

Manual

Booster B-3

Item no. 40-19327



tams elektronik

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Table of contents

1. Why Boosters?.....	3
2. Getting started.....	4
3. Safety instructions.....	6
4. Your B-3.....	7
5. Splitting your model railway layout.....	11
6. Connecting the B-3.....	12
7. Settings.....	16
8. Operation.....	17
9. Check list for troubleshooting.....	17
10. Guarantee bond.....	19
11. EU declaration of conformity.....	20
12. Declarations conforming to the WEEE directive.....	20

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To increase the text's readability we have refrained from referring to this point in each instance.

1. Why Boosters?

The three essential functions of boosters are:

1. Supplying the power needed for the operation of digital controlled locomotives and points and other digital consumers.
2. Bringing the voltage to the rails, in order to make sure that all vehicle and accessory decoders receive the digital switching and control commands.
3. Making sure the current is switched off in case of a short-circuit on the layout (e.g. when a vehicle derailed), in order to prevent damages at rails and vehicles.

In layouts monitored by RailCom the booster also provides the so-called RailCom-cutout needed to transfer RailCom-feedback data.

You can measure the power consumption as follows:

1 locomotive gauge N	600 mA
1 locomotive gauge H0	800 mA
1 locomotive gauge 0	1.000 mA
wagon light	50 - 200 mA
another consumer (such as a sound module)	100 - 300 mA
reserve for points	10% of the calculated sum of power consumption

The Booster B-3 can provide 2,5 A current. If your overall power demand exceeds the capacity of one booster you have to connect additional boosters according to the special requirements of your layout.

2. Getting started

How to use this manual

This manual gives step-by-step instructions for safe and correct connecting of the booster, and operation. Before you start, we advise you to read the whole manual, particularly the chapter on safety instructions and the checklist for trouble shooting. 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 booster on to another person, please pass on the manual with it.

Intended use

The booster B-3 is designed to be operated according to the instructions in this manual in model building, especially in digital model railroad layouts. Any other use is inappropriate and invalidates any guarantees.

The booster B-3 should not be mounted by children under the age of 14.

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

Checking the contents

Please make sure that your package contains:

- Booster B-3,
- one 5-pin connecting cable,
- two short-circuit jumpers,
- a CD (containing the manual and further information).

Required materials

In order to connect the booster you need:

- Wire. Recommended diameter:
 - for the connection to the transformer and the rails: $\geq 1,5 \text{ mm}^2$
 - for the connection to the digital control unit: $\geq 0,25 \text{ mm}^2$
- A transformer. The recommended voltage and the minimum power of the transformer depend on the desired settings.

Determining the necessary transformer's voltage

Desired track voltage	Recommended transformer's voltage	
	AC voltage	DC voltage
12 V	12 V	14 V
15 V	15 V	17 V
19 V	16 oder 18 V	21 V

Determining the transformer's minimum power

desired track voltage \times desired interrupting current
 = minimum transformer's power

Example: $19 \text{ V} \times 2,5 \text{ A} = 47,5 \text{ VA}$



Please note:

Use a transformer with a nominal voltage not much higher than the desired track voltage. The power resulting has to be dissipated as heat by the booster otherwise. When this power is too high, the booster overheats and switches off.

3. Safety instructions



Risk of fire

The booster is cooled by a heat sink to prevent overheating. Thus be careful to allow the air to flow unhindered through the heat sink at the booster's back. If the airflow is blocked components can overheat and catch fire.

Risk of electric shock

- Touching powered, live components,
 - touching conducting components which are live due to malfunction,
 - short circuits and connecting the circuit to another voltage than specified,
 - impermissibly high humidity and condensation build up
- can cause serious injury due to electrical shock. Take the following precautions to prevent this danger:
- Only operate indoors in a dry environment.
 - Wiring should only be carried out when the booster is disconnected.
 - Only use low power for this device as described in this manual and only use certified transformers.
 - Only connect the transformer in an authorised manner to the house power supply.
 - Use adequately thick cable for all wiring. Too thin a cable can overheat.
 - If the layout is exposed to condensation, allow at least two hours for drying out.

4. Your B-3

Technical specifications

Supply voltage	12 - 20 V AC voltage or 14 – 21 V DC voltage
Maximum output current	2,5 A
Output voltage	12, 15 or 19 Volt digital voltage
Power	max. 48 Watt
Digital formats	DCC, Motorola, mfx (control commands only)
Feedback log	RailCom
Interfaces	DCC-conforming booster port (3-pole) Märklin-compatible booster port (5 pole)
Track signal	symmetrical
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.)	100 x 90 x 35 mm
Weight (approx.)	181 g

- 1 Track port
- 2 Märklin booster port
- 3 DCC booster port
- 4 Transformer port
- 5 RailCom
- 6 Track voltage
- 7 Operation display (LED)



Ports

The booster B-3 can be connected either to a port for a Märklin-compatible booster or to a DCC-conforming booster port. Advice: The port (Märklin-compatible or DCC-conform) used for the booster's connection to the control unit, is of no importance for the data format used to control the decoders. Use the port compatible to your control unit.

Please note: With control units providing both booster ports (e.g. Tams MasterControl and Tams RedBox) you have to set the short circuit polarity according to the booster port in use.

Data formats

The booster B-3 is a multi protocol booster and capable of amplifying data sent in the Motorola or the DCC format. It transmits control commands in mfx-format as well, but no mfx feedback signals.

RailCom

The booster B-3 can provide the so-called RailCom-cutout needed to transfer RailCom-feedback data in RailCom-monitored sections.

When using the B-2 with control units sending a DCC signal but not compatible to RailCom, providing the RailCom-cutout can cause malfunction. Some older DCC vehicle decoders and current decoders (especially of US American manufacturers) which are not designed for use with Railcom, do not react to driving commands properly with the RailCom cutout activated. With sound decoders not compatible to RailCom interferences in the sound playback can occur.

Thus with the B-3 it is possible to switch RailCom on or off. With pure Motorola control units, malfunction due to sending the RailCom-cutout is impossible on principle.

Using the ABC-braking method

The booster amplifies the track signal completely symmetrically. This allows the ABC-braking method to be used in DCC-controlled layouts. The DCC-input of the B-3 is isolated through an opto-coupler.

Balanced track voltage

The booster B-3 provides a regulated track voltage, which can be set to a value of 12, 15 or 19 V. At delivery the track voltage is set to 19 V.

Regulating the track voltage to a constant value prevents changes in locomotive speeds and lighting brightness, resulting from voltage variations.

Rated size	Recommended track voltage	Value in state of delivery
Z	12 V	
N and TT	15 V	
H0	19 V	19 V

Short-circuit protection

The Booster B-3 provides an integrated short circuit breaking in shape of an integrated current limitation. This causes the booster to switch off automatically when a short circuit occurs at the track output and thus prevents damages to the booster, the tracks and the vehicles. The short circuit sensitivity or the interrupting current is set to 2,5 A.

When the short circuit feedback line is connected to the booster port of the control unit, the B-3 sends a feedback to the control unit when a short circuit occurs and then the control unit switches off the booster.

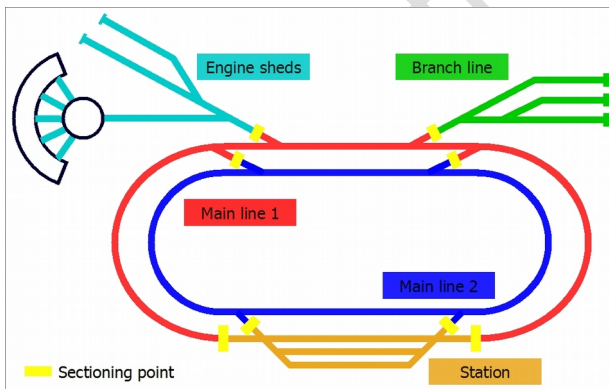
After approx. 5 seconds the B-3 switches on automatically. If the short circuit is still there, it switches off again immediately. After the booster has been switched on and off five times, the automatic switching on will be interrupted for approx. one minute before it starts again.

5. Splitting your model railway layout

Split your model railway layout in several track sections electrically isolating them from each other. Every section has to be supplied by a booster of its' own. In each section a maximum of three to five locomotives should run at the same time. The following divisions are useful:

- station
- engine sheds
- the main lines (if necessary in several sections)
- the branch lines (if necessary in several sections)

Make sure that section borders are not crossed too often.



Isolate the borders between the booster sections as follows:

- With 2-rail systems: one rail. Be sure to isolate in all booster sections on the same rail ("left" or "right"). In large confusing layouts it is recommended to isolate both rails.
- With 3-rail systems: the middle conductor.

6. Connecting the B-3



Please note:

Do not block the flow of air over the heat sink at the booster's back surface, otherwise the booster can overheat. **Risk of fire!** When connecting the booster be sure to keep sufficient distance to other devices, walls, and the like.

Connecting the central unit

It is possible to connect the booster to

- the interface of the central unit for a Märklin-compatible booster (with a 5-pin connecting cable) or
- the DCC booster interface of the central unit (with a 3-pin connecting cable).

The enclosed cable is intended for connecting the booster to the interface of a Märklin-compatible booster. It can be used for connecting the booster to the central unit MasterControl. The booster configuration of the MasterControl has to be set to "short circuit polarity: positive (MM)" (= factory setting).

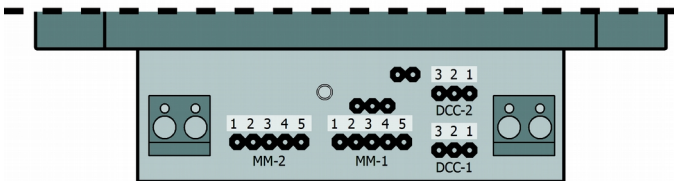
The booster B-3 has two Märklin-booster ports and two DCC-booster ports to be used at choice. Please make sure that the pin assignment of the central unit's booster interface corresponds to that of the booster port.



Please note:

When using the Märklin compatible booster port, the connection cable between booster and control unit should not exceed a length of 1 m. Otherwise a malfunction of the short circuit feedback can occur. When using the DCC conform booster port it is possible to use a longer connection cable.

Pin assignment of the booster ports



	Märklin booster port		DCC booster port
1	short circuit warning wire	1	short circuit warning wire
2	earth	2	data (-)
3	direct voltage appr.+ 19 V	3	data (+)
4	booster "on / off"		
5	data		

Connecting an additional booster

To connect an additional booster please use the Märklin or DCC booster port "still disengaged". Please note: If you have connected a booster via the Märklin-compatible booster port to your central unit you have to connect the additional booster via the "still disengaged" Märklin-compatible booster port. The same goes by analogy for the DCC booster ports.

Hint: Only use boosters of one type and made by one manufacturer to avoid problems such as:

- Problems with data transfer to the decoders.
- Current leakage that make locomotives move by themselves when other locomotives cross the borders between two track sections.
- Short circuits when crossing sections.

Connecting the tracks

Connect the booster's track port to both rails (with 2-rail systems) or to one rail and the middle conductor (with 3-rail systems). These connections should be repeated every 2-3 meters, because the resistance at the connection points of the tracks is quite high. When choosing too high intervals, problems with the short circuit indication or the power supply of the vehicles may occur.



Please note:

The connection order of the rails (or the rail and the middle conductor) to the two poles of the track port is not significant, if you haven't already connected a booster to your layout. If you have then please note:

The left pole of the second booster's track port has to be connected to the same rail (or the the middle conductor) as the left pole of the booster already connected. The same goes of course for the right pole of the boosters' track ports. In case the connections are mixed up short circuits will occur when vehicles cross the boundaries of the track sections.

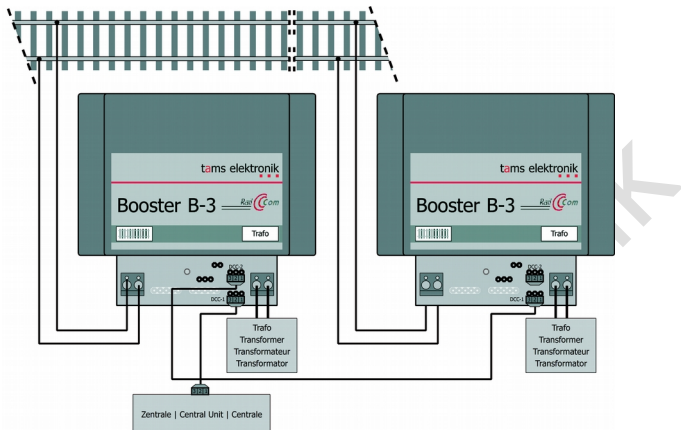
Connecting the power supply

Connect the transformer to the booster's transformer port. The required voltage and the minimum power of the booster depend on the desired track voltage. See section "required materials" on page 4.

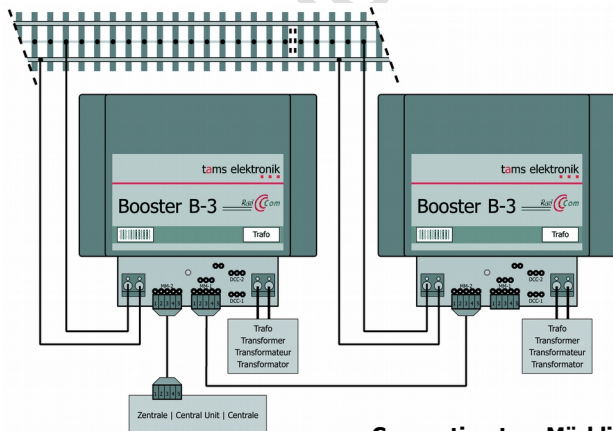


Please note:

You must not interchange the connections to the tracks and to the transformer. Interchanging these connections normally causes damages at the booster, in the worst case beyond repair.



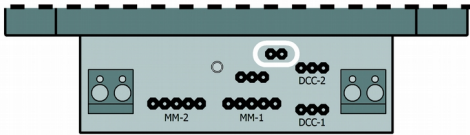
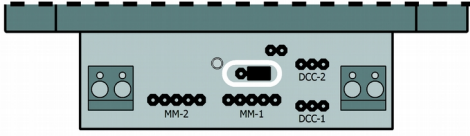
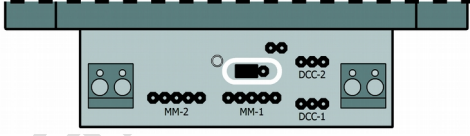
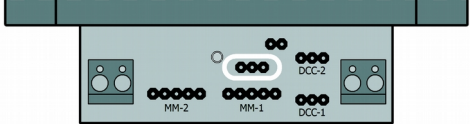
Connection to a DCC port



Connection to a Märklin port

7. Settings

With the B-3, you can set a track voltage of 12, 15 or 19 V and switch on or off RailCom. Position the short circuit jumpers included in the package in concordance with the drawings to the corresponding pins on the PCB.

	<p>Pins open = RailCom off Jumper inserted = RailCom on</p>
	<p>Jumper placed on pin 2 and 3: Track voltage = 12 V</p>
	<p>Jumper placed on pin 1 and 2: Track voltage = 15 V</p>
	<p>Pins open: Track voltage = 19 V</p>

8. Operation

LED

The LED on the front lights or flashes indicating the operation modes or problems that occur.

LED	Meaning
constantly lighting	booster in operation
slowly flashing (apprx. 1 sec. cycle)	no signal from the control unit
quickly flashing	short circuit at the track output

Shunting the boundry between two booster sections

You should take care not to allow locomotives or trains to halt directly on the boundary between two sections. This would lead to a connection between the outputs and possible damaging of the two connected boosters. The short circuit indication does not work under these circumstances.

9. Check list for troubleshooting

- The booster is getting too hot and/or starts to smoke.



Disconnect the system from the mains immediately!

Possible reason: The connections to the track and the power supply have been mixed up. → Alter the connections. Possibly the booster has been damaged.

- The LED at the booster does not light and the locomotives cannot be driven.

Possible reason: The power supply has been interrupted. → Check the connections to the power supply (transformer).

- The LED flashes slowly.

Possible reason: The control unit has been switched off or the connection to the control unit has been interrupted. → Check the control unit and the connections.

- The LED flashes quickly.

Possible reason: There is a short circuit at the track output. Therefore the booster switches off automatically and after approx. 5 seconds automatically on again. In case the short circuit is still there after autostarting, the booster switches off immediately. This procedure is repeated five times, followed by a one minute break.
→ Eliminate the short circuit.

Hotline

If problems with your device occur, our hotline is pleased to help you (mail address on the last page).

Repairs

You can send in a defective device for repair (address on the last page). In case of guarantee the repair is free of charge for you. With damages not covered by guarantee, the maximum fee for the repair is 50 % of the sales price according to our valid price list. We reserve the right to reject the repairing of a device when the repair is impossible for technical or economic reasons.

Please do not send in devices for repair charged to us. In case of warranty we will reimburse the forwarding expenses up to the flat rate we charge according to our valid price list for the delivery of the product. With repairs not covered by guarantee you have to bear the expenses for sending back and forth.

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

11. EU declaration of conformity

 This product conforms with the EC-directives mentioned below and is therefore CE certified.

2004/108/EG on electromagnetic. Underlying standards: EN 55014-1 and EN 61000-6-3. 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, connection diagrams and PCB layout included with this manual.
- Use only original spare parts for repairs.

2011/65/EG on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS). Underlying standard: EN 50581.

12. Declarations conforming to the WEEE directive



This product conforms with the EC-directive 2012/19/EG on waste electrical and electronic equipment (WEEE).

Don't dispose of this product in the house refuse, bring it to the next recycling bay.

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Information and tips:

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

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