LX
navigation

Constant speed user's manual

version 1.0

LX Constant Speed

User's manual
(version 1.0)

Refers to LX Constant speed FW version 1.0 and HW 1.0

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List of revised pages

Changes or revisions of this manual may only be carried out by the manufacturer. Any change should be recorded in the following table.
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1 Introduction

Thank you for buying an LX Navigation product. We have been a part of the world of air avionics since 1975, and consider it an honour to be part of your instrument panel.

LX CS 57 is a constant speed governor, intended for use with Woodcomp propellers.

Featuring a bright, high-contrast colour LCD with both Auto and Manual mode, along with pre-sets for take-off and cruise, thus allowing the pilot to focus his attention on flying instead of looking at the instrument panel.

It is our mission, to ease the pilot's workload in the cabin, and help him have more time to look through the canopy and enjoy his flights.

Never worry about your propeller pitch again.

Symbols used in the manual

NOTE: Used to highlight important information.

CAUTION: Used to warn the user and indicate a potentially hazardous situation or improper use of product.

WARNING: Used to indicate a dangerous situation that can cause personal injury or death if the instruction is disregarded.

Abbreviations used in the manual

Abbreviation	Meaning
RPM	Revolutions Per Minute
CS	Constant Speed
CAN	Controller Area Network
EXT	External
TX	Transmit
RX	Receive
MAX	Maximum
MIN	Minimum
INC	Increase
DEC	Decrease
SW	Software
HW	Hardware

Conditions

- Before installation of the LX CS 57 into aircraft, study this manual thoroughly.
- Pilot must completely understand operation of the governor prior to installation.
- Always have this manual ready in the cockpit.
- After installation of the LX CS 57, perform a test flight. Switch on your instruments one by one, to discover possible interference from another instrument or system, which could influence the operation of the LX CS 57.
- LX CS 57 connects directly to the propeller pitch adjustment mechanism. When the above-mentioned instructions voided or in case of a failure, propeller pitch can be inadvertently changed.

NOTE!
If you do not agree with these conditions, do not install LX CS 57 into your plane.

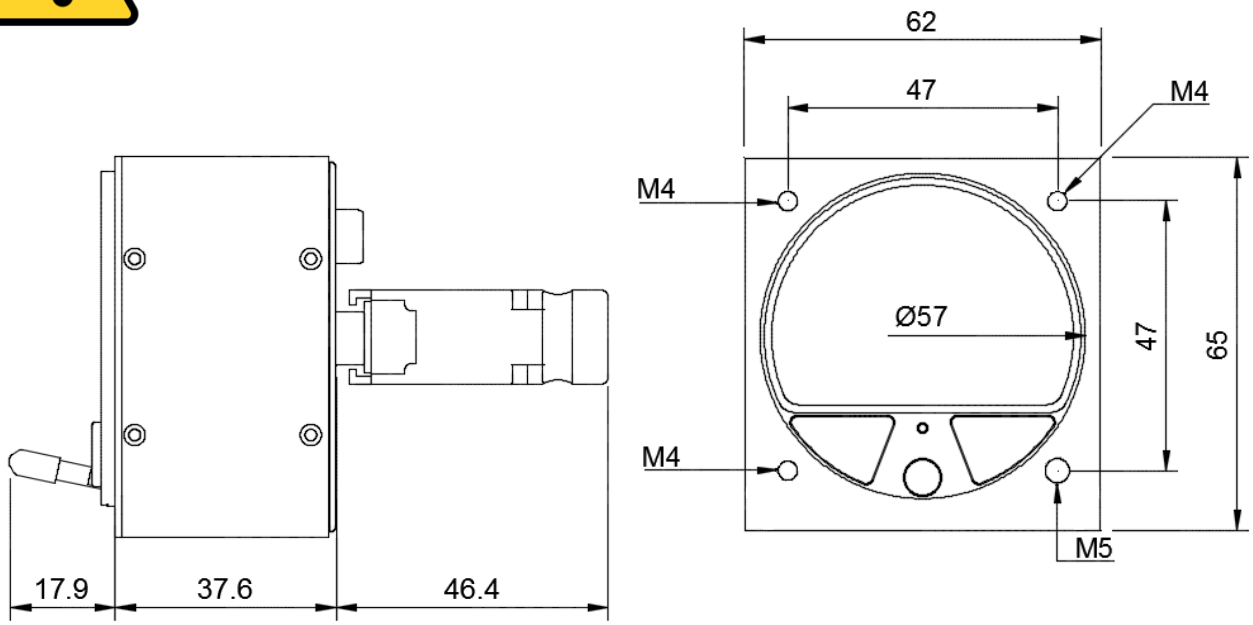
2 Mechanical installation

The LX CS 57 fits a standard aviation 57mm (2 ¼") instrument panel hole. It requires 3 M4, 5mm long Phillips screws and one hex M5 head screw, used for the push/rotary knob opening. Please use the supplied screws only, as using incorrect or mismatched screws could damage the instrument and thus void the warranty.

The correct way of installing the LX CS 57 is to insert it into the 57mm hole, align the screw holes in the unit with the ones on the instrument panel, and start screwing in the Philips screw from top to bottom.

When taking the unit out, start from the bottom screws and work your way up.

CAUTION!
Never start installing the device with the bottom screws, as it may get damaged.



The push/rotary knob is located in the bottom-right position on the front panel. In order to install the instrument, you need to remove the knob, by removing the black cap on top and unscrewing the flat head screw inside, whilst holding the knob with your other hand.

Typical installation for RPM sensor propellers

Connect the RPM sensor connector to the unit in compliance with the wiring diagram on page 10.
Turn the unit on, long press on the push rotary knob to enter Menu, enter the required password and choose ″RPM in″ under the ″Input″ option.

Typical installation for Hall sensor propellers

In some cases, RPM signal from the engine is noisy and it is not possible to distinguish between noise and signal. In such a case you can install Hall sensor to detect RPM. If propeller is connected to the engine via gearbox adjust RPM multiplicator respectively.

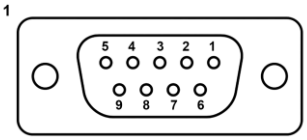
Connect the Hall probe connectors to the unit in compliance with the wiring diagram on page 10.
Turn the unit on, long press on the push rotary knob to enter Menu, enter the required password and choose ″Hall in″ under the ″Input″ option.

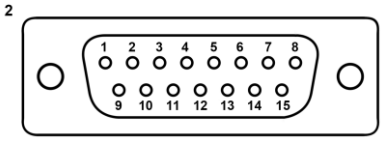
After setting Hall probe as input, scroll to RPM multiplicator and enter the gear ratio of the gearbox.

3 Electrical installation

The LX CS 57 features two connectors, a 15-pin and a 9-pin connector in a fashion showed below. The 15-pin is used for primary functions – power supply, propeller info, RPM info, external switches, etc. The 9-pin connector is used for secondary functions – CAN communication with other instruments, etc.

Pinout

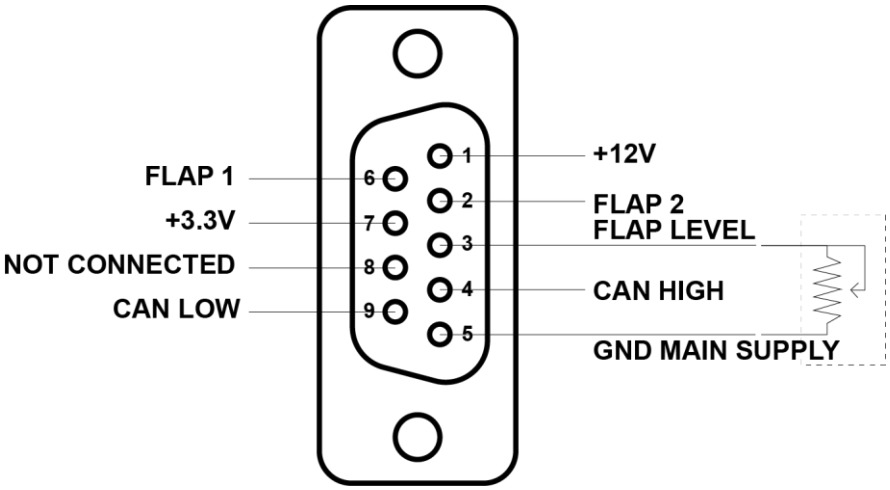


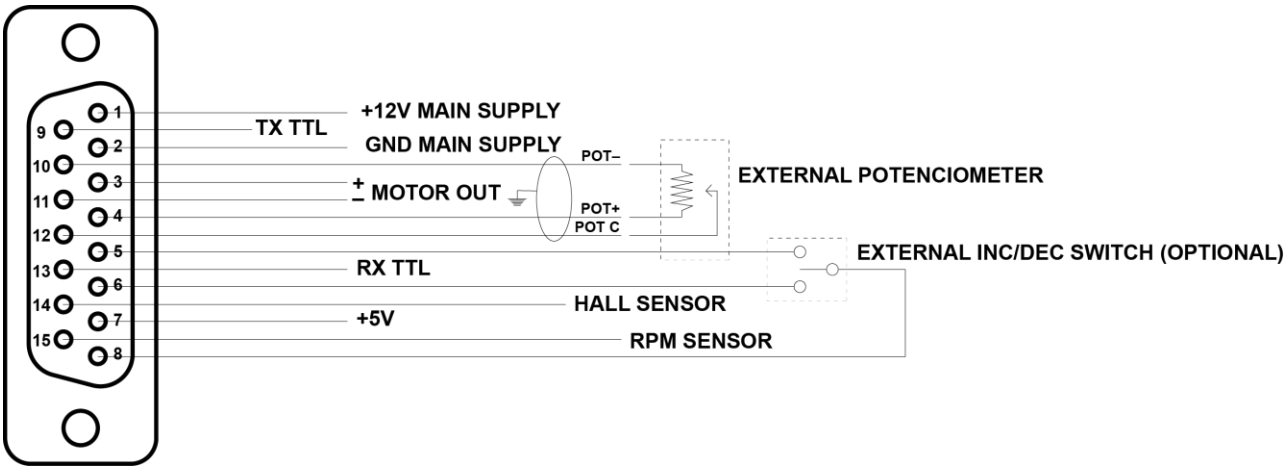


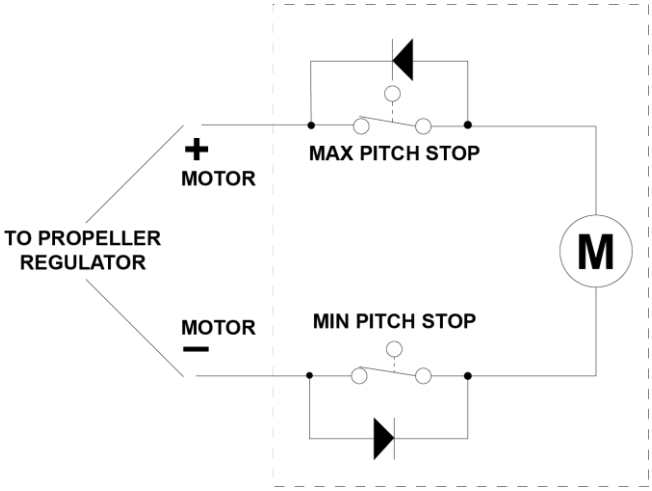
1		
Pin	**Function**	**Remark**
1	Ground	Not connected
2	CAN High	Not connected
3	/	Not connected
4	/	Not connected
5	+12V	Not connected
6	CAN Low	Not connected
7	/	Not connected
8	+3.3V	Not connected
9	/	Not connected

2		
Pin	**Function**	**Remark**
1	+12V	10~28V acceptable
2	Ground	Main GND
3	Propeller 1	+/-
4	+3.3V	
5	EXT Increase	
6	EXT Decrease	
7	5V	
8	Ground	
9	TX	Not connected
10	Ground	
11	Propeller 2	-/+
12	Propeller level	
13	RX	Not connected
14	Hall sensor	
15	RPM sensor	

Wiring diagram







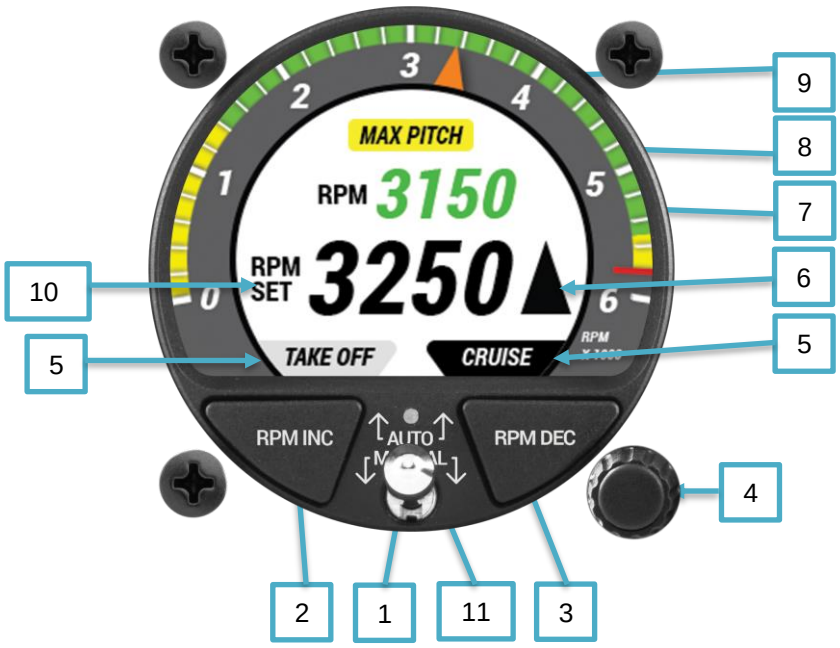
4 Operation

4.1 *Front panel interface*

1) **Main toggle switch with locking mechanism:** Used for selecting between manual mode (down) and auto (constant speed) mode (up).
2) **Increase button:** In manual mode, push button for increasing RPM. When in constant speed mode, sets the take-off defined value.
3) **Decrease button:** In manual mode, push button for decreasing RPM. When in in constant speed mode, sets the cruise defined value.
4) **Push/rotary knob:** When in Auto mode, turning the push/rotary knob sets the desired RPM. With long press (2 seconds) on push/rotary knob allows entering menu page. Inside menu page, you can see and adjust parameters of the LX CS 57.
5) **Cruise pre-set/decrease RPM indicator:** Display push button (3) current mode.
6) **Take-off pre-set/increase RPM indicator:** Display push button (2) current mode.
7) **Increase/Decrease indicator:** Arrows shows change of propeller pitch about to occur. When arrow is visible the LX CS 57 is trying to adjust current RPM to match desired RPM.

NOTE!
▲ **Increasing engine RPM, propeller pitch will decrease.**
▼ **Decreasing engine RPM, propeller pitch will increase.**

8) **Actual engine RPM indicator:** shows the current RPM of the engine.
9) **Min/Max propeller pitch indicator:** Notification show if propeller reached min / max pitch position. As long propeller stays in that position this indicator is visible in manual and auto mode.
10) **Digital RPM needle:** Works together with current engine RPM.
11) **Current mode indicator:** Displays current mode. In AUTO mode it shows SET engine RPM. Propeller pitch will be constantly adjusted to maintain SET engines RPM, In manual mode it will display MANUAL label.
12) **Ambient light sensor:** Measures the amount of luminescence in current surroundings. It is connected to the backlight dimmer, dimming the brightness in low luminescence conditions and using full brightness in daylight conditions.



4.2 *Control operation*

4.2.1 Constant speed (Auto) mode

The LX CS 57 activates when you turn airplane electrical system ON. To set device to AUTO mode, pull main toggle switch (1) towards you, then turn upwards to AUTO label. This will enable AUTO MODE. Current mode indicator MANUAL (11) will change to RPM SET, which indicates set engine RPM. Buttons (2) and (3) set engine RPM to TAKE OFF or CRUISE values. During flight, user can set desired engine RPM by rotating push/rotary knob (4). No additional short press is needed to accept selected value. The black arrow located right from the RPM SET value indicates the increase of RPM, when pointing up, and decrease of RPM, when pointing down.

Before taking off, press the left button (2), under the label ˝TAKE OFF˝ to set desired engine RPM to take-off value.

During take-off, propeller pitch is controlled automatically to prevent over-revving the engine.
After take-off, turn push/rotary knob (4) to set required engine RPM for level flight (combined operation with MANIFOLD PRESSURE control instrument!) to optimize fuel consumption and wear of the engine.
It is always recommended to check the engine user manual, for correct operation.

In flight, you can select CRUISE mode by pressing the right button (3) under the label ˝CRUISE˝ to set desired engine RPM to cruise value.

At any time, you can use the push/rotary knob (4) to change the engine SET RPM.

WARNING!
Before landing, the regulator should always be switched to Maximum RPM.

WARNING!
When regulation system is changing propeller pitch (when mechanism is in action), avoid increasing or decreasing throttle.

Example
Set RPM is 5000. If current RPM is 5150 RPM, the instrument increases propeller pitch to reduce engine speed and reaches new equilibrium, with regard to previously set hysteresis, i.e. 100 RPM. Engine speed will drop below 5100 RPM but not below 4900 RPM.
During active change of propeller pitch, display shows an arrow with the following meaning:
- Arrow up decreasing propeller pitch (increasing engine RPM).
- Arrow down increasing propeller pitch (decreasing engine RPM).

If limits of propeller pitch are reached, device will notify the pilot with the **Min/Max propeller pitch indicator (8).**

Warning!
When overheating of critical components appears, LX CS 57 will display ˝ERROR 1˝ warning. In case of ERROR 1 in AUTO MODE, change the main toggle switch (1) to MANUAL for manual control.

4.2.2 Manual mode

You may switch to MANUAL MODE from AUTO MODE by pulling the toggle switch (1) towards you, and turning downwards. Use buttons (2) and (3) to control propeller pitch manually. INCREASE button will increase engine RPM by decreasing propeller pitch. DECREASE button will decrease engine RPM by increasing propeller pitch. During the change, if limits of propeller pitch are reached, device will notify the pilot with the **Min/Max propeller pitch indicator (8).**

NOTE!
Note that the mechanism does not change propeller pitch instantly, rather it follows gradual motion, therefore it is strongly recommended NOT to increase or decrease throttle manually at the time.

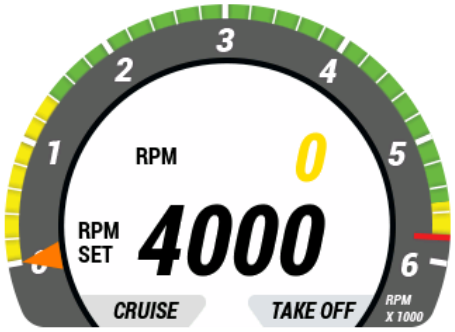
NOTE!
Propeller manufacturer advises equipping the aircraft with a manifold pressure measuring system to allow proper balance of propeller and engine function. Without such an instrument it is difficult to ensure economical operation of the engine and to avoid excessive engine stress, due to incorrect propeller adjustment (for example a low RPM engine setting accompanied by excessive throttle opening).

4.2.3 Night mode

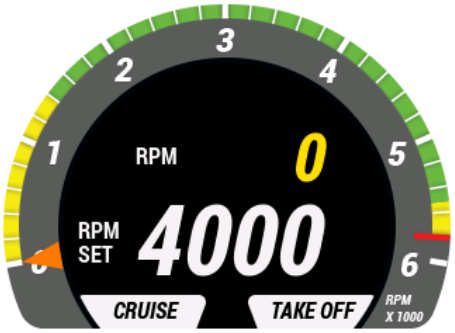
Night mode is intended for flying in low light conditions (e.g. night VFR), when screen brightness in combination with light colours could possibly blind the pilot or reduce his visibility.

Night mode enables a different home screen, which features no white colours. The back colour is changed to black, and the number colours are changed to a light shade of grey.

Night mode works independently of the Ambient light dimmer (12).

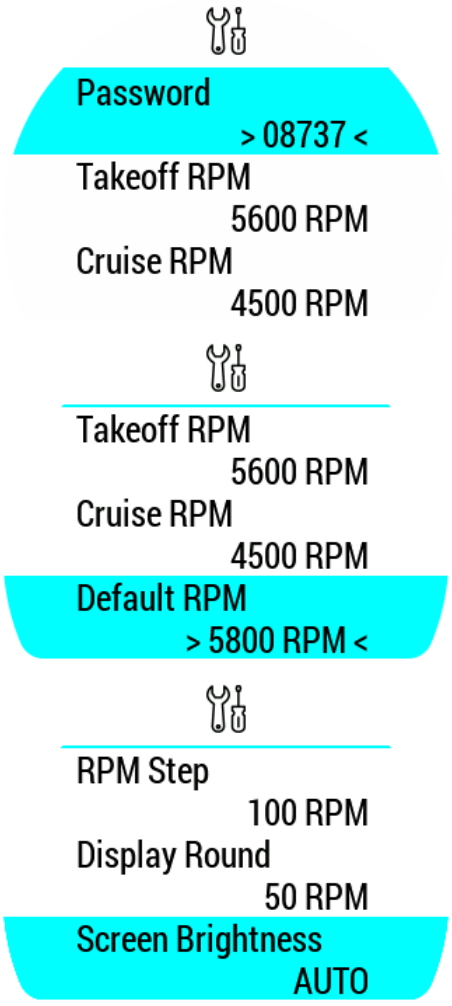


Day mode



Night mode

4.2.4 Menu page



You can access menu page by a **long press** on the push/rotary knob (4). You may browse the menu by turning the knob to left or right.

For enabling the change of user defined values, use password **08737**.

To type in the password, highlight the Password option with the blue screen selector. Then press enter to start changing the value. Select the value by rotating the push/rotary knob (4) and select the current digit by pushing the push/rotary knob (4).

Editable values are coloured with black colour, and non-editable with grey colour.

List and explanation of possible settings in menu page:

Password – used for enabling settings.

Takeoff RPM – set's the pre-set RPM for take-off.

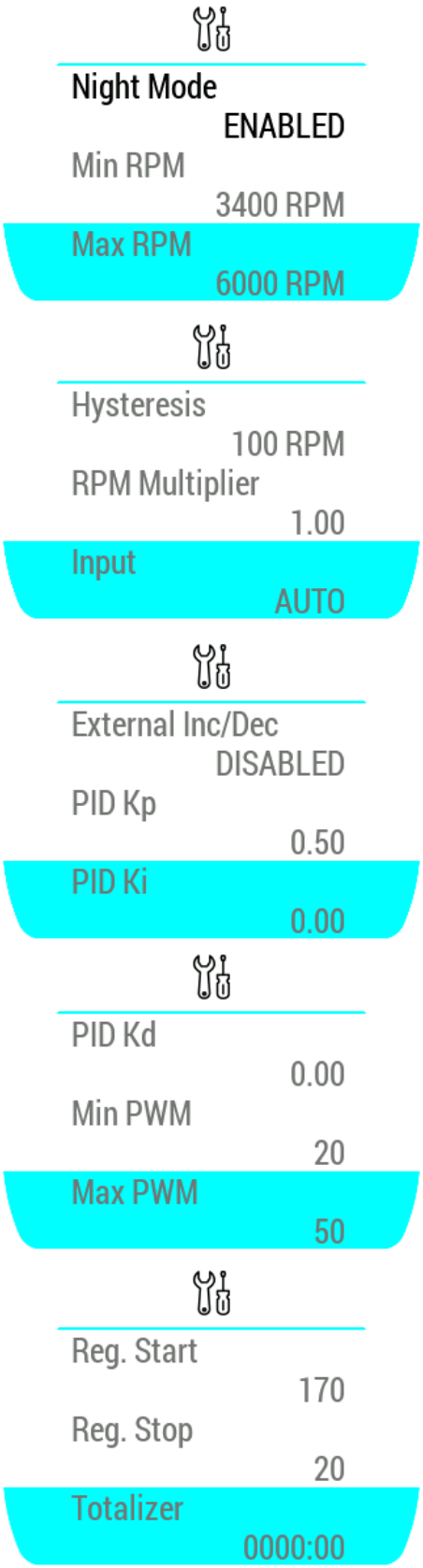
Cruise RPM – set's the pre-set RPM for cruise.

Default RPM – set's the pre-set RPM for cruise.

RPM Step – pre-setting engine RPM (10) is available in increments of 10, 25, 50 and 100 RPM. Default value is **50**.

Display Round – display of current RPM (7) is rounded to 10, 25, 50 and 100 RPM. Default value is **50**.

Screen brightness – set display brightness in percentage. Default value is **AUTO**.



Night mode – enables a darker screen, intended for flying in low light condition, in order to avoid blinding the pilot. The screen backlight, connected to the Ambilight sensor, will be dimmed regardless of this option. Default value is **Enabled**.

Min RPM – (Min RPM limit): Presents lowest RPM for all modes (AUTO MODE, Take-off and Cruise). Set by the manufacturer.

Max RPM – (Max RPM limit): pre-set highest RPM for all modes (AUTO MODE, Take-off and Cruise). Set by the manufacturer.

Hysteresis – Defines the allowed tolerance for propeller RPM before adjustments are made. Set by the manufacturer.

RPM Multiplier – Defines the gear ratio between the engine and the propeller. Defined by the manufacturer.

Input – Defines RPM info source – Hall's probe or RPM IN. Defined by the manufacturer.

External Inc/Dec – Allows the use of an external increase/decrease switch. Set by the manufacturer.

PID Kp – Proportional PID regulator parameter. Set by producer.

PID Ki – Integral PID regulator parameter. Set by producer.

PID Kd – Derivative PID regulator parameter. Set by producer.

Min PWM – PID regulator parameter. Set by the producer.

Max PWM – PID regulator parameter. Set by the producer.

Reg. Start – PID regulator parameter. Set by the producer.

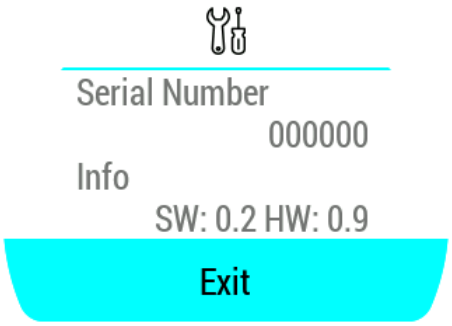
Reg. Stop – PID regulator parameter. Set by the producer.

Totalizer - indicates propeller working time. When engine RPM (7) exceeds 1000 RPM, the clock starts counting.

Serial number – Serial number of device, non-editable.

Info – indicates current software and hardware version of a device.

Exit – To exit menu, highlight the exit caption at the end of menu page and short press rotating encoder.



NOTE!
The user can revert the settings back to default values at any time, by entering the following password: 46486.

Table of settings

Name	Value	Step	Default	Set by	Remark
Password	-	-	-	-	-
Take-off RPM	3400 ~ 6000	10, 25, 50 or 100	5600	User	Check flight manual
Cruise RPM	3400 ~ 6000	10, 25, 50 or 100	4500	User	Check flight manual
Default RPM	3400 ~ 6000	10, 25, 50 or 100	5800	Manufacturer	-
RPM Step	10 ~ 100	10, 25, 50 or 100	100	User	-
Display Round	10 ~ 100	10, 25, 50 or 100	50	User	-
Screen brightness	10 ~ 100%	-	AUTO	User	-
Night Mode	Enabled/Disabled	-	Enabled	User	-
Min RPM	3400 ~ 5800	10, 25, 50 or 100	3400	Manufacturer	-
Max RPM	3600 ~ 6000	10, 25, 50 or 100	6000	Manufacturer	-
Hysteresis	50 ~ 150	50, 100 or 150	100	Manufacturer	-
RPM Multiplier	0.10 ~ 5.00	-	1.00	Manufacturer	-
Input	RPM IN/HALL IN	-	RPM IN	Manufacturer	Depends on RPM sensor type
External Inc/Dec	Enabled/Disabled	-	Disabled	Manufacturer	-
PID Kp	-	-	0.5	Producer	Regulator settings
PID Ki	-	-	0.0	Producer	Regulator settings
PID Kd	-	-	0.0	Producer	Regulator settings
Min PWM	-	-	20	Producer	Regulator settings
Max PWM	-	-	50	Producer	Regulator settings
Reg. Start	-	-	170	Producer	Regulator settings
Reg. Stop	-	-	20	Producer	Regulator settings
Totalizer	-	-	-	-	-
Serial number	-	-	-	-	-
Info	-	-	-	-	-

5 Technical specification

- 2,4″ transmissive colour LCD display, resolution 320x240 pixels
- Standard mounting 57mm (2 ¼″)
- Powder coated aluminium case and front panel
- Toggle switch with lock
- Ambilight sensor with automatic backlight dimmer
- **Dimensions:** 62,0 2 65,0 x 55,5 mm
- **Weight:** 188g
- **Supply voltage:** 10 ~ 28V
- **Power consumption:** 120mA @ 12V DC
- **Maximum motor supply current:** 8A
- **Minimum RPM voltage signal:** 10A
- **Measurable RPM range:** 800 ~ 9999 RPM
- **RPM resolution:** 10 RPM

6 Disclaimer

WARNING!
In no event shall LX Navigation be liable to the Customer, or any party related to the Customer, or unrelated, or third-party subjects for any indirect, incidental, consequential, special, exemplary, or punitive damages (including, without limitation, collateral damage, injury or death), whether under a theory of contract, warranty, tort (including negligence), products liability, or otherwise, even if LX Navigation has been advised of the possibility of such damages. Use of instrument is at one's own risk.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