

Instruction manual

EcuPlus

Counter T3

Version 1.1

English



Release

EcuPlus®
Team
ITALY

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Moreover it is underlined that the information in this document is subject to change without notice and has not to be interpreted as obligation on EcuPlus® side.

We are grateful for references to mistakes or for improvement proposals in order to offer an even better product in the future.

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1.0 Introduction

Thank you for having bought the EcuPlus® products and we hope you can get the best satisfaction from it. This manual will help you understanding functional, installation and management requirements of your new Tachometer.

1.1 Conventions and terminology used

In the following table, there are described the conventions used in this manual about the symbols.

 WARNING	Dangerous operation for your safety
	Operation not allowed
	Relevant information
	Pay attention

- **EGT**
Exhaust Gas Temperature
- **Run**
It is the session of the engine usage considered from its ignition until the engine off. Every time the engine starts, it starts a new run.
- **Run time**
It describes the time elapsed from the ignition of the engine until the time of reading.
- **RPM Peak**
It is the maximum peak reached by RPM.
- **Temperature Peak**
It is the maximum peak reached by Temperature.
- **Coil**
Ignition coil
- **Firmware**
Firmware is a software constituted by instructions that are executed inside the Ecu. The Ecu firmware can be updated any time by the user, in order to allow the use of the most up to date functionalities.
- **Ecu**
Engine Control Unit

1.2 Product warranty

This product is designed and manufactured to the highest standards to give high quality performance, ease of use and installation.

In case of problems during installation or use of the product, please refer in first instance to the instructions or the information contained in the user manual. If the product proves defective, EcuPlus® arranges for its repair, replacement, refund or the provision of related spare parts under the terms of the warranty in force in the country where it was purchased.

The warranty begins on the day the product is purchased and ends after two years (24 months). If defects occur due to a fault in material or workmanship during the warranty period, EcuPlus® provides the repair or replacement of the product at its own expense. In case of product replacement, the start date of the warranty is the date of purchase of the original product.

The costs of shipping, are to be paid by the consumer.

The warranty is valid only if the warranty card that attaches the electronic unit, filled in all its parts by the purchaser and accompanied by valid proof of purchase (sales receipt to the consumer), is presented at the warranty intervention request.

- The warranty does not cover damage caused and does not apply in the following cases:
- The purchase documents have been altered in any form or made unreadable.
- You have performed repairs, modifications or alterations to the product by unauthorized people.
- The product is not used properly and therefore not respecting the instructions in the instruction manual.
- There are defects caused by misuse, improper use not in accordance with the recommended operation of the product.
- There are defects caused by accessories or additional devices connected and not recommended by EcuPlus®.
- There are defects caused to the product accidentally including, without limitation, abnormal voltage, exposure to fire or accidents related to the sport.
- The serial number (serial number) on the product should not be in any way made illegible or deleted, otherwise void warranty
- The warranty parts subject to wear following use as connecting cables, connectors, box enclosing and temperature probes that do not have manufacturing defects.
- After the warranty period, assistance actions will be expounded by charging the parts replaced, the cost of labor and transport, according to the rates in vigor.

After the warranty period, the assistance interventions will be performed by debiting the replaced parts, labor and transport costs, according to the rates in force.

1.3 Technical support

Do you need support?

Before contacting EcuPlus® it is suggested to carefully read the instructions and refer to the section on troubleshooting.

You can obtain technical support by writing to: technical@ecuplus.it

1.4 Package content

1.4.1 Standard equipment (Kit code: U.TC-IEC)

- EcuPlus Easy Counter T3
- Velcro & nylon cable ties
- Installation manual

1.4.2 Optionals

- Universal temperature probe, cod. T.TK-P1E
- Engine temperature probe kit “**Flexible**”, cod. T.TK-P2FE
- Engine temperature probe kit “**Rigid**”, cod. T.TK-P2RE
- EGT measurement kit, cod. T.TK-P3E
- Thermocouple Adapter, cod. T.TK-ADP
- Rpm signal acquisition clip from high voltage Coil lead, cod. A.CL-AT1
- Micro USB C-B cable, cod. H.USB-CB
- Micro USB B-B cable, cod. H.USB-BB
- 3 Pin connector, cod. A.CN-B3P
- Bluetooth A Class connection module, cod. H.BTA-01 (in preparation)

2.0 Operation overview

EcuPlus® Easy Counter T3 is an advanced, handy and portable multifunctional instrument. The combined measurement of engine rpm, temperature, elapsed time, and also of maximum data value reached allows you to better monitor and/or adjust your 2 or 4-stroke petrol engine. Furthermore, the possibility of connecting it to a smartphone or PC makes this rev counter a useful development tool not only for the engine, but also for the vehicle being tested.

Thanks to its compact size, the digital tachometer for combustion engines is a flexible tool that can be used outside the workshop or directly installed on your vehicle. The device can measure the revolutions of engines with up to sixteen cylinders and thanks to its simplicity of use, it can also be used by non-professional mechanics.

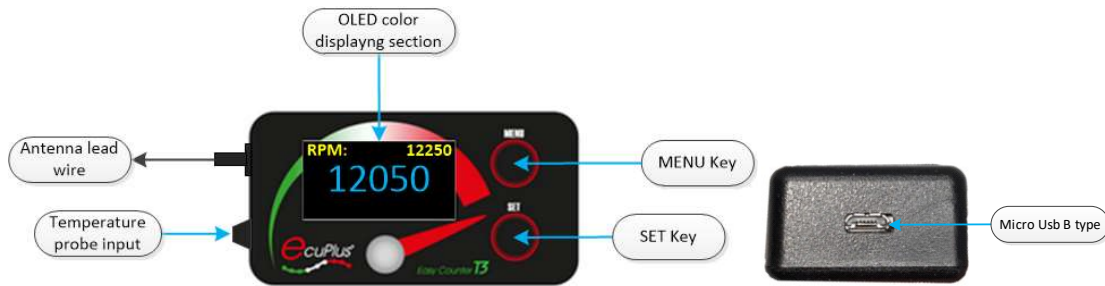
This device is built with a waterproof structure so that water cannot enter the device during normal engine operation if it is wet due to rain or water splashes.

2.1 Device functionality

- Measure the RPM through the spark plug cable
- Temperature measurement
- Run Time measurement
- Stores data acquired during the test
- Configuration Menu
- Integrated and rechargeable LiPo battery
- Smartphone connection
- Firmware upgradeable

The Easy Counter T3 units are a great help to the development of your Engine.

3.0 Counter T3 overview



Antenna lead: The tachometer is activated when a spark is induced in the spark plug and the pulse count allows the calculation of revolutions per minute.

Temperature probe: Input dedicated to type K temperature probes. Consult chapter 3.4 about the available models.

OLED display: In the OLED type 0.96 inch multicolor screen, the tachometer displays all the acquired information.

MENU Key: menu navigation button; refer to chapter 8.0.

SET Key: menu option selection button; refer to chapter 8.0.

Micro Usb B type: Connection for battery charging and communication with smartphone/tablet

3.1 Easy Counter T3 connection and installation

The tachometer installation is very easy:

Attach the antenna lead wire to the ignition plug cord with the Clip as shown in Fig.1 or wind the lead wire around the cord three to five turn after removing the clip from the lead wire, and fix the lead wire with an insulating tape etc.

Alternatively, use the Push Clip on the ignition plug cord after removing the clip from the lead wire as shown in Fig. 2

For a multicylinder engine, lay the lead wire so that the wire passes close to all ignition plug cord.



Fig. 1



Fig. 2

- Fasten the Tachometer using biadhesive velcro or nylon cable ties taking care avoiding high temperature areas. Due to vibrations, it is recommended not to install the Tachometer directly on the engine.

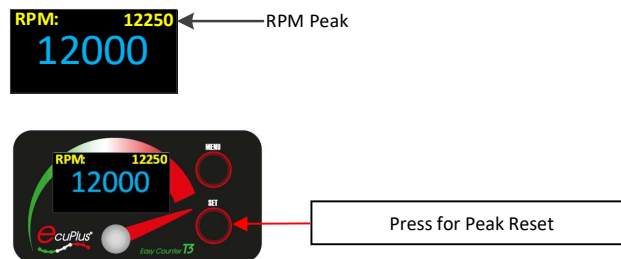


Make sure that the tachometer and the antenna electric wire do not obstruct operation of the engine at the time of fixing the tachometer and wiring the lead wire. A serious accident might occur.

3.2 How to measure the RPM

- Attach the tachometer to an engine or to an appropriate location on the engine mounted equipment with the supplied hook and loop tape. (Velcro tape)
- Attach the antenna lead wire to the ignition plug cord with the clamp as shown in Fig.1/2 or wrap the conductor wire around the cable with three to five turns after removing the clamp from the lead wire, and fasten the conductor wire with electrical tape, etc. For a multi-cylinder engine, lay the conductor wire in such a way that the wire passes close to all the cables of the spark plug.
- Select the spark plug firing referring to the table in Fig. 3. through the (Setup menu Fig.7)
- If the tachometer is initially off, when the engine is started the tachometer, after some functional checks, shows the number of revolutions of the engine.

While using the tachometer, the RPM Peak is shown in the top right of the display and stored in the device's internal memory and to be available when the device is re-started.



During operation it is possible to reset the Peak quickly in order to facilitate the engine inspection. For Peak reset, press the SET button.

Menu Easy Counter T3	Engine Type	Spark plug firing and engine rotate laps	RPM Capacity
21:42	2 stroke 1 cylinder 4 stroke 2 cylinder	1 spark per revolution	150-30000
:41	4 stroke 1 cylinder	1 spark 2 revolution	150-30000
22:44	2 stroke 2 cylinder 4 stroke 4 cylinder	2 spark per revolution	50-15000
23:46	2 stroke 3 cylinder 4 stroke 6 cylinder	3 spark per revolution	0-9500
:43	4 stroke 3 cylinder	3 spark 2 revolution	100-19000
22:48	2 stroke 4 cylinder 4 stroke 8 cylinder	4 spark per revolution	0-7500
:45	4 stroke 5 cylinder	5 spark 2 revolution	100-12000
26:412	2 stroke 6 cylinder 4 stroke 12 cylinder	6 spark per revolution	0-5000
:416	4 stroke 16 cylinder	8 spark per revolution	0-4000

Fig. 3

3.3 Precautions for use

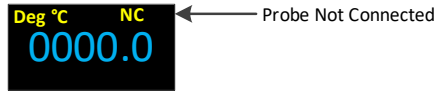
Signal detection position

- In case the ignition cables are separated from each other, the number of rpm displayed may be incorrect. When this happens, select a location of pulse detection so that the antenna lead wire passes close to all spark plug leads.
- In the engine of a car or other, Equipped with a distributor, if is possible, do not select a position near the distributor or ignition coil as the pulse detection position because the displayed RPM can be significantly wrong. For such an engine, select the pulse detection position so that the distributor and coil do not interfere with the tachometer.
- The spark plug firing must be selected by referring to the basic number of ignitions of an engine to be measured. When multiple cylinders simultaneously ignition in a multi-cylinder engine, change the position for the pulse detection clamp.

3.4 How to measure the Temperature

The Tachometer has a temperature measurement input, capable of detecting temperatures between 0 °C and 1000 °C through thermocouples probes.

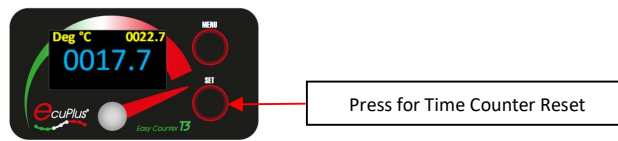
Connect the temperature probe to the specific connector placed on the instrument. The device is able to detect the presence of the probe and autonomously activate the temperature measurement also in combination with the engine revolutions measurement.



While using the thermometer, the Temperature Peak reached is shown in the top right of the display and stored in the device's internal memory and to be available when the device is re-started.



During operation it is possible to reset the Peak quickly in order to facilitate the engine inspection. For Peak reset, press the SET button.



If the probe is connected and the menu displayed is the one relating to the instantaneous temperature, the device will never turn off the screen, thus allowing it to be used as a normal thermometer.

The unit of measurement used by the device can be selected through the Setup Menu and precisely between degrees Celsius or Fahrenheit Fig.7.



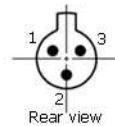
The presence of RPM is not necessary for temperature measurement

Probe type:

Compatible probes are **K Type:** ([Chromel](#) (Ni-Cr) (+) / [Alumel](#) (Ni-Al) (-). If you have specific probes, you can create temperature probes suitable for your application by following the pin-outs below or by using the specific Thermocouple Adapter cod. T.TK-ADP.

For more information, consult the technical specifications of the sensors available on the EcuPlus website.

Connector:



Type: Binder 719 series

- Pin 1 = Thermocouple (-)
- Pin 2 = Not Connected
- Pin 3 = Thermocouple (+)



The Tachometer is not compatible with temperature probes of the following type:
J, T, E, N, B, R, S, NTC, PTC.

3.5 How to measure the Elapsed Time

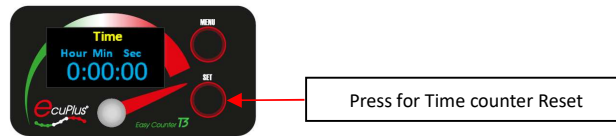
The device has the function of measuring the time elapsed from the moment of starting through the engine revolutions or pressing the Menu button, to the moment in which it performs the Sleep function.

The time is accumulated during operation, is displayed in the appropriate Time menu and is stored in the internal memory of the device which can also be viewed at the next restart.

The indication of the elapsed time is reported in hours, minutes, seconds and the maximum calculable value is 9hours :59min :59sec. At the end of 10 hours, the counter restarts from zero.



During operation, the Time counter can be reset by pressing the Set button.



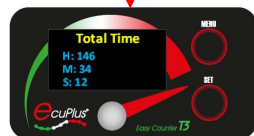
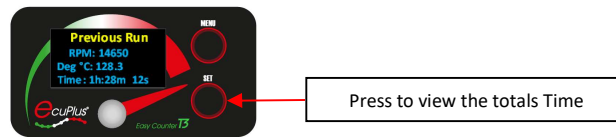
The device also has the function of measuring the time elapsed with the motor running and the total time is accumulated in a dedicated counter which is stored in the internal memory of the device. This data can also be viewed at the next restart.

In order to allow the possibility of reviewing the maximum values acquired in the previous Run, the device has a dedicated Menu that shows the following information:

- Maximum RPM reached
- Maximum temperature reached (according to the currently selected unit of measure)
- Elapsed time of the Run

The displayed data are saved in the device memory upon entering Sleep mode and are reloaded when the device is restarted according to the following logic:

- RPM -> saved only if there was the presence of engine rpm
- Temperature -> saved only if the temperature probe is present
- Run time -> is saved if RPM is present or if the temperature probe is connected or both are present.

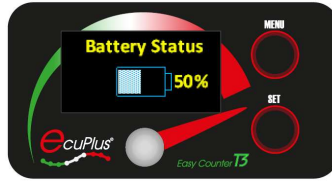


Note: while the Total Time menu is displayed, the hours value on the screen is not updated.

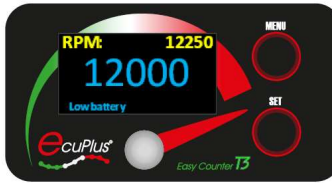
The maximum hours storable value is 32500h and cannot be reset. Upon reaching this value, the counter restarts from zero.

4.0 LiPo battery status and charge menu

The device is equipped with a LiPo rechargeable battery and the charge status can be viewed through the special menu that can be selected through the Menu button.



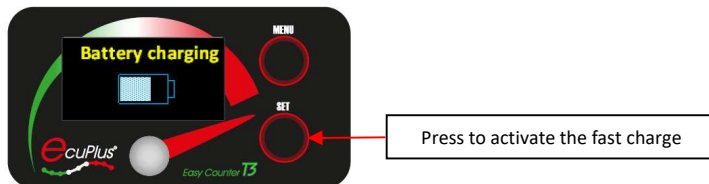
When the charge level reaches 10%, the "Low battery" warning message appears on the screen.



 The Low battery message will appear in the RPM and temperature menu.

For recharging, use any 5V power source with a type B micro Usb connection. Thanks to a dedicated electronic component, the device monitors and recharges the battery safely.

If the battery is charging correctly, the following image is shown with animation in the same menu indicating the charge status.



The battery charging times depend on the state of charge in which the recharge is carried out and on the state of health of the LiPo battery. Indicatively starting from the "Very low" condition, the time to reach 100% charge is 1.5 hours (If the power source is capable of delivering at least 150mA, otherwise it will take longer).

If the battery charging is in progress and you unplug the USB cable, the device will show the state of charge of the battery.

Note: wait about 10 seconds and reselect the charge status menu to view the real autonomy.

The Figure 4 shows the autonomy of the device in the different states of charge.

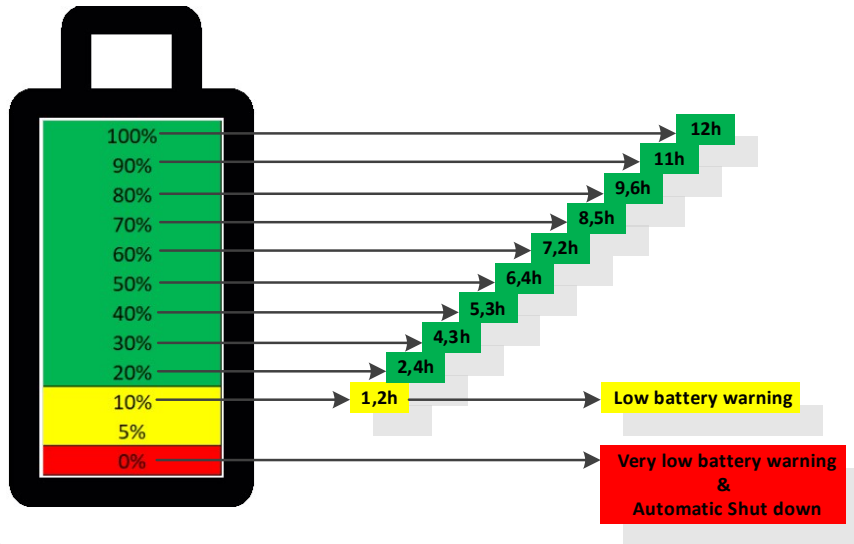


Fig. 4

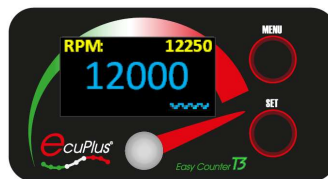
The autonomy values refer to a current absorption in conditions of RPM presence and a battery temperature of 22 °C (71.6 °F). The autonomy of the battery is therefore strictly linked to the conditions of use of and its state of health and longer times are encountered if the device is used without RPM measurement.



To obtain the shortest possible charging time, activate sleep mode by pressing the Set key (see Main menu).

4.1 Battery temperature monitoring

In order to safeguard the battery and the electronic integrity, a dedicated internal probe checks constantly the temperature. If the temperature is too high, a specific icon will appear on the screen.



the high temperature alarm is displayed in the following screens:

- RPM display
- Temperature measurement
- Battery status (both charging status and charging in progress).

The alarm icon remains displayed even when the temperature is within acceptable limits and can only be removed by pressing the menu button.



With the alarm active there are no functional limits but it is absolutely necessary to place the device in a colder position, otherwise the performance of the LiPo battery will be irreversibly reduced.

4.2 Battery maintenance rules



Even though LiPo batteries get better all the time, they don't have infinite lifespan. To reach 500 charge/discharge cycles, it is necessary to strictly follow some rules:

- A good rule of thumb here is the "40-80 rule". You can easily extend the overall battery life with a simple trick: charge it just over half, between 40 and 80%.
- Avoid using the device in very hot environments ($> 45^{\circ}\text{C}$) for a long time
- Charging must be done at the right temperature which varies between 18 and 25°C ($64.4^{\circ}\text{F} - 77^{\circ}\text{F}$) Do not load the LiPo in a very cold place.
- If the device is not used for a long time, always keep the charge state between 40 and 80%. Therefore, avoid completely discharging the battery until the device turns off automatically.

5.0 Auto Power Off function

In order to increase the battery life, the device has the function, Auto Power-OFF.

The following actions keep the device awake:

- Engine running
- Temperature probe connected and temperature display menu active
- Use of the MENU and SET buttons
- Usb powered for battery charging
- Android App connected

The opposite of the above conditions activates the Auto Power-OFF. The AUTO Power-OFF time can be selected through the Setup menu and precisely between 5/20/60 seconds (default value: 20).



Whenever the device wakes up, after the initial check, the menu displayed is the one relating to engine revolutions.

6.0 RPM rounding function

In order to make it easier to read the value of the engine revolutions, the indicated RPM is normalized by rounding.

The rounding value can be set from the menu according to the following RPM options:

- 10
- 50
- 100

For setting, see the Setup menu, Fig. 7

7.0 Smartphone connection

Through the micro Usb type B port, together with the dedicated App, it is possible to interface the Counter to the Android smartphone or tablet.

In this way the potential of the device is expanded allowing an easier visualization of the information. Thanks to the future development of the App it will be possible to record the data of the T3 Tachometer together with those acquired by the Android device and thus offer a fun tool for analyzing your system.

Once the App has been downloaded in the specific SW download section of the website www.ecuplus.it, install the App, activate it and proceed as follows:

- Connect the tachometer to the smartphone via the micro Usb type B cable
- If off, turn on the tachometer using the Menu button or start the engine
- Press the communication button provided in the App as shown in Fig. 5

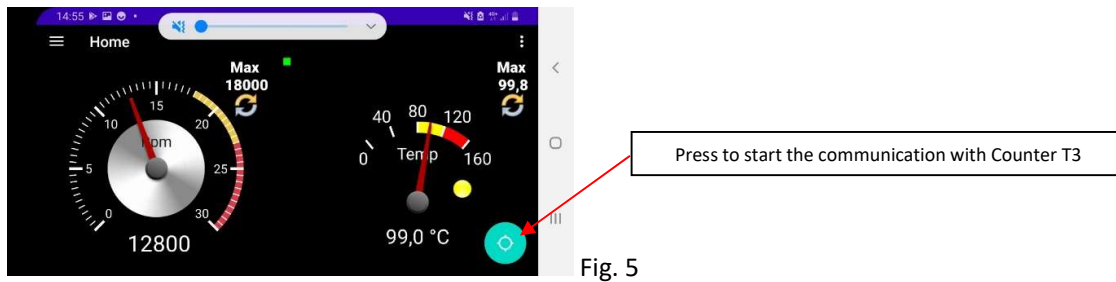
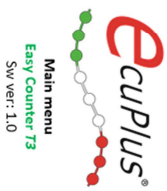
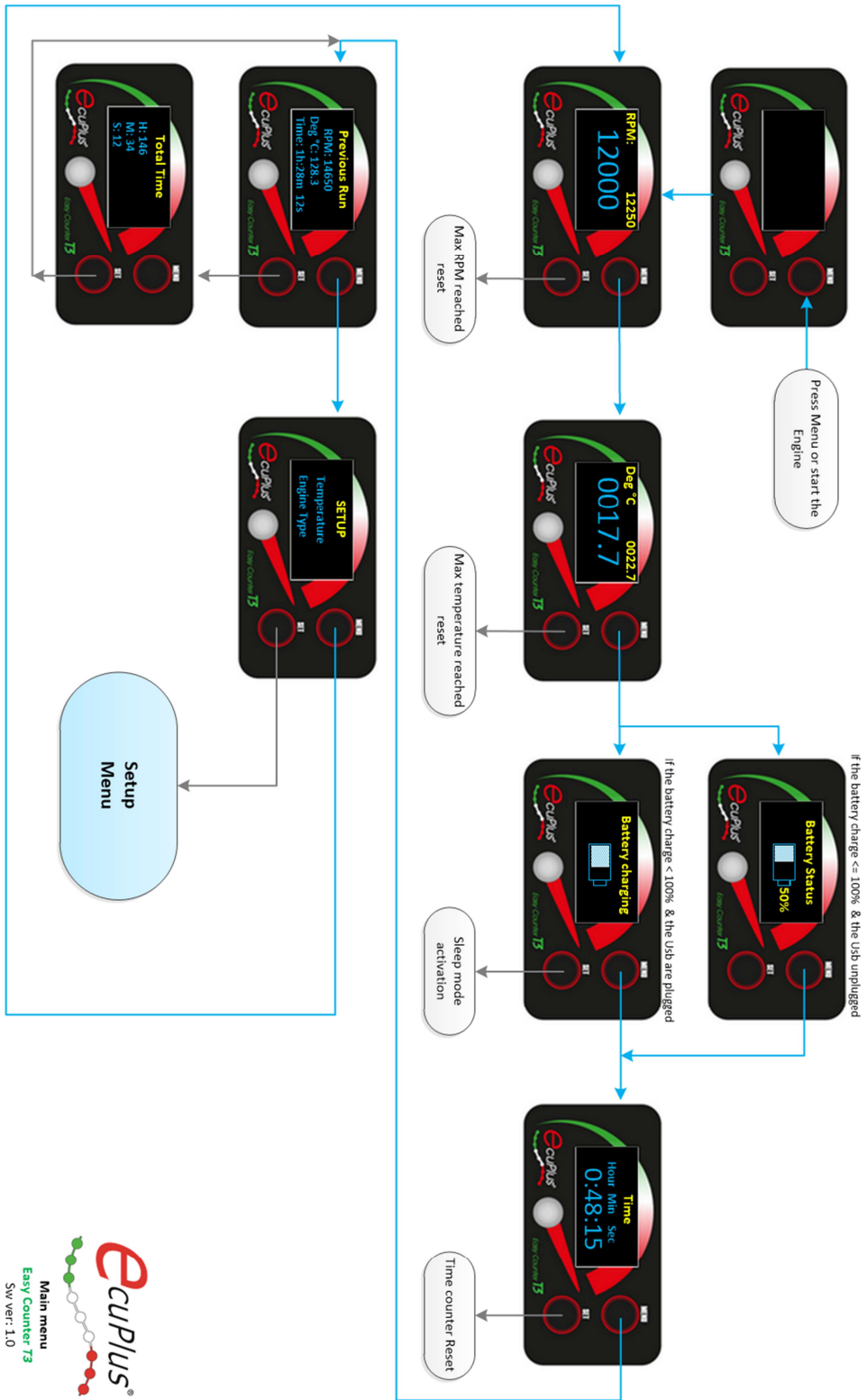


Fig. 5

Easy Counter T3, then show the successful connection image on the OLED display, the following image.



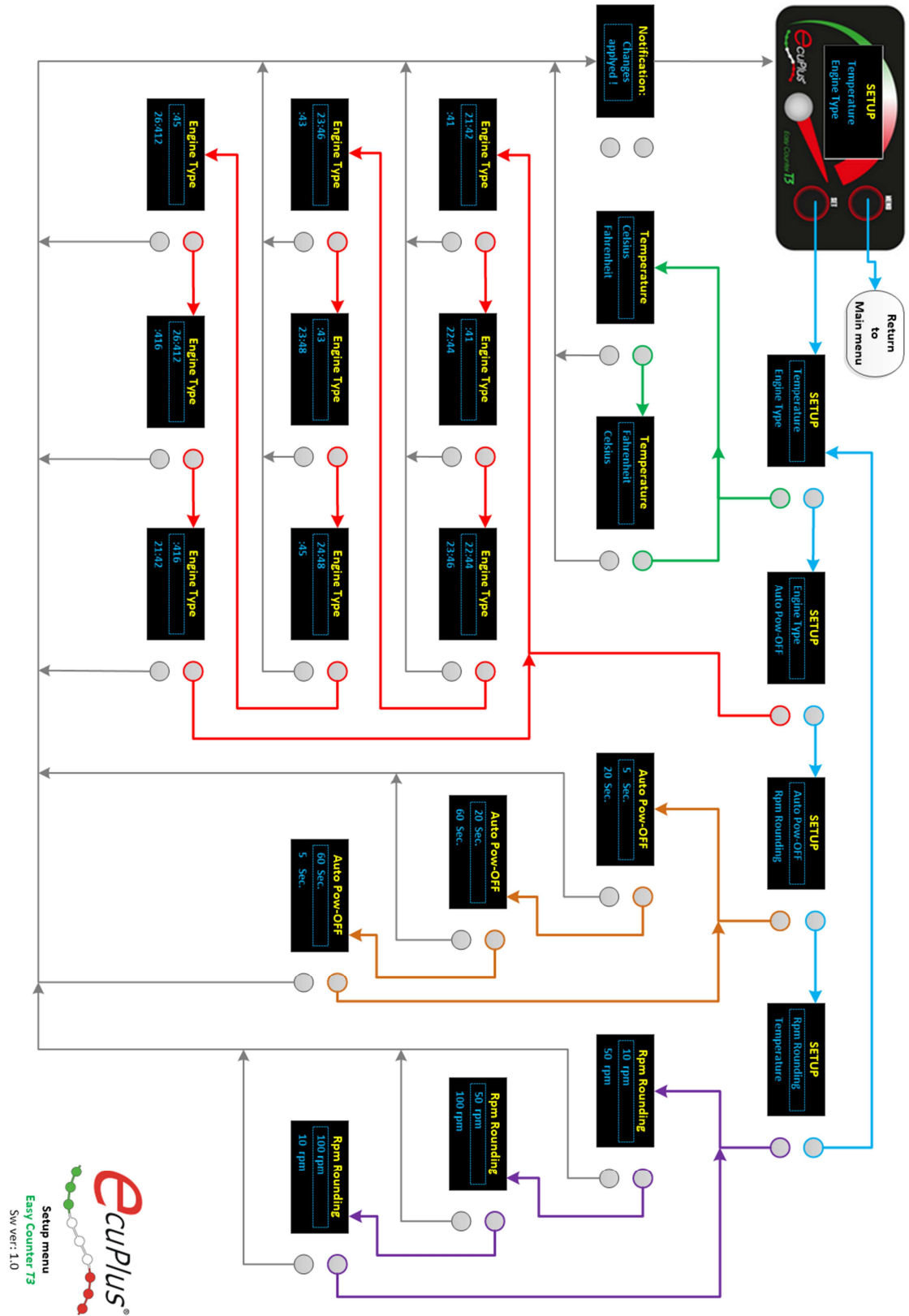
8.0



Quick setting

Fig.6

Fig:7



9.0 Firmware upgrade

Thanks to the continuous product development and updating, the firmware residing in the microcontroller can be updated through a specific programming tool available on the EcuPlus website for free in the download section. It is thus possible to have a product that is always updated in terms of performance and with all future features.

The updates suggested during the use of the App or through the website are available on the dedicated page: SW/FW DOWNLOAD. We recommend that you consult it often.

10.0 Cleaning and maintenance



Clean with soap and water or mild detergent to avoid damaging the protective. The use of contact cleaner or unblocking is generally permitted.



In the event of a fault, try to carefully follow this manual and, if the tachometer still not working properly, please contact our sales agent or our company. Not repair or disassemble the tachometer by yourself, as we will not accept any guarantee for damage caused after self-made repair or disassembly.



If necessary, you can lengthen the antenna cable and shorten it. For proper functioning consider the maximum length: 1,5m (590 inch).

11.0 Disposal at the end of life



The printed card is lead-free solder and conforms to the standard RoHS



At the end of its useful life, the device must be kept separate from unsorted municipal waste, and disposed of in special dedicated sites or give it to the seller, when buying new equipment of equivalent type.

12.0 Troubleshooting guide

Symptom	Possible cause	Workaround
Nothing is displayed on the OLED screen.	low battery	Recharge LiPo
	The ignition pulse is not being received .	Press the Menu key and check if the initial logo appears , Double-check the procedures for taking measurements .
	Malfunction	Please contact the store where you purchased the product to request repairs.
The RPM is not displayed .	The ignition pulse is not being received .	Double-check the procedures for taking measurements .
	It has stopped working for some reason .	Check the integrity of the antenna
	Low signal intensity from the spark plug cable	Wrap the antenna around the spark plug cable three five turns or more, after removing the clamp
	Malfunction	Please contact the store where you purchased the product to request repairs .
The RPM indicated is unstable (normally the engine RPM varies by approximately ± 10 to 150 rpm).	If using with the antenna lead wrapped around the spark plugcables , it is wrapped too few times, or the ignition pulse istoo weak and cannot be measured properly .	Increase the number of wraps . The normal number of wraps is between 3& 5, but it may vary with the strength of the ignition pulse .
	The tachometer is too close to sources of interference such as a spark plug cables , distributor , inverter or other devices with high power emissions	Measure at a distance of between 5 and 15 cm from the spark plug cables by positioning the tachometer in a point where the RPM indicated is stable .
	Malfunction	Please contact the store where you purchased the product to request repairs .
The RPM displayed is too high .	The spark plug firing does not match the ignition system of the engine . (It may be set to 1/2 the cylinder number measurement position .)	Double-check that the spark plug firing matches the ignition system of the engine .
The RPM displayed is too low .	The spark plug firing does not match the ignition system of the engine . (It may be set to double the cylinder number measurement position .)	Double-check that the spark plug firing matches the ignition system of the engine .
	If the antenna lead it touches somethingmetal, the received pulse is lost .	Connect so that the antenna cable is not exposed and does not touch anything metal
	If using with the antenna lead wrapped around the spark plugcables , it is wrapped too few times, or the ignition pulse is too weak and cannot be measured properly .	Increase the number of wraps . The normal number of wraps is between 3& 5, but it may vary with the strength of the ignition pulse .
The temperature indicated is unstable (normally the temperature value varies by approximately $\pm 1.5^{\circ}\text{C}$ / $\pm 59^{\circ}\text{F}$).	dirty probe contacts	clean the contacts with cleaner
	Damaged or exposed electrical connections of the probe	Repair or replace the temperature probe
The temperature indicated is too low or too high	The type of probe connected is not compatible with the device	Replace the temperature probe, see the dedicated section of this manual
	The cold junction compensation error is not sufficient	Cold junction compensation error is only possible at operating temperatures between 0 and 50 ° C (32 and 122 ° F)
When starting the device , the OLED display presents incomplete or unrecognizable images	Excessive dwell time with low battery .	Turn off the device , wait a few minutes and turn the device back on

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