

# MODELLBAHN DIGITAL

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## Module kit Power-Pack for Selectrix®

PPS6A  
v1-2006

with 6A continuous output current and  
electronic short circuit protection



**Degree of difficulty:** easy  
average  
difficult

**The Booster module Power-Pack PPS6A is a power amplifier for Selectrix controlled model railways to increase the maximum track current capacity of the system.**

An assembled PPS6A module connects to the PX-bus in the system central unit and to an external power supply (e.g. a transformer 15V, 90W). Digital control signal in boosters' outputs is identical to the output of the system central unit.

### Required capabilities:

- Extensive assembling and soldering of the PCB
- Exact mounting of power transistors

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## Specifications

### Measures

104mm x 77mm x 40mm

### Installation notes

The assembled Power-Pack module should be placed on an easy to reach, dry and well ventilated spot under the model railway layout. Use the plastic spacer rings included in the kit in the installation.

**Under no circumstances must the booster be subjected to heat accumulation!**

Also, it is vital to ensure that the booster's power connection wires have a sufficient diameter (minimum 1mm<sup>2</sup>).

### Power feed connection

The Power-Pack required a suitable external power supply.

Alternating current: about 15V, 90W, resp.

Direct current: about 20V, 90W

### Output current

Continuous current 6A, sustained short circuit proof:

Electronic short circuit protection with a red indicator LED and an automatic reset function once the short circuit is. Load warning indicator activating at 80% of the maximum load level.

### Connections

2x 2-pin screw clamp for power feed (AC-IN) and power output

2x mounted DIN sockets for PX-Bus

1x 10-pin double row pin header for 3 status LED's, ammeter and 5V output

### Indicators:

Yellow LED: Power-Pack's power feed

Green LED: SX-bus signal on (Central Unit)

Red LED: Overload/short circuit

### Selectrix PX-bus connection

The Power-Pack is connected to Central Unit's PX-bus using the cable shipped with the kit.

**The Power-Pack must never be connected to Selectrix SX-bus!**

### Assembly notes

The Power-Pack module kit PPS6A is assembled following the instructions on the next page. For soldering the components on the printed circuit board, a soldering iron of 12 to 25 Watts or a soldering station with the temperature set to approx. 350°C is necessary 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 in a speedy way not to overheat and destroy devices.

### Kit contents

Please first verify that the kit contains all the devices according to the kit contents listed on the right side.

### Non use of the kit

When the Power-Pack is not used it shall be stored at a dry and clean location.

For any questions please consult the FAQ-Section of our website, first: [www.firma-staerz.de](http://www.firma-staerz.de).

## Kit contents

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

### General parts:

- 1x printed circuit board 104x77mm
- 1x IC LM339
- 1x rectifier KBU6B
- 3x LED's (red, yellow, green)
- 2x 2-pin screw clamps
- 2x mounted DIN sockets for PX-bus
- 1x double row pin header
- 1x heat sink
- 2x mica insulator
- 2x insulating sleeve
- 7x machine screws
- 4x wood screws
- 4x spacer rings
- 1x PX-bus cable

### Transistors:

- 2x IRFZ44
- 2x IRF9Z34 (or SFP9Z34)
- 5x BC557B
- 7x BC547B

### Capacitors (marked):

- 3x ceramic 100nF (104Z)
- 1x ceramic 470nF (474M or 0,47/100)
- 4x ceramic 150pF (151K)
- 1x ceramic 1nF (102Z)
- 2x electrolytic 10µF
- 2x electrolytic 4700µF (4700µF35V)

### Diodes (marked):

- 1x BZX55/C5V1 (C5V1)
- 4x ZPD15V (C15)
- 5x ZPD4V3 (C4V3)
- 8x 1N4148 (4148)

### Resistors (marked):

- 1x SMD 0,01Ohm (R010)
- 1x power resistor 0,10Ohm
- 3x 100kOhm (brown, black, black, orange, brown)
- 7x 10kOhm (brown, black, black, red, brown)
- 1x 1MOhm (brown, black, black, yellow, brown)
- 9x 22kOhm (red, red, black, red, brown)
- 5x 2,2kOhm (red, red, black, brown, brown)
- 9x 2,7kOhm (red, lilac, black, brown, brown)
- 1x 330kOhm (orange, orange, black, orange, brown)
- 1x 470Ohm (yellow, lilac, black, black, brown)

## Assembly instructions

Assemble the kit in the order of these instructions. All the components are placed on the top side of the printed circuit board (marked „Top“) as close to the PCB as possible and soldered on the bottom side of the board (marked „Bottom“). Use a bending tool (for example Conrad 425869) to bend devices. Cut the leads of components flush using a wire cutter after soldering.

### Be careful when soldering components!

#### 1. SMD resistor (R35)

Resistor R35 is soldered on the top side of the PCB. Attach the resistor on its place using a small piece of scotch to hold and solder the ends of the resistor. Make sure that the solder forms a bridge to the bottom side of the PCB and fix the soldering if this is not the case.

#### 2. Resistors

Bend the resistor leads for 7.5 mm pitch. To facilitate placing components on the PCB, support the edges of the board with the help of two books, for instance, in order to leave enough space for the leads under the board. Insert the resistors on board aligning the colored rings of all the resistors in the same way to make it easier to verify the size of resistors later. Place a suitable 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 and check that they are positioned properly before soldering the other end of each resistor.

Solder resistors by groups of similar value before proceeding to the next group.

R22: 470Ohm (yellow, lilac, black, black, brown)  
 R23: 1MOhm (brown, black, black, yellow, brown)  
 R32: 330kOhm (orange, orange, black, orange, brown)  
 R6, R11, R21: 100kOhm (brown, black, black, orange, brown)  
 R1, R2, R5, R9, R10, R14, R19: 10kOhm (brown, black, black, red, brown)  
 R15, R17, R20, R25, R26, R27, R28, R31, R33: 22kOhm (red, red, black, red, brown)  
 R7, R8, R18, R29, R30: 2,2kOhm (red, red, black, brown, brown)  
 R3, R4, R12, R13, R24, R34, R36, R37, R38: 2,7kOhm (red, lilac, black, brown, brown)

### 3. Diodes

Proceed as with resistors. Note the polarity of diodes: the stripe on a diode must match the corresponding stripe printed on the circuit board.

D5: BZX55/C5V1 („C5V1“)  
 D6, D7, D9, D10: ZPD15V („C15“)  
 D1, D2, D8, D11, D18: ZPD4V3 („C4V3“)  
 D4, D12-D17, D19: 1N4148 („4148“)

### 4. IC

The notch must be facing capacitor C12.

### 5. Light emitting diodes (LEDs)

The cathode of the LEDs must face the edge of the PCB (legend). The shorter lead of the diode is the cathode and the collar is also flat on the cathode side.

H1: yellow, H2: red, H3: green

### 6. Power resistor

Bend the resistor leads for 35 mm pitch and solder in place.

### 7. Ceramic and foil capacitors

Proceed as with resistors.

C1, C2, C12: ceramic 100nF (104Z)  
 C13: ceramic 470nF (474M Z5U50)  
 C6, C7, C8, C9: ceramic 150pF (151K)  
 C11: ceramic 1nF (102Z)

### 8. Transistors BC547B und BC557B

Hear note especially the alignment of transistors.

V1, V8, V11, V12, V13, V15, V16: BC547B  
 V2, V7, V9, V10, V14: BC557B

### 9. Screw clamps and pin header

Make sure that screw clamps are not deformed while soldering. Observe that the pins reach the opposite side of the PCB.

### 10. Electrolytic capacitors (Observe the polarity!)

The negative terminal side of the capacitor must be facing the clamps.

C5, C10: 10μF

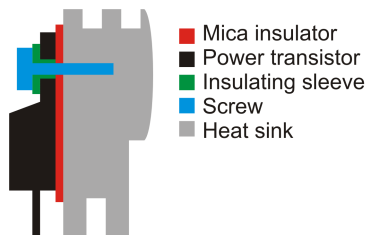
### 11. PX bus sockets

### 12. Heat sink

Align the heat sink with the circuit board edge and secure in place with screws.

### 13. Power transistors and rectifier

Power transistors IRF9Z34 and IRFZ44 (V3, V4) must be equipped with mica insulators and plastic insulator plate to insulate them electrically from the heat sink. Observe the order of installation: V3, V4, V6, V5 = IRF9Z34, IRFZ44, IRFZ44, IRF9Z34. Align the rectifier's (KBU6B) text towards the clamps. Screw the power transistors and rectifier first to the heat sink before soldering. Pay attention to the insulation of the two power transistors as illustrated.

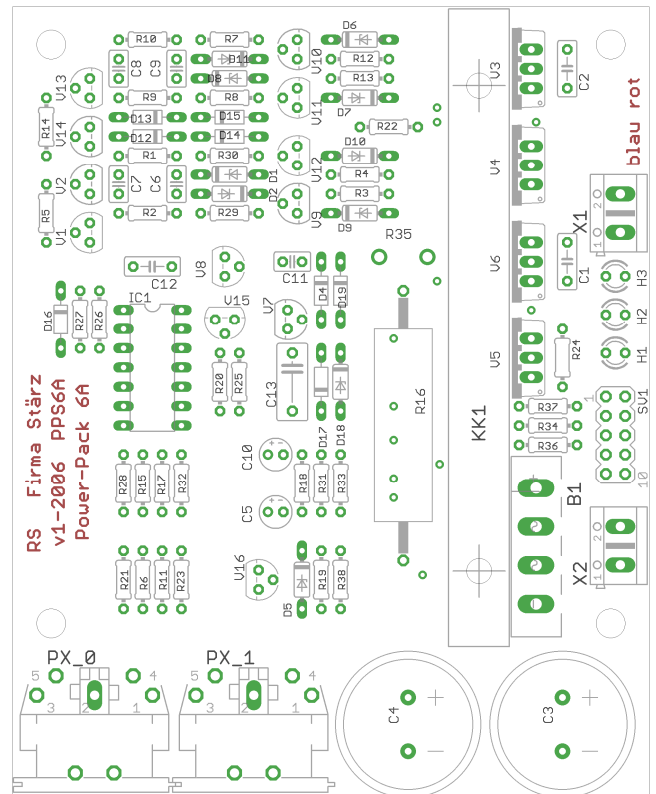


### 14. Electrolytic capacitors (Observe the polarity!)

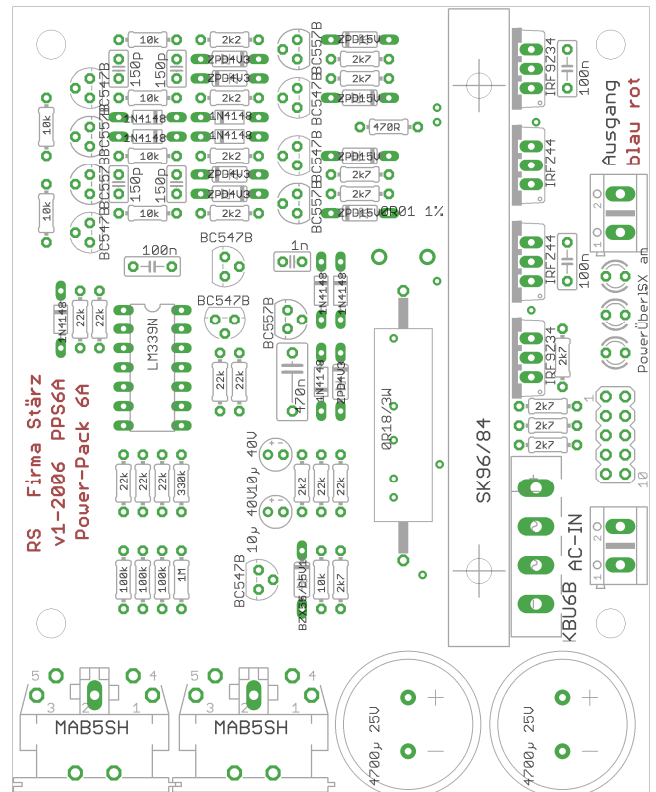
The negative terminal side of the capacitor must be facing the circuit board edge.

C3, C4: 4700μF

## Component layout diagram of the PCB



## Populated PCB



## 15. Quality control

When all the components are soldered on the PCB, verify that they are placed according to the silkscreen layout on the PCB and that all the components are oriented properly. Check that all the solder points on the reverse side of the PCB look correct. Note especially if there are any undesired solder bridges between solder pads. Verify that holes under the SMD resistor are completely filled with solder.

## Operation description

### Power supply and wiring

The Power-Pack should have its own dedicated power supply, a transformer with about 15V, 90W output. Use wire thick enough for Power-Pack current (minimum 1mm<sup>2</sup> wire) to avoid voltage drop. To feed the track of the Power-Pack, we recommend observing the wire color coding marked on the Power-Pack (rot = red, blau = blue). If there is a momentary short circuit when a locomotive moves between circuits powered by different Power-Packs or central unit, the polarity of the two circuits is opposite. In such a case the polarity of one of the circuits should be corrected.

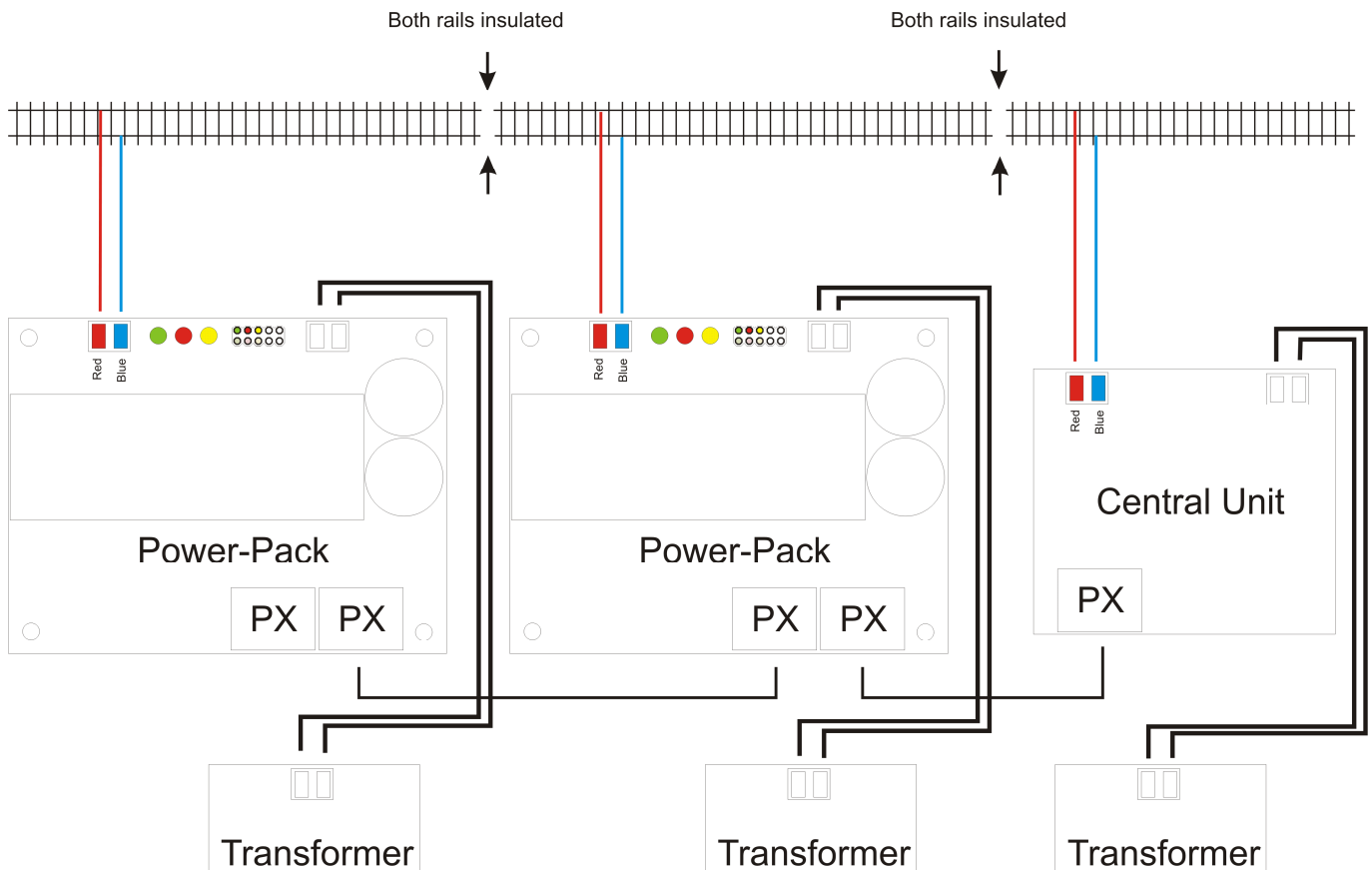
### Heat

With constant maximum output current of Power-Pack (6A) the heat sink will reach the temperature of about 70°C. Therefore the Power-Pack should not be placed inside the layout (e.g. next to polystyrene scenery). Place the Power-Pack in a spot where the air can circulate freely around it.

### Indicator LED's

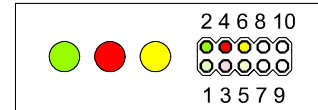
Power-Pack is equipped with three status indicator LED's. Yellow LED is the power indicator. When the Power-Pack is powered from its power transformer, yellow LED is on. Green LED is on when the Power-Pack is feeding current to the track. The system is in On or Start state. Red LED is an indicator of short circuit or overload situations. When the Power-Pack output current is close to the maximum output, the red LED starts to blink. At 80% level of the maximum output (about 5.6 A), the light stays on. When the Power-Pack reaches its maximum output current it switches itself off. The green light is off in this situation and the Power-Pack will attempt to turn the track power on in regular intervals. This is indicated by blinking green and red lights. If the short circuit situation has been solved, the Power-Pack will restore its normal operation.

### Connection scheme



### Pin header

The double row pin header allows connecting external status indicator LED's and an ammeter to Power-Pack. The pin arrangement is shown in the picture below. The three LED's are connected to pin pairs 1-2, 3-4 and 5-6. The cathodes (shorter legs) of LED's must be connected to even numbered pins (2, 4, 6). Pins 7 and 8 are for connecting an ammeter to indicate the output current of the Power-Pack. An ordinary standard multi meter or panel meter can be used (e.g. Conrad cat. no. 121142). The voltage in pins 7 and 8 is proportional to the Power-Pack output current. The range of the voltage measuring instrument should be 100mV (200mV). 1A direct current of Power-Pack output corresponds to 10mV. For powering the instrument there is a 5V direct current output in pins 9 and 10 (pin 9 = 5V, pin 10 = ground) available.



### Connection to PX data bus

Use the included cable to connect the Power-Pack's PX socket to the PX socket of the central unit.

**Do not connect the Power-Pack to Selectrix data bus (SX)!**

### Maintenance

Clumping of dust in combination with condensing liquids may under circumstances become conducting and affect the functionality of the Power-Pack in a negative way. That's why the Power-Pack should be cleaned from dust by blowing off or vacuuming off from time to time.

The usage of any kind of liquid for cleaning is expressly prohibited.