

AFR Tuner

User Manual

Version 1.18

www.afrtuner.com

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1. AFR Tuner pinout

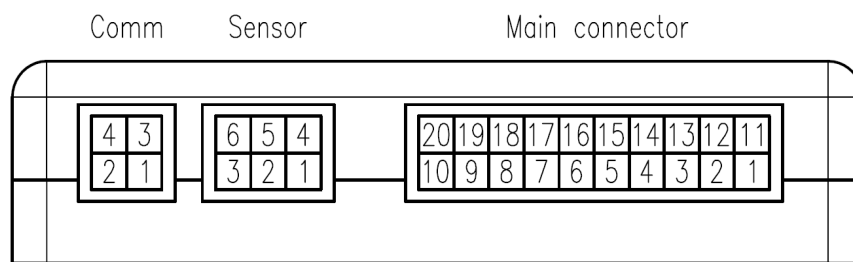


Figure 1: Connectors of the AFR Tuner

1.1. Main connector

No.	Function	No.	Function
1	Injector input #4	11	Injector driver #4
2	Injector input #3	12	Injector driver #3
3	Injector input #2	13	Injector driver #2
4	Injector input #1	14	Injector driver #1
5	External analog input	15	Injector ground
6	Engine coolant temperature sensor input	16	Injector power
7	Throttle position sensor input	17	Gear position sensor input
8	Speed sensor input ⁽¹⁾	18	RPM input
9	Heater ground	19	Digital user input
10	+12 V	20	Ground

Table 1: Pinout of the Main connector

(1): Speed measurement is not supported on AT2.1.

1.2. Sensor connector

No.	Function	No.	Function
1	Reserved	4	Heater+
2	Ip	5	Heater–
3	Vs	6	Vs / Ip

Table 2: Pinout of the Sensor connector

1.3. Comm connector

No.	Function	No.	Function
1	Reserved	3	RS232 GND
2	RS232 RX	4	RS232 TX

Table 3: Pinout of the Comm connector

2. Specifications

Supply voltage ⁽¹⁾ :	10 – 16 V _{DC}
Current consumption ⁽²⁾ :	< 70 mA
Wideband sensor type:	Bosch LSU-4 family and NTK L1H1/L2H2 ⁽³⁾
Air-fuel ratio measurement range	10.3:1 – 20.6:1
Injector impedance:	> 8 Ω
Data logger capacity:	2 or 4 MByte 3h 29m or 6h 59m
Maximum engine revolution:	18360 RPM ⁽⁴⁾
Analog inputs voltage range ⁽⁵⁾ :	0 – 5 V
Analog inputs input impedance ⁽⁵⁾ :	> 100 MΩ
Digital input voltage range ⁽⁶⁾ :	0 or 5 V
Digital input input impedance ⁽⁶⁾ :	1 kΩ pull-up resistor to 5V
Impedance between any ground terminals and vehicle ground ⁽⁷⁾ :	< 0.1 Ω
Weight ⁽⁸⁾ :	~ 250 g

(1): Main-10, Main-16

(2): Main-10, internal consumption only: sensor heater off, engine stopped

(3): Requires sensor specific firmware

(4): Map size limit only

(5): Main-5, Main-6, Main-7 and Main-17 with top speed derestriction feature inactive

(6): Main-19

(7): Main-9, Main-15 and Main-20

(8): Main unit without wiring harness

3. Installation

3.1. Caution

The installation of the AFR Tuner should be done by experienced technicians only.

Always disconnect the battery from the motorcycle before making any modification to the wiring harness. Remove the negative terminal from the battery before starting the installation work.

The quality of the installation work greatly affects the reliability of the AFR Tuner and the motorcycle. Work precisely and very carefully when modifying the wiring harness of the vehicle. Always double check that the wire you are about to cut or tap into is the correct one. The ECM or the AFR Tuner can be destroyed by a faulty installation.

3.2. Installing the AFR Tuner to the wiring harness

3.2.1. Main cable

The AFR Tuner connects to the motorcycle through its *Main connector*. *Figure 2* shows the wiring diagram and the necessary modifications, which needs to be made when installing the unit into the fuel injection system of the motorcycle. Information about the ECM terminal numbers and wire colors for some popular motorcycles can be found in *Chapter 6*.

The best location for installing the AFR Tuner main unit is at the passenger seat area of the motorcycle mounted in the trunk space or on the subframe under the fairing, as this place provides protection from engine heat and the weather. Electrical contact between the metal casing of the AFR Tuner and the rear subframe must be prevented by using insulating material, such as the included self adhesive velcro strips. If necessary use some cable ties to secure the unit in place.

The installation of the AFR Tuner into the wiring harness involves tapping into some wires and cutting others while connecting the two ends to the AFR Tuner. The harness modifications are best done near the ECM, since most of the wires can be found there.

Part of the wiring modifications are related to connecting the AFR Tuner in-line between the ECM and the fuel injectors. In such cases when the motorcycle is equipped with primary and secondary injectors the AFR Tuner has to be installed on the primary injectors, which operate under all engine conditions.

Correct grounding of the AFR Tuner is very important for electrical noise reduction. The above mentioned insulation of the metal case from the motorcycle frame is necessary for the same reason, which is to avoid the forming of a ground loop. An even more important requirement is the correct connection of the three ground wires of the AFR Tuner. As shown on *Figure 2*, these three wires must be led out separately to the ECM and connected together at same point where the ECM ground wire is tapped into. This point should be as close to the ECM terminal as possible.

For best quality of the electrical contacts all connections should be done by soldering and covering the exposed part of the wire with heat shrink tubing. For reliability reasons do not use clip on type wire taps.

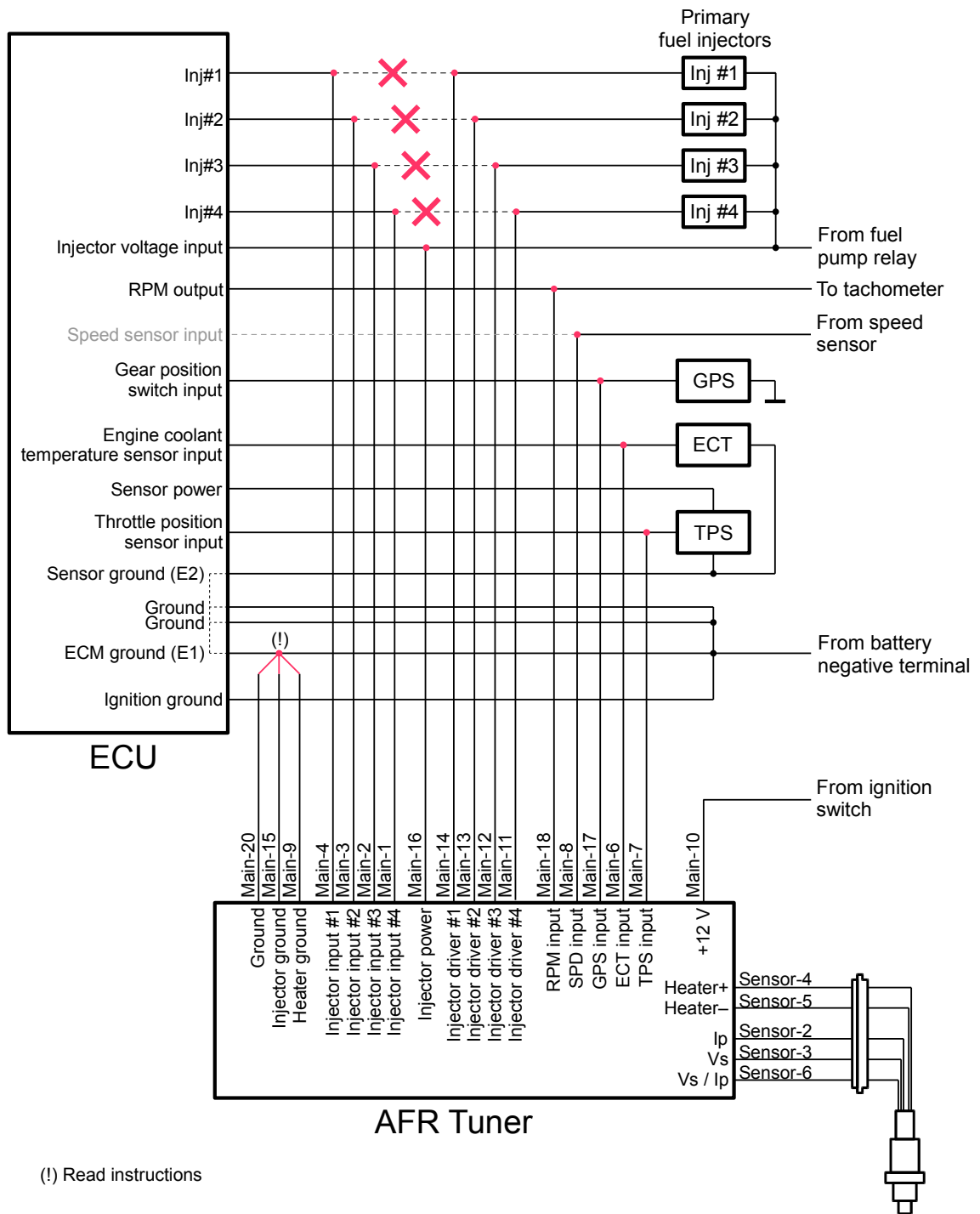


Figure 2: Wiring diagram

For wires tapped into, the use of heat shrink tubing requires that the wire is temporarily removed from the ECM connector for sliding a piece of heat shrink tubing on. All ECM connectors have some kind of locking mechanism that, after unlocking, allows easy removal and reinsertion of these wires. Make sure that after installing the heat shrink tubing the remaining wire end will be long enough to allow the connector terminal to

reach its stop in the ECM connector housing when the wire is reinserted. Remove one wire at a time from the ECM connector and make sure that the terminal is securely reinserted to the same position where it was removed from before continuing with the next wire.

On most motorcycles there is no power feed coming straight from the ignition switch to the ECM, so the power to the AFR Tuner has to be found elsewhere. The nearest place is usually the ignition circuit wire at the fusebox or on models where it is available the optional alarm connector under the rear fairing.

On motorcycle models that do have gear position sensor the connection of the speed sensor input is optional.

On motorcycle models that do not have gear position sensor the speed sensor input has to be connected and the AFR Tuner will calculate the gear position from the speed and RPM values. The gear position input of the AFR Tuner should be left unconnected.

3.2.2. Sensor cable

Route the *Sensor cable* from the *Sensor connector* of the AFR Tuner to the area under the fuel tank. Do not install the sensor to the exhaust system just yet, because it will have to be calibrated in free-air before use.

To avoid damaging the *Sensor cable* or the cable of your wideband lambda sensor always disconnect the sensor from the connector before installing or removing it from the exhaust system. During this operation pay attention that the cable of the wideband lambda sensor should be able to rotate freely as you are screwing the sensor in or out.

If the motorcycle is equipped with some kind of air injection system for the exhaust gases then for the correct operation of the lambda sensor such system must be disabled. See chapter 4.1.1 for details.

On motorcycles that come equipped with lambda sensor(s) from the factory the stock sensor needs to be removed from the wiring harness and measures have to be taken to avoid triggering an ECM fault code related to the removal of the original lambda sensor(s).

3.2.3. Installing the Comm cable

The AFR Tuner uses an RS232 serial interface to connect to a PC. *Figure 3* shows the wiring diagram of the connection.

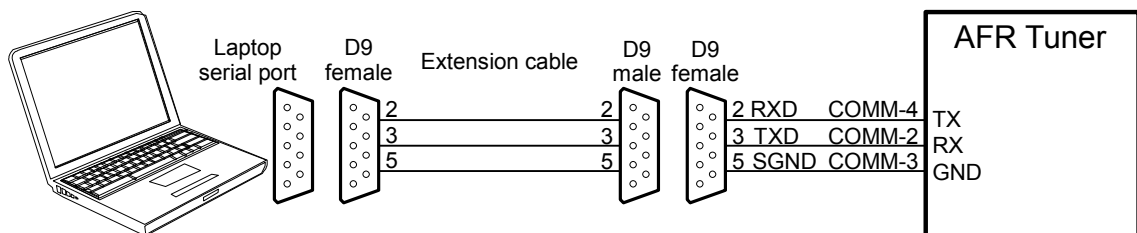


Figure 3: Wiring diagram of the RS232 interface

After the AFR Tuner is mounted to the subframe, connect the *Comm cable* to the AFR Tuner and route the other end to an easily accessible location under the

passenger seat. You will need a serial extension cable to comfortably connect your laptop to the AFR Tuner.

3.3. Verifying the installation

3.3.1. Verifying the electrical connections

Use the procedure below to verify the most important connections needed for starting the AFR Tuner for the first time.

	Procedure	Expected result
1	After the installation has been completed reinstall the battery leads and connect the AFR Tuner bypass connector to the installed <i>Main connector</i> on the wiring harness side. Start the engine.	The engine should run the same way as before the installation firing on all cylinders.
2	Stop the engine and remove the AFR Tuner bypass connector.	-
3	Using a digital multimeter measure the resistance between the negative terminal of the battery and each of the three ground terminals of the <i>Main connector</i> (Main-9, Main-15 and Main-20). <i>Warning: do not force the probe into the connector contacts.</i>	~0.1 Ω
4	Turn the ignition on. Using a digital multimeter measure the voltage on the +12 V (Main-10) power input.	~13-14.5 V
5	Turn the ignition on with the kill switch in the run position. Using a digital multimeter measure the voltage on the <i>Injector power</i> terminal (Main-16). On most motorcycles the voltage is only valid for about 3 seconds after the ignition and kill switch has been turned on, as the ECM deactivates the power feed after this.	~13-14.5 V

3.3.2. Connecting the AFR Tuner to the computer

1. Install the AFR Tuner software package to your laptop computer.
2. With the ignition switch in the off position connect the AFR Tuner to the *Main connector*.
3. Connect an RS232 serial cable to your laptop computer and connect the cable to the *Comm cable*.
4. Start the AFR Tuner Configurator application.
5. Turn the kill switch to the stop position and turn the ignition switch on.
6. Set the serial port in the AFR Tuner Configurator to the port via which the AFR Tuner is connected to the laptop (*File* → *Options* menu, page 20) or use the *File* → *Scan serial ports* menu (page 21) for automatically finding the right port.
7. The connection status in the statusbar of the AFR Tuner Configurator should indicate that the connection is active and the various values on the *Status* page should come alive.

Detailed information about the AFR Tuner Configurator can be found in chapter 4.2.

3.3.3. Verifying the operation of the AFR Tuner

After the connection is established between the PC and the AFR Tuner verify the remaining electrical connections from the AFR Tuner.

The AFR Tuner will need to be calibrated for each motorcycle for best accuracy, however the default calibration values should be sufficient for the following tests.

1. Start the AFR Tuner Configurator application.
2. Turn the kill switch to the run position and turn the ignition switch on. The connection to the AFR Tuner should become active.
3. Using the *Status* page of the configurator twist the throttle a couple of times and verify that the displayed throttle position value is following the change.
4. Switch the gearbox through the gears and verify that the displayed gear value is following the change.

3.3.4. Calibrating the AFR Tuner

You have to calibrate the AFR Tuner for your motorcycle and for your wideband lambda sensor before taking a test ride. Follow the procedures in chapter 4.2.8 to calibrate the following parameters:

- throttle position sensor values at 0% and 100% settings
- gear position sensor values in each gear
- free-air coefficient of your wideband sensor

3.3.5. Configuring the AFR Tuner

The AFR Tuner is shipped preconfigured with the most common user settings and default maps, however these settings may not suit your motorcycle or your needs. Please study the various user settings in the following chapter and consider adjusting them.

4. Using the AFR Tuner

4.1. Main features

The Motty AFR Tuner is an all in one package tuning system for providing all the necessary features for automatically custom mapping a typical fuel injected motorcycle engine.

The motorcycle engine can have up to four cylinders, has to be equipped with high impedance injectors, and the design of the exhaust system should at some point route the exhaust gases from all cylinders into one collector pipe where a lambda sensor can be installed.

These requirements are met by all current Japanese inline motorcycles with either the factory or an aftermarket exhaust system with lambda sensor bung.

The AFR Tuner is a powerful tuning tool which is aimed at the motorcycle enthusiasts with good understanding of the operation principles of internal combustion engines.

The individual systems of the Motty AFR Tuner are described in the following chapters.

4.1.1. Wideband lambda sensor controller

The AFR Tuner incorporates a wideband lambda sensor controller consisting of two digital control loops. One control loop is responsible for maintaining the optimal internal temperature in the wideband lambda sensor based on measuring the impedance of the sensing cell. The other controller is handling the pump cell current control which is the basis for the air-fuel ratio measurement.

The hardware implementation of the wideband lambda controller allows the use of both the Bosch LSU-4 family sensors and the NTK L1H1/L2H2 sensors with the AFR Tuner. Due to differences in the control algorithms the two sensor families require different firmware variants in the AFR Tuner.

Wideband lambda sensors have relatively large sensor to sensor variations, which makes it necessary to calibrate the air-fuel ratio measurement for new sensors before taking them into use. The calibration is done by placing the sensor in free-air and activating the sensor control from the AFR Tuner Configurator tool. Then after waiting a few minutes of settling time the actual free-air calibration is done by the press of a button from the configurator tool (see page 30 for the detailed procedure). It is recommended to repeat the free-air calibration of the sensor after a few hours of initial use and at least yearly after that.

The user can select between two options on how the heating of the wideband sensor is started. It can be controlled by the state of the engine, in which case the sensor controller starts the heating of the sensor when the engine is started and the heating stops when the engine is stopped. Alternatively the sensor heating can be configured to start when a user defined delay expires after startup. There is also a user setting to disable the sensor controller.

Important: Almost all current motorcycles are equipped with some kind of air supply system which introduces fresh air into the exhaust gases to reduce hydrocarbon emission. (Honda's Pulse Secondary Air Injection, Kawasaki's Clean Air System, Suzuki's Pulsed Air Injection, Yamaha's Air Induction System) As the operating

principle of the lambda sensors is based on sensing the remaining oxygen in the exhaust gases, such systems falsify the oxygen sensor reading and they must be disabled. This can be achieved for example by blocking the air supply hose of the system with a tight fitting plug near the air filter housing. Any possible air leaks along the exhaust system have similar effect and they should also be eliminated.

Important: *The wideband lambda sensors are heated oxygen sensors. For best accuracy their internal temperature has to be maintained near the optimum operating temperature, which is about 750 °C. If the sensor is too close to the exhaust valves then at full engine load it may be overheated even with the electrical heating turned off. If the sensor is too far then the cooling effect of the large volume of cooled exhaust gases may overcome the limited power of the integrated heater and over-cool the sensor. Usually the sensor should be placed about 1 meter distance from the exhaust valves along the length of the exhaust system.*

Important: *The air-fuel ratio measurement in the AFR Tuner is in fact based on λ measurement which is scaled to air-fuel ratio for regular pump gasoline for the benefit of the majority of users. The formula is: $AFR = 14.7 \cdot \lambda : 1$. If you are using other type of fuel (for example oxygenated race fuel) then the scaled AFR value may not be a correct representation of the real air-fuel ratio of the fuel. In this case it is recommended to think in lambda and simply use the same formula to convert to and from the format of the AFR Tuner. As a reference keep in mind that for any type of fuel the stoichiometric air-fuel ratio is always $\lambda = 1$, which will always be 14.7 : 1 in the AFR Tuner.*

Warning: *Do not leave the lambda sensor in the exhaust system if the sensor controller is disabled or the sensor is not connected to the AFR Tuner, because without heating the sensor element will not reach the temperatures needed for self cleaning.*

Warning: *By using leaded fuel the lifetime of the lambda sensor is seriously reduced. The normal lifetime of a wideband sensor is approximately 160,000 km or 10 years. Depending on the lead concentration level of the fuel the lifetime of the sensor can be reduced down to 1/10 of the unleaded value.*

4.1.2. Fuel injector control

The AFR Tuner is capable of adjusting the duration of the electrical pulses sent by the ECM to control the fuel injectors, which allows the AFR Tuner to control the quantity of fuel in the intake charge entering the cylinders.

The amount of the fuel injection adjustment is primarily based on the 1022 cell injector map covering all possible engine operating conditions on the RPM-TP domain. The firmware uses interpolation to calculate map values falling between grid lines. There are two independent injector maps available in the AFR Tuner which can be switched over instantaneously from the AFR Tuner Configurator.

There are user settings for selecting the initial map after power up, and it is also possible to disable the injector pulse width adjustment in which case the injector pulses from the ECM are passed to the injectors without alteration.

4.1.3. Self mapping

The most important feature of the AFR Tuner is the capability to combine the wideband air-fuel ratio measurement with the fuel injector control and merge the two into a closed

loop, self mapping fuel injection system. The biggest advantage of the automatic mapping is that the fueling can always be optimal even if new modifications are made to the motorcycle or slow changes take place like air filter clogging or engine wear.

The injector self mapping relies on the user defined target AFR values which are stored in the AFR map. The AFR map is the same size as the injector map and there are also two of them to accompany each of the injector maps.

During riding the motorcycle the AFR Tuner is constantly monitoring the measured air-fuel ratio and comparing it to the target value looked up from the target AFR map. Based on the error the AFR Tuner calculates the necessary injector map adjustments to drive the actual air-fuel ratio to the target value. If the operating conditions of the motorcycle were stable enough to make these calculations valid then a temporary version of the injector map is updated with the results and from then on the fuel injector controller uses the new map values.

The injector map, and in effect the fuel injection mapping of the engine, gets better and better the more the motorcycle is ridden. The injector map is updated only in those areas where the engine is operated, but there is no need to ride the motorcycle any other way than normally. The mapping will be the most accurate in those areas where the engine spends the most time and it can take a longer time for the map to settle where it operates rarely. In map cells where the engine spends a brief time only, for example in case of a full throttle acceleration the engine goes through RPM cells very quickly, it takes several acceleration cycles for the map cell values to stabilize.

At the end of the ride, depending on how the motorcycle is switched off, the modified temporary injector map can be stored in the permanent injector map location. If the motorcycle is switched off at the ignition switch then the temporary injector map is discarded. If the engine is stopped with the ignition switch staying in the on position (i.e. by the kill switch) then if the engine remains stopped for 5 seconds then the updated injector map is saved as the new permanent injector map. The actual saving of the map takes less than one second, but to ensure that the updated data is not lost, it is better to keep a safety margin before the ignition switch is turned off. There is a user setting which can be used to disable map saving. After the map saving is completed the AFR Tuner makes a complete restart.

For best accuracy self mapping is disabled if the engine coolant temperature is not in the normal operating temperature range. The range can be defined by the user. After startup the self mapping can be further delayed by a user defined time. A counter is measuring the time the engine has been running since the ignition has been switched on and the self mapping is disabled until the self mapping delay time is reached. If the engine stops during the self mapping delay without turning the ignition switch off then the delay time will continue after an engine restart. If the engine is stopped after the delay has expired then after restart the self mapping will be delayed by 10 seconds. The self mapping is also delayed until the wideband lambda sensor reaches its operating temperature.

4.1.4. Data logging

The AFR Tuner is also equipped with an integrated data logger. It is recommended that by downloading and analyzing the logged data the user is regularly monitoring the operation of the AFR Tuner and the fuel injection mapping.

The data logger is recording engine revolution, engine coolant temperature, throttle position, gear position, vehicle speed, air-fuel ratio, target air-fuel ratio and the external 0-5 V analog user input. The sampling period is 0.064 seconds, which is equal to 15.625 samples per second. Depending on the AFR Tuner hardware version the data logger memory is either 2 or 4 MByte, which can hold more than 3:29 or 6:59 hours of data.

The data logger can be controlled from the AFR Tuner Configurator. It is possible to check the memory usage status, to start and stop the recording and to download or erase the memory content. The downloaded data logger file (.atlog) can be viewed by the AFR Tuner Log Viewer application.

The data logger has a user setting which controls whether the data recording shall start automatically at startup.

At startup the data logger scans the logger memory content to find the still available space. This may take a few seconds during which the starting of the new data recording session is postponed. When the logger memory becomes full the recording is stopped and no further logging will take place until the memory is erased.

4.1.5. Top speed derestriction for Suzuki motorcycles

The ECM of the Suzuki GSX-R1000 and GSX1300R Hayabusa motorcycles has a built in top speed limiter. When the ECM is registering that a certain revolution limit has been exceeded in 6th gear then the speed limiter is activated, which prevents the engine from revving higher.

The AFR Tuner can circumvent this top speed limiter by sending 5th gear position information to the ECM when a user defined RPM limit is exceeded in 6th gear. This limit should be set a few hundred RPM below the actual top speed RPM limit of the ECM.

If the motorcycle is equipped with gear position display then it will display 5th gear during the time the top speed derestriction is activated. The AFR Tuner data logger will correctly record the 6th gear position.

4.1.6. “Control gestures”

The "control gestures" feature provides the possibility to activate selected controls of the AFR Tuner without a computer connection.

After the ignition switch is turned on the “control gestures” is active only until the engine is cranked over for the first time.

The desired controls are selected by shifting the gearbox into the corresponding gear and the controls are activated by opening the throttle fully for at least 1 second. The kill switch has to be in the run position and for controls which require putting the gearbox into gear the sidestand has to be up.

The following controls are supported:

- N:** start data logger recording
- 1:** select the other injector and AFR map pair
- 2:** erase data logger memory
- 3:** disable self mapping

It is recommended to get familiar with the usage of the "control gestures" first by having the AFR Tuner Configurator connected to the AFR Tuner and using the visual feedback from the *Status page*.

Unlike settings, the controls only stay in effect in the current start up cycle of the AFR Tuner. If the AFR Tuner is restarted for any reason all statuses revert to their default state and they need to be reactivated if necessary.

In order to protect the data logger memory content the data logger recording has priority over the logger memory erasing. The logger memory can only be erased when the data logger has not been started yet.

On motorcycle models not equipped with a gear position sensor only the *start data logger* control is available.

4.1.7. Configurable digital input

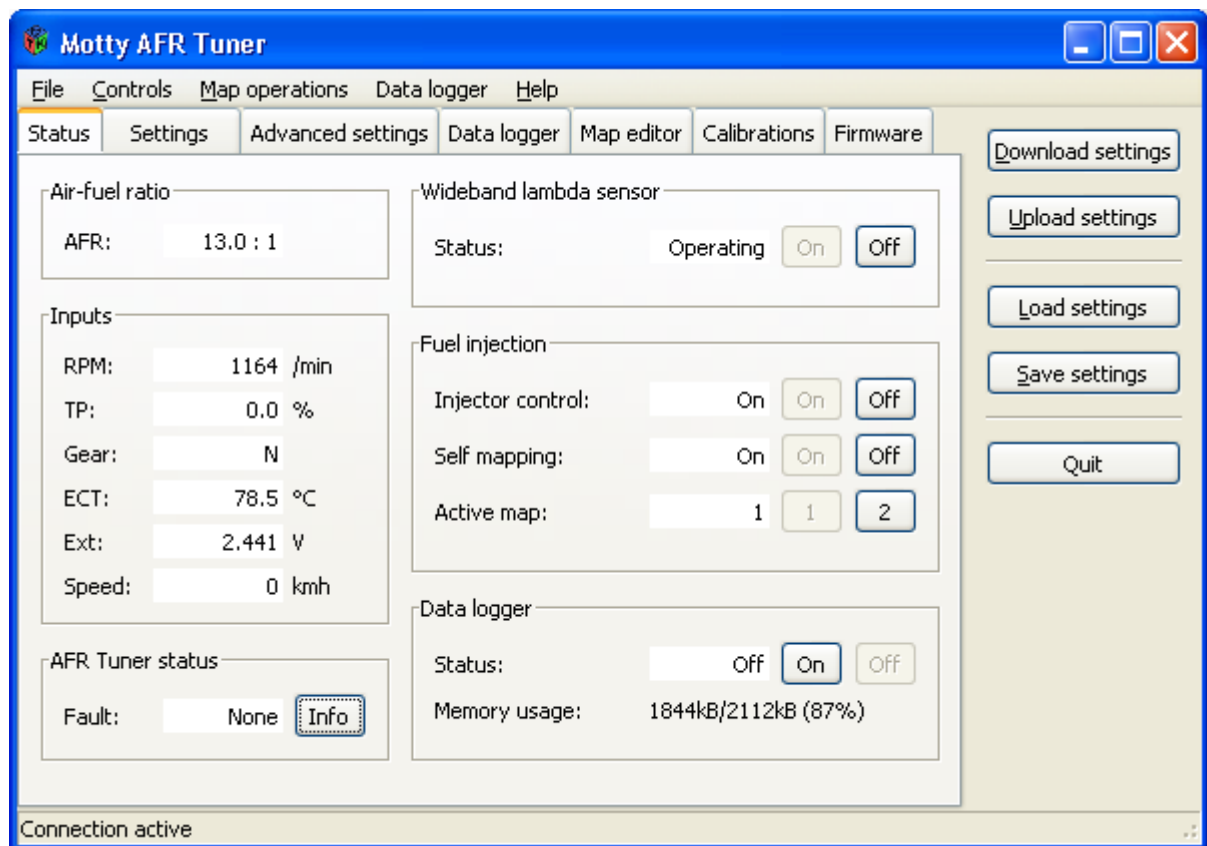
It is possible to connect a switch or an external device with a digital output (for example lap timer) to the AFR Tuner *Main-19* digital input pin. The data logger records the state of the digital input and the user can assign one of the following functionalities to the input:

- **None:** The digital input state is not used to control any of the functionalities of the AFR Tuner. Only the data logger will store the state of the digital input pin according to the configured input polarity. This mode can be used for lap timing with a push button or an infrared beacon.
- **Data logger control:** The data logger recording is controlled by the digital input. A switch can be installed between the *Main-19* pin and ground with the pin polarity set to *active low*. The data logger will start recording when the switch is turned on and will stop when the switch is turned off. When this mode is selected then the *Start data logger automatically after power on* setting and the *start data logger recording* control gesture is ignored.
- **Self mapping control:** The fuel injection self mapping can be controlled by the digital input. A switch can be installed between the *Main-19* pin and ground with the pin polarity set to *active low*. The self mapping will start operating when the switch is turned on and will stop when the switch is turned off. The self mapping will continue using all self mapping related settings except the *Enable self mapping* setting and the *disable self mapping* control gesture.
- **Fuel enrichment:** This mode is for dry NOS systems. When the digital input is activated then the AFR Tuner will increase the fuel injector on-time by the configured duration (or by as much as the injector duty cycle allows). The self mapping is suspended during the fuel enrichment period.
- **Map switch:** The active injector and target AFR map pair is selected by the digital input. When this mode is selected then the *Default map* setting and the map toggling control gesture is ignored. The map switching takes place the same way as the *Map operations* → *Select injector and AFR map* menu, that is any modifications made by self mapping to the temporary injector map are lost.

4.2. AFR Tuner Configurator

The Motty AFR Tuner Configurator is a software application for MS Windows and Linux to provide the graphical user interface for interacting with the AFR Tuner. It handles the following main tasks:

- displaying the current status of the AFR Tuner and the motorcycle
- controlling the current state of the AFR Tuner
- editing the user settings
- editing the maps
- uploading/downloading the settings to/from the AFR Tuner
- saving/loading the settings to/from a file on the PC
- downloading the data logger data and saving it to file on the PC
- calibrating the AFR Tuner for the wideband lambda sensor and the motorcycle
- displaying faults detected by the AFR Tuner
- updating the firmware in the AFR Tuner



The tasks above are accessible through the main menu, the configuration transfer buttons on the right side and the several tabbed pages.

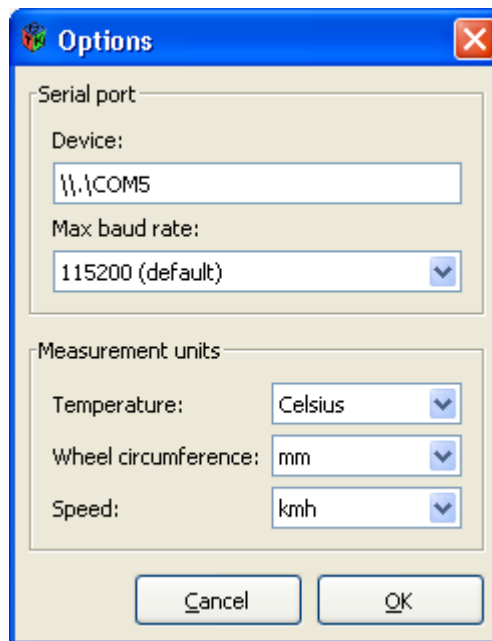
There are a few rules to remember when working with the AFR Tuner.

- Controls that are available through the main menu and the *Status* and *Data logger* pages are for controlling the current state of the AFR Tuner. They are temporary and are not preserved over an AFR Tuner restart.
- Modifications made to the AFR Tuner settings (user settings, maps, calibrations) stay in the configuration data memory of the AFR Tuner Configurator until they are explicitly sent to the AFR Tuner by pressing the *Upload settings* button.
- The AFR Tuner Configurator starts with default values preset to its configuration data memory. Always download the current settings from the AFR Tuner by pressing the *Download settings* button before editing the configuration, otherwise you may risk unintentionally overwriting settings or maps. The configurator will issue a warning if you attempt to upload a configuration which was not based on a downloaded configuration.
- The AFR Tuner helps the user to understand the dependency of controls and settings by deactivating the options that would take no effect in the current situation due to the state of other controls or settings. For example activating the self mapping is not possible if the wideband lambda sensor controller or the fuel injector control is disabled.

4.2.1. Main menu

File → Options

The dialog window activated by this menu collects the settings of the AFR Tuner Configurator application itself.



The *serial port device* defines the serial communication port through which the AFR Tuner is connected to the PC. Before connection can be established to the

AFR Tuner it is necessary to set the serial communication port by entering the device name of the serial port here or using the *File* → *Scan serial ports* menu to automatically find the used serial port.

If the AFR Tuner is connected to the PC via a USB-serial adapter, then it may be possible to increase the transfer rate of the data logger memory downloads by doubling or quadrupling the used baud rate between the PC and the AFR Tuner. Whether this will work depends on the particular AFR Tuner and the USB adapter. The increased baud rate value is defined by the *max baud rate* setting and its highest possible value can be determined by trial and error method.

In the bottom half of the dialog window the user preferred *measurement units* can be selected from the listed options.

File → Scan serial ports

Automatically scans all serial communication ports of the PC for the presence of the AFR Tuner. Before starting the scan the AFR Tuner must be powered on and connected to a serial port.

File → Quit

Exits from the AFR Tuner Configurator. All ongoing operations are terminated and all modified configurations are lost.

Controls → Lambda sensor control

Enables or disables the wideband lambda sensor controller. This is the same control as the *On* and *Off* buttons in the wideband lambda sensor section of the *Status* page.

Controls → Injector pulse control

Enables or disables the fuel injector pulse width adjustment feature. This is the same control as the *On* and *Off* buttons in the injector control section of the *Status* page.

Controls → Self mapping

Enables or disables the automatic self mapping feature. This is the same control as the *On* and *Off* buttons in the self mapping section of the *Status* page.

Map operations → Select injector and AFR map 1 (2)

Instantaneously switches to the first (second) injector and AFR maps. Any modifications made by self mapping to the temporary injector map are lost. This is the same control as the *1* and *2* buttons in the active map section of the *Status* page.

Map operations → Select AFR map 1 (2)

Instantaneously takes the first (second) target AFR map into use. The temporary injector map is preserved during the map switch.

Map operations → Store injector map

Saves the temporary injector map as the new active permanent injector map and restarts the AFR Tuner. If the control is activated with a running engine, then the engine may stall. If there is any other running tasks in progress (for example downloading the logger memory) then the menu is ignored.

Map operations → Reset injector map

Fills all cells of the temporary injector map with zeros.

Data logger → Start (stop) logging

Start (stops) the data logger recording. This is the same control as the corresponding buttons on the *Data logger* page or in the data logger section of the *Status* page.

Data logger → Download log

Starts downloading the content of the data logger memory. When the download process is completed a dialog window pops up asking for the filename where the logged data will be saved on the PC.

Data logger → Erase log memory

Starts the data logger memory erasing process. The progress of the operation can be followed from the displayed data logger status. The control is ignored if the downloading of the data logger is in progress.

Help → About

Displays the version number of the AFR Tuner Configurator application.

4.2.2. Configuration transfer buttons

Download settings

Starts the downloading of the user settings, calibrations and maps from the AFR Tuner. At the end of the download process a dialog window notifies the user about the outcome.

Upload settings

Starts the uploading of the modified user settings, calibrations and/or maps to the AFR Tuner. Before the actual upload process starts a list of the modified items is displayed, which needs to be confirmed. At the end of the upload process the AFR Tuner is restarted and a dialog window notifies the user about the outcome. A running engine will stall during the upload.

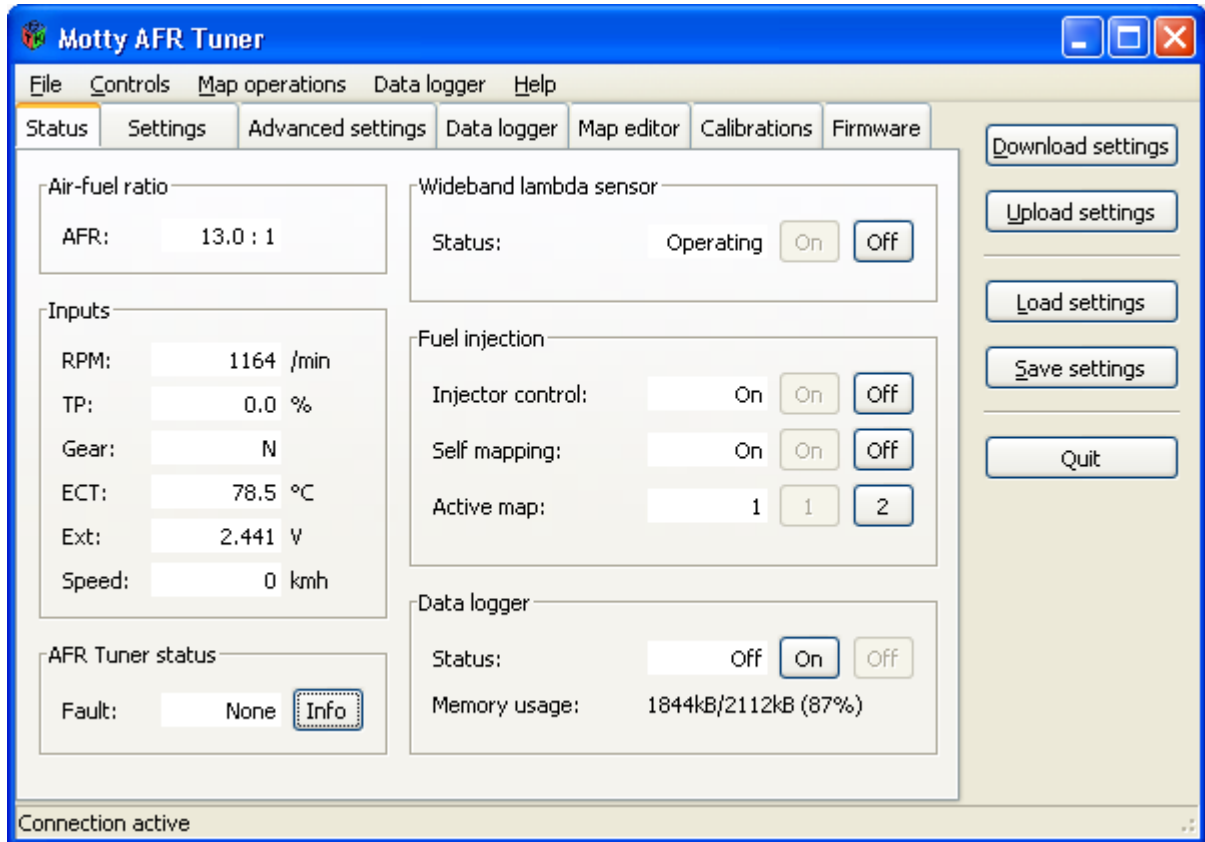
Load settings

Loads an AFR Tuner configuration file from the file system of the PC to the configuration memory of the AFR Tuner Configurator.

Save settings

Saves the data from the configuration memory of the AFR Tuner Configurator to the file system of the PC.

4.2.3. Status page



This page gives an overview of the current status of the AFR Tuner. The current values of the most important monitored parameters are displayed on the left side. On the right the current states of the AFR Tuner features are shown with control buttons for toggling them. In the lower left corner there is a fault code field where the AFR Tuner can indicate if a malfunction has been detected.

Air-fuel ratio

Displays the air-fuel ratio of the intake charge as measured by the wideband lambda sensor placed in the exhaust gas. Possible values are:

- The measured air-fuel ratio.
- *N/A*: no air-fuel ratio measurement result is available. The wideband lambda controller is not operating or the internal sensor temperature is out of operating temperature range.
- *Rich*: the air-fuel ratio is richer than the air-fuel ratio measurement range.
- *Lean*: the air-fuel ratio is leaner than the air-fuel ratio measurement range.
- *FreeAir*: the oxygen concentration of the measured gas is about the same as at the free-air calibration.

Fault

This field may display a fault code for a malfunction which has been detected by the AFR Tuner. The detected faults are stored in the non-volatile memory of the AFR Tuner until they are manually cleared. Faults detected in the current startup cycle are also shown separately. Pressing the *Info* button displays a dialog window with the active faults listed as human understandable text. The dialog also allows the clearing of the fault codes. Possible faults are:

- Injector driver overcurrent for each of the four injectors
- Sensor heater overcurrent
- Map CRC error

Troubleshooting instructions for the faults can be found in chapter 5.

Wideband lambda sensor status

Displays the current state of the wideband lambda sensor controller. Possible values are:

- *Off*: the sensor controller is disabled.
- *Waiting*: the sensor controller is enabled, but it is waiting for either the engine to start or the sensor startup delay to expire.
- *Warming*: the controller has started heating the sensor, but the operating temperature has not been reached yet.
- *Operating*: the wideband lambda sensor is at operating temperature and the air-fuel ratio measurement is enabled.

By using the *On* and *Off* buttons it is possible to immediately force the sensor controller to the started or stopped state. By doing so, the engine state or delay dependent automatic startup of the sensor controller is disabled and the sensor is under the manual control of the user until the next restart of the AFR Tuner.

Injector control

Displays the current state of the fuel injector controller. Possible values are *On* and *Off*. By using the *On* and *Off* buttons the injector controller state can be changed instantaneously.

Self mapping

Displays the state of the fuel injector self mapping. Possible values are:

- *Off*: the self mapping is disabled.
- *Waiting*: the self mapping is enabled, but it is waiting for the self mapping delay to expire.
- *On*: the self mapping is active.

Active map

Displays the currently active injector and AFR map pair. The maps can be switched instantaneously by the 1 and 2 buttons which are the same as the *Map operations* → *Select injector and AFR map 1 (2)* menus. Any modifications made by self mapping to the temporary injector map are lost.

Data logger status

Displays the status of the data logger. Possible values are:

- *Off*: the data logger is ready for operation, but it is inactivate.
- *On*: the data logger is recording.
- *Busy*: the data logger is busy with an internal operation. It is either scanning its memory for free space after startup or it is erasing the memory.
- *Full*: the data logger memory is full. Recording is no longer possible until the user erases the memory from the *Data logger* → *Erase log memory* menu.

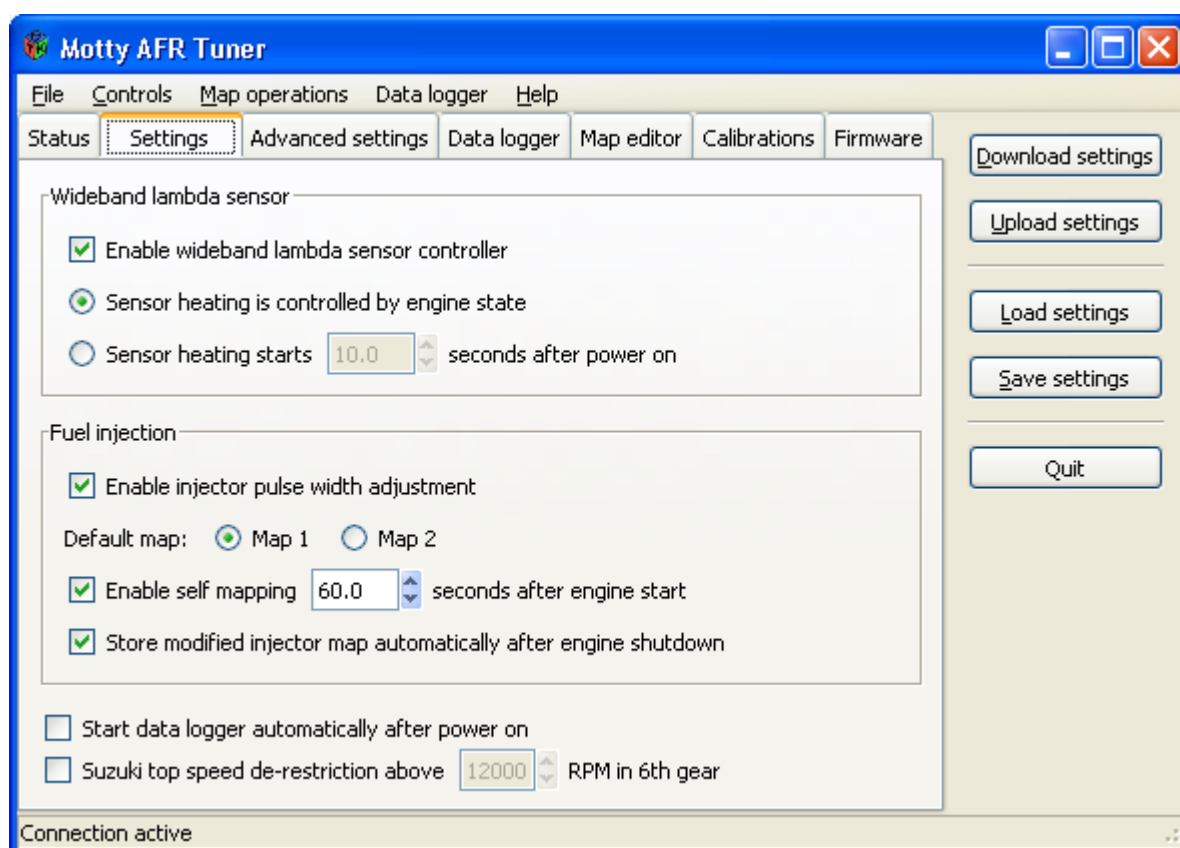
The same information is also available on the *Data logger* page.

The data logger can be easily started and stopped by pressing the *On* and *Off* buttons.

Data logger memory usage

Displays the memory usage statistics of the data logger. The same information is also available on the *Data logger* page.

4.2.4. Settings page



This page collects the basic user settings of the AFR Tuner. The interface and the setting options are self explanatory. Information about the meaning of the settings can be found in chapter 4.1.

4.2.5. Advanced settings page

Motty AFR Tuner

File Controls Map operations Data logger Help

Status Settings **Advanced settings** Data logger Map editor Calibrations Firmware

Map RPM grid: 200 (RPM range: 0 - 14399)

Speed scaling factor: 0.71146 Calculate

Engine coolant temperature

Self mapping low limit: 75.0 °C

Self mapping high limit: 85.0 °C

Self mapping throttle ranges

	N	1	2	3	4	5	6
TPS low limit:	0	0	0	0	0	2	4
TPS high limit:	2	0	0	28	100	100	100

Set defaults

Digital user input setup

Polarity: ☒ active low ☐ active high

Assigned functionality: None 0.00 ms

Download settings

Upload settings

Load settings

Save settings

Quit

Connection active

Map RPM grid:

This setting determines the resolution of the AFR and injector maps in the RPM scale. The setting should never be changed unless the AFR Tuner is moved to another motorcycle with different engine revolution range. Changing the setting resizes all maps which most likely renders the content of the edited AFR maps and the injector maps invalid. It also changes the top speed derestriction RPM limit.

Speed scaling factor

This setting defines the conversion ratio between the speed sensor frequency and the vehicle speed. The scaling factor can be calculated by using the dialog window that opens by pressing the *Calculate* button. The number of pulses per gearbox output shaft revolution and the teeth counts for the stock secondary reduction ratio can be looked up from the *Gear ratio database*.

Engine coolant temperature self mapping low/high limit

The self mapping functionality is only enabled when the engine coolant temperature is in the normal operating temperature range. The low and high limits of this range can be defined here.

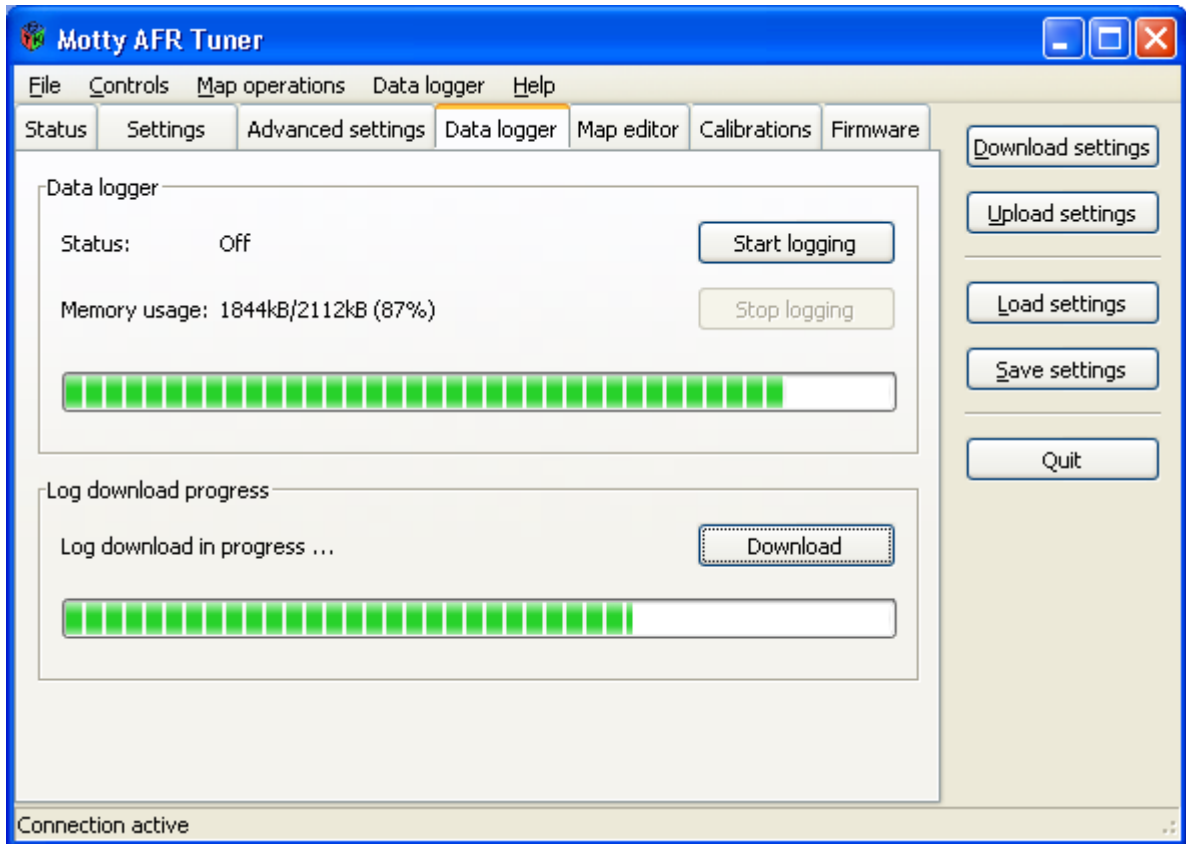
Self mapping throttle ranges

It is possible to restrict the operation of the self mapping to certain throttle position ranges for each gears. Ideally the mapping should take place in the higher gears to account for the ram air effect, but in some applications (e.g. racing) allowing the self mapping in the lower gears can also be desirable. The self mapping can be totally disabled for a gear by setting both the low and high TPS limits to zero.

Digital user input setup

Some functionalities in the AFR Tuner can be controlled by the *Main-19* digital input as described in chapter 4.1.7. The polarity of the digital input and the assigned functionality can be set up here.

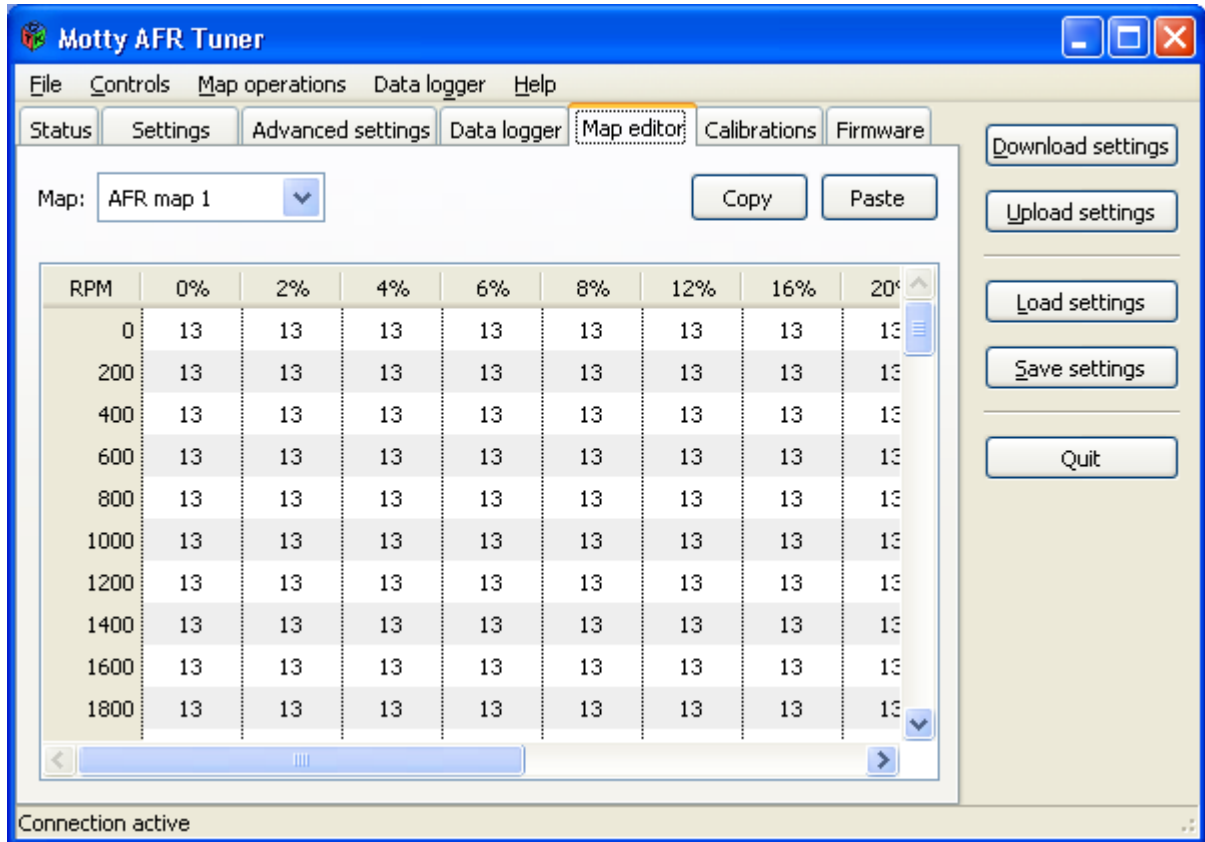
4.2.6. Data logger page



The top half of the page gives the same status and memory usage information of the data logger as the *Status* page and there are also buttons available for starting and stopping the data recording.

The progress of a started data logger memory download operation can be followed from the bottom half of the page. The downloading of the logger memory can either be started by pressing the *Download* button on this page or by selecting the *Data logger* → *Download log* menu. Depending on the amount of data in the logger memory the process can take a few minutes. After the data has been downloaded into the AFR Tuner Configurator a dialog window pops up asking for the filename where the logged data will be saved on the PC. After successful saving the user is asked if the logger memory should be erased or not.

4.2.7. Map editor page



The map editor page can be used to view or edit the AFR Tuner maps. The map shown in the editor can be selected at the top of the page.

For serious map editing it is recommended to use a spread sheet application such as Microsoft Excel. The transfer of the whole map is done via the clipboard by using the *Copy* and *Paste* buttons.

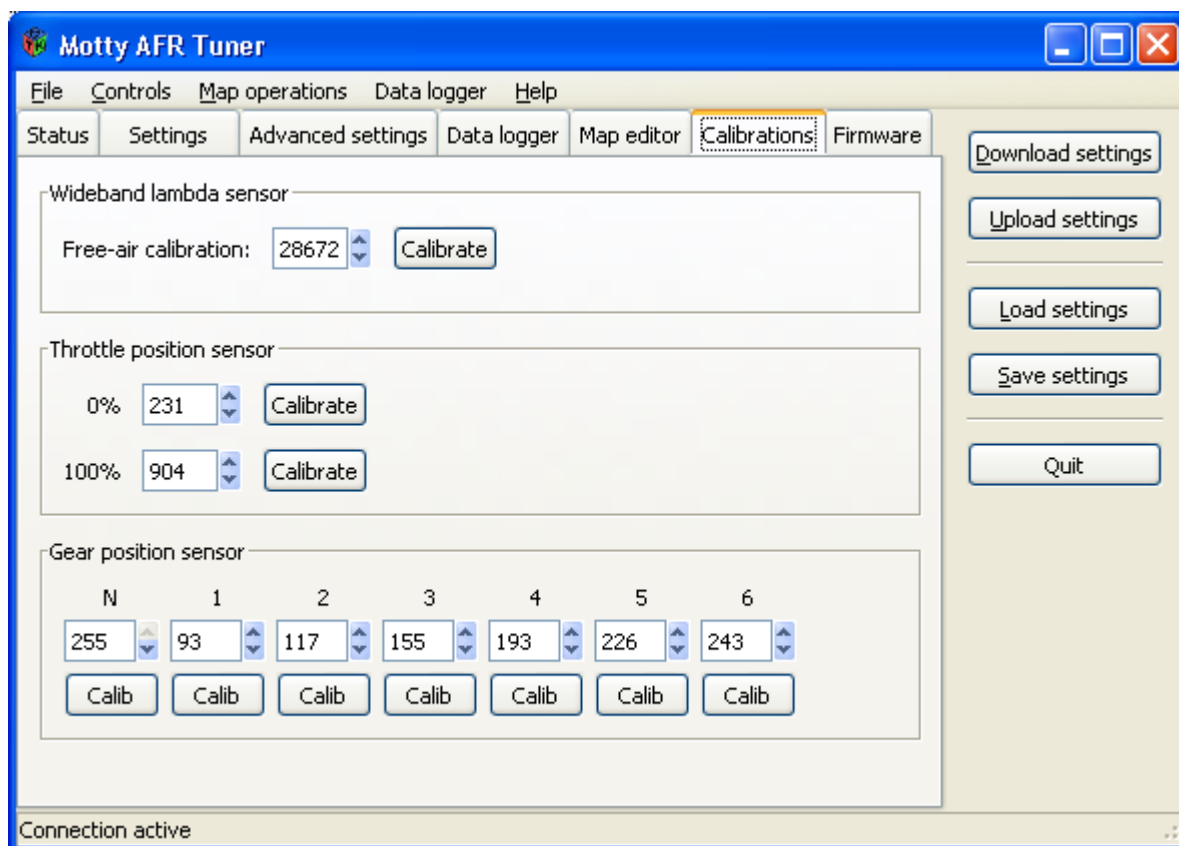
Normally the user only needs to edit the AFR maps and the injector maps will be updated by the automatic self mapping. Even this is not necessary because the default AFR maps preloaded in the AFR Tuner give maximum power and good throttle response on most motorcycles. However by the careful leaning of the AFR map in the cruising area there is room for improving the fuel economy of the motorcycle.

The map editor cells are organized in a matrix with the throttle position values on the horizontal axis and RPM values on the vertical. The visible area of the current map is controlled by the two scrollbars.

An AFR map value falling into the air-fuel ratio measurement range is treated as the target air-fuel ratio for automatic self mapping in the given map position. A zero value in an AFR map cell is an indication that the corresponding injector map position is not to be modified by the self mapping.

The values in the injector maps are proportional to the amount of the fuel adjustment in the given map position. A positive numbers represents fuel addition, a negative number fuel removal, and a zero means no adjustment.

4.2.8. Calibrations page



Calibrating the AFR Tuner for the motorcycle is essential for the accurate operation of the unit and it must be done before the first test ride. It is recommended to repeat the free-air calibration of the sensor after a few hours of initial use and at least yearly after that.

Wideband lambda sensor calibration

Warning: The lambda sensor will get very hot during the calibration procedure. Take care not to touch the sensor until it has cooled down.

1. Remove the lambda sensor from the exhaust system, and let it hang freely from its cable. Take care that the body of the sensor is not touching anything. To avoid damaging the sensor cable during installation or removal always disconnect the sensor cable from the connector and ensure that it can rotate freely while screwing it in or out of the exhaust system.
2. Turn the kill switch to the off position and turn the ignition switch on.
3. Make connection from the AFR Tuner Configurator to the AFR Tuner and download the current configuration by pressing the *Download settings* button.
4. Switch to the *Status* page.
5. Start the wideband lambda sensor controller by clicking the *On* button in the *Wideband lambda sensor* section.

6. The *Wideband lambda sensor state* shall first turn to *Warming* and in about half minute to *Operating*.
7. Wait a couple of minutes to allow the temperature of the lambda sensor body to stabilize.
8. Switch to the *Calibrations* page and press the button for free-air calibration. Make sure that the displayed free-air coefficient has been updated.
9. Write the new calibration to the AFR Tuner by pressing the *Upload settings* button.
10. Switch back to the *Status* page.
11. Start the wideband lambda controller again (step 5) and verify that the air-fuel ratio is indicated as *FreeAir* soon after the sensor is in *Operating* state.
12. Reinstall the lambda sensor to the exhaust system.

Throttle position sensor calibration

1. Warm up the engine to the normal operating temperature. This is necessary to avoid erroneous calibration of the 0% throttle position due to the fast idle mode activated by the ECM.
2. Set the idle speed of the engine to the factory specified value (for example GSX-R1000: 1150 RPM). Do this even if you plan on using higher idle speed. Follow the service manual of your motorcycle for detailed instructions. Use the AFR Tuner for accurate engine speed measurement.
3. Check the TPS adjustment and if necessary reset its position. Follow the service manual for instructions.
4. Make connection from the AFR Tuner Configurator to the AFR Tuner and download the current configuration by pressing the *Download settings* button
5. With the engine idling at the specified speed press the *Calibrate* button for the 0% throttle position.
6. Shut down the engine by the kill switch.
7. Set the kill switch back to the run position, but do not start the engine.
8. Hold the throttle in the fully open position and press the *Calibrate* button for the 100% throttle position.
9. Write the new calibrations to the AFR Tuner by pressing the *Upload settings* button.
10. Verify the throttle position sensor readings from the *Status* page. Check the 100% position with the engine off and the 0% value with the engine idling. You can also verify and manually fine tune the TPS calibration by analyzing the throttle position values from the data logger after a test ride.

Gear position sensor calibration

Calibrating the gear position is only possible when the AFR Tuner is used on a motorcycle that is equipped with a gear position sensor, and the AFR Tuner is running

a firmware variant that supports the gear position sensor.

1. Make connection from the AFR Tuner Configurator to the AFR Tuner and download the current configuration by pressing the *Download settings* button
2. Turn the ignition switch on and the kill switch to the run position. On most motorcycle models it is not necessary to start the engine, but on some models it is. In this case get someone to help operating the laptop and do the procedure with the engine running and the clutch lever pulled in.
3. Repeat steps 4 and 5 starting in neutral and continuing in gears 1st to 6th.
4. Switch the gearbox into the desired gear.
5. Press the *"Calib"* button for the corresponding gear position.
6. Write the new calibrations to the AFR Tuner by pressing the *Upload settings* button.
7. Verify the gear position readings on the *Status* page by switching through the gears.

On motorcycle models that do not have gear position sensor the AFR Tuner firmware is calculating the current gear from the speed and engine revolution values. In this case the calibration data stores the internal gear ratio parameters of the engine and the gearbox. These values must be entered exactly for the motorcycle model from the *Gear ratio database*.

4.2.9. Firmware page

This page displays the serial number of the AFR Tuner hardware and the version and variant of the firmware currently running in the unit. The AFR Tuner firmware can be updated from this page too.

4.3. AFR Tuner Log Viewer

The Motty AFR Tuner Log Viewer is the software application for displaying the downloaded AFR Tuner data logger (.atlog) files.



The window is divided into two sections with the main display area on the left and the display controls on the right.

The display area on the left shows the plots of those logger channels which are selected for displaying by the channel controls.

The display controls on the right consist of channel and time scale controls. The checkboxes for the individual channels are used to select which of the logger channels are plotted in the display area. The scale and grid in the display area is determined by the currently highlighted channel.

Clicking a channel with the right mouse button in the channel controls area brings up a pop-up menu. In this pop-up menu the *Channel setup* can be used to modify the vertical placement, the value range, the smoothing factor and the plotting color of the selected channel. The *Show all channels* and *Hide all channels* menus can be used to quickly enable or disable the plotting of all data logger channels.

When the mouse is moving inside the display area then the current time position of the mouse cursor and the corresponding individual channel values are continuously updated in the controls area.

5. Troubleshooting

5.1. Fault codes

5.1.1. Injector driver overcurrent

This fault is supported separately for each of the four fuel injector driver circuits and the fault text specifies which injector has triggered the fault. The fault is triggered when an abnormally high current is detected while actuating an injector.

Probable causes are:

- short circuit between the AFR Tuner injector driver output and the injector power source
- using an injector type which does not comply with the injector impedance specification

5.1.2. Sensor heater overcurrent

The fault is triggered when an abnormally high current is detected in the wideband lambda sensor heater circuit.

Probable causes are:

- Short circuit between the two lambda sensor heater wires
- Short circuit between ground or battery voltage and one of the heater wires

5.1.3. Map CRC error

The fault is triggered when the AFR Tuner detects an unrecoverable map corruption in any of the maps. In this state the fuel injection control and the self mapping features are disabled. To recover from the fault condition:

1. download the current configuration from the AFR Tuner
2. fix the corruption by either
 - a) analyzing the content of all maps and correcting them if necessary
 - b) loading a previously saved AFR Tuner setting file
3. upload the new configuration
4. clear the fault code

6. Motorcycle specific wiring information

6.1. Suzuki

6.1.1. GSX-R 1000

AFR Tuner terminal	Suzuki GSX-R1000		
	K1-K4 2001-2004	K5-K6 2005-2006	K7-K9 2007-2009
Injector input #1 (Main-4)	ECM-4 Grey/White	ECM-48 Grey/White	ECM-46 Grey/White
Injector input #2 (Main-3)	ECM-5 Grey/Black	ECM-47 Grey/Black	ECM-45 Grey/Black
Injector input #3 (Main-2)	ECM-6 Grey/Yellow	ECM-46 Grey/Yellow	ECM-44 Grey/Yellow
Injector input #4 (Main-1)	ECM-7 Grey/Red	ECM-45 Grey/Red	ECM-43 Grey/Red
Injector driver #1 (Main-14)	Inj #1 (ECM-4) Grey/White	Inj #1 (ECM-48) Grey/White	Inj #1 (ECM-46) Grey/White
Injector driver #2 (Main-13)	Inj #2 (ECM-5) Grey/Black	Inj #2 (ECM-47) Grey/Black	Inj #2 (ECM-45) Grey/Black
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Grey/Yellow	Inj #3 (ECM-46) Grey/Yellow	Inj #3 (ECM-44) Grey/Yellow
Injector driver #4 (Main-11)	Inj #4 (ECM-7) Grey/Red	Inj #4 (ECM-45) Grey/Red	Inj #4 (ECM-43) Grey/Red
Injector power (Main-16)	ECM-42 Yellow/Red	ECM-33 Yellow/Red	ECM-24 Yellow/Red
ECT input (Main-6)	ECM-51 Black/Blue	ECM-10 Black/Blue	ECM-32 Black/Blue
TPS input (Main-7)	ECM-49 Pink/Black	ECM-8 Pink/Black	ECM-6 Pink/Black
GPS input (Main-17)	ECM-57 Pink	ECM-23 Pink	ECM-22 Pink
RPM input (Main-18)	ECM-55 Yellow/Blue	ECM-37 Yellow/Blue	ECM-11 Yellow/Blue
Speed sensor (Main-8)	Speed sensor Pink	Speed sensor Pink	ECM-2 Pink
+12 V (Main-10)	K1-K2: rear brake light switch Orange/ Green K3-K4: ignition circuit at fusebox Orange/Yellow	Ignition circuit at the fusebox Orange/Yellow	Ignition circuit at the fusebox Orange/Yellow
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-35 Black/White	ECM-34 Black/White	ECM-36 Black/White

6.1.2. GSX-R 600 and GSX-R 750

AFR Tuner terminal	Suzuki GSX-R600 and GSX-R750		
	GSXR750 Y0-K3 2000-2003	K4-K5 2004-2005	K6-K7 2006-2007
Injector input #1 (Main-4)	ECM-4 Grey/White	ECM-44 Grey/White	ECM-48 Grey/White
Injector input #2 (Main-3)	ECM-5 Grey/Black	ECM-43 Grey/Black	ECM-47 Grey/Black
Injector input #3 (Main-2)	ECM-6 Grey/Yellow	ECM-42 Grey/Yellow	ECM-46 Grey/Yellow
Injector input #4 (Main-1)	ECM-7 Grey/Red	ECM-41 Grey/Red	ECM-45 Grey/Red
Injector driver #1 (Main-14)	Inj #1 (ECM-4) Grey/White	Inj #1 (ECM-44) Grey/White	Inj #1 (ECM-48) Grey/White
Injector driver #2 (Main-13)	Inj #2 (ECM-5) Grey/Black	Inj #2 (ECM-43) Grey/Black	Inj #2 (ECM-47) Grey/Black
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Grey/Yellow	Inj #3 (ECM-42) Grey/Yellow	Inj #3 (ECM-46) Grey/Yellow
Injector driver #4 (Main-11)	Inj #4 (ECM-7) Grey/Red	Inj #4 (ECM-41) Grey/Red	Inj #4 (ECM-45) Grey/Red
Injector power (Main-16)	ECM-42 Yellow/Red	ECM-33 Yellow/Red	ECM-33 Yellow/Red
ECT input (Main-6)	ECM-51 Black/Blue	ECM-10 Black/Blue	ECM-10 Black/Blue
TPS input (Main-7)	ECM-49 Pink/Black	ECM-8 Pink/Black	ECM-8 Pink/Black
GPS input (Main-17)	ECM-57 Pink	ECM-23 Pink	ECM-23 Pink
RPM input (Main-18)	ECM-55 Yellow/Blue	ECM-37 Yellow/Blue	ECM-38 Yellow/Blue
Speed sensor (Main-8)	Speed sensor Pink	Speed sensor Pink	Speed sensor Pink
+12 V (Main-10)	Rear brake light switch Orange/Green	Ignition circuit at the fusebox Orange/Yellow	Ignition circuit at the fusebox Orange/Yellow
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-35 Black/White	ECM-34 Black/White	ECM-34 Black/White

AFR Tuner terminal	Suzuki GSX-R600 and GSX-R750		
	K8-K9 2008-2009		
Injector input #1 (Main-4)	ECM-46 Grey/White		
Injector input #2 (Main-3)	ECM-45 Grey/Black		
Injector input #3 (Main-2)	ECM-44 Grey/Yellow		
Injector input #4 (Main-1)	ECM-43 Grey/Red		
Injector driver #1 (Main-14)	Inj #1 (ECM-46) Grey/White		
Injector driver #2 (Main-13)	Inj #2 (ECM-45) Grey/Black		
Injector driver #3 (Main-12)	Inj #3 (ECM-44) Grey/Yellow		
Injector driver #4 (Main-11)	Inj #4 (ECM-43) Grey/Red		
Injector power (Main-16)	ECM-24 Yellow/Red		
ECT input (Main-6)	ECM-32 Black/Blue		
TPS input (Main-7)	ECM-6 Pink/Black		
GPS input (Main-17)	ECM-22 Pink		
RPM input (Main-18)	ECM-11 Yellow/Blue		
Speed sensor (Main-8)	ECM-2 Pink		
+12 V (Main-10)	Ignition circuit at the fusebox Orange/Yellow		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-36 Black/White		

6.1.3. GSX1300R Hayabusa

AFR Tuner terminal	Suzuki GSX1300R		
	-K7 1999-2007	K8-K9 2008-2009	
Injector input #1 (Main-4)	ECM-4 Grey/White	ECM-48 Grey/White	
Injector input #2 (Main-3)	ECM-5 Grey/Black	ECM-47 Grey/Black	
Injector input #3 (Main-2)	ECM-6 Grey/Yellow	ECM-46 Grey/Yellow	
Injector input #4 (Main-1)	ECM-7 Grey/Red	ECM-45 Grey/Red	
Injector driver #1 (Main-14)	Inj #1 (ECM-4) Grey/White	Inj #1 (ECM-48) Grey/White	
Injector driver #2 (Main-13)	Inj #2 (ECM-5) Grey/Black	Inj #2 (ECM-47) Grey/Black	
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Grey/Yellow	Inj #3 (ECM-46) Grey/Yellow	
Injector driver #4 (Main-11)	Inj #4 (ECM-7) Grey/Red	Inj #4 (ECM-45) Grey/Red	
Injector power (Main-16)	ECM-42 Yellow/Red	ECM-33 Yellow/Red	
ECT input (Main-6)	ECM-51 Black/Blue	ECM-10 Black/Blue	
TPS input (Main-7)	ECM-49 Pink/Black	ECM-8 Pink/Black	
GPS input (Main-17)	ECM-57 Pink	ECM-23 Pink	
RPM input (Main-18)	ECM-55 Yellow/Blue	ECM-38 Yellow/Blue	
Speed sensor (Main-8)	Speed sensor Pink	Speed sensor Pink	
+12 V (Main-10)	Rear brake light switch Orange/Green	Rear brake light switch Orange/Green	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-35 Black/White	ECM-34 Black/White	

6.1.4. GSX1300BK B-King

AFR Tuner terminal	Suzuki GSX1300BK		
	K8-K9 2008-2009		
Injector input #1 (Main-4)	ECM-48 Grey/White		
Injector input #2 (Main-3)	ECM-47 Grey/Black		
Injector input #3 (Main-2)	ECM-46 Grey/Yellow		
Injector input #4 (Main-1)	ECM-45 Grey/Red		
Injector driver #1 (Main-14)	Inj #1 (ECM-48) Grey/White		
Injector driver #2 (Main-13)	Inj #2 (ECM-47) Grey/Black		
Injector driver #3 (Main-12)	Inj #3 (ECM-46) Grey/Yellow		
Injector driver #4 (Main-11)	Inj #4 (ECM-45) Grey/Red		
Injector power (Main-16)	ECM-33 Yellow/Red		
ECT input (Main-6)	ECM-10 Black/Blue		
TPS input (Main-7)	ECM-8 Pink/Black		
GPS input (Main-17)	ECM-23 Pink		
RPM input (Main-18)	ECM-38 Yellow/Blue		
Speed sensor (Main-8)	Speed sensor Pink		
+12 V (Main-10)	Rear brake light switch Orange/Green		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-34 Black/White		

6.1.5. GSX1400

AFR Tuner terminal	Suzuki GSX1400		
	K1-K4 2001-2004	K5-K7 2005-2007	
Injector input #1 (Main-4)	ECM-5 Grey/White	ECM18-7 Grey/White	
Injector input #2 (Main-3)	ECM-6 Grey/Black	ECM18-6 Grey/Black	
Injector input #3 (Main-2)	ECM-7 Grey/Yellow	ECM18-16 Grey/Yellow	
Injector input #4 (Main-1)	ECM-8 Grey/Red	ECM18-15 Grey/Red	
Injector driver #1 (Main-14)	Inj #1 (ECM-5) Grey/White	Inj #1 (ECM18-7) Grey/White	
Injector driver #2 (Main-13)	Inj #2 (ECM-6) Grey/Black	Inj #2 (ECM18-6) Grey/Black	
Injector driver #3 (Main-12)	Inj #3 (ECM-7) Grey/Yellow	Inj #3 (ECM18-16) Grey/Yellow	
Injector driver #4 (Main-11)	Inj #4 (ECM-8) Grey/Red	Inj #4 (ECM18-15) Grey/Red	
Injector power (Main-16)	ECM-28 Yellow/Red	ECM34-10 Yellow/Red	
ECT input (Main-6)	ECM-36 Black/Blue	ECM34-19 Black/Blue	
TPS input (Main-7)	ECM-19 Pink/Black	ECM34-21 Pink/Black	
GPS input (Main-17)	ECM-31 Pink	ECM34-1 Pink	
RPM input (Main-18)	ECM-4 Brown/Black	ECM18-4 Brown/Black	
Speed sensor (Main-8)	Speed sensor Pink	Speed sensor Pink/Black	
+12 V (Main-10)	Ignition circuit at fusebox Orange/Yellow	Ignition circuit at fusebox Orange/Yellow	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-13 Black/White	ECM34-13 Black/White	

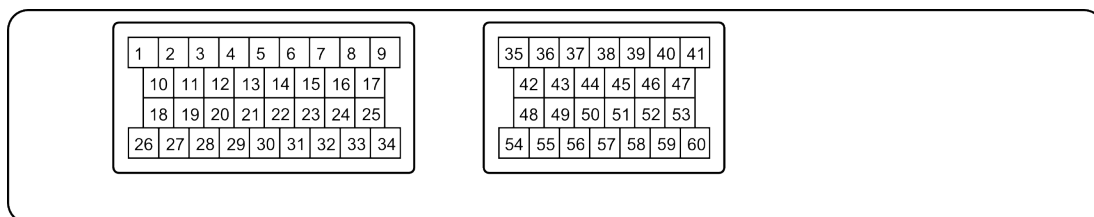
6.1.6. SV1000

AFR Tuner terminal	Suzuki SV1000		
	K3-K7 2003-2007		
Injector input #1 (Main-4)	ECM-5 Grey/White		
Injector input #2 (Main-3)	ECM-6 Grey/Black		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-5) Grey/White		
Injector driver #2 (Main-13)	Inj #2 (ECM-6) Grey/Black		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-28 Yellow/Red		
ECT input (Main-6)	ECM-36 Black/Blue		
TPS input (Main-7)	ECM-19 Pink/White		
GPS input (Main-17)	ECM-31 Pink		
RPM input (Main-18)	ECM-4 Brown/Black		
Speed sensor (Main-8)	Speed sensor Pink/White		
+12 V (Main-10)	Ignition circuit at fusebox Orange/Yellow		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-13 Black/White		

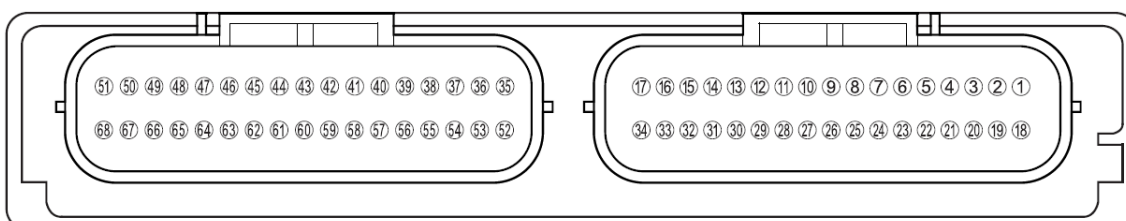
6.1.7. VZR1800 / M109R

AFR Tuner terminal	Suzuki VZR1800 / Suzuki M109R		
	K6-K8 2006-2008		
Injector input #1 (Main-4)	ECM-48 Grey/White		
Injector input #2 (Main-3)	ECM-47 Grey/Black		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-48) Grey/White		
Injector driver #2 (Main-13)	Inj #2 (ECM-47) Grey/Black		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-33 Yellow/Red		
ECT input (Main-6)	ECM-10 Black/Blue		
TPS input (Main-7)	ECM-8 Pink/Black		
GPS input (Main-17)	ECM-23 Pink		
RPM input (Main-18)	ECM-64 Black/Green		
Speed sensor (Main-8)	Speed sensor Pink		
+12 V (Main-10)	Ignition circuit at the fusebox Orange/Yellow		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-34 Black/White		

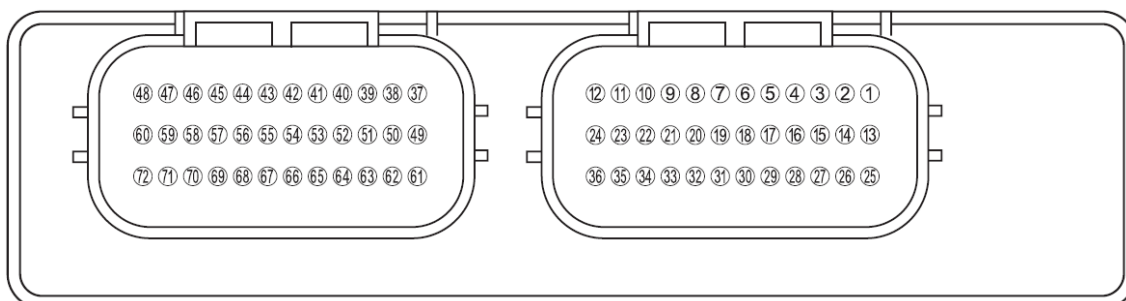
6.1.8. ECM terminal numbering



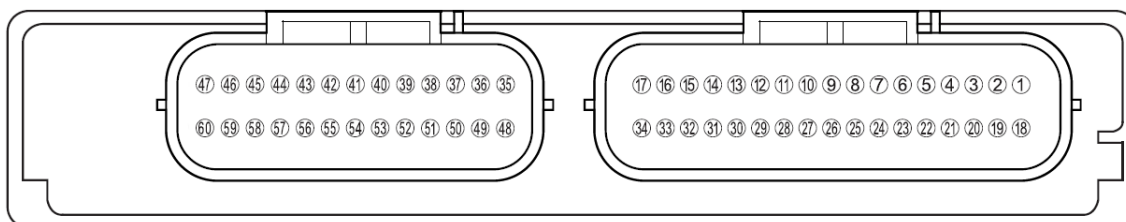
ECM terminals of the GSX-R1000 K1-K4, 2000-2003 GSX-R750, 2001-2003 GSX-R600 and 1999-2007 GSX1300R



ECM terminals of the GSX-R1000 K5-K6, GSX-R600/750 K6-K7, GSX1300R K8-K9, GSX1300BK K8-K9 and VZR1800 / M109R



ECM terminals of the GSX-R1000 K7-K9 and GSX-R600/750 K8-K9



ECM terminals of the GSX-R600/750 K4-K5

6.2. Honda

6.2.1. CBR 1000RR

AFR Tuner terminal	Honda CBR1000RR		
	2004-2005	2006-2007	2008-2009
Injector input #1 (Main-4)	ECM-A11 Pink/Yellow	ECM-A17 Yellow	ECM-A17 Pink/Yellow
Injector input #2 (Main-3)	ECM-A12 Pink/Blue	ECM-A6 Yellow/Blue	ECM-A6 Pink/Blue
Injector input #3 (Main-2)	ECM-A13 Red/White	ECM-A8 Yellow/Green	ECM-A8 Pink/Green
Injector input #4 (Main-1)	ECM-A14 Yellow/Red	ECM-A7 Yellow/Black	ECM-A7 Pink/Black
Injector driver #1 (Main-14)	Inj #1 (ECM-A11) Pink/Yellow	Inj #1 (ECM-A17) Yellow	Inj #1 (ECM-A17) Pink/Yellow
Injector driver #2 (Main-13)	Inj #2 (ECM-A12) Pink/Blue	Inj #2 (ECM-A6) Yellow/Blue	Inj #2 (ECM-A6) Pink/Blue
Injector driver #3 (Main-12)	Inj #3 (ECM-A13) Red/White	Inj #3 (ECM-A8) Yellow/Green	Inj #3 (ECM-A8) Pink/Green
Injector driver #4 (Main-11)	Inj #4 (ECM-A14) Yellow/Red	Inj #4 (ECM-A7) Yellow/Black	Inj #4 (ECM-A7) Pink/Black
Injector power (Main-16)	ECM-B16 Black/White	ECM-A5 Black/White	ECM-A5 Black/White
ECT input (Main-6)	ECM-B27 Blue/Yellow	ECM-B13 Blue/Yellow	ECM-B13 Blue/Yellow
TPS input (Main-7)	ECM-B30 Red/Yellow	ECM-B31 Red/Yellow	ECM-B31 Blue/Yellow
GPS input (Main-17)	NC	NC	NC
RPM input (Main-18)	ECM-B7 Yellow/Green	ECM-B17 Yellow/Green	ECM-B17 Yellow/Green
Speed sensor (Main-8)	ECM-B25 Pink	ECM-B28 Pink	ECM-B28 Pink/Green
+12 V (Main-10)	Ignition circuit at the fusebox White/Black	Ignition circuit at the fusebox White/Black	Ignition circuit at the fusebox White/Yellow
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-A32 Green	ECM-B4 Green	ECM-B4 Green

Note: ECM-A: Black, ECM-B: Grey

6.2.2. CBR 600RR

AFR Tuner terminal	Honda CBR600RR		
	2003-2004	2005-2006	2007-2008
Injector input #1 (Main-4)	ECM-A11 Pink/Yellow	ECM-A11 Pink/Yellow	ECM-A17 Pink/Yellow
Injector input #2 (Main-3)	ECM-A12 Pink/Blue	ECM-A12 Pink/Blue	ECM-A6 Pink/Blue
Injector input #3 (Main-2)	ECM-A13 Pink/Green	ECM-A13 Pink/Green	ECM-A8 Pink/Green
Injector input #4 (Main-1)	ECM-A14 Pink/Black	ECM-A14 Pink/Black	ECM-A7 Pink/Black
Injector driver #1 (Main-14)	Inj #1 (ECM-A11) Pink/Yellow	Inj #1 (ECM-A11) Pink/Yellow	Inj #1 (ECM-A17) Pink/Yellow
Injector driver #2 (Main-13)	Inj #2 (ECM-A12) Pink/Blue	Inj #2 (ECM-A12) Pink/Blue	Inj #2 (ECM-A6) Pink/Blue
Injector driver #3 (Main-12)	Inj #3 (ECM-A13) Pink/Green	Inj #3 (ECM-A13) Pink/Green	Inj #3 (ECM-A8) Pink/Green
Injector driver #4 (Main-11)	Inj #4 (ECM-A14) Pink/Black	Inj #4 (ECM-A14) Pink/Black	Inj #4 (ECM-A7) Pink/Black
Injector power (Main-16)	ECM-B16 Black/White	ECM-B16 Black/White	ECM-A5 Black/White
ECT input (Main-6)	ECM-B27 Pink/White	ECM-B27 Pink/White	ECM-B13 Blue/Yellow
TPS input (Main-7)	ECM-B14 Red/Yellow	ECM-B30 Red/Yellow	ECM-B31 Blue/Yellow
GPS input (Main-17)	NC	NC	NC
RPM input (Main-18)	ECM-A21 Yellow/Green	ECM-B7 Yellow/Green	ECM-B17 Yellow/Green
Speed sensor (Main-8)	ECM-B25 Pink/Green	ECM-B25 Pink/Green	ECM-B28 Pink/Green
+12 V (Main-10)	Ignition circuit at the fusebox Red/Black	Ignition circuit at the fusebox Red/Black	Ignition circuit at the fusebox White/Yellow
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-A32 Green	ECM-A32 Green	ECM-B4 Green

Note: ECM-A: Black, ECM-B: Grey

6.2.3. VTR 1000 SP1/SP2

AFR Tuner terminal	Honda VTR 1000 SP1/SP2		
	2000-2006		
Injector input #1 (Main-4)	ECM-A1 Pink/Yellow		
Injector input #2 (Main-3)	ECM-A2 Pink/Green		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-A1) Pink/Yellow		
Injector driver #2 (Main-13)	Inj #2 (ECM-A2) Pink/Green		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-B2 Black/White		
ECT input (Main-6)	ECM-B14 Pink/White		
TPS input (Main-7)	ECM-B5 Red/Yellow		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-A21 Yellow/Green		
Speed sensor (Main-8)	ECM-B7 Pink/Green		
+12 V (Main-10)	Ignition circuit at the fusebox White/Black		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-A11 Green		

Note: ECM-A: Black, ECM-B: Grey

6.2.4. VTX 1800

AFR Tuner terminal	Honda VTX 1800		
	2002-2004	2005-2008	
Injector input #1 (Main-4)	ECM Pink/Yellow	ECM-A11 Pink/Yellow	
Injector input #2 (Main-3)	ECM Pink/Blue	ECM-A12 Pink/Blue	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM) Pink/Yellow	Inj #1 (ECM-A11) Pink/Yellow	
Injector driver #2 (Main-13)	Inj #2 (ECM) Pink/Blue	Inj #2 (ECM-A12) Pink/Blue	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	ECM Black/White	ECM-B16 Black/White	
ECT input (Main-6)	ECM Pink/White	ECM-B27 Pink/White	
TPS input (Main-7)	ECM Red/Yellow	ECM-B14 Red/Yellow	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM Yellow/Blue	ECM-A3 Yellow/Blue	
Speed sensor (Main-8)	ECM Pink/Green	ECM-B25 Pink/Green	
+12 V (Main-10)	Ignition circuit at the fusebox White/Black	Ignition circuit at the fusebox White/Black	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM Green	ECM-A32 Green	

Note: ECM-A: Black, ECM-B: Grey

6.3. Kawasaki

6.3.1. ZX-10R

AFR Tuner terminal	Kawasaki ZX-10R		
	2004-2005	2006-2007	2008-2009
Injector input #1 (Main-4)	ECM-29 Blue/Red	ECM-46 Blue/Red	ECM-63 Blue/Red
Injector input #2 (Main-3)	ECM-36 Blue/Green	ECM-59 Blue/Green	ECM-46 Blue/Green
Injector input #3 (Main-2)	ECM-54 Blue/Black	ECM-44 Blue/Black	ECM-44 Blue/Black
Injector input #4 (Main-1)	ECM-56 Blue/Yellow	ECM-57 Blue/Yellow	ECM-48 Blue/Yellow
Injector driver #1 (Main-14)	Inj #1 (ECM-29) Blue/Red	Inj #1 (ECM-46) Blue/Red	Inj #1 (ECM-63) Blue/Red
Injector driver #2 (Main-13)	Inj #2 (ECM-36) Blue/Green	Inj #2 (ECM-59) Blue/Green	Inj #2 (ECM-46) Blue/Green
Injector driver #3 (Main-12)	Inj #3 (ECM-54) Blue/Black	Inj #3 (ECM-44) Blue/Black	Inj #3 (ECM-44) Blue/Black
Injector driver #4 (Main-11)	Inj #4 (ECM-56) Blue/Yellow	Inj #4 (ECM-57) Blue/Yellow	Inj #4 (ECM-48) Blue/Yellow
Injector power (Main-16)	ECM-21 White/Red	ECM-14 White/Red	ECM-14 White/Red
ECT input (Main-6)	ECM-13 Orange	ECM-25 Orange	ECM-25 Orange
TPS input (Main-7)	ECM-5 Yellow/White	ECM-26 Yellow/White	ECM-26 Yellow/White
GPS input (Main-17)	ECM-12 White/Yellow	ECM-4 White/Yellow	ECM-4 White/Yellow
RPM input (Main-18)	ECM-49 LightBlue	ECM-51 LightBlue	ECM-35 LightBlue
Speed sensor (Main-8)	ECM-16 Blue/Yellow	ECM-6 Blue/Yellow	ECM-12 Blue/Yellow
+12 V (Main-10)	Ignition circuit at the fusebox Brown/White	ECM-33 Brown	ECM-24 Brown
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-60 Black/Yellow	ECM-17 Black/Yellow	ECM-17 Black/Yellow

6.3.2. ZX-6R

AFR Tuner terminal	Kawasaki ZX-6R		
	2003-2004 ZX-6R & ZX-6RR	2005-2006 ZX6R & ZX6RR	2007-2008
Injector input #1 (Main-4)	ECM-36 Blue/Red	ECM-44 Blue/Red	ECM-48 Blue/Red
Injector input #2 (Main-3)	ECM-35 Blue/Green	ECM-43 Blue/Green	ECM-47 Blue/Green
Injector input #3 (Main-2)	ECM-49 Blue/Black	ECM-57 Blue/Black	ECM-65 Blue/Black
Injector input #4 (Main-1)	ECM-48 Blue/Yellow	ECM-56 Blue/Yellow	ECM-64 Blue/Yellow
Injector driver #1 (Main-14)	Inj #1 (ECM-36) Blue/Red	Inj #1 (ECM-44) Blue/Red	Inj #1 (ECM-48) Blue/Red
Injector driver #2 (Main-13)	Inj #2 (ECM-35) Blue/Green	Inj #2 (ECM-43) Blue/Green	Inj #2 (ECM-47) Blue/Green
Injector driver #3 (Main-12)	Inj #3 (ECM-49) Blue/Black	Inj #3 (ECM-57) Blue/Black	Inj #3 (ECM-65) Blue/Black
Injector driver #4 (Main-11)	Inj #4 (ECM-48) Blue/Yellow	Inj #4 (ECM-56) Blue/Yellow	Inj #4 (ECM-64) Blue/Yellow
Injector power (Main-16)	Fuel pump relay White/Red	Fuel pump relay White/Red	Fuel pump relay White/Red
ECT input (Main-6)	ECM-5 Orange	ECM-9 Orange	ECM-9 Orange
TPS input (Main-7)	ECM-2 Yellow/White	ECM-7 Yellow/White	ECM-7 Yellow/White
GPS input (Main-17)	NC	NC	ECM-53 White/Yellow
RPM input (Main-18)	2004 6RR: ECM-19 all other: ECM-34 LightBlue	ECM-51 LightBlue	ECM-59 LightBlue
Speed sensor (Main-8)	ECM-20 Yellow	ECM-6 Yellow	ECM-6 Yellow
+12 V (Main-10)	Ignition circuit at the fusebox Brown/White	Ignition circuit at the fusebox Brown/White	Ignition circuit at the fusebox Brown/White
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-26 Black/Yellow	ECM-34 Black/Yellow	ECM-34 Black/Yellow

6.3.3. ZX-12R

AFR Tuner terminal	Kawasaki ZX-12R		
	2000	2001-2006	
Injector input #1 (Main-4)	ECM-4 Blue/Red	ECM-4 Blue/Red	
Injector input #2 (Main-3)	ECM-5 Blue/Green	ECM-5 Blue/Green	
Injector input #3 (Main-2)	ECM-6 Blue/Black	ECM-6 Blue/Black	
Injector input #4 (Main-1)	ECM-7 Blue/Yellow	ECM-7 Blue/Yellow	
Injector driver #1 (Main-14)	Inj #1 (ECM-4) Blue/Red	Inj #1 (ECM-4) Blue/Red	
Injector driver #2 (Main-13)	Inj #2 (ECM-5) Blue/Green	Inj #2 (ECM-5) Blue/Green	
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Blue/Black	Inj #3 (ECM-6) Blue/Black	
Injector driver #4 (Main-11)	Inj #4 (ECM-7) Blue/Yellow	Inj #4 (ECM-7) Blue/Yellow	
Injector power (Main-16)	ECM-51 White/Red	ECM-42 White/Red	
ECT input (Main-6)	ECM-40 Orange	ECM-58 Orange	
TPS input (Main-7)	ECM-42 Yellow/White	ECM-56 Yellow/White	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-23 LightBlue	ECM-22 LightBlue	
Speed sensor (Main-8)	Speed sensor Yellow	ECM-9 Yellow	
+12 V (Main-10)	Ignition circuit at the fusebox Brown/White	Ignition circuit at the fusebox Brown/White	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-35 Black/Yellow	ECM-35 Black/Yellow	

6.3.4. ZX-14 / ZZR 1400

AFR Tuner terminal	Kawasaki ZX-14 / ZZR 1400		
	2006-2007		
Injector input #1 (Main-4)	ECM-46 Blue/Red		
Injector input #2 (Main-3)	ECM-59 Blue/Green		
Injector input #3 (Main-2)	ECM-44 Blue/Black		
Injector input #4 (Main-1)	ECM-57 Blue/Yellow		
Injector driver #1 (Main-14)	Inj #1 (ECM-46) Blue/Red		
Injector driver #2 (Main-13)	Inj #2 (ECM-59) Blue/Green		
Injector driver #3 (Main-12)	Inj #3 (ECM-44) Blue/Black		
Injector driver #4 (Main-11)	Inj #4 (ECM-57) Blue/Yellow		
Injector power (Main-16)	ECM-14 White/Red		
ECT input (Main-6)	ECM-25 Orange		
TPS input (Main-7)	ECM-26 Yellow/White		
GPS input (Main-17)	ECM-4 Green/Red		
RPM input (Main-18)	ECM-47 White/Red		
Speed sensor (Main-8)	ECM-6 Blue/Yellow		
+12 V (Main-10)	ECM-33 Brown		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-17 Black/Yellow		

6.3.5. Z1000

AFR Tuner terminal	Kawasaki Z1000		
	2007-2008		
Injector input #1 (Main-4)	ECM-44 Blue/Red		
Injector input #2 (Main-3)	ECM-43 Blue/Green		
Injector input #3 (Main-2)	ECM-57 Blue/Black		
Injector input #4 (Main-1)	ECM-56 Blue/Yellow		
Injector driver #1 (Main-14)	Inj #1 (ECM-44) Blue/Red		
Injector driver #2 (Main-13)	Inj #2 (ECM-43) Blue/Green		
Injector driver #3 (Main-12)	Inj #3 (ECM-57) Blue/Black		
Injector driver #4 (Main-11)	Inj #4 (ECM-56) Blue/Yellow		
Injector power (Main-16)	Fuel pump relay White/Red		
ECT input (Main-6)	ECM-9 Orange		
TPS input (Main-7)	ECM-7 Yellow/White		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-51 LightBlue		
Speed sensor (Main-8)	ECM-6 Pink		
+12 V (Main-10)	Ignition circuit at the fusebox Brown/White		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-34 Black/Yellow		

6.3.6. Ninja 650R / ER-6F

AFR Tuner terminal	Kawasaki Ninja 650R / ER 6F		
	2006-2008		
Injector input #1 (Main-4)	ECM-42 Blue/Red		
Injector input #2 (Main-3)	ECM-41 Blue/Green		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-42) Blue/Red		
Injector driver #2 (Main-13)	Inj #2 (ECM-41) Blue/Green		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	Fuel pump relay White/Red		
ECT input (Main-6)	ECM-20 Orange		
TPS input (Main-7)	ECM-7 Yellow/White		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-47 LightBlue		
Speed sensor (Main-8)	ECM-6 LightGreen/Red		
+12 V (Main-10)	Ignition circuit at the fusebox Brown/White		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-34 Black/Yellow		

Note: ECM-1...34: 34 way connector, ECM-35-52: 18 way connector

6.3.7. VN1500 and VN1600 Mean Streak

AFR Tuner terminal	Kawasaki VN 1500 and VN 1600		
	2002-2003	2004-2005	
Injector input #1 (Main-4)	ECM-40 Blue/Red	ECM-40 Blue/Red	
Injector input #2 (Main-3)	ECM-39 Blue/Green	ECM-39 Blue/Green	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM-40) Blue/Red	Inj #1 (ECM-40) Blue/Red	
Injector driver #2 (Main-13)	Inj #2 (ECM-39) Blue/Green	Inj #2 (ECM-39) Blue/Green	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	ECM-30 White/Red	ECM-30 White/Red	
ECT input (Main-6)	ECM-7 Orange	ECM-7 Orange	
TPS input (Main-7)	ECM-26 Yellow/White	ECM-26 Yellow/White	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-4 Yellow/Black	ECM-4 Yellow/Black	
Speed sensor (Main-8)	ECM-27 LightGreen/Red	ECM-27 LightGreen/Red	
+12 V (Main-10)	Ignition circuit at the fusebox Brown/Red	Ignition circuit at the fusebox Brown/Red	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-10 Black/Yellow	ECM-10 Black/Yellow	

6.3.8. ECM terminal numbering

27	28	29	30	31	32	33	34	35
36	37	38	39	40	41	42	43	
44	45	46	47	48	49	50	51	
52	53	54	55	56	57	58	59	60

1	2	3	4	5	6	7		
8	9	10	11	12	13			
14	15	16	17	18	19			
20	21	22	23	24	25	26		

ECM terminals of the 2004-2005 ZX-10R

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	34

35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	
52	53	54	55	56	57	58	59	
60	61	62	63	64	65	66	67	68

ECM terminals of the 2000 ZX-12R

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	34

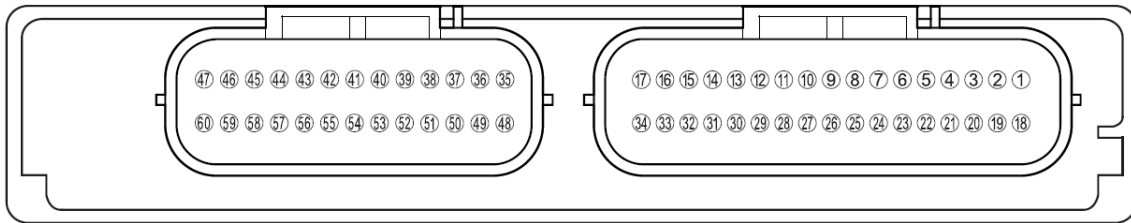
35	36	37	38	39	40	41		
42	43	44	45	46	47			
48	49	50	51	52	53			
54	55	56	57	58	59	60		

ECM terminals of the 2001-2006 ZX-12R

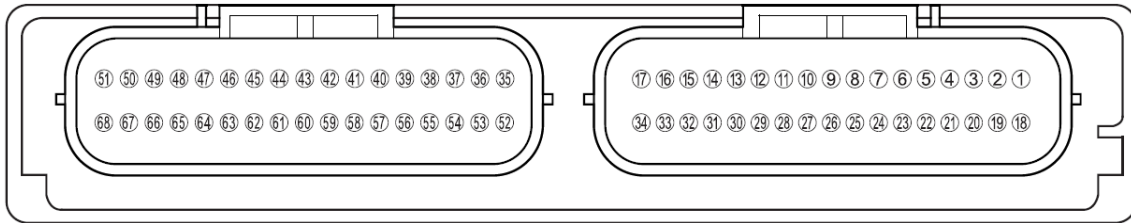
39	38	37	36	35	34	33	32	31	30	29	28	27
52	51	50	49	48	47	46	45	44	43	42	41	40

13	12	11	10	9	8	7	6	5	4	3	2	1
26	25	24	23	22	21	20	19	18	17	16	15	14

ECM terminals of 2003-2004 ZX-6R and ZX-6RR



ECM terminals of the 2006-2007 ZX-10R, 2005-2006 ZX-6R, 2006-2007 ZX14 and 2007-2008 Z1000



ECM terminals of the 2008-2009 ZX-10R and 2007-2008 ZX-6R

6.4. Yamaha

6.4.1. YZF-R1

AFR Tuner terminal	Yamaha YZF-R1		
	2004-2006	2007-2008	2009 YEC
Injector input #1 (Main-4)	ECM-8 Red/Black	ECM-14 Red/Black	ECM-A6 Red/Black
Injector input #2 (Main-3)	ECM-7 Green/Black	ECM-13 Green/Black	ECM-A5 Green/Black
Injector input #3 (Main-2)	ECM-6 Blue/Black	ECM-12 Blue/Black	ECM-A8 Blue/Black
Injector input #4 (Main-1)	ECM-5 Orange/Black	ECM-11 Orange/Black	ECM-A7 Orange/Black
Injector driver #1 (Main-14)	Inj #1 (ECM-8) Red/Black	Inj #1 (ECM-14) Red/Black	Inj. #1 (ECM-A6) Red/Black
Injector driver #2 (Main-13)	Inj #2 (ECM-7) Green/Black	Inj #2 (ECM-13) Green/Black	Inj. #2 (ECM-A5) Green/Black
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Blue/Black	Inj #3 (ECM-12) Blue/Black	Inj. #3 (ECM-A8) Blue/Black
Injector driver #4 (Main-11)	Inj #4 (ECM-5) Orange/Black	Inj #4 (ECM-11) Orange/Black	Inj. #4 (ECM-A7) Orange/Black
Injector power (Main-16)	ECM-13 Red/Blue	ECM-27 Red/Blue	ECM-A15 Red/Blue
ECT input (Main-6)	ECM-44 Green/White	ECM-60 Green/White	ECM-B34 Green/White
TPS input (Main-7)	ECM-41 Yellow	ECM-39 White (next to Pink/White)	ECM-B7 White (next to Pink/White)
<i>Optional External analog input (Main-5)</i>		ECM-38 White	ECM-B6 White
GPS input (Main-17)	NC	NC	NC
RPM input (Main-18)	ECM-34 White/Black	ECM-36 White/Black	ECM-B2 White/Black
Speed sensor (Main-8)	ECM-14 White/Yellow	ECM-32 White/Yellow	ECM-A32 White/Yellow
+12 V (Main-10)	ECM-11 Red/White	ECM-35 Red/White	ECM-B1 Red/White
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-10 Black	ECM-26 Black/White	ECM-A26 Black/White

Note: 2009 YZF-R1ECM-A: 34 pin 2 row connector, ECM-B: 34 pin 4 row connector

6.4.2. YZF-R6

AFR Tuner terminal	Yamaha YZF-R6		
	2003-2005	2006-2007	2008-2009
Injector input #1 (Main-4)	ECM-8 Red/Black	ECM-14 Red/Black	ECM-14 Red/Black
Injector input #2 (Main-3)	ECM-7 Green/Black	ECM-13 Green/Black	ECM-13 Green/Black
Injector input #3 (Main-2)	ECM-6 Blue/Black	ECM-12 Blue/Black	ECM-12 Blue/Black
Injector input #4 (Main-1)	ECM-5 Orange/Black	ECM-11 Orange/Black	ECM-11 Orange/Black
Injector driver #1 (Main-14)	Inj #1 (ECM-8) Red/Black	Inj #1 (ECM-14) Red/Black	Inj #1 (ECM-14) Red/Black
Injector driver #2 (Main-13)	Inj #2 (ECM-7) Green/Black	Inj #2 (ECM-13) Green/Black	Inj #2 (ECM-13) Green/Black
Injector driver #3 (Main-12)	Inj #3 (ECM-6) Blue/Black	Inj #3 (ECM-12) Blue/Black	Inj #3 (ECM-12) Blue/Black
Injector driver #4 (Main-11)	Inj #4 (ECM-5) Orange/Black	Inj #4 (ECM-11) Orange/Black	Inj #4 (ECM-11) Orange/Black
Injector power (Main-16)	ECM-28 Red/Blue	ECM-27 Red/Blue	ECM-27 Red/Blue
ECT input (Main-6)	ECM-31 Green/White	ECM-60 Green/White	ECM-60 Green/White
TPS input (Main-7)	ECM-19 Yellow	ECM-39 Blue	ECM-39 Blue
<i>Optional External analog input (Main-5)</i>		<i>ECM-38 White</i>	<i>ECM-38 White</i>
GPS input (Main-17)	NC	NC	NC
RPM input (Main-18)	ECM-12 White/Black	ECM-36 White/Black	ECM-36 White/Black
Speed sensor (Main-8)	ECM-18 White/Yellow	ECM-32 White/Yellow	ECM-32 White/Yellow
+12 V (Main-10)	ECM-15 Red/White	ECM-35 Red/White	ECM-35 Red/White
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-13 Black/White	ECM-26 Black	ECM-26 Black

6.4.3. FJR 1300

AFR Tuner terminal	Yamaha FJR 1300		
	2001-2005 non-ABS	2006-2008 ABS	
Injector input #1 (Main-4)	ECM-5 Red/Black	ECM-5 Red/Black	
Injector input #2 (Main-3)	ECM-6 Green/Black	ECM-6 Green/Black	
Injector input #3 (Main-2)	ECM-7 Blue/Black	ECM-7 Blue/Black	
Injector input #4 (Main-1)	ECM-8 Orange/Black	ECM-8 Orange/Black	
Injector driver #1 (Main-14)	Inj #1 (ECM-5) Red/Black	Inj #1 (ECM-5) Red/Black	
Injector driver #2 (Main-13)	Inj #2 (ECM-6) Green/Black	Inj #2 (ECM-6) Green/Black	
Injector driver #3 (Main-12)	Inj #3 (ECM-7) Blue/Black	Inj #3 (ECM-7) Blue/Black	
Injector driver #4 (Main-11)	Inj #4 (ECM-8) Orange/Black	Inj #4 (ECM-8) Orange/Black	
Injector power (Main-16)	ECM-28 Red/Blue	ECM-28 Red/Blue	
ECT input (Main-6)	ECM-31 Green/White	ECM-31 Green/White	
TPS input (Main-7)	ECM-19 Yellow	ECM-19 Yellow	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-12 White/Black	ECM-12 White/Black	
Speed sensor (Main-8)	ECM-18 White/Yellow	ECM-18 White/Yellow	
+12 V (Main-10)	ECM-15 Red/White	ECM-15 Red/White	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-13 Black/White	ECM-13 Black/White	

6.4.4. MT-01

AFR Tuner terminal	Yamaha MT-01		
	2005		
Injector input #1 (Main-4)	ECM-A5 Grey		
Injector input #2 (Main-3)	ECM-A14 Green		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-A5) Grey		
Injector driver #2 (Main-13)	Inj #2 (ECM-A14) Green		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-B8 Red/Blue		
ECT input (Main-6)	ECM-B32 Brown		
TPS input (Main-7)	ECM-B20 Yellow		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-A3 Orange		
Speed sensor (Main-8)	ECM-B26 White/Yellow		
+12 V (Main-10)	ECM-B7 Red/White		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-B5 Black/Brown		

Note: ECM-A: 18 pin connector, ECM-B: 34 pin connector

6.4.5. TDM 900

AFR Tuner terminal	Yamaha TDM 900		
	2002-2003	2004	
Injector input #1 (Main-4)	ECM-4 Red/Black	ECM-5 Red/Black	
Injector input #2 (Main-3)	ECM-5 Green/Black	ECM-4 Green/Black	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM-4) Red/Black	Inj #1 (ECM-5) Red/Black	
Injector driver #2 (Main-13)	Inj #2 (ECM-5) Green/Black	Inj #2 (ECM-4) Green/Black	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	ECM-17 Red/Blue	ECM-17 Red/Blue	
ECT input (Main-6)	ECM-18 Green/Red	ECM-18 Green/Red	
TPS input (Main-7)	ECM-39 Yellow	ECM-39 Yellow	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-16 White/Black	ECM-16 White/Black	
Speed sensor (Main-8)	ECM-43 White/Yellow	ECM-43 White/Yellow	
+12 V (Main-10)	ECM-9 Red/White	ECM-9 Red/White	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-14 Black/White	ECM-14 Black/White	

6.4.6. ECM terminal numbering

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44

*ECM terminals of the 2004-2006 YZF-R1,
2003-2005 YZF-R6, 2001-2008 FJR1300 and 2002-
2005 TDM900*

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	34

35	36	37	38	39	40	41
42	43	44	45	46	47	
48	49	50	51	52	53	
54	55	56	57	58	59	60

ECM terminals of the 2007-2009 YZF-R1 and 2006-2009 R6

6.5. Aprilia

6.5.1. RSV Mille, RSV 1000 R, RSV 1000 R Factory

AFR Tuner terminal	Aprilia RSV Mille, RSV 1000 R, RSV 1000 R Factory		
	1999-2003 ¹⁾	2004-2008	
Injector input #1 (Main-4)	ECM-9Y Grey/Red	ECM-A33 Grey/Red	
Injector input #2 (Main-3)	ECM-7Y Brown/Red	ECM-A15 Grey/Green	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM-9Y) Grey/Red	Inj #1 (ECM-A33) Grey/Red	
Injector driver #2 (Main-13)	Inj #2 (ECM-7Y) Brown/Red	Inj#2 (ECM-A15) Grey/Green	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	ECM-8Z Green/Black	ECM-B11 Light Blue/Grey	
ECT input (Main-6)	ECM-6Z Pink/Black	ECM-A11 Pink/Black	
TPS input (Main-7)	ECM-4Z Brown/Yellow	ECM-A24 Brown/White	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-14Y Grey/Violet	ECM-A34 Yellow/Blue	
Speed sensor (Main-8)	Speed sensor Grey/White	ECM-B6 Grey/White	
+12 V (Main-10)	Fuse box or Alarm connector Light Blue/Grey	ECM-B36 White/Yellow	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-2Y Blue/Green	ECM-B1 Blue/Green	

1) ECM Y: 26-way connector, ECM Z: 16-way connector

6.6. Benelli

6.6.1. Tornado Tre 900

AFR Tuner terminal	Benelli Tornado Tre 900 (LE, 900, 900 RS)		
	2001-2005		
Injector input #1 (Main-4)	ECM-P1H2 Grey/Green		
Injector input #2 (Main-3)	ECM-P1H3 Grey		
Injector input #3 (Main-2)	ECM-P1G3 Blue/Grey		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-P1H2) Grey/Green		
Injector driver #2 (Main-13)	Inj#2 (ECM-P1H3) Grey		
Injector driver #3 (Main-12)	Inj#2 (ECM-P1G3) Blue/Grey		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-P1H4 Red/White		
ECT input (Main-6)	ECM-P1B2 White/Violet		
TPS input (Main-7)	ECM-P1E3 Yellow/Blue		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-P2A1 Grey/Red		
Speed sensor (Main-8)	Speed sensor Blue		
+12 V (Main-10)	Speed sensor Brown		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-P2G4 Black		

6.6.2. TnT 1130

AFR Tuner terminal	Benelli TnT 1130		
	2004-2005	2008	
Injector input #1 (Main-4)	ECM 1/B1 Grey/Green	ECM 1/B1 Grey/Green	
Injector input #2 (Main-3)	ECM 1/C1 Grey	ECM 1/C1 Grey	
Injector input #3 (Main-2)	ECM 2/B8 Blue/Grey	ECM 2/B8 Blue/Grey	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM 1/B1) Grey/Green	Inj #1 (ECM 1/B1) Grey/Green	
Injector driver #2 (Main-13)	Inj #2 (ECM 1/C1) Grey	Inj #2 (ECM 1/C1) Grey	
Injector driver #3 (Main-12)	Inj #3 (ECM 2/B8) Blue/Grey	Inj #3 (ECM 2/B8) Blue/Grey	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	Solenoid Red/White	ECM 1/A3 Red/White	
ECT input (Main-6)	ECM 1/C6 White/Violet	ECM 1/C6 White/Violet	
TPS input (Main-7)	ECM 1/B7 Yellow/Blue	ECM 1/B7 Yellow/Blue	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM 1/C2 Grey/Red	ECM 1/C2 Grey/Red	
Speed sensor (Main-8)	Speed sensor Blue	Speed sensor Blue	
+12 V (Main-10)	Service fuse or Speed sensor Brown	Starter relay 4 Brown	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM 2/A8 Black	ECM 2/A8 Black	

Note: ECM 1: black connector, ECM 2: grey connector

6.7. BMW

6.7.1. K1200 GT

AFR Tuner terminal	BMW K1200 GT		
	K44		
Injector input #1 (Main-4)	V1, ECM-79 Blue/Red		
Injector input #2 (Main-3)	V2, ECM-55 Blue/Violet		
Injector input #3 (Main-2)	V3, ECM-80 Blue/Grey		
Injector input #4 (Main-1)	V4, ECM-78 Blue/Yellow/Red		
Injector driver #1 (Main-14)	Inj #1 (ECM-79) Blue/Red		
Injector driver #2 (Main-13)	Inj #2 (ECM-55) Blue/Violet		
Injector driver #3 (Main-12)	Inj #3 (ECM-80) Blue/Grey		
Injector driver #4 (Main-11)	Inj #4 (ECM-78) Blue/Yellow/Red		
Injector power (Main-16)	V1+, ECM-31 Green/Yellow		
ECT input (Main-6)	TFKS, ECM-63 Grey/Violet		
TPS input (Main-7)	DKPS, ECM-91 Violet/Yellow		
GPS input (Main-17)	GPS, ECM-64 Violet/Black		
RPM input (Main-18)	ZS1, ECM-73 Black/Red		
Speed sensor (Main-8)	NC		
+12 V (Main-10)	ECM-34 Green		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-3 Brown		

6.8. *Ducati*

6.8.1. 1098/1098S and 1198/1198 S

AFR Tuner terminal	Ducati 1098/1098S and 1198/1198 S		
	1098 2007-2008	1198 2009-	
Injector input #1 (Main-4)	ECM-Eng-28 Pink/Yellow	ECM-Eng-28 Pink/Yellow	
Injector input #2 (Main-3)	ECM-Eng-37 Green/Yellow	ECM-Eng-37 Green/Yellow	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (Eng-28) Pink/Yellow	Inj #1 (Eng-28) Pink/Yellow	
Injector driver #2 (Main-13)	Inj #2 (Eng-37) Green/Yellow	Inj #2 (Eng-37) Green/Yellow	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	Injector relay Brown/White	Injector relay Brown/White	
ECT input (Main-6)	ECM-Eng-5 White/Blue	ECM-Eng-5 White/Blue	
TPS input (Main-7)	ECM-Eng-3 Orange	ECM-Eng-3 Orange	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM-Eng-38 Grey/Blue	ECM-Eng-38 Grey/Blue	
Speed sensor (Main-8)	ECM-Body-24 Green	ECM-Body-24 Green	
+12 V (Main-10)	ECM-Body-17 Red/Black	ECM-Body-17 Red/Black	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM housing	ECM housing	

6.8.2. 748, 748 Biposto, 748 SPS, 748 S

AFR Tuner terminal	Ducati 748, 748 Biposto, 748 SPS, 748 S		
	1999-2001		
Injector input #1 (Main-4)	ECM-5 Orange/Blue		
Injector input #2 (Main-3)	ECM-22 Yellow/Green		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-5) Orange/Blue		
Injector driver #2 (Main-13)	Inj #2 (ECM-22) Yellow/Green		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	Injector relay or Injectors Brown		
ECT input (Main-6)	ECM-13 Grey		
TPS input (Main-7)	ECM-30 Yellow		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-24 Green/Blue		
Speed sensor (Main-8)	Speed sensor or NC		
+12 V (Main-10)	Rear brake switch Violet/Black		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-17 Black		

6.8.3. Monster 696 & 1100

AFR Tuner terminal	Ducati Monster 696 & 1100		
	2009		
Injector input #1 (Main-4)	ECM-K4 Pink/Yellow		
Injector input #2 (Main-3)	ECM-L4 Green/Yellow		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj# 1 (ECM-K4) Pink/Yellow		
Injector driver #2 (Main-13)	Inj #2 (ECM-L4) Green/Yellow		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-L1 Brown/White		
ECT input (Main-6)	ECM-F4 White/Blue		
TPS input (Main-7)	ECM-G3 Orange		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-M2 Grey/Blue		
Speed sensor (Main-8)	ECM-H3 Green		
+12 V (Main-10)	ECM-A4 Red/Black		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-M3 Black		

6.8.4. MultiStrada 620

AFR Tuner terminal	MultiStrada 620		
	2005		
Injector input #1 (Main-4)	ECM-Eng-28 Pink/Yellow		
Injector input #2 (Main-3)	ECM-Eng-37 Green/Yellow		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (Eng-28) Pink/Yellow		
Injector driver #2 (Main-13)	Inj #2 (Eng-37) Green/Yellow		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	Injector relay Brown/White		
ECT input (Main-6)	ECM-Eng-5 White		
TPS input (Main-7)	ECM-Eng-3 Orange		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-Eng-38 Grey/Blue		
Speed sensor (Main-8)	ECM-Body-24 Green		
+12 V (Main-10)	ECM-Body-17 Red/Black		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM housing		

6.9. Highland

6.9.1. Highland 950

AFR Tuner terminal	Highland 950		
	2004-2007		
Injector input #1 (Main-4)	ECM-5 Red		
Injector input #2 (Main-3)	ECM-6 Red		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-5) Red		
Injector driver #2 (Main-13)	Inj #2 (ECM-6) Red		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-2 White		
ECT input (Main-6)	ECM-30 Violet		
TPS input (Main-7)	ECM-28 Red		
GPS input (Main-17)	Ground		
RPM input (Main-18)	ECM-13 White		
Speed sensor (Main-8)	NC		
+12 V (Main-10)	Rear brake light switch Orange		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-4 Black		

6.10. KTM

6.10.1. 990 Superduke

AFR Tuner terminal	KTM 990 Superduke		
	2005-2006	2007-2008	
Injector input #1 (Main-4)	ECM_CO-6 Black/White	ECM_CO-6 Black/White	
Injector input #2 (Main-3)	ECM_CO-5 Black/Grey	ECM_CO-5 Black/Grey	
Injector input #3 (Main-2)	NC	NC	
Injector input #4 (Main-1)	NC	NC	
Injector driver #1 (Main-14)	Inj #1 (ECM_CO-6) Black/White	Inj #1 (ECM_CO-6) Black/White	
Injector driver #2 (Main-13)	Inj #2 (ECM_CO-5) Black/Grey	Inj #2 (ECM_CO-5) Black/Grey	
Injector driver #3 (Main-12)	NC	NC	
Injector driver #4 (Main-11)	NC	NC	
Injector power (Main-16)	Main relay Orange	Power relay Orange	
ECT input (Main-6)	ECM_AO-9 Yellow/Blue	ECM_AO-9 Yellow/Black	
TPS input (Main-7)	ECM_AO-10 Yellow/White	ECM_AO-10 Yellow/White	
GPS input (Main-17)	NC	NC	
RPM input (Main-18)	ECM_CO-14 Blue/White	ECM_CO-14 Red/Purple	
Speed sensor (Main-8)	Speed sensor Black/Orange	Speed sensor Black/Orange	
+12 V (Main-10)	Accessories connector Red/Brown	Accessories connector Red/Black	
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM_AO-6 Brown	ECM_AO-6 Purple/Brown	

Note: ECM_CO: 34 pin connector, ECM_AO: 26 pin connector

6.10.2. 690 Enduro, 690 SMC

AFR Tuner terminal	KTM 690 Enduro, 690 SMC		
	2008-2009		
Injector input #1 (Main-4)	ECM-40 Black/Grey		
Injector input #2 (Main-3)	NC		
Injector input #3 (Main-2)	NC		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-40) Black/Grey		
Injector driver #2 (Main-13)	NC		
Injector driver #3 (Main-12)	NC		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-6 Orange		
ECT input (Main-6)	ECM-36 Black/Yellow		
TPS input (Main-7)	ECM-13 Yellow/Orange		
GPS input (Main-17)	NC		
RPM input (Main-18)	ECM-22 White/Violet		
Speed sensor (Main-8)	Speed sensor Black/Orange		
+12 V (Main-10)	Rear brake light switch Yellow/Blue		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-3 Brown/Violet		

6.11. Triumph

6.11.1. Daytona 675

AFR Tuner terminal	Triumph Daytona 675		
	2006-2008		
Injector input #1 (Main-4)	ECM-A15 Yellow/Pink		
Injector input #2 (Main-3)	ECM-A14 Yellow/Purple		
Injector input #3 (Main-2)	ECM-A13 Yellow/Black		
Injector input #4 (Main-1)	NC		
Injector driver #1 (Main-14)	Inj #1 (ECM-A15) Yellow/Pink		
Injector driver #2 (Main-13)	Inj #2 (ECM-A14) Yellow/Purple		
Injector driver #3 (Main-12)	Inj #3 (ECM-A13) Yellow/Black		
Injector driver #4 (Main-11)	NC		
Injector power (Main-16)	ECM-A6 Brown/Pink		
ECT input (Main-6)	ECM-A29 Pink/Green		
TPS input (Main-7)	ECM-A10 Green/Yellow		
GPS input (Main-17)	ECM-B24 Black/Pink		
RPM input (Main-18)	ECM-B17 Green/Pink		
Speed sensor (Main-8)	ECM-A34 Pink/Yellow		
+12 V (Main-10)	Fuse box Blue/Yellow		
Ground (Main-20), Injector ground (Main-15), Heater ground (Main-9)	ECM-B19 Black		

7. Gear ratio database

Motorcycle	Gear position calculation							Speed calculation		
	N	1	2	3	4	5	6	N _F	N _R	NoP
2001-2004 Suzuki GSX-R1000 (w TRE)	22	90	118	144	167	185	200	17	42	4
2005-2006 Suzuki GSX-R1000 (w TRE)	22	94	118	141	161	178	190	17	42	4
2007-2008 Suzuki GSX-R1000 (w TRE)	22	94	118	141	161	178	190	17	43	4
2000-2003 Suzuki GSX-R750 (w TRE)	25	82	112	137	158	176	194	17	42	4
2004-2005 Suzuki GSX-R750 (w TRE)	25	82	112	137	158	176	194	17	43	4
2006-2009 Suzuki GSX-R750 (w TRE)	25	87	118	141	161	180	200	17	45	4
2004-2005 Suzuki GSX-R600 (w TRE)	26	83	112	137	159	177	195	16	45	4
2006-2007 Suzuki GSX-R600 (w TRE)	28	87	118	141	161	180	200	16	43	4
1999-2007 Suzuki GSX1300R (w TRE)	19	78	105	133	158	179	195	17	40	4
2008-2009 Suzuki GSX1300R (w TRE)	19	78	105	133	158	179	195	18	43	4
2008-2009 Suzuki GSX1300BK (w TRE)	19	78	105	133	158	179	195	18	43	4
2006-2008 Suzuki VZR1800 (w TRE)	14	59	92	124	155	187	255	12	32	4
2004-2005 Honda CBR1000RR	3	91	119	147	168	185	199	16	41	29
2006-2007 Honda CBR1000RR	3	91	119	147	168	185	199	16	42	29
2008-2009 Honda CBR1000RR	2	72	92	109	123	135	144	16	42	33
2003-2004 Honda CBR600RR	4	85	117	140	161	180	194	16	43	28
2005-2006 Honda CBR600RR	4	85	117	140	161	180	194	16	42	28
2007-2008 Honda CBR600RR	4	85	117	141	162	180	194	16	42	29
2000-2006 Honda VTR1000 SP1/SP2	3	76	104	132	152	174	196	16	40	25
2002-2008 Honda VTX1800	2	53	84	112	143	179	255	25	73	23
2004-2005 Kawasaki ZX-10R	GPS	GPS	GPS	GPS	GPS	GPS	GPS	17	39	30
2006-2007 Kawasaki ZX-10R	GPS	GPS	GPS	GPS	GPS	GPS	GPS	17	40	30
2008-2009 Kawasaki ZX-10R	GPS	GPS	GPS	GPS	GPS	GPS	GPS	17	41	30
2003-2004 Kawasaki ZX-6R	27	78	111	132	157	179	197	15	40	4
2004 Kawasaki ZX-6RR	29	90	119	142	163	184	199	15	40	4
2005-2006 Kawasaki ZX-6R	3	69	99	122	140	160	176	15	43	30
2007-2008 Kawasaki ZX-6R	GPS	GPS	GPS	GPS	GPS	GPS	GPS	16	43	26
2000-2006 Kawasaki ZX-12R	2	68	91	115	133	147	160	18	46	31
2006-2007 Kawasaki ZX-14 / ZZR 1400	18	76	102	129	150	173	192	17	41	4
2007-2008 Kawasaki Z1000	3	67	91	110	129	143	157	15	40	23
2006-2008 Kawasaki Ninja 650R / ER-6F	4	59	83	107	129	148	168	15	46	4
2002-2005 Kawasaki VN1500/1600 non-US/CA	2	47	74	99	122	151	255	9	33	15

Motorcycle	Gear position calculation							Speed calculation		
	N	1	2	3	4	5	6	N _F	N _R	NoP
2002-2005 Kawasaki VN1500/1600 US/CA	2	47	67	89	110	136	255	9	33	15
2004-2008 Yamaha YZF-R1	2	74	90	106	122	137	147	17	45	33
2009 Yamaha YZF-R1	2	74	90	106	122	137	147	17	47	33
2003-2005 Yamaha YZF-R6	3	60	87	109	128	143	157	16	48	26
2006-2009 Yamaha YZF-R6	4	73	95	114	131	147	165	16	45	23
2001-2005 Yamaha FJR1300	2	56	80	105	132	153	255	22	61	26
2006-2008 Yamaha FJR1300 ABS	4	67	96	126	158	183	255	1	1	42
2002-2004 Yamaha TDM 900	12	65	92	116	144	172	194	16	42	6
1999-2003 Aprilia RSV 1000	38	68	97	124	155	177	199	1	1	5
2004- Aprilia RSV 1000	40	78	108	136	162	184	199	1	1	5
2004- Benelli Tornado 900 TRE	41	77	110	140	164	183	198	1	1	6
2004- Benelli TnT 1130	34	77	111	141	165	185	199	1	1	6
2007-2008 Ducati 1098 / 1098S	52	77	108	136	161	182	198	1	1	4
2009- Ducati 1198 / 1198S	48	71	99	130	161	183	199	1	1	4
2009- Ducati Monster 1100	48	69	97	127	157	178	199	1	1	4
2009- Ducati Monster 696	40	75	111	138	163	185	200	1	1	6
2008 KTM Superduke 990R	33	81	111	138	161	183	199	1	1	6
2009 KTM 690 SMC	37	69	98	129	157	180	198	1	1	6
2006-2008 Triumph Daytona 675	GPS	GPS	GPS	GPS	GPS	GPS	GPS	17	42	34

8. Version history

Version	Date	Comment
v1.00	14.11.2007	Initial version Firmware: v2.14, Configurator: v2.14, Log Viewer: v1.11
v1.10	15.12.2007	Updated for software version v2.21 Firmware: v2.21, Configurator: v2.21, Log Viewer: v1.20
v1.12	05.02.2008	Updated for software version v2.23 Firmware: v2.23, Configurator: v2.23, Log Viewer: v1.21
v1.13	03.03.2008	Updated for software version v2.24 Firmware: v2.24, Configurator: v2.23, Log Viewer: v1.22
v1.14	14.03.2008	Added new motorcycle wiring information Firmware: v2.24, Configurator: v2.23, Log Viewer: v1.22
v1.15	17.05.2008	Added new motorcycle wiring information Firmware: v2.24, Configurator: v2.24, Log Viewer: v1.22
v1.16	18.08.2008	Updated for software version v2.31 Firmware: v2.31, Configurator: v2.31, Log Viewer: v1.23
v1.17	10.02.2009	Updated for software version v2.41 Firmware: v2.41, Configurator: v2.41, Log Viewer: v1.25
v1.18	07.10.2009	Added new motorcycle wiring information Firmware: v2.41, Configurator: v2.41, Log Viewer: v1.25