

# Power 3

The Multiprotocol Power System

## User's Manual



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# 1. General

## 1.1 Description

Power 3 is a short-circuit-proof 3-ampere booster capable of handling different data transfer formats. It features a selectable automatic return-loop handling, and its operation mode may be changed over to work as a NMRA-compatible DCC brake generator.

The device is compatible with Central Units of Uhlenbrock, Arnold, Lenz, and Märklin.

## 1.2 Technical data

### Maximal input voltage

18 VAC

### Maximal track current

3 amperes

All outputs are short-circuit proof.

### Dimensions

180 x 136 x 80 mm (7 <sup>1</sup>/<sub>8</sub> x 5 <sup>3</sup>/<sub>8</sub> x 3 <sup>3</sup>/<sub>16</sub> inches)

### Required transformer capacity

52 - 70 VA

## 2. Setup

In the following, the connectors of Power 3 are described together with the necessary hookup instructions

### 2.1 Connector definition

*Pict. 2.11  
Rear side showing  
all connectors*



- 1 6-pole male connector: Transformer, track, return loop
- 2 5-pole male connector: Next booster or Central Unit
- 3 5-pole male connector: Next booster or Central Unit
- 4 3-pole male connector: DCC Central Unit
- 5 4-pole DIP switch: Operation mode

### 2.2 Plug wiring

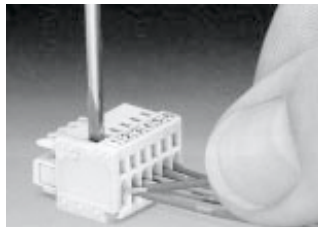
*Pict.2.21  
Rear side showing  
all connectors*

The device comes with two plugs for connection of transformer, track, return loop, and DCC Central Unit. The necessary wires have to be inserted into their spring-loaded terminals.

The terminal identifiers are shown on the picture beside.



*Pict. 2.22  
Plug terminal  
identifiers*



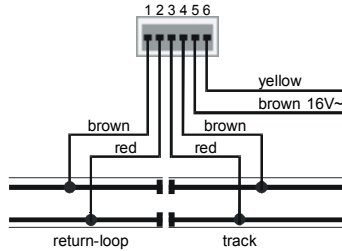
The leads have to be made from either solid or stranded wire of 0,25 mm<sup>2</sup> (AWG 23/SWG 24). Insulation must be stripped off for 6 mm (¼ in) at the end. Stranded wire must either be twisted or tinned.

Use a small screwdriver of 2 mm (0.08 in), insert it in the upper opening and push down the spring slightly. Slide the stripped end of the lead into the terminal. Release the screwdriver and the wire will be held firmly in position.

## 2.3 Hookup of transformer and track

Transformer, track, and return-loop are all hooked up to connector #1. The plug terminals are designated as follows:

Pict. 2.31  
6-pole plug terminal  
designations



- 1 return-loop
- 2 return-loop
- 3 track feeder N digital (Märklin red)
- 4 track feeder S digital (Märklin brown)
- 5 16 V AC input - common (Märklin brown)
- 6 16 V AC input - phase (Märklin yellow)

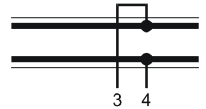
### Transformer requirements

For trouble-free operation, the transformer must be able to supply 52 VA at 16 VAC minimally. Under full load, we recommend a 70 VA transformer such as the Uhlenbrock type 20 070. The voltage should not exceed 18 VAC. The transformer must be connected to the terminals #5 (brown) and #6 (yellow) of the plug.

Pict. 2.32  
2-rail hookup

### 2-rail track

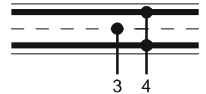
2-rail track is connected to terminals #3 and #4 of the plug.



Pict. 2.33  
3-rail hookup

### 3-rail track

3-rail track (Märklin) is connected by inserting the brown lead into terminal #4 and the red lead (center conductor) into terminal #3.

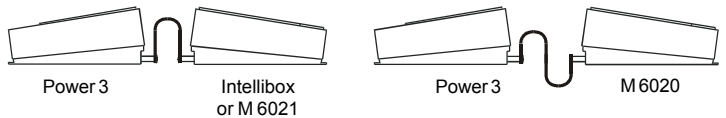


## 2.4 Connection to the Central Unit

Either Intellibox or Märklin Central Unit may be used. Electrical connection is achieved by a ribbon-cable supplied with Power 3.

Connector 2 of booster is linked to connector 5 of the Intellibox or the booster connector of the Märklin Central Unit.

Pict. 2.41  
Way of connecting  
the ribbon-cable with  
booster and different  
Central Units



The plugs have to be oriented upwards for Uhlenbrock devices and M 6021, and downwards for M 6020.

## 2.5 Connection to a DCC Central Unit

Connector 4 is used for DCC input. It is also possible to use the booster in connection with a Lenz LZ100 Central Unit or an Arnold 86200 Central Unit.

Pict. 2.51  
3-pole plug terminal  
assignments

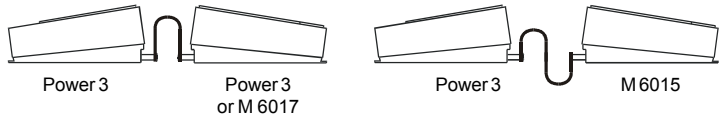


- 1 C = Signal N
- 2 D = Signal S
- 3 E = Short circuit indication

## 2.6 Adding more boosters

Connector 3 is used for connecting another Power 3 or Märklin boosters 6015 or 6017.

Pict. 2.61  
Way of connecting the  
ribbon-cable with  
Power 3 and different  
boosters



The plugs have to be oriented upwards for Uhlenbrock devices and M 6017, and downwards for M 6015.

## 2.7 Selection of operating mode

Dip-switch 5 selects the different operating modes of the device.

- 1 Input selector Intellibox-Märklin or DCC
- 2 Brake generator mode on/off
- 3 Automatic return-loop handling on/off
- 4 Voltage limit on/off

Power 3 DIP-switch setting	DIP-switch no.	1	2	3	4
	 ON OFF	Motorola input	OFF		
DCC input		ON			
Booster without return-loop			OFF	OFF	
Booster with return-loop			OFF	ON	
Break generator mode			ON	OFF	
Voltage limit (H0 and bigger)					OFF
Voltage limit max. 18 V (N)					ON

## 3. Booster

### 3.1 Description

Power 3 delivers a current of 3 amperes. The output is short-circuit proof.

The device can be used in conjunction with different digital Central Units. When used with an Intellibox, it will deliver Motorola, DCC, and Selectrix data formats to the track.

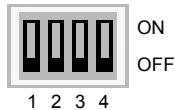
When used with a Märklin, Lenz, or Arnold Central Unit it will transfer the data format supplied by these.

It is not possible to operate the device together with a Selectrix Central Unit.

### 3.2 Selection of control input connector

Power 3 may work on input provided by Motorola- or DCC Central Units. Depending on the data format, these Central Units are jacked to different connectors. The DIP-switch on the rear side of the device must be set accordingly.

Pict. 3.21  
DIP-switch  
of Power 3



*Switch 1 OFF* - when the device is connected to an Intellibox or a Märklin Central Unit via connector 2.

*Switch 1 ON* - when the device is connected to a DCC Central Unit (Lenz LZ100, Arnold 86200) via connector 4.

### 3.3 Output voltage limiting

The output voltage depends on the transformer used and the load present. A standard 16 V AC transformer delivers a no-load peak voltage of 22 V.

As this is too high for the smaller scales, it can be limited to a peak value of 18 V for e.g. N scale.

*Switch 4 OFF* - no output voltage limit

*Switch 4 ON* - the peak voltage is limited to 18V



### **3.4 DCC-operation without feedback to the Central Unit**

If a booster is feeding a track sector and the short-circuit feedback to the Central Unit is not desired, this booster must be connected by the DCC-input. Only C and D terminals are used (refer to connection of a DCC Central Unit)

In case of a short, the booster will cut the track power for 10 seconds. If the short-circuit continues, it will cut it out for 10 seconds again.

**IMPORTANT** If this mode is used in conjunction with an Intellibox, Selectrix decoders cannot be operated in the sectors fed by this booster.

## 4. Automatic return-loop handling

### 4.1 Description

When using 2-rail track, a return loop will always create a short-circuit and the booster will shut down. This is valid for analog and for digital operation.

A gapped sector within the loop eliminates this condition. It has to have its special supply so that a vehicle can go through the loop without difficulty.

Power 3 offers such a supply module with isolated outputs for 2-rail operation (DCC, Märklin Gauge 1, Selectrix). Any number of return-loops may be connected to it subject to the limitation that only one can be crossed by a vehicle at a time.

### 4.2 Activation of return-loop handling

The DIP-switches on the rear of Power 3 must be set for 'booster with return-loop handling' mode.

Switch 3 ON - activate return-loop handling

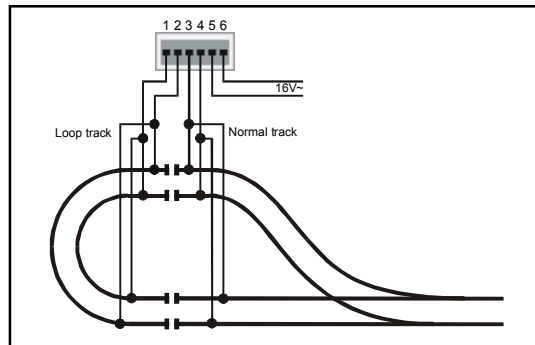
Switch 2 OFF - deactivate brake generator mode

**IMPORTANT** When handling return-loops, brake-generator mode must be off.

### 4.3 Connection

The return-loop is fed by a 6-pole plug attached to connector 1 of Power 3.

Refer to the following schematic showing the loop track connected to terminals 1 and 2, and the normal track(s) connected to terminals 3 (red) and 4 (brown).



*Pict. 4.31*  
Connection of a  
return-loop

**CAUTION** Both rails of the loop track must be gapped!

**IMPORTANT** Tracks immediately adjacent to the return-loop must be fed by the booster that controls the loop.

As the loop control is activated by a vehicle crossing the gaps, feeders from the booster running to loop and normal trackage should be placed close to them.

## 5. Break generator

### 5.1 Description

A brake generator takes care of the prototypical deceleration of DCC-locos in front of a signal showing 'danger'. The loco will slow down according to the rate set in its decoder CV.

A particular 'brake' signal triggers this action. Moreover, a special circuitry has to avoid short circuits between the braking section and the remainder of the track when a vehicle crosses the gap.

The brake generator monitors every individual braking section. As soon as a train is completely within the section, the brake generator takes over.

### 5.2 Selection of control input connector

The Power 3's data signal may derive from a Motorola- or a DCC Central Unit. They are connected to different inputs depending on the data format. Moreover, the DIP-switch on the booster's rear side must reflect this selection.

*Switch 1 OFF* - when the device is connected to an Intellibox or a Märklin Central Unit via connector 2.

*Switch 1 ON* - when the device is connected to a DCC Central Unit (Lenz LZ100, Arnold 86200) via connector 4.

### 5.3 Selection of operating mode

In order to use the Power 3 as a brake generator, the DIP-switches on the rear side must be set accordingly.

*Switch 2 ON* - Brake generator mode on

*Switch 3 OFF* - Booster mode off

### 5.4 Connection

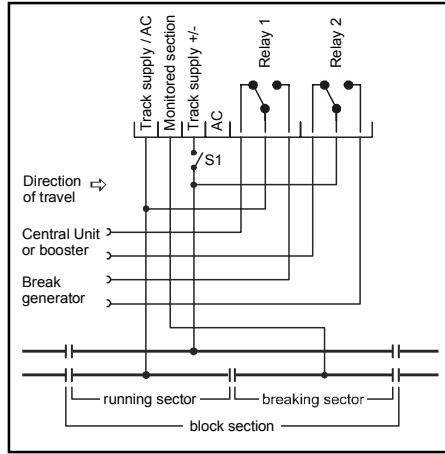
A section in front of a distant signal is subdivided into a running and a braking sector. They are switched over to brake generator operation by an occupancy detector as soon as the train enters the braking sector. Therefore, the running sector must be made a trifle longer than the longest train in order to avoid shorts.

The length of the braking sector must be chosen in such a way that all locos with a set deceleration will come to a full stop within.

The changeover to braking can be achieved e.g. by occupancy detector with relay, item #43 400.

The power supply can be provided by the Intellibox's booster, another Power 3 (item # 65 600), or a Märklin booster (6015 or 6017).

Switch S1 must be a NC type. It may be taken from the block signal or a relay contact. Switching the signal to 'proceed' must open S1, so that the occupancy detector (GBM) is not activated.



Pict. 5.41  
Possible circuit  
employing a GBM  
occupancy detector

The whole block section is fed by a Central Unit or a booster in this case.

When the signal is set to 'danger', S1 closes and the occupancy detector (e.g. GBM 43400) monitors the braking sector.

As soon as a vehicle enters it, the whole block section's supply will be taken over by the brake generator.

### 5.5 Brake generator operation without connection to a Central Unit

If the booster is used as a braking generator without short-circuit feedback and control by the Central Unit, the operation mode has to be set to brake generator and Motorola input. A cable connection to the Central Unit is not needed in this case.

In case of a short, the booster will cut the track power for 10 seconds. If the short-circuit continues, it will cut it out for 10 seconds again. The braking sector cannot be switched off by the Central Unit.

## 6. Error indications

Power 3 indicates errors and failures by different blinking sequences of the red and green LEDs.

**green LED on - red LED off**

'go'-key depressed

Track voltage present (normal operation)

**red LED on - green LED off**

'stop'-key depressed

Track voltage cut by the Central Unit

**green LED off - red LED flashing**

Short circuit indication

**LEDs flash alternatively red and green**

Overheating, track voltage is off

**LEDs flash alternatively one time red and two times green**

No data input signal present

**LEDs flash alternatively one time red and three times green**

External voltage present at outputs when Power 3 is switched on

## **HOTLINE**

**Any problems?**

**Please e-mail to  
info@uhlenbrock.de**