Stairs light controller 11-20k LCD

Manual





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1. Technical data

Operating voltage	8-15V DC (typically 12V DC)
Current consumption (only the controller)	20 mA
Power consumption (only the controller)	0,25W
Ampacity	1A per channel
Supported sensors	mini PIR HC-SR501 with adapter
	optical sensors 'standard 0,8m'
	optical Sharp sensors with microprocessor adapter
Operating temperature	5-45 °C
Dimensions (in plexi case)	8cmx 12cm x 4cm

2. Controller description

The controller is designed for 12V LED strips or spots. In practice, the controller can be connected to the same diodes (with resistors), LED strips, LED modules, LED spots or LED bulbs. The distance from the light source to the controller can be up to several meters. The driver 11-20k LCD has a very high efficiency.

The controller has a LCD display which provides information on the current operation of the controller (status messages), and the setup menu - the name of the menu item and the currently set value of the parameter.

2.1. Inputs and outputs



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Inputs and outputs:

- 1 channel outputs (from 1 to 20)
- 2 'P1' button input to set the menu parameters (increase)
- 3 'P2' button input to set the menu parameters (increase)
- 4 blocking input vPB. It is also used to enter, exit and walk through the menu (next item).
- 5 constant lighting input ^PS. It is also used to exit and walk through the menu (previous item).
- 6 2 x minus (-) 12V DC
- 7 4 x plus (+) 12V DC
- 8 PD bottom sensor (button) input. Do not connect any voltage to this input!
- 9 PG top sensor (button) input. Do not connect any voltage to this input!
- 10 2 x plus (+) 5V DC to power the sensors.

Microbuttons:

- a microbutton '>' to set the menu parameters (increase)
- $b-microbutton\ '<'\ to\ set\ the\ menu\ parameters\ (decrease)$
- c PB microbutton to enter (together with P2), exit and walk through the menu (next item).
- d PS microbutton to test the constant lighting function
- ${\rm e}-{\rm microbutton}~{\rm PD}-{\rm to}~{\rm simulate}~{\rm the}~{\rm signal}~{\rm from}~{\rm bottom}~{\rm stairs}~{\rm sensor}/~{\rm button}$
- $\mathsf{f}-\mathsf{microbutton}\;\mathsf{PG}-\mathsf{to}\;\mathsf{simulate}\;\mathsf{the}\;\mathsf{signal}\;\mathsf{from}\;\mathsf{top}\;\mathsf{stairs}\;\mathsf{sensor}/\;\mathsf{button}$

2.2. Principle of operation - a typical algorithm

Controller's action is based on sequential switching of stair lighting - after receiving a signal from the optical Sharp detector. The person entering the stairs activates the detector. Signal from the detector goes to the driver. The controller steers channels and the lights are turning on in accordance with the selected algorithm. Leaving the stairs the person activates the second detector - this is the signal to start turning the stairs lights off.

For the purpose of this manual, the 'bottom' ('down') detector (mounted at the lower end of the stairs/ downstairs) is connected to the PD input and the 'upper' detector (mounted on the higher end of the stairs/ upstairs) is connected to the PG input. Channel 1 is the light of the first lower treble, the last of used channels is the highest step.

The default algorithm is the algorithm No. 5 (see Section 4.9 Algorithm (lighting effect)). The LED-spots/ LED-stripes go on sequentially, step by step, in the direction of moving person. Turning off - in the same direction as lighting on. Algorithm 5 also distinguishes the situation when two people come from opposite directions. Stair treads are then lit for each of them – one light effect goes from bottom to top, the other - from top to bottom. Effects meet the road. Turning off also takes place in both directions.

Optical detectors, mini mini PIR, mini PIR with adapter for 5V GND GND OUT +V +V OUT 9 10 6 8 11 X GND PD +5V GND PG +5V 12V ^PS vPB P1 **P**2 Buttons parameter settings + 1 Fuse overcurrent 2 Power 3 Ν housing, case, supply N 0 12V Button navigate through the menu cavity, a place to PE settings connect controllers. V PE power supply, etc. Optional switch or Optional switch, the signal from the GND GND buttons function light ECU home, installing inteligent constant building, etc, to the lock controller

3. Controller wiring diagram

4. Controller functions

The controller is equipped with a number of features and controls that allow the user to configure the final effect of highlighting stair treads. The final effect should be optimal for the conditions of the stairs and visually attractive. The following features/ adjustments are discussed in the following sections. Parameter settings have to be done in settings menu (see Chapter 5. Settings menu).

- speed of turning the light on 2 regulations: from bottom to top, from top to bottom
- speed of turning the light off 2 regulations: from bottom to top, from top to bottom
- adjustment of irregularity (non-linearity, unevenness) lighting on and off
- control of blur effect in smooth mode
- adjustable maximum lighting time
- second input (second detector) lock for launch
- constant lighting input ^PS with additional timer function (adjustable)
- 'stand-by' lighting: all steps or two extremes, adjustable brightness from 0 to 50% electric power
- maximum brightness of effect adjustable in the range of 50-100% LED's electric power
- adjustable constant light (PS input) brightness: from 50-100% electric power of LED
- 10 algorithms (choosable lighting effects)
- 'leap' and 'smooth' mode
- number of connected stair treads (points of light) from 11 to 20
- locking input PB (signal from twilight sensor, time module, or 'smart home')
- factory reset

4.1. Turning on/ off speed adjustment

There are 4 speed regulations available in the controller:

- speed of turning the light on from bottom to top
- speed of turning the light off from bottom to top
- speed of turning the light on from top to bottom
- speed of turning the light off from top to bottom.

4.2. Calibrating the unevenness (nonlinearity)

Adjusting the non-linearity is able in the following range: 0-255. The parameter is unit-less and has different reflection for 'smooth' and 'leap' mode. This parameter is not used in the 9th algorithm at random extinction.

The unevenness is adding a constant time delay for lighting on/ off next stairs. For small unevenness values turning on/ off is almost even in time for all steps. When this parameter is large, the illumination or dimming get *slower towards the end.* Looking otherwise it can be said, that with the increase of the unevenness value the effect is accelerated at the beginning.

The nonlinearity function is very useful if the detectors are mounted on the first/last step, very close to the stairs and/ or operate with a delay. In this case, using the adjustment of non-linearity of the high parameter, you can make your stairs lights turning on quickly at the beginning and the slower, the closer to the end of stairs (so you can see the selected algorithm/ light effect).

4.3. Adjusting blur effect in 'smooth' mode

Adjusting the blur effect is only possible in the 'smooth' mode. It is to set the activation threshold, for which the next stair tread will start to glow/ dim. This threshold applies to the previous step. For example, the next step can lighten/ darken, like the previous one reaches 20% of capacity or - for different parameter values - the next step starts to lighten/ darken, when the former reaches 50% of electric power.

Adjusting blur effect in 'smooth' mode is possible in the range of 0-255. For the small values, the blur is very large (the stair treads more "overlap" while illuminating/ dimming), for the large values - the blur is small.

4.4. Maximum lighting time calibration

Lighting time is the maximum amount of time all stair treads are lighting (after sensor triggers and the selected light effect reaches the end of the stairs). This time is reduced when the second detector will trigger (in algorithm optimal for detectors). Setting range: 0-52 seconds (not every value available).

This maximum time is necessary for both: detectors and buttons optimal algorithms. In the case of the algorithm optimal for buttons, where it is only required to press the activation button entering the stairs, setting maximum time decides when lighting is to be deactivated. In the case of the algorithm optimal for detectors: maximum lighting time is

a kind of protection, if the second detector will not trigger (e.g. a person turns back or the detector does not detect motion) the staircase lights will be turned off after the set time.

4.5. 'Second' detector lock function (locking time)

The detector lock function is provided for detectors without timing calibration, which act quickly and react quickly. If the detector is mounted low and detects only close objects, there can be a situation, that it detects two legs instead of one person. The driver recognizes that for two people or a turning back person (walked down the stairs, left stairs, turned and walked up the stairs again). By setting detector lock parameter the controller PD/PG input is "frozen' for a specified time so that the driver recognizes the signal from the detector as one, not two (two legs).

Lock always refers to the detector, which trigger as the second when walking the stairs (when leaving the stairs).

Detector lock is adjusted in seconds, in the range of 0 to 9. Especially useful in the application of the reflective optical detectors (optimal setting 2-3s) and light barriers (photoelectric).

Short-lock is activated after a pass through the detector signal. Optimum blocking time of about 3 seconds allows to avoid a situation in which the detector with a fast response time will give a signal twice per person, as it detects passing each of the legs separately. The risk of a double detector activation is the greater, the lower the sensor is mounted.

4.6. Constant light function

Constant light input ^PS can operate in two modes: continuous mode and timer mode (timer function).

- **Continuous mode** activated by shorting the ^PS input to ground above 2s. In practice, a bistable switch can be mounted or you can apply time module.
- Timer mode

 (so-called 'timer'), activated by shorting the ^PS input to ground below 2s. For timer mode, you can determine (in the menu) the time lights will be activated to, after pressing the PS button (one or many buttons can be connected in parallel). The lighting is switched off automatically after a set time. Time is adjusted in a following range: 4 to 719 seconds, 13 to 999 minutes. Timer function can be deactivated at any time by pressing the PS button again.

TIP:

In the case of stairs with an additional room entrance from the landing, the 'timer mode' constant lighting function can be used to switch the lighting when getting out the room. A person coming from the room on the landing activates the timer and goes safely in any direction, because all stair are lighting by the time set in the menu. Switching time function can be performed by pressing the button, the signal (logical 0) or detector's relay.

4.7. Stand-by' modes and stand-by brightness adjustment

The controller allows a low dim illumination ('stand-by') of <u>all</u> or <u>first and last step</u>, which provides more safety in the dark. 'Stand-by' brightness can be set in the range of 0 to 50%. The parameter can be set so low that the stairs will be only slightly illuminated in the dark. After the sensor triggers stairs will light up to the set maximum brightness value.

Stand-by light can work in two modes: all steps are illuminated (<all>) or only first and last steps are illuminated (<two extremes>).

TIPS:

- a) if <two extremes> mode is selected, in a classic case the first and last step will be highlighted.
- b) In the case of mounting the LED strips also on the arms, you can just use the rails as a backlight rest. In this case, the LED strip railings must be connected to the first and last of the channels used by the controller.
- c) There is a third possibility to use additional lighting: ambient, decorative, on the ceiling above the stairs.

In the case of b) and c) to determine the number of channels used by the controller, you have to add two more channels (LED strips in handrails or other lights) to the number of stairs. This two channels are connected in parallel.

4.8. Maximum brightness adjustment

Adjusting the maximum brightness is an useful feature especially when using very strong LED strips. Maximum brightness can be set between 50 to 100% electric power of LEDs. Frequently seen hack is to use power LED strips, since they have more densely packed LEDs and the light appears to be more linear. To the human eye linearity of light emitted by the LED strips 60 LEDs per meter type is much smaller as compared with the 120 LEDs per meter type. If the power LED strips are shining too much, the maximum brightness parameter in the menu can be set lower.

4.9. Algorithm (lighting effect)

There are 10 different algorithms (lighting effects) available in the controller. Algorithms are marked with numbers from 1 to 10. Selection is made in the menu item *"Effect No."*.

- Algorithm 1 consecutive (one after the other) turning on, consecutive turning off (in the same direction as lighting on). Do not press the button leaving the stairs the lights go off after the time set in the menu. Optimal for buttons
- Algorithm 2 consecutive turning on, consecutive turning off; with a function of second button switch-off by
 pressing and holding for 2 sec. optimal for buttons
- Algorithm 3 consecutive turning on, turning off all at once optimal for buttons
- Algorithm 4 consecutive turning on, consecutive turning off optimal for buttons and detectors
- Algorithm 5 consecutive turning on, consecutive turning off, additional functions: person from the opposite direction, turning back optimal for buttons and detectors
- Algorithm 6 consecutive turning on, turning off all at once optimal for buttons and detectors
- Algorithm 7 carriage, train effect
- Algorithm 8 waterfall, cascade effects (in smooth mode, smooth random darkening) optimal for buttons and detectors
- Algorithm 9 consecutive turning on, random turning off optimal for buttons and detectors
- Algorithm 10 turning on and off all at once. No speed control. Lighting time set in the menu. Optimal for buttons and detectors.

4.10. Modes of operation

There are two basic operation modes: 'leap' and 'smooth'.

- Leap mode the spotlights, LED strips on the stairs switch immediately from 0% (or stand-by brightness) to 100% (or to max. effect brightness).
- Smooth mode the spotlights, LED strips on the stairs smoothly brighten (from 0% or stand-by brightness to 100% or to max. effect brightness) and dim (to 0% or stand-by brightness), reaching all intermediate values (1, 2, 3, 4%, and so on). This effect is especially good on looking with LED strips.

4.11. Choosable number of stairs

From 11 up to 20 stair treads / points of light can be connected to the controller. Exact number of used channels have to be set in the menu item "The number of stair treads". For example, if there are 15 steps – you have to choose 15 in the menu. Then the first step is a channel 1, and the last step is a channel 15. Other channels are not used.

4.12. Lock function

The controller has an PB input, which after a short circuit to ground blocks the action of the controller (no lighting effects and no 'stand-by'). The lock can be manually switched on with a standard switch, signal (logical 0) or twilight detector's relay, signal (logical 0) from the time module/"smart home".

NOTE: The permanent lighting (PS) has a higher priority and will run even when the controller is locked.

4.13. Reset

Reset function – to return to the factory settings of all parameters.

4. Settings menu

- To access the settings configuration menu, press and hold the PB input microbutton and press P2 microbutton. *"MENU setup"* should apper on the LCD. If you can see *"MENU setup"* – relase buttons. <u>ATTENTION</u>: When you are using the time module, make sure that the PB input is not blocked by the time module while doing menu setting. If this is the case, you can either unplug the time module for setting time, or modify the lock time to prevent PB from being blocked at any given time.
- Go to the **next** menu item pressing **PB** microbutton
- Setting the parameters is done using the 'P1' (up) and 'P2' (down) microbuttons
- To **exit** the menu, **press and hold 'PB' for about 2 seconds**. When you reach the last menu item 'Reset' and press PB the controller will exit the menu automatically.



5. Status messages



6. Priority of operation

- The highest priority of operation is triggering constant light from the ^PS input (constant lighting or timer function).
- Lock from the ^PB input
- The lowest priory are the effects from PD and PG inputs.

For example, if the lock function from the PB input is on and there is an input signal to PS, a constant light function will be launched, because it has a higher priority.

7. Disposal



Do not dispose of the controller in your normal domestic waste. This product is subject to the provisions of European Directive 2002/96/EC.

Disposal of the appliance

• Arrange for the product, or parts of it, to be disposed of by a professional company or by your communal waste facility.

• Observe the currently applicable regulations. In case of doubt, please contact your waste disposal centre.

Disposal of packaging



Dispose of all packaging materials in an environmentally friendly manner.

