O2 disable maps and the Tuning maps.
  - If you have a key for the **Cruise Control and Tuning** key you can download any tune file.

After you have selected a tune file the following screen will be displayed:

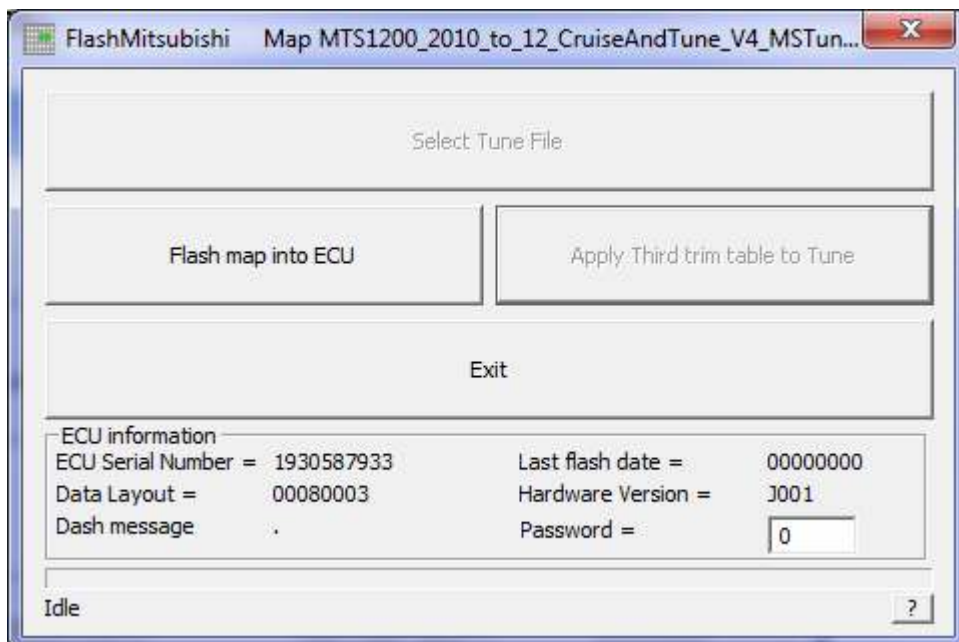


If you have been provided with a trim file you can apply the trim file to the tune by clicking the "Apply trim table to tune". This will display a file open box.

- 20. Select the trim file you wish to load. After you have selected a trim file the button text will change to "Apply second trim table to tune". If you want to apply multiple trim maps to the ECU you can repeat the trim selection up to two more times.



- 21. Once you have selected the third be greyed out as shown in the following screen shot:



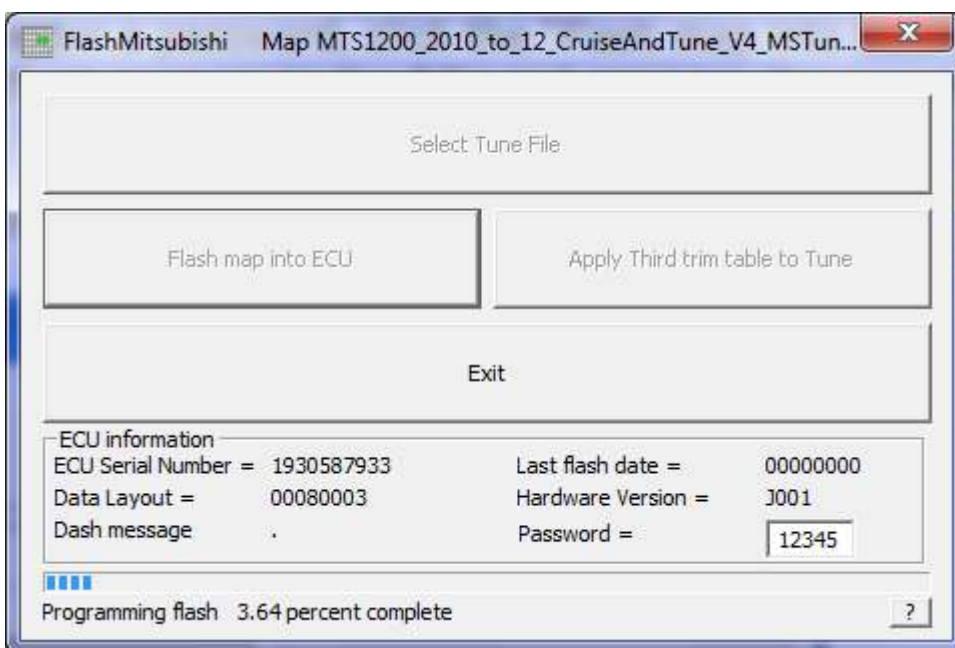
## Passwords:

The password field is used to protect against unauthorized access to your bike by another TuneBoy user should you leave the WB-01 on the bike while riding. This is not your User ID's password that is linked to your key. You can enter any number from 0 to 65535 as a password. Please make note of your chosen password for future reference:

**My Chosen Password Is:** \_\_\_\_\_

22. Once you enter a password, click the "Flash map into ECU" button. This will again erase the flash memory in the ECU and program the completed map into the ECU.

The following screen shot shows the download in progress:



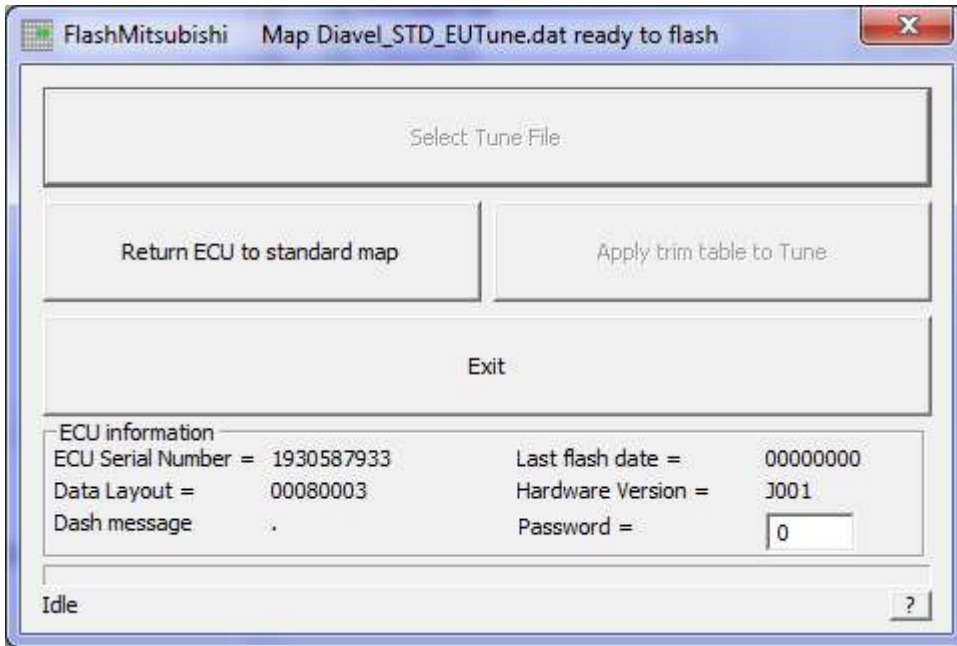
After the "Download Complete" message is displayed you are ready to ride the motorcycle or tune using the TuneBoyTrim software.

## 4.2 Returning the Bike to Standard:

The TuneBoy CD contains the factory standard maps for EU, US and Japanese model bikes. These maps can only be loaded into the ECU once a TuneBoy map has been loaded and the correct key entered (steps shown above).

When you start the FlashMitsubishi program you will only be able to open the standard tune files if the "ECU Serial Number" field has a valid serial number. If this field does not show a serial number you should stop the flash program, wait 30 seconds then start it again.

Once you select a standard tune file the "Flash map into ECU" button will change to "Return ECU to standard map" (see screen shot below).



Returning the ECU to standard mapping will not prevent you from reloading one of the TuneBoy tune files at a later date. Many customers like to return the ECU to a standard state when they take the bike in for service work. Returning the ECU to standard will require all standard parts to be fitted again. For example, the exhaust flap and O2 sensors will need to be connected otherwise you will have errors on the dash.

These maps have a name ending with STD\_Tune.dat.

**N.B.** Once you have returned the ECU to a standard tune, the serial number will no longer be displayed in the FlashMitsubishi program and the TuneBoyTrim program will not be able to read the map from the ECU.

Simply use the FlashMitsubishi program to load a TuneBoy tune and the TuneBoy features will work again. You will not need to get a new key.



## 5. SET-UP OF THE INNOVATE LC-2 WIDEBAND O2 CONTROLLER



### CAUTION

**The oxygen sensor when used in this device gets very hot in operation. Do not touch the hot sensor. Do not let a hot sensor touch a combustible surface. Do not use the sensor with or near flammable liquids or gases. Failure to heed these warnings may result in severe burns, explosions or fires. When installed in the exhaust, the oxygen sensor MUST be connected and operating with the LC-2 whenever the vehicle is running. An un-powered oxygen sensor will be quickly damaged when exposed to hot exhaust gases.**

With the addition of an Innovate LC-2 wideband O2 controller you can make use of the new real-time mapping to allow auto-tuning of the fuel map.



The LC-2 no longer comes with the cable to connect to the WB-01 WiFi box; this part must be purchased separately if you need it. We recommend connecting directly to the O2 sensor plug on the motorcycle.



If you purchase the LC-2 as part of a kit we will put the correct plug on the LC-2 to directly plug into the wiring loom. Our LC-2 Kit (P/N 3884) is exclusive to TuneBoy and comes with a 3ft Sensor cable for convenience.

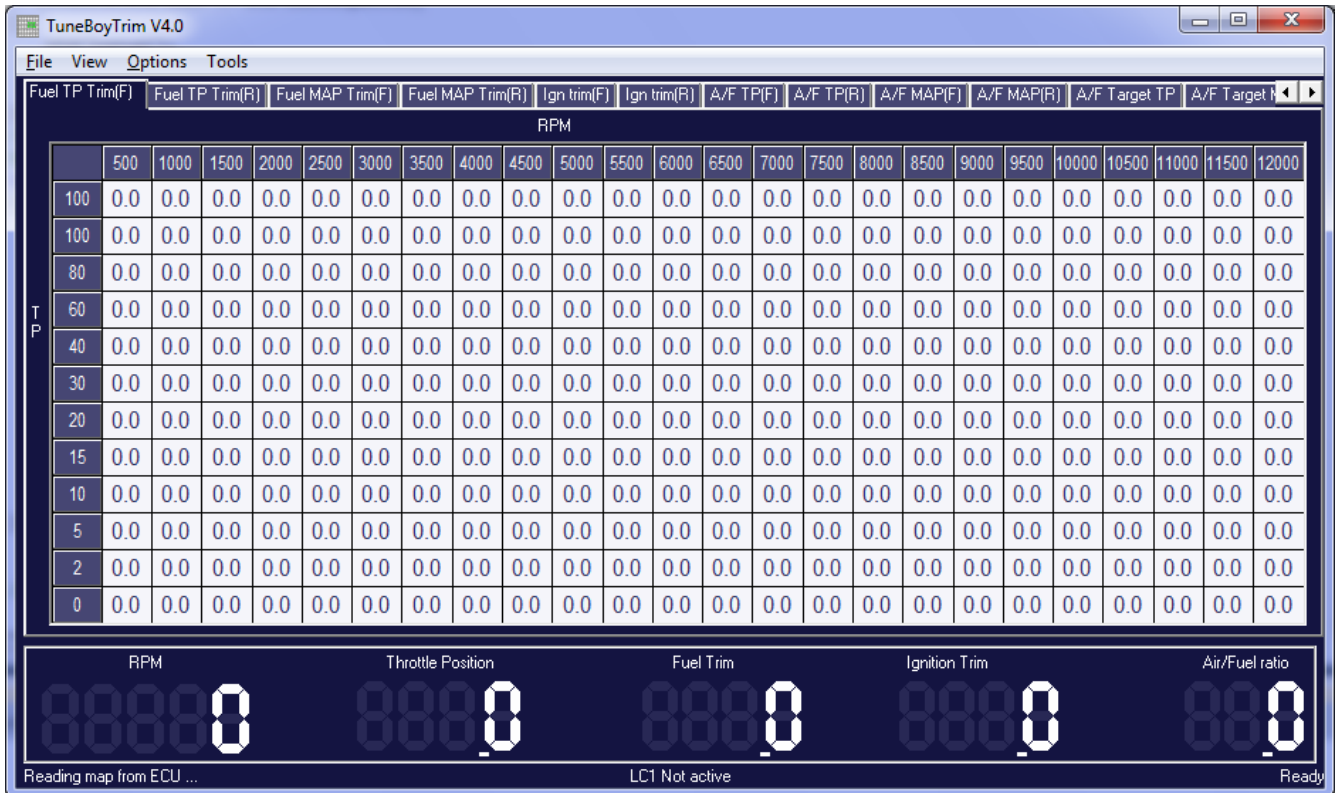
When the LC-2 is connected in this way it is powered on with the ignition. This is important to remember and for the protection of the O2 sensor you should avoid leaving the ignition on for long periods without the motor running. The O2 sensor can be damaged if it is exposed to the moisture that can build up in the exhaust system as it cools down. The moisture is not a problem if the sensor is cold when the motor is started.

You can connect any wide band O2 controller to the O2 sensor plugs on the bike. The only requirement is that the output of the wide band controller is 0 volts for 10/1 AF Ratio and 5 volts for 20/1 AF Ratio. If you are using a different wide band O2 sensor you must make sure you select "Generic 0-5v" in the TuneBoyTrim target screen, the default is the Innovate A/F range.

1. Start the TuneBoyTrim program.

When this program starts you will see a screen similar to the image below:





Note: Message at the bottom of the screen "Reading map from ECU".

2. If you have entered a password on the FlashMitsubishi program you will be prompted for this password again when you start the TuneBoyTrim program. This password is your chosen number between 0 to 65535. You will only be asked for this once. The number will be remembered the next time you start the TuneBoyTrim program. (for passwords see page 14)
3. Once the program has read the trim map from the ECU you will see a message "Map Read Complete" and the message will change to "Get running data", or a pop-up window asking if you want to replace the data in the ECU with the data from the PC.

**If you click "NO", the data from the ECU will replace the data in the TuneBoyTrim program.**

**If you click "YES", the data from the TuneBoyTrim program will replace the data in the ECU.**

Example:

If you are working on the dyno and need to stop for a break, you should go to the "File" menu and select "Save Trim File", enter a file name and save the file.

When you want to start working on the dyno again you should do the following:

- Start the TuneBoyTrim program and select "Open Trim File" from the "File" menu. This will open the file and display the trim values as they were when you saved the file.

- Turn the ignition on and the TuneBoyTrim program will ask if you want to replace the data.
- Click "Yes" and the program will update the data in the ECU with the data saved in the trim file.
- 

You can now resume the tuning work without needing the reflash the ECU.

**Note:** The first time you connect to the ECU with the TuneBoyTrim program you should click "No" (if asked) to make sure the data you start working with is the same as the data in the ECU.

## 6. TABLES IN TUNEBOYTRIM PROGRAM

The tables available in the TuneBoyTrim program are:

- Fuel TP Trim (F)
- Fuel TP Trim (R)
- Fuel MAP Trim (F)
- Fuel MAP Trim (R)
- Ign. Trim (F)
- Ign. Trim (R)
- A/F TP (F)
- A/F TP (R)
- A/F MAP (F)
- A/F MAP (R)
- A/F Target TP
- A/F Target MAP
- Blip H
- Blip Length
- TPH H
- TPH L

### 6.1 Fuel TP Trim and Fuel MAP Trim (Front) and (Rear)

These tables contain the fuel trim values for front and rear cylinders. The TP tables are used when the ECU is mapping based on throttle position. The MAP tables are used when the ECU is mapping based on manifold pressure. "F" indicates the table is for the Front cylinder. "R" indicates the table is for the Rear cylinder.

To change the values in the cells select the area you want to change and use the PageUp and PageDown keys on the keyboard.

The values in the table are percentage adjustments. These values are applied to the main fuel tables once the ECU has looked up the main fuel table.

Example,

+5.0% in a trim table will increase the fuel delivery by 5%,  
-5.0% in a trim table will decrease the fuel delivery by 5%.

Any adjustments to these tables will be sent to the ECU within a second and the result should be seen in the air fuel ratio.

You should not need to adjust the MAP tables as the base program in the ECU has been changed to restrict the manifold pressure mapping to the area from 0 to 2.5% throttle up to 5000 RPM.

All mapping on the dyno should be done with the TP tables.

## **6.2 Ignition Trim, F/R**

These tables are for adjusting the ignition advance for the front and rear cylinders. Values in these tables are in degrees of ignition and are added or subtracted from the main ignition map values used by the ECU.

To change the values select the area you want to change and use the Page Up (PgUp) and Page Down (PgDn) keys on the keyboard.

Changes to these ignition trim tables should only be done on a dyno that can show horsepower while holding a fixed RPM.

If you are on a dyno that shows horsepower while holding RPM you can adjust the ignition trim while watching the horsepower reading on the dyno. If you add ignition advance and the horsepower increases, this is good. Once you get to the point where adding ignition does not increase horsepower you should back off the ignition to the point that made the most horsepower with the lowest ignition value. The reason for this is that the power will plateau for a number of degree's (up to 10 degree's) before the ignition advance starts to cause detonation and a reduction in power.

## **6.3 A/F TP (F) and (R)**

If you have an Innovate LC-2 wideband O2 controller connected this table will be filled in with the average A/F (Air/Fuel) ratio from the LC-2 when the throttle position and RPM are within +/- 25% of the exact cell location.

For example, if the LC-2 A/F ratio is 13.5/1, the RPM is at 2600 RPM and throttle position is at 45%, the value 13.5 would show in the 40% throttle 2500 RPM map location.

The TuneBoyTrim program uses these measured values in conjunction with the target A/F values to work out the amount of trim required to correct the fuel map.

**N.B.** If you have the LC-2 connected to O2 sensor plug on the motorcycle it is important that you do not have the QuickShifter or Nudge buttons selected, this makes sure the output of the LC-2 is not mistaken for Nudge button or QuickShifter input.

### 6.4 A/F MAP (F) and (R)

If you have an Innovate LC-2 wideband O2 controller connected this table will be filled in with the average A/F (Air/Fuel) ratio from the LC-2 when the manifold pressure and RPM are within +/- 25% of the exact cell location.

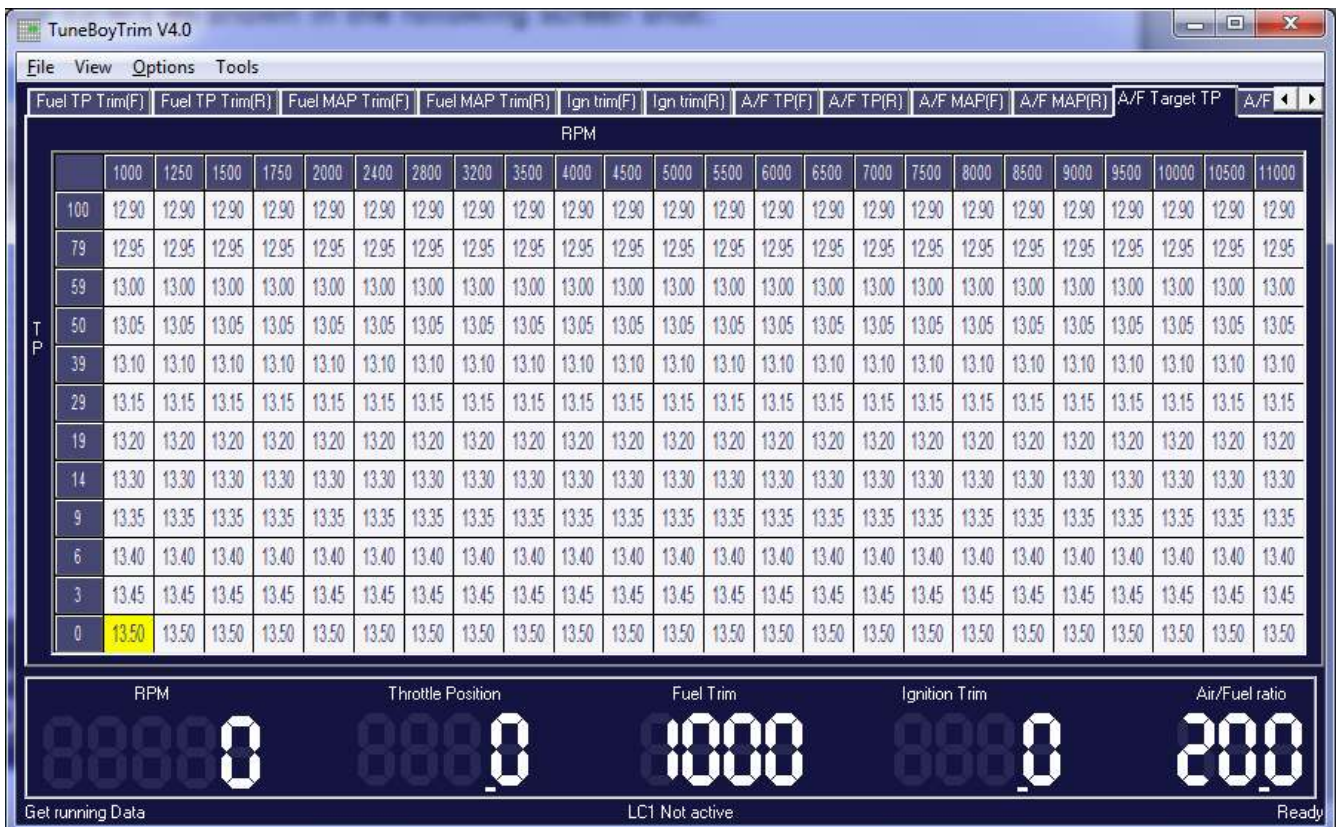
For example, if the LC-2 A/F ratio is 13.5/1, the RPM is at 2600 RPM and manifold pressure position is at 488 millibars, the value 13.5 would show in the 488 millibar row 2500 RPM map location.

The TuneBoyTrim program uses these measured values in conjunction with the target A/F values to work out the amount of trim required to correct the fuel map.

**N.B.** If you have the LC-2 connected to O2 sensor plug on the motorcycle it is important that you do not have the QuickShifter or Nudge buttons selected, this makes sure the output of the LC-2 is not mistaken for Nudge button or QuickShifter input.

### 6.5 A/F Target (TP)

This table contains the target A/F ratio you would like for each point in the map. You can set this so that low throttle positions have 13.5/1 and high throttle positions have 12.9/1 as shown in the following screen shot:



When the TuneBoyTrim programs Roll-On feature is used these values will be compared to the measured values from the "A/F TP (F)" and "A/F TP (R)" tables to work out how much to change the trim values by in order to try and bring the measured A/F values in line with the target A/F value.

## 6.6 Blip H

This table contains the target throttle percentage to be used for the down-shift auto-blip. This table is only used if you have the strain-gauge Quick-Shifter fitted.

The table contains a row for each gear and 24 RPM points.

When the strain-gauge shifter reaches the trigger point for the down-shift blip the ECU uses the value from this table to know how far the throttle needs to open for the current gear and RPM.

Values in the table are throttle percentage.

Below is a screen shot of this table:

	1000	1250	1500	1750	2000	2400	2800	3200	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	11000	12000
6	10.0	10.0	9.0	5.3	4.0	4.0	5.0	5.3	5.5	6.0	6.5	7.7	9.5	11.5	13.8	16.2	18.0	19.0	19.5	20.0	20.5	21.0	0.0	0.0
5	10.0	10.0	9.0	5.3	4.0	4.0	5.0	5.3	5.5	6.0	6.5	7.7	9.5	11.5	13.8	16.2	18.0	19.0	19.5	20.0	20.5	21.0	0.0	0.0
4	10.0	10.0	9.0	5.3	4.0	4.0	5.0	5.3	5.5	6.0	6.5	7.7	9.5	11.5	13.8	16.2	18.0	19.0	19.5	20.0	20.5	21.0	0.0	0.0
3	10.0	10.0	9.0	5.3	4.0	4.0	5.0	5.3	5.5	6.0	6.5	7.7	9.5	11.5	13.8	16.2	18.0	19.0	19.5	20.0	20.5	21.0	0.0	0.0
2	10.0	10.0	9.0	5.3	4.0	4.0	5.0	5.3	5.5	6.0	6.5	7.7	9.5	11.5	13.8	16.2	18.0	19.0	19.5	20.0	20.5	21.0	0.0	0.0
1	30.0	30.0	30.0	11.5	10.0	8.0	7.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

You can see that the throttle opening gets higher as the RPM increases.

The values in the row for first gear are used for the blip function on the iPhone and Android apps.

If you increase the values in the Blip H table you will feel more of a push forward as you down-shift. If you feel that the down-shift has too much of a surge forward you should reduce the value at the point that you feel this is happening.

## 6.7 Blip Len

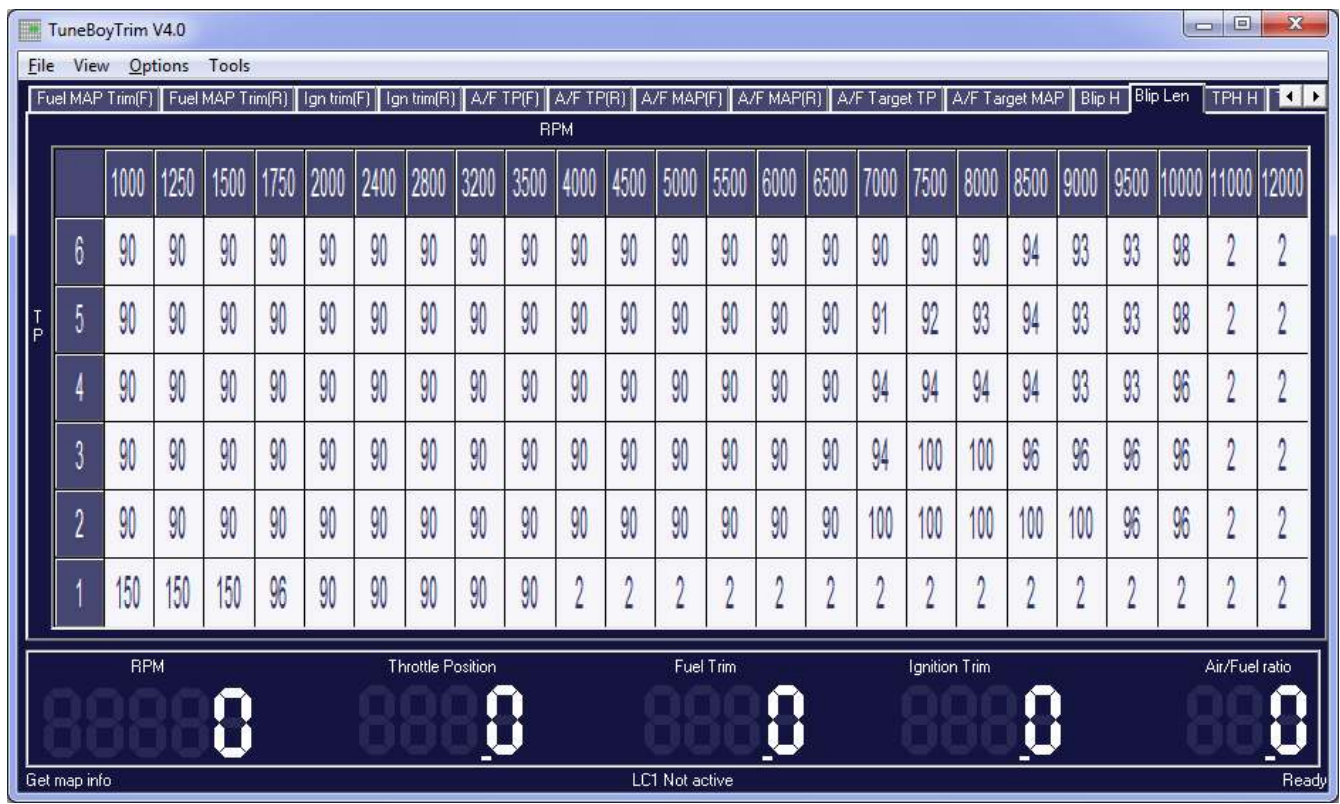
This table contains the time, in milliseconds, that the down-shift throttle blip will last. This table is only used if you have the strain-gauge quick-shifter fitted.

The table contains a row for each gear and 24 RPM points.



When the strain-gauge shifter reaches the trigger point for the down-shift blip the ECU uses the value from this table to know how long to hold the throttle at the value from the Blip H table for the current gear and RPM.

Below is a screen shot of this table:



Increasing the values in this table will have the same effect as increasing the values in the Blip H table. We suggest increasing the values in this table before you increase the values in the Blip H table.

If you want to reduce the blip effect it is best to reduce the Blip H table value. This is recommended this is because the throttle blip is a mechanical action and it takes time for the throttle to react.

If you decrease the Blip Len value you may be reducing the height of the blip by not allowing enough time for the throttle to reach the desired blip height.

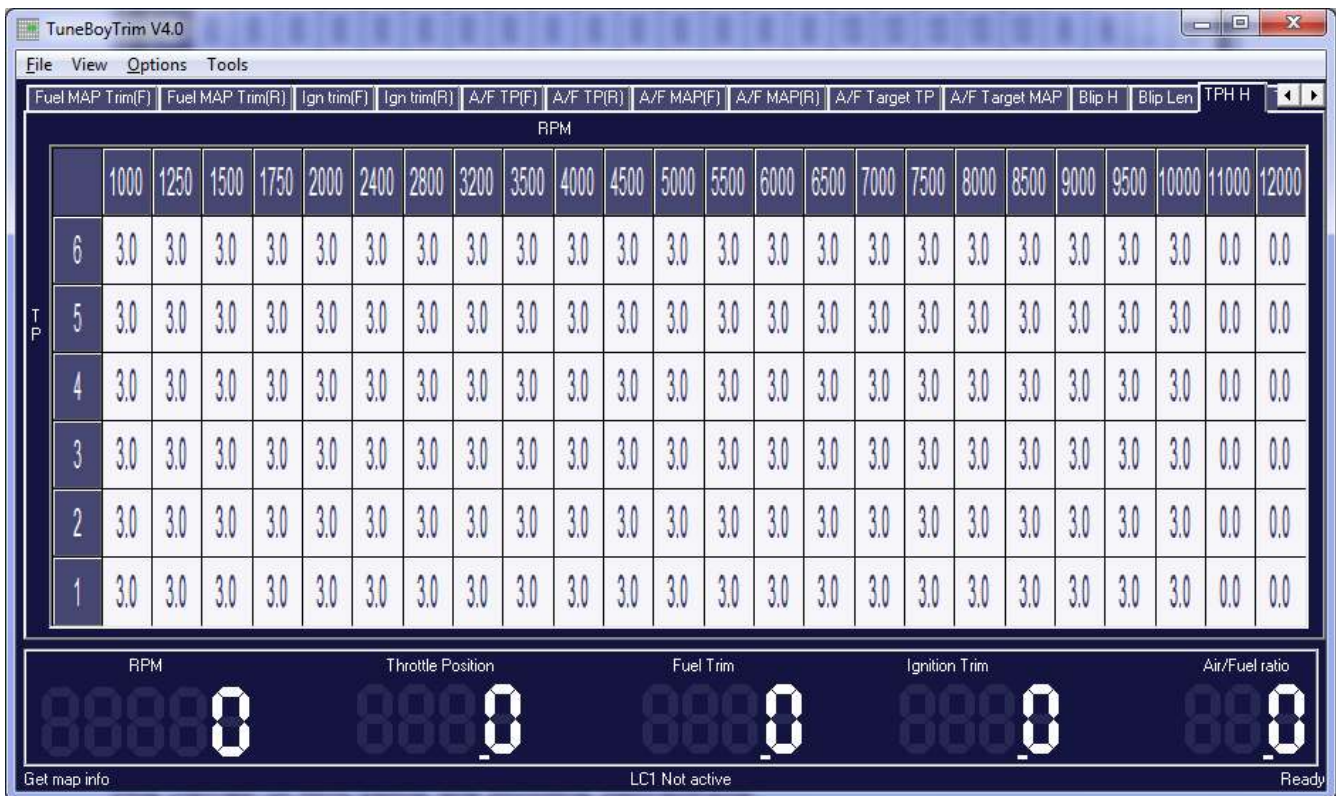
### 6.8 TPH H

This table contains the value to use as the lowest throttle value after a down-shift has completed. The purpose of this table is to reduce the engine brake effect when the throttle closes after the down shift.

The values in this table are throttle percentage.

An increase in the values in this table will make the bike feel like it wants to roll forward after the down shift.

Below is a screen shot of this table:



The best way to understand these values is to make some changes and ride the bike. You can use the trim map switch feature of the TuneBoy maps to try different values.

**Example:**

1. Select this entire table and increase the values to 5.0. This will mean the throttle stays at 5% for a short period after the down-shift.
2. Save the trim file with a new name.
3. Use the FlashMitsubishi to load the original trim file and the modified trim file. Ride the bike to get a feel for the down-shift action.
4. Pull to the side of the road and turn the ignition off and on (don't start motor).
5. Turn the throttle fully open and pull the clutch in, then release the clutch. This is the signal to the ECU that you want to switch to the next trim file.
6. The rev counter will go to 5000, 7500 or 10000 to indicate which trim map it has changed to (trim map 1, 2 or 3).
7. Start the motor and ride the bike to feel the difference in the down-shift action.
8. Using this method is the best way to get an understanding of what to expect from a change to these tables.

## 6.9 TPH Len

This table contains the time, in milliseconds, that the post-blip low throttle should stay in effect. The values in this table work with the values in the TPH H table in the same way that the Blip Len values work with the Blip H values.

The maximum time you can set for any value in this table is 200 milliseconds

Below is a screen shot of this table:

The screenshot shows the TuneBoyTrim V4.0 interface. The main window displays a table for TPH Len values across various RPM ranges (1000 to 12000) for throttle positions 1 through 6. The values are generally 100 or 110 milliseconds, with a slight increase to 105 or 110 at higher RPMs. The bottom of the screen features digital readouts for RPM, Throttle Position, Fuel Trim, Ignition Trim, and Air/Fuel ratio, all currently showing 0. Status indicators at the bottom include 'Get map info', 'LC1 Not active', and 'Ready'.

		RPM																								
		1000	1250	1500	1750	2000	2400	2800	3200	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	11000	12000	
T P	6	100	100	100	100	100	100	100	100	100	100	100	100	105	105	105	110	110	110	110	110	110	110	110	2	2
	5	100	100	100	100	100	100	100	100	100	100	100	100	105	105	105	110	110	110	110	110	110	110	110	2	2
	4	100	100	100	100	100	100	100	100	100	100	100	100	105	105	105	110	110	110	110	110	110	110	110	2	2
	3	100	100	100	100	100	100	100	100	100	100	100	100	105	105	105	110	110	110	110	110	110	110	110	2	2
	2	100	100	100	100	100	100	100	100	100	100	100	100	105	105	105	110	110	110	110	110	110	110	110	2	2
	1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	2	2

RPM: 00000  
 Throttle Position: 0000  
 Fuel Trim: 0000  
 Ignition Trim: 0000  
 Air/Fuel ratio: 0000

Get map info      LC1 Not active      Ready



## 7. USING THE TUNEBOYTRIM PROGRAM FOR AUTO-TUNING

We recommend this be used on an eddy-current brake dynamometer for best results. Some common dyno's are not very good at steady state mapping because they are very poor at holding a set RPM. Dyno's like the Dyno Dynamics, Factory Pro, Mainline, Mustang, Superflow etc are much easier to use for this process.

Using the Auto-Tune feature requires use of an Innovate LC-2 or other wideband O2 controller.

When the auto-tune feature is turned on the TuneBoyTrim will start to make adjustments to the trim values after a set number of A/F samples have been read. This option is best used at lower throttle points, up to about 20% throttle. To use this option you select the "Auto-Tune" mode then set the dyno to hold a fixed RPM. Apply throttle to hold the throttle position within the target zone (green dot on target screen).

If you click the mouse in any of the tables you can use the 'A' key on the keyboard to turn the auto tune on and off. This allows you to hold a point and press 'A' to turn the feature on then 'A' again to turn the feature off. Working in this on/off way allows you to watch the A/F after a change as it sometimes takes a few seconds for the reading to react to the changes.

It is also good to toggle auto tune off as you move the throttle to the next throttle point. This makes sure that any throttle enrichment is ignored. Throttle enrichment is extra fuel that the ECU adds when the throttle is moved; this will make the A/F ratio appear richer while the throttle is moved.

Once the throttle has been within the target for 10 samples the TuneBoyTrim program will calculate the average A/F ratio from these samples and update the trim table to try and bring the A/F value in line with the target value for this map point.

After the correction is sent to the ECU the program will start to sample again until it has 10 samples then it will make another adjustment. This process will repeat until you move the throttle out of the target zone or toggle the auto tune off by pressing the 'A' key.

Tuning this way makes it easy to adjust the steady-state throttle values (low throttle values are considered steady-state values).

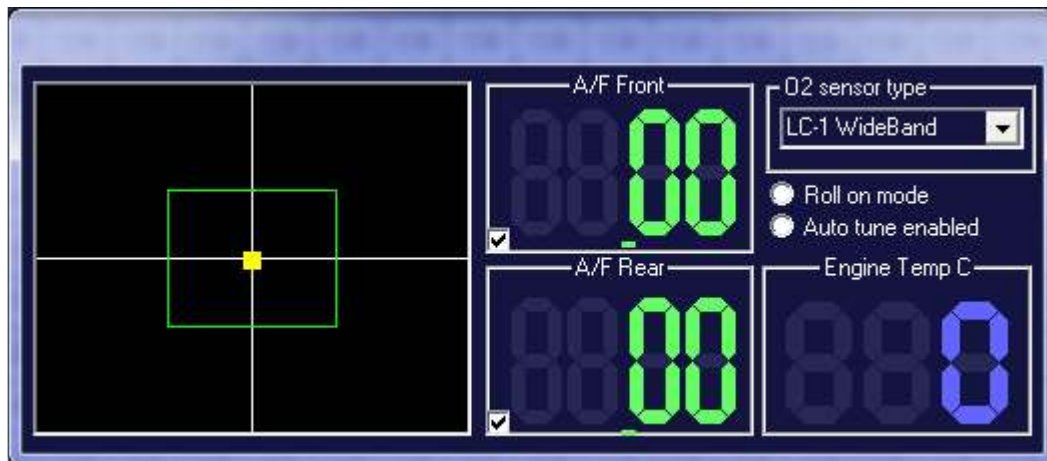
In this mode you should avoid sudden throttle changes as these unexpected changes will trigger the ECU's throttle enrichment (throttle pump function) and this will make the A/F values appear rich. The auto-tune mode should only be used on the dyno as the throttle can be controlled on the dyno without sudden changes.

## 7.1 Target Screen

The target screen can be displayed by selecting the "View" menu and selecting "Target Screen" from the drop down menu. You can also display the target screen by clicking anywhere in one of the tables and hitting the **T** key on the keyboard.

The target screen is also displayed when you select "Roll-On Mode".

The target screen:



You can use the mouse to drag this screen off to the side if you need to see the tables. You can also use the **T** key to toggle the target screen off and on (Once you click back in to one of the tables).

The yellow dot in the target shows how close you are to the most relevant cell in the map.

The drop down box marked "O2 sensor type" allows you to select between the default 0 to 5 volt output for the LC-1 wideband, or a generic 0 to 5 volt wide band.

The LC-1 wideband by default has 0 volt = 7.35/1 to 5volts = 22.39/1.

Generic 0-5 volt has 0 volt = 10/1 to 5 volts = 20/1.

Make sure this value is correctly set or you're A/F values will be incorrect

If you do not have two wide band O2 sensors connected you can remove the tick from the A/F sensor value that should be ignored. e.g. A/F Front or A/F rear tick boxes in the target screen. This allows you to use the auto-tune mode with a single sensor. You can run once with the sensor in the front cylinder, then once with the sensor in the rear cylinder.

For example, if the RPM was 2600 and throttle was at 11% the yellow dot will be slightly above the horizontal line and to the right of the vertical line.

If the RPM was exactly 2500 and throttle position was exactly 10% the yellow dot would be in the middle of the target.

The target screen always shows the location relative to the closest cell in the map. As revs increase the yellow dot will move from left to right, once it goes off the target on the right side it will reappear on the left side as it is now showing position relative to the next RPM point in the map.

The inner green square is +/- 25% of a map point. A/F values are only recorded and used when the yellow square is within this green box. The size of the target zone can be adjusted if required in the Process Log File in the TuneBoyTrim program.

The target screen will display the current A/F ratio from the Innovate LC-2 wideband O2 sensor for the front and rear cylinders. These figures will be displayed in colour based on the corresponding value from the Air Fuel Target screen. (See following image.)

- If the current A/F is within 0.2 of the target the figures will be shown in green.
- If the current A/F is more than 0.2 over the target the figures will be shown in red to indicate a lean situation.
- If the current A/F is more than 0.2 under the target the figures will be shown in blue to indicate a rich situation.

**Note:**

On the Diavel the rear O2 sensor is under the tank, this makes it hard to access. To solve this problem we have added a feature to duplicate the front A/F value on the rear A/F display.

If you have the O2 sensor in the rear exhaust and the plug connected to the front O2 plug you press ctrl O and the front A/F reading will appear in A/F Rear, now remove the tick from the front A/F display and the readings will only appear in the rear A/F table.

This allows tuning of the rear cylinder without needing to remove the fuel tank to access the rear O2 sensor plug.

## 7.2 Engine Temperature

The engine temperature is displayed to make sure the motor does not overheat while tuning the bike. Note that tuning when the motor is cold will skew the results.

- Blue on the engine temp indicates a cold motor, below 75° C (176° F). Green indicates the motor is between 75° C and 100° C (167° F and 212° F). (The range can be adjusted if required in the Process Log File in the TuneBoy Trim program. See page 25.)
- Red indicates the motor is over 100° C (212° F) and you should let it cool down before making any mapping changes.

## 7.3 Using the Auto-Tune Feature

To start the Auto-Tuning feature click the **A** key on the keyboard or select "Auto Tune" from the Options menu. A marker will appear in the "Auto Tune Enabled" (radio button) on bottom right of the target screen.

When Auto-Tuning is enabled the TuneBoyTrim program will make adjustments to the map whenever it been within the green target zone for the stable sample

count (this is 20 by default but can be changed on the "Process Log Screen"), This count is used to make sure any throttle enrichment has decayed to 0 before the software tries to make adjustments. Once the stable count has been reached the software will collect 10 samples for the cell in the map. Once it has collected the 10<sup>th</sup> sample with a yellow dot still within the green target box, the program will compare the average A/F value from these 10 samples against the target A/F from the target table. It will calculate the change required to bring the A/F into line with the target. This change is sent to the ECU and the sample count is set to zero for that map location.

The program ignores the next 5 samples for this point to allow time for the change to be sent and a resulting change in the A/F.

If the map point has not changed the software will repeat the process.

If the map point has not changed the software will not need to wait for the stable sample count; it will only need to wait for the stable sample count if the throttle point has changed.

If you have the bike on a dyno that can hold the RPM without too much fluctuation you simply need to turn the throttle while watching the yellow dot in the target. Once the yellow dot is within the green square hold the throttle and watch the A/F display change until it is green. Now turn the throttle to the next throttle point and the process will repeat.

This type of tuning should only be done for the lower throttle points, up to the 20% throttle point. Auto-tuning tuning does not work on the 0% throttle row. This must be adjusted manually.

To tune the points above 20% throttle you should use the following method:

1. Set the dyno to hold at around 2500 RPM;
2. Set the ramp rate on the dyno to a slow climb. On a DynoDynamics dyno we set this to 6 kph/sec to 10 kph/sec, depending on the throttle amount. On a DynoJet<sup>®</sup> dyno you will need to set the dyno to hold some load once you start the run;
3. With the dyno holding the bike at 2500 RPM turn the throttle to the point you want to tune;
4. Once you have the throttle stable between the lower and upper green lines in the target screen you should click the button to allow the dyno run to start.

As the ECU runs through the map points the average A/F value will be stored. Provided the ramp rate is slow enough the TuneBoyTrim program will collect enough samples to adjust the map.

If the "Roll On Mode" has been selected the trim software will calculate the required changes as soon as the throttle position drops out of the target zone. These changes will be sent to the ECU and the text colour on the A/F screen will turn grey.

The screen shot below shows the A/F table after running the bike up through the revs at the end of a tuning session:



In the image above you can see that most points in the map are green. The text colour is grey to indicate that changes have been made, based on these readings. The few points that still show red and blue have had a correction made based on these values. If the bike was run through these points again the values should be on target. In effect this screen shot shows the second to last state of tune. It is not necessary to run through again as we can see the A/F values are very good.

Each cell in the Air Fuel Ratio table is coloured to indicate if the point in the map is rich (blue), lean (red), or close to the target value (green). The further from the target the darker the colour.

Any point that is obviously incorrect can be cleared/zeroed by clicking on that point in the map and hitting the **Z** key on the keyboard. Hitting the Z key moves the value back one level in the A/F screen and moves 0 into the current value. You may need to hit the Z key twice to actually see 0 in all locations in the table.

To make the Air Fuel numbers easier to interpret we have added a graph view for the A/F values. Click the **G** key on the keyboard to display the A/F Graph screen. See screen shot next page:



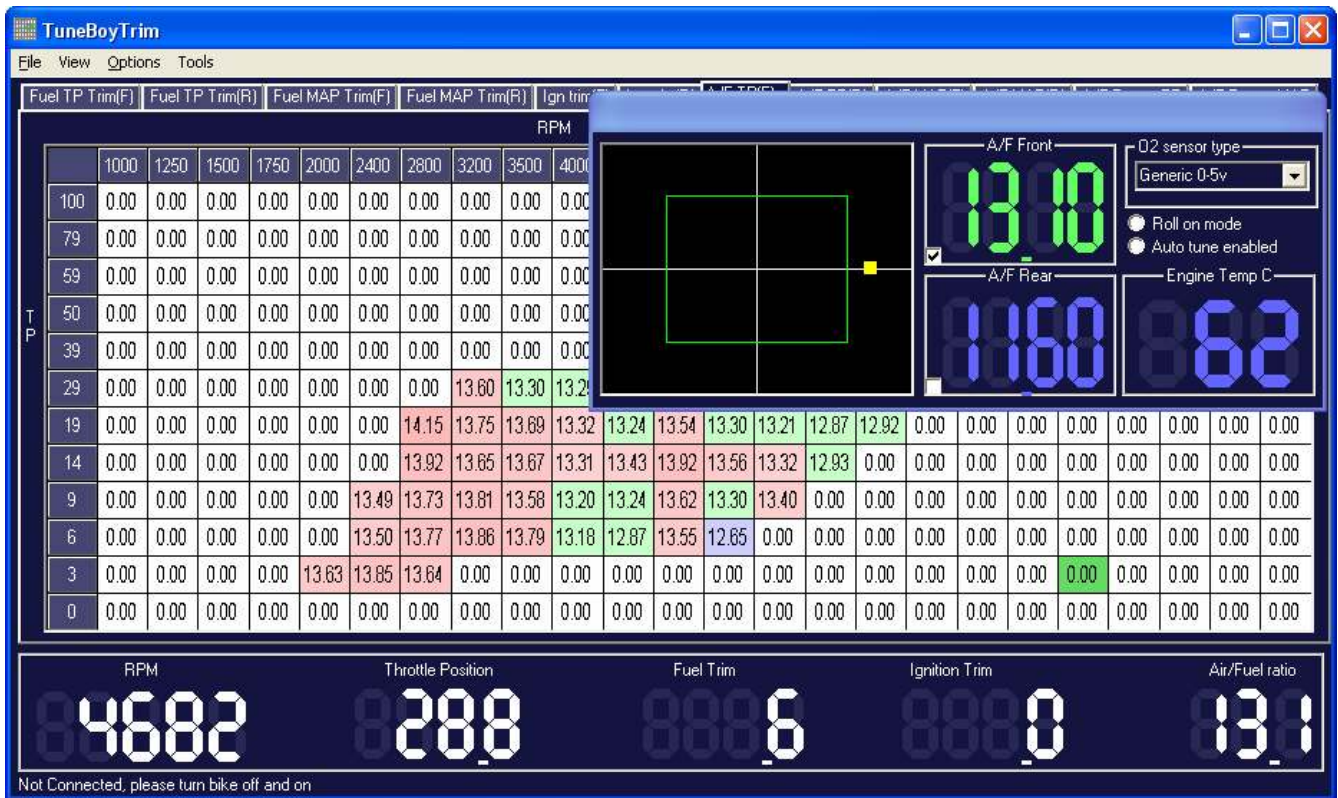


## 7.4 Manual Mapping Correction

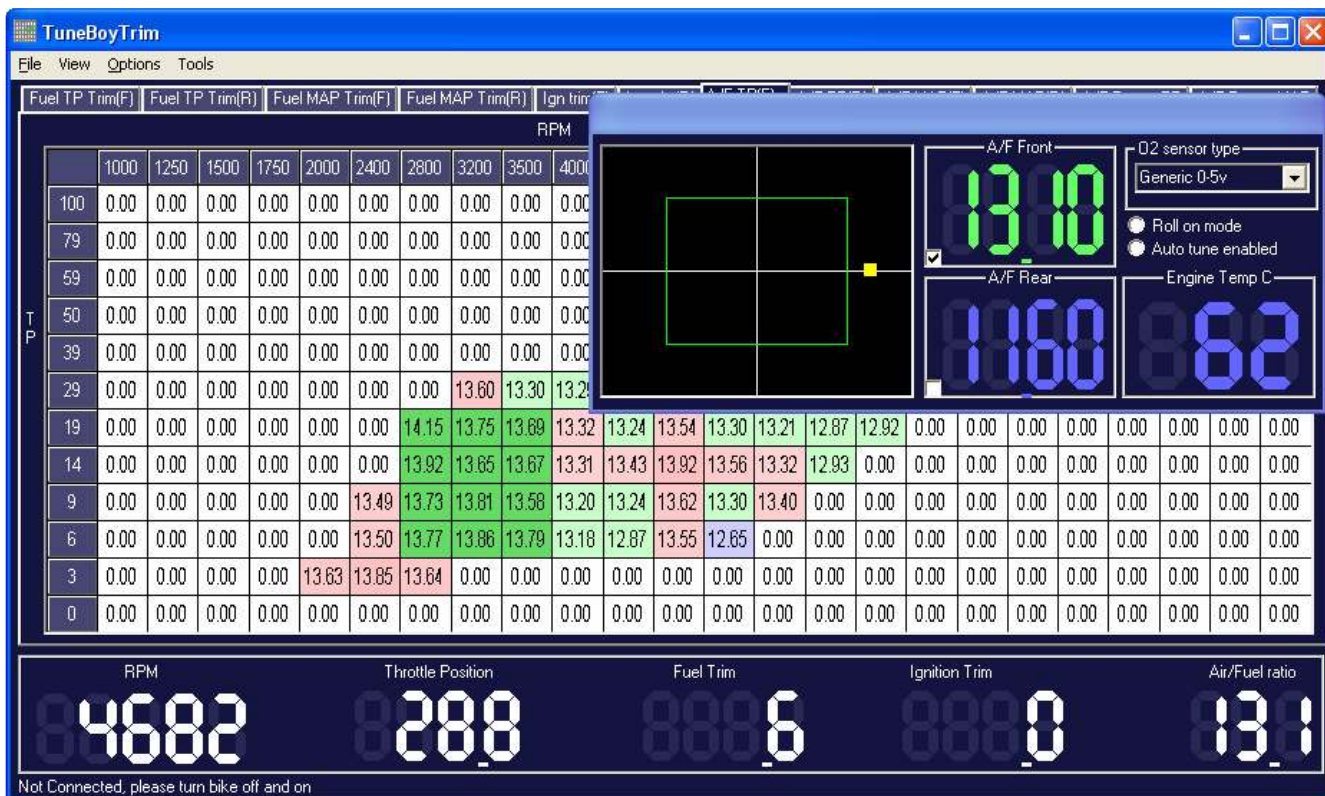
If you do not want the program to make the changes in an automated fashion you can still use the recorded values to help tune.

If Auto-Tune and Roll-On Mode are both disabled the values will be stored in the A/F tables but no corrections will be made to the trims.

In the screen shot below you can see the recorded A/F values and the text is black to indicate that the value has not been corrected.



To correct the map rows up to 19% throttle between 2800RPM and 3500RPM you need to select the area you want to correct. Do this by clicking and dragging the mouse over the area to be selected as below:

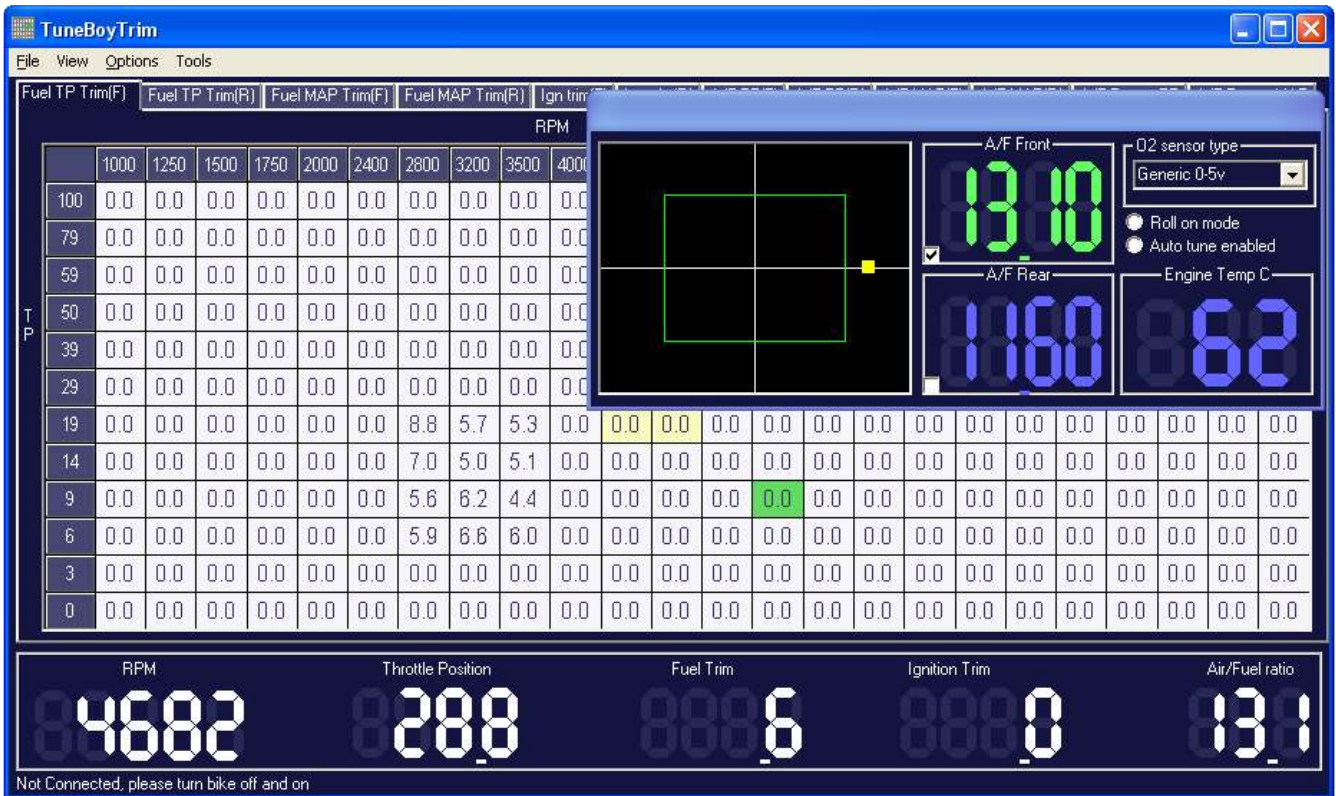


Now click the **C** key on the keyboard. This will calculate the trim required to bring the A/F ratio in line with the target and will update the fuel trim table with the required values.

Once the changes are made to the Fuel Trim table the selected area in the Air Fuel Ratio table is changed to show the text in grey, indicating that the area has been corrected.

On the following screen you can see the corrections that the program has calculated. The changes will be sent to the ECU assuming that the program is connected to the motorcycle. The line at the bottom of the screen will show "Update Data" until the data has been fully sent to the ECU.



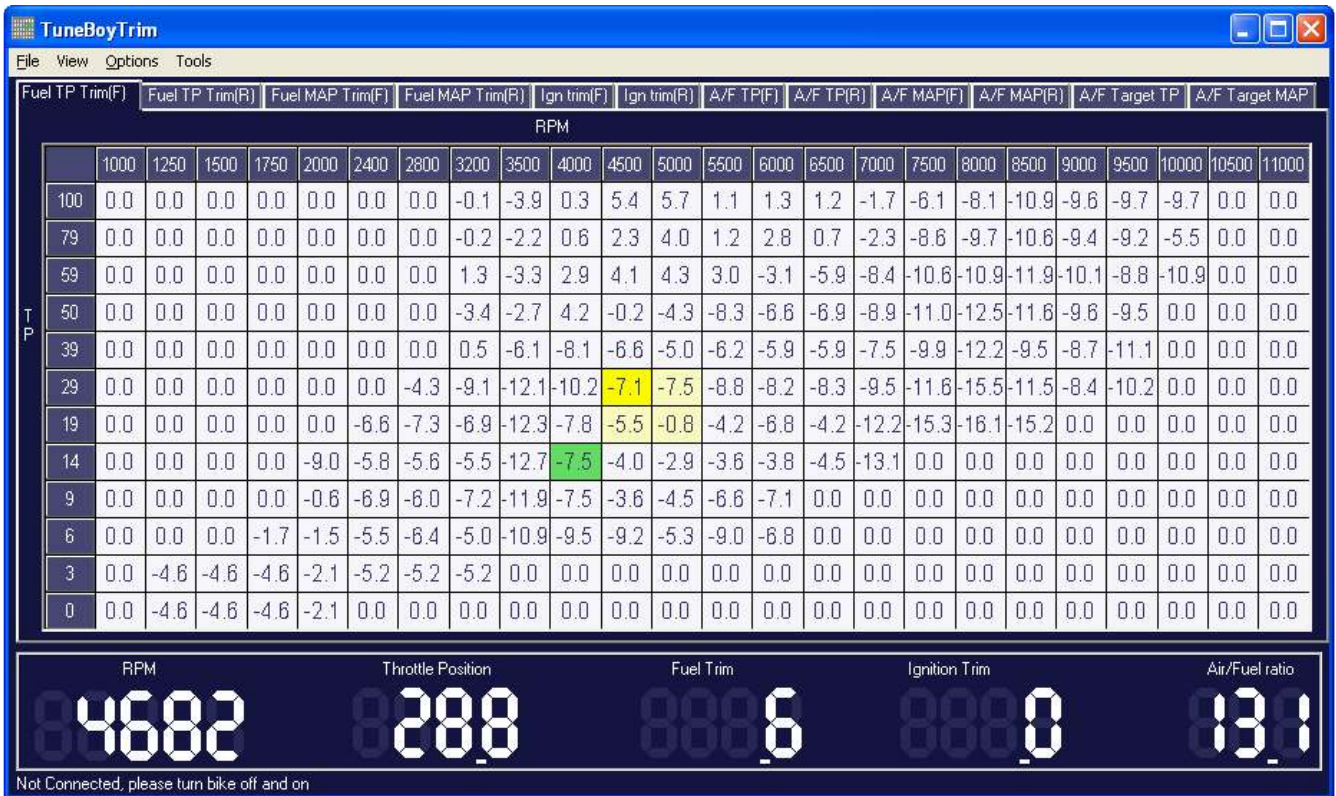


The new trims are sent to the ECU and you can now run the bike again and check the results. You should not need to do more than two passes to correct the fuel mapping.

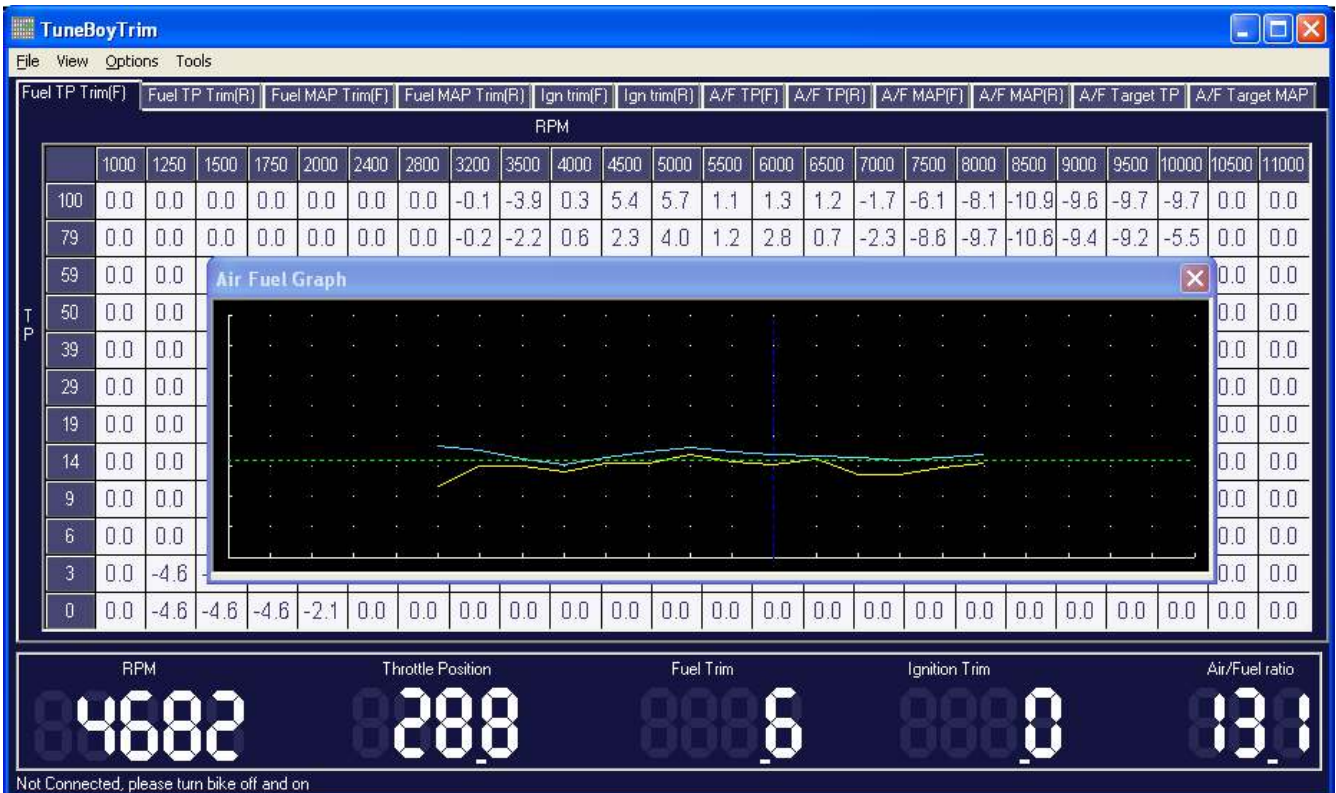
The following screen shot shows the A/F table after two passes at each throttle point.



The next screen shows the final trim values:



The next screen shot shows the A/F graph at the 19% throttle point:



You can see the yellow and blue lines are now very close to the green target line.



## 8. ROLL-ON MODE TUNING

The Roll-On Mode is provided to help automate the tuning process.

To use this mode you must have an Innovate LC-2 wideband O2 controller connected to the O2 sensor input on the bike or connected to the Serial In on the WB-01 (Using cable sold separately).

**N.B.** If the LC-2 is connected to the Serial In on the WB-01 it is important that the LC-2 is powered on *before* the WB-01 or at the same time. If the WB-01 is powered on before the LC-2 you will not see any A/F readings from the LC-2.

If the LC-2 is connected to the O2 sensor plug on the motorcycle you should make sure the output of the LC-2 is set to the factory default output values and that the fuel type is set to "14.7/1 Gasoline". Use the LM-Programmer software included with the LC-2 to check these settings.

Any wide band O2 controller can be connected providing it can output the 0-5volt signal, just make sure it has 0v for 10/1 and 5v for 20/1 and that the O2 sensor type is set to Generic 0-5v on the target screen..

1. To enable the roll-on mode go to the "Options" menu and select "Roll-On". This will display the target screen and put a marker (radio button) in "Roll-On Mode" on the target screen. If you only have one wide band O2 sensor you should only have a tick on the target screen in the A/F display that the wide band is connected to (A/F Front or Rear). This will make sure the value from the second O2 sensor input is ignored.
2. With this mode selected you should set the dyno to hold at the desired starting RPM then turn the throttle to the throttle row you want to tune. Use the target screen to get the throttle position as close to the horizontal line as you can. Once the throttle has been stable in the throttle zone for a number of samples the A/F value will be updated in the table. The number of samples can be adjusted in the Process Log File screen.
3. Now release the hold on the dyno to let the revs increase. It is best to use a slow ramp rate at low throttle and a faster rate at high throttle. Hold the throttle steady until the revs climb as far as they can and then release the throttle.
4. When you release the throttle the program will calculate the correction required and make the changes to the trim table. These changes will get sent to the ECU as soon as they are made.

### NOTE:

- For the first pass at a given throttle row the program will apply the full trim amount.
- For the second pass at a given throttle row the program will again apply the full trim amount.

- For the third pass at the same throttle row the program will apply half the calculated correction value.
- For any extra passes the program will step 0.5% in the direction required.

This process prevents the “yo-yo effect” you can get with auto-tune options.

Two passes at any throttle row should be enough to get the A/F values into the green zone.

Roll-On mode can be used for on-road tuning. If you do this it is important to try to ride the bike in a smooth way. Avoid sudden throttle changes as this will make it hard for the software to match throttle points with the A/F readings. The best way to tune on the road is to record a data log and make the adjustments by using the ‘C’ key after you have completed your test ride.

## 9. LOADING THE TRIM FILE ONCE TUNING IS COMPLETE

1. Go to the File menu and select “Reflash ECU”. The program will prompt you to save the trim file.
2. Once the file is saved the TuneBoyTrim program will close and the FlashMitsubishi program will start. The FlashMitsubishi program will open the last tune flashed into the ECU and apply the trim file you have just saved.
3. If you want to select a second or third trim map you can do this.
4. Now click the “Re-flash ECU” button to load the changes into the ECU.
5. Once the re-flash is completed you should start the trim program and check that the correct numbers are shown when the trim file is read from the ECU.

## 10. REAL-TIME IGNITION MAP CHANGES



### CAUTION

**Adjusting ignition maps in real-time should only be done on a dyno by a trained dyno operator. This should also only be done on a dyno that can show HP or torque while the dyno is holding a set RPM (most DynoJet® dyno’s are unable to do this).**

1. Start the TuneBoyTrim program and open the target screen (T).
2. Turn on Auto-Tuning (click the Auto-Tune Enabled radio button on the target screen). This will make sure the A/F ratio is corrected as you adjust the ignition mapping.

3. Now select the "Ignition Trim" table.
4. Set RPM to hold at one of the RPM points in the map and turn the throttle until the yellow dot is inside the green square. If you hit the **spacebar** on the keyboard this will make the current edit cell follow the point shown in the target.
5. Use the **PageUp** or **PageDown** to alter the ignition trim value and watch the HP reading on the dyno.
6. Increase the ignition trim until the HP on the dyno stops increasing, and then reduce the ignition trim until you have the value that gives the best HP for the least ignition advance.

While you are adjusting the ignition advance the TuneBoyTrim program will make sure the A/F ratio stays on target.

Using this method to map ignition at lower throttle points can make big improvements to the throttle response and fuel economy of the motorcycle. Again, once the changes have been made the trim map must then be saved and loaded into the ECU using the FlashMitsubishi program.

## 11. AUTO-THROTTLE FEATURE

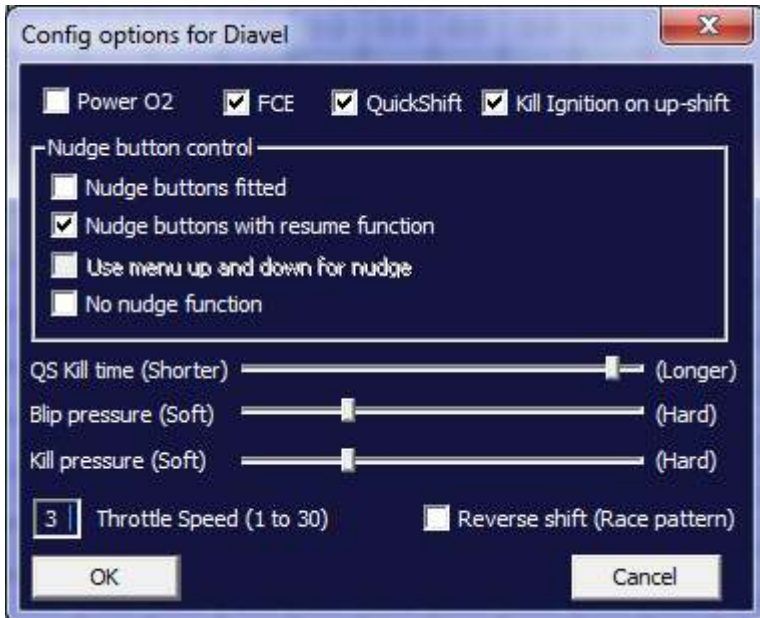
For dyno operators we have added the ability to control the throttle from the PC. To do this you set the dyno to hold RPM then click on the end throttle and RPM point in the map, for example 4500RPM and 20% throttle.

Now hit the **F5** key on the keyboard.

The throttle on the motorcycle will go to 20% until the RPM reaches 4500 RPM, at this point the throttle will close.

If you need to stop before the 4500 RPM hit the space bar on the keyboard. This will **instantly** return the throttle to the closed position.

The rate that the throttle opens is controlled by the "Throttle Speed" value on the Config Options screen. (see next screen shot)



A value of 1 will make the throttle open at a slow rate, a value of 30 will make it open very quickly.

This allows accurate throttle control for dyno-tuning.

**N.B.** On the Panigale and 2013 Multistrada the use of the F5 function will make the ECU switch to a linear throttle table. This allows a one to one ratio between the throttle grip position and the butterfly position.

When the linear throttle table is not active the butterfly position will change throughout the rev range even if the throttle grip is held at the same point.

## 12. HIGH SPEED DATA-LOGGING

1. To allow data-logging the bike must be running.
2. Go to the "Tools" menu in the TuneBoyTrim software and select "Start Logging".
3. Create a file name and select "Save".

You can still make changes and use all normal functions in the program whilst data-logging.

When you stop the TuneBoyTrim program it closes off the data-log file.

The data-log file is in a raw data format so it can only be processed by the TuneBoyTrim program.

The data-logging can be used to trim the bike after collecting data from a ride.

When collecting data from a road ride you should try to avoid sudden throttle movements as these will cause the A/F ratio to change due to acceleration

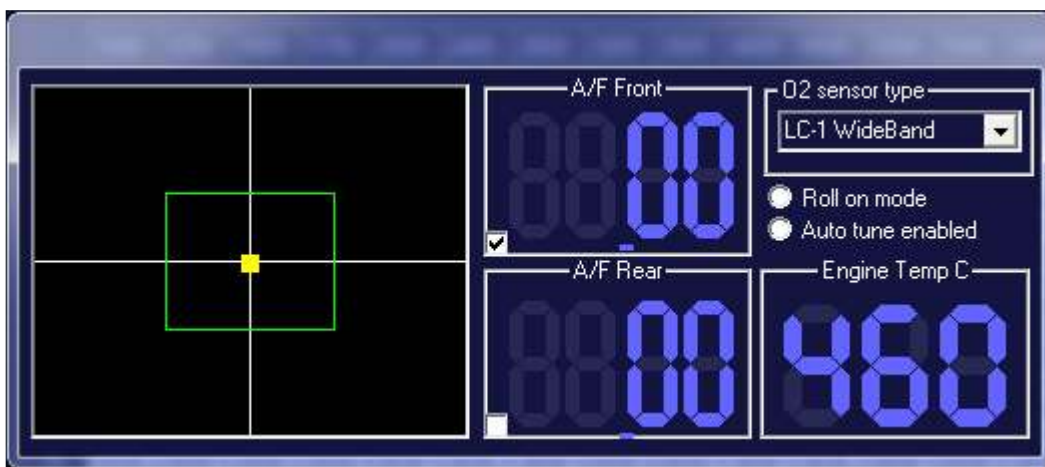
enrichment (the throttle pump function of the ECU adds extra fuel for sudden throttle changes).

**N.B.** You must make sure your laptop does not go into suspend mode when you close the lid. This can be changed under the power options in the control panel of your laptop (Windows function).

## 12.1 Processing a Log File

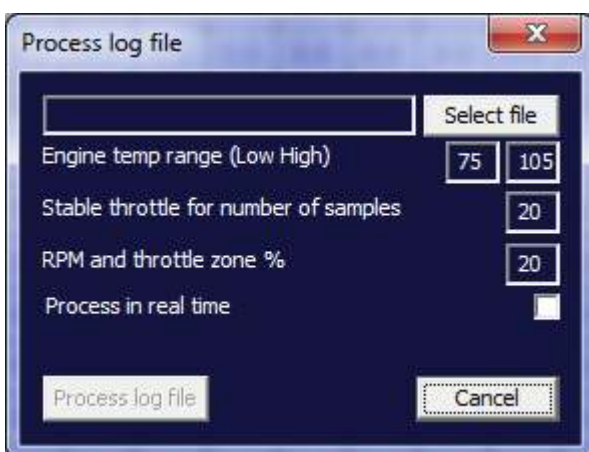
1. Hit the 'T' key on the keyboard to display the target screen. If you only have one A/F sensor connected you should make sure you only have a tick next to the A/F number for the cylinder that had the sensor when you collected the log.

The following screen shot shows the target screen if you have the A/F sensor connected to the front cylinder.



2. Now go to the "Tools" menu and select "Process log file".

The following screen is displayed:

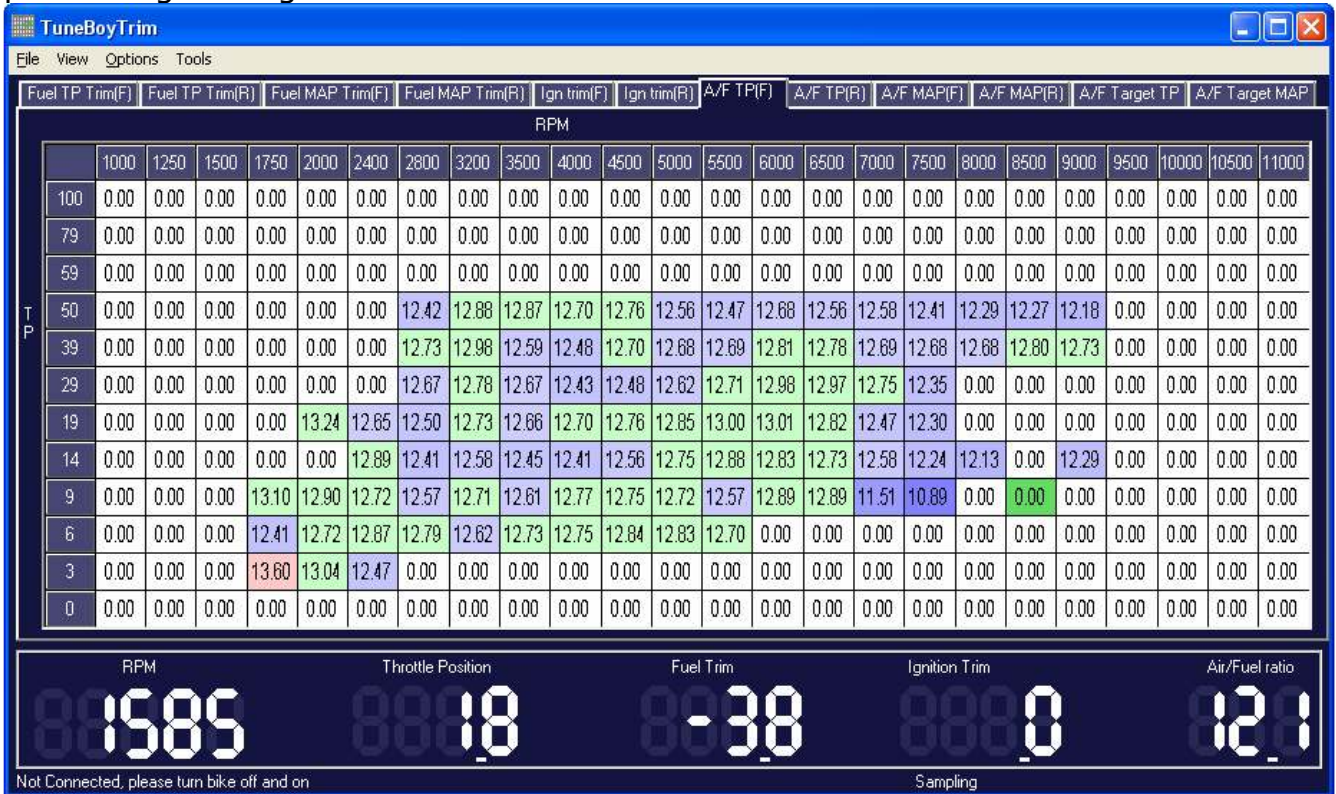


3. Click the "Select file" button and select the log file you have created.

4. Now click the "Process log file" button. The software will process all the records in the file and fill in the A/F tables.

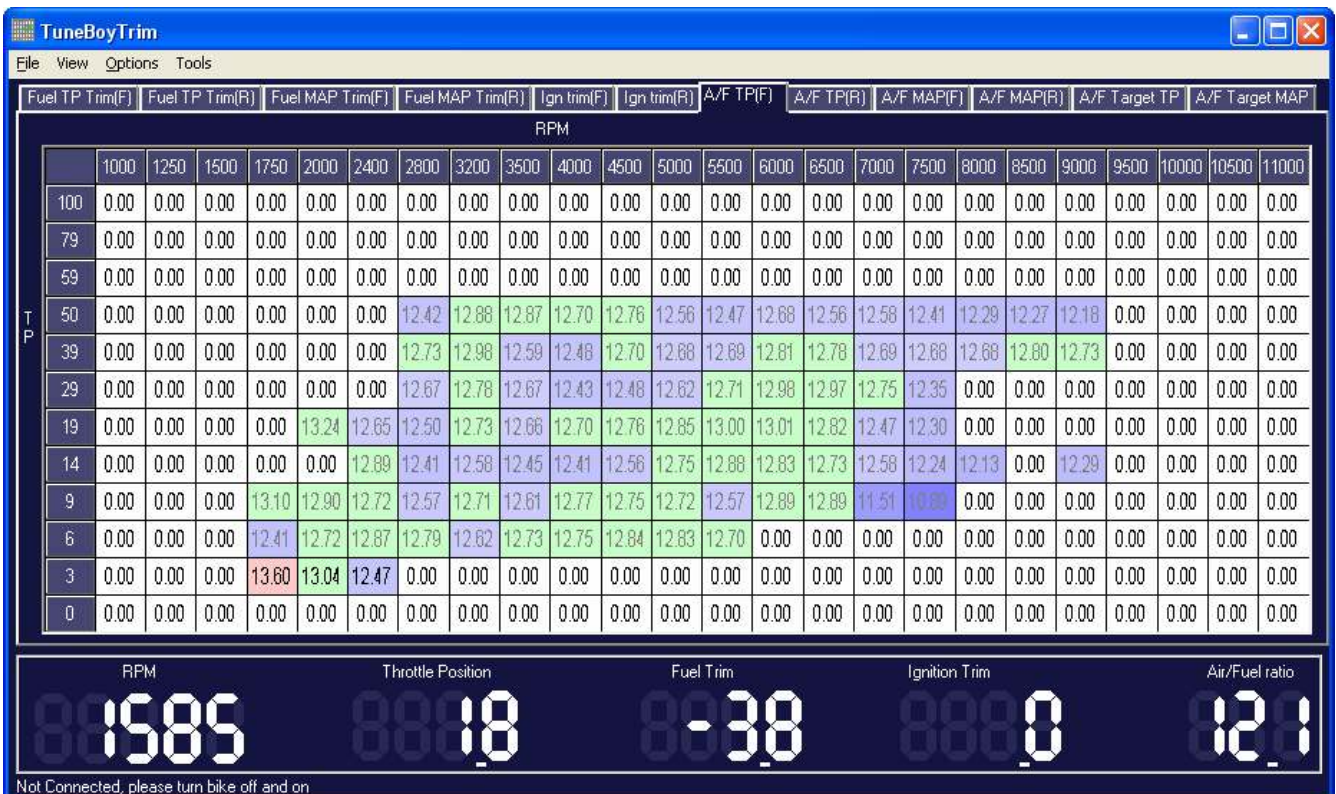


The following screen shot shows the A/F table for the front cylinder after processing the log file:



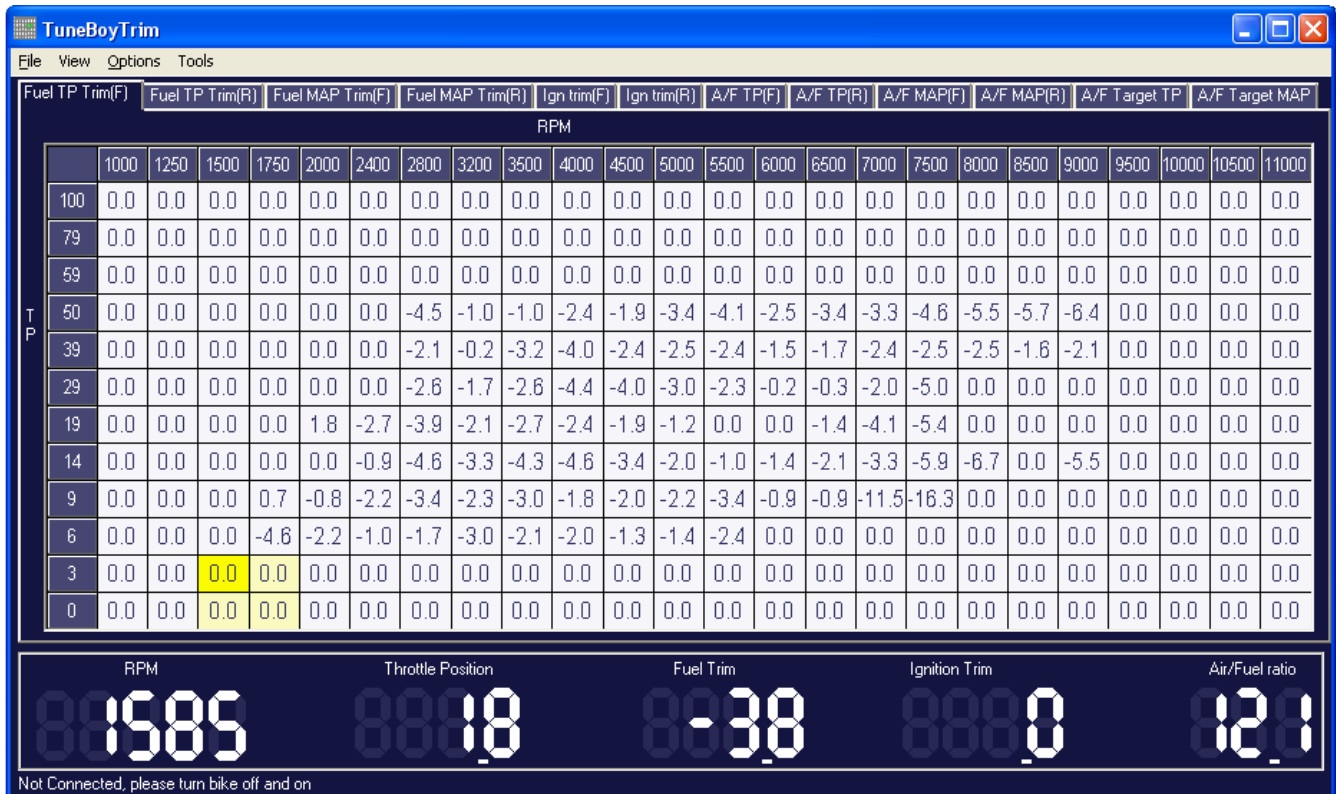
5. Now with the A/F tables filled in you can select the areas that need correcting and hit the **C** key on the keyboard to correct the fuel trim table.

Once you correct an area of the map the text colour in this area will change to grey. This is shown in the next screen shot:





The next screen shot shows the trim table with the calculated trims:



6. To reflash the ECU with this new trim table you go to the "File" menu and select "Reflash ECU". You will be asked to save the trim file then the TuneBoyTrim program will close and the FlashMitsubishi program will start.

7. Click the "Reflash ECU" button.

Once this is complete you can record another log file to check the results of the changes.

It is important that any changes made are applied to the trims that are in the bike at the time the log was recorded; if not, the corrections will be incorrect.

By default the TuneBoyTrim program will open the last trim file that was saved.

8. Once you are happy with the trims on one cylinder you can move the A/F sensor to the second cylinder and record a data log from the second cylinder.

The "Process log" screen allows you to adjust the settings used to process the log file.

## 12.2 Settings

- The "**Stable throttle for number of samples**" tells the software how many records must be read with the throttle between the lower and upper green line in the target screen before A/F records are collected. This is used to make the software ignore any A/F values recorded when the throttle is opening or closing as these values will be richer or leaner than the steady state values. If you adjust this number to a smaller number it will show

more values in the A/F table but the values may show leaner or richer than the actual A/F at steady throttle.

- The **“RPM and throttle zone %”** controls the size of the green square in the target screen. If you make the number smaller you will only get values in the A/F table if the throttle and RPM are closer to the point in the table. Making this number bigger will fill in more of the A/F table but the numbers may be less accurate as they can be further from the actual point in the tables.
- The **“Update in real time”** tick box will make the program show the values as they are processed.

## **13. SERVICE INDICATOR RESET**

To clear the Oil Service indicator you need to go to the “Tools” menu and select “Reset Oil Service Indicator”. This will clear the service indicator light from the dash.

To clear the Desmo Service indicator you need to go to the “Tools” menu and select “Desmo Oil Service Indicator”. This will clear the service indicator light from the dash.

These options only work if you have a TuneBoy map loaded into the ECU. It will not work on a standard Ducati map.

## **14. THROTTLE RESET**

The throttle can be reset in two ways.

The first type of reset is the APS reset. This resets the low point for the Accelerator Position Sensor. The APS is the throttle grip position sensor. To clear the APS low point you need to go to the “Tools” menu and select “Reset Accelerator Position Sensor”.

The second throttle reset function is the TPS Reset. This resets the Throttle Position Sensor on the throttle body. To clear the TPS low point you need to go to the “Tools” menu and select “Reset Throttle Position Sensor”.

Use the APS and TPS reset functions if you have problems with the throttle action or high idle problems.

## **15. CLEAR LEARNED AF TRIMS**

The learned AF values are the long term fuel trims that the ECU has made based on the O2 sensor readings. If you have run the motorcycle with a faulty O2 sensor these values can cause running issues.

Using the “Clear Learned AF Trims” under the “Tools” menu will clear these values back to 0.

The TuneBoy Tuning and CruiseAndTuning maps disable the O2 sensors. This means you should only need to do this once if you have one of our maps loaded.

## 16. CRUISE CONTROL

The Cruise Control feature adds full electronic cruise control to the ECU.

In its most basic form this allows the start button to be used to turn on and set a cruise speed.

- **Cruise control cannot be activated until the motorcycle speed is over 30 kph.**
- **Cruise control cannot be activated if the clutch is pulled in or the brakes applied.**

Once the cruise control is active the ECU will monitor the speed of the motorcycle and adjust the throttle to hold the speed that the motorcycle was doing at the time the cruise control was set.

Cruise control will disengage under the following conditions:

1. If the rider applies the front or rear brake (even minutely),
2. If the clutch is pulled in,
3. If the engine RPM goes past 6500RPM, (7500 for Panigale),
4. If the throttle required to hold the set speed reaches 50% throttle.

### 16.1 Activating Cruise Control

To turn the cruise control on, start the motorcycle then hold the start button pushed-in for **three seconds**. This will turn the feature on and at the same time the throttle will give a small blip to indicate that the cruise control is on.

N.B. The throttle 'blip' (audible indicator) will not be done if the clutch is pulled or brake applied.

You can turn cruise control on while riding by holding the start button for three seconds.

N.B. The throttle 'blip' (audible indicator) will not be done while the bike is moving but the cruise control will still be turned on.

Once the cruise control is turned on you activate the cruise mode by pressing the start button (unless you have nudge buttons fitted). When you press the start button you will notice a slight change in throttle and the motorcycle will drop speed slightly before the ECU takes control. At this point you can roll-off the throttle completely and the bike will maintain speed by itself.

Under most riding conditions the cruise control will maintain speed to within 2-3kph of the set speed.

If you need to overtake a slow vehicle you can apply throttle. This will override the cruise control and allow you to increase speed. Once you back the throttle off the cruise control will take over as soon as the speed drops back to the previously set cruise speed.

If you need to increase the set cruise speed you do not need to disengage; simply accelerate to the new speed and press the start button again.

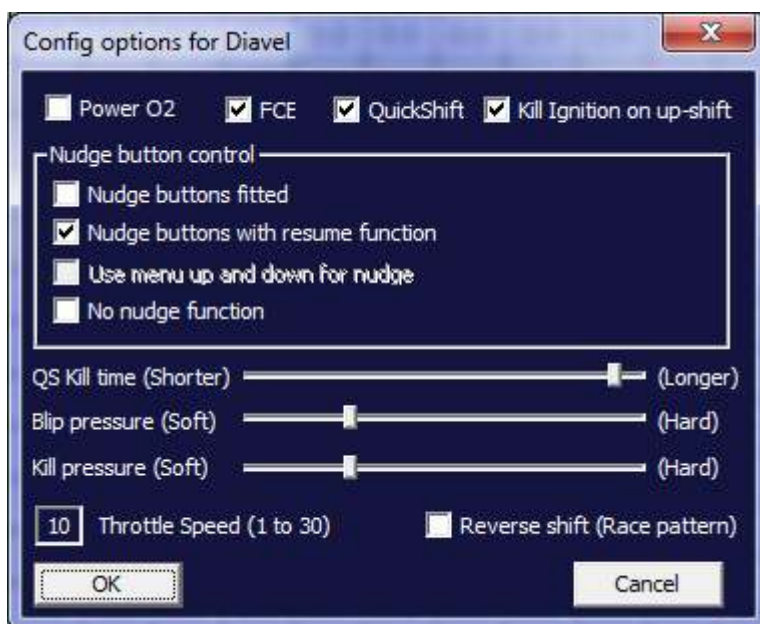
If you need to decrease speed simply touch the brakes then press the start button when the bike slows to the desired speed.

If you have purchased a key for both tuning and cruise control you can fit the optional nudge buttons for the cruise control. These connect to the rear O2 sensor for the Multistrada and Diavel or the front O2 sensor for Panigale.

Note: older versions of the TuneBoy maps used the front O2 plug for the nudge buttons on the Diavel, this has been changed to the rear O2 plug as the QuickShifter now uses the front O2 plug.

The nudge buttons must be enabled. This is done in the TuneBoyTrim program from the Config Options screen. Go to the "Tools" menu and select "Config Options".

The following screen will be displayed:



As long as you do not have a tick in the "Power O2" option the ECU will assume you have an LED connected between pin 3 and 4 on the O2 sensor plug. If you do have the LED fitted the LED will light up when cruise control is active and blink when you accelerate to overtake a car.

The "Nudge buttons fitted" tick box tells the ECU that you have the buttons but do not want the resume function to be enabled.

The "Nudge buttons with resume function" tells the ECU that you have nudge buttons fitted and you want the *nudge down* button to act as a resume button. If you have to brake to slow down you can press the *nudge down* button and the ECU will go back into cruise control and accelerate back to the previously set cruise speed.

The ECU will only accelerate at 3 kph (1.86 mph) per second for safety reasons.

The “Use menu up and down for nudge” is for the Panigale only. This allows the menu up and down buttons to be used to increase and decrease the cruise speed.

The buttons allow the following extra function:

- Cruise speed can be increased by pressing the up button, or decreased by pressing the down button (while cruise control is active).
- If the cruise control is on but not active the *nudge up* button can be used to set the cruise.
- If the resume function has been enabled, the *nudge down* button acts as a resume button. The resume function only works if you have been using cruise control and had to brake or pull the clutch. When the resume button is pushed the cruise will activate and the speed will increase at a rate of 3kph (1.86 mph) per second until the previous cruise speed is reached. If you need to accelerate to a new speed you can accelerate without turning the cruise off and by pressing the *nudge up* button the system will set a new cruise speed.

On the Panigale the menu buttons can be used to increase and decrease speed. These buttons cannot be used to set the cruise speed. They can only be used for adjusting speed. The normal function of these buttons still takes place, this is controlled by the dash and we have no way of disabling this.

If you have the nudge buttons selected the start button is only used to turn cruise on. It no longer acts as a set button.

## 16.2 Heated Grips

If you have the heated grips on a Multistrada 1200 these will function as normal.



**N.B. The cruise function may take over if the bike speed is over 40kph. To prevent the cruise control taking over while adjusting the heated grips we recommend pulling the clutch in while you adjust the heated grip settings.**

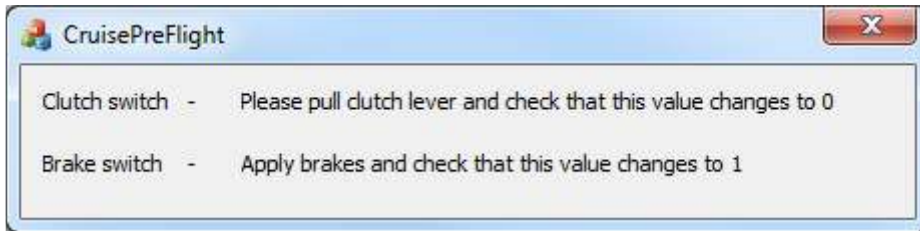
The cruise control will not be activated if the clutch is pulled in.

If you have the nudge buttons fitted the start button is only used to turn the cruise control on, after this the start button acts as it always did.

## 16.3 Cruise Control *PreFlight Check*

Before riding with cruise control you will need to run the CruisePreFlight.exe. This displays the clutch switch flag and brake switch flag. Pull the clutch in and apply front and rear brakes to ensure that these flags change from 1-0 or 0-1 as indicated on the screen. You will see a 1 or 0 displayed on this screen:





## 17. QUICK SHIFTER

The Quick-Shifter option allows you to fit a strain-gauge Quick-Shifter to the MTS1200, Diavel or Panigale.

A strain-gauge quick-shifter outputs a voltage based on the amount of pressure applied to the shift lever. With no pressure the output of the quick-shifter is 2.5 volts. As pressure is applied to the shift lever the output voltage will increase or decrease. As the Quick-Shifter comes under compression the voltage will increase and as the Quick-Shifter comes under tension the output voltage will decrease. The range of pressure sensing is +/- 30kg.

The output of the Quick-Shifter is connected to the O2 sensor input on the motorcycle; this allows the TuneBoy program in the ECU to monitor the shift lever pressure.

When the pressure on the shifter reaches the trigger point (set in the config. options) the ECU will either kill power (for up-shifts) or blip the throttle (for down shifts). This allows the rider to change up through the gearbox without needing to use the clutch or back off the throttle, it also allows the rider to shift down through the gearbox without needing to use the clutch or throttle blip.

### 17.1 What is Auto-Blip?

The Auto-Blip is a feature that has been used on MotoGP bikes for a number of years. It allows the rider to change down through the gearbox without touching the clutch and without having to 'blip' the throttle.

This can only work if the ECU can detect the down shift pressure on the gear lever. This is why a strain-gauge type quick-shifter is required. When the ECU detects that the rider has pushed down on the lever the ECU gives the electronic throttle a small blip. The blip amount and duration will vary based on RPM and gear as the ECU needs to give a big enough throttle blip to unload the gearbox (this means bringing the engine output up to a point where it matches the back torque being applied by the force of the motorcycle slowing down). The normal way that the rider would unload the gearbox is to pull the clutch in. With the auto-blip this is not required as the blip removes the load on the gearbox and allows the gear change with less force than you would require with the clutch pulled in. The auto-blip does not only blip the throttle for the gear change, it also holds the throttle slightly open after the down-shift. This small throttle opening is used to stop the rear wheel locking up due to the down-shift. This allows the engine to come up to speed before the throttle returns to the fully closed point. This after-blip throttle hold can be used to reduce the engine brake effect; this is like the EBC function included in the Panigale.

See the info on the Blip and TPH tables for details on the table values.

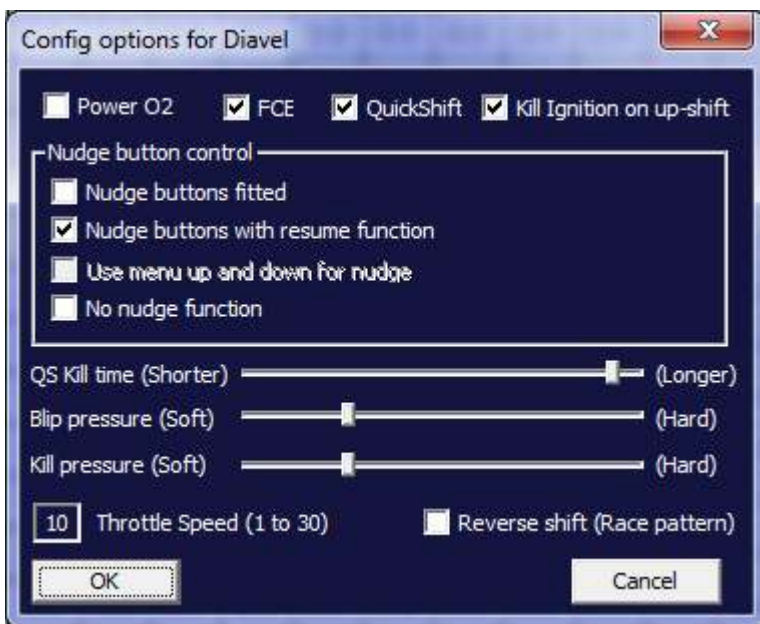
## 17.2 Quick-Shift Option

Before the strain-gauge Quick-Shifter will work you must enable it in the Config Options (under Tools in TuneBoy Trim program). This is done by adding a tick to the Quick-Shift tick box.

N.B. If your motorcycle is a Panigale you should only tick this box if you have the strain-gauge shifter fitted, not the factory shifter.

## 17.3 Blip and Kill Pressure Setting

Setting the pressure for up and down shifting is done in the Config Options screen (see screen shot below):



Moving the Blip Pressure slider to the left will set a lower pressure to trigger the down-shift blip. Moving to the right will set a higher pressure. If you move the slider fully to the left it will disable the down-shift auto blip function.

You should start with a soft pressure for the blip and kill pressures and only increase the pressure if you have problems with the shift action.

The code in the ECU will increase the kill pressure if you are shifting at higher throttle. This increase is 5kg more at full throttle. This allows a light shift action at low throttle while requiring a firmer action at higher engine loads. This helps prevent false neutrals on up-shifts.

The blip pressure is also increased by the program in the ECU but this is done based on RPM. The light pressure point is required for smooth down-shifts at low RPM, but a higher pressure is required for good down-shifts at higher RPM.

These pressure modifiers are a new feature in the V4 TuneBoy maps.

If you have changed your motorcycle to use a race-shift pattern (up for lower gear and down for higher gear) you should put a tick in the "Reverse Shift (Race Pattern)" tick box. This reverses the pressure points inside the ECU.

### **17.4 Adjusting the Quick Shifter Kill Time**

The "QS Kill Time" slider allows you to adjust the kill time used for up-shifts. If the slider is fully to the right, the kill time will use the default time.

As you move the slider to the left the kill time will be reduced.

N.B. If your motorcycle is a Panigale this time adjust can be used to adjust the kill-time for the factory fitted shifter.

### **17.5 Kill Ignition on Up-Shift**

If you have a tick in this option the ECU will kill ignition during the up-shift. This will result in a 'pop' from the exhaust as any unburnt fuel will build up in the exhaust pipe. Having a tick in this option should provide a better up-shift power kill.

This may create a loud pop on up-shifts if you have a very open exhaust. You can use this option at your discretion. The up-shift kill will still work if this option is un-ticked.

This option does nothing on the Panigale; it is only for the Multistrada and Diavel.

## **18. SHIFT-LIGHT**

The TuneBoy V4 maps have support for an external shift-light. This allows you to fit a bright shift-light. These will become available on the TuneBoy website soon.

The shift-light function turns on the O2 heater circuit on the O2 sensor plug used for the Quick-Shifter. The O2 sensor plug has 12v on pin 3 and the O2 heater ground is pin 4. The TuneBoy QuickShifter does not have anything connected to pin 4 on the QuickShifter plug. Connect the + of the Shift light to pin 3 and the - of the shift light to pin 4. The pin numbers are marked on O2 sensor plug.

We will soon provide a program to adjust the turn on points for the shift light.

## 19. MAP SWITCH FUNCTION

The TuneBoy V4 maps can have up to three trim maps that the rider can switch between. For example you could create a trim map for open silencers and one for silencers with DB Killers fitted. The FlashMitsubishi program can load both these trim maps into the ECU.

Once the ECU has been reflashed the rider can select the trim that they want to use by following the steps listed below:

1. Turn the ignition on but don't start the motor,
2. Turn the throttle to the fully open position, the rev counter will show 5000 RPM, 7500 RPM or 10000RPM to indicate which trim map is currently selected,
3. Continue to hold full throttle and pull clutch in then release. The RPM will show 5000, 7500 or 10000 to show which map the ECU has switched to,
4. Repeat this process to switch to the next trim map.

If you have loaded two trim maps the RPM will cycle between 5000 and 7500 to indicate map 1 or map 2.

If you have loaded three trim maps the RPM will cycle between 5000, 7500 and 10000 to indicate map 1, 2 or 3.

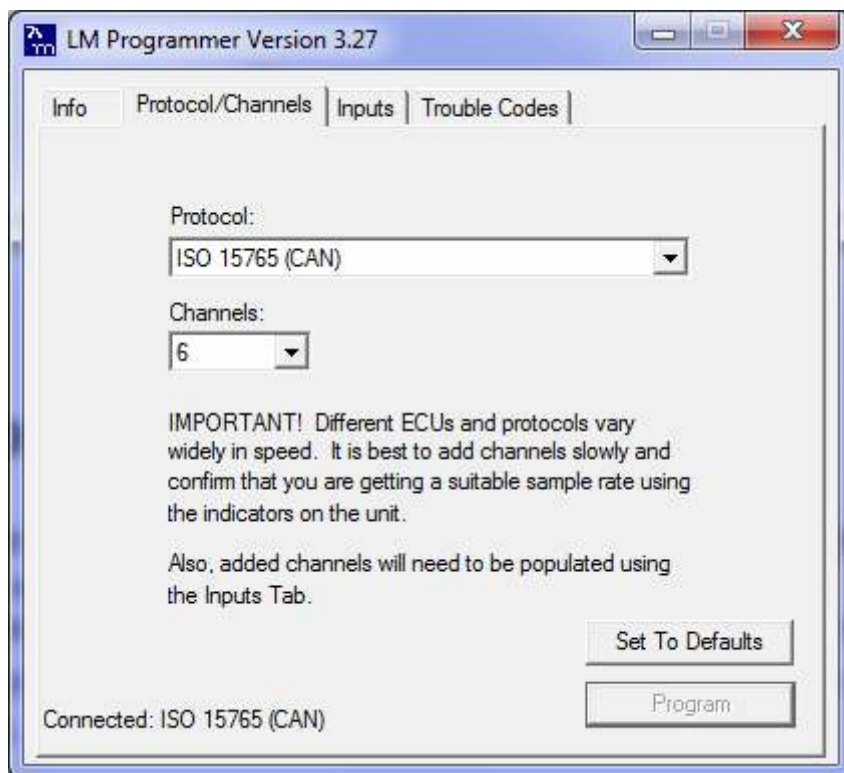
If you have only loaded one trim map the map switch function is disabled.

By loading multiple trim maps you can easily compare two different trim files to work out the one that is best for your motorcycle.

## 20. LOGWORKS MOBILE

The latest TuneBoy maps have code added to allow the Innovate LogWorks Mobile iPhone/iPad app to be used with your motorcycle.

Do a search for "LogWorks Mobile" on the app store and download the free app. Run the LM-Programmer and set the protocol as shown in the following screen shot.



Once this option is set you should be able to run the LogWorks app on the iPhone. The LogWorks app allows you to show info from the ECU and many other useful features.



## 21. LIST OF KEYBOARD COMMANDS

- A** Turns **Auto-Tune** mode on. Target screen must be displayed.
- C** **Corrects** the selected area of the Air Fuel Ratio table. A/F Ratio table must be selected.
- G** Displays A/F **Graph** screen.
- R** Turns **Roll-On-Mode** on or off. Target screen must be displayed.
- T** Shows the **target** screen.
- Z** **Zeroes (clears)** the selected area of the current table. On the A/F table you may need to hit the 'Z' key twice to fully clear the values.
- Ctrl-S** **Saves** the trim map. The date and time are added to the file name automatically. This is a good way to make a save point that is easy to go back to.
- SpaceBar** This will make the green edit square **follow** the current TP and RPM. Hit the SpaceBar again to turn this function off.
- The SpaceBar will also **turn off the auto throttle** function when this is used on the dyno.
- F5** **Drives the throttle to a point in the map.** This is used by clicking on a cell in the map and pressing the F5 key. The throttle will move to the throttle row until the selected RPM is reached.
- Ctrl-F5** **Sets the lowest throttle** to use (for dyno use). This prevents the bike dropping back down to idle when the operator is otherwise occupied.

## APPENDIX A:

### TuneBoy Advance WiFi Kit Components for Mitsubishi or Magneti Marelli (5AM/59M ECU)



N.B. Both Ducati adapters are not included in your kit. Only the adapter you selected for your kit is provided.

Other adapter options are available for Aprilia (Sagem only), KTM (Keihin), Benelli (Sagem only).

## APPENDIX B:

### LC-2 Kit Components

LC-2 Kit with 3 ft Sensor Cable and O<sup>2</sup> Sensor  
P/N 3884

