Stair lighting controller

RGB

STX-1793

STX-1793 controller is used for dynamic color (RGB) lighting of the stairs. The backlight is switched on with the subsequent steps, depending on the motion directions: ascending or descending while changing the color of lighting.

The controller is adapted to control the RGB LED strips arranged in stair steps and possibly the staircase handrails.

The controller has three programs of color changing: in the first program each stage is lit with a different color; in second program color at all steps is the same, but changes smoothly when the steps are turned on, lights on and off. The last program is fixed and immutable (there can be selected one of the 7 colors) or will change to another color at every turning on the light of the stairs.

When you press the button (eg at the bottom of the stairs), illumination lights up step by step from bottom to top. After lighting up the entire staircase the light is stable for a short period, and then lighting of the staircase goes from the lower to the upper level, sequentially step by step.

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.

In case when another person steps on the stairs, the controller switches on full illumination of stairs and extinguish them after a set period of time.

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 25 steps. It can also control lighting of handrail (max. 2).

The number of supported steps and the number of illuminated handrails can be set and changed by the user.

Other parameters of the controller can also be set by the user. These are mainly: time intervals between lightening succesive stairs steps, or time after which steps will be faded out. Additionally, there can be set up ways of colour change, their brightness and other detailed settings of the controller.

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Specifications

Maximum number of illuminated stairs — 21
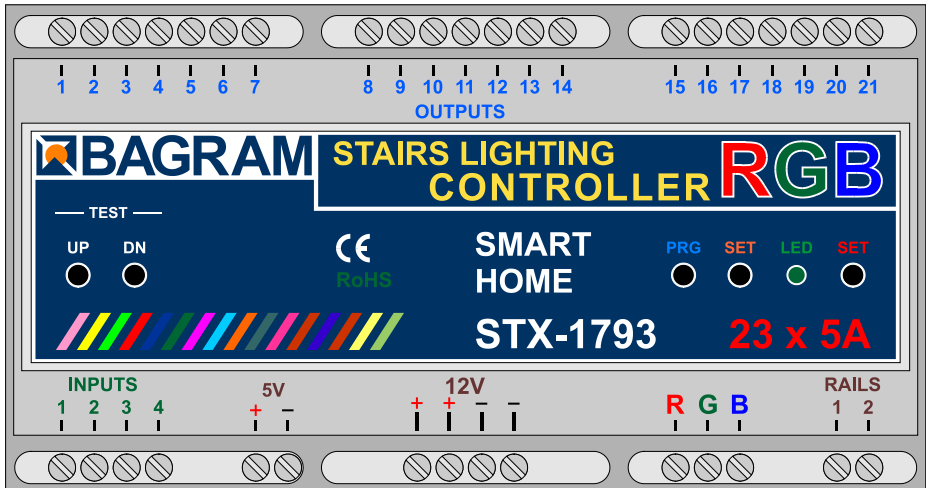
Quantity of illuminated handrails — 2

Voltage — 12V

Dimensions: length — 14cm (5,5''), width — 9cm (3,5''), height — 7 cm (2,75'')

Mounting on T-35 rail — the width of 8 modules.

Output capacity — up to 5A

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

Description of the buttons on the housing:

UP — button that starts the animation up
DN — button that starts the animation down
PRG — RGB program change button
OPT — RGB program options change button
LED — signaling diode
SET — parameter setting button

Description of the controller inputs:

1 — lower sensor,
2 — top sensor,
3 — RGB program change button,
4 — RGB program options change button.

RGB color programs and their options

RAINBOW program:

In the RAINBOW program, each step has a different color. There are seven color grades in total, so the colors are repeated accordingly. The program has two options to choose from:

1 – The colors on the steps are stationary

2 – The colors when lighting the steps and constant lighting go up or down, respectively

Color change program:

In the Color Changes program, all grades glow with the same color, which changes smoothly throughout the entire spectrum during the animation. The options determine the rate of color change:

1 – 7 — color change rate, where 1 is the fastest and 7 the slowest.

Solid color program:

In the Solid colors program, all the steps glow with the same color, which remains unchanged during the animation of the steps. The options determine what color will be used:

1 – The color is constant, but it changes cyclically with each start of the stairs

2 – 7 — the color is constant and the same every time you run the steps.

Color list:

1 – cyclical change,

2 – white,

3 – red,

4 – green,

5 – blue,

6 – yellow,

7 – pink,

8 – cyan

You can define your own colors in the driver settings and use them in this program.

Change programs and options

The **PRG** button or input 3 is used to change programs, and the **OPT** button and input 4 to change options. Programs and options can only be changed when the controller is idle.

Each press of the **PRG** button changes the program to the next one, which is signaled by the blinking of the **LED** diode on the casing and the blinking of the first stage. For program 1 it is one flash, for program 2 - two flashes, and for program 3 - three flashes.

The **OPT** button works similarly, but remember that each program has a different number of options.

The change of programs and options can be controlled by conveniently located buttons connected to inputs 3 and 4 or remotely by means of the **SRF-4884** radio controller.

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 to the driver and press button TOP on the case of controller. The controller should start lighting up the steps one by one. 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.

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.

The diameter of the wires

1,5 mm^2

0,5 mm^2

1,0 mm^2

RGB

TO CONTROLLER

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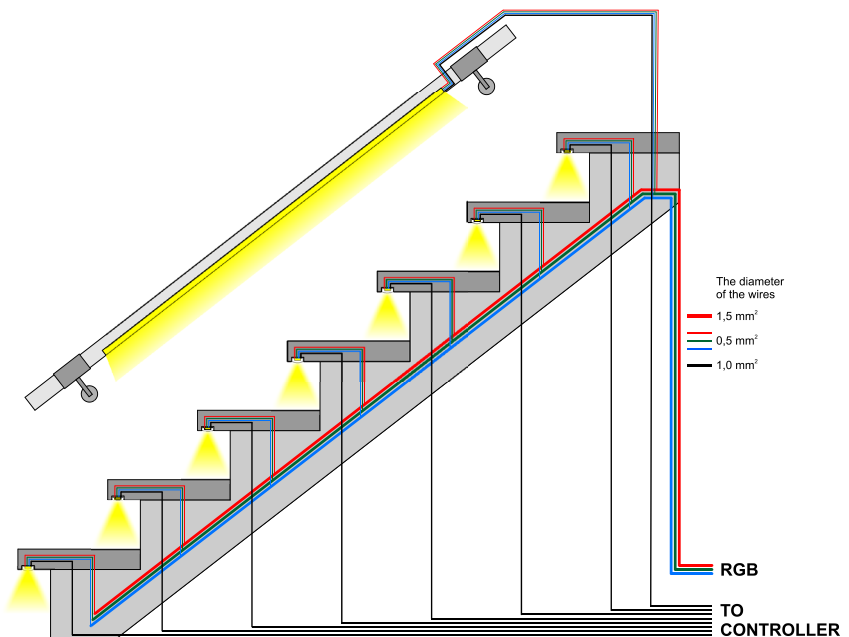
LED Lighting

STX-1793 może sterować podświetleniem zrealizowanym wyłącznie za pomocą taśm LED RGB. Taśmy LED na ogół montowane są pod stopniem, a podświetlenie poręczy w pochwycie (świecą w dół). Podłączenie elementów oświetlających do sterownika pokazują kolejne rysunki.
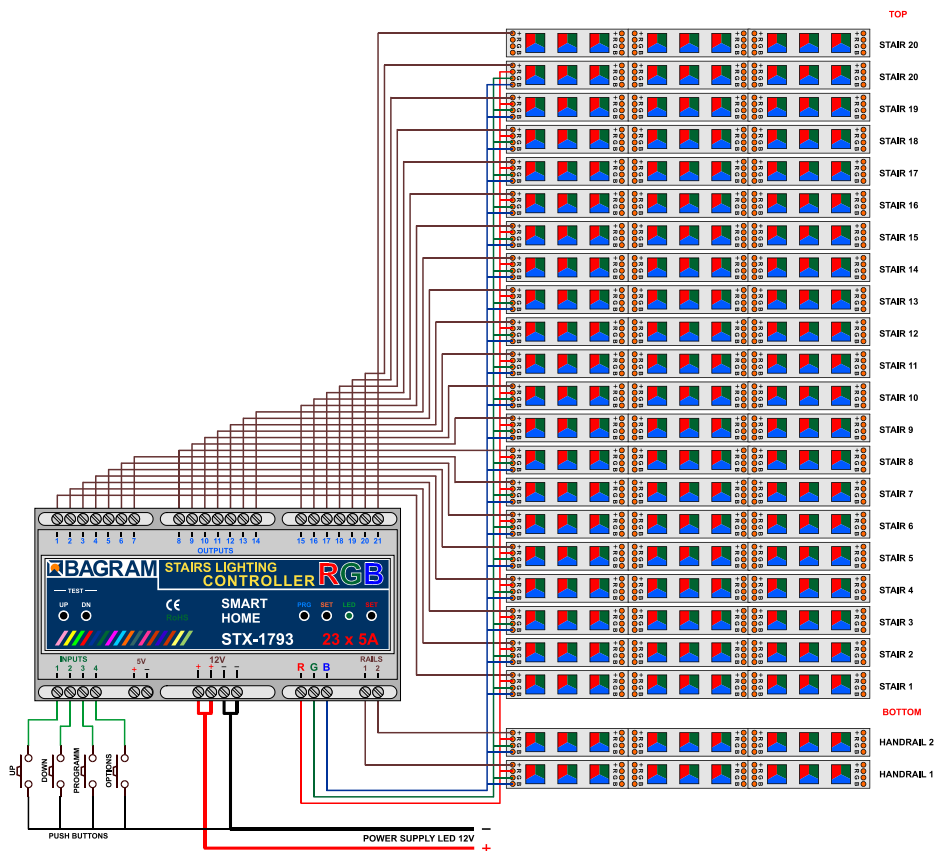

Diagram: LED RGB strip connected to the controller
NOTE: Arrangement of points R, G i B on the strip
may vary from shown above!

The diagram above shows the connection of the controller to the staircase consisting of 20 steps and two handrails. Output 1 is connected to the plus (+) RGB strip from the first, the bottom step of the stairs, output 2 to the plus (+) RGB another (higher) step of the stairs, etc. The output 20 is connected to the plus (+) RGB strip at last step of the stairs. The output 21 is connected, looking from the bottom of the stairs, to the right handrail (running up), and the output 22 to the left handrail (running down) . Points R, G and B LED strip should be connected properly to each other, ie, all the points of R together, all the points of G together and all points B together. Then just set up collection points should be connected to the respective outputs RGB controller.

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!

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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.
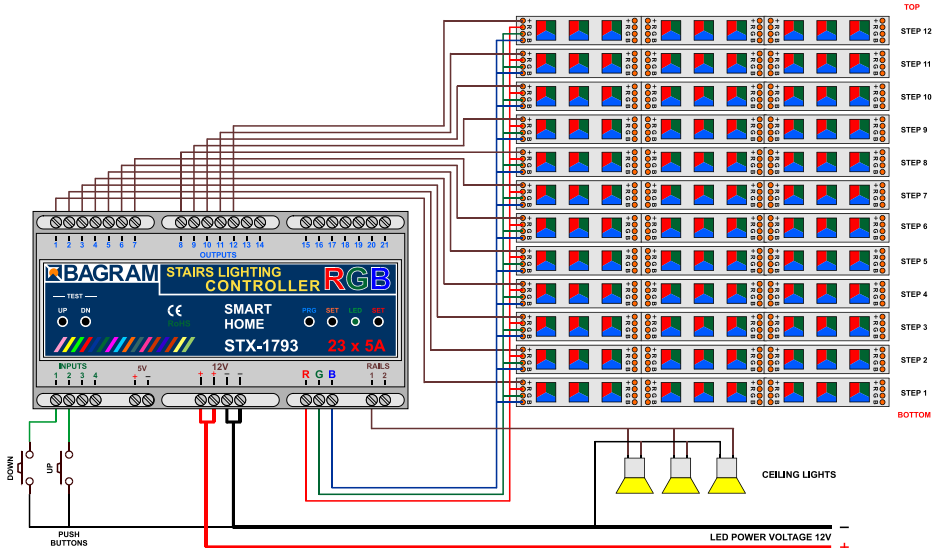

Diagram: Ceiling lighting

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.

ATTENTION! You cannot connect the AC to 5V plus (+) and minus (-) outputs. These contacts are used for low-voltage power sensors.

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.

The picture on the next page shows an example of the assembly of motion sensors operating

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Control

Controller inputs function on a short to ground basis.. Any mechanical button (not a switch) will activate the controller after a short press. One end of the button should be connected to the controller input, and the other should be grounded ((-) of 12V). All the above diagrams show this solution.

You can also run the controller with other elements or devices, including motion sensors. Motion sensors can be found in two versions: a voltage of 230V voltage and a voltage of 5 or 12V. Do not connect the sensor directly to the input of the controller, because, especially in the case of 230V sensors, it will cause (at best) incorrect performance of the controller, and at worst the controller can be completely damaged.
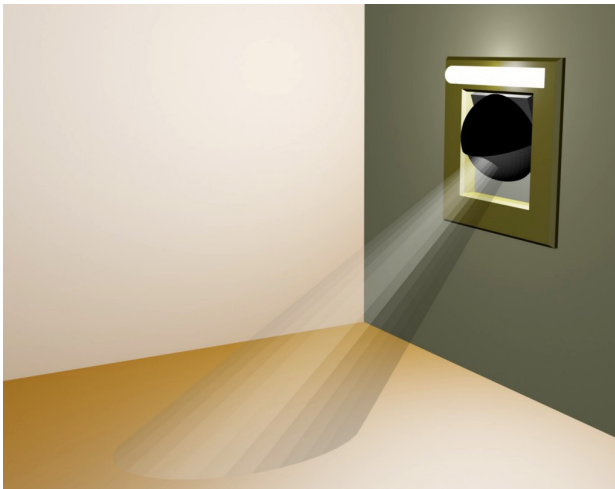
We offer several different motion sensors that work well with the controller. They all have the appropriate runtimes (pulse length). However, you need to choose the right type of sensor for your interior and the layout of the stairs.

Before mounting the sensors, set their parameters. The most important is the length of the impulse (the time for the sensor to start), which should be set to a minimum and should not exceed 15 seconds (preferable time about 1-5 seconds — this should be checked before purchase). The second parameter which can be set on the sensor is the sensitivity and range of the sensor. This parameter should be set experimentally in order to enable a steady connection at the proper time.

In some sensors you can choose between various modes of operation. The triggering mode should be turned off, because in this mode the sensor provides the impulse continuously when someone is within its range - and the impulse becomes too long in respect to the requirements of the controller.

Sensors operating at 230V network require the use of relays to separate the 230V circuit from the controller inputs. Low voltage 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 establish how to connect the sensor.

We recommend that buttons (such as door bell ones) are installed on the top and bottom of the stairs, besides motion sensors,.

Installation of motion sensors in order to work properly is extremely difficult. The visualization presented here may be helpful.

We recommend the sensor to be tilted down, so it „sees" only a portion of the first step. The top of the Fresnel lens should be covered with an opaque material.

The motion sensor mounted on the wall

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Motion sensors for 12V voltage

Low voltage sensors differ in dimensions, capabilities and working principle. We will briefly discuss all of them. For detailed information, please refer to the instructions for each type of sensor.

## Motion Sensor 12V wall mounted with twilight CRN-5480

The **CRN-5691** is a motion sensor for 12V voltage with wall mounted case for applications as a device that triggers controllers when motion of an object is detected. The sensor is cooperating with lighting controllers for stairs. The sensor detects objects emitting infrared (heat) radiation, such as people or animals. The sensor sends a fixed-length pulse (about 5 sec) after motion detection. The pulse has a negative level and can be connected directly to the controller input. A special feature of the sensor is the twilight sensor instaled.

## Miniature motion sensor 12V CRN-5686 with sensitivity adjustment
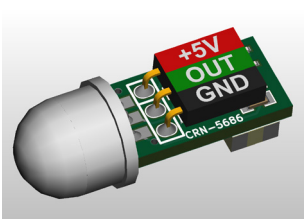
The **CRN-5686** is a subminiature motion sensor for 5V voltage for applications as a device that triggers controllers when motion of an object is detected. The sensor is cooperating with lighting controllers for stairs. The sensor detects objects emitting infrared (heat) radiation, such as people or animals. The sensor sends a fixed-length pulse (about 5 sec) after motion detection. The pulse has a negative level and can be connected directly to the controller input.

## Standard motion sensor 12V CRN-5481
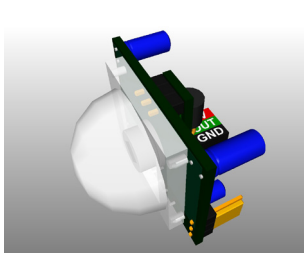
The **CRN-5481** sensor fits freely into a 60 mm mounting box. Dimensions: 32x24x18 mm. The sensor has a wide range of sensitivity adjustment, as well as a removable large bowl that can be accurately outlined to reduce the field of view. It can be powered from the same voltage (12V) as LEDs.

Compact Twilight Motion Sensor 12V CRN-5684
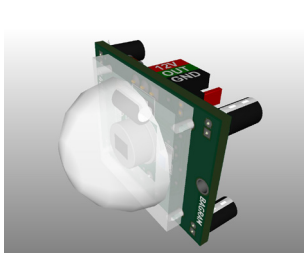
A special feature of the **CRN-5684** sensor is the twilight sensor installed. It blocks the work of the sensor if the light level exceeds the set value. The sensor fits freely into a 60 mm mounting box. Dimensions: 26x24x18 mm. The sensor has a wide range of sensitivity adjustment, as well as a removable large bowl that can be accurately outlined to reduce the field of view. It can be powered from the same voltage (12V) as LEDs. It has a diode signaling the sensor pulse.

Ultrasonic sensor 12V CRN-5462
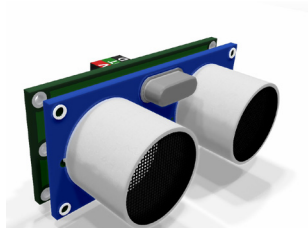
The **CRN-5462** ultrasonic motion detector has a precisely adjustable field of view range from 1 cm to 250 cm. The field of view can have a selected depth and distance from the sensor in the range of 1 cm to 250 cm. Dimensions: 46x20x20 mm. The sensor fits freely into a 60 mm mounting box. It can be supplied with the same voltage as the LED diodes. It has a diode signaling the sensor pulse.

Installation of sensors

Each low voltage sensor can be directly connected to the controller input. It is important that the sensor and the controller itself are connected in the correct way.
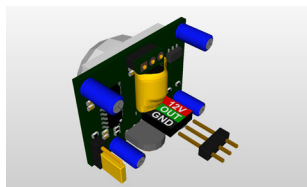
On the back of the sensor is a connector for connecting wires leading to the controller. To facilitate assembly, to each sensor is added the connector to soldering wires. You should keep the correct order of wires according to the description on the sensor connector.
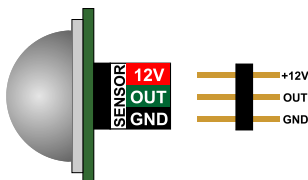
It is recommended to use colored wires with a possibly small cross-section, eg a telephone cable harness. Please note that any mistake in connecting wires, especially power supplies, can damage the sensor or controller. To facilitate assembly, to each sensor is added the connector to soldering
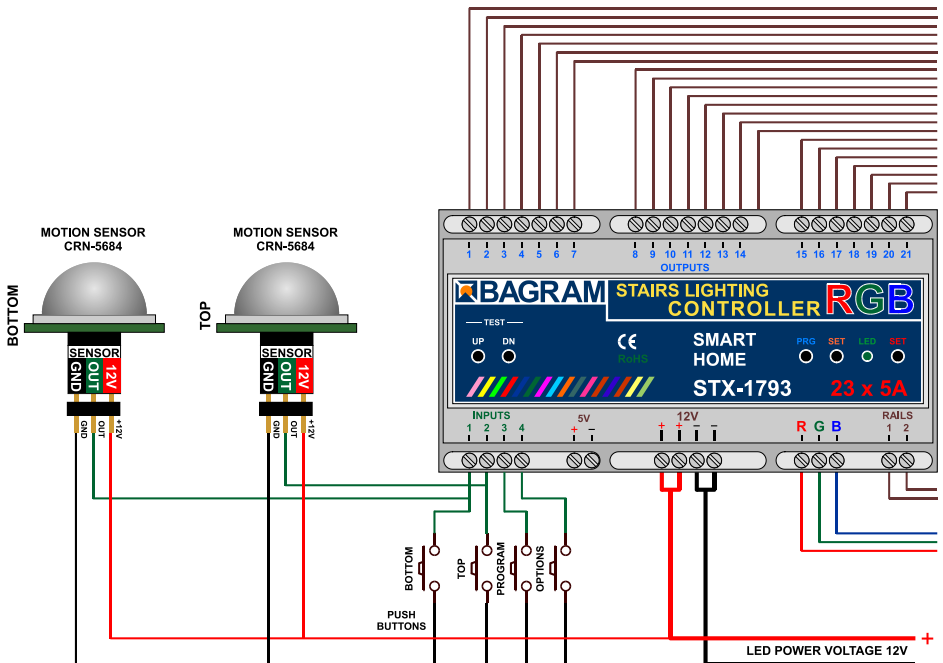
The sensor's angle of view can be adjusted by gluing the sensor's bowl (removed) from the inside with a white insulating tape so that it does not see people passing by. For the ultrasonic sensor, select and set the work zone.

The sensors can be mounted in a skirtingboard or bound. It's best to use the so-called frame with end cap. A hole should be drilled in the cap with the diameter of the sensor bowl or with the diameter of the emitters.

Before installing the sensors, their operating time and sensitivity must be set to minimum. In the case of sensors having a jumper for selecting the mode of operation with or without support (triggering), select the „non-repeatable trigger" position.

Two sets of sensors prepared in this way should be installed in a suitable place near to the first and last stage.

The diagram on the next page shows exactly how the whole set is built with the use of 12V motion sensors.

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Motion sensors CRN-5691 12V for mounting in the installation box

LOWER SENSOR — CRN-5691

TOP SENSOR — CRN-5691

SENSOR · GND · OUT · +12V

BAGRAM STAIRS LIGHTING CONTROLLER RGB
SMART HOME
STX-1793 — 23 x 5A

OUTPUTS
1 2 3 4 5 6 7 · 8 9 10 11 12 13 14 · 15 16 17 18 19 20 21

TEST — UP DN — CE RoHS — PRG SET LED SET

INPUTS 1 2 3 4 · 5V + − · 12V + + − · R G B · RAILS 1 2

PUSH BUTTONS — BOTTOM · TOP · PROGRAM · OPTIONS

LED POWER VOLTAGE 12V

MOTION SENSOR CRN-5684 — BOTTOM

MOTION SENSOR CRN-5684 — TOP

SENSOR · GND · OUT · 12V

BAGRAM STAIRS LIGHTING CONTROLLER RGB
SMART HOME
STX-1793 — 23 x 5A

OUTPUTS
1 2 3 4 5 6 7 · 8 9 10 11 12 13 14 · 15 16 17 18 19 20 21

TEST — UP DN — CE RoHS — PRG SET LED SET

INPUTS 1 2 3 4 · 5V + − · 12V + + − · R G B · RAILS 1 2

PUSH BUTTONS — BOTTOM · TOP · PROGRAM · OPTIONS

LED POWER VOLTAGE 12V

Installation diagram: 12V motion sensors connected to the controller

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Setting the motion sensors

This is one of the most difficult operations — it requires patience and precision. First of all, adjust the sensitivity of the sensor in order to have it react effectively to a person entering the staircase. The second problem to solve is that the sensor should not react to a person coming down the stairs - that it does not re-activate the fading lighting of the stairs. The best way is to cover the sensor hemispheres 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 ('right-hand traffic'). Some sensors have an additional adjustable parameter — the so-called 'dead time'. It is the time measured after an impulse, during which the sensor does not respond to the next person entering the field of its operations. When the mentioned parameters are adjusted patiently, the sensors will function properly, providing a satisfactory lighting of the stairs.

Remote control

For this controller, we recommend the **SRF-4884** radio remote control. It can be used remotely, using a small remote control, to control the change of programs, colors, their options and turn on the anmation of stairs

Adjusting the controller

Setting the parameters should be performed only when strictly necessary, after carefully reading the following description. In case of failure or disturbance of the controller parameters, it can be reset to default settings by the RESET button.

To start the parameter setting mode, press and hold the SETUP button on case of the controller for about 5 seconds until the LED go off. Release the button to go to the controller parameter setting mode. A few seconds flickering of the green LED corresponds to each parameter. You can set or change 13 parameters, and therefore there will be twelve consecutive flashes of the green LED divided into three groups. Each group, to facilitate, is signalized by different stairs color. To select a specific parameter to be changed, you should count each flickering and the at 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 bottom 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
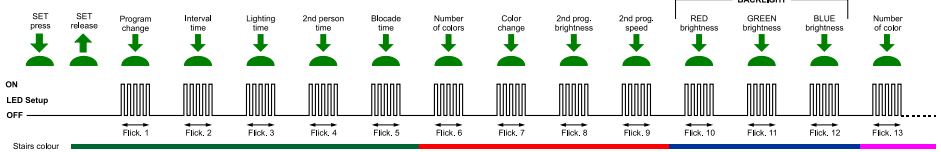

Adjusting controller parameters diagram

blinking of the first step of staircase. If during this flickering the bottom button is pressed and held, then, depending on the parameter, you will see from one to dozens of slow 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 bottom button is not pressed, after a short time of fading out the step, 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 button is pressed during the flickering 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.

To start serring parameters, press and hold the SET button on the driver's case, until the LED
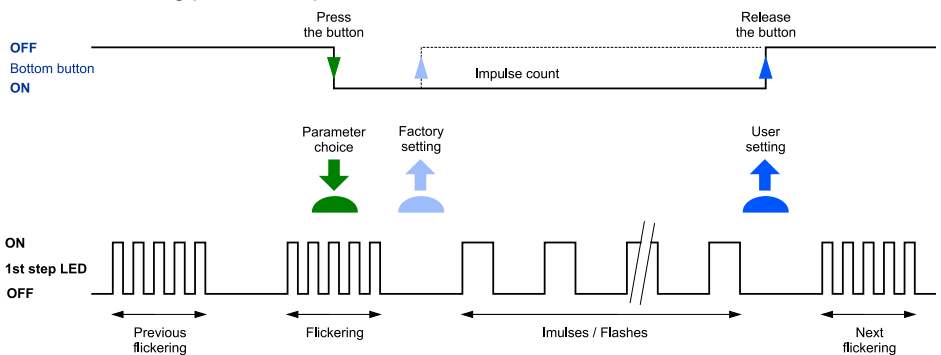
Setting single parameter

placed next will go off. After releasing the buttin, the process of setting parameters will start. It will be indicated by succesive LED flickering..

Description of parameters

The green color of the stairs - basic parameters

1. The controller is factory-set for 15 steps. This can be changed with this parameter. The range is from 5 to 23 steps. To change the number of steps, press and hold the SET button during the first flickering. You should release the button after the right number of flicks. Eg., to set 18 steps, release the button after 18th flick.

2. The controller is factory-disabled for lighting the railing. You can turn on one or two rails. Note: two rails should be set only if in the entire staircase there are handrails on both sides. In other cases, such as one handrail divided into two sections, set the operation to one handrail! Releasing the button after the first slow pulse sets the lighting for one rail, and letting go after the second pulse – sets the lighting for two rails. Releasing the button after the end of flickering and before the first pulse switches off the backlight railing.

3. Program selection. The controller has three color changing programs: in the first one, each step is lighted with different color; in the next one, the color of all of the steps is the same, but changes smoothly when the steps are lit; in the last one the color is fixed and immutable (can be selected from 7 colors) or will change periodically to another each time the stairs are illuminated. For the program 1 there are no additional options. For the program 2, you can change the brightness of the LED and the rate of colors change. In program 3, you can select a specific color of light or set a cyclic operation (in each stairs illumination the color of light will change). Releasing the button after the first pulse enables program 1, after the second program 2, and after the third - program 3.

4. Interval between lighting succesive steps. This is the time interval between lighting the steps, which has an impact on the speed of lighting up the whole staircase. The factory setting is 0.5 seconds - 10 pulses. To shorten it, the button should be released eg. after 5 pulses; to increase - for example, after 20 pulses.

5. Time between illumination and fading out the steps. This is the time, in which after lighting up the steps one by one, all of the steps lit continuously (before they start fading out one by one). Factory setting is 10 seconds, which equates to 20 pulses.

6. The time the whole stairs are lit, when the second (or any subsequent) person will come to them. It os re-measured at each entry of the new person, and therefore light will turn off after a set time measured from the last person entry. Factory setting is 20 seconds which equates to 80 pulses.

7. 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 start of the first pulse, during which the driver will not respond to further impulses. Blockade time is pre-set for 3 seconds, which corresponds to 3 pulses (1 pulse = 1 second).

The yellow color of the stairs — color parameters

8. Number of colors displayed by the program no. 3. Factory set is maximum 7 colors (see below). This amount can be reduced or increaset - from 1 to 20. This is useful when the user wants to define his own colors and the driver with program no. 3 to switch between more than 7 colors. Number of colors is set by releasing the button after certain number of pulses. Releasing the button immediately after flickering restores factory setting - 7 colors.

9. Setting the stairs color for program 3. There is a choice of 7 colors (in order): white - 1, red - 2, green - 3, blue - 4, yellow - 5, cyan - 6, violet - 7. If the cycle operating was not set, the stairs and (if necessary) handrails will be highlighted with consistently chosen color. To select a specific color, the number of assigned pulses should be measured. Releasing the button immediately after flickering sets the cycle operating - with every each start of stairs lighting, different (next) color will be shown.

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10. Adjusting brightness for program 2. Range from 1 to 7, where 1 is the darkest color and 7 is full brightness. Please, select desired number of pulses.

11. The rate of color change for program 2. Range from 1 to 7, where 1 is the fastest color changing, and 7 - the slowest. The default setting is 4 - average value. Please select desired number of pulses.

The blue color of the stairs — Backlight

Each color is composed of three primary colors: red, green and blue - RGB. So it is with the backlight. It can be set with each color independently in the range from 0 to 250, where 0 means complete blanking of color, 1 - a minimum value, and 250 - a maximum value. By setting these values of three colors you can get any color and backlight brightness. At values 0, 0 and 0, the light will be switched off. The values 1, 1 and 1 - minimal illumination with white color - and this is the default setting. It can be changed by selecting the desired number of pulses for each of the colors.

12. The brightness of the red color backlight, in range from 0 to 250. Zero can be adjusted by releasing the SETUP button immediately after the end of flickering.

13. The brightness of the green color backlight, in range from 0 to 250. Zero can be adjusted by releasing the SETUP button immediately after the end of flickering.

14. The brightness of the blue color backlight, in range from 0 to 250. Zero can be adjusted by releasing the SETUP button immediately after the end of flickering.

Purple color of the stairs — Settings of Solid Colors
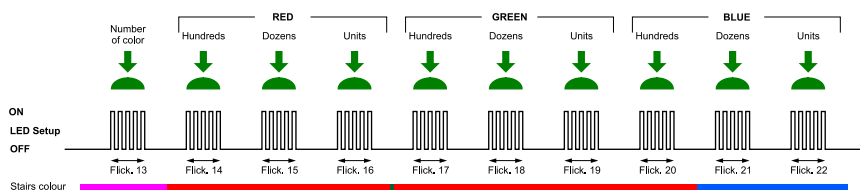
For the program 3 there are programmed seven solid colors (see point 6). You can change and set your own color in the RGB code. To facilitate entering each value (0 to 255) for each color, you sequentially set a value of hundreds of (0 to 2), dozens (0 to 9) and units (0 to 9). When a value is omitted (the button during the flickering was not pressed) or dissolved soon after the end of flickering - the value will be set to 0.

15. Selecting color number to be programmed. You can select any number (from 1) of the range set in step 5. If you won't press the button while flickering, the program will end parameter setting and proceed to wait for a signal that starts the animation. Each parameter change operation allows you to set only one selected color. Therefore, to change few colors you will have to repeat the process few times. You choose the color number by releasing the button after a specified number of pulses. The following steps set the RGB values for the three primary colors.

Red color (R) - the red color of the stairs

A. Setting hundreds. Release the button at 1 (100) or the second pulse (200).

B. Setting dozens. Release the button when the number of pulses is equal to the number of dozens in the red color value, for example after five pulses for 5 dozens (50).

C. Setting units. Release the button when the number of pulses is equal to the number of units in the red color value, for example after five pulses for 5 units (5).

Green color (G) - the green color of the stairs

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D. Setting hundreds. Release the button at 1 (100) or the second pulse (200).

E. Setting dozens. Release the button when the number of pulses is equal to the number of dozens in the green color value, for example after six pulses for 6 dozens (60).

F. Setting units. Release the button when the number of pulses is equal to the number of units in the green color value, for example after three pulses for 3 units (3).

Blue color (B) - the blue color of the stairs

G. Setting hundreds. Release the button at 1 (100) or the second pulse (200).

H. Setting dozens. Release the button when the number of pulses is equal to the number of dozens in the blue color value, for example after eight pulses for 8 dozens (80).

J. Setting units. Release the button when the number of pulses is equal to the number of units in the blue color value, for example after four pulses for 4 units (4).

Setting three basic colors ends the process of changing one color, the program will finish setting the parameters and proceed to wait for a signal that starts the animation or another paraeter change.

Red color of the stairs — Parameters reset

16. If the user incorrectly changed the parameters and it had an impact on the controller operation, you can easily restore the factory settings of the parameters. To reset the controller, press and hold the **SET** button during the flickering. After the flickering, slow LED pulses will appear. You should release the button after the fifth impulse. The controller will confirm the bound reset with five LED pulses..

At this point, the parameters are reset to their default settings and the controller will work normally in standby mode, waiting for a signal from the button or sensor.

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