Fully adjustable shiftlight and revcounter for DIY projects

LSK 5005 V1.1

Thank you for showing interest in our products. We strongly advise you to read and follow this user manual. It contains important instructions about installation, setup and use of the gauge. By following these instructions, the product will reward you with long time flawless functionality.

Basic information

Multifunctional revcounter is suitable for integrating into a motorcycle's dashboard. It can be used as a single revcounter, but also in addition to a default revcounter as a warning before revlimiter like in Triumph Speed Triple (including flashlight when close to the limiter). There is also high power output for the function called "shift-light" – connected LED will flash when a certain revs were reached. The device also contains function for smooth changing of color of multicolor RGB LED (in depends to actual revs).

Technical info

Board dimensions: 37 x 51mm (1.46 x 2in)

Outputs:

1x External button output	
7x Standard LEDs outputs:	standard 20mA LEDs of any shape and color
1x Shiftlight output:	12V / max 1A unfused
1x High power RGB LED output:	12V / max 3x 1A unfused (1x Red LED out, 1x Green LED out, 1x Blue LED out)
1x 16-bit digital SPI output	trough LED1, LED2 and LED3 outputs

Inputs:

1x Light sensor input	
1x RPM input:	29 900 impulses/minute max.
Supply voltage:	12V

LEDs connected to RGB and Shiftlight output requires series resistor.

Functions and possible settings

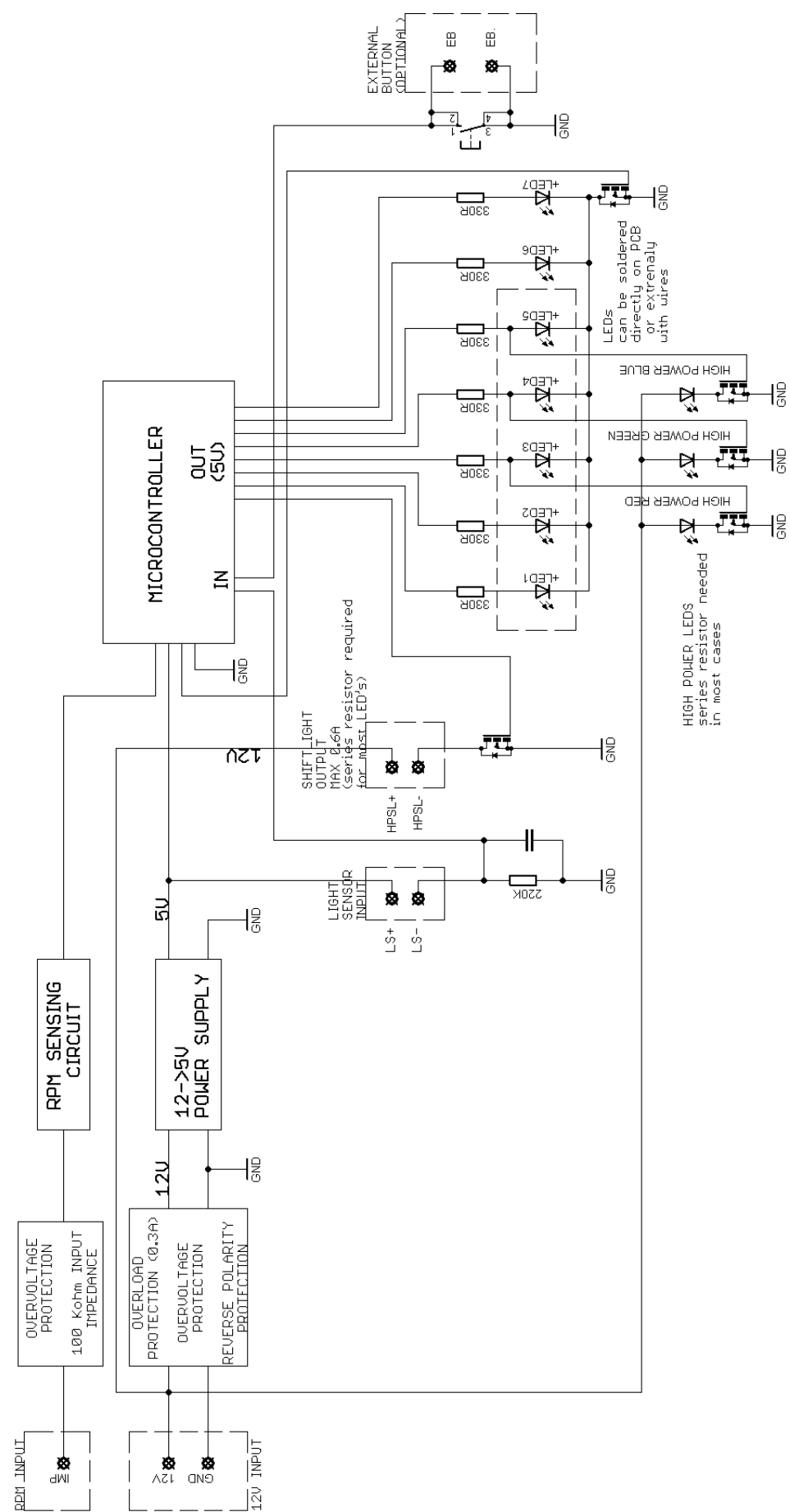Possible setting of the revcounter for various uses:

- Activation of 1 to 7 LED's
- Column mode/point mode/shift-light mode (all LEDs flash when certain revs are reached)
- Set minimum displayed revs
- Set maximum displayed revs
- Set RPM when all LEDs will start flashing
- Automatic or manual brightness control
- Change order of LEDs
- Mode for driving multicolor RGB LED chips (smooth change of color depending on revs).

- LED's and light sensor can be soldered directly to the PCB or put to other places using wires
- Connected via three wires: +,- and rev sensing (specified later)
- Protected by an electronic fuse (polyswitch), and also against surge and wrong polarity
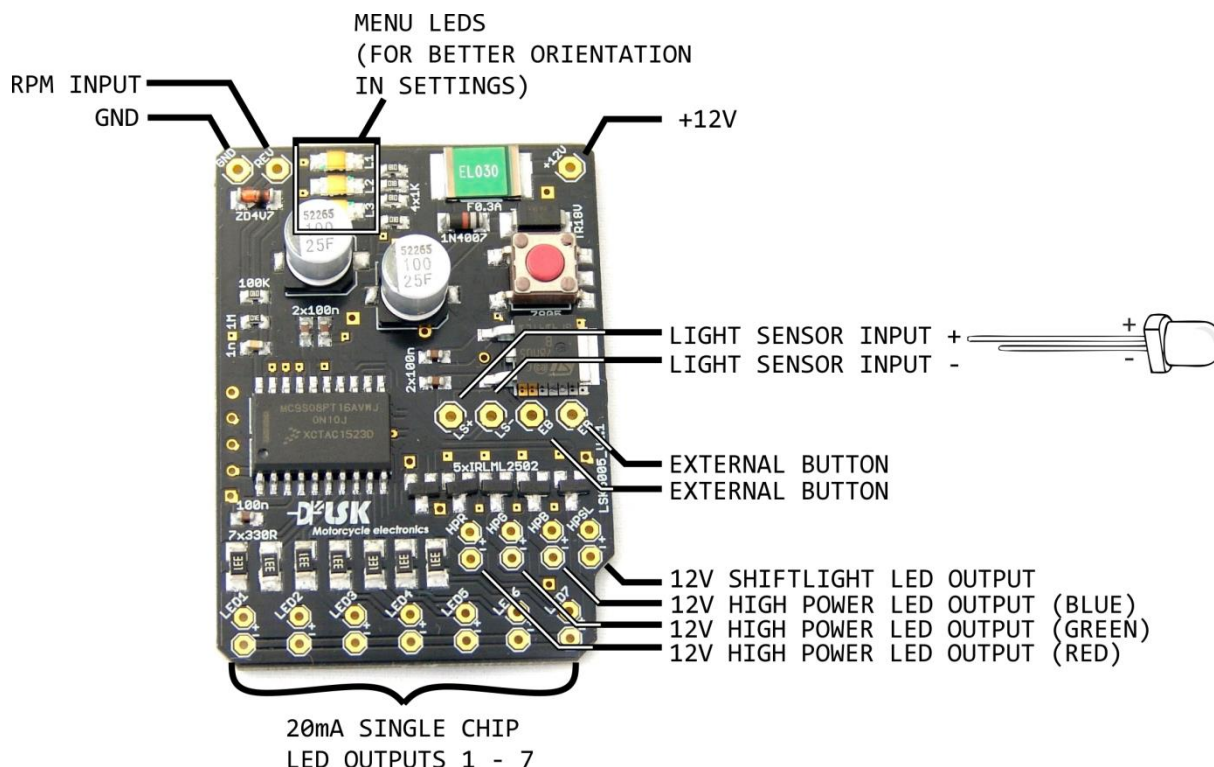
The package contains
- Assembled and tested PCB of the revcounter (no LEDs)
- Brightness sensor (phototransistor)
- User manual

- LEDs can be bought at most stores with electronic components. Use LEDs with nominal current of 20mA, any color and size you wish.

Block diagram

EXTERNAL BUTTON (OPTIONAL)

EB

GND

LED7
330R

LED6
330R

LED5
330R
LEDs can be soldered directly on PCB or extrenaly with wires

LED4
330R
HIGH POWER BLUE
GND

LED3
330R
HIGH POWER GREEN
GND

LED2
330R
HIGH POWER RED
GND

LED1
330R

HIGH POWER LEDS series resistor needed in most cases

MICROCONTROLLER

OUT (5V)

IN

GND

12V

SHIFT LIGHT OUTPUT MAX 0.6A (series resistor required for most LED's)

HPSL+
HPSL-
GND

5V

LIGHT SENSOR INPUT

LS+
LS-

220K
GND

RPM SENSING CIRCUIT

OVERVOLTAGE PROTECTION
100 Kohm INPUT IMPEDANCE

12->5V POWER SUPPLY

GND

OVERLOAD PROTECTION (0.3A)
OVERVOLTAGE PROTECTION
REVERSE POLARITY PROTECTION

12V

GND

RPM INPUT
IMP

12V INPUT
12V
GND

3

PCB pin out

RPM INPUT
GND
MENU LEDS (FOR BETTER ORIENTATION IN SETTINGS)
+12V
LIGHT SENSOR INPUT +
LIGHT SENSOR INPUT -
EXTERNAL BUTTON
EXTERNAL BUTTON
12V SHIFTLIGHT LED OUTPUT
12V HIGH POWER LED OUTPUT (BLUE)
12V HIGH POWER LED OUTPUT (GREEN)
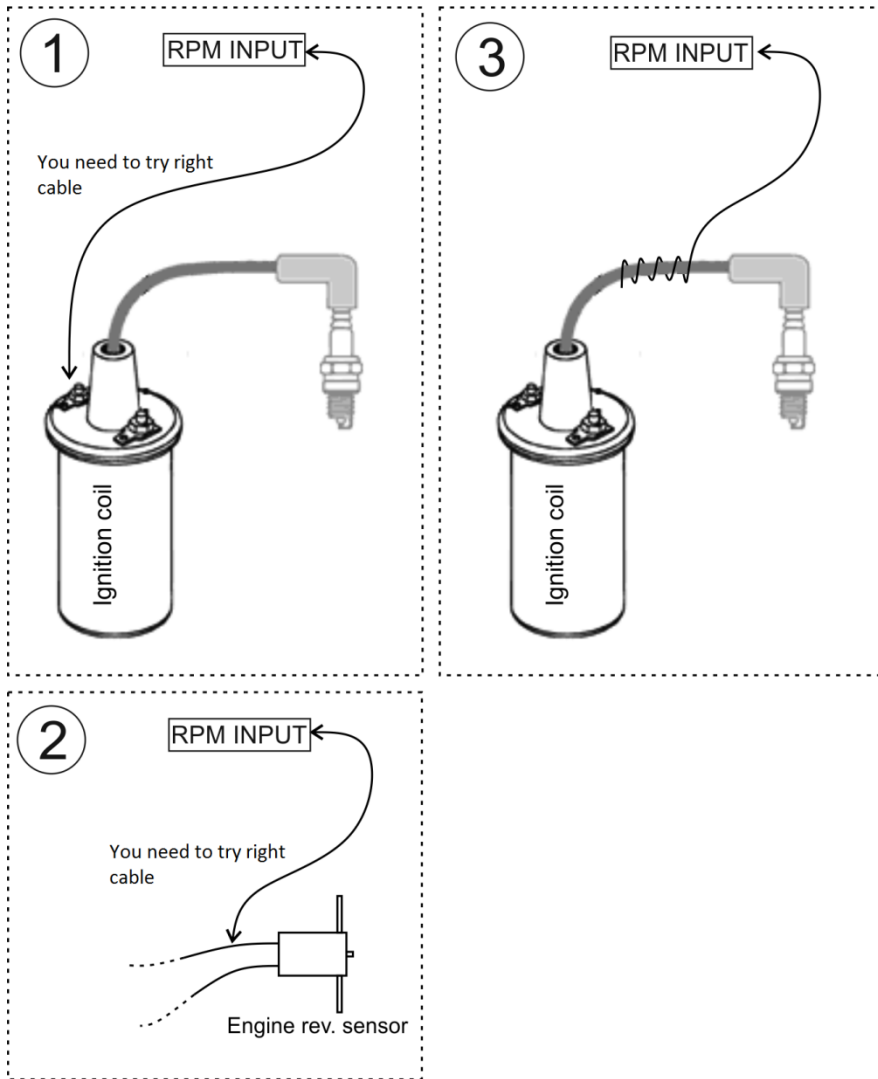12V HIGH POWER LED OUTPUT (RED)
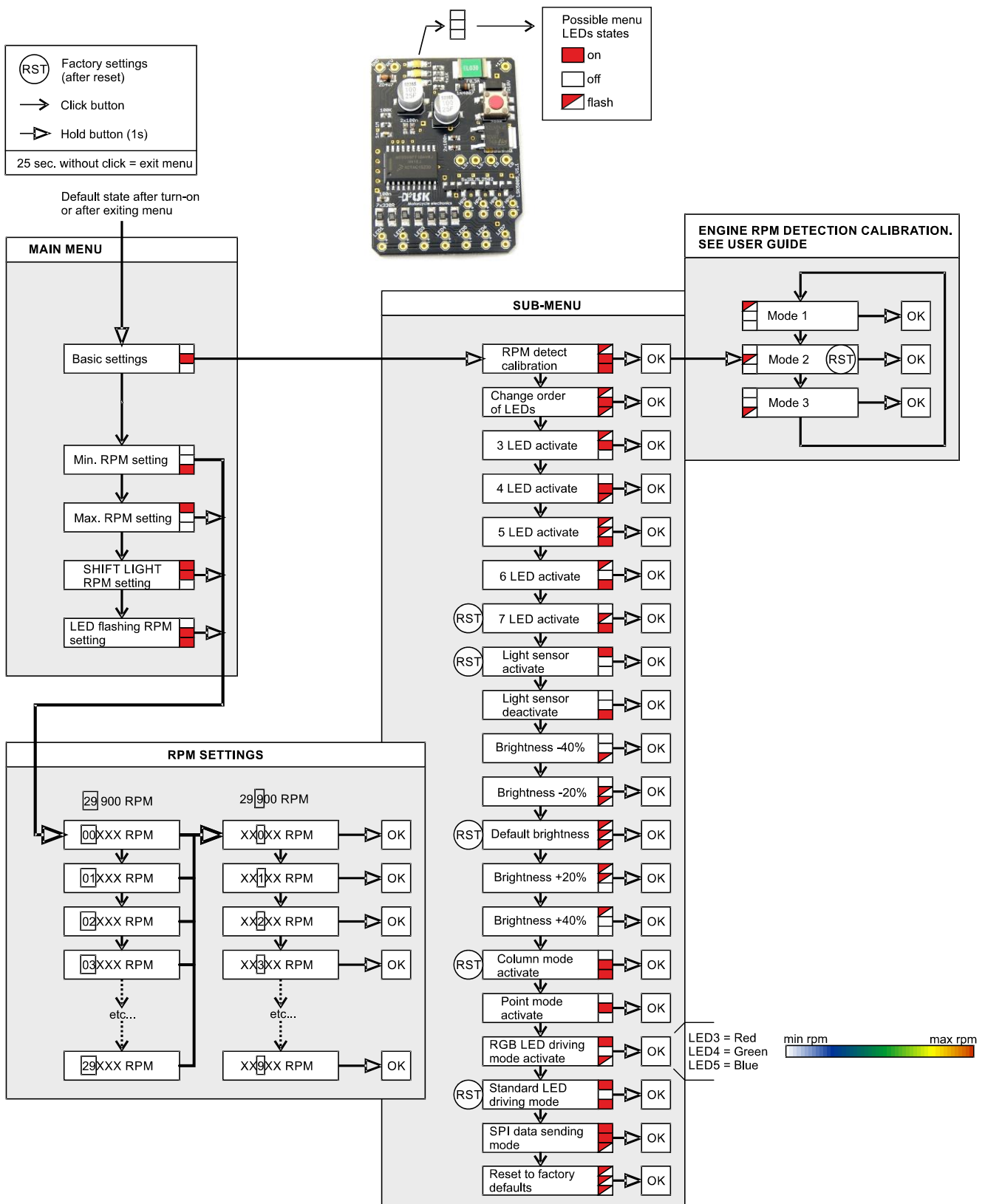20mA SINGLE CHIP LED OUTPUTS 1 - 7

Engine revolutions input (RPM input)

Possible to connect to:

1) Primary (low voltage) side of the ignition coil – if there are two leads, you may need to check which one works
2) Directly to the engine rev sensor – if there are more leads, you may need to check which one works
3) Winding up a wire (like antenna) around the high voltage wire between the ignition coil and spark plug. Approximately eight screw-threads. The number varies depending on the type of the bike – you need to switch to calibration mode and check for the correct amount of screw-threads, so the revcounter works at full RPM range. This is the least recommended option.

To control the correct work of the device, use Engine RPM detect calibration: (see page 7 in this manual).

① RPM INPUT

You need to try right cable

Ignition coil

③ RPM INPUT

Ignition coil

② RPM INPUT

You need to try right cable

Engine rev. sensor

Settings diagram

Legend:
- (RST) Factory settings (after reset)
- → Click button
- ▷ Hold button (1s)
- 25 sec. without click = exit menu

Possible menu LEDs states
- ■ on
- □ off
- ◪ flash

Default state after turn-on or after exiting menu

MAIN MENU
- Basic settings
- Min. RPM setting
- Max. RPM setting
- SHIFT LIGHT RPM setting
- LED flashing RPM setting

ENGINE RPM DETECTION CALIBRATION. SEE USER GUIDE
- Mode 1 → OK
- Mode 2 (RST) → OK
- Mode 3 → OK

SUB-MENU
- RPM detect calibration → OK
- Change order of LEDs → OK
- 3 LED activate → OK
- 4 LED activate → OK
- 5 LED activate → OK
- 6 LED activate → OK
- (RST) 7 LED activate → OK
- (RST) Light sensor activate → OK
- Light sensor deactivate → OK
- Brightness -40% → OK
- Brightness -20% → OK
- (RST) Default brightness → OK
- Brightness +20% → OK
- Brightness +40% → OK
- (RST) Column mode activate → OK
- Point mode activate → OK
- RGB LED driving mode activate → OK
- (RST) Standard LED driving mode → OK
- SPI data sending mode → OK
- Reset to factory defaults → OK

LED3 = Red
LED4 = Green
LED5 = Blue

min rpm — max rpm

RPM SETTINGS

29 900 RPM   29 900 RPM

- 00XXX RPM → XX0XX RPM → OK
- 01XXX RPM → XX1XX RPM → OK
- 02XXX RPM → XX2XX RPM → OK
- 03XXX RPM → XX3XX RPM → OK
- etc... → etc...
- 29XXX RPM → XX9XX RPM → OK

General setup

On some bikes, the rev sensor generates two pulses during one engine revolution. In that case, you need to set RPM multiplied by 2. (For example: it is needed to set 20 000RPM to indicate 10 000 RPM in real).
On many bikes with fuel injection system, when the RPM are measured from the ignition cable, the ignition generates one pulse every two engine revolutions. (one working cycle of the 4-stroke engine is two revolutions long) So it is needed to set RPM divided by 2. (For example: it is needed to set 5 000 000RPM to indicate 10 000 RPM in real).

Engine RPM detect calibration:

It is recommended to enter this mode after installation of device to check if the engine revolutions are detected correctly. In this mode, all LEDs flash to indicate a received pulse (from the ignition or the rev sensor).

1) Start the engine.
2) **Put the device into ENGINE RPM DETECTION CALIBRATION MODE:**
   Hold the button, hold the button, hold the button.
3) Now, the continuously flashing Menu LED L2 shows that the mode 2 is active. Check if the all connected LEDs are flashing periodically. 1 flash = 1 revolution of engine.
4) Shortly push the button to set detection to Mode 3. Check the flashing of connected LEDs again. Shortly push the button again to set Mode 1.
5) Now select the best mode with short pushing of the button. The flashing of connected LEDs must greatly periodical. Save selected mode by holding the button for 1 second.

If there are no mode with flashing LEDs, you must change connection of RPM input and try it again.

Technical details of RPM Detect settings:
Setting no. 1:
Suitable for measuring the impulses via a cable (antenna) wrapped around the ignition lead to the spark plug (diagram connection no.3). It can be usually used for diagram connection no.1 and sometimes even no.2.
Setting no. 2:
Settings no.2 and no.3 are suitable for contact revs measuring (diagram connection no.1 and no.2)
Setting no. 3:
Suitable for long ignition impulses. Use if setting no.2 doesn't work properly.

Parameters of revs measuring settings:

Setting no.	Sample voltage	Maximum impulse time (deadtime after detected edge)	Reacts to
1	1,45V	1ms	Rising edge
2	4,5V	4ms	Falling edge
3	4,5V	7ms	Falling edge

Min RPM settings

This is the value, when the first LED lights up. If you set minimum revs higher than maximum revs, the device will swap them around. (They stay not swapped in the memory.)
Setting procedure:
  - Hold the button, press, hold.
  - Next you set the value of thousands: you begin at 0 thousands RPM, every time you press the button the actual value goes up by 1000 RPM.
  - Confirm the value by holding the button for 1 sec.
  - Now set the value of hundreds RPM: you begin at 0 hundreds PRM, every time you press the button the actual value goes up by 100 RPM.
  - Confirm by holding the button for 1 sec. (LEDs will flash several times after storing value in the memory).
Default value: 400 RPM.
Maximum possible value: 29 900 RPM (impulses per minute).

Max RPM settings

Value, when the last LED will light up. If you set minimum revs higher than maximum revs, the device will swap them around. Setting procedure:
  - Hold the button, 2x press the button, hold the button.
  - Next you set the value of thousands: you begin at 0 thousands RPM, every time you press the button the actual value goes up by 1000 RPM.
  - Confirm the value by holding the button for 1 sec.
  - Now set the value of hundreds RPM: you begin at 0 hundreds PRM, every time you press the button the actual value goes up by 100 RPM.
  - Confirm by holding the button for 1 sec. The LEDs will flash a few times to confirm successful save.
Default value: 15 000 RPM.
Maximum possible value: 29 900 RPM.

SHIFT LIGHT RPM settings

After reaching this RPM, LED connected to 12V Shift light output start flashing.
Setting procedure:
  - Hold the button for 1 sec., press the button 3x, hold the button for 1 sec.
  - Now set the value of thousands: you begin at 0 thousands RPM, every time you press the button the actual value goes up by 1000 RPM.
  - Confirm the value by holding the button for 1 sec.
  - Now set the value of hundreds RPM: you begin at 0 hundreds PRM, every time you press the button the actual value goes up by 100 RPM.
  - Confirm by holding the button for 1 sec. The LEDs will flash a few times to confirm successful save.
Default value: 12 000 RPM
Maximum possible value: 29 900RPM.

LED flashing RPM settings

After reaching this value, all LEDs connected to LED outputs 1 to 7 will be flashing.
Setting procedure:
  - Hold the button for 1 sec., press the button 4x, hold the button for 1 sec.
  - Now set the value of thousands: you begin at 0 thousands RPM, every time you press the button the actual value goes up by 1000 RPM.
  - Confirm the value by holding the button for 1 sec.
  - Now set the value of hundreds RPM: you begin at 0 hundreds PRM, every time you press the button the actual value goes up by 100 RPM.
  - Confirm by holding the button for 1 sec. The LEDs will flash a few times to confirm successful save
Default value: 12 000 RPM.
Maximum possible value: 29 900RPM.

Change order of LEDs

This function will reverse the order of the LED outputs. Output LED1 will be used to detect maximum revs and outputs 2 to 7 for lower revs (depends on how many LEDs you have active).
Activation:
  - Hold the button for 1 sec, hold the button for 1 sec, press the button, hold for 1 sec
Deactivation: same as activation.
Default setup: Output LED7 = maximum revs.

Activating 3 to 7 LEDs

Useful, if you don't want to use all seven LEDs. Let it set at 7 LEDs in RGB LED driving mode (in this mode, all LEDs need to be activated as by default). For example: if you activate three LEDs, the RPM range you selected will be split only into LED1 to LED3 output. The other outputs will be disabled.
Setting procedure:
- Hold the button, hold the button, press the button.
- Next press the button selected times for selected amount of LEDs:
  1x press = 3LED / 2x press = 4LED / 3x press= 5LED / 4x press = 6LED / 5x press = 7LED.
- Hold the button to confirm.

The device will flash the LEDs a few times to confirm save successful.
Default setup: all 7 LEDs activated

Light sensor activation/deactivation

If the light sensor will not be used, it will be good to deactivate it. In the fact, this function activates/deactivates the automatic brightness control function.
Activation:
- Hold the button, hold the button, 7x press, hold.
- The device will flash the LEDs a few times to confirm save successful.
Deactivation:
- Hold the button, hold the button, 8x press, hold.
- The device will flash the LEDs a few times to confirm save successful

Default setup: Light sensor activated

Brightness settings

If the brightness of LEDs is to low or high, it can be set with this function. This setting works when the light sensor is activated and also when the sensor is deactivated.
Setting it up:
- Hold the button, hold the button, 8x press, hold
- 9x to 13x press (from minimum to maximum, 11x = default value)
- Hold the button
- The device will flash the LEDs a few times to confirm save successful
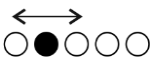
Default setting: default (middle) value

Column mode/point mode

The device can be used in one of these two modes. Only one can be active at a time.

Column mode: ⟵⟶ ●●●○○

Activation:
- Hold the button, Hold the button, 14x press, hold.
- The device will flash the LEDs a few times to confirm save successful.
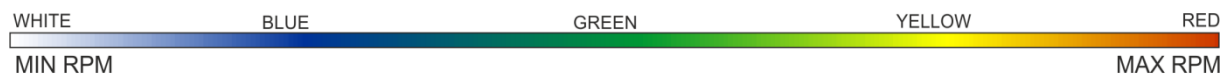
Point mode: ⟵⟶ ○●○○○

Activation:
- Hold the button, Hold the button, 15x press, hold.
- The device will flash the LEDs a few times to confirm save successful.

Default setting: Column mode

Driving RGB LED depending on engine revs.

For use of this feature, the RGB LED driving mode must be activated

WHITE	BLUE	GREEN	YELLOW	RED
MIN RPM				MAX RPM

Color of light is smoothly changing with revs.
There is the PWM at 0.5KHz used for driving LEDs.
Outputs:
LED1 to LED7 outputs are deactivated.
High power red, green and blue outputs are active. **Output voltage is 12V, max current is 1A for every output. Most LEDs will require external resistor!**

-We can help you with choosing the series resistor and with connection in your device.

Activation:
- Hold the button, hold the button, 16x press, hold.
- The device will flash the LEDs a few times to confirm save successful.

Deactivation:
- Hold the button, hold the button, 17x press, hold.
- The device will flash the LEDs a few times to confirm save successful.

SPI digital data sending mode

In this mode, device will send actual RPM periodically in 16-bit words over SPI bus. Data resolution is 10 RPM

- Device generates clock - works in master mode
- Voltage: +5V high, GND low
- Clock edge: rising
- Data polarity: active high
- Data bits: 16
- Device sends: MSB first
- Data shift frequency: 625Hz
- Clock period: 1,6ms
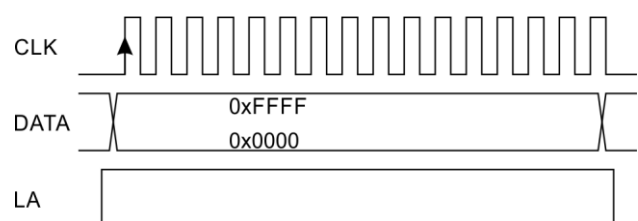
- **Data sending frequency (refresh rate):**
    Engine is off: 2Hz (device sending value 0x0000)
    <1500RPM: with every detected ignition pusle (every rotation of engine)
    >1500RPM: 25Hz

Data sent by device are divided by 10. Value 0x64 means 1000 RPM. Data are in raw format and they are not affected by minimal and maximal revs settings. Do not forget to set „rpm detect settings" if the device doesn't detecting ignition impulses correctly.

In the SPI mode:
LED1(+) = DATA signal
LED2(+) = CLK signal
LED3(+) = LA signal
In this mode, all (-) outputs of LED1 to LED7 must be unconnected.
GND input in left top corner of the board and GND of SPI Slave device must be connected together.

LED4 – LED7 are off
High power RED, GREEN and BLUE outputs are off.
High power shift light and light sensor remains active.

Activation:
- Hold the button, hold the button, 18x press, hold.
- The device will flash the LEDs a few times to confirm save successful.

Deactivation:
- Hold the button, hold the button, 17x press, hold.
- The device will flash the LEDs a few times to confirm save successful.

Reset to factory defaults
This choose will return the device to the default settings, on scheme with this symbol (RST)
Activation of feature:
- Hold the button, hold the button, 19x press the button, hold the button.

Safety warnings
- The device should be installed by a trained people or by a service.
- Bad electric connection can cause damage of this and other electrical devices on the bike.
-The device works with safe voltage.
-Keep away from children.
-Not approved for the use on public roads. Use only at owners risk.

Recycling
Worn out (broken) device should be handed to places designed for collecting old electrical devices.
Packaging should be thrown out into an appropriate bin

Manufactured in compliance with RoHS norm.