

S88-5

s88 Feedback Module with
integrated track occupancy detector
8-fold

Manual



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Printing the manual

The formatting is optimised for double-sided printing. The standard page size is DIN A5. If you prefer a larger display, printing on DIN A4 is recommended.

**** The asterisks**

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

Gebr. MÄRKLIN & Cie. GmbH | Stuttgarter Straße 55-57 | DE-73033 Göppingen

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1. Getting started

The instructions will help you step by step with the safe and proper installation and use of your s88 feedback module. Before you put the feedback module into operation, read this manual completely, especially the safety instructions and the section on possible errors and their elimination. You will then know what you have to pay attention to and thus avoid errors that sometimes can only be rectified with a lot of effort.

Keep the instructions in a safe place so that you can restore functionality later in the event of any malfunctions. If you pass the feedback module on to another person, also give the instructions with it.

1.1. Contents of the package

- 1 ready-built and tested circuit board S88-5 (item no. 44-01506-01) or
1 s88 feedback module S88-5 in housing (item no. 44-01507-01)
- 1 patch cable (RJ 45)

1.2. Accessories

Connection cables

The use of stranded wire is recommended for making the connections. Stranded wires consist of several thin individual wires and are therefore more flexible than rigid wires with the same copper cross-section. Recommended cross-sections:

- Connections to the tracks: $\geq 0.25 \text{ mm}^2$
- Connections to the booster: $\geq 0.75 \text{ mm}^2$

1.3. Connection to devices with 6-pole s88 interface

For connection to conventional feedback modules or digital devices with 6-pin s88 interface you need an adapter S88-A (see section 2.4.)

1.4. Intended use

The s88 feedback module is intended for use in model railway layouts as specified in the instructions. Any other use is not in accordance with the intended use and will result in the loss of the warranty claim. Intended use also includes reading, understanding and following all parts of the instructions. The s88 feedback module is not intended to be used by children under the age of 14.

1.5. Safety instructions

**Note:**

The s88 feedback module contains integrated circuits (ICs). These are sensitive to electrostatic charging. Therefore, do not touch these components until you have "discharged" yourself. For this purpose, e.g. a grip on a radiator is sufficient.

Improper use and non-observance of the instructions can lead to incalculable hazards. Prevent these dangers by carrying out the following measures:

- Only use the s88 feedback module in closed, clean and dry rooms. Avoid moisture and splash water in the environment. After condensation has formed, wait two hours for acclimatisation before use.
- Disconnect the module from the power supply before carrying out wiring work.
- Supply the s88 feedback module only with extra-low voltage as specified in the technical data. Use only tested and approved transformers.
- Only plug the mains plugs of transformers into properly installed and fused earthed sockets.
- When making electrical connections, ensure that the cable cross-section is sufficient.
- Heating of the s88 feedback module during operation is normal and harmless.
- Do not expose the s88 feedback module to high ambient temperatures or direct sunlight. Observe the information on the maximum operating temperature in the technical data.
- Regularly check the operational safety of the s88 feedback module, e.g. for damage to the connection cables.
- If you notice damage or if malfunctions occur, disconnect the connection to the power supply immediately. Send the s88 feedback module in for inspection.

1.6. Care

Do not use any cleaning agents to clean the s88 feedback module. Only wipe the module dry. Disconnect the module from the power supply before cleaning.

2. Operation overview

The S88-5 feedback module is compatible with all components that work with the s88 bus developed by Märklin**. It combines in one circuit

- an 8-fold track occupancy detector and
- an 8-fold s88-feedback detector

and is therefore particularly suitable for use in DC layouts.

The 8 track sections must be located in one booster section.

2.1. Integrated track occupancy detector

Detection of occupied track sections

The integrated track occupancy detector detects vehicles with a current consumption of at least 6 mA (e.g. illuminated locomotives or wagons) that are located in the connected sections. False alarms that can occur in digital operation due to interference voltages are minimised because of the comparatively low sensitivity of 6 mA.

Note: The small current that flows in DC systems when an axle of a vehicle is coated with resistive paint may not be sufficient to be detected.

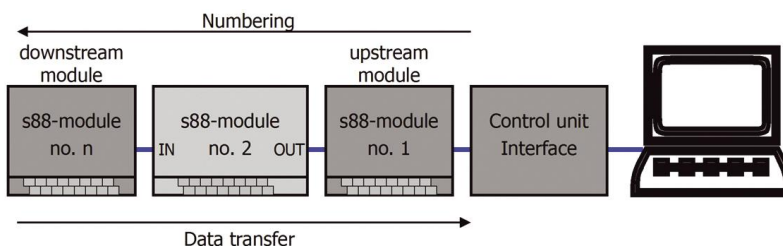
Evaluating the occupied messages

The areas "track occupancy detector" and "s88 feedback detector" are electrically separated from each other by optocouplers (galvanically isolated). This filters out interference peaks and effectively prevents hum loops and fault currents.

2.2. Sending the feedback in the s88-bus

The information is transmitted from the S88-5 via the s88-bus to the upstream feedback module or to the connected digital device (interface, memory or central unit). The data transmission from one feedback module to the other takes place in the s88 bus according to the bucket-chain-memory principle.

The number of feedback devices you can connect to a bus line depends on the interface, memory or central unit you use. Please observe the specifications of the device manufacturer.



Addressing the feedback modules

The addressing of the S88-5 feedback module is done automatically according to its position in the bus line. It is therefore used in linear bus lines with direct connection to the interface, memory or central unit.

2.3. Connection to digital devices and other feedback devices



Info: Standard s88-N

The S88-5 has RJ-45 connectors according to the s88-N standard, which regulates the assignment of commercially available patch cables for use in s88 feedback systems. Unlike the commonly used 6-core connection cables, patch cables, which are common in computer networks, are largely shielded against foreign electrical signals. By using patch cables, the susceptibility to interference in the s88 bus is therefore considerably reduced.

Connection to digital devices or feedback modules with 6-pole s88 interface

If a connection to an s88 feedback module or a digital device with 6-pole s88 interface is to be established, an additional adapter S88-A is required. Four different versions of the adapter are available, which differ in terms of

- connection (socket or plug) and
- direction of installation.

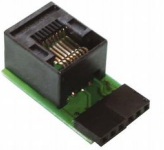
Further information → Section 2.4.

2.4. Versions of the adapters S88-A

S88 adapters with socket

can be plugged directly onto the 6-pin connector of an S88 back module.

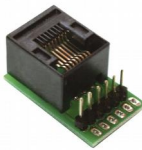
Recommended use: Modules with connectors coming out from the side

 S88-A-BL Item no. 44-09100	 S88-A-BR Item no. 44-09110
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S88-adapter with plug

are connected via a 6-core cable that is as short as possible (e.g. S88-15, item no. 44-09250-01). These adapters should always be used for the connection to the digital central unit in order to avoid mechanical damage to the S88 interface of the central unit.

Recommended use: digital devices, modules with connectors leading out upwards

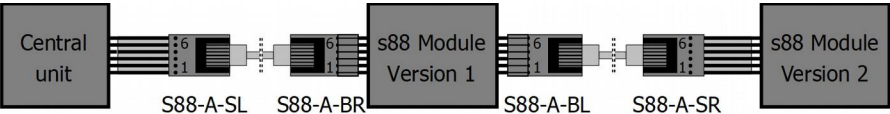
 S88-A-SL Item no. 44-09200	 S88-A-SR Item no. 44-09210
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Mounting directions of the adapters S88-A

Depending on the installation direction, the "R" or "L" versions of the adapter are used.

Versions	Direction of the 6-pole connection*	
S88-A-SL and S88-A-BL	Central unit	* Explanation: The specification refers to the direction in which the 6-pin connector of the adapter points.
S88-A-SR and S88-A-BR	Feedback module	

Application examples



s88 module version 1: with connectors coming out from the side

s88 module version 2: with plugs protruding upwards

3. Connections S88-5

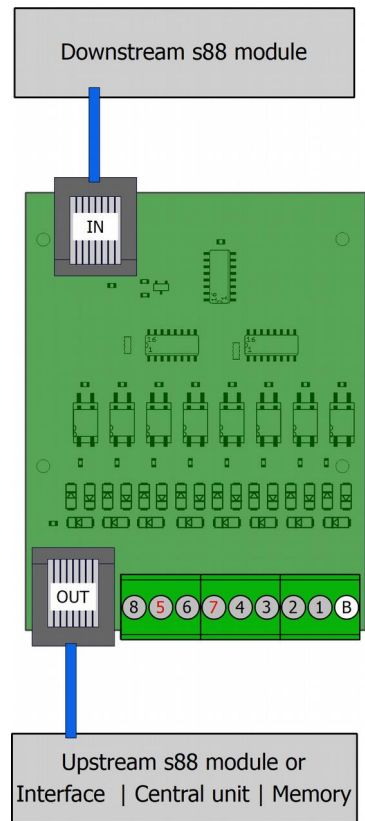
Pin assignment

IN	RJ-45 socket for the connection of a downstream s88 module
OUT	RJ-45 socket for the connection of an upstream s88 module or digital device
8...1	Isolated conductors of the supervised rail sections Observe the numbering of the terminal strips! The occupancy status can only be reported trouble free, when with each supervised section one conductor is isolated at both ends: 2-rail systems (digital): one of the two rails 3-rail systems: middle conductor or both rails
B	Booster (one booster for all track sections)

Connection digital devices and s88 feedback modules

The S88-5 has two RJ-45 sockets (IN, OUT) to connect commercial Ethernet patch-cables (RJ-45 cables), which allow an interference free connection to other feedback modules or digital devices in accordance with the s88-N standard.

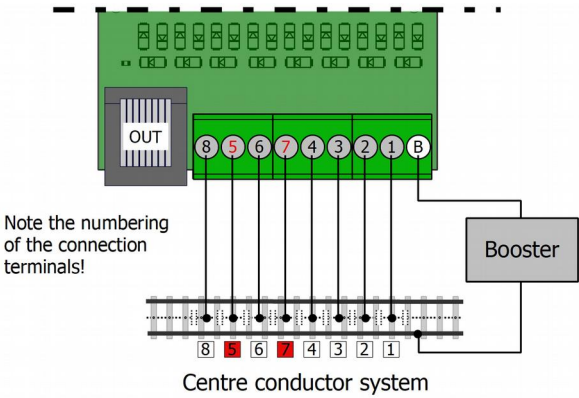
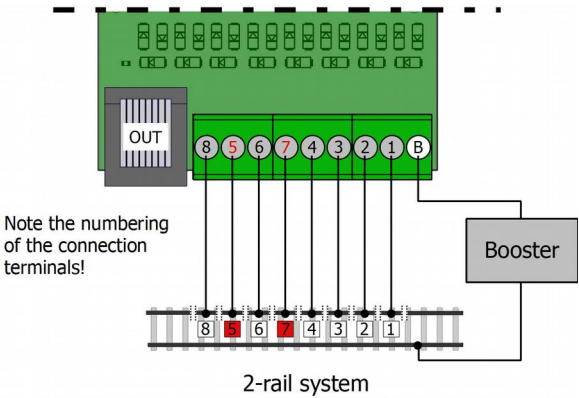
Use an s88-A adapter (special accessory) and, if necessary, a 6-pole ribbon cable (→ section 1.3.) to connect feedback modules or digital devices with a 6-pole s88 connection.



Connecting the track sections and the booster

The S88-5 is equipped with terminal strips into which you plug and screw the connecting cables for the track sections and the booster.

Connect the inputs 1 to 8 to the rails or the centre conductor.



4. Checklist for troubleshooting and error correction

 **Warning:** If you notice a strong heat development, immediately disconnect the connection to the supply voltage. **Fire hazard!**

Possible causes:

- One or more connections are faulty. → Check the connections.
- The module is defective. → Send the feedback module in for inspection.

Faulty display of the states

The central unit, the memory or the interface do not show the proper status.

Possible causes:

- The connection(s) between the feedback module and other feedback modules and/or digital devices are interrupted. → Check the connections. When using a ribbon cable, check as well, if the connecting socket of the ribbon cable is put on in the right direction.
- The connection between the input and the track section is interrupted. → Check the connections.
- You have connected track sections 5 and/or 7 to the wrong terminals. → Check the connections.

The central unit/memory/interface permanently shows a section as occupied.

Possible cause:

- A consumer (switch decoder, switch motor or similar) is connected in the track section, which is supplied directly via the rails. The self-consumption is sufficient to generate a busy signal.
- Supply the consumer separately or arrange the monitored sections so that the consumer is not in a monitored section.

4.1. Technical Hotline

If you have any questions about the use of your s88 feedback module, our technical hotline will help you (telephone number and e-mail address on the last page).

4.2. Repairs

You can send us defective modules for repair (address on the last page). In the event of a warranty or guarantee claim, the repair is free of charge for you. As proof of any warranty or guarantee claim, please enclose the proof of purchase with your return.

If there is no warranty or guarantee claim, we are entitled to charge you the costs of the repair and the costs of the return shipment. We charge a maximum of 50% of the new price for the repair according to our valid price list. We reserve the right to refuse the repair if it is technically impossible or uneconomical.

If you want to clarify whether a repair is possible or economical before sending it in, please contact our Technical Hotline (telephone number and email address on the last page).

Please do not send us repair shipments freight collect. In the event of a warranty or guarantee claim, we will reimburse you for the regular shipping costs.

5. Technical data S88-5

Feedback log	s88
Number of track sections	maximum 8
Connections to the s88-bus	RJ-45 according to S88-N

Electrical characteristics

Supply voltage	5 – 15 V d.c. voltage (provided by the s88-bus)
Maximum current in the monitored sections	1.500 mA per track section
Sensitivity	6 mA

Protection

Protection class	Ready-made module (without housing): IP 00 Meaning: No protection against foreign bodies, contact and water. Ready device (in housing): IP 20 Meaning: Protected against solid foreign bodies with diameter ≥ 12.5 mm and access with a finger. No protection against water.
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Environment

	For use in closed rooms
Ambient temperature during operation	0 ~ + 30 °C
Permissible relative humidity during operation	10 ~ 85% (non-condensing)
Ambient temperature during storage	- 10 ~ + 40 °C
Permissible relative humidity during storage	10 ~ 85% (non-condensing)

Other features

Dimensions (approx.)	Circuit board: 85 x 64 mm
	Ready device including housing: 100 x 90 x 35 mm
Weight (approx.)	Assembled board (ready-made module): 42 g
	Ready device including housing: 90 g

6. Warranty, EU conformity & WEEE

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

6.2. EU Declaration of Conformity



This product fulfils the requirements of the following EU directives and therefore bears the CE marking.

2001/95/EU Product Safety Directive

2015/863/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

2014/30/EU on electromagnetic compatibility (EMC Directive). Underlying standards:

DIN-EN 55014-1 and 55014-2: Electromagnetic compatibility - Requirements for household appliances, electric tools and similar electrical appliances. Part 1: Emitted interference, Part 2: Immunity to interference

To maintain electromagnetic compatibility during operation, observe the following measures:

Only connect the supply transformer to a professionally installed and fused earthed socket.

Do not make any changes to the original components and follow the instructions, connection and assembly diagrams in this manual exactly.

Only use original spare parts for repair work.

6.3. Declarations on the WEEE Directive

This product is subject to the requirements of the EU Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE), i.e. the manufacturer, distributor or seller of the product must contribute to the proper disposal and treatment of waste equipment in accordance with EU and national law. This obligation includes

- registration with the registering authorities ("registers") in the country where WEEE is distributed or sold
- the regular reporting of the amount of EEE sold
- the organisation or financing of collection, treatment, recycling and recovery of the products
- for distributors, the establishment of a take-back service where customers can return WEEE free of charge
- for producers, compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive.



The "crossed-out wheeled bin" symbol means that you are legally obliged to recycle the marked equipment at the end of its life. The appliances must not be disposed of with (unsorted) household waste or packaging waste. Dispose of the appliances at special collection and return points, e.g. at recycling centres or at dealers who offer a corresponding take-back service.

Further Information and Tips:

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

Warranty and Service:

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