

MODELLBAHN DIGITAL PETER STÄRZ

Dresdener Str. 68 – D-02977 Hoyerswerda – ☎ +49 3571 404027 – www.firma-staerz.de – info@firma-staerz.de



Reverse loop module for all digital systems

KS-1
v1a-2011



Degree of difficulty: **easy**
medium
difficult

Necessary skills:

- simple assembly and soldering procedure of the board

The reverse loop module KS-1 is a device for adjusting the polarity of reverse loop sections on model railway systems. It is being continuously checked whether there is a micro short-circuit, and if so the polarity of the reverse loop section is switched.

Two equipping possibilities are available to deal with the different requirements of variable track scales (small scales Z to TT, large scales from H0 on) ensuring an optimum adjustment of the reverse loop module to the model railway layout and the central unit.

Special features

- suitable for all digital systems
- external turnout control possible
- 2 equipping possibilities

Table of Content:

Special features	1
Technical specifications	2
Installation site	2
Kit contents	2
Accessory and expendabilities	2
Maintenance and care	2
Assembly instruction	3
Component layout diagram on the PCB	3
Populated PCB	3
Functional description	4
Operating principle of the reverse loop module	4
Bringing into service	4
Occupancy indication within the reverse loop section	4
Connection of the reverse loop module	4
Connection scheme	4

Technical specifications

Size

50,0mm x 53,0mm x 20,0mm

Power supply

The module is powered by track voltage or the digital voltage from a booster or a central unit.

Operating current

approx. 1,5A constant current

Connections (Screw terminal blocks with 5mm pitch):

- 2 terminals for the supply voltage
 - 1 R: Red colour of digital voltage
 - 2 B: Blue colour of digital voltage
- 3 terminals for controlling procedures
 - 3 l (connected in parallel)
 - 4 + (+VS supply voltage)
 - 5 r (connected crosswise)
- 2 terminals for the reverse loop section
 - 6 R: Red colour of the reverse loop section
 - 7 B: Blue colour of the reverse loop section

Equipping possibilities

Two equipping possibility ([1] and [2]) are available.

In case of version [1] a reduced short-circuit switching current flows offering electrical power for boosters and central units of lower performance. This is a feature other devices do not have. This allows this configuration to be run with low performance power supplies and shall preferably be used for small track scales (up to TT).

For track scales from H0 on, configuration [2] shall be used.

Assembly

The reverse loop module KS-1 is assembled following the instructions on the next page. For soldering the components on the PCB a soldering iron of 12 to 25 Watts or a soldering station with the temperate set to approx. 400°C is needed together with 0.5 or 1.0 mm soldering wire with rosin flux. No special tools are required. Do not use soldering flux! Pay attention to solder speedily to avoid device damage by overheating.

The Instruction

The full content of the instruction is important. Very important information is marked in **colours**; critical information is highlighted in **red**. Some setting options have a (*) representing a recommended value.

Installation site

Your reverse loop module should be located in a dry, ventilated and clean area being easily accessible and lying beside or next to the model railway layout.

The reverse loop module KS-1 must be kept free of coarse dirt or electro conductive parts falling down.

The reverse loop module KS-1 may be arranged without a housing needed. In that case the module shall be put on an insulating sub floor by means of the plastic spacer sleeves and screws delivered. Keep all electro conductive tools, assembly kits and cables away from the reverse loop module KS-1 during operation, please.

A negligently and by external circumstances caused short-circuit (impinging on the module from above or from the bottom) may destroy the reverse loop module KS-1. If that happens, all terms of warranty will become invalid.

Kit contents

Please first verify that the kit contains all the components listed below.

General parts:

- 1x circuit board
- 4x SFH628A-3
- 1x relays
- 2x PTC 955
- 4x screws
- 4x spacer sleeves

Connectors:

- 2x terminal clamps 2-pin
- 1x terminal clamp 3-pin

Transistors:

- 2x BC517
- 2x BC557

Capacitors (marking):

- 2x electrolytic 47µF
- 2x ceramics 10nF [1]
- 2x ceramics 4,7nF ([2] in the bag)

Diodes (marking):

- 4x 1N4148 (4148)

Resistors (marking):

- 4x 18kOhm (brown, grey, black, red, brown)
- 2x 1MOhm (brown, black, black, yellow, brown)
- 2x 8,2kOhm (grey, red, black, brown, brown) ([2] in the bag)
- 2x 560Ohm (green, blue, black, black, brown)) [1]
- 2x 1,8kOhm (brown, grey, black, brown, brown) [1]
- 2x 3,3kOhm (orange, orange, black, brown, brown)
- 2x 3,9kOhm (orange, white, black, brown, brown)
- (1x 10kOhm (brown, black, black, red, brown))

Accessory and expendabilities

The following equipment is available:

Housing:

- **Housing for KS1: G 521**

Art. 174

Maintenance and care

Dust clumping together can, in combination with condensating liquids, become conductive and deteriorate the functionality of the reverse loop module KS-1. It is therefore important to remove dust regularly by blowing it off or vacuuming the module.

CAUTION: A liquid cleaning of the part is prohibited!

Non-Use

When the reverse loop module KS-1 is not used it should be stored at a dry and clean place.

For further information, please refer to the FAQ section of our website at <http://www.firma-staerz.de>.

Assembly instruction

Assemble the kit in the order of these instructions. All components are placed on the top side of the PCB (marked "top") as close to the PCB as possible and soldered on the bottom side of the PCB (marked "Bottom"). Use a bending tool (e.g. Conrad 425869 – 62) for bending. Cut the leads of components flush using a wire cutter after soldering.

Solder cleanly and precisely!

1. Resistors

Bend the resistor leads for 7.5 mm pitch before insertion. To facilitate placing components on the PCB support the edges of the board with the help of two books, for instance, to leave enough space for the leads under the board. Insert the resistors on board aligning the coloured rings of all the resistors in the same way to make it easier to verify the value of the resistors later. Place a suitable plane piece of wood or similar on top of the resistors on board. Turn the board together with the wood upside down. The underside of the board is now conveniently accessible for soldering the components.

Solder one end of each resistor first and check that they are positioned properly before soldering the other end of each resistor.

[1] R1, R2:	560Ohm	(green, blue, black, black, brown)
[2] R1, R2:	8,2kOhm	(grey, red, black, brown, brown)
R5-R8:	18kOhm	(brown, grey, black, red, brown)
R9, R10:	1MOhm	(brown, black, black, yellow, brown)
R11, R12:	3,3kOhm	(orange, orange, black, brown, brown)
R13, R14:	3,9kOhm	(orange, white, black, brown, brown)
[1] R3, R4	1,8kOhm	(brown, grey, black, brown, brown)
[2] R3, R4		not to be equipped!

1. Diodes

Proceed as with resistors. Observe the polarity of components: the stripe on one end of a diode must be aligned with the stripe printed on the circuit board silkscreen layout.

D1-D4: 1N4148D

2. Optocoupler

Observe the polarity: The orientation notch of the component must be aligned with the one printed on the circuit board. In case of optocouplers being marked otherwise, the designation must show to the inner side of the circuit board.

U1-U4: SFH628A

3. Ceramic capacitors

[1] C3, C4:	10nF	(103)
[2] C3, C4:	4,7nF	(in the bag)

4. Transistors

Don't confuse the transistors BC517 and BC557!

T1, T2: BC557

T3, T4: BC517

5. Relays, terminals

Observe the orientation of terminal blocks as printed on the circuit board, and put them together, before soldering.

K1: relay

IN, X1, OUT: terminals

6. Electrolytic capacitor, observe the polarity!

The minus side of the capacitor must be inserted towards the optocouplers.

C1, C2: 47µF

7. PTCs

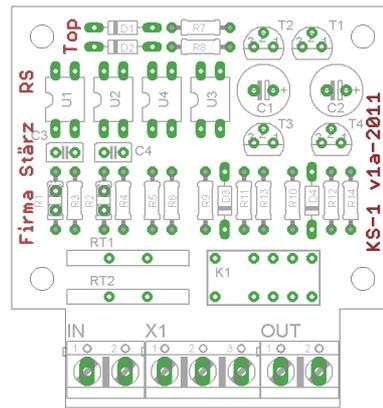
Both PTCs must be installed in a way being able to be bent over the resistors. Pay particular attention to the pins not touching each other.

RT1, RT2: 955

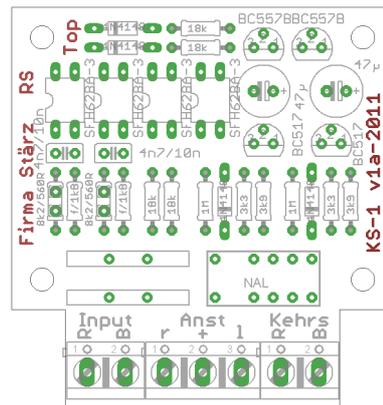
8. Verification

After soldering all components on the PCB verify once more that they are placed according component layout diagram and that they are oriented properly. Check that all solder points on the bottom side of the PCB look correct. Note especially if there are any undesired solder bridges between solder pads.

Component layout diagram on the PCB



Populated PCB



Functional description

Operating principle of the reverse loop module

The reverse loop section is to be isolated electrically double-sided from the rest of the model railway layout.

The reverse loop section must at least be as long as the longest train that is going to use it.

The reverse loop module KS-1 is continuously checking, whether there is a short-circuit between the reverse loop section and the rest of the model railway layout. In that case the reverse loop module KS-1 switches the polarity of the reverse loop section to cancel the short-circuit.

The switching is affected by a locomotive (or a railway carriage) that temporarily interconnects both sections by running over their double-sided joint.

During that process a micro short-circuit occurs, but only in a fraction of a second. Nevertheless some components as for instance the wheel polishers can be affected by that. We offer both equipping variations to minimize negative effects as far as possible.

Bringing into service

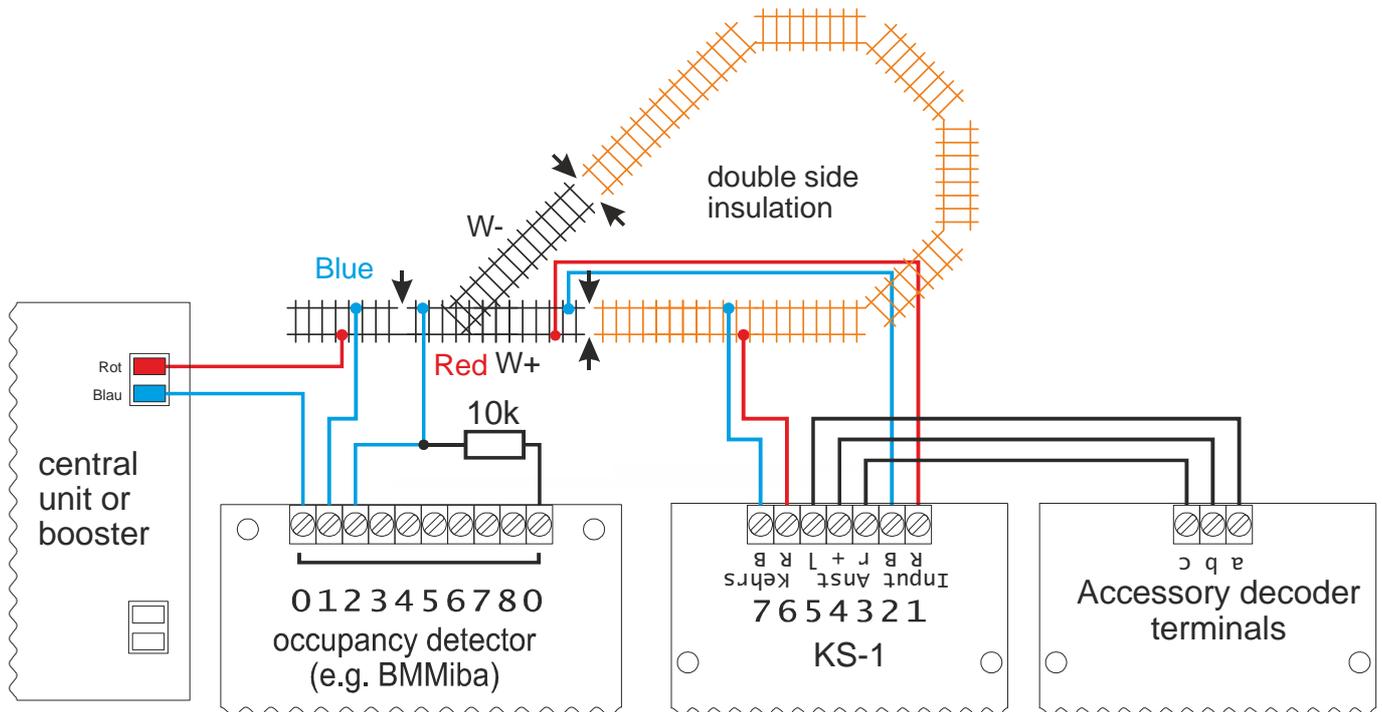
Before using the module for the first time, the wiring of the module should be tested. This can be done by means of a simple screwdriver bridging a double-sided isolation of the reverse loop on active traction current. According to its position the relay may have already been switched. For that reason the other side of the reverse loop section is also bridged once. At the latest now a clicking of the relay should be audible.

Occupancy indication within the reverse loop section

It is possible to include the reverse loop section in the occupancy detection. Do the wiring as shown in the connection scheme:

The power supply of the reverse loop module takes place immediately at the adjacent main switches and exit points. A short track

Connection scheme



All brands and trademarks are property of their respective owners.

Modellbahn Digital Peter Stärz, Dresdener Str. 68, D-02977 Hoyerswerda

Illustrations and technical data are subject to change. We are not responsible for printing or typographical errors.

Printable version of 21.10.2012

section from the outside up to the turnout must be separated one-sided (a separate occupancy detection section is being created). The occupancy indication of the short track section is identical to that one concerning the reverse loop section, since the reverse loop sources its electricity from the track section.

Beyond that please consider to add, completing the regular connection needed, a supplementary 10 kOhm resistor (brown, black, black, red, brown) to the occupancy detector covering the general input (value „0“ in the drawing) and the specific occupied section (value „2“ in the drawing) to ensure a reliable occupancy detection.

Connection of the reverse loop module

Connection to the power supply

The power supply input of the reverse loop module KS-1 consists of the terminal clamps (Input R, B). Connect always a red and a blue contact of the model railway section to the clamps. You should take the track voltage immediately from the adjacent entrance or exit track.

Connection of the reverse loop

The reverse loop module KS-1 is connected with its reverse loop section by use of the terminals 6 and 7 (backside R, B). The polarity is not significant in that case.

Controlling of the reverse loop module

The reverse loop module KS-1 can be connected via output of a functional decoder (e.g. WDMiba) and by use of the terminals 3 to 5. It is therefore possible to switch the reverse loop module from your computer taking the address of the corresponding functional decoder into account. Pay attention to the correct wiring of the module (see connection scheme). The ground voltage is applied at connection 4, and the connections 3 and 5 are supplied with the switching voltage.