TM-26781

Digital booster

User's manual

5 998975 300810

© 2011 BioDigit Ltd.
All rights reserved. It is forbidden to reproduce and/or publish the contents of the present document in any form including electronic and mechanical design without the written permission of BioDigit Ltd.

Safety warning

During the operation of the device the specified technical parameters shall always be met. At the installation the environment shall be fully taken into consideration. The device must not be exposed to moisture and direct sunshine.
A soldering tool may be necessary for the installation and/or mounting of the devices, which requires special care.
During the installation it shall be ensured that the bottom of the device should not contact with a conductive (e.g. metal) surface!

Contents

Features and properties

- Developed for DCC systems
- Short-circuit protected output with 4A limit
- Switching mode – high efficiency
- No heat sink required
- Comprehensive DCC CV programming
- Track voltage regulation
- Control from rail signal and LocoNet
- Remote switching on/off as device decoder
- Status feedback to the LocoNet
- Acoustic warning of short-circuit
- Delayed switch-on
- Automatic restart possibility after short-circuit
- Automatic reversal of polarization (loop reversing method)
- Easily portable compact design

Technical parameters:

Dimensions: 120x78x27 mm
Idle mode current consumption: 40 mA
Max. input current: 5000 mA
Short-circuit protection: 4000 mA (max. 0,5 sec.)
Automatic recovery time: 5-60 sec. (adjustable)
Automatic reversal of polarization: Yes (loop reversing method)
Start-up delay: 5-60 mp (adjustable)
Supply voltage: 12-18V AC / 12-18V DC
Output voltage: 11-19Vp (adjustable)
Connection / disconnection by switch address : Yes (1-2048)
LocoNet status support: Yes (GPON, GPOFF, IDLE)
LocoNet feedback support: Yes (1-2048)
Supported signal format: NMRA DCC

Short description

The digital booster can amplify the DCC signal in digital systems. It enables higher load currents for tracks divided into independent sections.

Applicable supply units

A TM-87380 type 230V safety mains transformer is proposed for supplying the booster.
Parameters of the transformer:
Output voltage: 16V AC
Max. output current: 5A
Power rating: 80 VA
Input voltage: 230V AC
Other transformers type with similar parameters can also be applied. (16V AC, min. 80VA)

Grounding and power supply of the booster

To avoid interferences and ground-loops, in larger networks that containing more boosters, it is required to operate the boosters with a common grounding point. The booster is weakly connected to ground when connection to the LocoNet 1 connector is performed (through 100KOhm internal resistor).
In case the length of the network (exceeding 40 resp. 50 m) requires the use of a separate thicker ground wire, the GROUND connector of the booster shall be used for connecting the common ground wire. (see Figure 2)

Details are given in: http://www.wiringfordcc.com/booster.htm (English)
Attention! Each booster shall be powered by an own supply unit. More boosters shall never be powered from a common power source!

When the booster is operated from LocoNet, the signal arriving from the centre (or the previous booster) shall always be

connected to the LocoNet 1 connector and the extension branch into the LocoNet 2 connector.

Supply voltage

The booster can be supplied by DC or AC as well. In order to achieve appropriate dissipation at the bridge rectifier of the booster, it is definitely preferred to use AC supply.
The AC supply voltage shall never exceed 18V AC!

Connectors

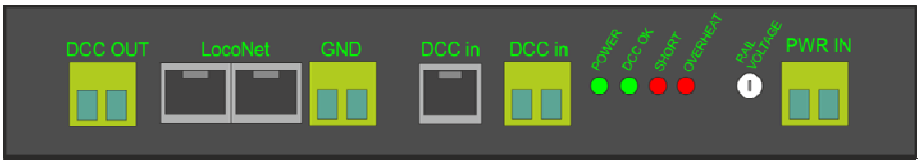
The receiving possibilities of the booster synchronizing signal are described below. Since the booster can be adapted to various systems, it can be perfectly used if supplied from any of its inputs.
Solely fully insulated track sections with both rails cut shall be supplied by the digital booster!

DCC OUT: Boosted signal output.

It is required to pay attention to the correct polarity during connection. In case the isolated rail section is of reversed polarity compared to the previous section, the booster will give a short-circuit signal when the train changes the sections.
Only one sync source can be used at a time. The booster shall never be used with synchronizing of rail signal and signals of other source simultaneously.
DCC IN: Synchronizing signal can be received from the rail signal. This can be applied if neither of the other input signals is available or it is not required to ensure a separate synchronizing signal for the booster.
The input can be used also for receiving the synchronizing signal of Roco, Lenz, Tran, ESU etc. centres.
In this case it shall be considered that a short-circuit status at the previous booster / maybe the centre can cause the breaking of the synchronizing signal from the rail. Now the given booster will shut down, i.e. the output will be turned off.
The input has galvanic isolation.

LOCONET: At a LocoNet type centre the LocoNet bus connection associated with the digital centre contains also the DCC synchronizing signal. According to the LocoNet system the booster contains two RJ12 (6p6c) connectors, whereby more devices can be connected in a daisy chain configuration.
The input has galvanic isolation.
Certain digital centres are provided with separate **LocoNet T** and **LocoNet B** outputs. The digital booster shall always be connected to the "B" (Booster) output.
GROUND: In case of larger track systems it can be required to use a separate grounding wire. In the booster a discharge resistor (>100K resistance) is integrated between point **1** and point **2** of its GROUND connector. The assignment of the GROUND connector is as follows:

1. LocoNet grounding point (core 2 and 5)
2. Internal grounding point of the booster



Signals

The booster contains signalling LEDs showing the following operating statuses:

PWR LED	DCC LED	SHORT LED	OVERHEAT LED	Mode
Dark	Dark	Dark	Dark	The device is out of operation. No supply voltage.
Blink	Dark	Dark	Dark	Delay after start-up.
Light	Dark	Dark	Dark	The device operates. No synchronizing signal.
Light	Blink	Dark	Dark	The device operates. Synchronizing signal containing errors.
Light	Light	Dark	Dark	The device operates.

-	-	Flash	Dark	Short circuit protection activated.
-	-	Dark	Flash	Booster is overheated.

Prevent the booster from being under continuous short-circuit status. If the device indicates more short-circuits in short intervals it shall be determined whether this was caused by overload or real short-circuit.
Overload shall be tested by removing some engines or waggons or other loads from the given track section to examine the presence of the short-circuit.

Thermal protection

The booster has an integrated thermal protection. In case the internal temperature exceeds 75°C, the booster stops with an overheat signal. If the internal temperature decreases below 50°C, the outputs are automatically turned on again.
Attention! Tripping of the thermal protection during permanent operation generally means insufficient wiring and/or a low-capacity transformer. Never open the device, when the thermal protection tripped for faster cool-down!

Switching-in/-out of the output voltage

If the synchronizing signal is missing or regularly contains errors, the output will be automatically turned off to protecting the connected devices from faulty operation.
The output of the booster is provided with the possibility of remote switching-in/out by accessory commands. The address can be adjusted by traditional CV settings. Default status of the remote control is "Not permitted" (address = 0).
The address is contained by the CV119 and CV120 and can be calculated as follows:

e.g. Required address: 1410
1410/256 = 5 with remainder 130

CV119 value: 5
CV120 value: 130

Feedback of the operating status

Feedback of the operating status works by traditional feedback addresses, to the LocoNet system. Default status of the feedback is "Not permitted" (address = 0)
The address of the device giving the feedback is contained by the CV122 and the CV123 and can be calculated as follows:

e.g. Required address decimal value: 509
509/256 = 1 with remainder 253
CV122 value: 1
CV123 value: 253

Startup delay

Startup delay can be adjusted in a wide range. With this delay it can be avoided that faulty data get on the rail from the digital centre before its starting. The startup delay can be adjusted between 0 and 60 sec. by the CV126 in one second steps.

Recovery delay

In case of short-circuit the booster automatically resets. Due to the delay the booster will not be permanently overloaded.
The recovery delay can be adjusted between 5 and 60 sec. by the CV127 in one second steps.
Automatic recovery can be disabled by the CV125. (see the CV table)

Short-circuit current

If the booster is used for smaller (less consumption) sections, it is practicable to adjust the short-circuit current to a lower value for the protection of the model railroad layout wires and the devices.
The short-circuit tripping current can be adjusted between 0,5A and 4A in 0,1A steps using the CV128.

e.g. Required short-circuit tripping current: 3,5A
3,5A = 35*0,1A => CV128 = 35
Short-circuit delay: 0,5 sec.

Polarity change current limit

The booster can be applied also as an automatic reverse loop. Loop reversing will automatically occur in case of sudden current change provided that automatic polarity change is permitted.
Enable / Disable: CV125 (see CV table)
The polarity change current limit can be adjusted between 0,5A and 4A in 0,1A steps using the CV129.
e.g. Required polarity change current limit: 2A
2A = 20*0,1A => CV129 = 20
Attention! It is practicable to adjust the polarity change current limit at a lower value. Thus the sudden "stalling" of the vehicle passing along the section can be avoided.
At polarity change there is no short-circuit delay.

Programming of the parameters

The parameters can be modified by the DirectCV programming method. The booster supports the Write, Read and Verify commands.
To achieve this programming method the "DCC IN" connector of the booster is to be connected directly to the PROG OUT or normal output connector of the digital centre. During programming attention shall be paid to the appropriate power supply of the booster (PWR IN).
The booster responds towards the centre by an ACK (acknowledge) known in decoder programming, provided that the entered value is valid. If after programming the digital centre returns an Error, the value to be entered into the CV is outside the valid range, or the address of the CV is not suitable.

CV address	Parameter name	Default	Range
7, 112	Version number	-	-
8, 113	Manufacturer identifier	61	- *
119	Switch address (upper)	0	0-8
120	Switch address (lower)	0	0-255
121	Switch operation mode 0/1 = Inverse operation mode	0	0-1
122	Feedback address (upper)	0	0-8
123	Feedback address (lower)	0	0-255
124	Feedback operation mode 0/1 = Inverse operation mode	0	0-1
125	Configuration 0/1 = Automatic restart 0/2 = Automatic polarity change	1	0-3
126	Startup delay (sec.)	2	0-60
127	Recovery delay (sec.)	5	5-60
128	Short-circuit tripping current (Ampere*10)	40	5-40
129	Polarity change current limit (Ampere*10)	20	5-40

* Entering any value into the CV8/CV113 forces reset to the default parameter values.

Attention! The booster /boosters shall always be separately connected to the programming signal, otherwise all boosters connected to a common signal line will be programmed to equal values.

Guarantee and legal statement

Each parameter of the device will be submitted to comprehensive testing prior to marketing. The manufacturer undertakes one year guarantee for the product. Defects occurred during this period will be repaired by the manufacturer free of charge against the presentation of the invoice.

The validity of the guarantee will cease in case of improper usage and/or treatment.

Attention! By virtue of the European EMC directives the product can be used solely with devices provided with CE marking.

The mentioned standards and brand names are the trademarks of the firms concerned.

TrainModules *®: BioDigit Ltd.*
LocoNet*®: Digitrax Inc.*
XpressNet*®: Lenz GmbH*
Roco*®: Roco Modellesienbahn GmbH*
NMRA DCC*: National Model Railroad Association*

TrainModules – BioDigit Ltd
Kerepesi street 92.
H-1144, Budapest

Made in Hungary.

Tel.:+36 1 46-707-64
http://www.trainmodules.hu/

Figure 1. Wiring of digital booster

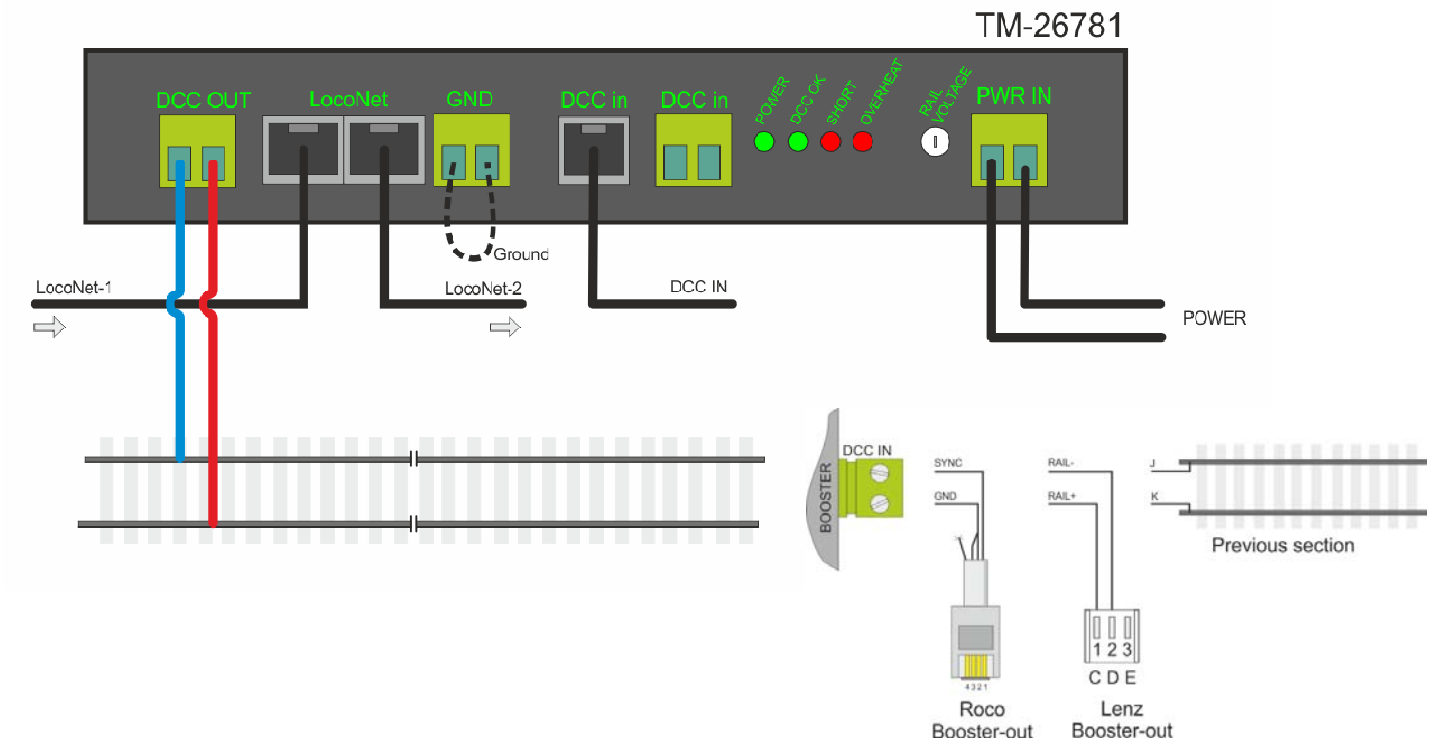


Figure 2. Large layout network grounding