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Technische Änderungen vorbehalten.



■ **Deutsch** 3

■ **English** 18

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Technische wijzigingen voorbehouden.

Table of contents

How to use this manual	19
Intended use	19
Safety instructions	19
EMC declaration	21
Operation overview	22
Technical specifications	22
Choosing the power supply	23
Checking the package contents	23
Required tools and consumables	23
Safe and correct soldering	24
Assembling the kit	25
Performing a visual check	26
Functional test and connecting the double flashlight	27
FAQ	29
Manufacturer's note	29
Certification	29
Conditional warranty	30
Parts list WBA-1	I
Printed Circuit Board (PCB) layout WBA-1 (Fig.1)	I
Circuit Diagram (Fig. 2)	II
Connections WBA-1 (Fig. 3a)	III
Connections WBA-2 (Fig. 3b)	IV

(Pages I to IV in the centre of this handbook are removeable)

How to use this manual

If you have no specialist technical training, this manual gives step-by-step instructions for safe and correct assembly of the kit or fitting of ready-built modules, 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 on to another person, please pass on the manual with it.

Intended use

The kit or the ready-built module can be assembled or fitted using this manual. The ready-built module is designed for use in model building, e.g. to control LEDs in level crossings or in warning lights. Two or more LEDs are connected in parallel or in series to the two outputs of the module. They flash alternately with a frequency of 1 to 2 Hz. The frequency can be varied by changing the capacitors and the respective resistors.

The kit and the ready-built module are not suitable for children under the age of 14. Reading, understanding and following the instructions in this manual are mandatory for the user.

Any other use of the kit is inappropriate and invalidates any guarantees.

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

- Do not touch powered, live components.
- Do not touch conducting components which are live due to malfunction.
- Avoid short circuits.
- Do not connect the circuit to a higher voltage than designed.
- Impermissibly high humidity.
- Condensation building up can cause serious injury due to electrical shock.

Take the following precautions to prevent this danger:

- Never perform wiring on a powered module.
- Only use low power for this module as described in this manual and only use certified transformers.
- Connect transformers and soldering stations only in approved mains sockets installed by an authorised electrician.
- Observe cable diameter requirements.
- Assembling the kit should only be done in closed, clean, dry rooms. Beware of humidity.
- If the humidity in the room is too high, please do not start working until after a minimum of 2 hours of acclimatisation.
- 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 life-threatening fire, burns and toxic smoke. Connect your soldering iron or soldering station only when actually needed. Use the correct soldering iron or station and 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.

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. Life threatening! 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 in accordance with the European standards EN 55014 and EN 50082-1, tested corresponding to the EC - directive 89/336/EEG (EMVG of 09/11/1992, electromagnetic tolerance) and meets legal requirements.

To guarantee the electromagnetic tolerance 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 module is a so-called "astable multivibrator". Two transistors on the PCB serve as switches and alternately switch the power supply for the connected LEDs on and off: When the one switch (transistor) is opened, the other one is closed. As long as the switch is open, electric energy is saved in the respective capacitor. As soon as the capacitor is charged, the circuit is switched: The switch closes and the capacitor belonging to the other switch starts to charge.

Depending on the value of the capacitors and the respective resistors (RC-combination), the LEDs connected to the module, flash faster or slower. By inserting the original components, the flashing frequency is 1 to 2 Hz.

The LEDs should be connected directly to the module. Additional series resistors are not required.

Technical specifications

Supply voltage	12-20 Volt a.c. or d.c. voltage
Current consumption (without connected devices)	ca. 5 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 (WBA-1)	ca. 23 x 26 mm
Dimensions (WBA-2)	ca. 10 x 10 mm
Weight (WBA-1)	ca. 5 g
Weight (WBA-2)	ca. 0,45 g

Choosing a power supply

The module is designed for connection to a model railway power source, i.e. 12-20 Volt direct (d.c.) or alternating (a.c.) voltage.

Checking the package contents

Check the contents of the package for completeness:

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

Required tools and consumables

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

- a heat-resistant mat
- a soldering iron stand with tip-cleaning sponge
- a small side cutter and wire stripper
- a pair of tweezers and long nose pliers (not necessary for the ready-built module)
- an electronic soldering iron (max. 30 Watt) with a fine tip
- tin solder (0,5 mm. diameter)
- wire (diameter: $\geq 0,08 \text{ mm}^2$ for all connections)
- 2 LEDs for the functional test

Safe and correct soldering



Caution:

Incorrect soldering can cause fires (through excessive heat). Avoid this danger by reading the chapter **Safety instructions** again and following the directions given.

If you have had training in soldering you can skip this chapter.

- When soldering electronic circuits never use soldering-water or soldering grease. They contain acids that can corrode components and copper tracks.
- Only use tin solder SN 60 Pb (i.e. 60 % tin, 40 % lead) with rosin-based flux.
- Solder fast: long soldering can destroy components and copper tracks, and damages through plated holes.
- 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.
- 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 spot 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 tin solder finds its way, then remove the soldering iron.
- Do not move the component for about 5 seconds after soldering. A glossy and perfect soldering spot should remain.
- 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, 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 a ready-built module.

Preparation

Put the sorted components in front of you on your workbench. An explanation of the separate electronic components follows:

Resistors



A resistor will "brake" the current. Mounting orientation is of no importance. Because resistors are very small there is no readable information on them, but their value is given with colour rings.

Key:

Value	Colour ring
4,7 k Ω	yellow - violet - red (gold)
330 k Ω	orange - orange - yellow (gold)

The colour ring in brackets indicates the tolerance of the resistor and is of no importance here.

Capacitors



There is a difference between "normal" capacitors and electrolytic capacitors which have to be placed in a certain direction. They have a very bright line at one end marked with the minus (-) sign. That end must always be connected to minus.

Diodes



Diodes allow current to flow in one direction only and have to be placed in that direction. The characteristic for a diode is the ring at one end. Place them as drawn in the PCB layout.

Transistors



Transistors are in fact power switches. They have three wires and a flat part on the body. They also have to be placed in a certain direction. The PCB layout will help you to place the transistor. In the layout, the flat part of the transistor is shown.

PCB sockets

The sockets (small metallic tubes) are designed for the connection to the voltage supply and to connected modules or components. 2,6 mm model railway connectors fit exactly to the sockets.

Assembling the kit

Start the assembly with the PCB sockets. Continue with the resistors and the diode. First solder the components on the solder side of the PCB and then cut the excess wires with the side cutter as short as possible. Next solder the transistors and finally the capacitors.



Caution:

Electrolytic capacitors, transistors and diodes 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. In any case, a wrongly connected part will not function.

Performing a visual check

Even if you have a ready-built module you must perform a visual check that screws, plugs and other fasteners are firm and tight to exclude transport damage.

**Caution:**

Do not power up the module yet.

Damaged material and/or incorrect handling of parts can always be a danger. After assembling the kit, perform a visual inspection.

Check all nuts, pins and connections as well as the mechanical connections for correct assembly.

Remove all loose parts, wire ends or drops of solder from the PCB. Remove all sharp wire ends.

Check solder spots that are too close to each other for short circuits. Check that all components are polarised correctly. When you have taken all these precautions, go on to the next part.

Functional test and connecting the double flashlight

If you have purchased a ready-built module, check all functions. Transport damage can never be excluded.

Connecting WBA-1

Follow the connections diagram WBA-1 Fig. 3a. Test the module with two LEDs. Connect the LEDs with the sockets "LED1-", "LED+" and "LED2-". Pay attention to the polarity of the LEDs.

Then connect the module with the power supply (sockets "12V" and "GND"). If you connect it to alternating (a.c.) voltage, the polarity of the connections is not relevant, if you connect it to direct voltage (d.c.) it is!

Switch on the power supply. Now the LEDs must flash in turn.

Connecting WBA-2

Follow the connections diagram WBA-1 Fig. 3a. Test the module with two LEDs. Solder the LEDs to the soldering points "LED-1(-)", "LED-2(-)" and "VCC". Pay attention to the polarity of the LEDs.

Then solder the wires for the power supply to the soldering points "GND" and "Uin". If you connect it to alternating (a.c.) voltage, the polarity of the connection is not important, if you connect it to direct voltage (d.c.) it is.

Switch on the power supply. Now the LEDs must flash in turn.

 **Caution:**

If a component gets too hot, disconnect the module and power supply from the mains **immediately**. Possible short circuit! Check the assembly!

After performing a successful functional test, disconnect power from the double flashlight. Disconnect the LEDs from the module and install the module. Proceed as described in the functional test.

Connectings several LEDs to one output

You can connect up to two LEDs in parallel to one output or several LEDs in series to one output. You can determine the number of the LEDs that can be connected in series to one output from the following formula:

$$\boxed{(\text{number of LEDs} + 3) \times 1,5 < \text{power supply}}$$

Using as a single flashlight

The module can also be used as a single flashlight. For that purpose you must replace one LED with a wire bridge. Compared to when LEDs are connected to both outputs, the flashing frequency is a little faster.

Connection to a locomotive or a function decoder

Connect "GND" to the output of the decoder you want to use for switching the double flashlight, and "Uin" and "12V" to the return conductor of the decoder.

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.

- The LEDs connected to the module do not light.

Possible cause: One or several LEDs are connected in the wrong direction.

→ Change the direction!

Possible cause: One or several LEDs are defective.

→ Check the LEDs.

Possible cause: If connected to direct voltage the connections "GND" and "Uin" with "12V" are incorrectly connected.

→ Check the connections.

- Only WBA-1: One or several LEDs seem to light permanently. .

Possible cause: The capacitors are not correctly soldered in.

→ Check the connections of the capacitors.

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

Manufacturer's note

According to DIN VDE 0869, 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 conforms with the EC- directive 89/336/EEG on electromagnetic radiation and is therefore CE certified.

Conditional warranty

This product is guaranteed for two years. The warranty includes free repair if the problem is due to material failure or incorrect assembly of the ready-built module by us. Because we have no control over the assembly of the kit, we can only guarantee the quality of the components and the completeness of the kit.

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 or the circuit diagram,
- if the circuit has been altered and repair attempts have failed,
- if arbitrary changes in the circuit are made,
- if parts are stored incorrectly and if the wires to the switches, the power resistors, etc. are made incorrectly,
- if parts other than the original ones delivered with this kit are used,
- if the copper tracks or soldering points are damaged,
- if parts are placed incorrectly or the circuit is connected incorrectly,
- if damage occurs due to an overload of the circuit,
- if the wrong power or current is connected,
- if damaged by other persons,
- if damaged by the wrong use or abuse of the circuit,
- if parts are damaged due to static because they were touched before a discharge is performed.

Stückliste - Parts list

Nomenclature - Stuklijst

WBA-1

Kondensatoren - Condensers Condensateurs - Condensatoren	C1, C2, C3	2,2 μ F, 25 V
Dioden - Diodes	D1	1N4148 *
Widerstände - Resistors Résistances - Weerstanden	R1, R4	4,7 k Ω
	R2, R3	330 k Ω
Trasistoren - Transistors	T1, T2	BC547B *
Aufbaubuchse - PCB-sockets Douilles pour circuits imprimés Abstandbus - 2,6 mm	LED1-, LED2-, LDE+, 12V, GND	

* oder ähnlich - or similar - ou équivalent - of gelijkwaardig

Bestückungsplan

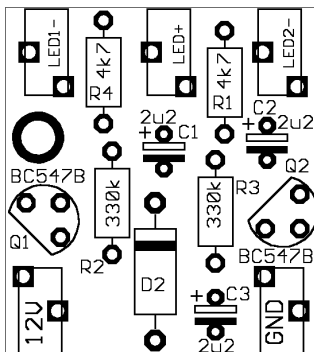
PCB layout

Plan d'implantation

Printplan

WBA-1

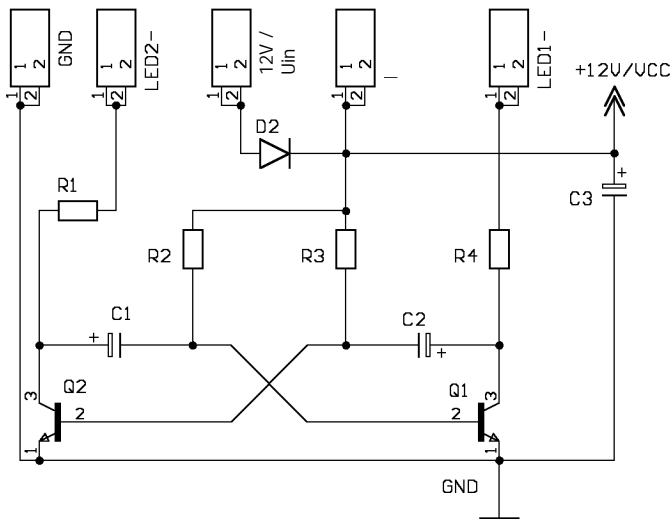
■ ■ ■ Fig. 1



Schaltplan - Circuit diagram

Schéma de principe - Schakelschema

■ ■ ■ Fig. 2

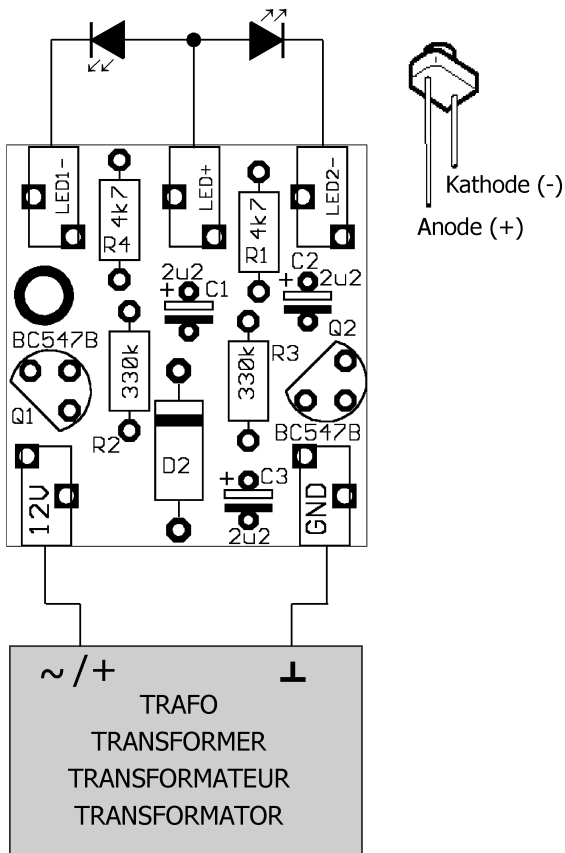


Anschlußplan - Connections

Plan de raccordement - Aansluit plan

WBA-1

Fig. 3a



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:

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