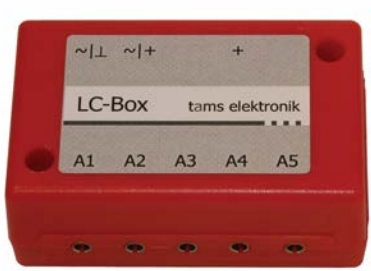
Manual

LC-Box

Item no. 53-02017 - 53-02247



For all versions of the LC-Box

tams elektronik

Table of contents

1. Getting started

How to use this manual

This manual gives step-by-step instructions for safe and correct connecting of the device, and operation. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the checklist for trouble shooting. You will then know where to take care and how to prevent mistakes which take a lot of effort to correct.

Keep this manual safely so that you can solve problems in the future. If you pass the device on to another person, please pass on the manual with it.

Intended use

The LC-box is designed to be operated according to the instructions in this manual in model building, especially with model railways. Any other use is inappropriate and invalidates any guarantees.

The LC-box 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.

Checking the package contents

Please make sure that your package contains:

- one LC-Box;
- additionally with LC-Box 16: one dim switch and one light sensitive resistor;
- additionally with LC-Box 24: one diode 1N400x, $x \geq 2$;
- a CD (containing the manual and further information).

Required materials

You can connect small light bulbs or LEDs (via series resistors) to the outputs of the LC-Box. Light bulbs, LEDs and series resistors are not included in the package. For further information on the maximum number of bulbs or LEDs to be connected to one output see section 5.2. or 5.3.

In order to connect the module to the power supply and the light bulbs or LEDs you need

- mini banana plugs, diameter: 2.5 or 2.6 mm
  (e.g. item no. 85-1950x-05, x = 0...8);
- wire, recommended diameters: $\geq$ 0,10 mm² for all connections
  (e.g. item no. 73-1011x-01, x = 0...9).

In addition, you possibly need for the following versions of the LC-Box:

- LC-Box 16: For the connection of accessories with a current consumption of more than 100 mA to output 1: a monostable relay 1xUm 12 V (e.g. item-no. 84-61010-01) and a protective diode 1N400x, x $\geq$ 2.
- LC-Box 18: a loudspeaker (recommended impedance $\geq$ 32 Ohm, e.g. item no. 70-03121-01).
- LC-Box 24: For the connection of other LC-Boxes (except LC-Box 9, LC-Box 10, LC-Box 24): a monostable relay 1xUm 12 V (e.g. item-no. 84-61010-01) and a protective diode 1N400x, x $\geq$ 2.

2. Safety instructions

Risk of electric shock:

- Touching powered, live components,
- touching conducting components which are live due to malfunction,
- short circuits and connecting the circuit to another voltage than specified,
- impermissibly high humidity and condensation build up

can cause serious injury due to electrical shock.

Take the following precautions to prevent this danger:

- Only operate indoors in a dry environment.
- Wiring should only be carried out when the booster is disconnected.
- Only use low power for this module as described in this manual and only use certified transformers.
- Only connect the transformer in an authorised manner to the house power supply.
- Use adequately thick cable for all wiring. Too thin a cable can overheat.
- If the layout is exposed to condensation, allow at least two hours for drying out.

3. Operation overview

The LC-Box is controlled by a micro controller in which a special program is stored. Depending on the version the program controls

- 5 or 6 outputs or
- 5 outputs and reacts to a switching input.

Sequence and timing for controlling the outputs are different with the various versions. It is possible to connect lamps, LEDs or other circuits (if neccesary via relais) to the outputs.

LC-1 "Advertising light 1": The 5 outputs are switched on one after the other, blink together three times and are switched off afterwards. If the input is switched to earth, the light sequence switches off after the completion of the program. If the input remains open, the program repeats continuously.

LC-2 "Advertising light 2": The 5 outputs are switched on and off one after the other (running light sequences) and afterwards are switched on commonly for approx. 3 seconds. If the input is switched to earth, the light sequence switches off after the completion of the program. If the input remains open, the program repeats continuously.

LC-3 "Advertising light 3": At the start the 5 outputs are briefly switched on and off apparently without any system and afterwards are switched on commonly for approx. 3 seconds. If the input is switched to earth, the light sequence switches off after the completion of the program. If the input remains open, the program repeats continuously.

LC-4 "Building site flasher": At the 6 outputs a regular running light sequence is created.

LC-5 "Flickering flame": At the 6 outputs an irregular light pattern is created. If red and yellow bulbs are connected, the appearance of a flickering flame results.

LC-6 "Welding light": At each of the 6 outputs short and strong light impulses are created, interrupted by breaks at irregular intervals. Please note: The breaks can last for several minutes! The patterns are different at all outputs, which allows you to connect several "work places". The effect is most realistic when blue LEDs are connected to the outputs.

LC-7 "Traffic light control": Traffic light control for a complete intersection. Outputs 1 and 2 are red and green for direction A, outputs 4 and 5 are red and green for direction B. Output 3 is the amber for both and overlaps with red when changing to green, as common e.g. in Germany, Great Britain, Austria, Hungary, Switzerland, Poland, Lithuania, Norway and Sweden. If the input is switched to earth, the traffic lights switch to flashing amber and simulte a traffic light out of order, as common e.g. in Germany, Austria, Hungary, Switzerland and Poland. If the input remains open, the traffic lights operate continuously.

LC-8 "Advertising light 4": Fusion of the advertising lights 1 to 3, coming on one after the other. If the input is switched to earth, the light sequence switches off after the completion of the active part of the program. If the input is switched to earth, the light sequence is interrupted. If the input remains opens, the program is repeated constantly.

LC-9 "Ignition module for gas lamps": If the input is given a short electric pulse (earth), the gas lamps start to flicker and grow brighter gradually. Every ignition process is slightly different. After approx. 5 seconds the gas lamps reach their maximum brightness. During operation, the lamps flicker now and then at different times (variations

of gas pressure). After the switch-off impulse, (when the input is given a short electric pulse) all lamps shine on with moderate brightness and go off completely in approx. 1.5 seconds.

LC-10 "Fluorescent tube simulator: If the input is given a short electric pulse (earth), the different fluorescent tubes flicker for a moment before all of them light one after the other - just like the real thing. The turning on pattern is a little different for each. If the input is switched to earth shortly, the light switches off. When the input is switched to earth permanently, a defective tube is simulated on output 1. This tube flickers at irregular intervals, at times brightening quickly, at times slowly.

LC-11 "Occupied house": Two different programs are available. Program 1, "Home", starts if the input is switched to earth, Program 2, "Office", if the input remains opens. The programs take approximately 15 minutes and are repeated after a short pause.

Program 1: First the light in the kitchen (output 1) goes on for a while, followed a bit later by the living room (output 2). Output 3 is assigned for connecting a blue light bulb (the TV set), which flickers like a television picture. Some time later the light in the kitchen switches off, and goes on again once during the program flow. The light in the bathroom (output 4) goes on for a short time at irregular intervals. By the end of the program the lights in the bedroom (output 5) and in the bathroom go on for some time, the bulbs connected to outputs 2 and 3 switch off.

Program 2: In the entrance-hall (output 1) the light goes on for a short time at irregular intervals. The offices (or the flats in a multiple family dwelling) are connected to the outputs 2 to 5. The lights in the offices go on one after the other, but only after the light in the entrance hall has previously been switched on. By the end of the program the lights in the offices switch off one after the other and each time the light in the entrance hall goes on for a short time.

LC-12 "Fairground attraction illumination": Each of the 5 outputs can control several connected light bulbs, which form different patterns: they flash in changing sequences, form running lights, flicker irregularly etc. The input has no function in this version.

LC-13 "Candlelight simulator": After switching on the module the "candles" at the 5 outputs start to flicker - just like the real thing. At irregular intervals they brigthen and dim. The input has no function in this version.

LC-14 "Signal tower box light": The 6 outputs switch at random the connected bulbs or LEDs. These light for a while and simulate the activities in a signal tower box. If the input is switched to earth, the light sequence is interrupted. If the input remains open, the program repeats continuously.

LC-15 "Emergency vehicle light": Two different programs are available. Program 1, "double flashlights", starts if the input is switched to earth, Program 2, "rotating beacons", if the input remains opens.

Program 1 "double flashlights": The bulbs / LEDs connected to the 5 outputs make 2 short flashes and then go off for a short time. The breaks between the double flashes are of varing duration for the 5 outputs. This way the characteristic light pattern for modern emergency vehicles is created. The effect is most realistic when LEDs are connected to the outputs.

Program 2 "rotating beacons": the lamps or LEDs conneted to the 5 outputs are switched on and off in different frequencies. This creates the impression of rotating beacons. The effect is most realistic when electric bulbs are connected to the outputs.

LC-16 "Dim switch for street lamps": The input is switched on and off automatically via a light sensitive switch (included). The sensitivity of the switch is set via a trimpot.

Four outputs are designed for the connection of street lamps. The street lamps are getting brighter gradually after being switched on and obtain their maximum brightness after about one minute. Additional accessories (e.g. house lightings) which are intended to be switched depending on the ambient lighting can be connected to output 1 via a relay (not included).

The circuit responds to changes of the ambient lighting with a delay of some seconds. While the street lamps are getting brighter after being switched on and some seconds after being switched off, the circuit does not respond to changes of the ambient lighting.

LC-17 "Speed trap": The output 1 controls the speed trap, which flashes at irregular intervals (from approx. 3 to 25 seconds). The outputs 2 to 5 are assigned for connecting the flash lights of police cars. The outputs 2 and 3 produce an asynchronous double flashing light (for modern police cars), the outputs 4 and 5 an asynchronous flashing light (for older police cars). The input has no function in this version.

Tip: The effect of the light patterns is most realistic when a white LED with high luminosity is connected to the output 5, blue LEDs are connected to the outputs 2 and 3 and small blue bulbs to the outputs 4 and 5.

LC-18 "Vehicle lighting": Via the switching input you can set the following programs: "moving vehicle" (with the input open) or "standing vehicle" (with the input switched to earth).
Assignment of the outputs:

1: Flashing lights on the left
2: Flashing lights on the right
3: Interior light (standing vehicle) or horn (moving vehicle)
4: Front lights
5: Back lights / brake lights

In the program "moving vehicle": The front and back lights are always switched on. It is possible to connect a loudspeaker (recommended impedance: $\geq$ 32 Ohm) as a horn (not included) to output 3, the volume can be reduced by connecting a series resistor (approx. 10 Ω to 1 kΩ). The flashing lights on the left and the right, the horn and the stop lights are switched on and off at random. After the stop lights having been lighted the flasher is switched on, afterwards the stop lights and a little bit later the flasher are switched off.

In the program "standing vehicle": The front and back lights are switched on most of the time. Now and again the flashing lights on the left and the right, the warning flasher and the interior light are switched on. After the interior light having been lighted the front and back lights and then the interior light are switched off. Afterwards all lights are switched off for a period.

LC-19 "Paparazzi flash": The photographer´s flash lights are connected to the 5 outputs of the module. They flash at random independently from each other. At irregular intervals flashlight thunderstorms break when all flashlights are used nearly simultaneously and several times close together. Using white LEDs creates a very realistic effect. The input has no function in this version.

LC-20 "Roadworks vehicle": The module´s 5 outputs control the lighting of a complete roadworks vehicle including a trailer. Assignment of the outputs:

1: Lane indication arrow of the trailer
(gets slowly brighter and then darker)

2: Flash lights of the trailer

3 and 4: Warning flasher of the service vehicle

5: Double flash light

The input has no function in this version.

LC-21 "Funfair flow effect lighting 1": The 5 outputs generate a light flow sequence. After the first run through the output 5 stays on, after the second run through the output 4, and so on, so that after 5 cycles all connected lamps or LEDS are switched on. With the cycles 6 to 10 the outputs are switched off in reverse order. If the input is switched to earth, the light sequence switches off after the completion of the active part of the program. If the input remains open, the program is repeated constantly.

LC-22 "Funfair flow effect lighting 2": The 5 outputs generate a light flow sequence. After being switched off, the outputs continue to glow for a short time. In the first cycle one output stays on and one continues to glow, in the second run through two outputs stay on and two continue to glow and finally, in the third cycle three outputs stay on and two continue to glow. If the input is switched to earth, the light sequence switches off after the completion of the active part of the program. If the input remains open, the program is repeated constantly.

LC-23 "Funfair flow effect lighting 3": The 5 outputs generate a running light sequence, which changes the running direction at random. If the input is switched to earth, the light sequence switches off after the completion of the active part of the program. If the input remains open, the program is repeated constantly.

LC-24 "City lighting": After switching on the LC-Box 24 (in other words as soon as the switching input is connected to earth) the five outputs are switched on one after the other. The length of the delay between switching on the box and gradually switching on the outputs is varied at random. The overall duration between switching on the box and the fifth output is 40 seconds to 2.5 minutes. When switching off, the sequence is altered and the length of the delay is shortened.

The LC-Box 24 can be freely cascaded, which means that it is possible to connect to one or several outputs further LC-Boxes 24 to be switched delayed. There are no restrictions concerning the number of LC-Boxes 24 connected in series. This allows to switch time-delayd on and off the lightings for an entire model railroad layout with one switch.

4. Technical specifications

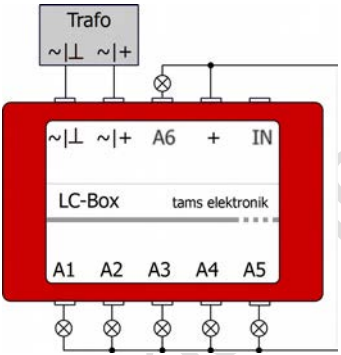
Supply voltage	10 – 18 Volt a.c. or d.c. voltage
Current consumption (without connected devices) approx.	20 mA
Max. total current	600 mA
Number of outputs	5 or 6 (depending on the version)
Max. current per output	100 mA
Number of switching inputs	0 or 1 (depending on the version)
Protected to	IP 00
Ambient temperature in use	0 ... +60 °C
Ambient temperature in storage	-10 ... +80 °C
Comparative humidity allowed	max. 85 %
Dimensions including housing (approx.)	34 x 54 x 22 mm
Weight including housing (approx.)	23 g

5. Connecting the LC-Box

Connect the power supply, the light bulbs, LEDs or other accessories and if neccessary switches or push-buttons, according to the following list and connecting diagrams, to the LC-Box.

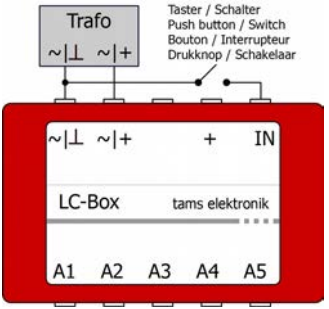
Use mini banana plugs with a diameter of 2.5 or 2.6 mm (e.g. item no. 85-1950x-05, x = 0...8, not included) for the connections.

Please note: Depending on the version there are not all connections in use and assembled with a plug socket. This is no fault.



~|⊥ ~|+	Power supply (10-18 V) Check the polarity when connecting the module to d.c. voltage. With a.c. voltage the polarity is of no importance.
+	Return conductor for the outputs A1 to A5 (A6)
IN	Switching input
A1 to A5 or A6	Outputs A1 to A5 (A6) Max. current per output: 100 mA

5.1. Use of the switching input IN

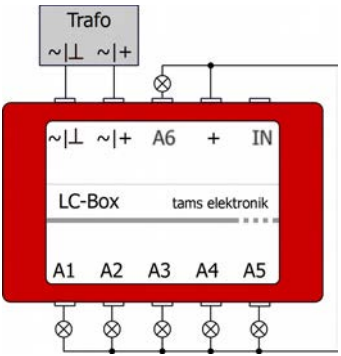


With some versions you can control the program flow or choose one of two different program variants via the switching input IN. According to the version and to the intended mode of operation you can use switches, push-buttons, fixed solder connections or upstream control modules (e.g. switching decoders). With some versions the switching input IN has no function.

Version LC-Box	Number of outputs	Switching input IN
1, 2, 3, 8, 21, 22, 23	5	IN open → endless repeat. IN connected to earth* → The cycle will be ended after the end of the program.
4, 5, 6, 14	6	No funciton.
7	5	IN open → standard operation. IN connected to earth* → Traffic lights switch to flashing amber.
9	5	IN is connected to earth for a short time (e.g. by the switching impulse of a push-button) → program will be started / finished.

Version LC-Box	Number of outputs	Switching input IN
10	5	IN is connected to earth for a short time (e.g. by the switching impulse of a push-button) → program will be started / finished. IN is connected to earth → defective fluorescent tube at output 5.
11	5	IN connected to earth → "Home". IN open → "Office".
12, 13, 17, 19, 20	5	No funciton.
15	5	IN connected to earth → "double flashlights". IN open → "rotating beacons".
16	5	for the connection of a dim switch.
18	5	IN connected to earth → "standing vehicle". IN open → "moving vehicle".
24		IN connected to earth* → gradually switching on of the outputs. IN open → gradually switching off of the outputs.
* e.g. by closing a switch		

5.2. Connecting light bulbs



As a rule you can connect one or two bulbs to one output. Bulbs are not polarized. Connect one side to the output, the other to the return conductor (+).

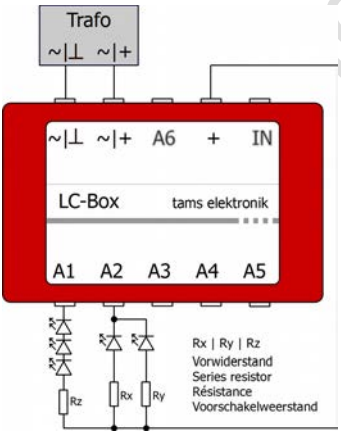
Caution: The maximum current of 100 mA per output should not be exceeded. In this case the output would be damaged. For that reason strictly uphold the specification of the current consumption (given in mA) on the bulb´s socket or it´s packaging.

5.3. Connecting LEDs

You can connect several LEDs in parallel or serial (in series) to one output (see following sections). Which version fits better depends amongst others from the mounting situation.

LEDs are polarized. Connect the cathode (-) to the output and the anode (+) to the return conductor (+). With wired versions the anode (+) has the longer "leg", with SMD versions the cathode (-) is marked (e.g. by a reamed corner or a paint mark).

Caution: LEDs always have to be connected via a series resistor, otherwise they will be damaged when put into operation. Advice concerning choosing a series resistor → "Parallel / Serial connection of LEDs".



Examples for the connection of LEDs:

Output A1:
Serial connection

Output A2:
Parallel connection

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 100 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	10
transformer (~) | 12 V	820 Ohm	20 mA	5
transformer (~) | 15-16 V	2,2 kOhm	10 mA	10
transformer (~) | 15-16 V	1 kOhm	20 mA	5
transformer (~) | 18 V	2,7 kOhm	10 mA	10
transformer (~) | 18 V	1,2 kOhm	20 mA	5

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

series resistor [kOhm] = power supply [V] / 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.

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:

nec. R_V [Ohm] = (U_B [V] – U_F [V] x n_{LED}) / (I_F [mA] x 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:

nec. R_V = (25 V – 4 V x 2 – 2 V x 3) / (20 mA x 0,001) = 550 Ohm

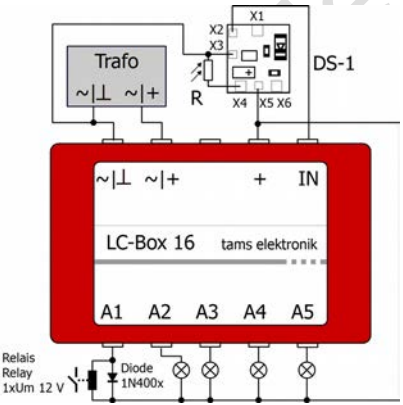
We choose the next resistor´s value which is provided as a standard, which means a resistor of 560 Ohm. If using a resistor with a higher value the current of the LEDs would be reduced and the LEDs would light less brightly.

5.4. Connecting the LC-Box 16

Connecting the dim switch DS-1 (LC-Box 16)

DS-1	LC-Box	
X2	IN	
X3	transformer(~|⊥)	light sensitive resistor
X4		light sensitive resistor
X5	+	

The light sensitive resistor R has to be placed that way it is exposed to the ambient light. In order to set the sensitivity of the dim switch first set the trim pot on the dim switch DS-1 to mid-position and change the sensitivity as far as necessary. The circuit requires 3 or 4 seconds to react.



Connections LC-Box 16

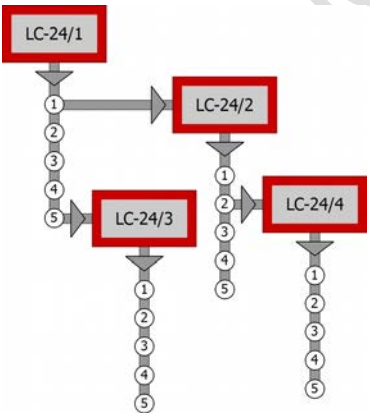
Connecting additional loads (LC-16)

With the LC-16 the output 1 is designed for the connection of additional accessories (e.g. houses´ lightings), to be switched on via the dim switch commonly with the street lamps connected to the outputs 2 to 5. Accessories with a current consumption of max. 100 mA can be connected directly, accessories with a higher current consumption have to be connected via a monostable relay 1xUm 12 V and a protective diode 1N400x, x $\geq$ 2.

5.5. Connecting the LC-24

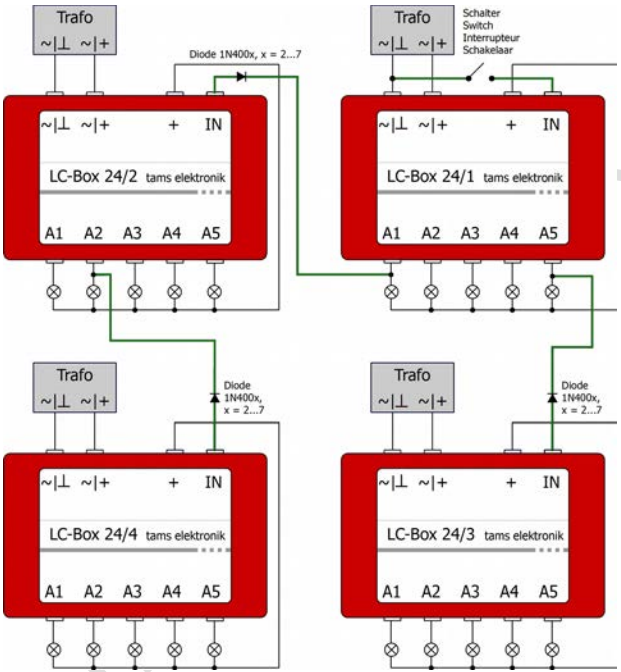
Connecting cascaded LC-Boxes 24

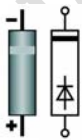
You can connect further LC-Boxes 24 to the outputs of your LC-Box 24 (also in addition to lamps or LEDs), in order to switch them on and off together with one single switch. As each LC-Box 24 has to be connected directly to the voltage supply, there is no need to take into account additional boxes when calculating the current for the outputs.



On the left:

Sequence after switching on LC-Box 24/1 for connection example on page 25.



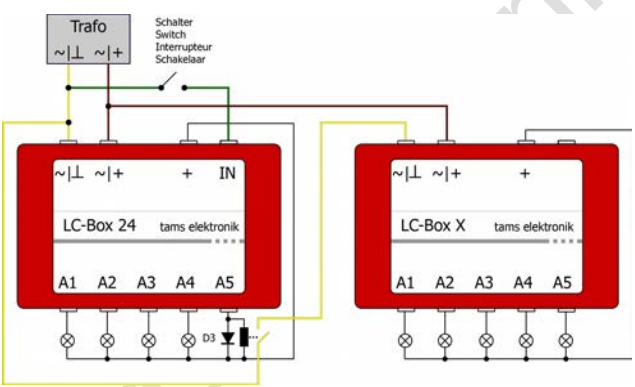


You have to connect a diode 1N400x (x = 2...7) into the leads of cascaded LC-boxes 24 (see connection diagram). Observe the polarity of the diode!
The negative end of the diode is marked with a ring.

Connecting other LC-Boxes to a LC-Box 24

You can connect other LC-Boxes (than LC-24) to the outputs of a LC-Box 24 to switch them delayed. You can use all LC modules except LC-Box 9 and 10. When connecting a LC-Box 16 you do not need the dim switch DS-1.

You have to connect the LC-Boxes via a monostable relay 1xUm 12 V (e.g. item no. 84-61010-01) and a diode (see connection diagram).



RL	Monostable relay 1xUm 12 V
D3	Diode, 1N400x, x = 2...7

6. Check list for troubleshooting

The lamps connected to the module do not light.

Possible cause: A switch connected to the module is closed. → Check the position of switches.

Possible cause: The bulbs or LEDs are defective. → Check the bulbs / LEDs.

Possible cause: The LEDs are connected falsely polarized. → Check the LEDs´polarity.

Possible cause: One or more outputs have been damaged due to overload. → Send in the module for repair.

Possible cause: With a serial connection too many LEDs have been switched in series. → Decrease the number of LEDs or increase the voltage supply.

Hotline: If problems with your module occur, our hotline is pleased to help you (mail address on the last page).

Repairs: You can send in a defective module for repair (address on the last page). In case of guarantee the repair is free of charge for you. With damages not covered by guarantee, the maximum fee for the repair is the difference between the price for the ready-built module and the kit according to our valid price list. We reserve the right to reject the repairing of a module when the repair is impossible for technical or economic reasons.

Please do not send in modules for repair charged to us. In case of warranty we will reimburse the forwarding expenses up to the flat rate we charge according to our valid price list for the delivery of the product. With repairs not covered by guarantee you have to bear the expenses for sending back and forth.

7. 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-built module or device,
- if damaged by other persons,
- if damaged by faulty operation or by careless use or abuse.

8. EU declaration of conformity

CE This product conforms with the EC-directives mentioned below and is therefore CE certified.

2004/108/EG on electromagnetic. Underlying standards: EN 55014-1 and EN 61000-6-3. To guarantee the electromagnetic tolerance in operation you must take the following precautions:

- Connect the transformer only to an approved mains socket installed by an authorised electrician.
- Make no changes to the original parts and accurately follow the instructions, connection diagrams and PCB layout included with this manual.
- Use only original spare parts for repairs.

2011/65/EG on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS). Underlying standard: EN 50581.

9. Declarations conforming to the WEEE directive

This product conforms with the EC-directive 2012/19/EG on waste electrical and electronic equipment (WEEE).

Don´t dispose of this product in the house refuse, bring it to the next recycling bay.

Information and tips:

http://www.tams-online.de

Warranty and service:

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