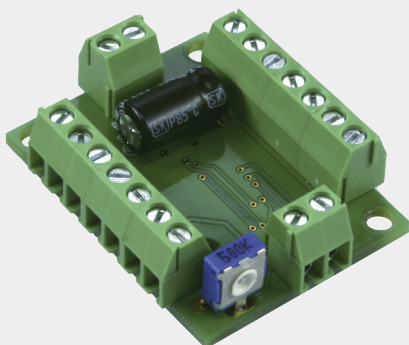


LC-Modules Next Generation

Manual

For all kits and assembled modules
of the LC-NG series



Item numbers
53-04015 ... 53-04156



Item numbers
53-04017 ... 53-04157

Version: 2.0 | Status: 06/2024

© Tams Elektronik GmbH

All rights reserved, in particular the right of reproduction, distribution and translation. Copies, reproductions and alterations in any form require the written permission of Tams Elektronik GmbH. We reserve the right to make technical changes.

Printing the manual

The formatting is optimised for double-sided printing. The standard page size is DIN A5. If you prefer a larger display, printing on DIN A4 is recommended.

Contents

Part A: General Information.....6

1. Getting started.....6

 1.1. Contents of the package.....6

 1.2. Accessories.....6

 1.3. Intended use.....8

 1.4. Safety instructions.....8

 1.5. Care.....8

2. Operation overview.....9

3. Assembling the kit.....11

 3.1. Safety instructions.....11

 3.2. Soldering properly.....12

 3.3. Preparation.....13

 3.4. Parts list.....13

 3.5. Assembly.....14

 3.6. Performing a visual check.....15

4. Connecting the LC-NG modules.....15

 4.1. Connection to the power supply.....15

 4.2. Connecting a switch or push-button.....16

 4.2.1.Connecting a switch.....16

 4.2.2.Connecting a push-button.....17

 4.3. Connecting light bulbs.....17

 4.4. Connecting LEDs.....18

 4.4.1.Parallel connection of LEDs.....18

 4.4.2.Serial connection of LEDs.....19

 4.4.3.Tip: Connecting many LEDs to one LC-NG module.....20

 4.5. Connecting a loudspeaker (LC-NG-05,-06,-08,-15).....21

 4.6. Connecting a Sound-Booster (LC-NG-05,-06,-08,-15).....22

 4.7. Connecting a servo (LC-NG-07,-08,-10).....23

 4.8. Connecting subordinate circuits.....24

 4.9. Connection test.....25

 4.10.Configuration.....26

5. Checklist for troubleshooting and error correction.....29

 5.1. Technical Hotline.....31

 5.2. Repairs.....31

6. Technical data.....32

7. Warranty, EU conformity & WEEE.....33

7.1. Guarantee bond.....33

7.2. EU Declaration of Conformity.....34

7.3. Declarations on the WEEE Directive.....34

Part B: LC-NG versions.....35

1. LC-NG-01 "City Lighting".....35

1.1. Mode of operation.....35

1.2. Pin assignment LC-NG-01.....36

1.3. Connecting cascaded modules LC-NG-01.....36

2. LC-NG-02 "Residential buildings".....38

2.1. Mode of operation.....38

2.2. Pin assignment LC-NG-02.....39

2.3. Connection of synchronous modules LC-NG-02.....40

2.4. Sequence House 1 & 2.....41

2.5. Sequence House 3 & 4.....42

3. LC-NG-03 "Office and commercial buildings".....45

3.1. Mode of operation.....45

3.2. Pin assignment LC-NG-03.....46

4. LC-NG-04 "Street lamps".....47

4.1. Mode of operation.....47

4.2. Pin assignment LC-NG-4.....48

5. LC-NG-05 "Road traffic"49

5.1. Mode of operation.....49

5.2. Pin assignment LC-NG-05.....50

6. LC-NG-06 "Emergency vehicles".....51

6.1. Mode of operation.....51

6.2. Pin assignment LC-NG-06.....52

7. LC-NG-07 "(Road) construction site".....53

7.1. Mode of operation.....53

7.2. Pin assignment LC-NG-07.....54

8. LC-NG-08 "Fire station".....55

8.1. Mode of operation.....55

8.2. Pin assignment LC-NG-08.....55

8.3. Procedure.....56

9.	LC-NG-09 "Railway station".....	57
9.1.	Mode of operation.....	57
9.2.	Pin assignment LC-NG-09.....	58
10.	LC-NG-10 "Workshop".....	59
10.1.	Mode of operation.....	59
10.2.	Pin assignment LC-NG-10.....	59
10.3.	Procedure.....	60
11.	LC-NG-11 "Flickering flames & candle lights".....	61
11.1.	Mode of operation.....	61
11.2.	Pin assignment LC-NG-11.....	61
12.	LC-NG-12 "Event".....	62
12.1.	Mode of operation.....	62
12.2.	Pin assignment LC-NG-12.....	63
13.	LC-NG-13 "Chaser lights".....	64
13.1.	Mode of operation.....	64
13.2.	Pin assignment LC-NG-13.....	66
14.	LC-NG-14 "Funfair lighting".....	67
14.1.	Mode of operation.....	67
14.2.	Pin assignment LC-NG-14.....	69
15.	LC-NG-15 "Automatic track warning system".....	70
15.1.	Mode of operation.....	70
15.2.	Pin assignment LC-NG-15.....	71

Part A: General Information

1. Getting started

The instructions will help you step by step with the safe and proper assembly of the kit and installation and use of your LC-NG-module. Before you start to assemble the kit or put the LC-NG-module into operation, read this manual completely, especially the safety instructions and the section on possible errors and their elimination. You will then know what you have to pay attention to and thus avoid errors that sometimes can only be rectified with a lot of effort. Keep the instructions in a safe place so that you can restore functionality later in the event of any malfunctions. If you pass the LC-NG-module on to another person, also give the instructions with it.

1.1. Contents of the package

- 1 kit consisting of all the components listed in the parts list (→ section 3.4 page 13) and a circuit board or
 - 1 ready-made module or
 - 1 ready-made module with housing;
- additionally for modules LC-NG-01 and LC-NG-02 (from software version 06/2021): a diode 1N400x, x = 2...7.

Lights, LEDs, servos and loudspeakers that can be connected to the outputs of the LC-NG modules as well as any additional components that may be required are not included in the scope of delivery.

1.2. Accessories

To assemble the kit you will need

- a soldering iron with temperature control and a thin tip and a deposit stand or a controlled soldering station
- a scraper, rag or sponge
- a heat-resistant pad
- a small pair of side cutters and wire strippers
- tweezers and flat-nose pliers if necessary
- electronic solder (preferably 0.5 to 0.8 mm diameter)

For the power supply you need

- an AC transformer with 10 to 18 volts nominal voltage or
- a DC power supply unit with 10 to 22 volts nominal voltage

You can connect several LC-NG modules or other consumers/circuits to one transformer or one power supply unit. To improve clarity, the use of a distribution board is recommended (e.g. Power-Block item numbers 72-00315, 72-00316, 72-00326, 72-0335, 72-00336, 72-00346).

Stranded wires

You need stranded wires to connect the module. Recommended cross-sections:

- Connections to the power supply: $\geq 0.14 \text{ mm}^2$
- Connection of push-buttons or switches: $\geq 0.04 \text{ mm}^2$
- Connection of consumers: depending on the load

Switches or buttons

To trigger the switching input, you need the following, depending on the version

- a switch (e.g. item no. 84-51510-02) or
- a push-button (e.g. item no. 84-5212x-05)

Further information → section 4.2

Connection of subordinate circuits

You must connect subordinate circuits via a relay and a protective diode if the current of the circuit and the connected loads is higher than 200 mA or if galvanic isolation is required, i.e. the circuit is connected with another type of current or to another circuit. In addition to the circuit, you then need

- a relay (e.g. monostable relay 1xUm / 3 A / 12 V, item no. 84-61011-01),
- a protection diode 1N400x, x = 2...7 (e.g. item no. 83-11200-10)

Servo

If you want to connect a servo to the module, you need:

- a servo
- a current and voltage supply (e.g. servo board item no. 70-05900-01)
- or an LC-NG servo set, consisting of servo, servo board and a 470 Ω resistor (item no. 53-04321-01)

Note: Not all modules have an output for connecting a servo.

Loudspeaker

If you want to connect a loudspeaker to the module, you need:

- a loudspeaker with an impedance of at least 8 ohms. Note: It is recommended to use a loudspeaker with an impedance of: 32 or 50 ohms.
- one choke 1 mH (e.g. item no. 84-30200-10)
- two resistors 220 Ω /**0.25 W** or one resistor 470 Ω /**1 W** (e.g. item no. 84-11134-10)
- one electrolytic capacitor 22 F/25 V (e.g. item no. 84-43123-10)
- or an LC-NG loudspeaker set consisting of a loudspeaker LSF-27M/SC, a sound capsule, a choke 1 mH, two resistors 220 Ω /0.25 W, an electrolytic capacitor 22 μF /25 V (item no. 53-04311-01)
- or a Sound-Booster (item no. 72-08017-01)

Note: Not all modules have an output for connecting a loudspeaker.

* In earlier versions of the manual, an electrolytic capacitor 220 μF /25 V was specified by mistake. When using an electrolytic capacitor with this value, the sound reproduction is very quiet.

1.3. Intended use

The LC-NG modules are intended for use in model construction and in model railway systems in accordance with the instructions in this manual. Any other use is inappropriate and invalidates any guarantees.

The LC-NG modules should not be assembled or mounted by children under the age of 14.

Reading, understanding and following the instructions in this manual are mandatory for the user.

1.4. Safety instructions

**Note:**

The LC-NG modules contain integrated circuits (ICs). These are sensitive to electrostatic charging. Therefore, do not touch these components until you have "discharged" yourself. For this purpose, e.g. a grip on a radiator is sufficient.

Improper use and non-observance of the instructions can lead to incalculable hazards. Prevent these dangers by carrying out the following measures:

- Only use the module in closed, clean and dry rooms. Avoid moisture and splash water in the environment. After condensation has formed, wait two hours for acclimatisation before use.
- Disconnect the module from the power supply before carrying out wiring work.
- Supply the module only with extra-low voltage as specified in the technical data. Use only tested and approved transformers or power supply units.
- Only plug the mains plugs of transformers / power supply units into properly installed and fused earthed sockets.
- When making electrical connections, ensure that the cable cross-section is sufficient.
- Heating of the module during operation is normal and harmless.
- Do not expose the module to high ambient temperatures or direct sunlight. Observe the information on the maximum operating temperature in the technical data.
- Regularly check the operational safety of the module, e.g. for damage to the connection cables.
- If you notice damage or if malfunctions occur, disconnect the connection to the power supply immediately. Send the module in for inspection.

1.5. Care

Do not use any cleaning agents to clean the module. Only wipe the module dry. Disconnect the module from the power supply before cleaning.

2. Operation overview

The LC-NG module is controlled by a micro-controller. The programme stored in the micro-controller

- controls the 14 outputs of the module. The sequence and timing differ between the different versions.
- defines whether and to which outputs servos and/or loudspeakers can be connected.
- defines what effect the switching input and the trim potentiometer have on the programme sequence.

Switching outputs

The following can be connected to the 14 outputs

- lights or LEDs (via series resistors)
- other circuits (possibly via a relay)
- servos and/or loudspeakers on some versions

Switching input

Depending on the version and whether the module's switching input is connected to earth or not,

- the programme is started or ended;
- a special action is triggered;
- one or the other variant of a programme is played.

Configuration

With several versions of the LC-NG module, an individual configuration is possible, e.g. the selection of a programme variant. The setting is saved and cannot be changed during operation.

With several versions of the LC-NG module, further settings (e.g. speed of the sequence, length of pauses between repetitions) can be made at the trim potentiometer during operation.

Test mode

If the trim potentiometer is set to the left stop, the LC-NG module switches to test mode when it is switched on. All light bulbs or LEDs at the outputs are switched on one after the other.

Versions

LC-NG-01	City lighting	→ Section 1 page 35
LC-NG-02	Residential buildings	→ Section 2 page 38
LC-NG-03	Office and commercial buildings	→ Section 3 page 45
LC-NG-04	Street lamps	→ Section 4 page 47
LC-NG-05	Road traffic	→ Section 5 page 49
LC-NG-06	Emergency vehicles	→ Section 6 page 51
LC-NG-07	(Road) construction site	→ Section 7 page 53
LC-NG-08	Fire station	→ Section 8 page 55
LC-NG-09	Railway station	→ Section 9 page 57
LC-NG-10	Workshop	→ Section 10 page 59
LC-NG-11	Flickering flames & candle lights	→ Section 11 page 61
LC-NG-12	Event	→ Section 12 page 62
LC-NG-13	Chaser lights	→ Section 13 page 64
LC-NG-14	Funfair lighting	→ Section 14 page 67
LC-NG-15	Automatic track warning system	→ Section 15 page 70

3. Assembling the kit

You can skip this section if you have purchased a ready-built module or device.

3.1. Safety instructions

Mechanical hazards

Cut wires can have sharp ends and can cause serious injuries. Watch out for sharp edges when you pick up the PCB.

Visibly damaged parts can cause unpredictable danger. Do not use damaged parts: recycle and replace them with new ones.

Fire risk

Touching flammable material with a hot soldering iron can cause fire, which can result in injury or death through burns or suffocation. Connect your soldering iron or soldering station only when actually needed. Always keep the soldering iron away from inflammable materials. Use a suitable soldering iron stand. Never leave a hot soldering iron or station unattended.

Thermal danger

A hot soldering iron or liquid solder accidentally touching your skin can cause skin burns. As a precaution:

- use a heat-resistant mat during soldering,
- always put the hot soldering iron in the soldering iron stand,
- point the soldering iron tip carefully when soldering, and
- remove liquid solder with a thick wet rag or wet sponge from the soldering tip.

Dangerous environments

A working area that is too small or cramped is unsuitable and can cause accidents, fires and injury. Prevent this by working in a clean, dry room with enough freedom of movement.

Other dangers

Children can cause any of the accidents mentioned above because they are inattentive and not responsible enough. Children under the age of 14 should not be allowed to work with this kit or the ready-built module.



Caution:

Little children can swallow small components with sharp edges, with fatal results! Do not allow components to reach small children.

In schools, training centres, clubs and workshops, assembly must be supervised by qualified personnel. In industrial institutions, health and safety regulations applying to electronic work must be adhered to.

3.2. Soldering properly

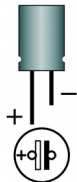
- Use a soldering iron with temperature control, which you set to approx. 300 °C.
- Only use electronic solder with a flux.
- Never use soldering water or soldering grease when soldering electronic circuits. These contain an acid that destroys components and conductor paths.
- Insert the connecting wires of the components as far as possible through the holes of the board without using force. The body of the component should be close above the board.
- Make sure that the polarity of the components is correct before soldering them.
- Solder quickly: soldering for too long can cause pads or tracks to become detached or even destroy components.
- Hold the soldering tip on the soldering point in such a way that it touches the component wire and the pad at the same time. Add (not too much) solder simultaneously. As soon as the solder begins to flow, remove it from the soldering point. Then wait a moment for the solder to flow well before removing the soldering iron from the soldering joint.
- Do not move the component you have just soldered for about 5 seconds.
- A clean, non-oxidised (scale-free) soldering tip is essential for a perfect soldering joint and good soldering. Therefore, before each soldering, wipe off excess solder and dirt with a damp sponge, a thick damp cloth or a silicone wiper.
- After soldering, cut off the connecting wires directly above the soldering point with a side cutter.
- After assembly, always check each circuit again to ensure that all components are correctly inserted and polarised. Also check that no connections or tracks have been accidentally bridged with tin. This can lead not only to malfunction, but also to the destruction of expensive components. You can re-liquefy excess solder with the clean hot soldering tip. The solder then flows from the board to the soldering tip.

3.3. Preparation

Put the sorted components in front of you on your workbench.

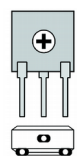
The separate electronic components have the following special features you should take into account in assembling:

Electrolytic capacitors



Electrolytic capacitors are often used to store energy. Unlike ceramic capacitors, they are polarised. The value is printed on the casing. They are available with different voltage strengths. The use of an electrolytic capacitor with a higher voltage resistance than required is possible without any problems.

Trim potentiometers



Trim potentiometers (short "trim pots") are resistors where the resistance value can be changed and thus adapted to the requirements. They have a small slot in the middle into which a small screwdriver is inserted to adjust the resistance value. The maximum resistance value is printed on the housing.

Terminal strips

Terminal strips are solder-in screw-type terminals. They provide a solder-free and safe connection of the cables to the circuit, which can still be separated any time.

3.4. Parts list

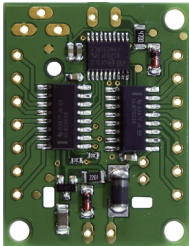
Component	Value	Number
Electrolytic capacitor	100 μ F/25 V	1
Trim pot	250 K or 500 K	1
Screw terminals	2-pole, grid spacing 3.5 mm	2
	7-pole*, grid spacing 3.5 mm * consisting of two 2-pole and one 3-pole modular terminal	2

3.5. Assembly

The Light Computer LC-NG is assembled on the side that is **not** equipped with SMD components. The components are soldered on the side that is equipped with SMD components.



Assembly side

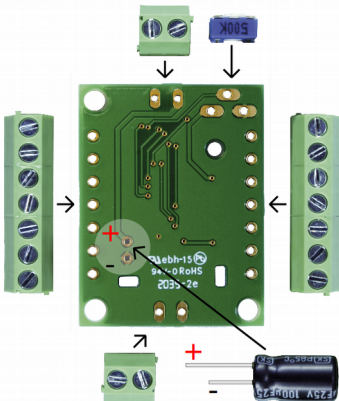


Solder side

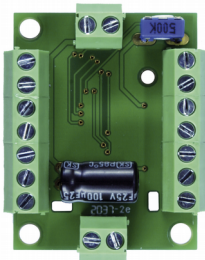
Proceed according to the order given in the list below. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutter. Follow the instructions on soldering in section 3.2.

 **Caution:** Several components have to be mounted according to their polarity. When soldering these components the wrong way round, they can be damaged when you connect the power. In the worst case the whole circuit can be damaged. At the best, a wrongly connected part will not function.

1.	Electrolytic capacitor	 Pay attention to the polarity! If you solder in electrolytic capacitors with the wrong polarity, they will be destroyed during commissioning. In the worst case, the entire module can be damaged. One of the two connections (the shorter one) is marked with a minus sign.
2.	Trim pot	The installation direction is determined by the arrangement of the three connections.
3.	Screw terminals	Plug the 7-pole terminals together before installation.



Assembly



Ready-built module

3.6. Performing a visual check

Perform a visual check after the assembly of the module and remove faults if necessary:

- Remove all loose parts, wire ends or drops of solder from the PCB. Remove all sharp wire ends.
- Check that solder contacts which are close to each other are not unintentionally connected to each other. Risk of short circuit!
- Check that all components are polarised correctly.

When you have remedied all faults, go on to the next part.

4. Connecting the LC-NG modules

In this section you will find information that applies to all LC-NG modules. Please also note the section in Part B of the instructions, where the special features of the respective version, especially the connection assignment, are shown.

4.1. Connection to the power supply

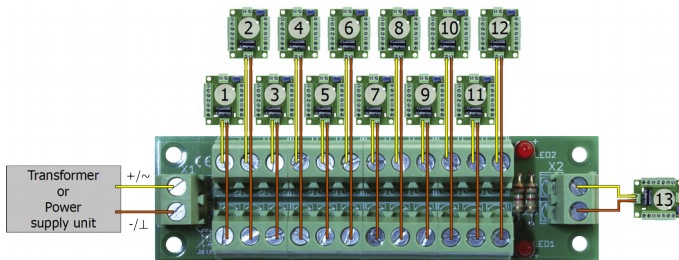
Use the following as power supply

- an AC transformer with 10 to 18 volts nominal voltage or
- a DC power supply unit with a nominal voltage of 10 to 22 volts.

When connecting to DC voltage, you must always observe the polarity.

When connecting to an AC transformer, the polarity is not important at first. If you connect several LC-NG modules to a transformer, you must always assign the connections of the modules to the transformer connections in the same way.

To keep track when connecting several LC-NG modules to a common power supply, the use of a distribution board is recommended.



Example: Connecting 13 LC-NG modules to one distribution board Power-Block
(item no. 72-00315 or 72-00316)

Up to 13 circuits (or other loads) can be connected to one power block. If further circuits or consumers are to be connected to a common voltage source, further Power-Blocks can be cascaded.

Note on the illustration: The power distribution board is shown enlarged 4 times in relation to the LC-NG modules.

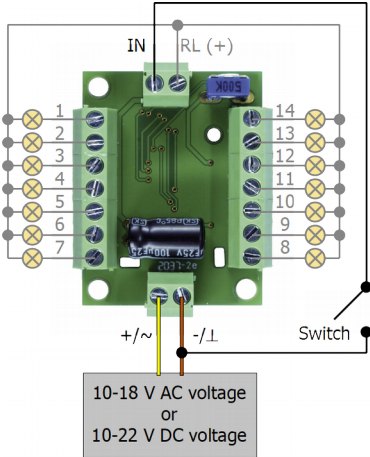
4.2. Connecting a switch or push-button

The way the switch input is used depends on the version of the LC-NG module.

4.2.1. Connecting a switch

To connect the switching input **permanently** to earth, you can install a switch in the supply line to the switching input.

The LC-NG modules for which a switch must be installed in the supply line to the input in order to trigger a specific action are shown in the following list.



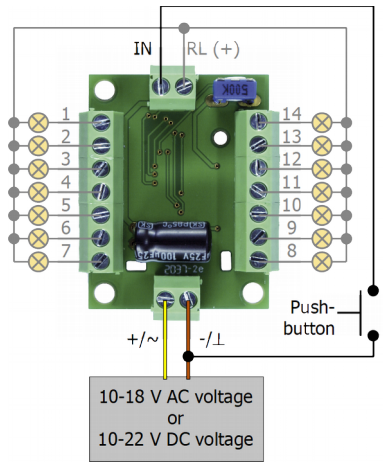
LC-NG version	Action
LC-NG-01 "City lighting"	Starting / stopping the sequence
LC-NG-02 "Residential buildings"	Switching between the programme variants (until version 06/2021) Synchronisation on/off and configuration* (from version 06/2021)
LC-NG-03 "Office and commercial buildings"	Switching on and off the lights in units 1 to 8
LC-NG-04 "Street lamps"	Switching the lanterns on and off Configuration*
LC-NG-05 "Road traffic"	Switching between standard operation and flashing yellow of the traffic lights Configuration*
LC-NG-06 "Emergency vehicles"	Starting / stopping the sequence Configuration*
LC-NG-08 "Fire station"	Configuration*
LC-NG-09 "Railway station"	Starting / stopping the sequence
LC-NG-10 "Workshop"	Fluorescent lamps on/off
LC-NG-11 "Fire flares & candles"	Starting / stopping the sequence
LC-NG-12 "Event"	Switching between normal and show mode
LC-NG-13 "Chaser lights"	Configuration*
LC-NG-14 "Funfair lighting"	Configuration*
LC-NG-15 "Automatic track warning system"	Starting / stopping the sequence

* During configuration of the module, the switching input must be temporarily connected to ground. Connecting a switch during configuration is helpful, but not necessary.

4.2.2. Connecting a push-button

To connect the switching input **briefly** to earth, you can install a push-button in the supply line to the switching input.

LC-NG modules for which the switching input must be briefly connected to earth in order to trigger a certain action are shown in the following list.

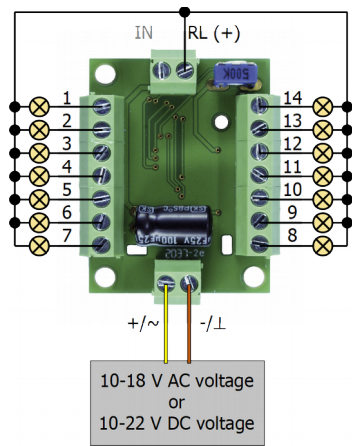


LC-NG version	Action
LC-NG-07 "(Road) construction site"	Triggering the servos
LC-NG-08 "Fire station"	Triggering the alarm

4.3. Connecting light bulbs

You can usually connect two to three light bulbs to one output. Light bulb are not polarised. Connect one side to the output and the other to the return conductor.

**Please note:** The maximum current of 200 mA per output and 1,000 mA for the entire module must not be exceeded. In this case, the output or the module would be damaged.
It is therefore essential to observe the rated current (given in mA) on the lamp cap or the packaging of the bulb. Furthermore, you must take into account that when the lamp is switched on, the current can be up to twice as high as the specified rated current.

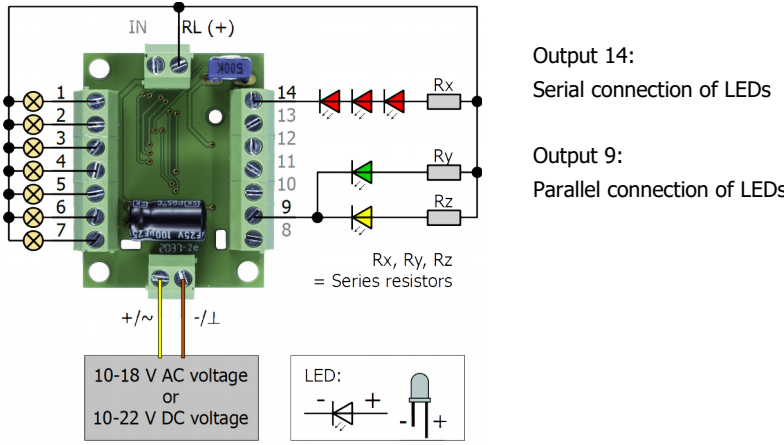


4.4. Connecting LEDs

You can connect several LEDs in parallel or serially (in series) to one output (see following sections). Which connection variant is more suitable depends, among other things, on the installation situation.

LEDs are polarised. Connect the cathode (-) to the output and the anode (+) to the return conductor. In the wired versions, the anode (+) has the longer "leg", in the SMD versions, the cathode (-) is marked (e.g. bevelled corner, colour marking).

! Please note: Light-emitting diodes must always be connected via a series resistor, otherwise they will be destroyed when switched on. Notes on selecting a series resistor → "Parallel / serial connection of LEDs".



4.4.1. Parallel connection of LEDs

With a parallel connection each LED has to be connected via it's own series resistor to the output. The total current at the output results from summing up the current of each single LED.

The current consumption of one LED depends on the value of the series resistor. The higher the value, the lower is the current and the more LEDs can be connected to one output. But, the LEDs light the darker, the higher you choose the series resistor's value.

! Caution: The maximum current of 200 mA per output should not be exceeded. In this case the output would be damaged.

Examples for parallel connection of LEDs:

Power supply	Series resistors	Current per LED	max. number of LEDs per output
Transformer (~) 12 V	1,5 kOhm	10 mA	20
Transformer (~) 12 V	820 Ohm	20 mA	10
Transformer (~) 15-16 V	2,2 kOhm	10 mA	20
Transformer (~) 15-16 V	1 kOhm	20 mA	10
Transformer (~) 18 V	2,7 kOhm	10 mA	20
Transformer (~) 18 V	1,2 kOhm	20 mA	10

The calculation of the series resistors is based on the following formula:

$$\text{series resistor [kOhm]} = \text{power supply [V]} / \text{current [mA]}$$

Note: The operating voltage with a.c. transformers is approx. 1,4 times the nominal voltage given on the transformer. With d.c. power packs the operating voltage corresponds to the given nominal voltage.

4.4.2. Serial connection of LEDs

With a serial connection all LEDs have to be connected (in series) via one series resistor to the output. The current consumption of the LEDs depends on the value of the series resistor. The higher the value, the lower is the current. But, the LEDs are dimmer, the higher you choose the series resistor's value.

The number of LEDs you can connect in series depends on the transformer's nominal voltage and the colour of the LEDs. When connecting too many LEDs, the voltage is not sufficient and the LEDs do not light.

Examples for serial connection of LEDs:

Nominal voltage transformer (~)* ¹	Operating voltage * ¹ appr.	Forward voltage of the LED* ²	Max. number of LEDs* ³ per output
12 V	17 V	2 V	7
		4 V	3
16 V	22 V	2 V	10
		4 V	4
18 V	25 V	2 V	11
		4 V	5

*¹ Nominal voltage and operating voltage: The operating voltage with a.c. transformers is approx. 1,4 times the nominal voltage given on the transformer. With d.c. power packs the operating voltage corresponds to the given nominal voltage.

*² The forward voltage of white and blue LEDs is approx. 4 V, differing coloured LEDs approx. 2 V.

*³ Tolerance and / or voltage fluctuations in practice often cause the calculated operating voltage not being available. For that reason it is recommended to connect one LED less than possible in theory.

Calculate the necessary series resistor as follows:

$$\text{nec. } R_V [\text{Ohm}] = (U_B [\text{V}] - U_F [\text{V}] \times n_{\text{LED}}) / (I_F [\text{mA}] \times 0,001)$$

U_B = operating voltage | U_F = forward voltage of the LED
 n_{LED} = number of LEDs | I_F = current with max. luminance

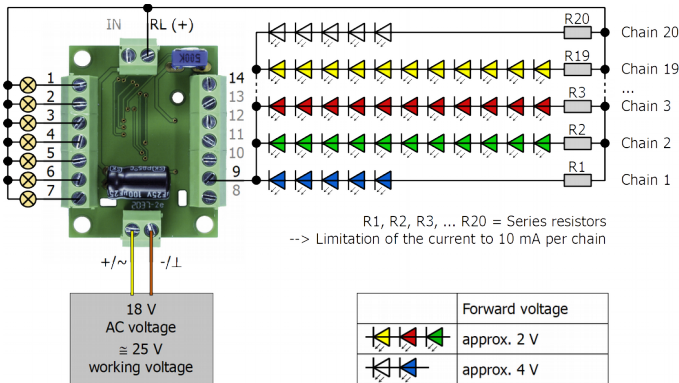
Example: Connection of 2 blue and 3 red LEDs with using a 18 V a.c. transformer. Designated current: 20 mA:

$$\text{nec. } R_V = (25 \text{ V} - 4 \text{ V} \times 2 - 2 \text{ V} \times 3) / (20 \text{ mA} \times 0,001) = 550 \text{ Ohm}$$

We choose the next resistor's value which is provided as a standard, which means a resistor of 560 Ohm. If using a resistor with a higher value the current of the LEDs would be reduced and the LEDs would light less brightly.

4.4.3. Tip: Connecting many LEDs to one LC-NG module

If you want to connect a large number of LEDs to one output of the LC-NG module (e.g. for chaser lights or funfair lighting), it is best to connect them as follows:



Connect as many LEDs in series as the available working voltage allows. If you use an 18 V AC transformer, for example, you can connect 5 white or blue or 11 other-coloured LEDs in series. Reduce the current by using an appropriate series resistor to such an extent that the brightness of the LEDs still meets your expectations.

Connect further "chains" of series-connected LEDs in parallel to the same output. Make sure that you do not exceed the maximum current of 200 mA. If the current of each individual "chain" is limited to 10 mA, for example, you can connect 20 chains in parallel to one output.



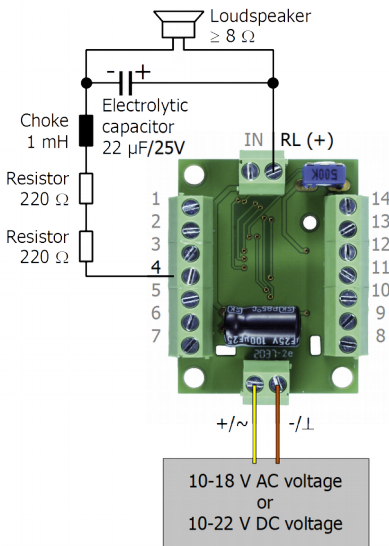
Please note: You cannot load all 14 outputs with 200 mA each, because then the maximum total current of the module of 1,000 mA would be exceeded. If the maximum total current is exceeded, the module will be irreparably damaged.

4.5. Connecting a loudspeaker (LC-NG-05,-06,-08,-15)

Connecting a loudspeaker is only possible with LC-NG modules that have a corresponding output. You need a loudspeaker set (item no. 53-04311-01) or a loudspeaker with an impedance of at least $8\ \Omega$. The sound quality is better if you use a loudspeaker with a higher impedance (e.g. 32 or $50\ \Omega$). In addition, you need as a filter

- a choke 1 mH
- two resistors $220\ \Omega$ /0.25 W or one resistor $470\ \Omega$ /1 W
- an electrolytic capacitor 22 μ F/25 V*

Chokes and resistors are not polarised, so they can be installed in any direction.



Please note:

Electrolytic capacitors are polarised. When connecting them, make sure that you connect the positive pole to the return line and the negative pole to the supply line. If the connections are reversed, the electrolytic capacitor may explode during commissioning and possibly damage other components.

* Note on the value of the electrolytic capacitor

In the previous versions of the manual

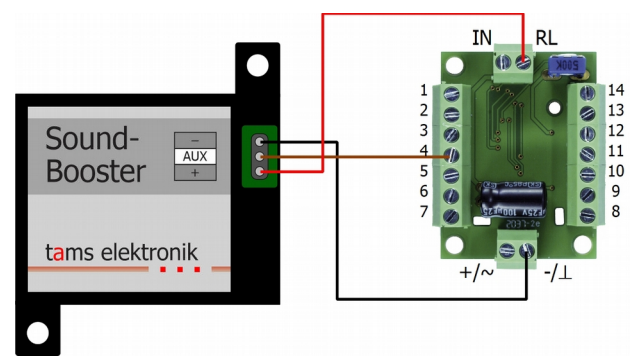
- version 1.0 (© 01/2021)
- version 1.1 (© 04/2021)

220 μ F/25 V is erroneously stated as the required value for the electrolytic capacitor. When using an electrolytic capacitor with this value, the sound reproduction is very quiet.

4.6. Connecting a Sound-Booster (LC-NG-05,-06,-08,-15)

You can connect a Sound-Booster (item no. 72-08017) to LC-NG modules with loudspeaker output instead of a loudspeaker (with upstream components as filters). The Sound-Booster has the following advantages over a loudspeaker:

- adjustable volume
- higher volume
- better playback quality
- simple connection via a socket connector with cables (included in the scope of delivery)



	Sound-Booster	LC-NG module	 Please note:
	-	-/~	If the "-" (black) and "+" (red) connections of the sound-booster are connected to the LC-NG module the wrong way round, both modules may be damaged when put into operation or, in the worst case, irreparably destroyed..
	AUX	4 (loudspeaker)	
	+	RL	



Adjusting the volume

The housing of the sound-booster has a hole on the back behind which the trim pot for adjusting the volume is located. Use a small screwdriver to adjust the volume

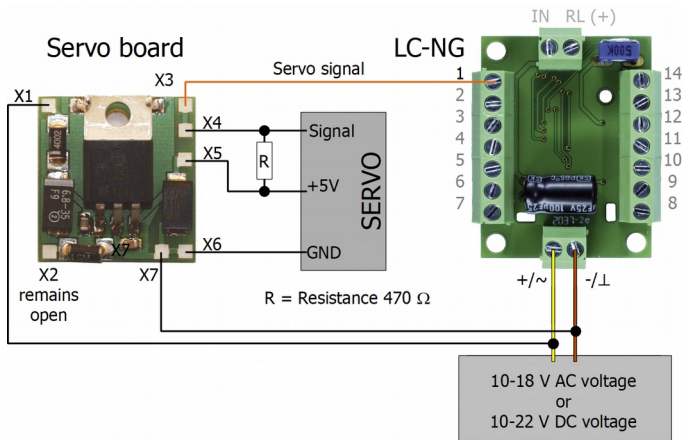
If you connect a Sound-Booster to your LC-NG module, please also observe the information in the instructions for the sound booster.

4.7. Connecting a servo (LC-NG-07,-08,-10)

Connecting a servo is only possible with LC-NG modules that have a corresponding output. The servo signal of the LC-NG modules is a 50 Hz signal (20 ms period length), which slowly changes between 1 millisecond (left stop = 0 degrees) and 2 milliseconds (right stop, 90 degrees).

You need a servo set (item no. 53-04321-01) or a servo and also

- as current and voltage supply for the servo: a servo board (item no. 70-05900)
- a 470 Ω resistor



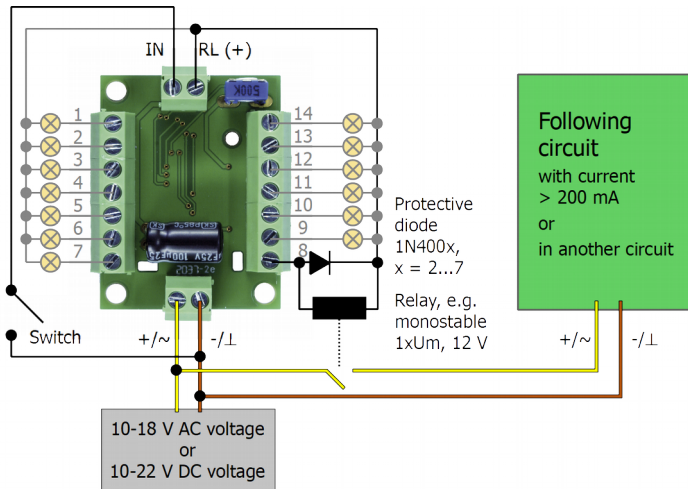
Please note: The connection shown differs from the standard connection of the servo board according to the instructions. In combination with the LC-NG module, the connection must be made in accordance with this illustration, otherwise errors will occur during servo control.

4.8. Connecting subordinate circuits

You can connect lower-level circuits (e.g. other LC-NG modules) to the outputs of an LC-NG module in order to switch them on and off. Please note: Connecting lower-ranking circuits does not make sense with LC-NG versions whose outputs are only switched on briefly.

You must connect the downstream circuit via a relay and a protective diode (e.g. monostable relay 1xUm / 3 A / 12 V, item no. 84-61011-01) if

- the current of the circuit and the connected loads is higher than 200 mA or
- galvanic isolation is required, i.e. the circuit is connected with another type of current or to another circuit.



4.9. Connection test

With all versions of the LC-NG module, you have the option of testing the functionality of the connected LEDs and lights.



Please note: Disconnect servos from the outputs before carrying out a connection test. Otherwise there is a risk of damage to the connected models.

To start the test, set the trim potentiometer to the left stop **before** switching on the power supply. As soon as you have switched on the power supply, all 14 outputs are switched on one after the other. You can then see whether connected LEDs or light bulbs light up. The programme sequence of the respective module has no influence on the test mode.

After a single run, all lamps / LEDs are switched off again except for those at output 12. To end the connection test, you must switch off the power supply and turn the potentiometer a little to the right. Otherwise, the LC-NG module will restart in test mode when you switch it on again.

Testing the potentiometer position

You can test the effect of the potentiometer position. To do this, start the test mode (trim potentiometer to the left stop) and wait until all outputs have been switched on and off again. Then turn the potentiometer: At the minimum position, only the LED or light bulb at output 1 is switched on. The further you turn, the more LEDs or light bulbs are switched on. In the maximum position, the LEDs or light bulbs at outputs 1 to 10 are switched on.

4.10. Configuration

For some modules, you can set one of two or more variants after switching to programming mode.

LC-NG-02, LC-NG-04, LC-NG-06 and LC-NG-08:

Setting a programme variant

To switch to programming mode, proceed as follows:

- Switch off the power supply and set the trim potentiometer to the **right** stop.
- Connect the switching input to ground by pressing the switch, holding the push-button or connecting the terminals "IN" and " -/⊥ ".
- Switch the power supply on again.
- After switching on the power, disconnect the switching input from earth by pressing the switch, releasing the button or disconnecting the connection between the terminals "IN" and " -/⊥ ".
- The module is now in programming mode.
- To switch between the two variants, briefly connect the switching input "IN" to earth.

Display of the set variant for LC-NG-02 and LC-NG-04:

The respective set variant is displayed on the connected LEDs or lamps.

	LC-NG-02	LC-NG-04
Outputs 1-7 on	House 1 & 2	modern street lamps
Outputs 8-14 on	House 3 & 4	gas lanterns

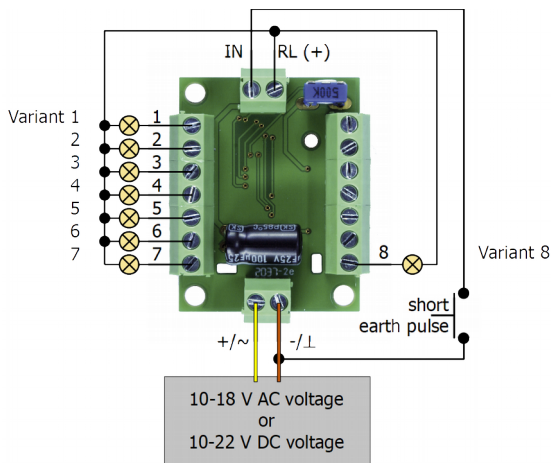
Display of the set variant for LC-NG-06 and LC-NG-08:

The set variant is immediately displayed on the connected LEDs or lamps.

To exit to programming mode, switch off the power supply. The selected variant is saved and is active the next time the module is switched on.

LC-NG-05 and LC-NG-14 : Setting a programme variant

The selected programme variant is indicated during configuration by the LED or lamp lighting up at the assigned output. Therefore, connect LEDs or lamps to outputs 1, 2, 3 and the following before switching to programming mode. Technically, a maximum of 8 programme variants are possible; the number of variants actually possible can be found in the description of the LC-NG version concerned.



To switch to programming mode, proceed as follows:

- Switch off the power supply and set the trim potentiometer to the **right** stop.
- Connect the switching input to earth by pressing the switch, holding the push-button or connecting the terminals "IN" and " -/⊥ ".
- Switch the power supply on again.
- After switching on the power, disconnect the switching input from earth by pressing the switch, releasing the button or disconnecting the connection between the terminals "IN" and " -/⊥ ".
- The module is now in programming mode.

Then set one of the programme variants by turning the trim potentiometer:

- **Left** stop: Variant 1
- **Right** stop: Variant 8. Note: Eight variants are technically possible, but may not be available for the LC-NG version you are currently configuring.
- The set variant is indicated by the light or LED at the assigned output lighting up.

As soon as the desired variant is set, briefly connect the switching input to earth by switching the switch on and off, pressing the push-button or briefly connecting the terminals "IN" and " -/⊥ ". The selected variant is saved.

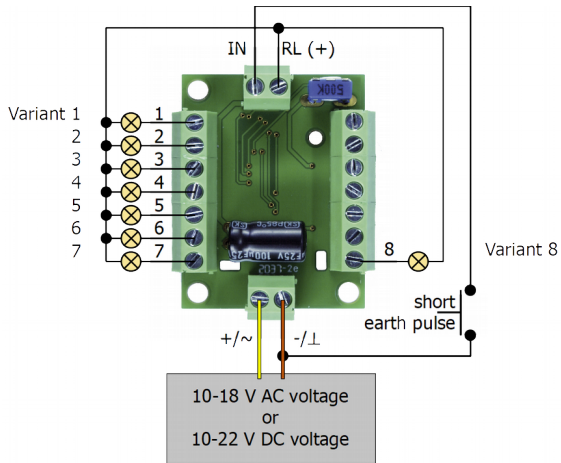
Switch off the power supply. The next time the module is switched on, the set variant is active.

LC-NG-13 : Setting the programme variant(s)

You can activate or deactivate one or more variants. Variants that are already activated are indicated by the light or LED at the assigned outputs lighting up after switching to programming mode.

Note: For the variant that is currently selected for programming, the current state is not displayed, but the state that the variant has after confirming the setting. When starting programming mode with the trim pot set to the right stop, a switched-off

LED/lamp at output 8 thus indicates that variant 8 is active and a switched-on LED/lamp indicates that variant 8 is inactive.



To switch to programming mode, proceed as follows:

- Switch off the power supply and set the trim potentiometer to the **right** stop.
- Connect the switching input to earth, by pressing the switch, holding the push-button or connecting the terminals "IN" and " -/ ".
- Switch the power supply on again.
- After switching on the power, disconnect the switching input from earth by pressing the switch, releasing the button or disconnecting the connection between the terminals "IN" and " -/ ".
- The module is now in programming mode.

To activate or deactivate a variant, first select the variant by turning the trimmer potentiometer:

- **Left** stop: Variant 1
- **Right** stop: Variant 8

The set variant is indicated by switching on or off the light or LED at the assigned output. Note that for the currently selected variant, the state that the variant has after confirming the setting is displayed:

- LED/light off: Variant is active, becomes inactive after confirmation.
- LED/light on: Variant is inactive, becomes active after confirmation.

To (de)activate the set variant, briefly connect the switching input to earth, by switching the switch on and off, pressing the push-button or briefly connecting the connections "IN" and " -/ ". The setting is saved.

You can activate or deactivate further variants afterwards. Switch off the power supply. The next time the module is switched on, the active programme variants run one after the other.

5. Checklist for troubleshooting and error correction

 **Warning:** If you notice a strong heat development, immediately disconnect the connection to the supply voltage. **Fire hazard!**

Possible causes:

- One or more connections are faulty. → Check the connections.
- The power supply was connected to the switching input (IN) and the return conductor (RL). If components and conductors have been visibly damaged, repair is usually not technically or economically possible.
- "Kit" version: one or more components are soldered incorrectly. → Carry out a visual inspection (→ section 3.5.) and eliminate the faults, if necessary. If components and conductor paths have been visibly damaged, repair is usually not technically or economically possible.
- The module is defective. → Send the module in for inspection.

The connected light bulbs or LEDs do not light up.

Possible causes:

- The light bulbs or LEDs are connected to the switching input instead of the return conductor. → Check the connection. It is possible that the switching input has been irreparably damaged.
- A connected switch is closed. → Check the position of the switch.
- The LEDs are connected with the wrong polarity. → Check the polarity of the LEDs.
- One or more outputs are damaged due to overload. → Send the module in for repair.
- With a serial connection, too many LEDs are connected in series. → Reduce the number of LEDs or increase the supply voltage. Note that the maximum voltage is 22 V.
- The light bulbs or LEDs are defective. → Check the light bulbs / LEDs.

A connected servo does not work.

Possible causes:

- The servo is connected to the wrong output. → Check the connection.
- A connected switch is closed. → Check the position of the switch.
- The servo is connected to the servo board with the wrong polarity. → Check the polarity of the servo.
- The servo is defective. → Check the servo.

A connected loudspeaker does not work.

Possible causes:

- The loudspeaker is connected to the wrong output. → Check the connection.
- The loudspeaker is connected to the switch input instead of the return conductor. → Check the connection.
- A connected switch is closed. → Check the position of the switch.
- The loudspeaker is defective. → Check the loudspeaker

The playback of the sound is very quiet.

Possible causes:

- No electrolytic capacitor 22 μF / >25 V was connected for the filter, but an electrolytic capacitor with a larger capacity. → Replace the electrolytic capacitor if necessary.

Hints: In the earlier versions of the instructions, an electrolytic capacitor 220 μF /25 V was erroneously specified as part of the filter. Until the end of June 2021, LC-NG speaker sets were delivered that contained a 220 μF electrolytic capacitor instead of a 22 μF electrolytic capacitor.

Noise occurs during the playback of the sound.

Possible causes:

- The required filter at the loudspeaker connection or parts of it are missing or incorrectly connected. → Check whether the filter is connected according to section 4.5.

5.1. Technical Hotline

If you have any questions about the use of your LC-NG-module, our technical hotline will help you (telephone number and e-mail address on the last page).

5.2. Repairs

You can send us defective modules for inspection / repair (address on the last page). Please do not send us your return freight collect. In the event of a warranty or guarantee claim, we will reimburse you for the regular shipping costs.

Please enclose the following with your shipment

- proof of purchase as evidence of any warranty or guarantee claim
- a brief description of the defect
- the address to which we should return the product(s)
- your email address and/or a telephone number where we can reach you in case of queries

Costs

The inspection of returned products is free of charge for you. In the event of a warranty or guarantee claim, the repair and return are also free of charge for you.

If there is no warranty or guarantee case, we will charge you the costs of the repair and the costs of the return. We charge a maximum of 50% of the new price for the repair according to our valid price list.

Carrying out the repair(s)

By sending in the product(s), you give us the order to inspect and repair it. We reserve the right to refuse the repair if it is technically impossible or uneconomical. In the event of a warranty or guarantee claim, you will then receive a replacement free of charge.

Cost estimates

Repairs for which we charge less than € 25.00 per item plus shipping costs will be carried out without further consultation with you. If the repair costs are higher, we will contact you and carry out the repair only after you have confirmed the repair order.

6. Technical data

Inputs and outputs

Number of outputs	14
Number of switching inputs	1

Electrical characteristics

Supply voltage	10 to 18 volts alternating voltage or 10 to 22 volts DC
Current consumption	approx. 40 mA (without connected loads)
Maximum total current	1,000 mA
Max. Current per output	200 mA

Protection

Protection class	IP 00 Meaning: No protection against foreign bodies, contact and water.
------------------	--

Environment



For use in closed rooms

Ambient temperature during operation	0 ~ + 30 °C
Permissible relative humidity during operation	10 ~ 85% (non-condensing)
Ambient temperature during storage	- 10 ~ + 40 °C
Permissible relative humidity during storage	10 ~ 85% (non-condensing)

Other features

Dimensions (approx.)	Circuit board: 37 x 28 mm including housing: 39 x 31 x 13 mm
Weight (approx.)	Assembled board (ready-made module): 13 g including housing: 15 g

7. Warranty, EU conformity & WEEE

7.1. Guarantee bond

For this product we issue voluntarily a guarantee of 2 years from the date of purchase by the first customer, but in maximum 3 years after the end of series production. The first customer is the consumer first purchasing the product from us, a dealer or another natural or juristic person reselling or mounting the product on the basis of self-employment. The guarantee exists supplementary to the legal warranty of merchantability due to the consumer by the seller.

The warranty includes the free correction of faults which can be proved to be due to material failure or factory flaw. With kits we guarantee the completeness and quality of the components as well as the function of the parts according to the parameters in not mounted state. We guarantee the adherence to the technical specifications when the kit has been assembled and the ready-built circuit connected according to the manual and when start and mode of operation follow the instructions.

We retain the right to repair, make improvements, to deliver spares or to return the purchase price. Other claims are excluded. Claims for secondary damages or product liability consist only according to legal requirements.

Condition for this guarantee to be valid, is the adherence to the manual. In addition, the guarantee claim is excluded in the following cases:

- if arbitrary changes in the circuit are made,
- if repair attempts have failed with a ready-made module or device,
- if damaged by other persons,
- if damaged by faulty operation or by careless use or abuse.

7.2. EU Declaration of Conformity



This product fulfils the requirements of the following EU directives and therefore bears the CE marking.

2001/95/EU Product Safety Directive

2015/863/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

2014/30/EU on electromagnetic compatibility (EMC Directive). Underlying standards:

DIN-EN 55014-1 and 55014-2: Electromagnetic compatibility - Requirements for household appliances, electric tools and similar electrical appliances. Part 1: Emitted interference, Part 2: Immunity to interference

To maintain electromagnetic compatibility during operation, observe the following measures:

Only connect the supply transformer to a professionally installed and fused earthed socket.

Do not make any changes to the original components and follow the instructions, connection and assembly diagrams in this manual exactly.

Only use original spare parts for repair work.

7.3. Declarations on the WEEE Directive

This product is subject to the requirements of the EU Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE), i.e. the manufacturer, distributor or seller of the product must contribute to the proper disposal and treatment of waste equipment in accordance with EU and national law. This obligation includes

- registration with the registering authorities ("registers") in the country where WEEE is distributed or sold
- the regular reporting of the amount of EEE sold
- the organisation or financing of collection, treatment, recycling and recovery of the products
- for distributors, the establishment of a take-back service where customers can return WEEE free of charge
- for producers, compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive.



The "crossed-out wheeled bin" symbol means that you are legally obliged to recycle the marked equipment at the end of its life. The appliances must not be disposed of with (unsorted) household waste or packaging waste. Dispose of the appliances at special collection and return points, e.g. at recycling centres or at dealers who offer a corresponding take-back service.

Part B: LC-NG versions

1. LC-NG-01 "City Lighting"

1.1. Mode of operation

After the module is switched on, i.e. as soon as the switching input is connected to earth, the 14 outputs are switched on successively. The length of the pauses between the switching on of the module and the successive switching on of the outputs varies randomly. The maximum pause length can be set at the trim potentiometer. When switching off, the sequence is changed and the length of the pauses is shortened.

The module can be cascaded as desired. This makes it possible to connect further LC-NG modules to one or more outputs that are to be switched with a time delay. The number of LC-NG-01 modules that can be connected in series is not limited. Therefore, the lighting for complete model railway layouts can be switched on and off with a time delay using one switch.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	The outputs are switched on one after the other. The pause length varies randomly.
Switch open	The outputs are switched off one after the other. The pause length varies randomly.

Settings on the trim potentiometer

During operation, you can use the trim potentiometer to change the maximum length of the pauses that elapse between the successive switching on and off of the 14 outputs. The length of the pauses is shorter in the left-hand direction of rotation* and longer in the right-hand direction of rotation.

Notes: The actual length of the pauses is randomly controlled, i.e. in individual cases it can be significantly shorter than when set. When switching off, the pause length is always shorter than when switching on.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right after setting it to the left stop in order to set the shortest possible pause length.

1.2. Pin assignment LC-NG-01

	Output	Connection options
	1 ... 14	Light bulbs (→ page 17)
	1 ... 14	LEDs (→ page 18)
	1 ... 14	further modules LC-NG-01 (→ page 36)
	1 ... 14	other LC-NG modules or following circuits (→ page 24)

Required accessories

- Light bulbs or LEDs with suitable series resistors
- Circuits that are switched on and off via the module, if necessary additionally a relay and a protective diode (→ page 24 section14)

1.3. Connecting cascaded modules LC-NG-01

You can connect (cascade) other LC-NG-01 modules to the outputs of the LC-NG-01 (also in addition to light bulbs or LEDs) to switch them on and off with a time delay together with a switch. Since each LC-NG-01 is connected directly to the power supply, you do not have to take it into account when determining the current for the output.

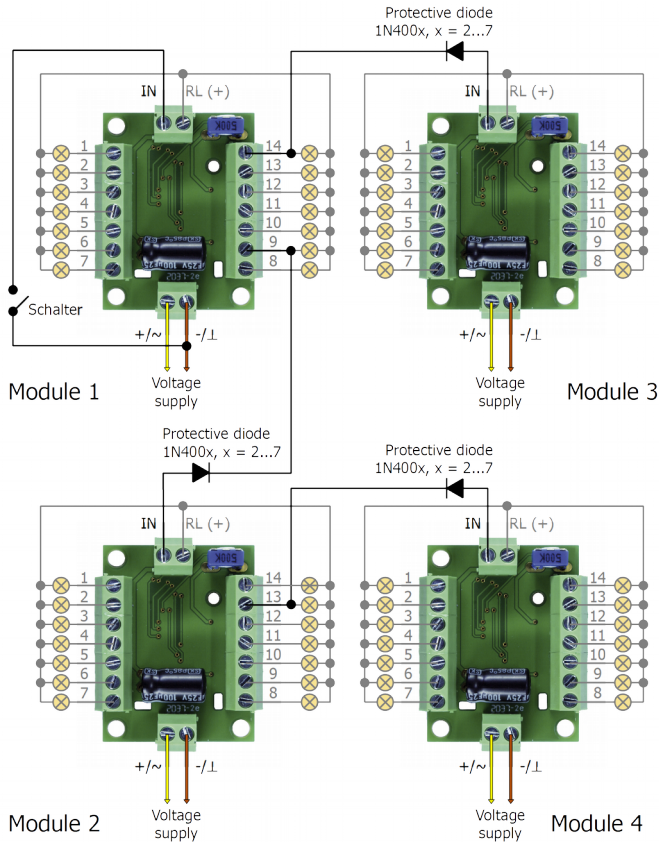
Using the same principle, you can also connect all other LC-NG modules that are switched on and off via the switching input "IN".

! Please note:

You must connect a 1N400x diode (x = 2..7) in the supply line to each cascaded module (see connection example on the next page). Note the polarity of the diode! Seen in the forward direction, the diode is marked with a ring that is offset towards the end.

If you do not connect the diode or connect it with the wrong polarity, the switching input of the module will be **irreparably damaged** during commissioning.

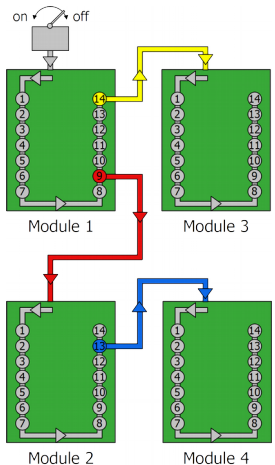
Connection example



Sequence for the connection example

After module 1 is switched on, outputs 1 to 14 (and the LEDs or light bulbs connected to them) are switched on one after the other. At the same time as the LEDs/lights on output 9, module 2 is switched on and with the LEDs/lights on output 14, module 3 is switched on. When output 13 of module 2 is switched on, module 4 is also switched on.

Since each LC-NG module is connected directly to the power supply, any number of modules can be cascaded.



2. LC-NG-02 "Residential buildings"

2.1. Mode of operation

The outputs of the LC-NG-02 control the lights and televisions of two houses (or flats) according to typical daily schedules. Subordinate circuits can also be connected to the outputs, which are to be switched on and off at the same time as the lights.

Two different programmes are available (house 1 & 2 or house 3 & 4). The speed of the sequence can be adjusted at the trim potentiometer.

Synchronisation of several LC-NG-02 modules

As of software version 06/2021, it is possible to synchronise several LC-NG-02 modules with each other. The synchronisation pulse is sent from one module to all connected modules at programme time 0:45. This ensures that the modules start their sequence at the same programme time and that deviations in the set time factors do not play a role even after several programme runs.

Use the switching input (from version 06/2021)

Switching input	Effect
open	No Synchronisation with other modules LC-NG-02
closed (connected to output 14 of the LC-NG-02 from which the synchronisation pulse is sent)	Synchronisation with other modules LC-NG-02

Using the switching input (version before 06/2021)

Until June 2021, the LC-NG-02 modules were delivered with a software variant in which the switching input is used to switch between the two programme variants. Synchronisation with other LC-NG-02 modules is not possible with this variant. You can recognise this version by the information on the packaging and by the fact that no diode is included in the delivery.

Switching input	Effect	Please note that this table only applies to the software version that was not supplied with a diode!
open	"House 1 & 2" programme	
closed (switched to earth)	"House 3 & 4" programme	

Tip: If you install a switch in the supply line to the switching input, you can switch between the two programme versions as desired.

Settings on the trim potentiometer

At the trim potentiometer you set the time factor, i.e. how many milliseconds in the programme sequence correspond to one minute in real life. The time factor decreases in the left-hand direction of rotation and increases in the right-hand direction of rotation.

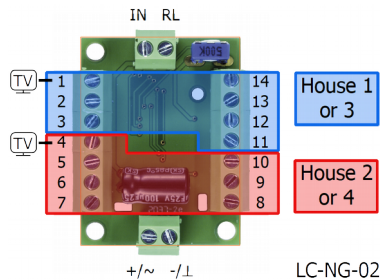
Time factor	Setting	1 Minute $\hat{=}$	Total duration of the sequence
4 *	left*	40 ms	57.600 ms (approx. 60 sec.)
44	right	480 ms	691.200 ms (approx. 12 min.)

*Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right to set the lowest time factor after you have set it to the left stop.

Configuration

To switch between the programme versions "House 1 & 2" and "House 3 & 4", proceed as described on page 27.

2.2. Pin assignment LC-NG-02



Connection of light bulbs

(→ page 17)

Connection of LEDs

(→ page 18)

Connection of downstream circuits

(→ page 24)

1	TV set house 1/3	14	Kitchen house 1/3
2	Living room house 1/3	13	Bedroom house 1/3
3	Bathroom house 1/3	12	Children's room house 1/3
4	TV set house 2/4	11	Hallway house 1/3
5	Living room house 2/4	10	Kitchen house 2/4
6	Bathroom house 2/4	9	Bedroom house 2/4
7	Hallway house 2/4	8	Model railway room house 2/4

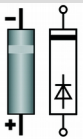
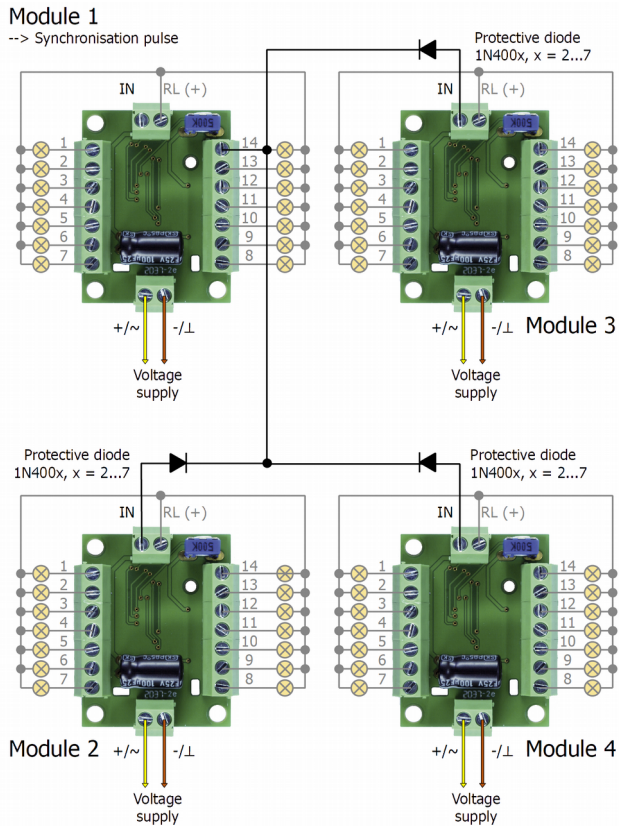
Required accessories

- Light bulbs or
- LEDs with suitable series resistors. Tip: The flickering of the television looks particularly realistic if you connect a blue LED to the output.

2.3. Connection of synchronous modules LC-NG-02

Select a module for which you have set the programme variant "House 1 & 2" as the transmitter for the synchronisation pulse. Connect the inputs of the modules you want to synchronise to output 14 of the synchronisation module. You can still use this output to connect consumers.

Tip: If you want to synchronise a larger number of LC-NG-02 modules via one module, the use of a distribution board (e.g. power block) is recommended.



! Note:

You must install a diode 1N400x ($x = 2...7$) in the connection between the input of the module you want to synchronise and the output 14 of the synchronisation encoder (see connection diagram on the next page).

Note the polarity of the diode! Seen in the forward direction, the diode is marked with a ring that is offset towards the end.

If you do not connect the diode or connect it with the wrong polarity, the switching input of the module will be **irreparably damaged** during commissioning.

2.4. Sequence House 1 & 2

→ Switching input IN closed (switched to earth)

Time	Output t	House 1	Output t	House 2
2:30	3	Bathroom on		
2:40	3	Bathroom off		
3:45			6	Bathroom on
4:05			6	Bathroom off
4:55			9	Bedroom on
5:00			7	Hallway on
5:05			6	Bathroom on
5:30			9 10	Bedroom off Kitchen on
5:40			6	Bathroom off
5:45	3	Bathroom on		
5:50			7	Hallway off
6:00	13	Bedroom on		
6:05			10	Kitchen off
6:10	11	Hallway on		
6:15	14	Kitchen on		
6:30	13	Bedroom off		
7:10	3	Bathroom off		
7:30	14	Kitchen off		
7:35	11	Hallway off		
17:00	14	Kitchen on		
17:30			7	Hallway on
17:45			8	Model railway room on
17:50			7 10	Hallway off Kitchen on
18:00	11	Hallway on		
18:05	3	Bathroom on		
18:15	3	Bathroom off		
18:20	11	Hallway off		
18:40	2	Living room on		
19:00	1	TV set on		

Time	Output	House 1	Output	House 2
19:05			7 8	Hallway on, Model railway room off
19:30	12	Children's room on		
19:45			10	Kitchen off
19:50			8	Model railway room on
19:55			5	Living room on
20:00	14	Kitchen off	4	TV set on
21:00			7	Hallway off
22:10			8	Model railway room off
22:30	1	TV set off		
22:45	2	Living room off		
22:47			4	TV set off
22:49	11	Hallway on		
22:50	3	Bathroom on		
23:10	13	Bedroom on	6	Bathroom on
23:15			5	Living room off
23:20	3	Bathroom off	9	Bedroom on
23:21	11	Hallway off		
23:50	13	Bedroom off		
23:55			6	Bathroom off
0:10			9	Bedroom off
0:45	12	Children's room off		

2.5. Sequence House 3 & 4

→ Switching input IN open

Time	Output	House 3	Output	House 4
1:10	3	Bathroom on		
1:15	3	Bathroom off		
3:00	3	Bathroom on		
3:15	3	Bathroom off		
3:50			6	Bathroom on
4:05			6	Bathroom off
5:05			6	Bathroom on
5:15			9	Bedroom on

Time	Output	House 3	Output	House 4
5:20	11	Hallway on	7	Hallway on
5:25	3	Bathroom on		
5:40			10	Kitchen on
5:55	13	Bedroom on		
6:00			6	Bathroom off
6:05			9	Bedroom off
6:10	14	Kitchen on		
6:20	3	Bathroom off	10	Kitchen off
6:30	13	Bedroom off		
6:35			7	Hallway off
7:10	14	Kitchen off		
7:25	11	Hallway off		
15:05			6	Bathroom on
15:15			6	Bathroom off
16:00	12	Children's room on	8	Model railway room on
16:10			7	Hallway on
16:25			10	Kitchen on
16:30		Hallway on	7	Hallway off
16:40	3	Bathroom on		
16:50	3	Bathroom off		
16:55	14	Kitchen on		
16:58	11	Hallway off		
17:15			7	Hallway on
17:20			6	Bathroom on
17:25			7	Hallway off
17:45	11	Hallway on		
17:50	3	Bathroom on		
18:00	3	Bathroom off		
18:05	11	Hallway off		
18:30			6	Bathroom off
18:35			7	Hallway on
18:50			5	Living room on
18:53			8	Modellbahnzimmer off
18:55			7	Hallway off

Time	Output	House 3	Output	House 4
19:45	11	Hallway on		
18:58			4	TV set on
19:25			10	Kitchen off
19:50	2	Living room on		
19:55	14	Kitchen off		
19:58	1	TV set on		
20:00	11	Hallway off		
20:20	11	Hallway on		
20:25			7	Hallway on
20:30			6	Bathroom on
20:35	3	Bathroom on		
20:40			6	Bathroom off
20:45			7	Hallway off
20 50	3	Bathroom off		
21:00	12	Children's room off		
21:05	11	Hallway off		
22:20	11	Hallway on		
22:25	3	Bathroom on		
22:30			7	Hallway on
22:35			6	Bathroom on
22:45	1	TV set off		
22:50	2	Living room off		
22:55	13	Bedroom on	4	TV set off
23:05			9	Bedroom on
23:10			5	Living room off
23:15	3	Bathroom off		
23:20	11	Hallway off		
23:35			6	Bathroom off
23:40			7	Hallway off
23:50			9	Bedroom off
23:55	13	Bedroom off		

3. LC-NG-03 "Office and commercial buildings"

3.1. Mode of operation

The outputs of the LC-NG-03 control the lighting in a maximum of 8 different units of an office and commercial building and in the communal stairwell, as well as a neon sign. Additional subordinate circuits that are to be switched on and off simultaneously with the lighting can be connected to the outputs for the units.

As soon as the module is supplied with power, the light show of the illuminated neon sign starts: First, the 5 outputs are switched on one after the other and then flash three times together. This light show is repeated continuously. The speed of the sequence is fixed.

After closing the switch, the lights in the units are switched on in the sequence unit 1, 2, ... 8. The sequence for each unit is:

- Stairwell lighting on
- Lighting in the unit on. The time interval between switching on the staircase light and switching on the light in the unit is shortest for unit 1 (on the 1st floor) and longest for unit 8 (on the 8th floor).
- Stairwell light off

As soon as the switch is opened, the lights in the units are switched off again, the order is random. Sequence:

- Stairwell light on and lighting in the unit off
- Stairwell light off

The pauses between switching the staircase lighting off and on are randomly long, they can also be omitted. The maximum pause length can be set at the trim potentiometer.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	Successive switching on of the lights in units 1 to 8
Switch open	Successive switching off of the lights in units 1 to 8

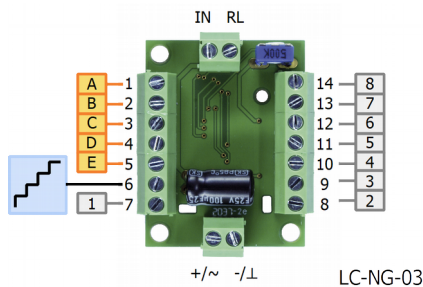
Settings on the trim potentiometer

During operation, you can use the trim potentiometer to change the maximum length of the pauses between successive switching on and off of the lights in the 8 units. The length of the pauses is shorter in the left-hand direction of rotation* and longer in the right-hand direction of rotation.

Notes: The actual length of the pauses is randomly controlled, i.e. in individual cases it can be significantly shorter than when set. When switching off, the pause length is always shorter than when switching on.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right after setting it to the left stop in order to set the shortest possible pause length.

3.2. Pin assignment LC-NG-03



Connection of light bulbs

(→ page 17)

Connection of LEDs

(→ page 18)

Connection of downstream circuits

(→ page 24)

1	A	Neon sign	14	Unit 8
2	B		13	Unit 7
3	C		12	Unit 6
4	D		11	Unit 5
5	E		10	Unit 4
6	Stairwell		9	Unit 3
7	Unit 1		8	Unit 2

Required accessories

- Light bulbs or
- LEDs with suitable series resistors

4. LC-NG-04 "Street lamps"

4.1. Mode of operation

The street lanterns in several streets can be connected to the outputs. Depending on the configuration, modern luminaires or gas lanterns are simulated.

The modern street lamps slowly become brighter when switched on before they reach their final brightness. After each switch-on, a light connected to a different output flickers, simulating a defective street light.

The gas lanterns slowly become brighter after being switched on, flickering independently in individual patterns. During operation, the brightness fluctuates (due to "gas pressure fluctuations"). After switching off, the lanterns first shine with lower brightness before they go out completely.

The time that elapses until the next lantern is switched on can be set at the trim potentiometer. By setting a long time, for example, the lighting of the gas lanterns by a lantern lighter can be simulated.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	The lanterns are switched on according to the set variant.
Switch open	The lanterns are switched off according to the set variant.

Settings on the trim potentiometer

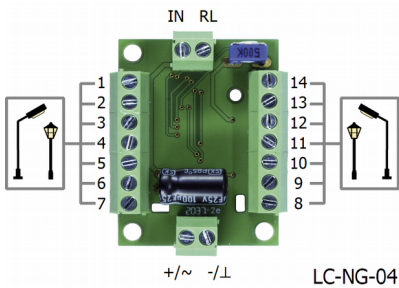
During operation, you can use the trim potentiometer to change the length of the pauses between switching on the individual lanterns. In the left-hand direction of rotation*, the length of the pauses becomes shorter so that they are switched on almost simultaneously; in the right-hand direction of rotation, they become longer (approx. 30 seconds).

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right after setting it to the left stop in order to set the shortest possible pause length.

Configuration

To change from the setting "modern lanterns" to the variant "gas lanterns" (or vice versa), proceed according to the instructions on page 27.

4.2. Pin assignment LC-NG-4



Connection of light bulbs

(→ page 17)

Connection of LEDs

(→ page 18)

Note: The maximum current of the LC-NG module is 1,000 mA and the maximum current per output is 200 mA. When connecting several lamps to one output, these maximum values can easily be exceeded and the module or the output will usually be irreparably damaged.

Required accessories

- Light bulbs or
- LEDs with suitable series resistors

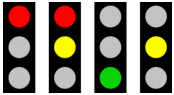
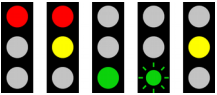
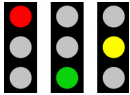
5. LC-NG-05 "Road traffic"

5.1. Mode of operation

The outputs of the LC-NG-05 control the four traffic lights and a hazard warning light at an intersection, lighting and horn of one or more cars and a speed trap.

Traffic lights and hazard warning lights

Three country-specific signal sequences are available for controlling the traffic lights:

		
with simultaneous red-yellow when changing to green	with green flashing light at the end of the green phase	with direct sequence from red to green (without yellow)
common for example in Germany, Great Britain, Norway, Poland, Sweden, Switzerland, Hungary	common for example in Croatia, Lithuania, Austria, Russia	common for example in Belgium, France, Greece, Italy, Ireland, Luxembourg, the Netherlands, Portugal, Romania, Spain, USA

During the green and yellow phases of traffic light 1, an additional hazard warning light is switched on (e.g. to secure a pedestrian crossing). For night-time operation or in the event of a malfunction, the switching input can be used to switch over to flashing yellow for all traffic lights.

Radar trap

The radar trap is triggered at irregular intervals.

Vehicle lighting and horn

With the LC-NG-05, the illuminations of "moving" and "parked" cars can be simulated. At irregular intervals

- the headlights and rear lights are switched on and off
- the headlights and rear lights are switched brighter (to simulate a headlight flasher and the brake light)
- the turn signals on the left or right side are switched on and off
- the interior lights are switched on and off

The horn is also triggered at irregular intervals. The sound of the horn is stored on the IC.

Note on the stored sound: The LC-NG module is not intended as a sound module, the stored sound is accordingly simple.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	Switch to flashing yellow traffic light
Switch open	Standard procedure

Settings on the trim potentiometer

During operation, you can use the trim potentiometer to set how fast the signal sequence for the traffic lights should be. The sequence becomes faster in the left-hand direction* and slower in the right-hand direction.

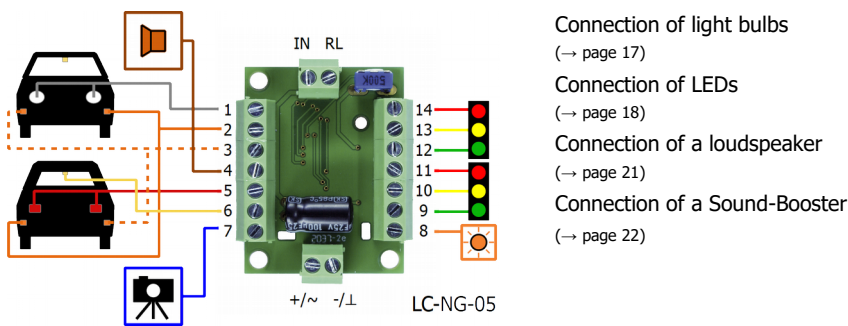
* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn it a little to the right to set the fastest signal sequence after you have set it to the left stop.

The trim pot is also used during configuration to select a variant. The set variant is saved before exiting programming mode, so changes to the position of the trim pot do not affect the variant setting.

Configuration

To set one of the three signal sequences for the traffic lights, proceed as described on page 27.

5.2. Pin assignment LC-NG-05



1	Headlights	14	Traffic light 1, red
2	Indicator left	13	Traffic light 1, yellow
3	Indicator right	12	Traffic light 1, green
4	Horn	11	Traffic light 2, red
5	Rear lights	10	Traffic light 2, yellow
6	Interior lighting	9	Traffic light 2, green
7	Speed trap	8	Flashing light

Required accessories

- Light bulbs or LEDs with suitable series resistors
- one loudspeaker and components for filters (→ page 21) or a Sound-Booster (→ page 22)

6. LC-NG-06 "Emergency vehicles"

6.1. Mode of operation

The outputs of the LC-NG-06 control the warning lights of (several) emergency vehicles and a siren. The sound of the siren is stored on the IC. The outputs can be set (together) either as simple flashing lights (for older emergency vehicles) or as flashlights (for modern emergency vehicles).

Note on the stored sound: The LC-NG module is not intended as a sound module, the stored sound is accordingly simple.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	Start of sequence
Switch open	End of sequence (after approx. one second)

Note: The programme sequence is only started or ended via the switch input if the trimmer potentiometer is not set to the right stop (→ following paragraph).

Settings on the trim potentiometer

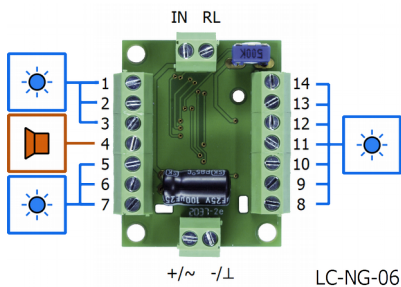
You can set the start mode at the trimmer potentiometer. When set to "right stop", the sequence is started as soon as the module is supplied with power - regardless of whether the switching input is open or closed. With any other potentiometer position*, the sequence is only started after the input has been connected to earth. You can thus start the sequence with a switch or by another circuit.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right after setting it to the left stop.

Configuration

To change from the "simple flashing lights" setting to the "flashlights" variant (or vice versa), proceed as described on page 26.

6.2. Pin assignment LC-NG-06



Connection of light bulbs
(→ page 17)

Connection of LEDs
(→ page 18)

Connection of a loudspeaker
(→ page 21)

Connection of a Sound-Booster
(→ page 22)

Variant "Simple flashing lights"			
1	Alternating flashing lights	14	Single flashing light
2		13	Single flashing light
3	Single flashing light	12	Single flashing light
4	Siren	11	Single flashing light
5	Single flashing light	10	Single flashing light
6	Single flashing light	9	Single flashing light
7	Single flashing light	8	Single flashing light

Variant "Flashlights"			
1	Triple flashlight	14	Double flashlight
2	Triple flashlight	13	Double flashlight
3	Triple flashlight	12	Double flashlight
4	Siren	11	Double flashlight
5	Double flashlight	10	Double flashlight
6	Double flashlight	9	Single flashing light
7	Double flashlight	8	Single flashing light

Required accessories

- Light bulbs or LEDs with suitable series resistors
- one loudspeaker and components for filters (→ page 21) or a Sound-Booster (→ page 22)

7. LC-NG-07 "(Road) construction site"

7.1. Mode of operation

The LC-NG-07 has outputs for the connection of lights or LEDs with which the prototypical protection of a construction site can be simulated. Two outputs control servos with which e.g. a crane or a road roller can be moved.

The typical chaser lights for barrier beacons are generated at seven outputs. The running speed can be adjusted at the trim potentiometer. Further outputs of the module are provided for switching additional warning lights. Different typical light patterns are generated at the outputs: fast flashing (approx. 1 Hz), slow flashing (approx. 0.5 Hz), rising and falling light, flashlight.

This can be used, for example, to control the lighting of a construction site vehicle with trailer (direction arrow, flashing lights and flashlights of the trailer, warning lights of the towing vehicle).

The signals for the two servos are sent either automatically after randomly long pauses or after a short earth pulse at the switching input.

- Servo 1 ("crane"): The pauses between the signals for changing the end position are of different lengths and simulate the typical motion sequence of a crane.
- Servo 2 ("road roller"): The signals for changing the end position are sent several times in succession at regular intervals and simulate the typical motion sequence of a road roller.

Use of the switching input

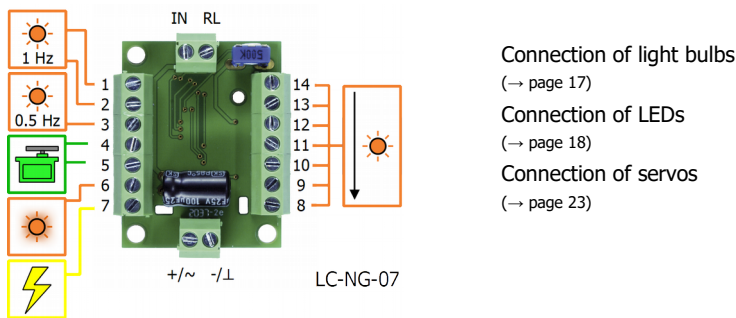
Switching input	Effect
Short earth pulse (via push-button)	Triggering the servos

Settings on the trim potentiometer

The trim potentiometer can be used to change the speed of the chaser lights during operation. The speed becomes faster in the counterclockwise direction* and slower in the clockwise direction.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn it a little to the right to set the highest speed after you have set it to the left stop.

7.2. Pin assignment LC-NG-07



1	fast flashing (ca. 1 Hz)	14	Order ↓	Chaser lights
2	fast flashing (ca. 1 Hz)	13		
3	fast flashing (ca. 0,5 Hz)	12		
4	Servo 1 ("crane")	11		
5	Servo 2 ("road roller")	10		
6	rising and falling light	9		
7	flashlight	8		

Required accessories

- Light bulbs or LEDs with suitable series resistors
- two servos, two servo boards and two resistors 470 Ω (→ page 23)

8. LC-NG-08 "Fire station"

8.1. Mode of operation

The outputs of the LC-NG-08 control the lights in a fire station, the warning lights ("flashing blue lights") and sirens of the emergency vehicles as well as the siren and one or more gates of the fire station. Parallel to the output at which the servo signal is sent, another output ("gate switch") is switched on and off.

The outputs for the warning lights of the emergency vehicles can be set either as simple flashing lights (for older emergency vehicles) or as flashlights (for modern emergency vehicles).

The alarm is triggered either automatically after randomly long pauses or by a short earth pulse at the switching input.

Use of the switching input

Switching input	Effect
Short earth pulse (via push-button)	Triggering the alarm

Settings on the trim potentiometer

At the trim potentiometer, you set the maximum pause until the next alarm is automatically triggered. The length of the pauses is shorter in the left-hand direction of rotation* and longer in the right-hand direction of rotation.

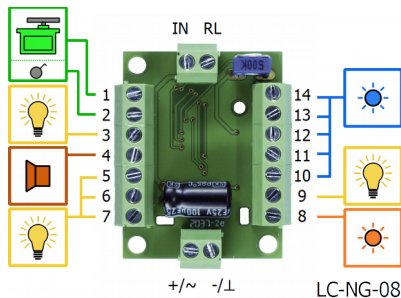
Note: The actual length of the pauses is randomly controlled, i.e. in individual cases it may be significantly shorter than when set.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right to set the shortest possible pause length after you have set it to the left stop.

Configuration

To change from the "simple flashing lights" setting to the "flashlights" variant (or vice versa), proceed as described on page 26.

8.2. Pin assignment LC-NG-08



- Connection of light bulbs
(→ page 17)
- Connection of LEDs
(→ page 18)
- Connection of a loudspeaker
(→ page 21)
- Connection of a Sound-Booster
(→ page 22)
- Connection of a servo
(→ page 23)

1	Gate Servo	14	Blue light 5	Tip: Connect an LC-NG-06 "Emergency vehicles" to one of the outputs to switch it on and off automatically in the event of an alarm.
2	Gate Switch	13	Blue light 4	
3	Changing room	12	Blue light 3	
4	Siren	11	Blue light 2	
5	Room 1	10	Blue light 1	
6	Room 2	9	Vehicle hall	
7	Room 3	8	Warning lamp	

Required accessories

- Light bulbs or LEDs with suitable series resistors
- one loudspeaker and components for filters (→ page 21) or a Sound-Booster (→ page 22)
- one servo, one servo board and one resistor 470 Ω (→ page 23)

8.3. Procedure

Alarm

- After the alarm has been triggered (either automatically after a randomly long pause or by a short earth pulse at the switching input), the lighting in the vehicle hall (output 9) and the warning lamp (output 8) are switched on first. The warning lamp flashes at regular intervals during the entire alarm.
- At the same time, the siren (output 4) is switched on. The characteristic howling sound swells and subsides a total of three times.
- After the first waning of the howling tone, the lights in the changing room (output 3) come on.
- When the howling tone dies down for the third time, the impulse for moving the servo to end position 1 (for opening the gate(s)) is sent to output 1 and the gate switch (output 2) is switched on simultaneously.
- Then the blue lights of the emergency vehicles (outputs 10 to 14) are switched on. At the same time, the wailing tone changes to the "nee naw" of the emergency vehicles' sirens.
- After a certain time, the alarm is stopped, all blue lights and the siren are switched off. Then the impulse for the movement of the servo to end position 2 (for closing the gate(s)) is sent to output 1 and the gate switch (output 2) is switched off simultaneously.
- Shortly afterwards, the lights in the changing room also go out.

Standard operation

During standard operation, the lights in the three rooms go on and off randomly. After a time, the next alarm is triggered automatically. The maximum pause between two alarms can be set at the trim potentiometer. The alarm can be triggered at any time by a short earth pulse at the switching input.

9. LC-NG-09 "Railway station"

9.1. Mode of operation

At seven of the 14 outputs of the LC-NG-09, fluorescent lamps are simulated, which can be used e.g. for the illumination of railway platforms. When switched on, the "fluorescent lamps" flicker briefly before reaching their final brightness. One of the fluorescent lamps has a defect and flickers accordingly.

Two other outputs produce flashing lights, e.g. as warning lights for luggage carts or cleaning vehicles.

The remaining 5 outputs are switched on and off seemingly at random. The speed of the sequence can be adjusted at the trim potentiometer. This makes the outputs suitable for connecting lighting in the station building as well as for simulating the displays in the signal box.

Use of the switching input

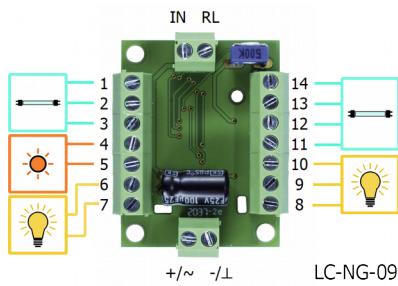
Switching input	Effect
closed (switched to earth)	Start of sequence
open	End of sequence

Settings on the trim potentiometer

Use the trimmer to set the speed of the sequence for outputs 6 to 10. The sequence is faster in the counterclockwise direction* and slower in the clockwise direction.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. Therefore, to set the fastest possible sequence, you must turn the potentiometer a little to the right after setting it to the left stop.

9.2. Pin assignment LC-NG-09



Connection of light bulbs

(→ page 17)

Connection of LEDs

(→ page 18)

1	Defective fluorescent lamp 1 ^{*1}	14	Fluorescent lamp 7 ^{*1}
2	Fluorescent lamp 2 ^{*1}	13	Fluorescent lamp 6 ^{*1}
3	Fluorescent lamp 3 ^{*1}	12	Fluorescent lamp 5 ^{*1}
4	Flashing light	11	Fluorescent lamp 4 ^{*1}
5	Flashing light	10	Room 5 / Signal box ^{*2}
6	Room 1 / Signal box ^{*2}	9	Room 4 / Signal box ^{*2}
7	Room 2 / Signal box ^{*2}	8	Room 3 / Signal box ^{*2}

Required accessories

- Light bulbs or
- LEDs with suitable series resistors

^{*1} Tip: The effect is particularly realistic if very bright cool white or blue LEDs are connected.

^{*2} Tip: For use in the signal box, coloured LEDs or lamps can be used to simulate the change of displays in the signal box.

10. LC-NG-10 "Workshop"

10.1. Mode of operation

Various lighting effects in a workshop are simulated at the outputs of the LC-NG-10: welding light, open fire (fire flicker), hazard warning lights and fluorescent lamps. The outputs for the fluorescent lamps are switched on and off by a switch. Two outputs are switched on and off without effects and can be used, for example, to connect small lamps or LEDs for lighting offices or recreation rooms.

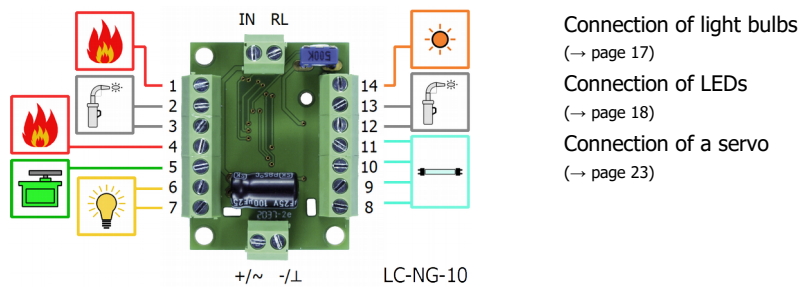
In addition, a servo can be connected for controlling a gate or crane. A warning flasher is switched in parallel with the transmission of the servo signal.

Use of the switching input

Switching input	Effect
closed (switched to earth)	Fluorescent lamps (outputs 8 -11) on
open	Fluorescent lamps (outputs 8 -11) off

Settings at the trim potentiometer: ---

10.2. Pin assignment LC-NG-10



1	Fire flicker 1* ¹	14	Hazard warning light
2	Welder 1* ²	13	Welder 4* ²
3	Welder 2* ²	12	Welder 3* ²
4	Brandflackern 2 * ¹	11	Fluorescent lamp 4* ³
5	Servo crane/gate	10	Fluorescent lamp 3* ³
6	Room 1	9	Fluorescent lamp 2* ³
7	Room 2	8	Fluorescent lamp 1* ³

Required accessories

- Light bulbs or LEDs with suitable series resistors
- one servo, one servo board and one resistor $470\ \Omega$ (→ page 23)

^{*1} Tip: The effect is particularly realistic if both outputs are connected together to a fireplace and one output is with a yellow and one with an orange LED or lamp.

^{*2} Tip: The effect is particularly realistic when very bright cool white or blue LEDs are connected.

^{*3} Tip: The effect is particularly realistic when white LEDs are connected.

10.3. Procedure

Outputs 1 and 4 ("fire flickering"): are permanently switched on. They produce the typical flickering of an open fire.

Outputs 2, 3, 12 and 13 ("welder"): produce the characteristic flashes of light that occur during welding. The pauses between the light flashes are of different lengths and vary individually for each output.

Outputs 5 and 14: At output 5 ("Servo crane/gate"), the impulse for moving the servo to one of the two end positions is sent after randomly long pauses. Parallel to sending the servo signal, output 14 ("hazard warning light") is switched on in each case.

Outputs 6 and 7 ("Room 1 and 2"): are switched on and off randomly.

Outputs 8 to 11 ("Fluorescent lamps"): are switched on as soon as the switching input has been connected to earth (e.g. with a switch). After switching on, the "fluorescent lamps" flicker for a while until they all light up one after the other. In the process, each pattern is a little different.

11. LC-NG-11 "Flickering flames & candle lights"

11.1. Mode of operation

After switching on the module, i.e. as soon as the switching input is connected to earth, the outputs are switched on in pairs. This simulates the flare-up of the fire.

While the module is switched on, the LEDs or small lamps at the outputs flicker in the manner typical of candles or fire. After the module is switched off, i.e. as soon as the switching input has been disconnected from earth, the outputs are switched off one after the other in pairs to simulate the fire burning up.

Use of the switching input

Switching input	Effect
Switch closed (switched to earth)	"Start phase": The outputs are switched on in pairs one after the other.
Switch open	"Closing phase": The outputs are switched off in pairs one after the other.

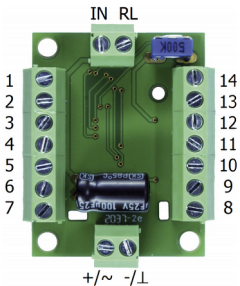
Settings on the trim potentiometer

You can change the length of the pauses between switching the output pairs on and off at the trim potentiometer. The length of the pauses is shorter in the left-hand direction of rotation* and longer in the right-hand direction of rotation.

Note: The position of the trim pot has no influence on the sequence after the start phase or before the end phase.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right to set the smallest possible pause length after you have set it to the left stop.

11.2. Pin assignment LC-NG-11

	Output	Connection options
	1 ... 14	Light bulbs (→ page 17)
	1 ... 14	LEDs (→ page 18)

Required accessories:

- for the simulation of candles: light bulbs or LEDs with suitable series resistors in warm white or yellow
- for the simulation of a fire: light bulbs or LEDs with suitable series resistors yellow, orange and/or red

12. LC-NG-12 "Event"

12.1. Mode of operation

The LEDs or lamps at the outputs of the LC-NG-12 simulate various lighting effects at an event (e.g. concert, show): 7 stage lights (spotlights), 2 strobes and 5 flashes from cameras. The switch can be used to change between two operating modes:

In show mode (switch closed), individual spotlights are switched on and off randomly. The strobes also come on and off individually or together.

In normal mode (switch open), phases in which all spotlights are switched on alternate with short phases in which the show mode runs. The length of the pauses between the two phases can be adjusted at the trim pot.

In both operating modes, the flashes from cameras are triggered continuously according to the random mode.

Use of the switching input

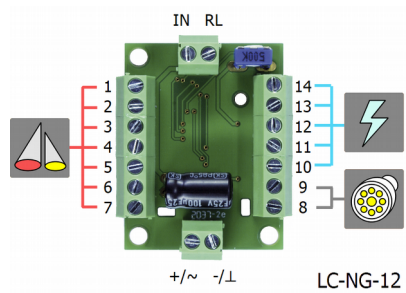
Switching input	Effect
Switch closed (switched to earth)	Show mode
Switch open	Normal mode

Settings on the trim potentiometer

Use the trim potentiometer to set the length of the pauses between the two phases in standard mode. The pauses are shorter in the left-hand direction* and longer in the right-hand direction.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. You must therefore turn the potentiometer a little to the right to set the shortest possible pause length after you have set it to the left stop.

12.2. Pin assignment LC-NG-12



Connection of light bulbs

(→ page 17)

Connection of LEDs

(→ page 18)

1	Stage lighting (Spotlights) Tip: The effect is particularly realistic if you connect LEDs in different light colours to the outputs.	14	Flashes from cameras Tip: The effect is particularly realistic if you connect very bright, cool white LEDs.
2		13	
3		12	
4		12	
5		10	Stroboscope Tip: The effect is particularly realistic if you connect very bright, cool white LEDs.
6		9	
7		8	

Required accessories

- Light bulbs or
- LEDs with suitable series resistors

13. LC-NG-13 "Chaser lights"

13.1. Mode of operation

Complex running lights are generated at the 14 outputs of the LC-NG-13, such as those used for advertising purposes, by the entertainment industry or at fairs. Of the eight variants, one, several or all can be activated. The activated variants are repeated in an endless loop.

If more than one variant is activated, each variant is repeated at least twice before the next variant starts. The number of repetitions is random and ranges from 2 to a maximum of 12 to 17 repetitions (depending on the length of the sequence of the respective variant). The order is basically: variant 8, 7, 6, 1, whereby only the activated variants run.

The speed of the sequence can be adjusted at the trim potentiometer.

In principle, both LEDs and small lamps can be connected to the outputs. In order to achieve prototypical lighting effects, a larger number of lamps is usually connected to one output, which are distributed over panels, screens or walls. Because of their high power consumption, lamps are therefore only suitable to a limited extent.

Use of the switching input

The switching input is used exclusively during configuration (→ section "Configuration").

Settings on the trim potentiometer

Use the trimmer to set the speed of the sequence. The sequence is faster in the counterclockwise direction* and slower in the clockwise direction.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. Therefore, to set the fastest possible sequence, you must turn the potentiometer a little to the right after setting it to the left stop.

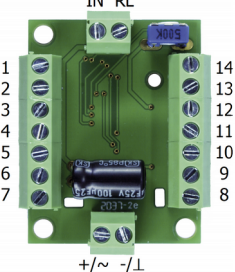
The trim pot is also used during configuration to select one of the variants. The set variant is saved before exiting programming mode, so changes to the position of the trim pot do not affect the variant setting.

Configuration

To set one of the eight variants, proceed as described on page 28.

Variant	Procedure
1	All the lights are switched on one after the other until the lights at all 14 outputs are lit. Then the lights are switched off again in reverse order.
2	The lights at outputs 1, 2, 3, 6 and 7 are switched on one after the other. The two groups of 2 or 3 switched-on lights continue to move, occasionally changing direction. This gives the impression that the groups are following each other.
3	First one light, then a group of first 2, then 3, 4, 5 and 6 lights run across the 14 connections one after the other. Between the lights of a group, one output remains switched off at a time.
4	The 14 lights are constantly switched on and off in such a way that a switched-on light alternates with a switched-off light. This gives the impression that the lights are moving back and forth. After several light changes, two groups flash alternately.
5	One after the other, all the lights are switched on in turn until all 14 lights are lit. This is followed by three runs in which one after the other of the 14 lights is switched off. Finally, all lights are switched off again in reverse order.
6	The 14 lights are switched on and off seemingly randomly, i.e. without any recognisable pattern.
7	One after the other, all the lights start flashing in sequence. After all 14 lights have flashed simultaneously, the lights are switched off again.
8	Individual lights run through. After the first light has reached the 14th connection, it remains switched on. With the second light, the 13th connection remains switched on, with the third the 12th connection and so on. After that, a light that has been switched off runs through and the last connection remains switched off, then the penultimate one, etc.

13.2. Pin assignment LC-NG-13

	Output	Connection options
	1 ... 14	Light bulbs (→ page 17) Note: The maximum current of the LC-NG module is 1,000 mA and the maximum current per output is 200 mA. When connecting several lamps to one output, these maximum values can easily be exceeded and the module or the output will usually be irreparably damaged.
	1 ... 14	LEDs (→ page 18)

Required accessories

- Light bulbs (only suitable to a limited extent) or
- LEDs with suitable series resistors

14. LC-NG-14 "Funfair lighting"

14.1. Mode of operation

The 14 outputs of the LC-NG-14 produce the light sequences typical of fairground rides, merry-go-rounds or funfair booths. Five variants are available for selection. The set variant is repeated in an endless loop after switching on. The sequences are based on real-life models:

Break Dance No. 2, Booster, Ghost Temple (in German: "Geister-Tempel") and Top Spin.

The speed of the sequence can be adjusted at the trim pot.

In principle, both LEDs and lights can be connected to the outputs. In order to create prototypical lighting effects, a larger number of lamps must usually be connected to an output and arranged in a distributed manner over the lettering, the fascia or a wall. Because of their high power consumption, lamps are therefore only suitable to a limited extent.

Use of the switching input

The switching input is used exclusively during configuration (→ section "Configuration").

Settings on the trim potentiometer

Use the trimmer to set the speed of the sequence. The sequence is faster in the counterclockwise direction* and slower in the clockwise direction.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. Therefore, to set the fastest possible sequence, you must turn the potentiometer a little to the right after setting it to the left stop.

The trim pot is also used during configuration to select one of the variants. The set variant is saved before exiting programming mode, so changes to the position of the trim pot do not affect the variant setting.

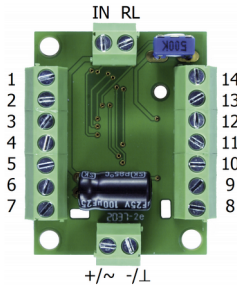
Configuration

To set one of the five variants, proceed as described on page 26.

Variant	Model	Assignment of the outputs	
1	Breakdance No. 2	1-12:	Chaser with 12 outputs e.g. for perimeter walls or fascia
		13,14:	Flashing and flickering lights e.g. for the inner cone and the backs of the nacelles
2	Breakdance No. 2	1-10:	Chaser lights in 2 groups with 5 outputs each e.g. for the letters "BREAK DANCE"
		11-13:	Chaser with 3 outputs e.g. for the outer border of the star
		14:	Flashing light e.g. for the inside of the star
3	Booster	1-7:	Chaser with 7 outputs e.g. for the letters "BOOSTER"
		8:	Flashing and flickering light e.g. for cross
		9-14:	Chaser with 6 outputs
4	Ghost Temple (in German: "Geister-Tempel")	1-7:	Chaser with 7 outputs e.g. for letters "GEISTER"
		8-13:	Chaser with 6 outputs e.g. for letters "TEMPEL"
		14:	Stroboscope
5	Top Spin	1-14:	Chaser with 14 outputs e.g. for the letters "TOP SPIN", where each letter is controlled by two separate outputs

14.2. Pin assignment LC-NG-14

Note that the outputs for the different programme variants are combined into groups of different sizes, which together form e.g. a chaser.

 The diagram shows the LC-NG-14 module with its 14 pins numbered 1 to 14. Pins 1-7 are on the left, and pins 8-14 are on the right. At the top, there are two input pins labeled 'IN' and 'RL'. At the bottom, there are two pins labeled '+/~' and '-/~'. A 500K resistor is connected between the 'IN' and 'RL' pins. A 100K resistor is connected between pin 1 and pin 14. A 100K resistor is connected between pin 7 and pin 8. A 100K resistor is connected between pin 14 and pin 13. A 100K resistor is connected between pin 13 and pin 12. A 100K resistor is connected between pin 12 and pin 11. A 100K resistor is connected between pin 11 and pin 10. A 100K resistor is connected between pin 10 and pin 9. A 100K resistor is connected between pin 9 and pin 8.	<table><tr><th>Output</th><th>Connection options</th></tr><tr><td>1 ... 14</td><td>Light bulbs (→ page 17) Note: The maximum current of the LC-NG module is 1,000 mA and the maximum current per output is 200 mA. When connecting several lamps to one output, these maximum values can easily be exceeded and the module or the output will usually be irreparably damaged.</td></tr><tr><td>1 ... 14</td><td>LEDs (→ page 18)</td></tr></table>	Output	Connection options	1 ... 14	Light bulbs (→ page 17) Note: The maximum current of the LC-NG module is 1,000 mA and the maximum current per output is 200 mA. When connecting several lamps to one output, these maximum values can easily be exceeded and the module or the output will usually be irreparably damaged.	1 ... 14	LEDs (→ page 18)	
Output	Connection options							
1 ... 14	Light bulbs (→ page 17) Note: The maximum current of the LC-NG module is 1,000 mA and the maximum current per output is 200 mA. When connecting several lamps to one output, these maximum values can easily be exceeded and the module or the output will usually be irreparably damaged.							
1 ... 14	LEDs (→ page 18)							

Required accessories

- Light bulbs (only suitable to a limited extent) or
- LEDs with suitable series resistors

15. LC-NG-15 "Automatic track warning system"

15.1. Mode of operation

The outputs of the LC-NG-15 control the signal lights and the acoustic warning device of an automatic track warning system (ATWS) for safeguarding a track construction site.

The 13 outputs for the signal lights are switched on and off at different frequencies so that the connected LEDs or lamps flash asynchronously. The signalling lights flash as long as the switch on the switching input is open.

The sound of the warning signalling device is stored on the IC. The trimmer potentiometer is used to set how long the acoustic warning signal remains switched on after the sequence is started.

Note on the stored sound: The LC-NG module is not intended as a sound module, the stored sound is accordingly simple.

Use of the switching input

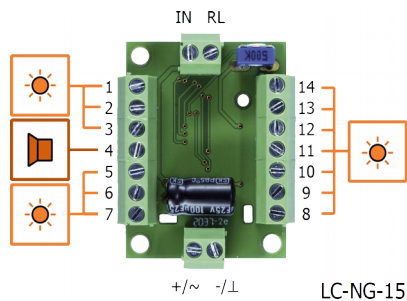
Switching input	Effect
Switch open	Start of the sequence
Switch closed (switched to earth)	End of the sequence

Settings on the trim potentiometer

Use the trim potentiometer to set how long the acoustic warning signal remains switched on after the sequence has started (after the switch has been opened). The duration is shorter in the direction of rotation to the left* and longer in the direction of rotation to the right. The maximum duration is approx. 12 seconds.

* Note: If the trim potentiometer is set to the left stop, the module goes into test mode when it is switched on. Therefore, to set the fastest possible sequence, you must turn the potentiometer a little to the right after setting it to the left stop..

15.2. Pin assignment LC-NG-15



- Connection of light bulbs
(→ page 17)
- Connection of LEDs
(→ page 18)
- Connection of a loudspeaker
(→ page 21)
- Connection of a Sound-Booster
(→ page 22)

1...3	Signal lights	14	Signal lights
4	acoustic warning device	...	
5...7	Signal lights	8	

Required accessories

- Light bulbs or LEDs with suitable series resistors
- one loudspeaker and components for filters (→ page 21) or a Sound-Booster (→ page 22)

Further Information and Tips:
<http://www.tams-online.de>

Warranty and Service:
tams elektronik GmbH

Fuhrberger Str. 4
30625 Hannover / GERMANY

Phone: +49 (0)511 / 55 60 60

Fax: +49 (0)511 / 55 61 61

Email: support@tams-online.de

