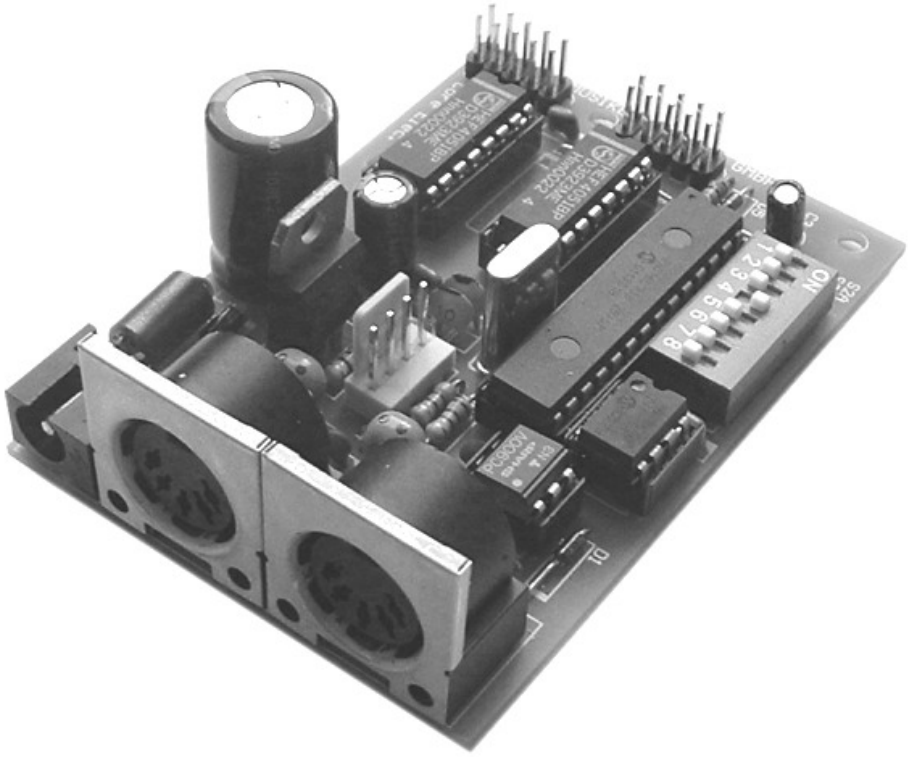
DOEPFER MUSIKELEKTRONIK GMBH



POCKET ELECTRONICS

(Universal Midi Control Electronics)
Installation and User's Guide

Table of contents

Electrical safety / EMC compatibility

POCKET ELECTRONICS (abbreviated "*PE*" in the following) is a so-called **OEM product** (OEM original equipment manufacturer) that cannot be used independently but has to be combined with additional electrical or electronical equipment to become a working device (e.g. potentiometers, switches, power supply, case/housing). The manufacturer of *PE* does not know the final assembly of the complete device in which the *PE* is used as a part of the complete device. The final responsibility with regard to **electrical safety** and **electromagnetic compatibility** is up to the user who is assembling the complete device.

Electronic basic knowledge is required to install PE and to connect the controls resp. control voltages. If you are not sure whether your knowledge is sufficient please consult an expert. We cannot take back modules that became defective because of wrong installation or wrong connection of the controls or voltages.

Please pay attention to the following items:

The **power supply** used in combination with the *PE* has to be a closed type (in Germany a power supply with VDE approval is required). Normally an AC adapter with plastic case is used. It is not allowed to use **open power supplies** whith open **mains voltage** access (e.g. via mains lead, pcb tracks, electronic parts).

On the *PE* **preventing measures** against **electromagnetic radiation** are taken (RF filters at the power supply input and the Midi lines). But it is impossible to estimate to what extend the **components added by the user** affect the **EMC properties** of the complete assembly. Therefore the **complete device** has to be **shielded** against **electromagnetic radiation** (incoming and outgoing)**.** These demands are normally met by a closed metal case that covers the complete assembly. The metal case should be connected to GND of the *PE*.

Warranty

- Applying any negative voltage (< 0V) or positive voltage above +5V (> +5V) to one of the 16 analog inputs (JP1, JP2) will destroy the circuit !
- If potentiometers and/or switches are connected between GND and +5V of *PE* as described in this manual no problems will occur.
- When external control voltages are connected to *PE* the user has to pay attention that the voltages applied are strictly within GND and +5V referenced to GND of *PE* !
- Do not solder directly to any of the pin headers but use female connectors to make the connections between *PE* and the potentiometers, switches or voltages. A cable set that contains all required connectors and cables is included with *PE*.
- Carry out all connections in the off-state of *PE* (i.e. when powered-off only) !
- Do not power on *PE* (i.e. do not connect the power supply to the corresponding jack socket) before all 16 analog inputs are connected. Do not leave analog inputs unconnected !
- The 4-pin connector is allowed to connect a button and LED only as described in the manual. Do not connect any other electronic parts or voltages.
- *PE* electronics is an electrostatic sensitive device. Avoid any electrostatic charges ! Do not touch the analog inputs with your fingers !
- Avoid short circuits !
- Ignoring any of these items will cause warranty loss !
- Return of the *PE* within the 2 weeks return time limit (valid only in Germany) is only possible if all these items have been met. Return of used cable sets is not possible. We also cannot take back modules that have been soldered by the user.

Introduction

- This manual describes only the connections of the controls resp. control voltages to *PE* (potentiometers, switches, buttons, LED). *PE* essentially contains the electronics core of **Pocket Control** but without the 16 controls (i.e. without rotary potentiometers). Concerning the Midi functions *PE* is identical to Pocket Control. Therefore the user's manual of Pocket Control is part of the *PE* delivery. The basic functions of *PE* and the programming of the Midi functions is described in the Pocket Control manual.
- *PE* is an universal electronics DIY kit to built your own Midi control box. Up to 16 controls can be connected to *PE* transmitting 16 different Midi messages on different (or even the same) Midi channels. The available Midi messages are described in the Pocket Control manual. The most important messages are probably the Midi Control Change messages – often simply called "Midi controllers". In the following we are sometimes talking about Midi controllers though other Midi messages are possible.
- Typical examples for controls that can be used are rotary potentiometers, fader/slider potentiometers, momentary switches, toggle switches, foot switches or foot controllers). The controls are not included but have to be added by the customer.
- Even voltages sources can be used instead of the controls provided that the voltages applied are strictly within the range 0...+5V (referenced to *PE* GND)! Voltages beyond this range will destroy the electronics !
- The *PE* configuration (i.e. the assignment of Midi messages and channels to the controls in the 128 presets) is made with a editor program (PC version, free download from our web site www.doepfer.com). It enables the user to program his own 128 presets. The OEM version of Emagic's Sounddiver is available too (extra charge).
- The factory presets are described in the the Pocket Control manual. These can be changed with the editor program.
- The 16 controls resp. control voltages are connected to double row pinheaders (10 pins each). To these headers two 10 pin ribbon cables are put up. The terminals of the controls are soldered to the free ends of the ribbon cables. In this way the controls might be disconnected from the electronics very easily.
- *PE* is equipped with Midi In and Midi Out. The incoming Midi messages are merged to the data generated by *PE*. In this way several *PE* can be linked together to obtain larger controller arrays with more than 16 controls.
- *PE* is available only as an assembled and tested pc board (about 80 x 56 x 25 mm).
- *PE* includes two 10 pin ribbon cables (about 30 cm each), button and LED (snapshot function) and the power supply.
- An external power supply (7-12VDC@min. 100mA) is required for the *PE*. It is included for all shipments within Germany (230V version with European mains plug). For shipments outside Germany please ask your local representative or dealer.
- We do not offer a suitable housing as this would have to be completely different for various combinations of controls.

Connection and Installation

Please pay attention to the following notes !

Electronic basic knowledge is required to install the PE electronics and to connect the controls resp. control voltages. If you are not sure whether your knowledge is sufficient please consult an expert. We cannot take back modules that became defective because of wrong installation or wrong connection of the controls or voltages. We also cannot take back modules or cables which have been soldered by the user.

Power Supply (1)

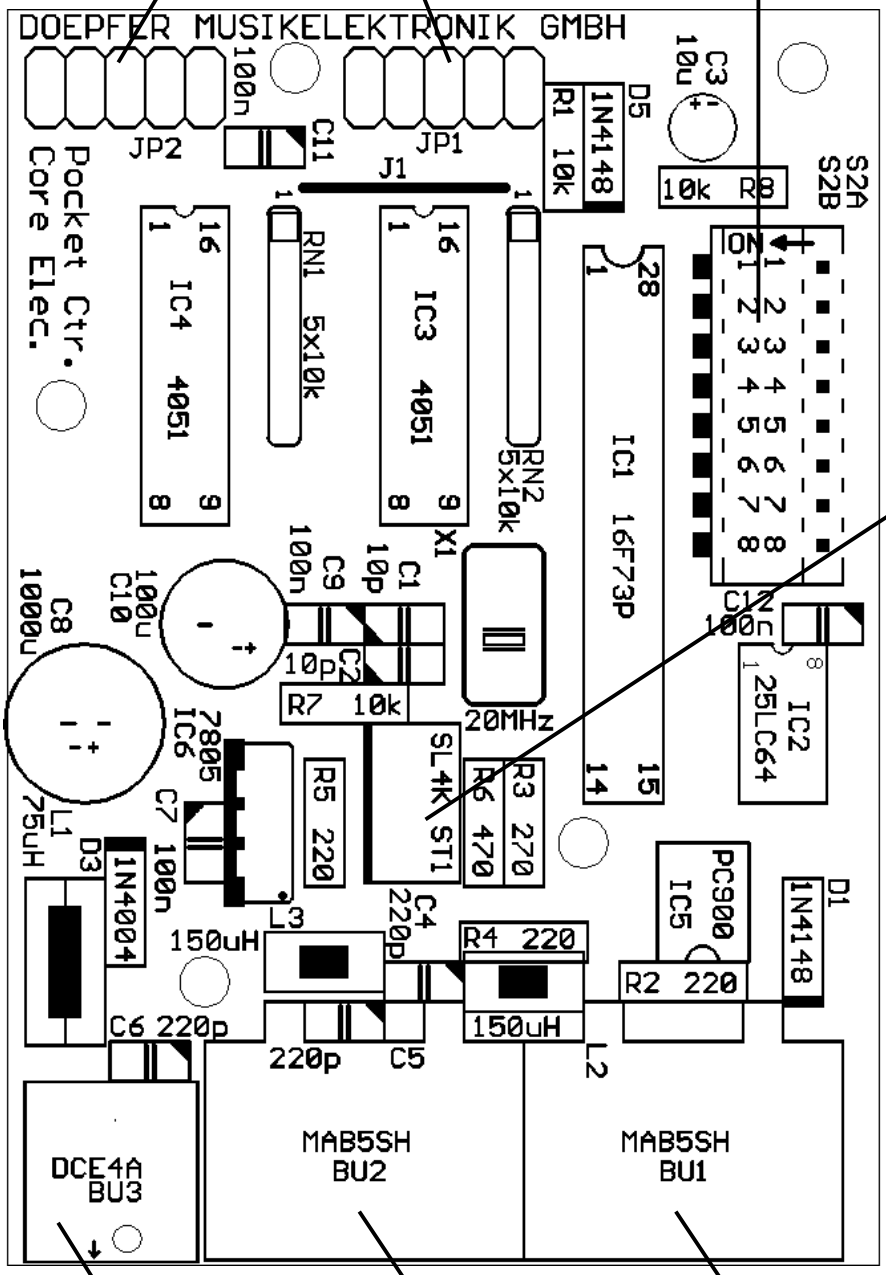
PE does not have a built-in power supply. Instead it uses a plug-in type external power supply (AC adapter). One reason for this feature is electrical safety. Keeping danger voltages (main) out of the *PE* increases the electrical safety. Therefore an external power supply of high quality and safety should be used. If *PE* is used in Germany the external power supply has to be VDE approved. Another reason for the external power supply is the fact that mains voltages and plug types vary considerably from country to country. Using a plug-in external supply *PE* can be used any where with a locally purchased power supply, thus keeping the retail price down.

The power supply has to be able to deliver 7-12 VDC unstabilized voltage, as well as a minimum current of 100mA. *PE* is switched ON by plugging the AC adapter into a wall outlet and connecting it to the appropriate jack on the *PE* board. There is no separate ON/OFF switch. If the polarity of the power supply is incorrect, *PE* will not function. However, there is no danger of damage to the circuitry since it is protected by a diode. The correct polarity is: outside ring = GND, inside lead = +7...12V. A power supply for 230V mains voltage with European type mains plug is included with the *PE* (valid only within Europe, for other countries ask you local Doepfer representative or dealer).

Midi Out Socket (2)

Connect the Midi Out socket with Midi In of the device to be controlled by *PE* (e.g. Computer, Synthesizer, second daisy-chained *PE*) via a suitable Midi cable. If you want to control more than one Midi device you have to use daisy chain Midi Thru / Midi In connection of the devices ore use a external Midi Thru box.

Overview: Pocket Electronics Connectors



(4)
connectors for the potentiometers resp. switches (JP1, JP2)

(6)
DIP switch for preset selection

(5)
connector for snapshot button and LED (ST1)

(1)
power supply
7-12V / 100mA DC
(BU3)

(2)
Midi Out
(BU2)

(3)
Midi In
(BU1)

Midi In Socket (3)

The *PE* features a Midi input. This input may be connected to another Midi device (e.g. Midi keyboard). The incoming Midi data are merged to the data generated by *PE*. The Midi input may be used as well for daisy-chaining several *PE*. The Midi input of *PE* is not suitable for large amounts of Midi data (e.g. SysEx strings or Midi messages coming from an computer sequencer) as the *PE* has only a small Midi in buffer. In case of large amounts of incoming Midi data loss or delay of data may occur.

The Midi input is also required when *PE* is programmed with the editor software. In this case the Midi input of *PE* has to be connected to the Midi output of the computer on which the editor program is running. The Midi output of *PE* has to be connected to the Midi input of the computer. Details can be found in the Pocket Control manual and the manual of the editor program.

If the merge feature of the *PE* is not required and the programming option is not used the Midi input is left open.

Connectors for the 16 controls (4)

The two pin headers JP1 and JP2 are used to connect the controls. Both pin headers have available these signals: GND, +5V and 8 control voltage inputs (range 0...+5V).

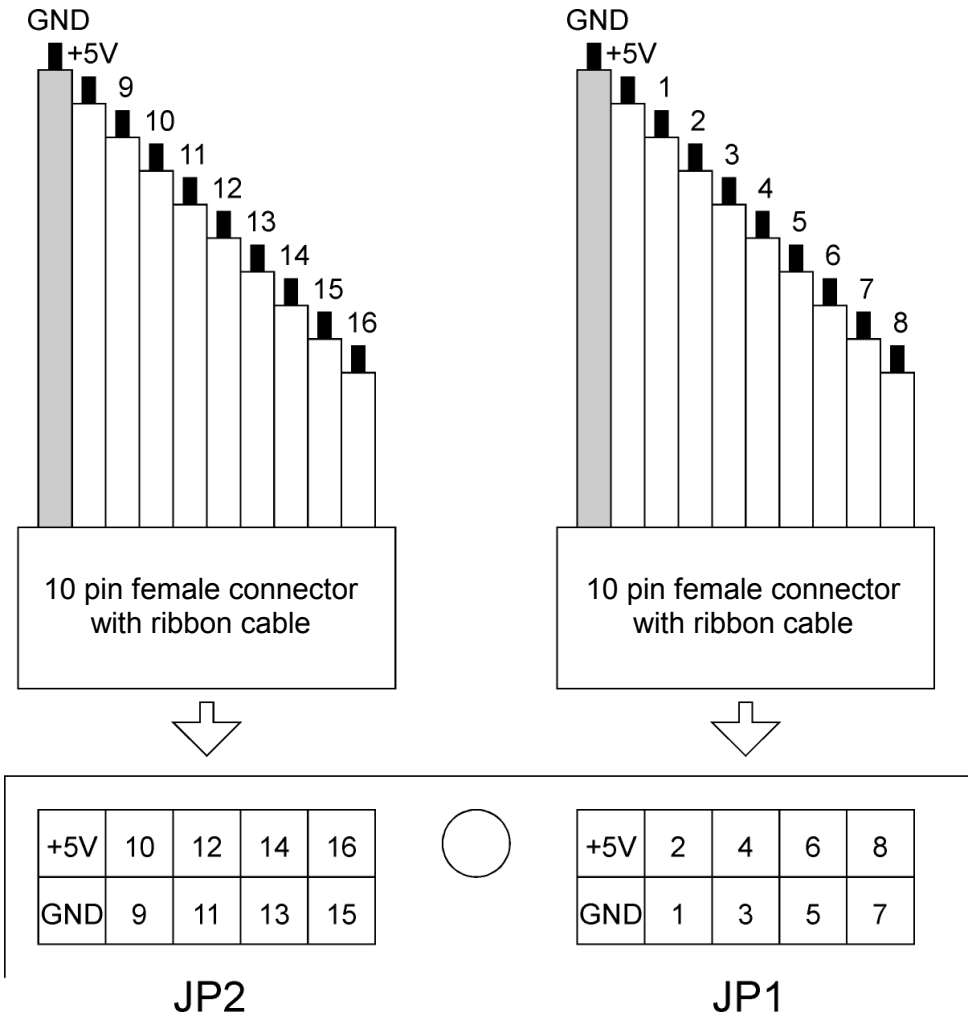
Remark: In the following the terms GND (= abbreviation of ground) and 0V (zero volts) are used synonymous.

The control voltages are normally generated by rotary or fader potentiometers that are connected between GND and +5V. In this case the wiper of the potentiometers outputs a voltage in the range 0...+5V while the potentiometer is operated. Another possibility is the connection of momentary switches or toggle switches.

The lower part of the sketch on the next page shows the pinout of the two pin headers JP1 and JP2 (same orientation as the picture on page 5). The pins labelled 1 ... 16 are the 16 control voltage inputs.

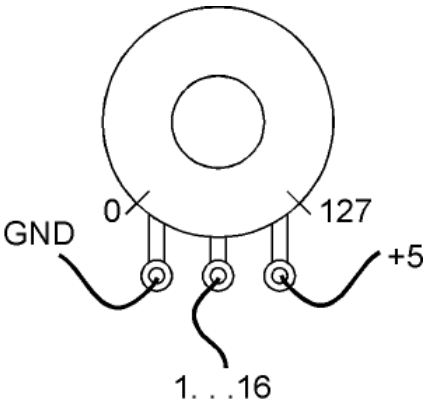
Normally two 10 pin female connectors with ribbon cables are plugged to the pin headers JP1 and JP2. The female connectors with ribbon cables are included with the *PE*. The controls (e.g. potentiometers, switches) are soldered to the open ends of the ribbon cable.

The upper part of the sketch shows the pinout of the 10 wires of the ribbon cables. We strictly recommend this type of wiring but not to solder the wires directly to the pin headers JP1 and JP2. Usage of the ribbon cables with female connectors allows to disconnect the controls from the electronics very easily.

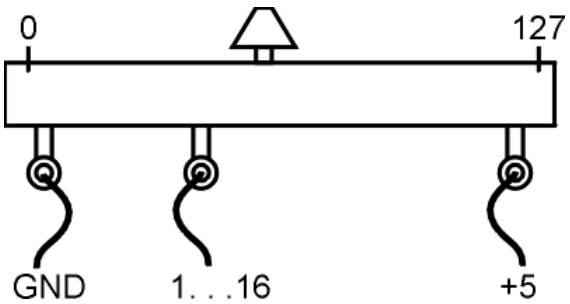


Rotary or slider potentiometers are connected in this way:

- lower resp. left end terminal to GND
- wiper / middle terminal to one of the analog inputs 1 ... 16
- upper resp. right end terminal to +5V



Connection of a rotary potentiometer



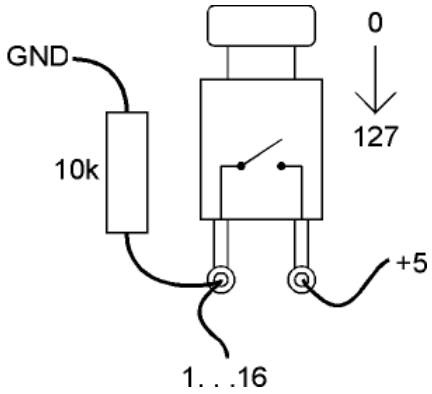
Connection of a slider potentiometer

Linear potentiometers with resistance values 4k7 ... 100k can be used. We recommend 10k (linear).

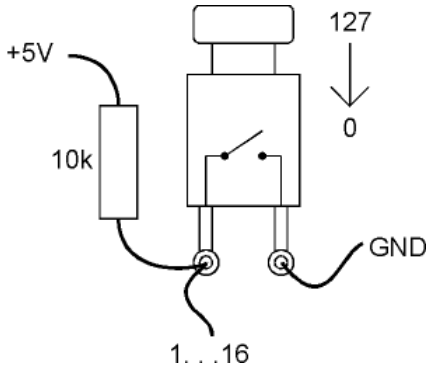
Momentary or toggle switches can be used in two different ways:

	state of rest		aktive state	
	Midi data	voltage	Midi data	voltage
version 1	0	0V	127	+5V
version 2	127	+5V	0	0V

Simple momentary switches (1 contact, open at rest) or simple toggle switches (1 contact on/off) are required. According to the desired behaviour (version 1 or 2 in the above table) the switch has to be wired correspondingly:



Connection of a momentary or toggle switch (<u>version 1</u>)



Connection of a momentary or toggle switch (<u>version 2</u>)

In both cases an additional 10k resistor is required (possible range 4k7 to 100k) to pull the analog input to a defined state during the switch is open.

- <u>Version 1</u>: The resistor is soldered between GND and the control voltage input 1...16. This way the input is pulled to GND (=0V corresponding to Midi data 0) as long as the switch is left open. When the switch is closed the voltage jumps to +5V corresponding to Midi data 127.

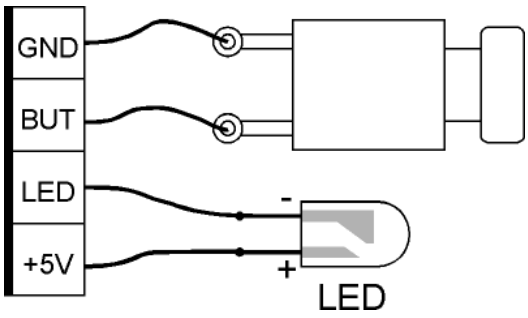
- <u>Version 2</u>: The resistor is soldered between +5V and the control voltage input 1...16. This way the input is pulled to +5V (corresponding to Midi data 127) as long as the switch is left open. When the switch is closed the voltage jumps to 0V corresponding to Midi data 0.

Sixteen 10k-resistors (range 4k7 ... 100k) are enclosed witch each *PE* delivery. Suitable resistors are available in each electronic shop too (value: 10k, power: ¼ W, tolerance: 5%, material: carbon).

<u>Unused inputs have to be connected to GND. Avoid open inputs !</u> An open input will cause the transmission of random Midi data causing undesirable side effects at the Midi receiver (e.g. Midi overflow or random parameter fluctuations).

Connector for snapshot button and LED (5)

As mentioned above *PE* is identical to the electronics used in Pocket Control. Pocket Control has available a so-called snapshot button and LED (for details please refer to the Pocket Control manual). When the user wants to have available these controls they are connected to the pin header ST1 in this way:



The button is a simple momentary switch (open at rest) and any standard LED can be used (3 or 5 mm or rectangle, red/yellow/green/blue/white color). Pay attention to the polarity of the LED. Normally the cathode (minus terminal) is indicated by a shortened pin and is the bigger electrode inside the LED.

A 4 pin female connector can be used for wiring. This allows to disconnect the button and LED from the electronics very easily.

The functions of the snapshot button and the LED are described in the Pocket Control manual. The LED is essentially used as a control display, the button is used to send off all 16 Midi messages with the data corresponding to the present positions of the 16 controls (snapshot function).

DIP Switches (6)

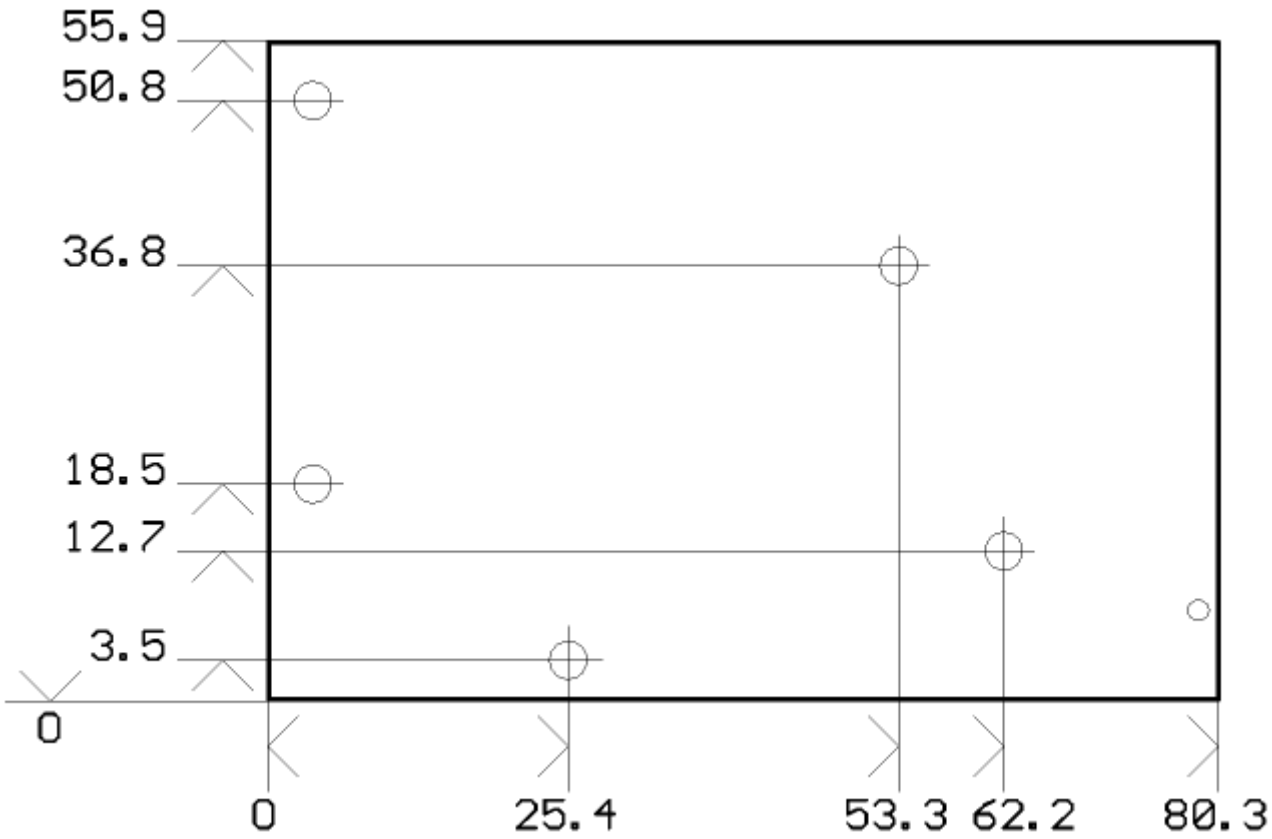
The positions of the 8 switches of S2 determine the number of the preset that is called up during power on. Up to 128 different presets are available. If none of the factory presets can be used the editor program enables the user to program his own presets.

The function of the DIP switches and the connection between the position of the switches and the preset number is described in the Pocket Control manual. The upper switch (near the capacitor C3) is switch number 1, the lower switch (near the 8 pin IC 25LC64) is switch number 8.

Mounting

Before *PE* is put into operation the board has to be fixed on a suitable support and built into a metal case together with the controls (refer to EMC notes on page 2). The metal case has to be connected to GND of *PE.* We recommend to use the metal plate of the voltage regulator 7805/IC6 or the GND terminal of the power supply socket for this connection.

The board measures about 80 x 56 x 25 mm. Five mounting holes with 3 mm diameter are available for mounting the board inside the case e.g. with distance sleeves or spacers (> 5 mm in length) and suitable screws. Pay attention that no short circuits are made – neither on the top of the board (electronic parts) nor on the bottom (solder points or pcb tracks). In case of doubt use isolating plastic parts (e.g. plastic screws, nuts and washers) for mounting.



Position of the mounting holes
(measures in mm)

Check list

In case that your *PE* installation does not work at the first go please check the following points:

- Is the power supply working correctly ? Provided that a LED is connected to ST1 (pay attention to the polarity) it should light up for a short time and then go out.
- Are the controls connected as described in this manual ?
- Was no short circuit made (neither in the wiring nor mounting) ?
- When the diode D1 and the voltage regulator IC6 become hot probably a short circuit between GND and +5V was made !
- When momentary or toggle switches are used: Are the 10k (4k7...100k) resistors soldered accordingly?
- Are unused inputs connected to GND ? When the LED is flickering permanently without operating one of the controls probably one of the 16 analog inputs is left open !
- Is the LED flickering if incoming Midi messages appear at the Midi In of *PE* (e.g. from a keyboard)?
- Are the Midi connections between *PE* and the other Midi devices installed correctly ? Midi Out of *PE* has to be connected to Midi In of the Midi device controlled by *PE*. Especially when computers are used Midi In and Out are very often mixed up by the user. Once again: Midi Out → Midi In (not Midi Out → Midi Out nor Midi In → Midi In).
- Please use only cables that are suitable for Midi.
- When a PC with sound card is used only high quality multimedia cables should be used. Low cost multimedia cables without optocouplers for Midi In and without drivers for Midi Out very often cause Midi data problems.
- Is the right preset number selected with the DIP switch ? A good preset number for testing is no 1: if 8 switches are "off" one obtains volume on the Midi channels 1...16 (provided that the factory presets are unchanged, otherwise the Midi messages you have programmed to preset no 1 will appear).

Extent of delivery

The PE delivery contains the following parts:

- Pocket Electronics pc board, assembled and tested
- Power Supply (230V mains voltage, European type mains plug, output voltage range 7...12V, current min. 100 mA) included only for shipments within Germany, for shipments outside Germany please contact your local representative or dealer
- Pocket Electronics user's guide
- Pocket Control user's guide
- Two 10 pin ribbon cables with double row female connectors, about 30 cm each (for connection of the 16 controlling potentiometers or switches)
- One button (snapshot function)
- one LED (control display)
- One 4 pin single row female connector with 30 cm cables, about 30cm (for connection of the snapshot button and LED)
- 16 resistors 8k2...100k (5% carbon)

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