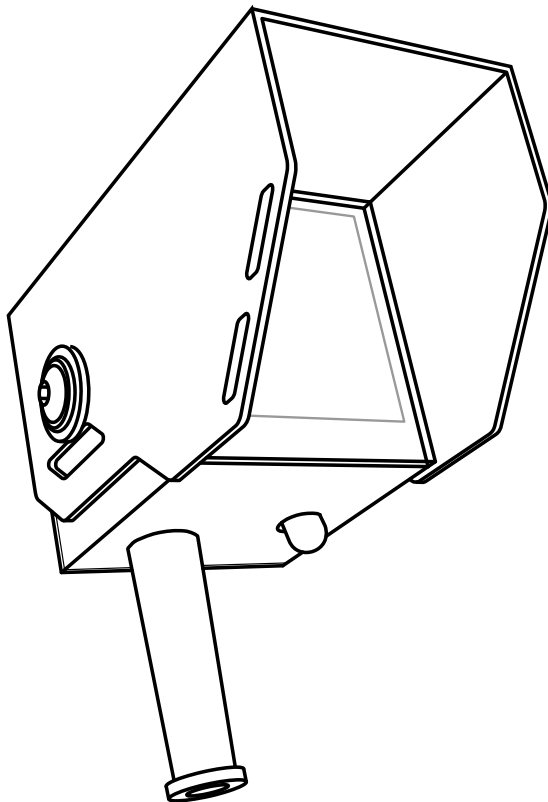


User Manual

Periscope - Software Version 2.4

Gimpo Garage UG, all rights reserved



*Thank you for purchasing your Periscope.
The design, development and test of this
product was primarily supported by the
genuine passion for motorcycles.
I hope that you will use it with satisfaction to
enhance your driving experience as well as
your safety.
I also want to thank all people that
supported this idea by sharing their
experiences and knowledge.*

Gimpo Garage UG

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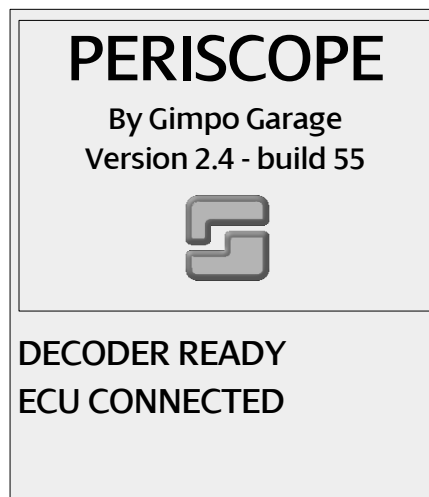
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Introduction

Starting

When correctly mounted, you can start Periscope by simply turning the ignition-key in the ON position.

At every start Periscope will check the status of the cable connections. If connections are working properly, then a screen like the following one should be displayed:

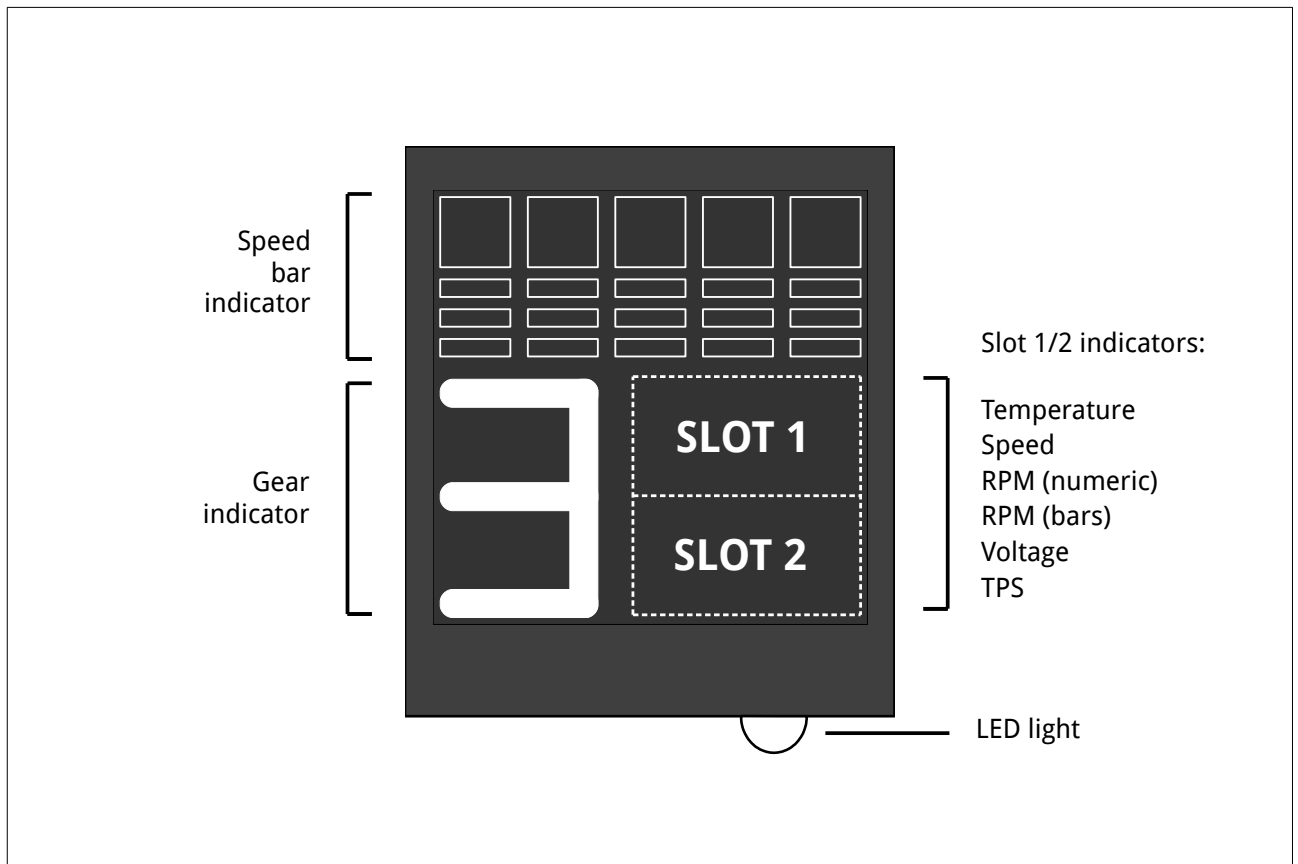


Otherwise, Periscope will show

- 'DECODER NOT READY' if there is a communication problem between the computer unit and the decoder;
- 'ECU NOT CONNECTED' if there is a communication problem between the decoder and the motorcycle ECU.

In both cases you have to check the cables between the computer unit and the decoder as well as between the decoder and the OBD plug.

Overview



The Periscope's screen show some permanent information and two additional indicator in the area of the slots 1 and 2.

Permanent information are:

- the gear currently engaged,
- the current speed by using a colored band indicator.

The two additional indicators can be selected to show two of the following information:

- current speed in numeric format,
- current engine temperature,
- current engine RPMs in numeric format,
- current engine RPMs in colored bands format,
- current opening angle of the air throttle (TPS),
- current battery voltage status.

The builded-in LED light can be activated either in automatic or manual mode.



Please note that the Periscope has no internal battery and is not directly connected to the motorcycle battery. This means that it completely turns off when the ignition-key is in the OFF position.

Indicators list

In the following all different type of indicators are listed.

Gear indicator

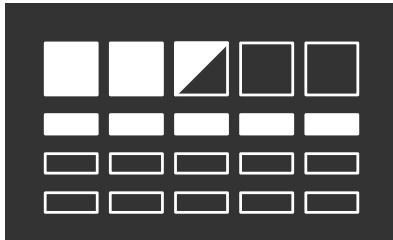


It shows the current engaged gear by calculating the ratio between the RPM value of the engine and the current speed. Some instants (typically less than one second) can be necessary before the indicator show the correct value.

Possible values are listed in the table below.

Displayed value	Meaning	Note
□	No gear engaged.	Gear lever is in the neutral position
1..E (white color)	Gear currently in use.	The gear has been correctly calculated.
1..E (yellow color)	Clutch engaged.	The last calculated gear is shown. Gear calculation is suspended until the clutch is released again.
— (horizontal line)	Gear unknown.	The gear cannot be calculated due to abnormal RPM and/or speed value.

Speed bar indicator



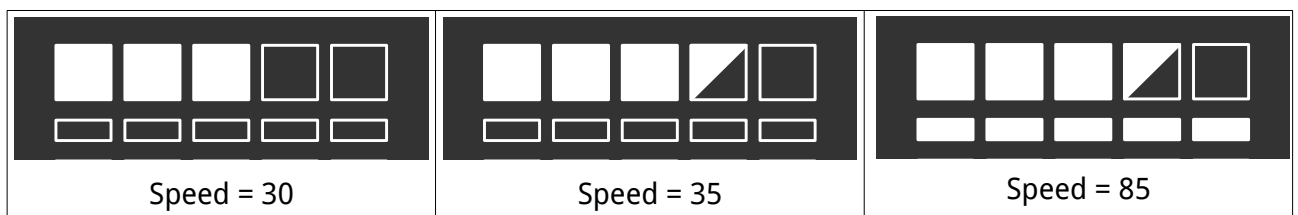
It shows the current speed in a graphical way.

It is composed by a set of four rows with five colourable bars each. The rows are vertically stacked one over the other, and the first row on top is taller than the others.

At the start of the motorcycle, all bars are uncolored. As the speed of the motorcycle increases, the bars in the first top-row get colored from left to right.

When all of the bars of the first row became fully colored the row itself is "pushed down", while the bars of the first row return uncolored.

Every bar can be full-colored or half-colored, here some examples:



(*) Note: you can configure the speed measure unit to be used (Kmh or Mph), as well as if every full-colored bar hold for 10 or 5 speed units. See further in this manual.

Temperature indicator



It shows the temperature of the engine as calculated by the ECU unit of the motorcycle. The digits will start blinking when

- the temperature is below the lower temperature threshold,
- the temperature is above the upper threshold.

Note: threshold values can be configured, as well as the measure unit (Celsius or Fahrenheit). See further in this manual.

Speed indicator



It shows the current speed as calculated by the ECU unit as a numerical value.

Note: the value can be tuned to be as closest as possible to the real speed value by using a reliable speedometer (e.g. a GPS device). See the 'Configuration' chapter of this manual in the following.

RPM indicator



Shows the current RPMs of the engine as a number. RPMs are divided by 100.

TPS indicator



Shows the current opening angle of the throttle located in the injection device.

Normal values are: 4.8* +/- 0.2° in the idle position, 84° +/- 2° at the max opening position.

Battery voltage indicator

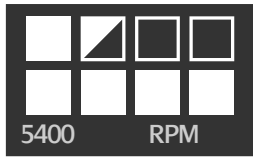


It shows the current voltage between the battery poles.

The indicator will starts blinking when the voltage goes below the threshold-value set.

Note: the threshold value can be configured, see further in this manual.

RPM bars indicator



It shows the current RPM value by using two little rows composed of four bars.

As the engine RPMs increases the bars get colored. A full-colored bar holds for 1,000 RPM, a half-colored bar holds for 500 RPM.

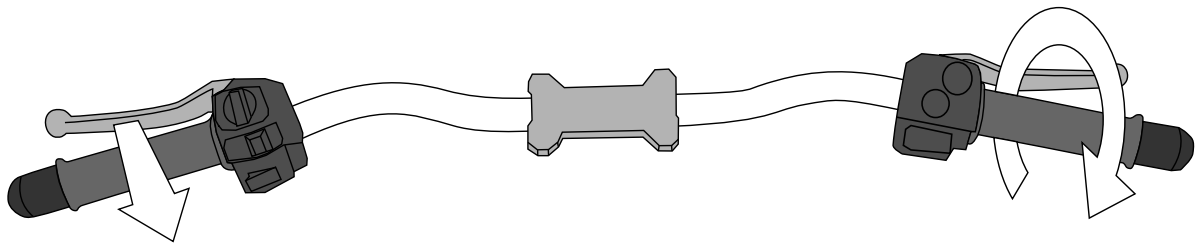
The maximum value displayed is 8,000 RPM.

Access to settings

In order to view/modify the settings of Periscope you have to execute the following procedure:

1. stop the engine if running,
2. put the ignition key in the ON position if not yet,
3. pull the clutch and rotate the throttle-handle, both at the same time,
4. hold for around 3 seconds,

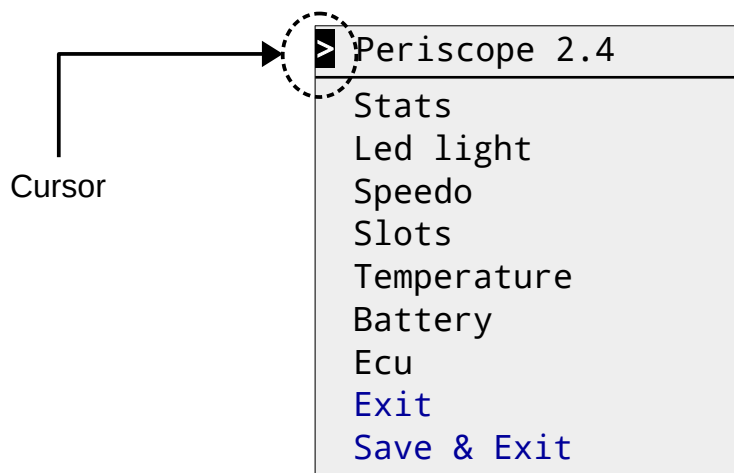
After that, the main settings menu will be shown on the screen.



The main menu

All of the available actions to change the Periscope settings are arranged in menu and sub-menu, as depicted in the image below.

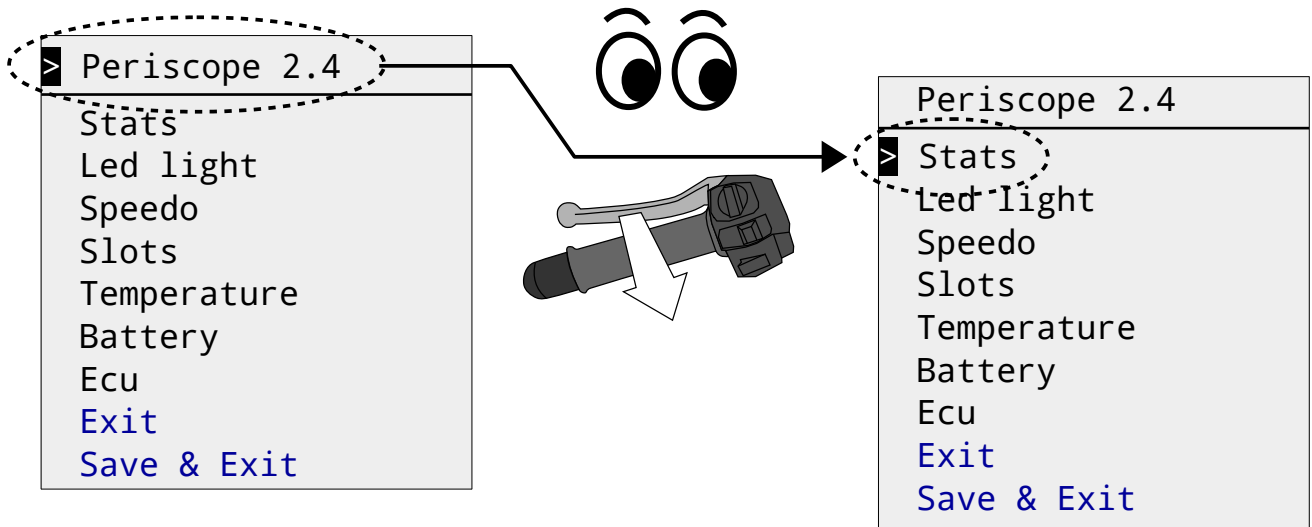
The square block on the left (cursor) indicates your current position in the menu.



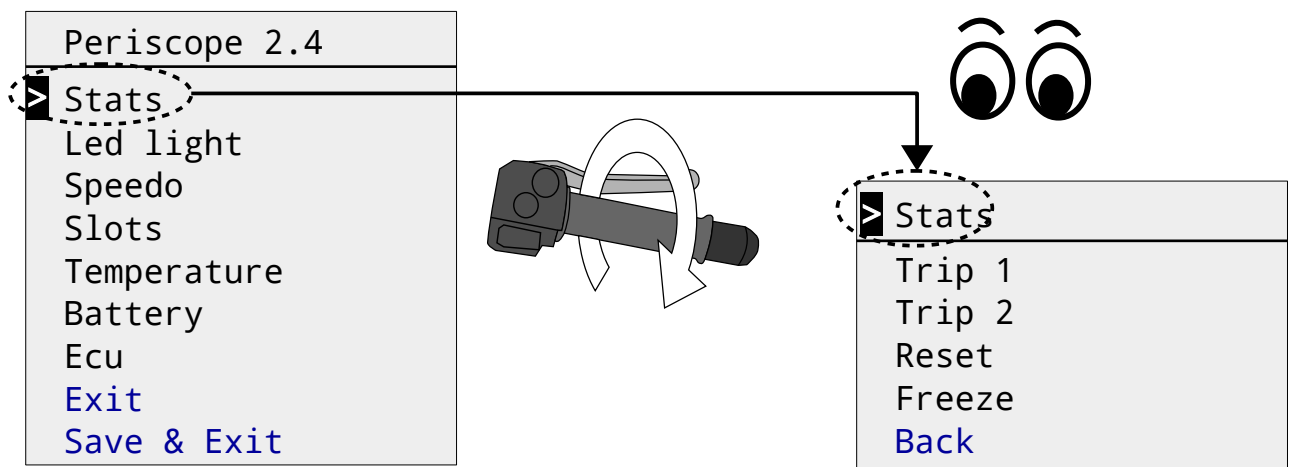
The Periscope software is constantly under refinement/improvement. Therefore, the style/colors/layout and typography of your version can be slightly different.

How to navigate across menus

To **move down the cursor** of one position simply pull the clutch lever and then release it after a fraction of second. The corresponding menu (or an action listed in a menu) is now ready for selection.



Instead, **to enter into the menu** (or to change a setting) simply rotate the throttle and then release it after a fraction of second.



That is all you need to change the Periscope settings. Just move the cursor and select. Have fun!



Periscope reads the status of the lever approximately every 0.5-0.7 seconds, so you have not to quickly pull and release the clutch .
The same holds about the throttle rotation: you have to rotate it smoothly.
Note also that if you keep the lever pulled (or the throttle rotated), without releasing it, nothing will happens on the screen.



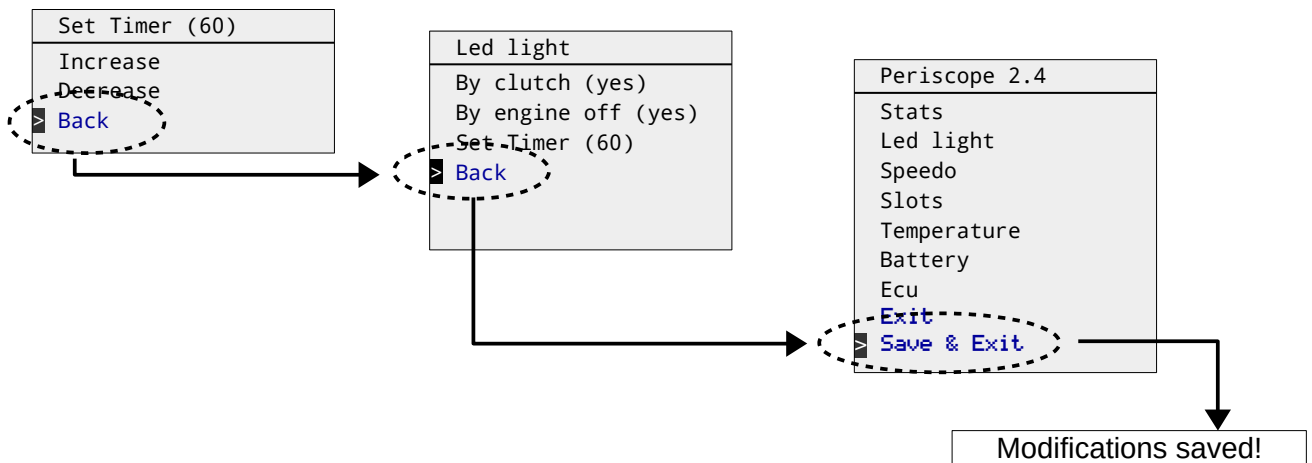
By using the clutch lever you can move the cursor position only downward. Don't get worry about that, after reaching the lowest position it will appear again at the top of the screen.

Save your changes!

Always remember to save your modification! You will lose your new settings otherwise.

To save your changes you have to select the *Back* command listed in any menu until you return to the main one. There you can select the *Save & Exit* command to store your changes permanently in the Periscope.

For example:



If you don't need to save your modifications, then simply select *Exit* command.



If you don't need to save any modification, then simply switch the ignition key off!

The fastest way for exiting from the configuration session is to simply turn off the ignition key and then turn it on again. Periscope will restart with the usual initial screen.

Data access and Configuration

Statistics

Periscope collects statistics about the gear usage when the motorcycle is moving and a gear is engaged.

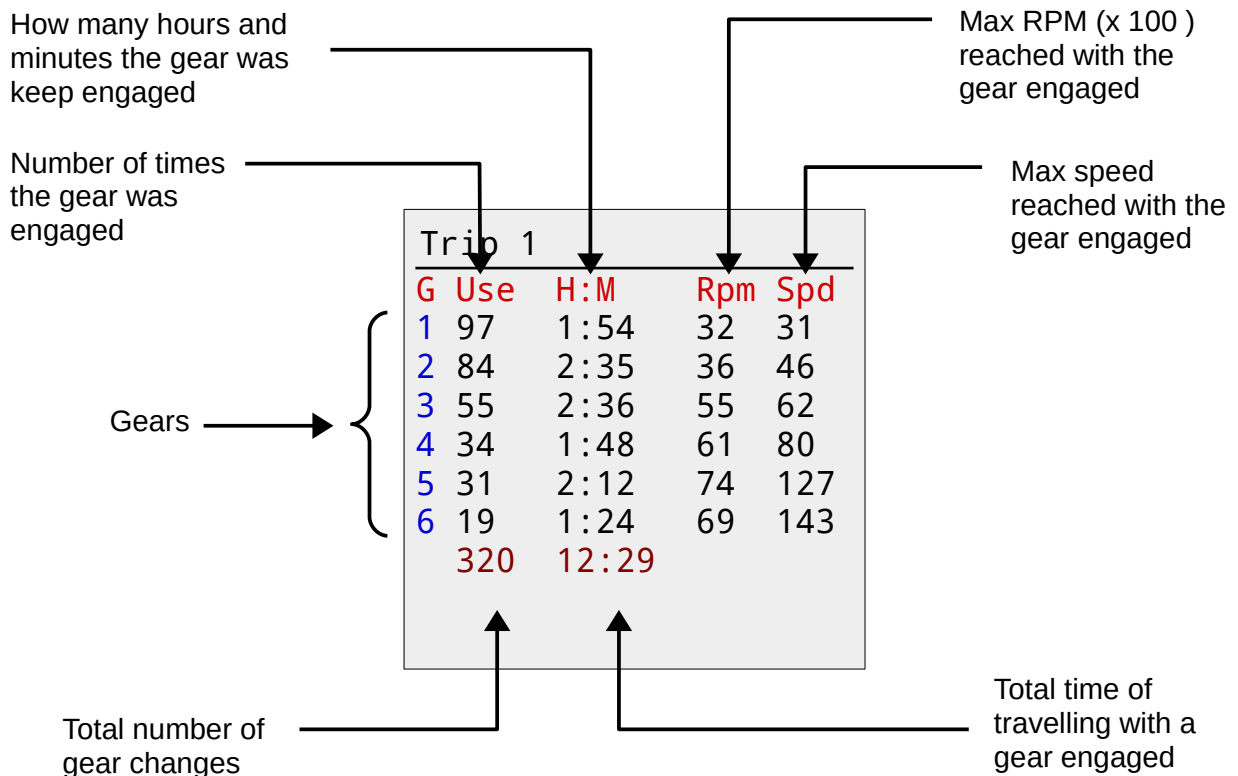
Separated data for two trips (1 and 2) are available. After selecting the *Stats* menu from the main list you will be able to view, reset or freeze the stored values for both trips.

> Stats
Trip 1
Trip 2
Reset
Freeze
Back

View statistics

By selecting *Trip 1* (or *Trip 2*) in the *Stats* menu you will see the stored data during your trips with the motorcycle. Pull the clutch to return to the previous menu.

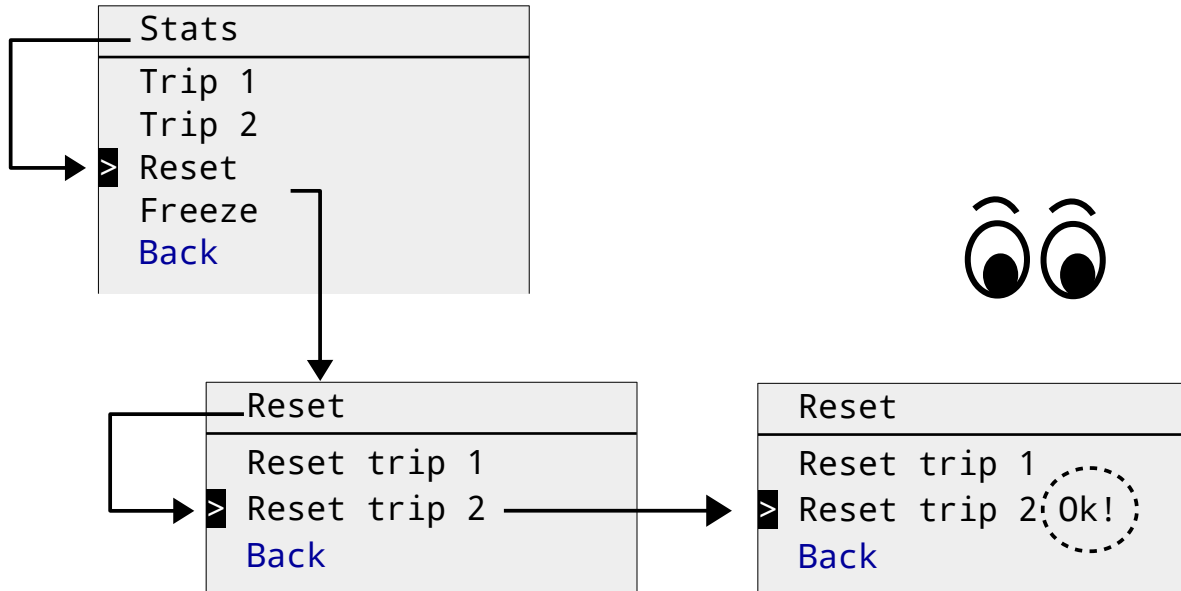
Here below an example:



Reset statistics

To set to zero all of the statistical values you have to move the cursor on the *Reset*, select it and choose what trip (1 or 2) you want to reset.

In the example below trip 2 is reset:

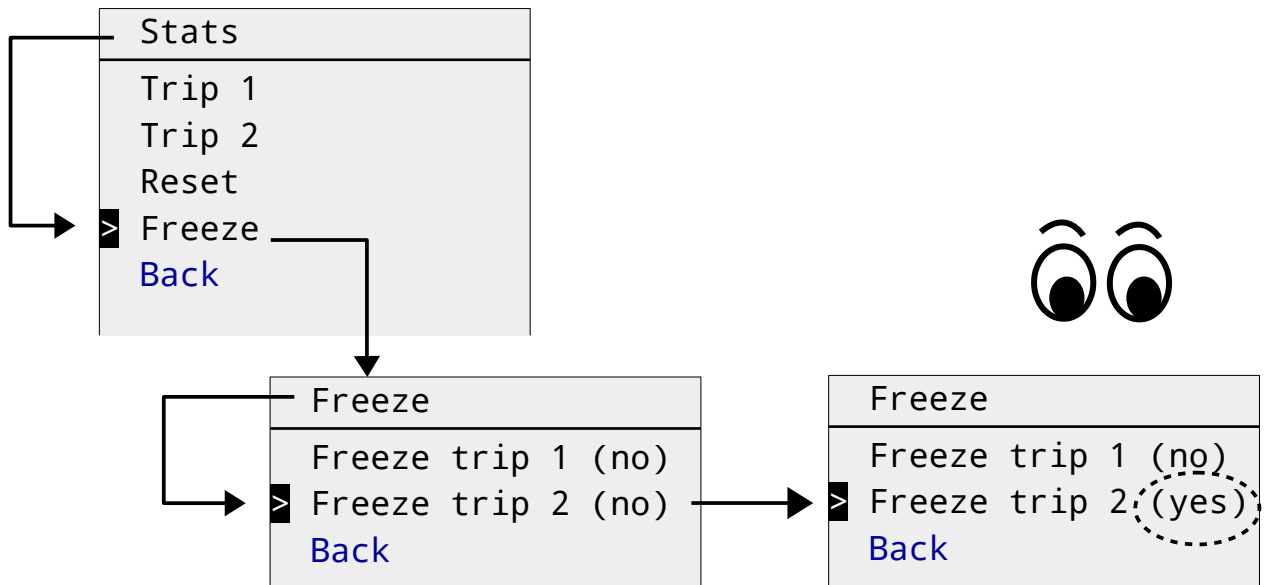


Note that the reset of statistics is executed immediately.
You don't need to go back to the main menu and select *Save & Exit*.

Freeze statistics

You can temporary stop recording statistics for trip 1 or 2 in any moment. This is useful if you want to analyze values about a particular road, or a particular day, and review data at home without having to take a notice on paper.

A “frozen” trip is depicted by *Yes* beside the name in the *Freeze* menu, as depicted in the example below (freezing of Trip 2):



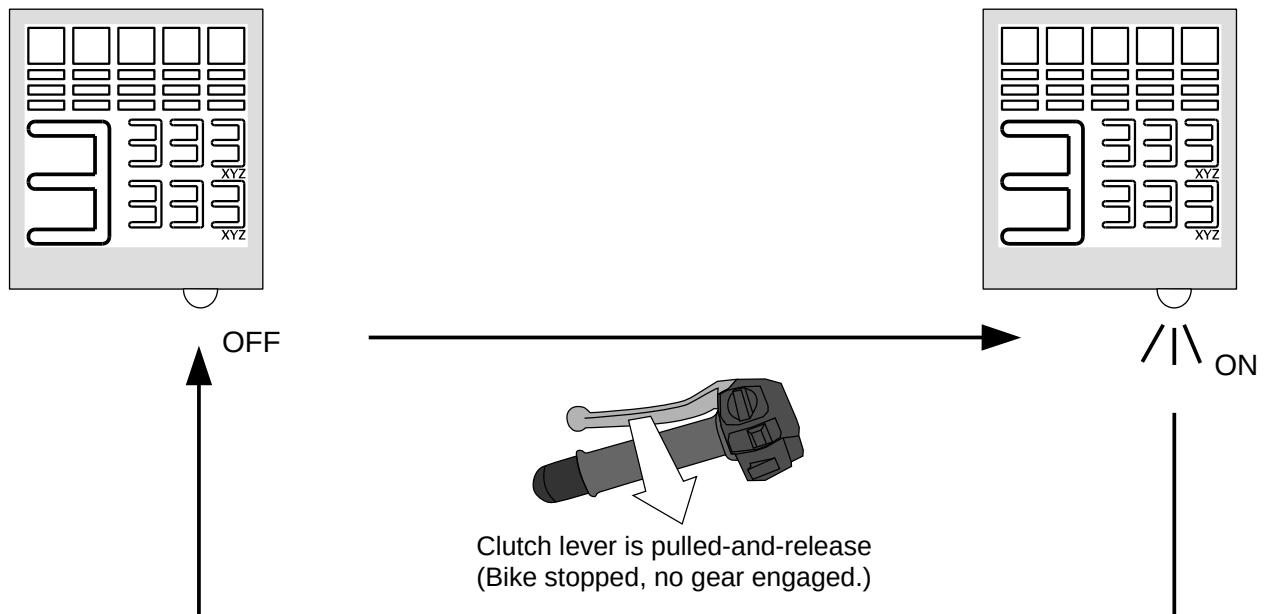
To make this command effective you have to go back to the main menu and select *Save & Exit*.

Led light

Periscope is equipped with a spot LED lamp. The light is useful at nighttime, when you need to look at a map/document or check your home keys.

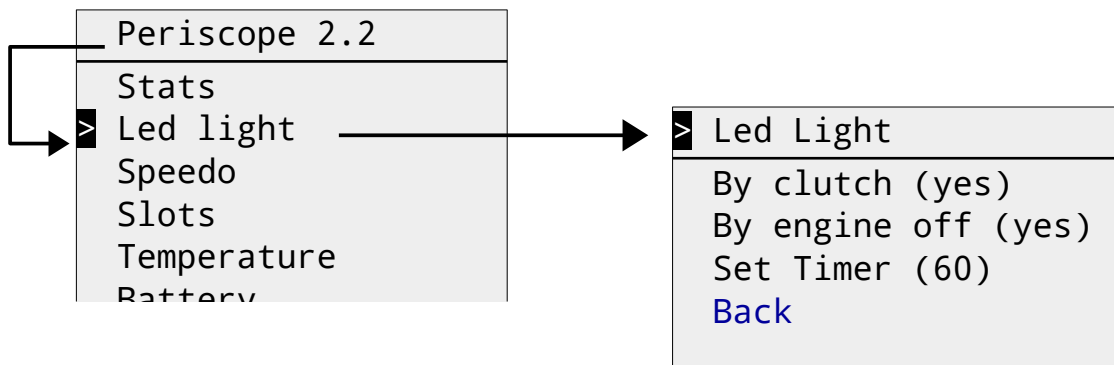
Turn it on/off manually

By default, you can turn on the light below the Periscope by pulling and release the clutch lever (when the motorcycle is not moving and the ignition key is on).



Note: if the engine is running, and you engage a gear, then the light will be automatically turned off.

LED light Settings

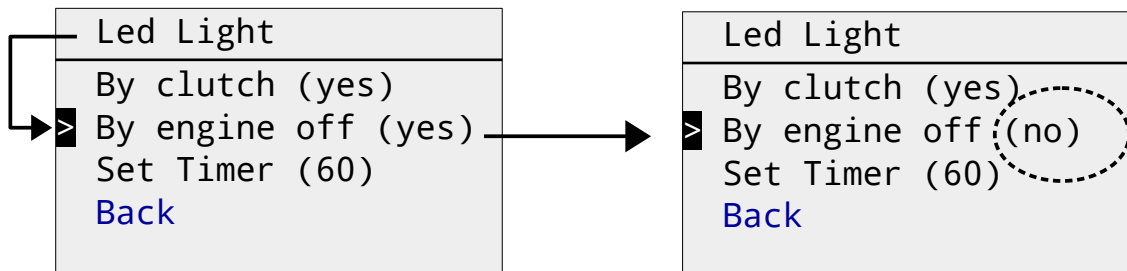


By using this menu you can decide to enable/disable the following options:

- to turn on/off manually the light by using the clutch lever,
- to turn on automatically the light every time after the engine is turned off (useful when parking at nighttime),
- to set the maximum amount of seconds the light will stay ON (useful to save the battery).

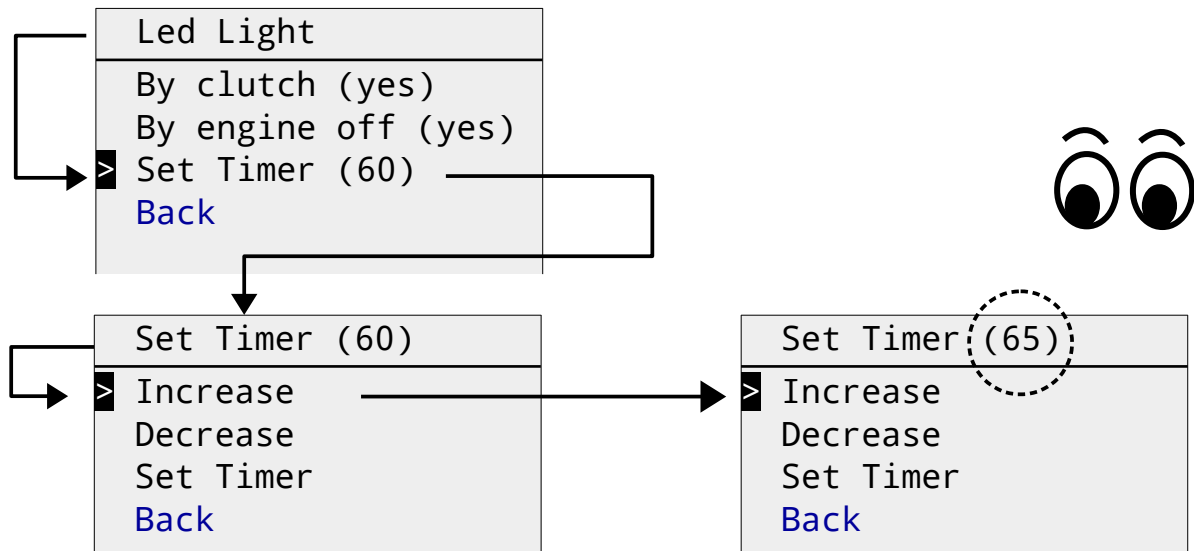
For enabling/disabling first two options you have simply move the cursor over the right command and toggle the value from yes to no (or vice versa).

For example:



To set the maximum amount of time the light could stay on you can use the timer option.

For example, the picture below show how to increase the timer (it can be increased/decreased with steps of 5 seconds):



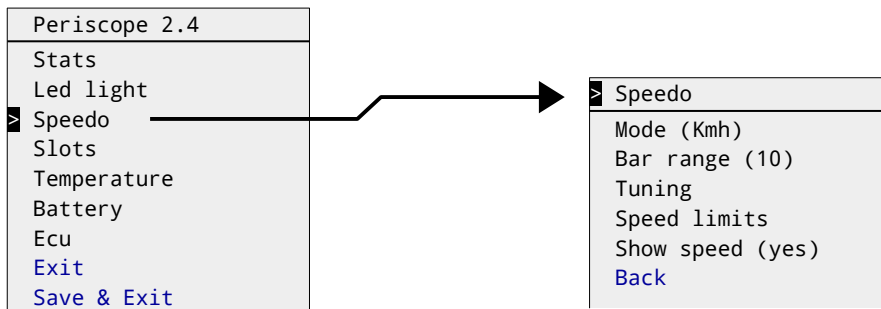
The timer can be useful to save the motorcycle battery if you forget your ignition key on the ON position (with the light ON too).



If you want to keep the light ON with no time-limitation, then decrease the value to 0 (zero).

Speedometer

By accessing to this menu you can personalize the way the speed is managed, to meet your personal needs/preferences:

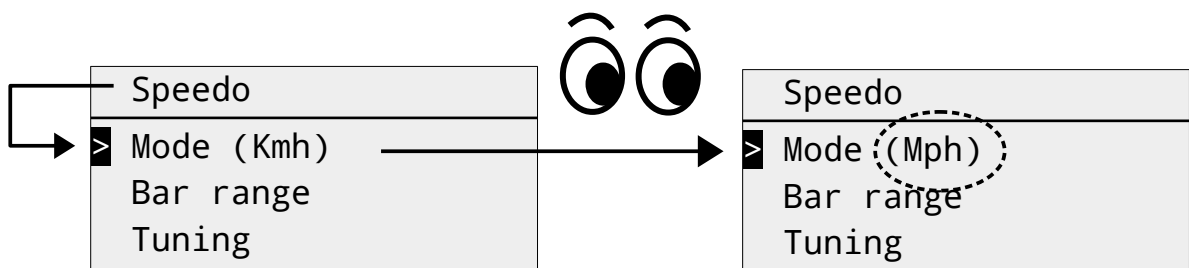


A note for non-native English speakers: the term 'speedometer' is equivalent to 'tachometer', used in middle/south-European countries. On the other side, in Anglo-Saxon countries, 'tachometer' refers to the instrument measuring the revolutions per minute of an engine.

Change the speed measure unit

Changing the measure unit is a useful option when you're going across foreign countries. To do so, you have to toggle the value beside the 'Mode' option in the 'Speedo' menu.

You can switch from Kilometers per hour (*Kmh*) to Miles per hour (*Mph*), or vice versa.





Please note that if you commute from Kph to Mph every single band on the band speed indicator (see above in the manual) will now have a value of 10 or 5 Mph, not 10/5 Kmh!

Obviously, the same symmetric case holds if you commute from Mph to Kmh.

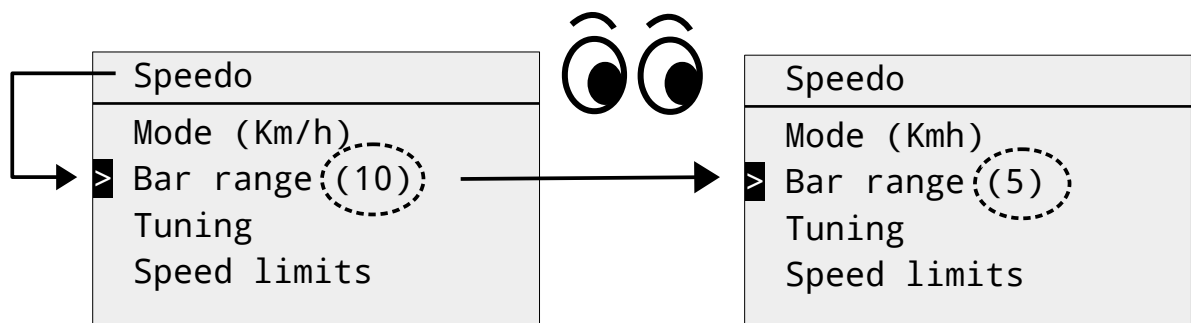
Note also that, if you have set, for example, a speed of limit 50 Kmh, then the colored band will switch color at 50 Mph. Obviously, the symmetric case holds if you commute from Mph to Kmh.

If you plan to stay long time in a foreign country maybe it could be a good idea to update your preferred speed limits too (see further in this manual).

Change the bar-range of the visual speedometer.

By default, every colored bar indicates a speed of 10 Kmh (or Mph). If you prefer a more fine-grained indication of the speed, you can switch it to 5 Kmh (or Mph).

All you have to do is to commute the value in the *Bar range* menu item:

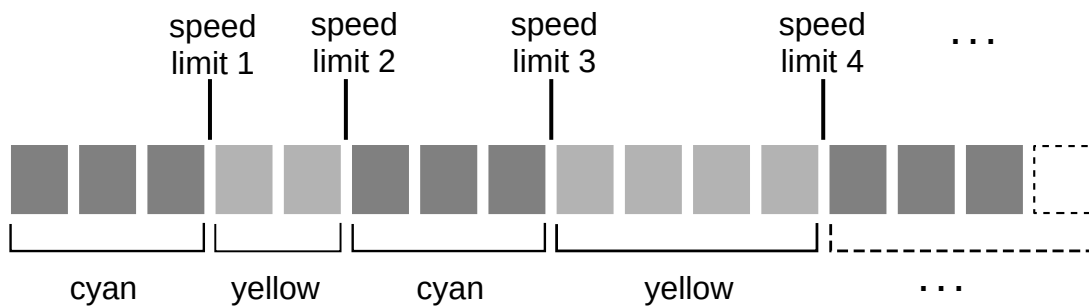


Speed limits

Since the first version of the Periscope the “speed limits” was designed to mark the most common speed limits existing on the roads. In this way you can take a quick look to the graphical indicator of the speed to quickly know if you are above or below the current limit.

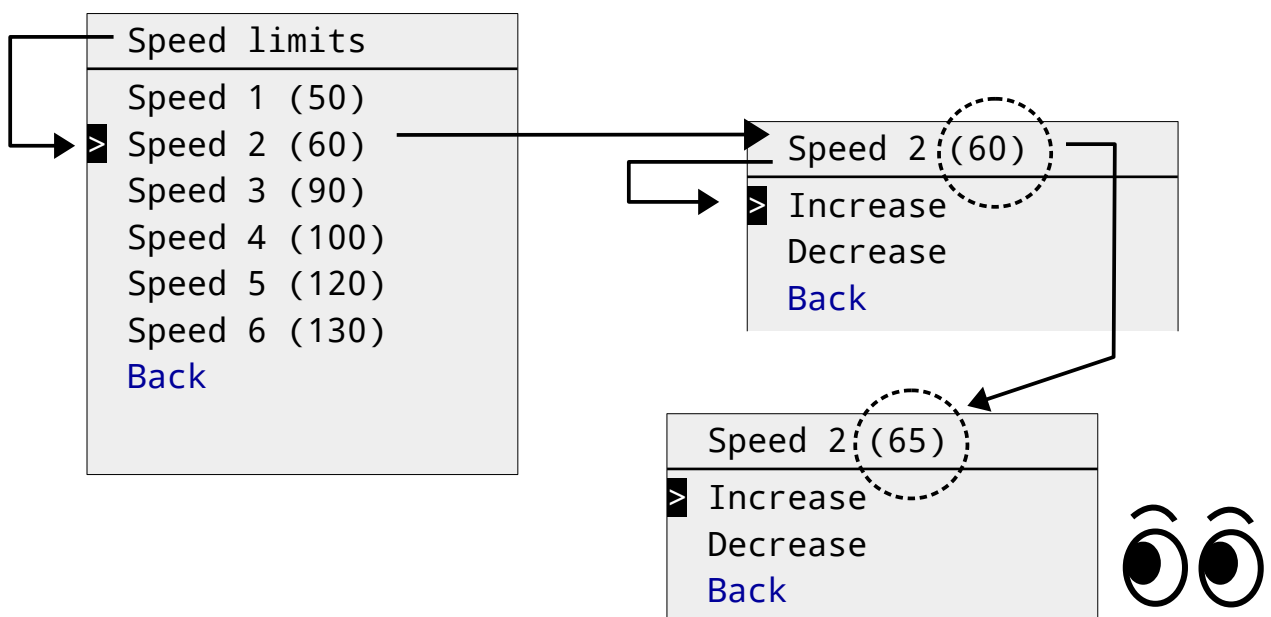
Anyway, you can use the “limits” just to set the color distribution that you like more.

You can set 6 values for 6 speed limits. Periscope will switch/swap the color, from cyan to yellow (or vice-versa), when the speed reaches a limit:



To change a limit, move the cursor on it and the select it. A sub-menu will allow you to increase or decrease the value.

In the example below, the speed limit 2 is increased to 65:





You should keep limits ordered! (I.e. limit 1 lower than limit 2; limit 2 lower than limit 3; and so on). If not, results are unpredictable.
Note also that only the first top-row of the indicator is coloured upon limits.



You can configure the limits by increasing/decreasing them with steps of 5 units. Nevertheless, you should note that if the "Bar range" option is set to 10 (as by default), the limit will be rounded to the next number multiple of 10.
In other words, if a limit of 45 is set, then the color will be switched when the speed of 50 kmh/Mph is reached.



I want all bars colored with cyan color at any speed, how I can achieve that?

Easy, just set all of the limits to 200.
In this way the speedometer will never switch to yellow color. (Note: 200 is the maximum value displayed on the visual speedometer.)

What if I want all bars colored in yellow instead?

Easy, set the limit 1 to zero, and all the other ones to 200.
In this way the speedometer will switch from cyan to yellow immediately.

Speedometer tuning



Please note that the speed reported by Periscope has only help/suggestion purposes. The speed shown by the standard speedometer mounted by the motorcycle manufacturer is the only one that the driver should observe.
Gimpo Garage UG is not liable for any improper use of the device as well as about problems that can occur on public roads or with current regulations/laws in your country.

Since all speedometers are quite optimistic, you can refine the speed showed by Periscope so it will be more close to the real value. (Or far away how much you want!)

In modern motorcycle the speed value is picked from the ECU and modified (in a mysterious way) by the circuits in the dashboard. Following the same principle you can do it by yourself by using Periscope instead.

To recalibrate Periscope you need to know the difference between your real speed while driving and the one showed on the display (by the numeric indicator). The most common way to do this is by using your GPS navigator.



Even if a GPS is not a very precise instrument, it can be used with satisfactory results if you maintain your speed as much as possible constant for at least 30 seconds.

Periscope needs to know the difference between the ECU-speed and the “real speed” at two precise speeds:

- at 60 Km/h (or 35 Mph),
- at 120 Km/h (or at 75 Mph)

The numerical difference that you see on the road (called “offset” in this manual) can then entered into the Periscope through the ‘Tacho’ menu.

For example:

Speed showed on your GPS	Speed displayed by the numerical indicator of the Periscope	Offsets 1 and 2 to be entered
60 Km/h	56 Km/h	4 (= 60 - 56)
120 Km/h	113 Km/h	7 (= 120 - 113)

The same happens if you have set Mph as measure unit on your GPS and Periscope both. For example:

Speed shown on your GPS	Speed displayed by the numerical indicator of the Periscope	Offsets 1 and 2 to be entered
35 Mph	32 Mph	2 (= 35 - 32)
75 Mph	71 Mph	4 (= 75 - 71)



Default offset values (in km/h) are

- Offset 1 = 5
- Offset 2 = 4

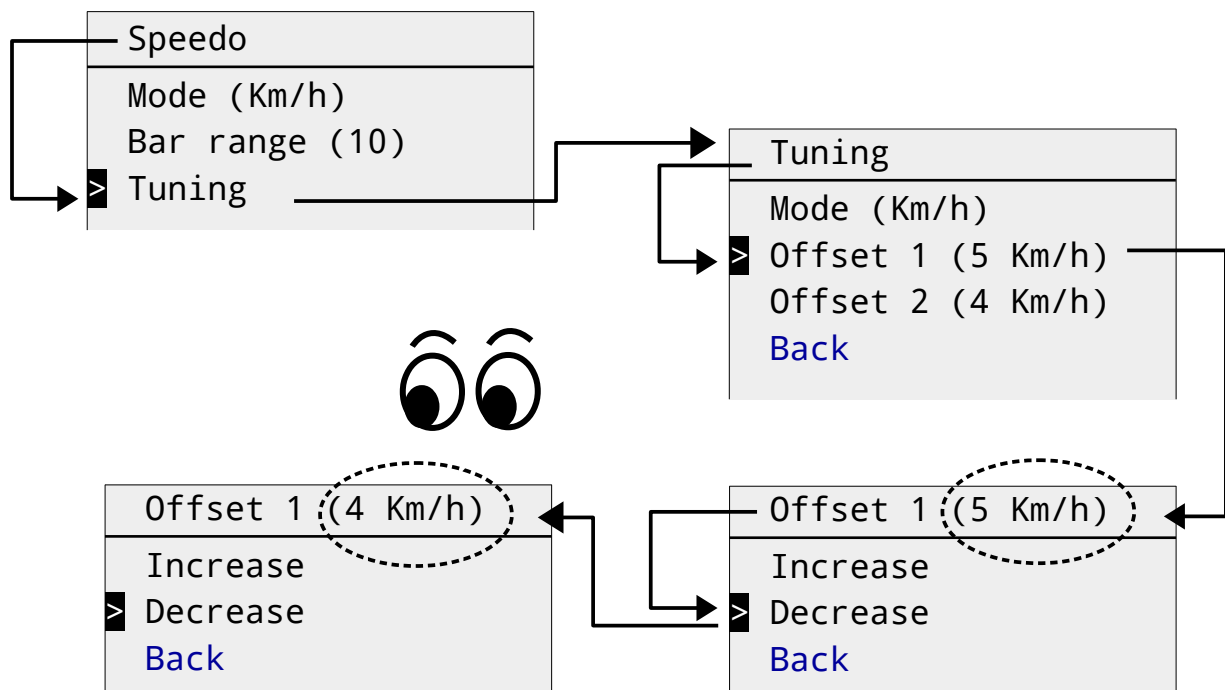
They was taken on a Moto Guzzi Stelvio 1200 4V equipped with Michelin Pilot Road 2 tires, but you can increment/decrement that value as you want.

The speed can slightly change when adopting other tires; even a small difference in the length of the circumference can affect the speed calculation in a motorcycle.

Once that you know the value for the two offsets you can enter them into Periscope.

To change an offset you have navigate to the *Tuning* menu and move the cursor to the the offset that you want modify. A sub-menu will allows you to increase/decrease the current value.

In the following example the Offset 1 is decremented by one unit:



To set the right measure unit for your tuning values, you have to set properly the *Mode* option before the tuning.

This option has not to be confused with the other one in the "Speedo" menu, the one having just visualization purposes.

To switch the tuning measure unit from Km/h to Mph (or vice versa) simply move the cursor over the *Mode* option and select it.



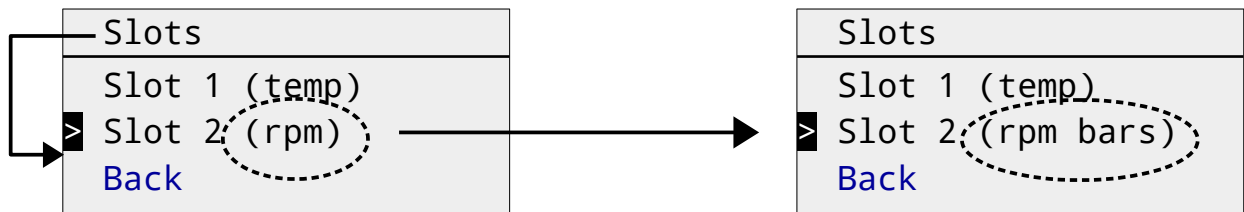
BE SURE THAT THE RIGHT MEASURE UNIT IS SET BEFORE ENTERING TUNING VALUES!

Choose the indicator in slot 1 and 2

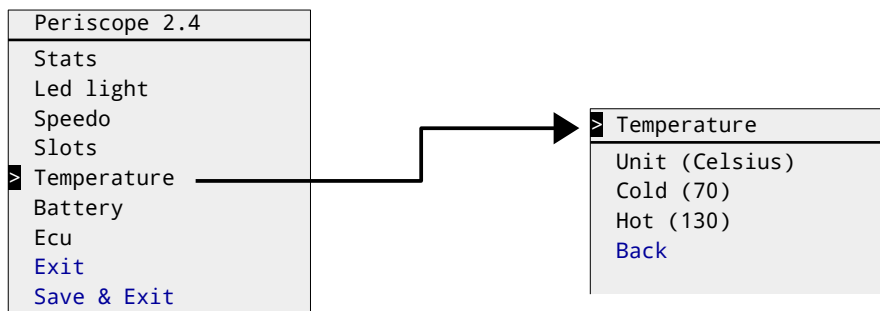
To choose what indicator to display in the area of the slots 1 and 2 you can use the 'Slots' menu and choose one indicator.

Available choices	Indicator displayed in the slot
speed	Numerical speed
temp	Numerical temperature
rpm	Numerical RPM
rpm bars	RPM band indicator
battery	Numerical battery voltage
TPS	Throttle opening in degrees

In the example below, the numerical RPM indicator in the slot 2 is replaced by the RPM bar indicator:



Settings for the temperature indicator



Measure unit

The Unit item allows you to choose between the two measure unit available for the engine temperature: Celsius or Fahrenheit.

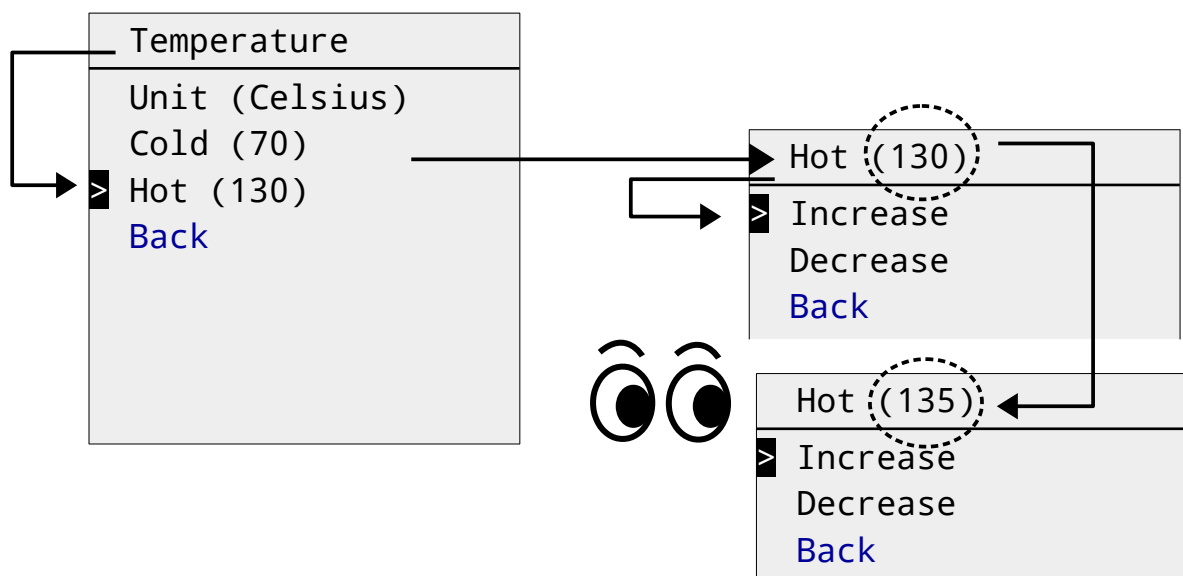
Please note that if you change the measure unit, then you probably have to change the alarm threshold values too (see below).

Temperature Alarm threshold

When displayed, the numerical indicator of the engine temperature will start flashing if the temperature is below a lower limit (cold motor) or if it raises above an upper limit (hot motor).

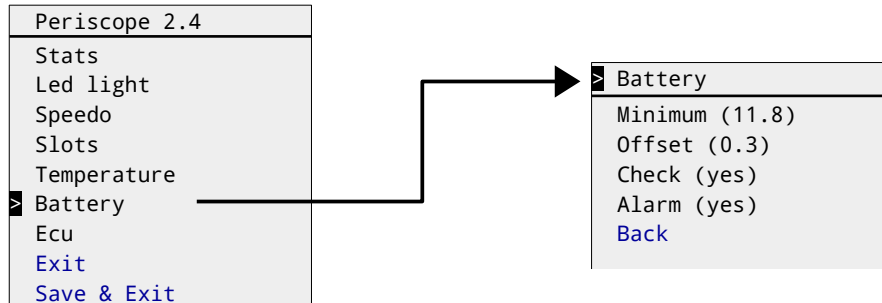
You can increase/decrease both thresholds (measured in Celsius degrees) by using the Temperature menu:

In the example below the upper threshold is increased by 5 Celsius degrees:



Configuring the battery voltage indicator

The Battery menu offer options to configure the settings for the numerical voltage indicator:



When displayed, the indicator will start flashing when the voltage level goes down the *Minimum* level. You can increase/decrease the level by moving the cursor over the item and selecting it.

The *Offset* setting is a parameter that you rarely will need to configure. It indicate an amount the difference in Volt between the voltage at the battery poles and the one reaching the ECU/Periscope.



The Periscope is not directly connected to the battery, so the picked voltage is always a little smaller than the real one. This well-know voltage-drop is due to the components adopted by the manufacturer to protect electric and electronics components (like fuses and diodes).

It can happen that the manufacturers apply some modifications to the electric circuits for production reasons without documenting such changes.

The raccomandation is to check the voltage directly at the poles of the battery by using a DMM (Digital Multimeter) and enter the proper *offset* accordingly.

The *Check* and *Alarm* options are enabled when the voltage is not visualized on slot 1 or 2. (i.e. the slots are configured to show some other indicator.)

If the *Check* is set to yes, then the voltage indicator will pops out on slot 2 when the dashboard turns on.

The indicator will remain visible until the engine is started.

The *Alarm* option is used to enable/disable the checking of the voltage during driving. If the voltage goes below the *Minimum* threshold, then the voltage indicator will pops out on slot 2 and it will start flashing.



The *minimum* value of the voltage is used to warn you about a battery malfunction. Possible reasons for that could be:

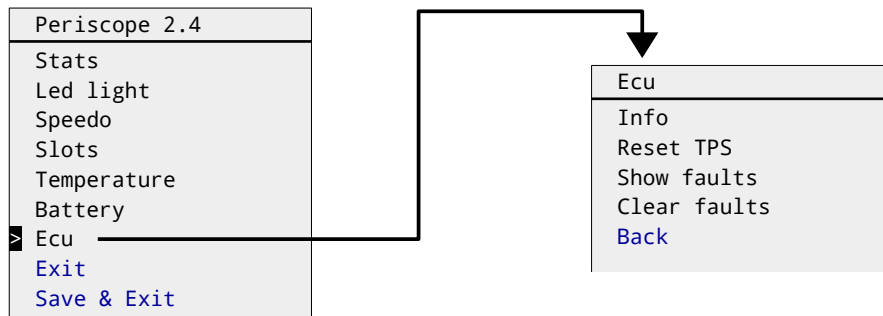
- the battery is damaged or too old to retain the charge,
- the generator of the motorcycle is damaged and it is no more recharging the battery.

If you will see a battery voltage below 12 Volt, after turning the ignition-key on, then you can be sure that there is some problem with your battery (regardless of the type: lithium, AGM, lead-acid, etc.)

Also note that, after starting the engine, the voltage should raise to around 13.7-14 Volt to allow the recharge of the battery. If this does not happens, then the generator of the motorcycle is probably damaged. In this case, there is a big risk that you will not be able to start again the engine after one stop.

ECU (Electronic Control Unit)

The ECU menu allows you to communicate directly with the Electronic Control Unit of the motorcycle.



Identification info

By selecting the *Info* item, the general information about the ECU will be displayed. The *upd* (update) ROW show the last time the ECU was written.

ECU Info
from: Magneti Marelli
type: IAW 5AM
ver: IAW5AMHW610
ser: CM227001
upd: 2019.04.24

Resetting the TPS sensor

The TPS sensor detects the opening angle of the air-throttle located near the fuel injector, his value is used for a correct fuel injection.

Normal values are:

Position of the throttle-handle	Standard value (degrees)	Tolerance	
		Min.	Max
idle position	4.8	4.7	4.9
fully opened	84	82	86

**Why should I reset the TPS?**

The TPS sensor indicates the quantity of air entering into the cylinders, it is necessary to ensure the right mixture of air and fuel. It works by sending an electrical voltage signal to the ECU, the more the throttle is open the more voltage value raise up.

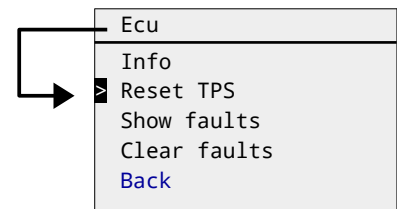
At idle position of throttle there is a minimum value of the voltage. The ECU assumes that value as the one corresponding to 4.8 degrees of opening.

Nevertheless, it can happens that the sensor changes his relative position along time (for example after cleaning maintenance, injector substitution, sensor substitution, screws getting loosed with time) so the minimum voltage is no more corresponding to 4.8° of throttle inclination. This happens because the sensor is very precise.

So, when you read values outside the allowed tolerance, a reset should be executed.

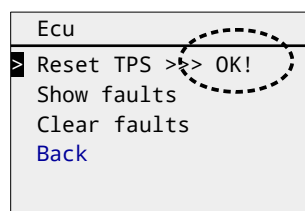
To reset the TPS start-position do the following:

1. Move the cursor to the *Reset TPS* entry in the *Ecu* menu.
2. Select the command by rotating the throttle-handle.
3. Now you have around 3 seconds to COMPLETELY RELEASE THE THROTTLE HANDLE (so it will return to the natural idle position.):



after 1 second: **Reset TPS >**
 after 2 seconds: **Reset TPS >>**
 after 3 seconds: **Reset TPS >>>**

4. After 3 seconds the reset-operation will be executed:



Be sure that you know what you're doing!

If you're not confident with the reset-TPS procedure, but you read abnormal TPS values by using the Periscope, then take the bike to an authorized dealer/workshop.

Gimpo Garage UG is not liable of any damage that can occur.

Read diagnostic trouble codes (faults)

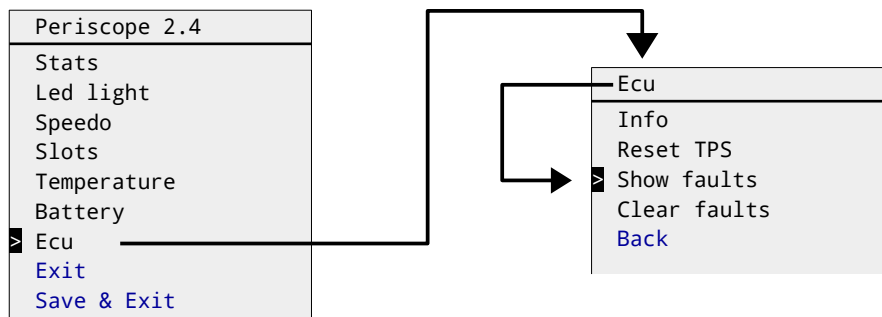
Diagnostic faults occurs when the ECU collects abnormal signals from sensors and/or other electronic units. Such faults indicate a possible damage or risk when/if you keep the motorcycle running anyway. Fault codes are classified upon the SAE J2012 normative. Nevertheless, a manufacturer can define his own special codes to fit particular needs.



A triangular warning light is turned on the dashboard when a fault occurs. This event indicates that you must bring the motorcycle to an authorized workshop/garage as soon as possible. Nevertheless, not all faults cause the warning light to turn on.

To read for current faults stored in the ECU do the following:

1. Move the cursor to the *Show faults* entry in the *Ecu* menu:



2. Select the command by rotating the throttle-handle.

3. Look at the results displayed on the screen. Here below an example:

Fault 1 of 2
Code: P0110
Norm: SAE J2019
Part: powertrain
Unit: fuel/air
State: above maximum
Cause: air temperature sensor

(For a detailed explanation of the codes and data please refer to the appendix at the end of this manual.)

Note: if more than one fault is stored in the ECU, then you can watch the next one by rotating the throttle-handle again.

4. Pull the clutch to return back at the *Ecu* menu, or simply turn off the ignition key.

Clear diagnostic trouble codes



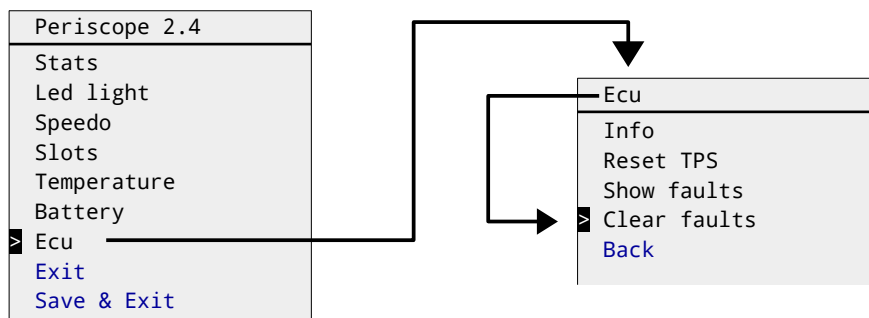
If you're not confident in clearing the codes, then it is recommended to entrust the operation to an authorized Guzzi workshop. Note also that, after deleting the errors, the mechanic in the workshop will be no more able to see them.

Gimpo Garage UG is not liable of any damage that can occur.

Diagnostic faults are permanently stored in the ECU memory until they are deleted. Deleting the faults does not solve the problem *per se*. So the clearing operation should be done only after the problem has been fixed.

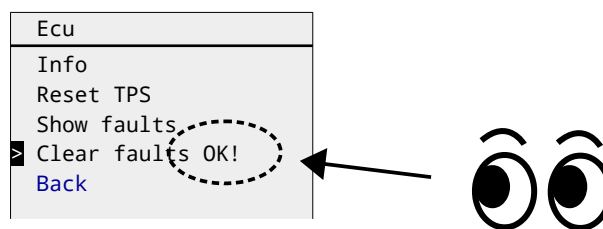
To clear all the faults stored in the ECU do the following:

1. Move the cursor to the *Clear faults* entry in the *Ecu* menu:



2. Select the command by rotating the throttle-handle.

3. Check if the operation has been executed with success:



4. Pull the clutch to return back at the *Ecu* menu, or simply turn off the ignition key.

Note: if the *ERROR* message appears, then there could be a problem with your ECU. It is recommended to take the motorcycle to an authorized dealer/workshop.



Clearing the fault codes normally should make the warning-service light turning off. However, some faults are detected by the ECU only if the engine is running. So, the error could come back after starting the engine again. This means that the problem has not be fixed.

Maintenance

Cleaning

Use only water and mild soap to remove dirt from the display screen. All other parts can be washed normally like any other part of the motorcycle.

Fuse substitution

To extract the fuse use the tip of a screwdriver. After a little rotation, the cap will pop up.

Use only fuses with following characteristics:

Type	Glass fuse – “fast blow” (or AGC)
Max current	1A
Max voltage	250V
Dimensions	5 x 20 mm (diameter x length)

Appendix

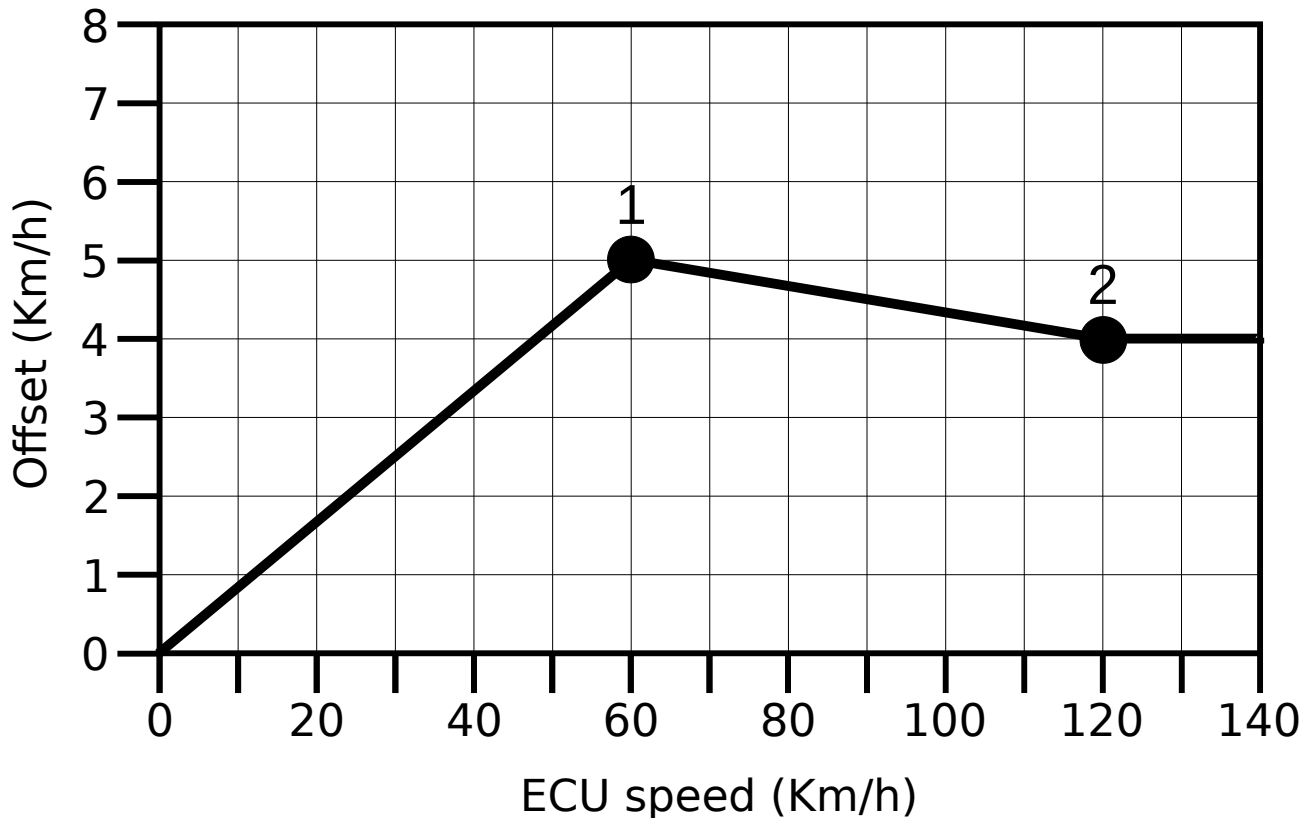
List of default settings

Setting	Default value
Turn on light when the engine stops	YES
Turn on the light when clutch lever is pull-and-released.	YES
Maximum time the light can stay ON (seconds).	60
Indicator on Slot 1	Temperature
Indicator on Slot 2	RPM (graphical)
Speedometer mode	Km/h
Speedometer tuning mode	Km/h
Offset 1	5 (Km/h)
Offset 2	4 (Km/h)
Speed limit 1	80
Speed limit 2	100
Speed limit 3	130
Speed limit 4	150
Speed limit 5	200
Speed limit 6	200
Temperature – minimum (°C)	70
Temperature – maximum (°C)	130
Battery – minimum (Volt)	11.8
Battery – offset (Volt)	0.3
Battery check	YES
Battery alarm	YES
Bar range (Kmh / Mph)	10
Temperature unit	Celsius

Speedometer tuning details

To calibrate the speed showed by the display Periscope uses the entered offset values to create a “correction curve”. It represents the value to be summed to the one provided by the ECU, to obtain the correct speed value.

The curve is calculated by interpolating the offsets 1 and 2 in a linear way, as depicted by the example diagram below (default settings are shown).



In the example, the offset

- grows linearly from 0 to the value of *Offset 1* (for speeds between 0 and 60 Km/h),
- decreases linearly until it reaches the value of *Offset 2* (for speeds between 60 and 120 km/h),
- stay constant at the value of *Offset 2* for all speeds greater than 120 Km/h

The resulting offset value is then added to the ECU speed to obtain the correct speed.

$$\text{Correct speed} = \text{ECU speed} + \text{Offset}$$

Please note that the same behaviour holds when the offsets are entered in Mph in place of Km/h. In this case the predefined offset speeds are 35 and 75 Mph for offsets 1 and 2 respectively.

Please note also that the values for offset 1 and 2 are independent. They can have any value, even zero.

ECU fault - screen description

	Value	Meaning
Code	PXXX	the code of the fault. See appendix: <i>Eco faults – code list</i>
Norm	SAE J2012	the code is defined by the SAE normative
	not standard	the code is defined by the manufacturer
		Part and specific unit of the vehicle involved
Part	powertrain	engine and/or transmission part of the vehicle
	chassis	steering, suspension or brakes
	body	secondary accessories for the driver
	network	computers and/or their communications lines
Unit	fuel/air	air intake or fuel tank
	injection	air/fuel mixing system (i.e. injectors)
	ignition	ignition timing system (misfire problems)
	emission	components regulating gas emissions (i.e. catalytic converter)
	computer	one of the computer units mounted on the vehicle
	transmission	gearbox and/or drive-shafts
	speed control	vehicle speed controls and idle control system
	unknown	-
		Sensor value (if applicable)
State	below minimum	the numeric value is below the allowed range
	above maximum	the numeric value is above the allowed range
	invalid signal	the numeric value is not congruent or expected
	no signal	no numeric value is received or no activity is detected
	unknown	-
Cause	<text>	a very short textual description of the fault

ECU fault – code list

Code	Description
P0105	air pressure sensor (cylinder)
P0107	air pressure sensor
P0110	air temperature sensor
P0115	engine temperature sensor
P0116	engine temperature sensor – invalid/incongruent signal
P0120	throttle position sensor (potentiometer 1)
P0121	throttle position sensor (potentiometer 1 – invalid/incongruent signal)
P0122	throttle position sensor (potentiometer 2)
P0123	throttle position sensor (potentiometer 2 – invalid/incongruent signal)
P0124	throttle position sensor (potentiometers 1 and 2 – invalid/incongruent signal)
P0130	lambda probe (left cylinder)
P0134	lambda probe (left cylinder – no activity)
P0135	lambda probe heater (left cylinder)
P0136	lambda probe (right cylinder)
P0140	lambda probe (right cylinder – no activity)
P0141	heater of the lambda probe (right cylinder)
P0150	gas grip position sensor – track A (blue)
P0151	gas grip position sensor – track B (blue)
P0152	gas grip position sensor – track C (white)
P0153	gas grip position sensor – track D (white)
P0154	gas grip position tracks A and B (blue)
P0155	gas grip position tracks C and D (white)
P0156	inconsistent/incongruent position of the gas grip
P0160	self-learning of throttle position (failed)
P0161	self-learning of throttle return time (failed)
P0162	self-learning of throttle idle position (failed)
P0163	incongruent rotation of the throttle (recovery necessary – maybe ice in the air duct)
P0164	self-learning tests not executed because of low power voltage
P0167	throttle position error, misalignment with respect to the position detected by the sensor
P0169	engine starter switch (invalid/incongruent signal)
P0170	engine starter switch
P0201	left injector
P0202	right injector
P0205	left injector (electric problem)

P0210	air intake (small overpressure)
P0215	air intake (too high / too low pressure)
P0217	air intake (small depression)
P0230	fuel pump
P0335	camshaft sensor
P0336	engine rotation speed sensor
P0351	central coil (left cylinder)
P0352	central coil (right cylinder)
P0353	lateral coil (left cylinder)
P0354	lateral coil (right cylinder)
P0461	gear sensor
P0510	self-learning of rear wheel radius (failed)
P0601	EEPROM memory problem in the ECU
P0604	RAM memory problem in the ECU
P0605	ROM memory problem in the ECU
P0607	analog-to-digital converter problem in the ECU
P0608	engine reset executed (protection level 2)
P0609	engine stop (for safety reasons)
P0610	Relays of the rear brake-light
P0611	all current ECU data memorized (after fault P0609)