

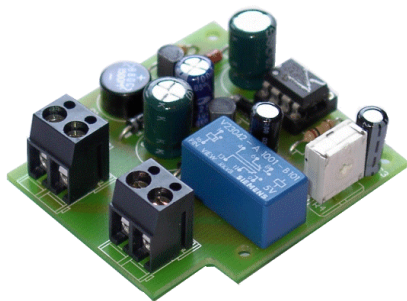
KSM-1

Kehrschleifenmodul für
Digitalsysteme

Loop module for digital
controlled model railways

Module de boucle de
retournement pour des
réseaux numériques

Keerlusmodule voor
digitaalsystemen



Art.-Nr. 21-01-050 C 21 03 24
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- **Anleitung**
- **Manual**
- **Mode d'emploi**
- **Handleiding**

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(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 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 on to another person, please pass on the manual with it.

Intended use



Caution:

Integrated circuits are very sensitive to static electricity. Do not touch components without first discharging yourself. Touching a radiator or other grounded metal part will discharge you.

The kit or the ready-built module can be assembled or fitted using this manual. The ready-built module is designed for use in digital model railways with a two-rail system. The loop Module detects short circuits which may occur when a locomotive gets into the supervised section. In this event it changes the polarity within the loop thus neutralizes the short circuit.

The ready-built module is designed for use in model railways. It delays electrical switching impulses of a given length for an optional period of time of up to 60 seconds. The module can be used e.g. for the delayed initiation of solenoid accessories (e.g. semaphore signals, points, bistable relays).

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

- Touching powered, live components,
- touching conducting components which are live due to malfunction,
- short circuits,
- connecting the circuit to a higher voltage than designed,
- impermissibly high humidity,
- condensation of water

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.
- After the condensation of water do not start working until after a minimum of 2 hours of acclimatisation.
- Mounting the module should only be done in closed, clean, dry rooms. Beware of humidity.
- Use only original spare parts if you have to repair the 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/EWG (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

In two-rail systems opposing electrical poles collide at the points into a loop. This causes a short circuit when the points are passed by a locomotive if no measures are taken to prevent it.

The loop module is controlled by an IC that permanently supervises the voltage on the rails within the loop. The IC detects a short circuit which may occur when a locomotive gets into or out of the supervised section. The direction in which the locomotive is moving within the loop is not significant.

When a short circuit occurs, the voltage decreases below a defined value and the IC switches a relay to reverse the connections (and thereby also the polarity) to the rails within the loop. This way the short circuit is neutralized.

The rail section within the loop should be separated from the remaining tracks. It is powered by the loop module.

The module may only be used in digital controlled two-rail model railway.

Technical specifications

Supply voltage	16 - 24 Volt digital supply
Current consumption (without connected devices)	ca. 20 mA
Max. current loading	2 A
Protected to	IP 00

Ambient temperature in use	0 - + 60° C
Ambient temperature in storage	-10 - + 80° C
Comparative humidity allowed	max. 85 %
Dimensions	ca. 48 x 52 mm
Weight	ca. 20 g

Choosing a power supply

The module is designed for connection to 16 - 24 Volt digital supply.

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: $\geq 0,22 \text{ mm}^2$ for all connections)

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.

- 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.
- 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.
- 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 deoxidised 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 "reduces" 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
470 Ω	yellow - violet - brown (gold)
4,7 k Ω	yellow - violet - red (gold)
100 k Ω	brown - black - yellow (gold)

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

Adjustable resistors (Trimming pots)



Adjustable resistors are a special kind of resistor, built symmetrically. Their orientation is easy to recognise because of their off-centre connection. Their value is easily adjusted with a screwdriver to meet particular requirements.

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.

ICs



The notch on the IC shows the mounting orientation. The PCB layout shows this marking. Micro-Controllers are ICs which contain an individual program to control the circuit.

Relays



Relays are electronic change-over switches. The mounting direction is preset by the order of the pins.

Rectifiers



Rectifiers convert alternating (a.c.) into direct (d.c.) voltage. They should be inserted according to the polarity shown on the PCB Layout.

Terminal strips

Terminal strips are solder-in screw-type terminals. They provide a solder-free and safe connection of the cables to the circuit.

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 cutter as short as possible. Next solder the IC-socket, the rectifier and the transistors. Continue with the trimm-pot and the capacitors. Finally solder the relay and the terminal strips.



Caution:

Electrolytic capacitors, transistors, diodes, rectifiers and ICs 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.

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 connection of the loop module

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

Preparing and connecting the loop module

Start by isolating the loop completely from the remaining circuit. Both breaks should be located as near as possible to the points.

Connect the loop module between the loop and the remaining circuit.

Follow the connections diagram (fig. 2)!

Setting the operating point

Turn the trimming pot to the left as far as possible. Turn it to the right until the relay switches with a clicking sound. Turn it a little bit back to the left from this position until the relay switches again with a clicking sound.

Perform a test by driving a locomotive in and out the loop. Ultimately when the locomotive gets out of the loop the relay must click, although this could happen when the locomotive enters the loop. The central unit should not switch off.



Caution:

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

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.

- When setting the trimming pot the relay does not switch.
Possible cause: one or more components are soldered incorrectly.
→ Perform a visual check.
Possible cause: The IC has been inserted into the IC-socket in the wrong direction.
→ The IC has consequently been destroyed and must be replaced. (The programmed IC can only be purchased directly from the manufacturer!)
- During the testing run the central unit switches off.
Possible cause: one or more components are soldered incorrectly.
→ Perform a visual check.
Possible cause: The trimming pot is set incorrectly.
→ Set the trimming pot according to the section "Setting the operating point" and repeat the test.

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/EWG 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 - Partslist

Nomenclature - Stuklijst

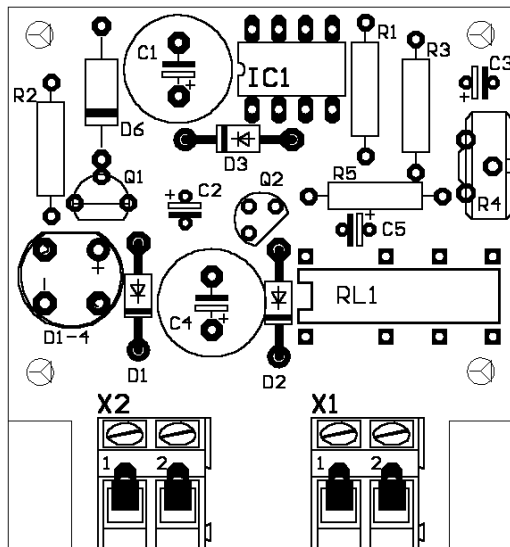
Kondensatoren - Capacitors Condensateurs - Condensatoren	C1, C4	220 μ F/25 V
	C2	100 μ F/25 V
	C3,C5	2,2 μ F/25 V
Dioden - Diodes - Diodes - Diodes	D1, D2, D3	1N4004 *
Zener-Dioden - Zener diodes Diodes Zener - Zenerdiodes	D6	ZD 5V1
Transistoren - Transistors	Q1, Q2	BC547B
Widerstände - Resistors Résistances - Weerstanden	R1	100 k Ω
	R2, R3	4,7 k Ω
	R5	470 Ω
Trimpotis - Trim pots Potentiomètres - Trimpotmeter	R4	470 k Ω
Micro-Controller - Micro-Controller Micro-contrôleur - Micro-controller	IC1	PIC 12C508A
IC-Sockel - IC-socket Soquet IC - IC-voetje	8-pol.	1 x
Relais	RL1	2xUm
Gleichrichter - Rectifier Redresseur - Gelijkrichter	D1-4	B80 C1500
Anreihklemmen - Terminal strips Borniers - Printkroonstenen	X1, X2	2-pol.

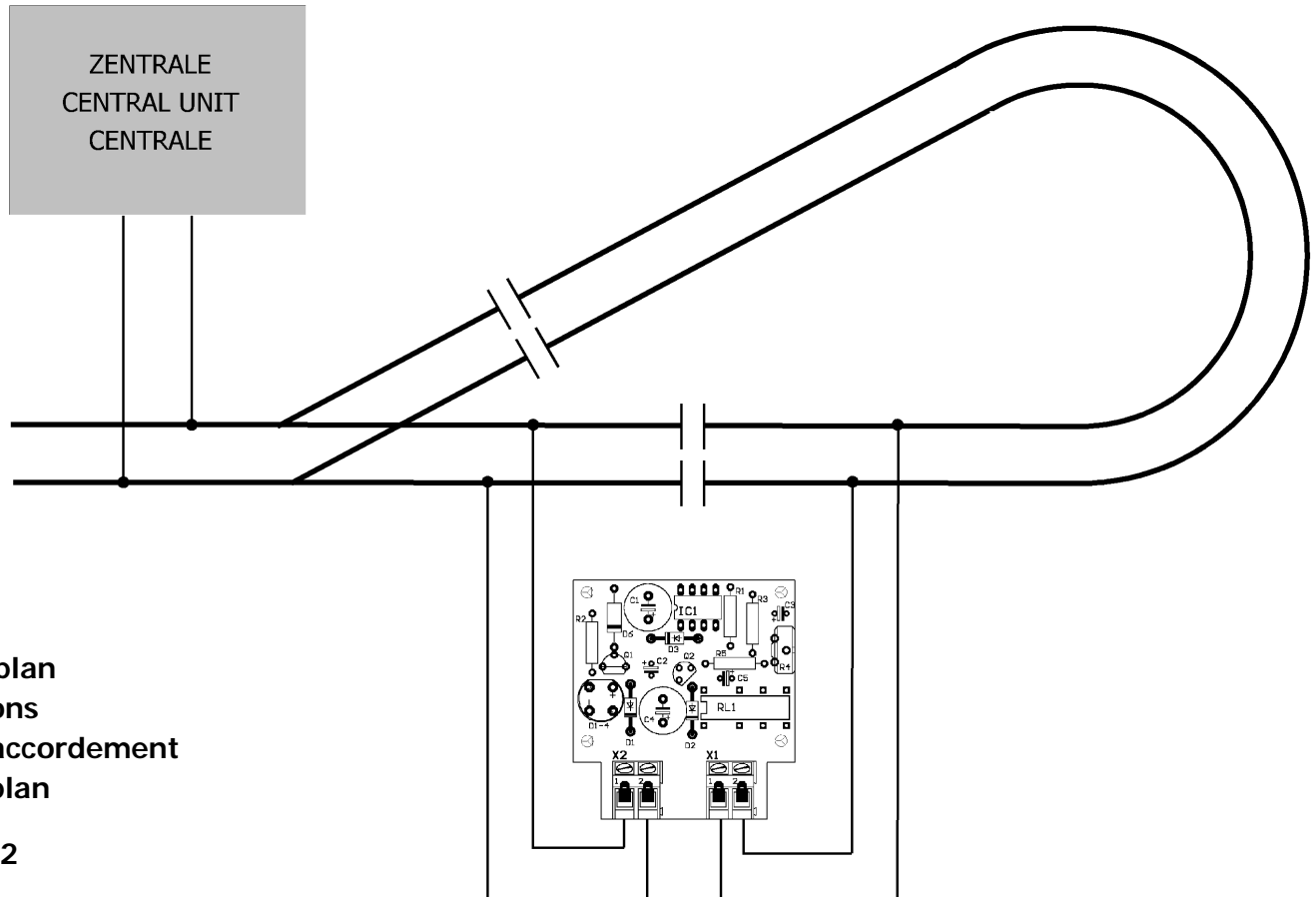
* oder ähnlich - or similar - ou équivalent - of gelijkwaardig

Bestückungsplan - PCB layout

Plan d'implantation - Printplan

■ ■ ■ Fig. 1





Anschlußplan
Connections
Plan de raccordement
Aansluit plan

■ ■ ■ Fig. 2

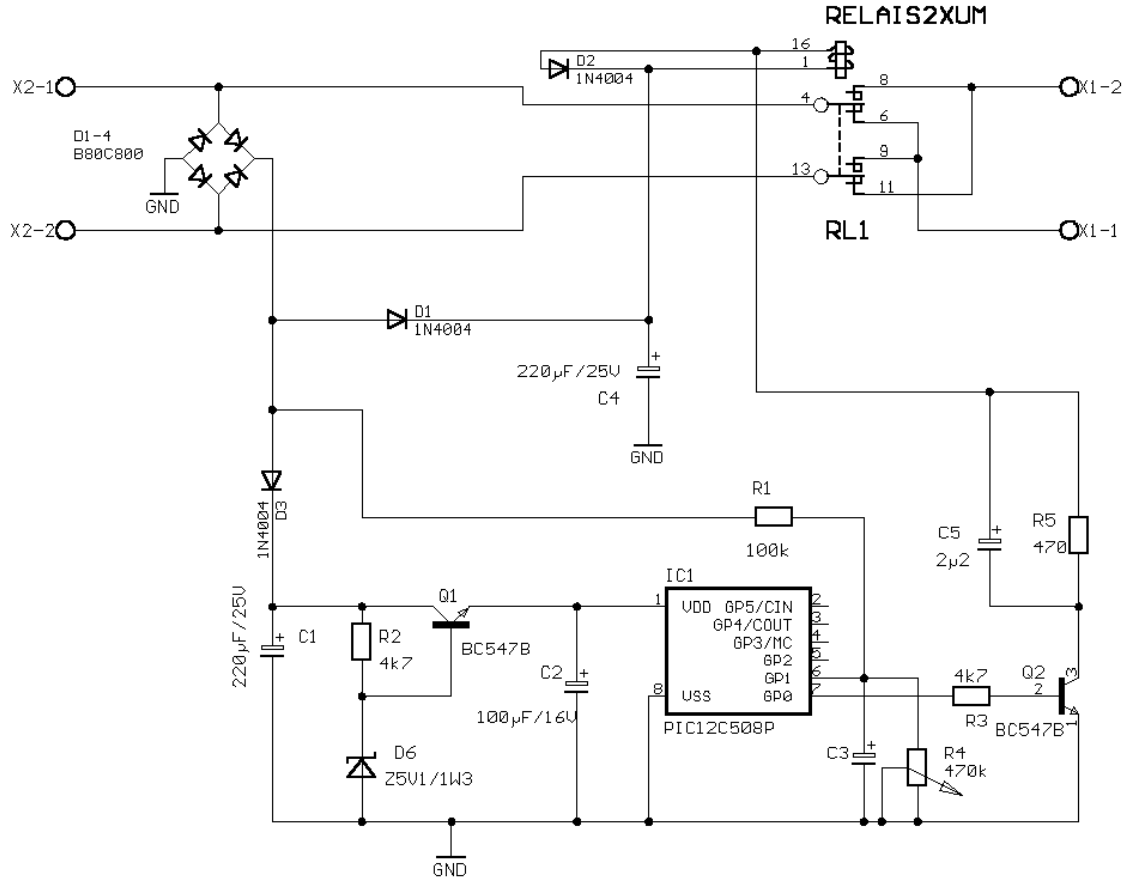
Schaltplan

Circuit diagram

Schéma de principe

Schakelschema

■ ■ ■ Fig. 3



Aktuelle Informationen und Tipps:
Information and tips:
Informations et conseils:
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