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LOGO! 8
Basic Light Circuits

LOGO! 8
LOGO! Soft Comfort V8.2

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1 Introduction

This application example describes how to implement basic light circuits using LOGO! 8.

The functions that are integrated in LOGO! 8 offer a wide range of additional options that allow you to solve a wide range of automation tasks quickly and easily.

In LOGO!, ready-made function blocks, like a weekly time switch, a pulse generator, an astrotimer, an annual time switch, a stopwatch, and simple logic gates, for example support you in creating your projects.

Benefits of LOGO! versus a classical electrical installation

Easy integration of LOGO! 8 offers you the following benefits:

- You can add other tasks to the software program, e.g. room lighting, stairwell lighting, safety and monitoring functions, etc.
- Simple, star-shaped wiring of the components.
- Use of simple switches (OFF switches) or pushbuttons instead of complex two-way circuits or cross connections.
- Integration of inputs and outputs of LOGO! in a KNX system

Target group

This application example is aimed at specialist electrical installation staff.

1.1 Task

The lighting circuits are implemented by means of different switches.

Ranging from simple pushbuttons, through intermediate switches, through to electronic staircase timer switches, a wide range of different resources are installed.

LOGO! is intended to implement conventional light circuits and to demonstrate your options for expanding these circuits in as flexible a way as possible. Refer to the related links, the literature chapter 0 and the general information in chapter 3.1 for the options for linking LOGO! TDE or the web server, and message texts.

Light circuits as a standard application in LOGO!

The way in which a domestic installation is implemented depends on various factors:

- Whether it is a new installation or an existing one is being adapted

- The conditions on-site and the flexibility that is necessary

- The desired functionality and possible additional functions

LOGO! provides you with the flexibility you need to cope with these conditions!

1.2 Types of representation – installation technology

Figure 1-1 demonstrates based on "off switch" of the conventional wiring diagrams in the installation technology.

In the illustrations of the LOGO! examples, you can find the respective circuit diagrams from installation technology compared to implementation using LOGO!

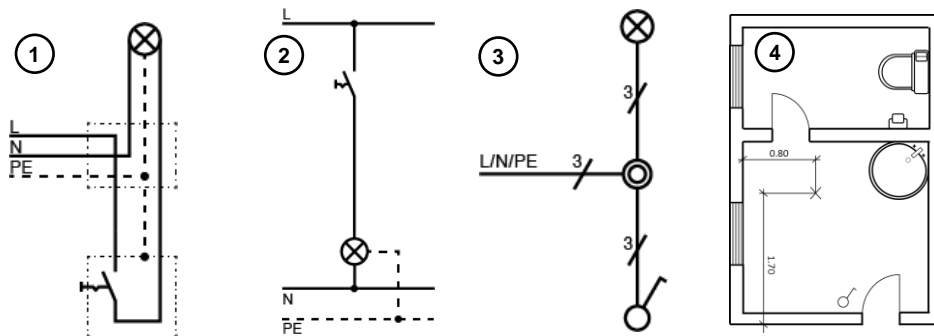Figure 1-1: Types of representation of a switch off

Table 1-1: Components for the application example

Item	Filename
1	Circuit diagram represented in context
2	Circuit diagram (Below, we will not show the PE to make things clearer to see!)
3	Overview diagram
4	Installation diagram

1.3 Types of switches for light circuits

Using a LOGO! gives you the benefit of using simple switches or pushbuttons as Figure 1-2 shows.

The switches that you choose affect programming of the LOGO!, as shown in the example of an extended intermediate switch in Figure 2-4.

OFF switches are the most favorably priced types of switch; in this connection, some hardware stores do offer changeover switches however, which you can use as OFF switches without any problems.

Pushbuttons have the following benefits:

- Easy wiring.
- With the same function in the task, external parallel switching is possible, which also saves LOGO! inputs (see Figure 2-5).
- Multiple functions are possible using pulses or long button presses. If a pushbutton is connected to its own LOGO! input, you can assign individual additional functions to the switches.
- If you use a 24V LOGO! configuration, you have the option of wiring bell wires for the switch and pushbutton wiring instead of 230V wires.

Figure 1-2: Types of switch and forms of representation for light switches
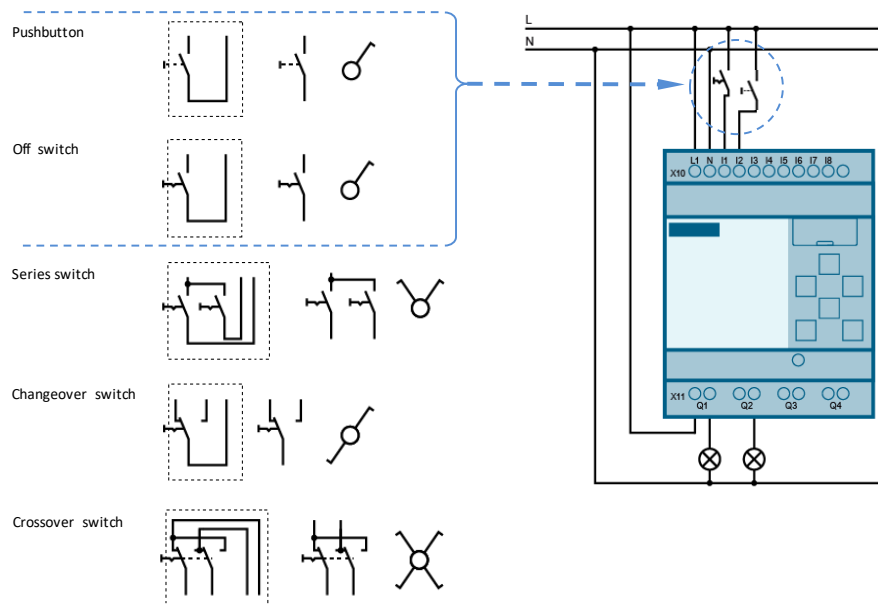
2 Structure and description
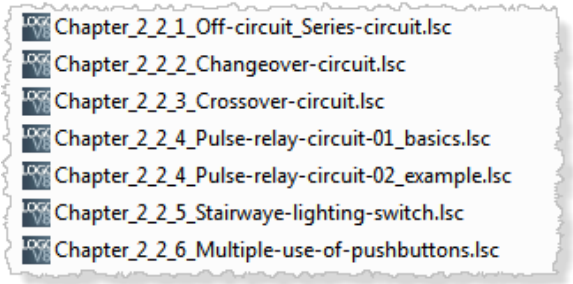
2.1 Components used

This application example was drawn up using the following components:

Table 2-1: Hardware and software components for the application example

Component	Number	Article number	Note
LOGO! Soft Comfort V8.2 DVD	1	6ED1058-0BA08-0YA1	You can find the upgrade to V8.2 by visiting: https://www.siemens.com/global/en/home/products/automation/systems/industrial/plc/logo
LOGO! 230RCE	1	6ED1052-1FB08-0BA0	Variant with 230 V relay
LOGO! TDE	1	6ED1055-4MH08-0BA0	Optional component

This application example consists of the LOGO! switching programs and this guide.

Table 2-2: Components for the application example

Component	Filename	Note
Documentation	109755863_LOGO8_Basic-Light-Circuits_en.docx	-
LOGO! 8 programs	109755863_LOGO8_Basic-Light-Circuits_en.ZIP Content: Chapter_2_2_1_Off-circuit_Series-circuit.lsc Chapter_2_2_2_Changeover-circuit.lsc Chapter_2_2_3_Crossover-circuit.lsc Chapter_2_2_4_Pulse-relay-circuit-01_basics.lsc Chapter_2_2_4_Pulse-relay-circuit-02_example.lsc Chapter_2_2_5_Stairwaye-lighting-switch.lsc Chapter_2_2_6_Multiple-use-of-pushbuttons.lsc	Requirement: LOGO! Soft Comfort V8.2

2.2 Light circuits

In Figure 2-1 below, you can find different light circuits shown as circuit diagrams.

In the LOGO! examples (from chapter 2.2.1 onward), there is a comparison between the traditional representation as a circuit diagram and the circuitry of LOGO! with its switching program.

You create the switching program using the LOGO! Soft Comfort software.

Lights are used as the consumers in this document. You can of course use different consumers or switchable resources like switchable sockets, for example.

In the document, the LOGO! is shown as a 230V module. This is irrelevant to the switching program.
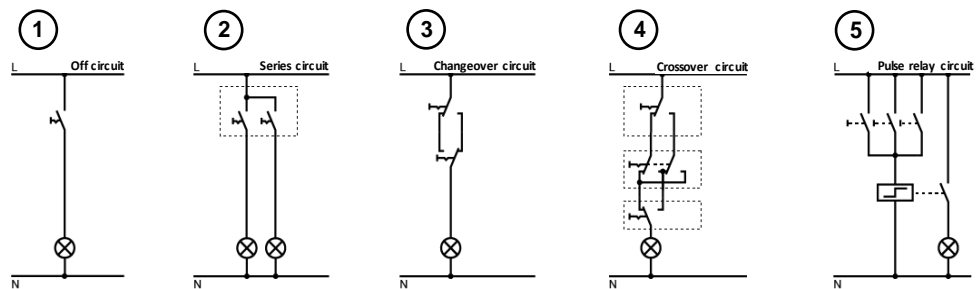
Figure 2-1: Application (classical light circuits)

Table 2-3: Light switches and their light circuits

Item	Switch	Application (classical light circuits)	Chapter
1	Off switch	The light is switched from one location in the room.	2.2.1
2	Series connection	In a switch insert, there are two OFF switches. (Typically with chandeliers)	2.2.1
3	Changeover switch	The light is switched from two locations.	2.2.2
4	Intermediate switch	The light is switched from three or more locations.	2.2.3
5	Pulse relay	The light is switched from any number of locations.	2.2.4
	Staircase lighting switch	The light is switched for a preset time from several locations.	2.2.5

### 2.2.1 OFF switch/series circuit

Typical use:

- Relatively small rooms with one light (OFF switch)
- Rooms with two Lights where another light source is switched in for basic lighting.
- Rooms with separate lighting for two halves of the room.

Implementation using LOGO!:

Figure 2-2 shows an OFF switch and a series connection on three digital inputs of the LOGO!

The OFF switch is connected to digital input [I1] of the LOGO! and it switches digital output [Q1] and with this light E1 that is connected to it. In this context, the series connection has two OFF switches in one housing that are connected to [I2] and [I3] and switch digital outputs [Q2] and [Q3].

Figure 2-2: OFF switch/series connection using LOGO!
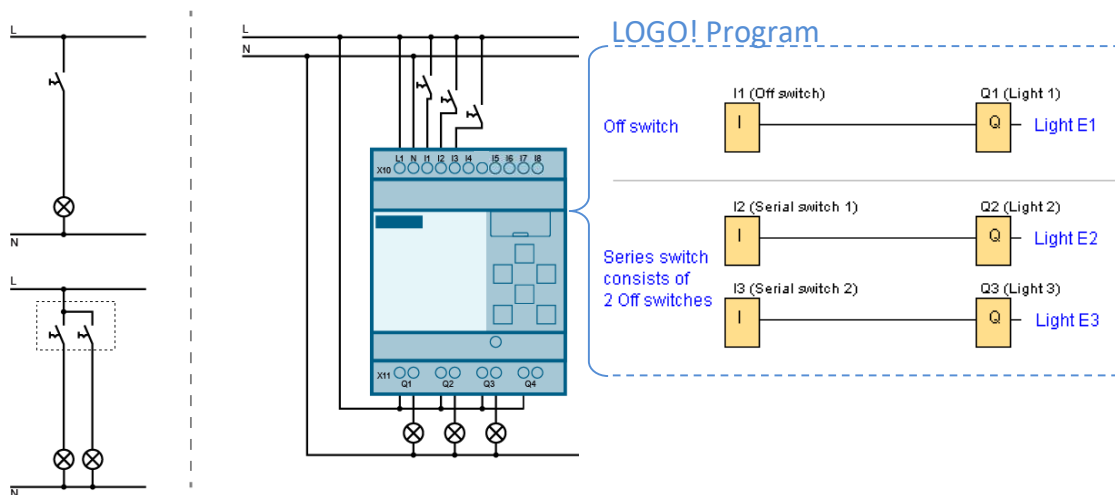
2.2.2 Changeover circuit

Typical use:

- Stairways and vestibules with two switching points
- Connecting rooms with two doors and one switching point each
- Basement stairways with one switch at the top and one in the basement.
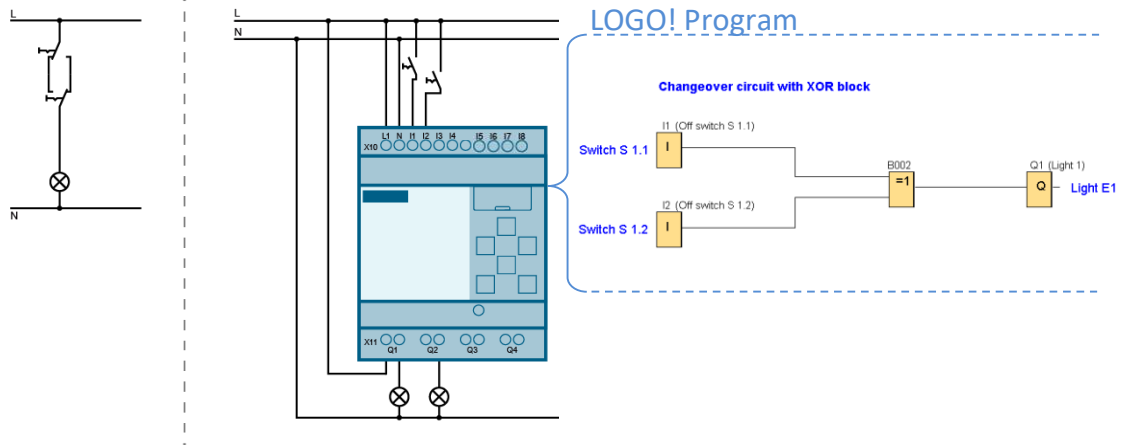
Function:

The light is switched from two locations in the room.

Implementation using LOGO!:

Using LOGO! means that you do not need a changeover switch; rather, you just need two simple switches or pushbuttons that you connect to inputs [I1] and [I2] as shown in Figure 2-3

Figure 2-3: Changeover switch using LOGO!

2.2.3 Crossover circuit

Typical use:

- Stairways and long vestibules
- Relatively large rooms in homes

Function:

The light is switched from three or more locations.

Traditional design:

With intermediate circuits, one or more intermediate switches are wired between two changeover switches.

In classical intermediate circuits, the use of more than three switching points is less attractive due to the increased amount of wiring and the more expensive switches that are involved. Using LOGO! gets rid of this issue!

Implementation using LOGO!:

With LOGO!, you use simple OFF switches or pushbuttons instead of changeover and intermediate switches.

One digital input – in this case [I1] to [I3] – on the LOGO! as shown in

In the example that is shown, you can see that a pushbutton is connected to digital input [I4].

In the LOGO! switching program, this pushbutton is integrated via an impulse switch (see the next chapter) into the existing intermediate circuit as a supplement.

This means that you have the option of extending on a flexible basis an already installed intermediate circuit to switch the light at [Q1].

Figure 2-4: Intermediate switch using LOGO!
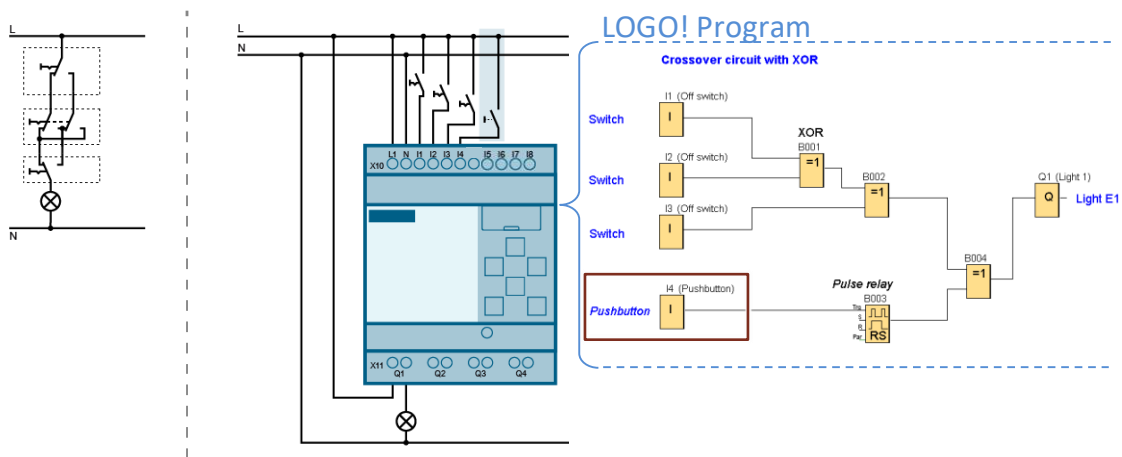
2.2.4   Pulsed relay circuit

Typical use:

- Relatively long stairways and vestibules
- Relatively large rooms with several light sources
- Halls and auditoriums

Function:

Pulsed switching is used in rooms in which you want to switch the lighting from more than two switching points. You can plan as many switching points as you like.

Traditional design:

With pulsed switching, you use only pushbuttons instead of switches. The do not switch on or off; rather, they only issue a current pulse when pressed. This pulse switches the light via an impulse switch.

Implementation using LOGO!:

In the example in Figure 2-5 you use three external pushbuttons on one digital input of the LOGO! The parallel pushbuttons at [I1] switch light E1.

You can have the same function by wiring several inputs [I2], [I3], and [I4] that use an OR block to switch the impulse switch and via this component to switch light E2.

This interconnection is sensible if each pushbutton has an individual multifunction.

Figure 2-5: Pulsed switching using LOGO!
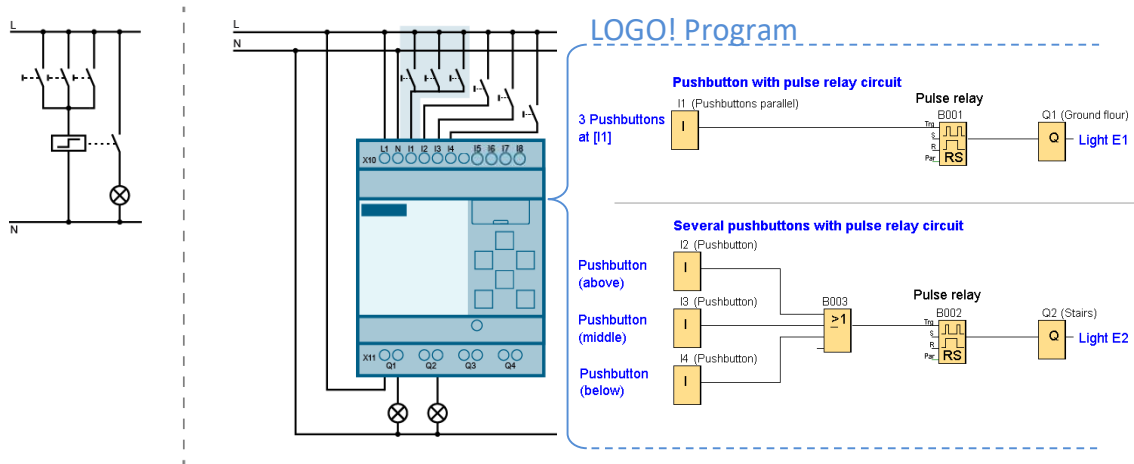
Central switch as an extended example

Figure 2-6 shows an application using four impulse switches.

The "three" parallel pushbuttons switch output [Q1] via [I1].
The pushbuttons at [I2], [I3], and [I4] switch individual Lights in the house on and off.

Pushbuttons [I5] and [I6] switch all of the Lights on or off at a central location at the same time.

An additional function is shown via the pushbutton at [I1]. Block "B006" starts a switch-on delay of five seconds. When the five seconds have been exceeded, all of the Lights switch on.

This function corresponds to a panic switch. You can also use LOGO! to easily implement a connection to an alarm system.

Figure 2-6: Pulsed switching – simple application using LOGO!
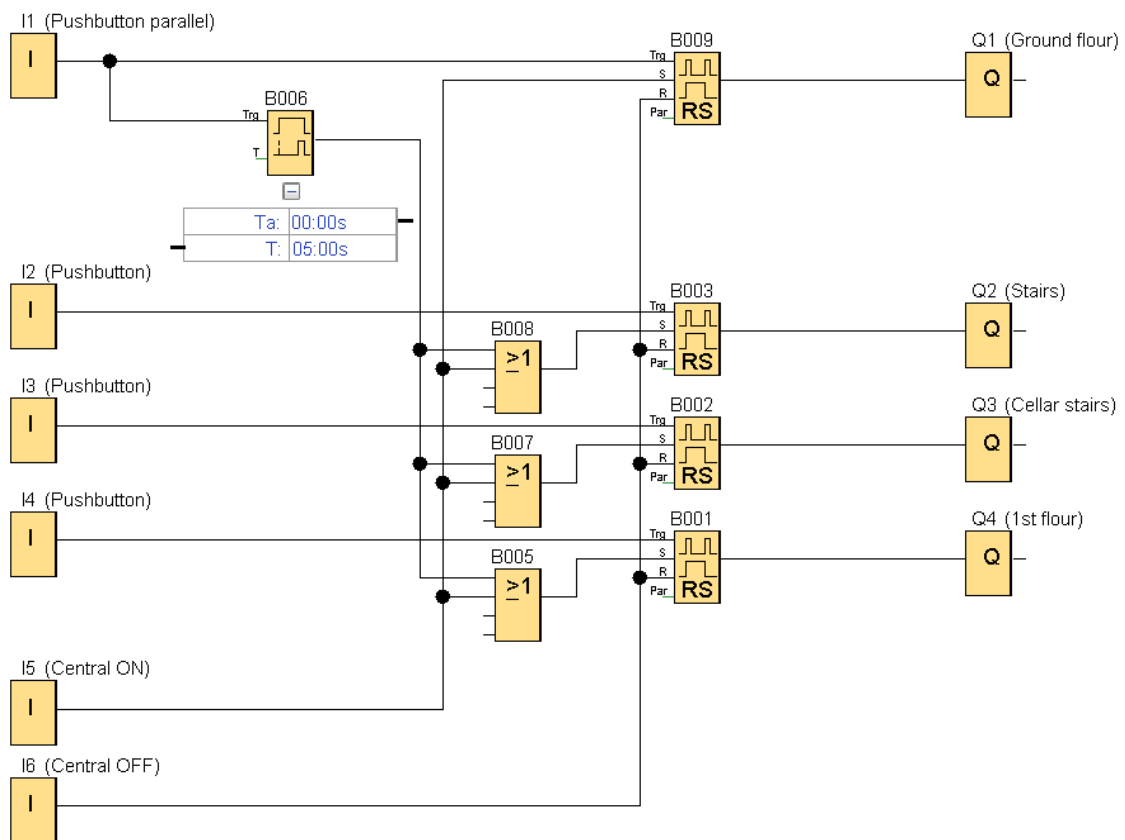
2.2.5   Staircase lighting circuit

Typical use:

- Stairwells and long vestibules

Function:

Lighting is switched for a preset time interval from several locations.

Traditional design:

The time interval can only be set at the staircase lighting time switch. At the end of the time interval, the light in the stairwell is switched off.

Enhancements to stairwell lighting time switches:

- Reset function:

  A reset function is supported with stairwell lighting time switches. If you press a pushbutton several times before the light switched off, the time switch's interval starts again from the beginning.

- Switch off function by means of a pushbutton:

  Normally, it is not possible to use the pushbutton to switch off the light. Some staircase lighting switches allow you to switch off the light by pressing the switch for a relatively long time.

- Warning function (switch-off alert):

  Since 1996, DIN 18015 has specified that the automatic cut-off facility in the stairwells of apartment buildings must be fitted with a warning function. Brief flickering or dimming of the lighting indicates that the current time interval is coming to an end, which allows you to press the button again in good time.

Using LOGO!, you can choose freely from the switching program how you want the light to switch.

Example of a staircase lighting timer using LOGO!

shows a staircase lighting timer. In the example, we are using the "Convenience switch" and "Staircase lighting switch" blocks.

The convenience switch offers the function of an impulse switch with switch-off delay and alerting as well as that of a simple switch for continuous light.

The staircase lighting switch starts after a parameterizable time interval following an edge-triggered pulse from the input switch during which the output is switched on. After this time interval has expired, the output is reset and the light is switched off.

If you press the pushbutton again during the time interval, it is restarted.

When you activate the convenience switch again, it is switched off. If you press the pushbutton for a pre-defined time, continuous light is switched on.

In accordance with the standard, both switches offer a switch-off alert before the light is switched off. In this example, the system switches the light off for two seconds five seconds before the interval for the light expires.

The pushbuttons at [I1] that are switched in-parallel must be interconnected such that they trigger the three subsequent multifunctions:

1. Tapping briefly has the effect of light E1 being switched on for the defined time interval (for example 15s).

2. If you press the pushbutton for two seconds, light E1 is switched on permanently.

3. If you press the pushbutton for five seconds, all of the Lights are switched on. In this connection, light E1 is switched on permanently with Lights E2 to E4 being switched on for 15s.

Figure 2-7: Staircase lighting switch using LOGO!
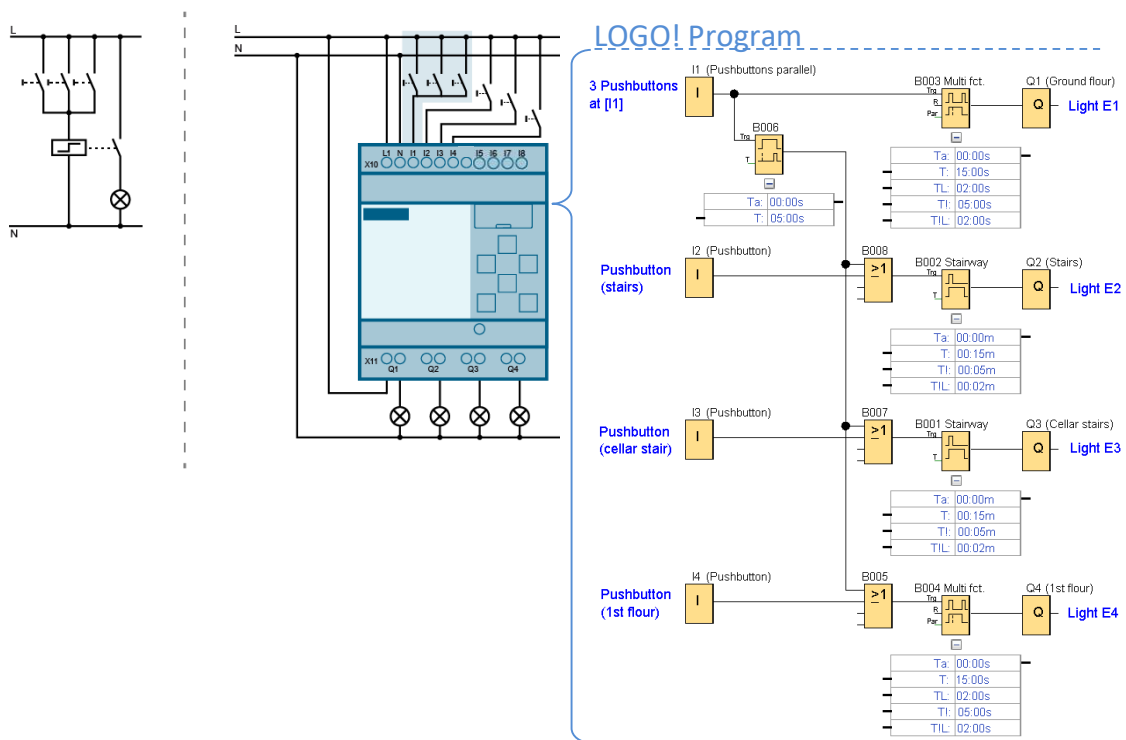
2.2.6 Multiple use of pushbuttons

The advantage of standardizing to the use of pushbuttons is that an individual pushbutton can be used several times.

In the example in Figure 2-8 below, the entrance area of a corridor is lit by briefly pressing the pushbutton (output Q1).

If you press the pushbutton for one second, the external lighting [Q2] is switched on.

You can switch different consumers by means of the number of button presses or by combinations of presses.

Figure 2-8: Multiple use with LOGO!
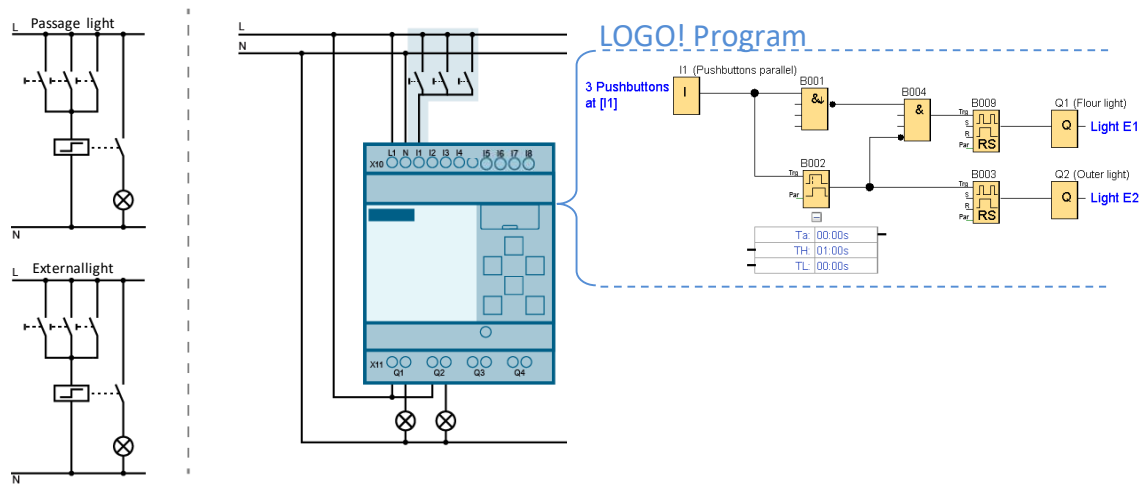
3 Commissioning

To commission the application example, proceed as follows:

LOGO!

1. Start LOGO! Soft Comfort V8
2. Open the supplied *.lsc LOGO! sample programs
3. Transfer the program to LOGO!

Note	In the application example, the factory default IP address of 192.168.0.3 was preset for LOGO!
	To find out how to set the IP address of a LOGO! 8, refer to the manual, in chapter 3.8.1 "Configuring network settings".

3.1 General information about input and output signals

In comprehensive switching programs, it is sensible to represent input and output signals to the switching program in table form as shown in Table 3-1
In the simple examples in this documentation, we have done without this. However, in the software, you should always describe the I/O names uniquely as shown in Figure 3-1 This means that when you print out the circuit, you get the table as well as the respective guide as a comment.

| Note	You can get a description of the function of the respective circuit as a comment for the switching program under LOGO! Soft Comfort by selecting: > "File" > "Properties" > "Comment" **Tip:** Under "Tools" > "Options" > "Print", select the "Comment" checkbox so that +the system prints the function description together with the program.

Table 3-1: Digital input and output signals in LOGO!

Signals	Description
[I1]	Digital input interconnected with the OFF switch
[I2] / [I3]	Digital input interconnected with one switch each of the series switch
[Q1]	Digital output interconnected with light E1
[Q2]	Digital output interconnected with light E2

In LOGO! Soft Comfort, you name input and output signals by means of the I/O names. Open the input screen form by double-clicking on the LOGO! icon at the bottom right-hand edge of the window or by means of the menu Figure 3-1

Figure 3-1: I/O names in LOGO! (Digital and analog input and output signals)
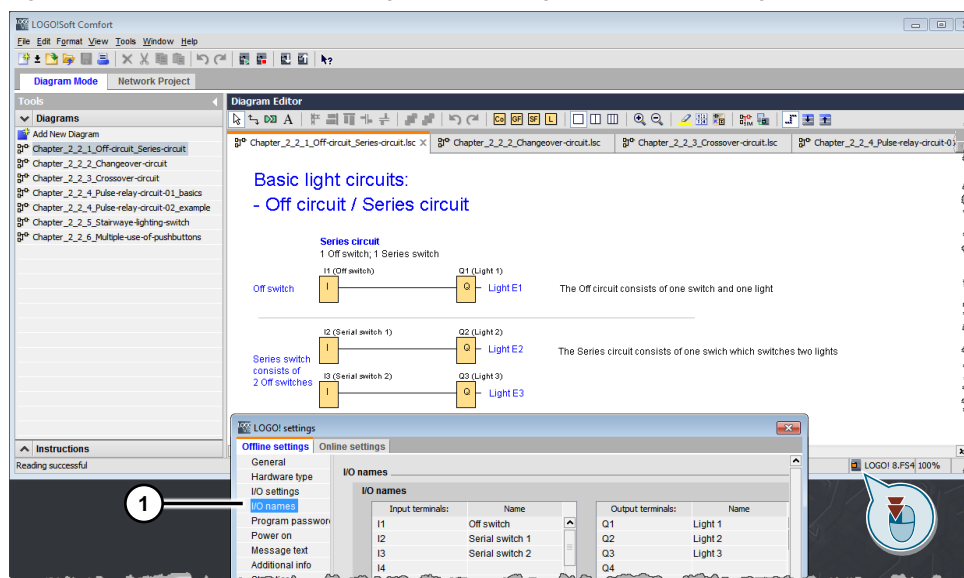
3.2 General information (message texts and web server)

With a LOGO! with a display and a LOGO! TDE, you can call the same or supplementary status information or you can set switching signals.

For the OFF switch/series connection Figure 2-2 a message text was added that is used to acquire the switching status of the Lights. Using the web server, you can access this message text with your smartphone if LOGO! is connected to a wifi network.

Figure 3-2: OFF switch/series connection using LOGO!
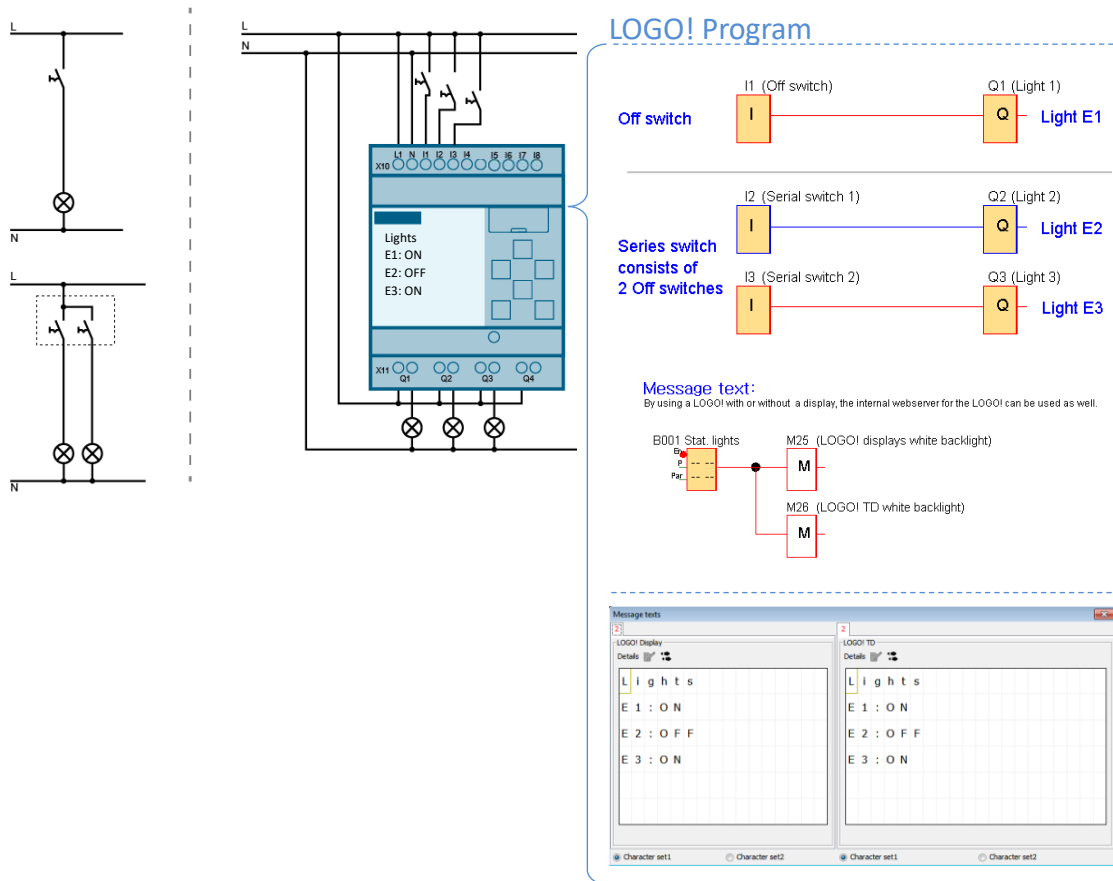
4 Appendix

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4.2   Links and Literature

Table 4-1: Links and Literature

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	This article https://support.industry.siemens.com/cs/ww/en/view/109755863
\3\	LOGO! 8 user manual https://support.industry.siemens.com/cs/document/109741041/logo!?dti=0&lc=en-WW
\4\	LOGO! application examples https://w3.siemens.com/mcms/programmable-logic-controller/en/logic-module-logo/application-examples/Pages/Default.aspx

4.3   Change documentation

Table 4-2: Change documentation

Version	Date	Change
V1.0	04/2018	First edition
V1.1	03/2019	Textual changes