

## LSU

Lichtsignalumschalter für  
Märklin\* Hobby-Signale

Light signal switch for  
Märklin\* Hobby light signals

Inverseur de feux  
pour signaux lumineux  
Hobby de Märklin\*

Lichtseinschakelaar voor  
Märklin\* Hobby-lichtseinen

Anleitung

Manual

Mode d'emploi

Handleiding

Art.-Nr. 21-01-096 / 22-01-096





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\* The following manufacturers and their products are mentioned in this manual:

Märklin & Cie. GmbH, Goeppingen, Germany

Viessmann Modellspielwaren GmbH, Germany

## How to use this manual

This manual gives step-by-step instructions for safe and correct assembly of the kit and fitting of the ready-built module, and operation. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the FAQ chapter. 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 kit or the ready-built module on to another person, please pass on the manual with it.

## Intended use

The kit or the ready-built module can be assembled and operated with a model railway to control a signal using this manual. It has been specially developed to control a Maerklin\* Hobby light signal.

Any other use is inappropriate and invalidates any guarantees.

The kit and the ready-built module should not be assembled or fitted by children under the age of 14.

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

## 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.

### Electrical hazards

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

can cause serious injury due to electrical shock. Take the following precautions to prevent this danger:

- Never perform wiring on a powered module.
- Assembling and mounting the kit should only be done in closed, clean, dry rooms. Beware of humidity.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering irons only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- After condensation build up, allow a minimum of 2 hours for dispersion.
- Use only original spare parts if you have to repair the kit or the ready-built module.

## **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.

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.

## EMC declaration

This product is developed and tested in accordance with the European standards EN 55014-1 and EN 61000-6-3 and meets the EC - directive 2004/108/EG and legal requirements.

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, circuit diagram and PCB layout included with this manual.
- Use only original spare parts if you have to repair the kit or the ready-built module.

## Operation overview

The light signal switch is developed to control a Maerklin\* Hobby-light signal. Using it with Viessmann\*-signal kits is possible as well. The Viessmann\*-signal kits have to be modified, you can order the manual from us or you can download it from our homepage.

The light signal switch has to be connected between the light signal and an external change-over switch which switches between the two signals ("red" and "green"). Using a switching decoder to switch between the two signals is possible as well. Push-button switches as used e.g. to switch points are not suitable to switch between signals. In exactly the same way as in real life, the light signal switch causes the LED switched off to fade slowly and the LED switched on to brighten slowly.

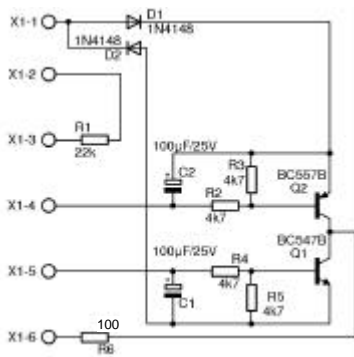


Fig. 1: Circuit diagram



## Technical specifications

Supply voltage	12-18 Volt a.c. voltage
Current consumption	approx. 1 mA (without loads)
Max. current at the output	50 mA
Protected to	IP 00
Ambient temperature in use	0 - + 60 °C
Ambient temperature in storage	-10 - + 80 °C
Comparative humidity allowed	max. 85 %
Dimensions	approx. 48 x 52 mm
Weight	approx. 15 g

## Checking the package contents

Check the contents of the package for completeness after unpacking:

- one kit, containing the components listed in the parts and one PCB or
- one ready-built module,
- one manual.

## Required tools and consumables

Make sure you have the following tools and materials ready for use:

- an electronic soldering iron (max. 30 Watt) with a fine tip,
- a soldering iron stand,
- a tip-cleaning sponge,
- a heat-resistant mat,
- a small side cutter and wire stripper,
- a pair of tweezers and long nose pliers (not necessary for the ready-built module),
- tin solder (0,5 mm. diameter),
- wire (diameter:  $\geq 0,25 \text{ mm}^2$  for all connections),
- a change-over switch (if necessary: bipolar).

## Safe and correct soldering



### Caution:

Incorrect soldering can cause dangers through fires and heat. Avoid these dangers by reading and following the directions given in the chapter **Safety instructions**. If you have had training in soldering you can skip this chapter.

- Use a small soldering iron with max. 30 Watt. Keep the soldering tip clean so the heat of the soldering iron is applied to the solder point effectively.
- Only use electronic tin solder with flux.
- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Solder quickly: holding the iron on the joints longer than necessary can destroy components and can damage copper tracks or soldering eyes.
- Observe correct polarity orientation of semi-conductors, LEDs electrolytic capacitors and integrated circuits before soldering and ensure that the solder time does not exceed 5 seconds, otherwise components can be damaged.
- Apply the soldering tip to the soldering spot in such a way that the part and the soldering eye are heated at the same time. Simultaneously add solder (not too much). As soon as the solder becomes liquid take it away. Hold the soldering tip at the spot for a few seconds so that the solder flows into the joint, then remove the soldering iron.
- Do not move the component for about 5 seconds after soldering.
- To make a good soldering joint you must use a clean and unoxidised soldering tip. Clean the soldering tip with a damp piece of cloth, a damp sponge or a piece of silicon cloth.
- Cut the wires after soldering directly above the PCB solder side with a side cutter.

- After placing the parts, please double check for correct polarity. Check the PCB tracks for solder bridges and short circuits created by accident. This would cause faulty operation or, in the worst case, damage. You can remove excess solder by putting a clean soldering tip on the spot. The solder will become liquid again and flow from the soldering spot to the soldering tip.

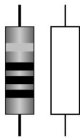
## Assembling the kit

You can skip this part if you have purchased a ready-built module.

### 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 to prevent mistakes in assembling:

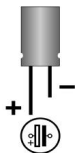
#### Resistors



Resistors reduce current. Their mounting orientation is of no importance. The value of resistors for smaller power ratings (under 5 W) is indicated through colour rings. Every colour stands for another figure. The colour ring in brackets indicates the tolerance of the resistor which here is of no importance.

Value	Colour rings
100 $\Omega$	brown - black - brown (gold)
4,7 k $\Omega$	yellow - violet - red (gold)
22 k $\Omega$	red - red - orange (gold)

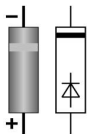
## Electrolytic capacitors



Electrolytic capacitors are often used to store energy. In contrast to ceramic capacitors they are polarized. One of the two leads is marked with a minus sign which indicates the mounting orientation. The value is given on the casing.

Electrolytic capacitors are available with different voltage sustaining capabilities. Using an electrolytic capacitor with a voltage sustaining capability higher than required is always possible.

## Diodes

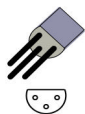


Diodes allow the current to pass through in one direction only (forward direction), simultaneously the voltage is reduced by 0,3 to 0,8 V. Exceeding of the limit voltage always will destroy the diode, and allow current to flow in the reverse direction.

The diode type is printed on the body.

Diodes must be mounted in a given direction. The negative end is marked with a ring. This is shown in the PCB layout.

## Transistors



Transistors are current amplifiers which convert low signals into stronger ones. They have three contacts. As they are polarized, they have to be mounted in a certain direction.

BC-Types have a housing in form of a half cylinder (SOT-housing). The cross section is shown in the PCB Layout which determines the mounting orientation.

## 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. When several terminal strips have to be mounted side by side, they have to be put together before mounting.

## Parts list

Resistors	R1	22 k $\Omega$
	R2, R3, R4, R5	4,7 k $\Omega$
	R6	100 $\Omega$
Electrolytic capacitors	C1, C2	100 $\mu$ F
Diodes	D1, D2	1N4148
Transistors	Q1	BC 547 B
	Q2	BV 557 B
Terminal strips	X1	2 x 3-pin

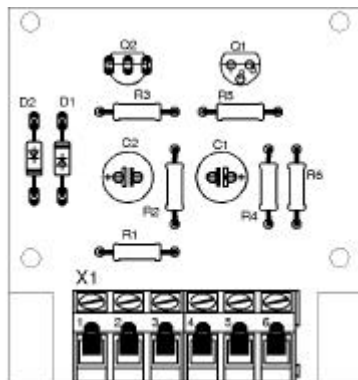


Fig. 2: Printed Circuit Board (PCB) layout

## Assembling the kit

Start the assembly with the resistors and the diodes. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutters, as short as possible. Continue the assembly with the electrolytic capacitors and the transistors.



### Caution:

Diodes, electrolytic capacitors and transistors must be placed in the right direction! If you solder them the wrong way the affected parts 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.

Finally solder the terminal strips. Join them together before soldering.

## 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.

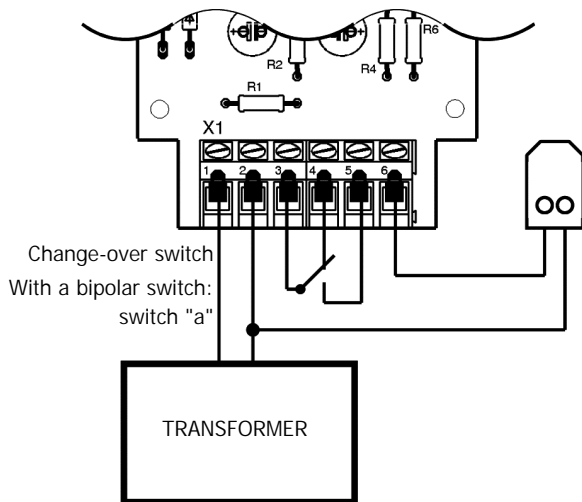
When you have remedied all faults, go on to the next part.

## Connecting the light signal switch

The Maerklin\* Hobby-light signals have two blue and one red connecting wire with a connector. Break off the connector, you won't need it. In case you want to install an additional train synchronisation you can use the red wire again.

Then make the connections according to the following list and the connecting diagram (Fig. 3).

	Connecting point	Remark
Signal (blue wires)	6 and 2	The polarity is of no importance.
Transformer	1 and 2	Do not connect the transformer to the power supply yet!
Change-over switch (not included)	3, 4 and 5	Connect the middle connecting point of the change-over switch to connecting point 3.



**Fig. 3: Connecting the signal**

After having connected the transformer to the power supply the LED should light. As soon as you operate the change-over switch the LED should fade slowly and the second LED should brighten slowly.

In case the LEDs do not light as described please check the module with help of the chapter "FAQ".

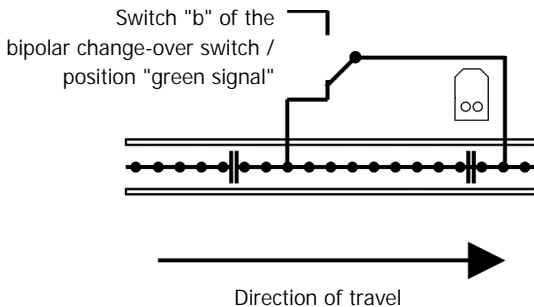
### Connecting the train synchronisation

It is possible to synchronise a train with the signal. For that purpose you need a bipolar change-over switch instead of a simple switch. Divide the rail section for the train's halt, from the rest of the rails as described in the signal's manual.

Follow the connecting diagram fig. 4. Connect the change-over switch as follows:

Middle connecting point: Middle conductor of the rail section behind the signal (in direction of travel).

Connecting point closed with a green signal: Middle conductor of the divided rail section in front of the signal.



**Fig. 4: Connecting the train synchronisation**



## FAQ

- Parts are getting too hot and/or start to smoke.



**Disconnect the system from the mains immediately!**

Possible cause: one or more components are soldered incorrectly.

→ Perform a visual check.

- None of the LEDs lights.

Possible cause: Neither the connecting points 3 and 4 nor the connecting points 3 and 5 are connected to each other when applying the supply voltage. → Check the connections.

Possible cause: The assembly of the module is faulty (wrong polarity of a component, "cold" soldering points, short circuit between two adjacent soldering points). → Check the assembly.

Possible cause: The change-over switch is defective. → Exchange the switch.

- Both LEDs light at the same time.

Possible cause: The connecting points 4 and 5 are connected to each other. → Check the connections.

Possible cause: The assembly of the module is faulty (wrong polarity of a component, "cold" soldering points, short circuit between two adjacent soldering points). → Check the assembly.

Possible cause: The change-over switch is defective. → Exchange the switch.

If you cannot find the problem, please return the module for repair (address on the cover page).

## Manufacturer's note

The person who builds this kit or brings the circuit into operation is the manufacturer of the product. If he sells the product to another person he is responsible for passing on all the relevant papers. Domestic appliances assembled from a kit are deemed industrial products and must comply with health and safety regulations.

## Certification

This product is developed and tested in accordance with the European standards EN 55014-1 and EN 61000-6-3. This product conforms with the EC- directive 2004/108/EG on electromagnetic radiation and is therefore CE certified.

## Conditions of warranty

This product is guaranteed for two years. The warranty includes the correction of faults which can be proved to be due to material failure or factory flaw. As we have no control over the correct and proper assembly and mounting we can only guarantee the quality of the components and the completeness of kits. We guarantee the function of the parts according to the parameters in not mounted state as well as the adherence to the technical specifications of the circuit when assembled and connected according to the manual.

Other claims are excluded. By law, we are not responsible for damages or secondary damages in connection with this product. We retain the right to repair, make improvements, supply spare parts or return the purchase price.

The following invalidate the warranty:

- using an unsuitable soldering iron, solder containing liquid acids or similar,
- if the kit is assembled and soldered poorly, or if damage is caused by not following the instructions in this manual,

- if the ready-built module has been altered and repair attempts have failed,
- if arbitrary changes in the circuit are made,
- if the circuitry is changed in any way, through adding or omitting wiring or components, or through modifying the circuit board,
- if parts other than the original ones delivered with this kit are used,
- if the copper tracks or soldering eyes are damaged,
- when components are mounted incorrectly, or if the components or the circuit are poled incorrectly, also subsequent damage resulting from these faults,
- if damage occurs due to an overload of the module,
- if connected to a incorrect voltage or current,
- if damaged by other persons,
- if damaged by faulty operation or if damaged by careless use or abuse,
- if damaged by touching components before electrostatic discharging of the hands.

Aktuelle Informationen und Tipps:

Information and tips:

Informations et conseils:

Actuele informatie en tips:

**<http://www.tams-online.de>**

Garantie und Service:

Warranty and service:

Garantie et service:

Garantie en service:

## **Tams Elektronik GmbH**

Rupsteinstraße 10

D-30625 Hannover

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

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

e-mail: [modellbahn@tams-online.de](mailto:modellbahn@tams-online.de)

