Stair lighting controller
STX-1792

STX-1792 controller is used to control stairs lighting dynamically. The backlight is switched on with the subsequent steps, depending on the motion directions: ascending or descending.

The controller has 3 different light animation programs (for upward direction): **WAVE** – stairs light up one after another in the direction of entry, **CASCADE** – light „jumps" fast from top to bottom, lighting up the steps, **ELEVATOR** – three lighted steps are slowly „moving" to the top of the staircase. When descending to the bottom, the animation respectively changes direction. You can permanently select one of the programs or set the options to change programs on a regular basis.

Depending on the setting parameters of the controller, the light of the stairs can fade out to zero or to a minimum value (allowing to illuminate the stairs for better presentation, or climb them easily in the dark — without turning on a full light — especially important for children!). When you press the top button, the stairs are lighted from top to bottom and turned off also in the same direction.

The controller is adapted to control the MONO LED strips arranged in stair steps or points (spots) LED built into the wall above the steps. LED strip driver can smoothly dimm at each step which gives a nice effect to the eye.

In case when another person steps on the stairs, the controller switches on full illumination of stairs and fade them out smoothly.

Lights can be turned on by pressing directly button on the wall, connected to the controller or by the use of additional sensor (infrared, motion, pressure, etc.) to detect when the person steps on the stairs.

The controller can support up to 20 steps. It can also control lighting of handrail — in this case the number of steps is reduced by the number of handrails (max. 2). If there is no handrail, the controller can highlight, for example, ceiling lights (12V).

Number of supported points of light (usually it is the amount of stairs) and the number of illuminated handrails, are set at the factory and cannot be changed by the user.

Other parameters of the controller can be set by the user. These include the backlight on or off the stairs in the dark, steps lightening time, the time interval between successive step lightening (it has an impact on the speed of lightening all of the stairs), or the time after which the steps will be faded out. If used motion detectors, "dead" time can be set after receiving a signal from a sensor, or a lack of response to one or both of the sensors until the end of the animation program, to prevent re-integration of lighting while descending the stairs. You can also set a long time to start up the driver does – it will not react to transients of the sensor while power is on. Possibility of changing options can be locked. At any time, you can also restore the factory settings.

Specifications

Maximum number of illuminated stairs — 20 (or 18 steps and 2 handrails)

Quantity of illuminated handrails — 2

Voltage — 12V

Dimensions: length — 11cm, width — 9cm, height — 7 cm

Mounting on T-35 rail — the width of 6 modules.

Output capacity — up to 5A

Running — by shorting the input to ground (negative power supply)

The number of steps and number of handrails supported by the controller is set at the factory — when ordering, please give the following information:
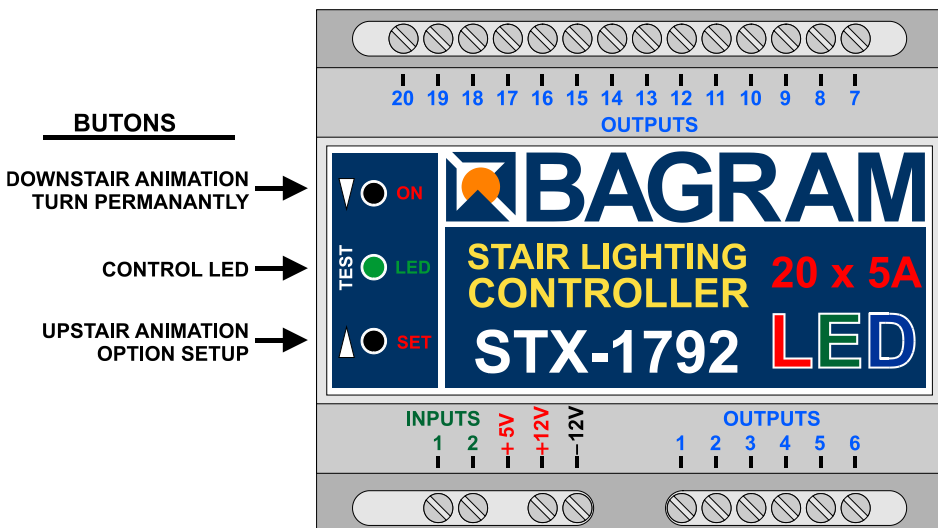
Quantity of illuminated handrails (1 or 2),

Stairs backlight type (LED strips or LED lights)

Type of handrails or overhead lighting (LED strips or LED lights)

Type of motion sensor (230V or 12V, please link to the sensor to be ordered).

If you have problems determining the amount and type of light points or sensors, please contact us.

Buttons functions and LED control

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Installation

Driver Installation should be done by the person having advanced skills in the field of electrical engineering, preferably a specialist with permission. Connecting the controller must be strictly carried out with the power off!

AC driver and LEDs should be stabilized with adequate current capacity dependent on the amount and length of the used LED strips or 12V LED light. Do not use a power supply (type 12) from halogens — the controller will be damaged immediately! The controller is designed for a voltage of 12V DC (stabilized). Maximum current per output is 5A. Do not exceed this value.

The first step is to connect the lights (LED strips or spots) to the driver. When you connect the 12V power supply, the stairs lightning should turn on with minimum brightness (so-called stairs illumination effect). When you press **UPSTAIRS ANIMATION** button (indicated by arrow pointing up) on the controller body, the controller should start lighting up the steps one by one. After pressing **DOWNSTAIR ANIMATION** button (indicated by arrow pointing down), the stairs lightning should go down. If there is no effect or steps are lighting up in a different way, you should check again carefully how to connect LED lighting.

Then it is recommended to adjust the sensor response to the movement without connecting them to the controller inputs. Be sure to first set the sensor pulse time (TIME) to extreme minimum and it should not be changed during adjustment, and the sensitivity (range) also at the minimum - but this parameter can be adjusted. In some sensors, there should be disabled or properly adjusted support function (called triggering). Only after obtaining the proper operation of the sensors, they can be connected to the controller.

After connecting the sensor, if only the first step is lighted, or the entire staircase is lighted, this means that the sensor pulse time exceeds 20 seconds, or is short-circuited. The sensor should be immediately disconnected from the controller and replaced operating properly.

Only after obtaining the proper light animation, you can begin to connect the motion sensor. Be sure to pre-set the operating time of sensors for extreme minimum and sensitivity (range) also at the minimum value. With some sensors, there should be disabled or switched triggering function.

Note: After powering of the whole system, the driver does not respond to the buttons or sensors for about 1 minute. This is indicated by the blinking of all steps.

The last step is time intervals adjustment. The best way is to do it after a few days of using the stairs in order to determine as accurately as possible the necessary changes. We recommend you to not adjust the parameters for no particular reason.

For the higher safety, changing parameters is permanently locked (Look: "Adjusting the controller").

LED Lighting

STX-1792 can control the backlight realized by LED strip and 12V LED lights (not 230V!). Strips are usually mounted under the steps, and the LED lights on the side of the steps. Connections between lighting elements are shown at attached pictures.
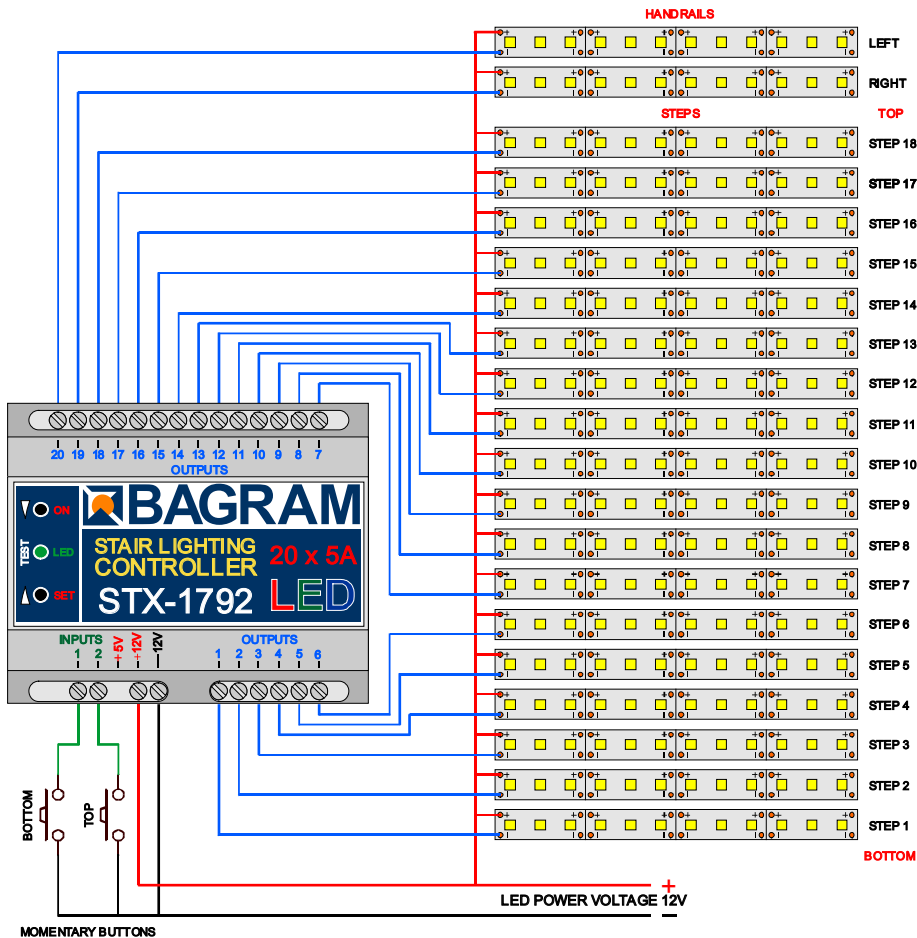
LED strips

A popular way for the stairs backlight is to use LED strips. In the case of STX-1792 controller, use one-color strips (mono). The color is not important. To control the colored bands (RGB) there is a dedicated STX-1793 controller. The standard supply voltage is 12V. The controller can also be connected 24V power, but because of the driver electronics voltage should not be exceeded.
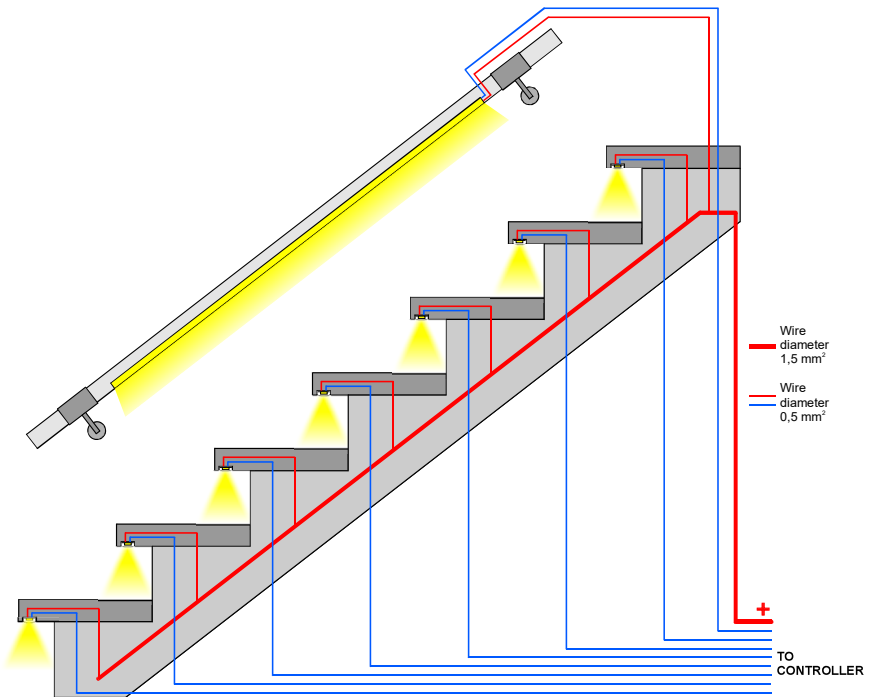
Electrical installation of stair treads — LED strip

LED strips are usually placed under the steps. Points (+) should be connected together and by single wire of 1.5 mm^2 fed to the controller. Points (-) of LED strips should be connected by separate wires of 0.5 mm2 to controller, as shown above.

You can also lead one pair of wires for each LED strip to the driver separately. Both solutions are equivalent.
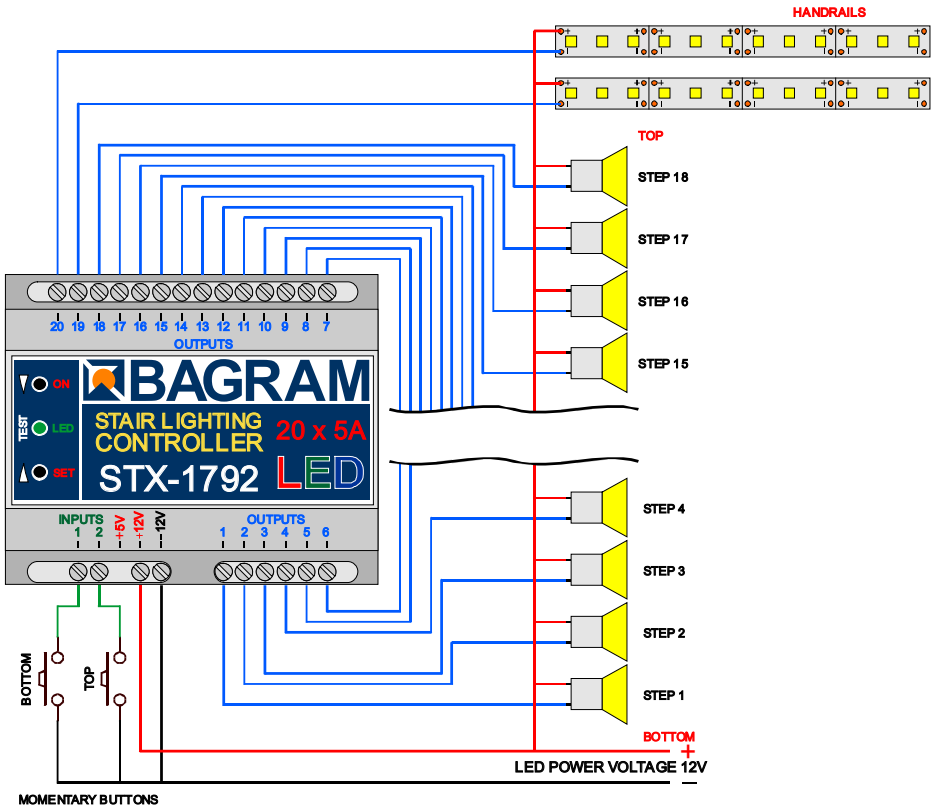
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LED strips connected to the controller

The diagram above shows the connection of the controller to the staircase consisting of 18 steps and two handrails. Output 1 is connected to the first, lower level, exit 2 to the second (higher), etc. The output 19 is connected, looking from the bottom of the stairs, to the right handrail (running up), and the output 20 to the left handrail (running down) . Please respect the principle that all the points (+) of LED strips should be connected with each other and plus value, points (-) should be connected to the controller's outputs.

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LED lights (spots)

Another way to highlight the stairs is to place on the wall, on each step, a small LED light (spot). Lights must be prepared to supply 12V voltage. We recommend the use of dimmable lights — then you will be able to use the backlight of the stairs, and the smooth illumination of each step.


12V spots connected to the controller

The diagram above shows the connection of the controller to the staircase consisting of 18 steps and two handrails. Output 1 is connected to the first light from the lower level, exit 2 to the second light (from a higher level), etc. The output 18 is connected to the last (18) light. Output 19 is connected, looking from the bottom of the stairs, to the right handrail (running up), and the output 20 to the left one(running down). Lamps generally have no polarity, so you should just follow the rule that the lights should be connected with each other and with the plus value, and the second end of each lamp must be connected to the corresponding driver output.

If the staircase is smaller and there is no illuminated handrails, for example you can use exit No. 20 for ceiling lighting above the stairs (of course, if you have one). However, there must be used LED elements with 12V power. Do not connect the lighting powered from 230V!

The next picture shows a solution where the exit No. 20 is connected to three 12V LED lights placed on the ceiling above the stairs. The driver will be turning it on with the first step and turn off after about 2 seconds from the extinction of the last step. Of course, you can use any other light source with the voltage of 12V, depending on the design of the stairs, in place of ceiling lamps.
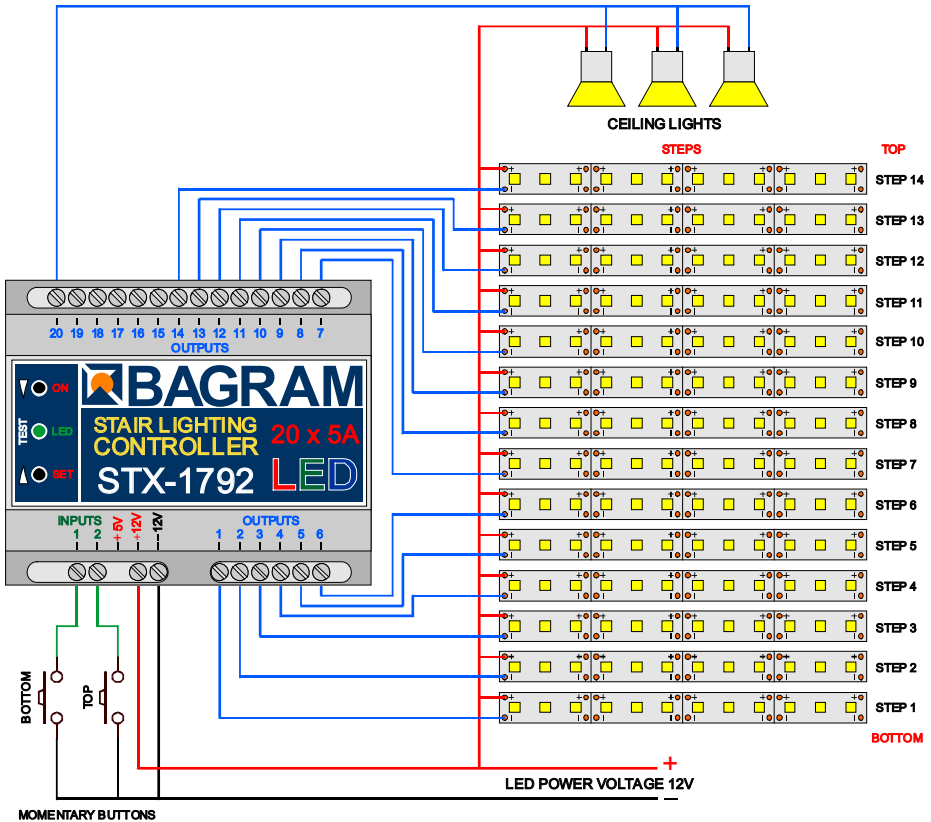
Ceiling lighting

When designing the connections between the controller and LED points, please include your current flowing in the circuit and select the appropriate type of wiring. Plus supply line for 12V LED strips or LED lights should have a much larger cross-section than the cables between the controller and the LED strips.

Installation must be carried out very carefully and securely to avoid loosening of wires or short circuits between them. LED strip wires should be soldered. We do not recommend using special sockets and plugs, because after a while, due to the movements of the stairs, they are loose and may lose contact.

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Control

Driver inputs are working on a short to ground. Connecting random mechanical button (not switch) will run the controller after a short press. One end of the button should be connected to the controller input, and the other to ground (minus of 12V). All previous diagrams show this solution.

You can also run the driver with other elements or devices, including motion sensors. Motion sensors are found in two versions: the 230V voltage and the voltage of 5 or 12V. Do not connect the sensor directly to the input of the driver, because, especially in the case of 230V sensors, it will cause (at best) incorrect working of the controller, and at worst it can be completely damaged.

Before mounting the sensors, please set their parameters. The most important is the length of the impulse (time of starting the sensor), which should be set to a minimum and should not exceed 15 seconds (preferably about 1-5 seconds — this should be checked before purchase). The second parameter possible to set on the sensor is its sensitivity and range. This parameter should be set experimentally in order to enable steady and in the right time.

In some sensors you can choose from various modes of operation. Please turn off triggering mode, because in this mode, the sensor provides the impulse continuously when a person is within its range - and the impulse becomes too long as for the requirements of the controller.

Sensors operating at 230V network require the use of transmitters to separate the 230V circuit from the controller inputs. LV Sensors will almost certainly need a special adapter matching the sensor signal to requirements of the controller. The following diagrams and descriptions explain how to connect the most common types of sensors. If you need to use a different type of sensor, please contact the manufacturer to agree on how to connect the sensor.

## Motion sensors for 230V voltage

A typical motion sensor (230V) is a standard size module and is connected to the installation box. It has regulatory elements (time, sensitivity, etc.) and usually three contacts for wires. Two are plugged into a 230V network, and the third wire is used to power the receiver (the lamp) and is marked with an appropriate symbol. Before installing the sensor, carefully read the instructions.

Motion sensor for 110-230V - CRN 5491

Some motion sensors have a built-in additional twilight sensor. Depending on the sensitivity settings it can be inactive in strong light. Thus, illumination of the stairs does not turn on during the day. However, this may cause problems - if it rains, the twilight sensor will lighten the stairs. By adjusting the sensitivity, you can try to prevent this. We can recommend our 230V sensor CRN-5491, modified to work with our controller:.

The next diagram is one of a typical motion sensor (230V) connected to the controller. Relays must be used! Relay coil voltage must be set at 230V, because this voltage is supplied from the motion sensor. Connect input 1 or 2 and (-) of 12V to the contacts of the relay NO (normally open) and CO (common),. We recommend the assembly to be done very carefully. If the connections are made erroneously, the controller will be damaged.

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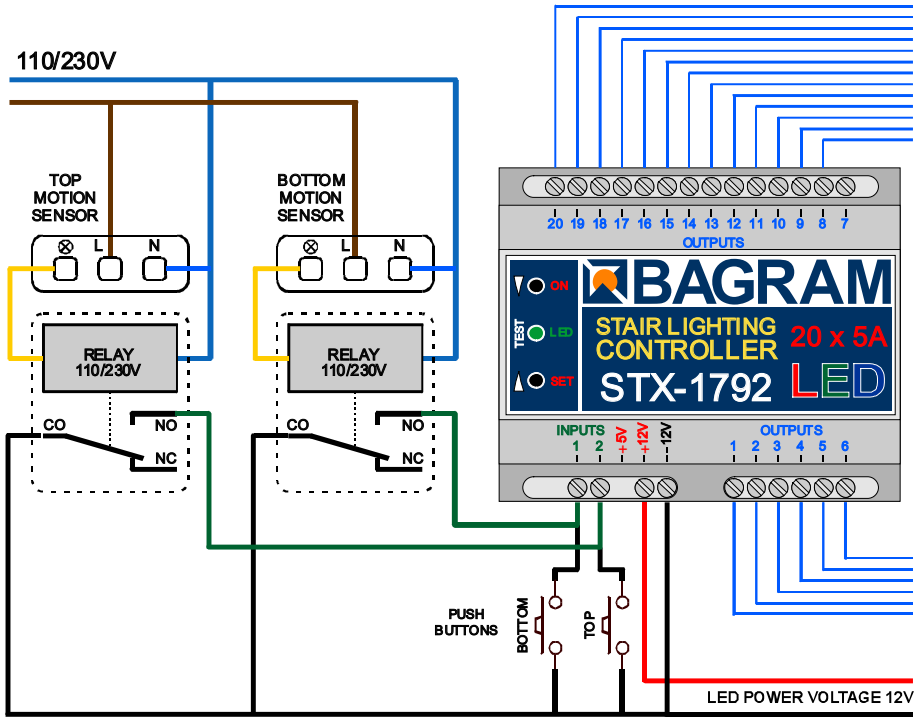
Installation diagram: 110-230V motion sensors connected to the controller

The relays used to separate 230V circuit from the controller may be of any type. We recommend the relays to be mounted on T-35 bus, the same as the controller. Their use helps with the installation.

Photo to the left shows our product STP-4811 — a set of two relays in a single-rail case T-35. This set makes it possible to separate 230 V voltage coming simultaneously from two motion sensors.

Set of two relays STP-4811
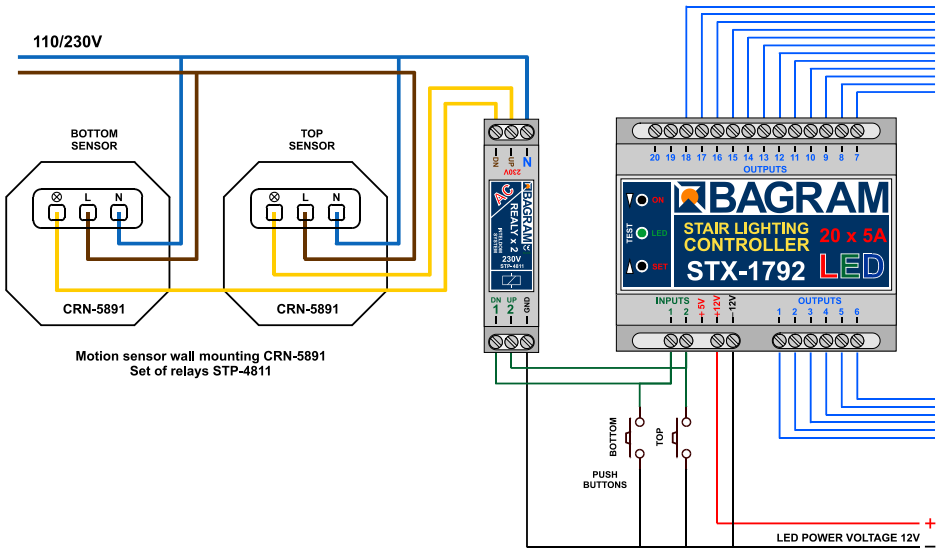
Installation diagram: motion sensor CRN-5891 connected to the controller
NOTE: Knob "Time" in the sensors must be set to minimum!

The picture above shows an example of the assembly of motion sensors operating at 230V. There are used two one-connection transmitters with stands for mounting on T-35 bus. Due to the fact that every manufacturer of transmitters and sockets uses a different pin configuration, you should always carefully consider how to connect the sensor and the controller to the transmitter so that the driver does not connect directly to 230V!
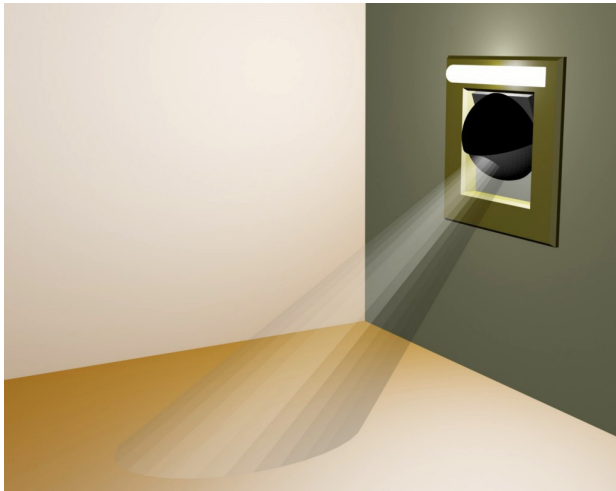

Installation of motion sensors in order to work properly is very difficult, and often impossible. Visualization next to the sensor assembly may help.

We recommend to tilt down the sensor so as to „see" only a portion of the first step while cloaking the top of the Fresnel lens with opaque material. If the motion sensor does not have built-in light sensor, add at least a small, steady source of light over the sensor to light up the field observed by the sensor.

Motion sensors for voltage 12V

You can also use miniature motion sensors operating at low supply voltage such as 12V. We offer the sensor with the symbol CRN-5481. Voltage of the sensor is identical to the LED supply voltage, which greatly simplifies installation of the entire system.
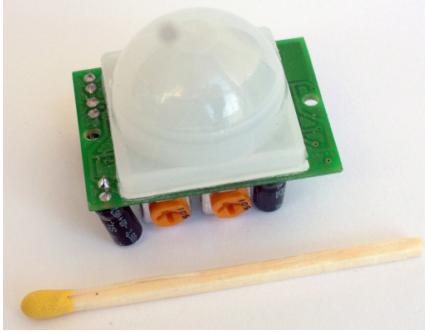

Miniature motion sensor

Sensor dimensions: plate: 32.5 x 23.5 mm, the diameter of the bowl: 23mm. The sensor has an adjustable impulse length and sensitivity.

The sensor can be connected directly to the controller input. It is important that the sensor, the adapter and the driver have been combined in the right way, according to the following pictures and diagrams.
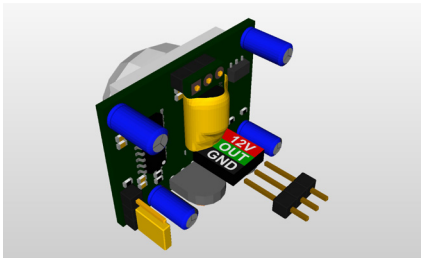

The view of the sensor back side

On the back of the sensor is a connector for connecting wires leading to the controller. To facilitate assembly, to each sensor is added the connector to soldering wires. You should keep the correct order of wires according to the description on the sensor connector.
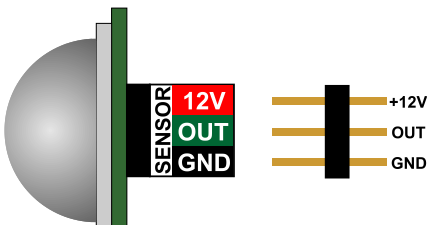
Sensor socket and plug

It is recommended to use colored cables with the smallest possible diameter, eg. telephone cable bundles. Please note that any mistake in wiring, especially power can damage the sensor or controller.

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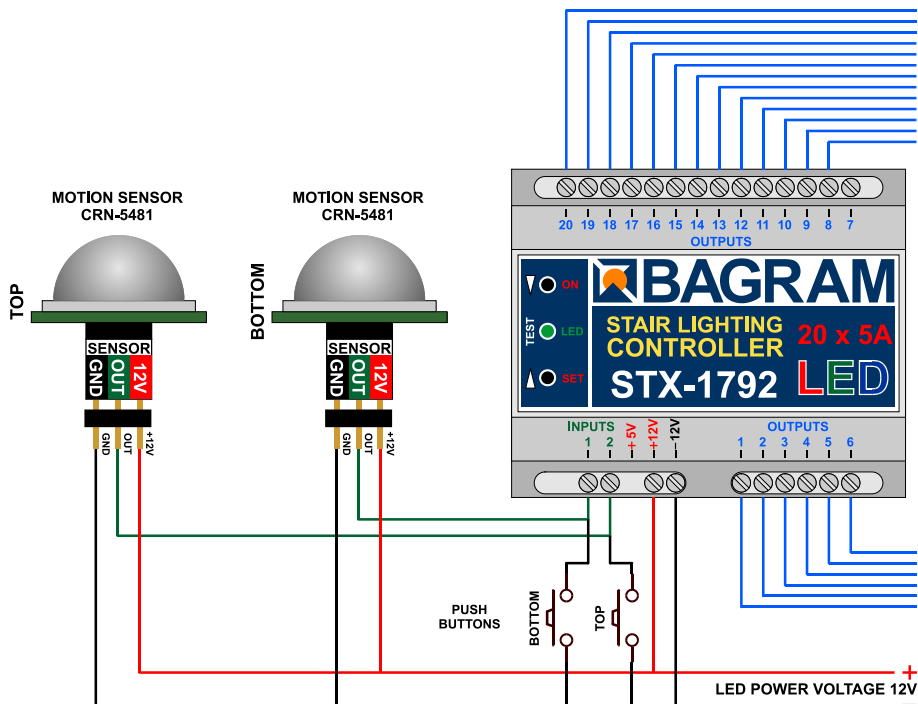
Installation diagram: 12V motion sensors connected to the controller

The diagram below shows exactly how the whole set is made using 12V motion sensors.

Before mounting the sensors, please set their time of action and sensitivity to a minimum. In the case of sensors with a jumper used to select the operating mode with or without triggering, choose the position "non-repeatable trigger."

These prepared two sets of adapters with sensors should be mounted in appropriate place on the side of the first and the last step.

Setting the motion sensors

This is one of the most difficult operations — it requires patience and accuracy. First of all, adjust the sensitivity of the sensor in order to accurate respond to the person entering the stairs. The second problem to solve is that the sensor does not respond to the person descending the stairs - that it not re-activate the fading of the stairs. Best thing to do is to cover the sensor hemisphere respectively. Of course, the arrangement of the sensors is also very important — usually they are placed on the right side of the stairs looking in the direction of movement (when the right-hand 'traffic'). Some sensors have additional adjustable parameter - the so-called 'dead time'. It is a time measured after pulse for which the sensor does not respond to the next person entering into the field of its operations. Patient changing mentioned parameters will adjust quite well the sensors so that their work and lighting the

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stairs will be rewarding.

Adjusting the controller

Setting the parameters should be performed only when strictly necessary, after carefully reading the following description. For greater safety, parameters change is already locked. It can be unlocked by the user after understanding the methods of setting parameters.

To start the parameter setting mode, press and hold the **SETUP** button for about 20 seconds (it stars lighting up the steps) until the green **LED** will fade out. Release the button to go to the controller parameter setting mode. A few seconds flickering of the **LED** corresponds to each parameter. You can set or change 12 parameters, and therefore there will be twelve consecutive flashes of the **LED**. In order to facilitate counting them, a marker is inserted every five flashes marker – a two second **LED** solid light. To select a specific parameter to be changed, you should count each flickering and the at
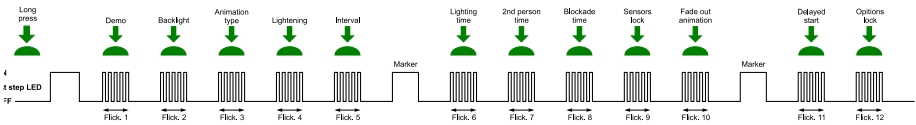
Adjusting controller parameters diagram

relevant number of the flickering, press the **SETUP** button. If you do not want to change a parameter, skip the flickering without pressing the button. If at the parameter setting mode the **SETUP** button is not pressed, none of the parameters will change.

The principle of setting the parameters is as follows: setting each parameter is indicated by rapid blinking of the green **LED**. If during this flickering the **SETUP** button is pressed and held, then, depending on the parameter, you will see from one to dozens of slow **LED** flashes. Setting the parameter is to release the button with the desired number of flashes or just after the end of flickering. During the flickering, if the **SETUP** button is not pressed, after a short time of fading out the **LED**, there will appear flickering of the next parameter and so on until the end of setting mode. If desired flickering is omitted, then the corresponding parameter is not changed. This allows you to set, for example, only one parameter, except of all the others. Notice: if the **SETUP** button is pressed during the flickering
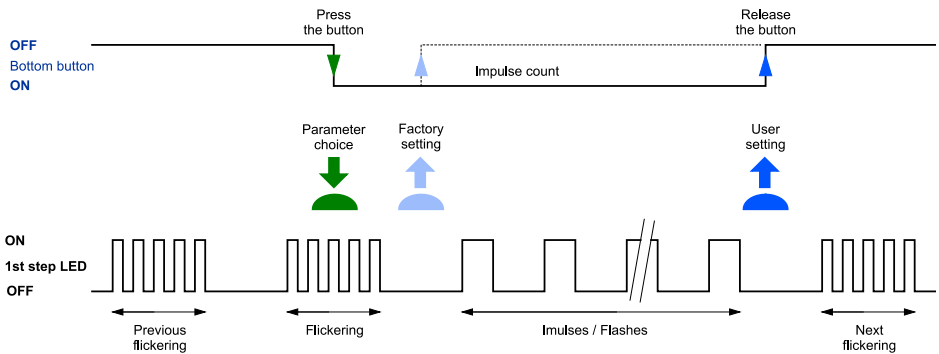
Setting single parameter

and released immediately after it, but before the first impulse, the value of the parameter will be set to the factory setting.

We recommend setting only one parameter a time.

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Although the parameters change is locked, the process described above works, and you can practice it without worrying about changing any of the parameters. Chosen values are not stored in memory of the controller.

Description of parameters

Flickering 1 – Demo mode.

This parameter is not locked and it works always, independently from the parameter lock status. It shows lighting controller capabilities for the stairs. This function can be used to demonstrate the stairway lighting or to check if the controller works properly. After demo mode, the driver enters the standby mode and waits for a signal from the button or motion sensor.

Flickering 2 – Staircase backlight.

Steps illumination is used to gently brighten the dark steps so as to be easily visible, which makes good impression. There is no possibility of adjusting the backlight brightness. The backlight does not work with lamps having no dimming function (dimmable) and should then be turned off. For this parameter (backlight on), releasing the button just after the flickering turns off the backlight, and releasing after the first impulse - enables the backlight.

Flickering 3 – Animation type.

The controller has 3 different light animation programs (for upward direction): **WAVE** – stairs light up one after another in the direction of entry, **CASCADE** – light „jumps" fast from top to bottom, lighting up the steps, **ELEVATOR** – three lighted steps are slowly „moving" to the top of the staircase. When descending to the bottom, the animation respectively changes direction. In the factory, cycle animation function is set: first WAVE, then CASCADE and finally ELEVATOR, and then the sequence is repeated. Releasing the button after the first pulse turns the program 1 (Wave), the second pulse will turn on program 2 (Cascade), and releasing the button after the third pulse switch permanently program No. 3 (Elevator). To turn back cycle animation function, the button should be let go immediately after the end of the flickering.

Flickering 4 – Lightening of the steps.

You can set the time of slow lightening of the steps. This gives a pleasing effect, rather than a sharp light at full power. The factory setting is 10, which corresponds to 0.5 second time of single step illumination (a total of 10 seconds for 20 steps). Releasing the button after the end of the flickering sets the time to the default value (approx. 0.5 sec. – 10 units). However, if the button is held on, you can set a different, shorter or longer period of time illuminating a single step. Number of flashes is proportional to the time of illumination. Just hold the button for the appropriate number of flashes (default setting of 10).

Flickering 5 – Time interval between lighting following steps.

Releasing the button after the end of the flickering sets the time to the minimum so that the speed of the staircase lighting depends on the time of steps illumination. However, if the illumination time (parameter 4) is set to a low value or zero (eg lamp lights), set the value of the experimental time interval so that the steps will light up at the right speed. Number of flashes is proportional to the

time interval and is approximately 0.5 seconds per unit (pulse). This parameter is factory-set to 0 (minimum value), which makes the next step is lightened immediately after the previous one.

Marker – Fixed light – 2 sec.

Flickering 6 – Time between illuminating and fading out the staircase.

It is a time in which, after switching steps such as one by one, they light up continuously at all levels, before the start of their fading out. Factory value is set to 10 seconds, which is equal to 10 pulses (1 pulse = 1 second).

Flickering 7 – Time of illumination for the other person.

If the next person enters the staircase, illumination of all steps go on. It is re-measured at each entry of the new person, and therefore light will turn off after a set time measured from the entry of last person. This time is pre-set to 20 seconds, which equates to 20 pulses (1 pulse = 1 second).

Flickering 8 – Controller blockade time.

If the sensor detects when a person sends more than one pulse for example, by the movement of other people on the stairs, the driver can react by turning the lights all over the stairs, just like during the entrance of another person. To avoid this, you can set the so-called blockade time counted from the end of the first pulse, during which the driver will not respond to further impulses. Blockade time is pre-set for 2 seconds, which corresponds to 2 pulses (1 pulse = 1 second).

Flickering 9 – Sensors lock.

Important parameter when installing motion sensors. In some cases, motion sensors can not be placed in an ideal direction, and it happens that when a person starts going down the stairs, and turn all the lights on as if at the stairs came next person. This can be prevented by blocking the sensors in two ways. When you release the button after the first impulse, the opposite the sensor to the sensor that started the animation is blocked. When released after the second pulse, both sensors are blocked. Lock lasts for the duration of the animation to the end of lighting time of the stairs or turning on the backlight. From that point on the two sensors are again active and animation can be run in either directions. You can disable the lock by releasing the button immediately after the end of flickering. As you get the controller from the factory, the lock is turned off.

Flickering 10 – Fade out animation.

If the other person comes up the staircase, all the lights light up. It can be turned off by a smooth, slow fade or animation of the steps. Releasing the button immediately after the flickering sets the first option, and releasing after one impulse - the second one.

Marker – Fixed light – 2 sec.

Flickering 11 – Controller delayed start.

Some motion sensors, after power on, transmit a long, often tens of seconds, pulse. It can cause an incorrect operation of the controller (eg the inclusion of constant light). In this case, you can set a controller delayed start — about 1 minute. At that time, after powering of the whole system, the driver does not respond to the buttons or sensors. This is indicated by the blinking of all steps. Normally, the delayed start function is on. Releasing the button immediately after flickering turns delayed start off, and after one impulse – turns it on.

Flickering 12 – Changing parameters lock and controller reset.

This option is always active, even during the lockout to make adjustments. To unlock the parameter setting, press and hold the **SETUP** button during twelfth flickering and release immediately after the third pulse. Unlocking is confirmed by three slow flashes of the **LED**. From this point, you can change all parameters of the controller.

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To block the ability to change parameters, after they are set correctly, press the button again during the twelfth flickering and release it immediately after flashing and before the first impulse.

If the parameter setting is enabled, before the first flickering will show three short pulses indicating the standby controller to change parameters.

You can reset the controller, or restore it to factory settings (for example, after wrong setting the parameters) by pressing and holding the **SETUP** button during the twelfth flickering and releasing it immediately after the fifth pulse. A successful reset is confirmed by five slow flashes of the **LED**.

To turn the light of the stairs on the permanently, press and hold for 20 seconds the **UP** button (ignition of lighting up the steps) until the lights go out at all steps. Releasing the button will light up the staircase. To turn off the permanent light, press the UP button and hold it for more than 20 seconds. The driver then goes to normal functioning.