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# **MIDI Master Keyboard**

# **LMK4+**

## **User's Guide**



# User's Guide LMK4+

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# 1. OPERATION (Hardware)

## 1.1 Power Supply

The LMK4+ 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 keyboard increases the electrical safety. Therefore a external power supply of high quality and safety should be used. If the keyboard is used in Germany the external power supply must be VDE approved.

Another reason for the external power supply is the fact that line voltages and plug types vary considerably from country to country. Using a plug-in external supply the LMK4+ can be used any where with a locally purchased power supply, thus keeping the retail price down.

The power supply must be able to deliver 7-12 VDC unstabilized voltage, as well as a minimum current of 400mA. The LMK4+ is switched ON by plugging the AC adapter into a wall outlet and connecting it to the appropriate jack on the back of the keyboard case. There is no separate ON/OFF switch.

If the polarity of the power supply is incorrect, the LMK4+ will not function. However, there is no danger of damage to the circuitry since it is protected by a diode. A power supply for 230V AC and European type plug is included with the LMK4+. Any other type of power supply and must be purchased locally by the user.

If you are using the power supply shipped with LMK4+ you may find the pinout of the LMK4+ power jack in the appendix B.

Once the power supply has been plugged in a message should appear on the display (e.g. "LMK4 V1.00" for indicating the software version 1.00) and the 8 LED's should flicker. If this does not happen the power supply is either defective or does not have proper polarity/voltage/current. After that the LMK4+ should go into preset-mode (see chapter 2.3.1 for details). The first LED should be illuminated.

## 1.2 MIDI-Interface

LMK4+ features 4 MIDI outputs with 2x2 parallel connected outputs. This means that the 2 MIDI outputs labelled "MIDI OUT 1" transmit the same MIDI informations. Same is valid for the MIDI outputs labelled "MIDI OUT 2". In the SPLIT menu (see chapter 2.3.4) the allocation of the split zones to the MIDI outputs is defined.

Connect MIDI outputs of the LMK4+ with MIDI-IN of the device(s) to be controlled by the LMK4+ (i.e. expander, sequencer, synthesizer, sampler etc.). If several devices are to be controlled by the LMK4+ you may use the 4 MIDI outputs of the LMK4+. If you want to control more than 4 devices they have to be chain-linked via MIDI-THRU/IN. Alternatively one may utilize a so-called MIDI-THRU-box.

The LMK4+ features a MIDI input. This input may be connected to another MIDI keyboard oder MIDI base pedal. The incoming MIDI data can be managed by the LMK4+ as split zone. So it is possible to modify the MIDI channel or the transposition of incoming MIDI data and to treat the external device as a split zone of the LMK4+. The MIDI input can be used also for switching the LMK4+ presets via incoming Program Change events or for transferring LMK4+ memory data via MIDI dump. For this purpose a suitable MIDI dump or editor software is required.

MIDI cables are not included with the LMK4+.

## 1.3 Connection of External Controllers & Footswitches

Located on the rear of the keyboard case are three jacks labelled "EXT. INPUTS" for hooking up a double-footswitch ("SWITCHES") and two foot pedals ("CTRL1", "CTRL2"). Allocation of these controllers to the various MIDI-functions is completely user-defined (see chapter 2.3.5). The name of the external inputs for programming is *EX.SW1* and *EX.SW2* for the foot switches and *E.CTR.1* and *E.CTR.2* for the foot controllers.

Do not connect the footswitches or foot controllers unless the LMK4+ is switched OFF (i.e. unplugged). While power on the LMK4+ electronics checks the levels of the foot switches and assumes that these levels are the "off" states. So do not operate the foot switches while turning power on. This feature allows the use of foot switches with contacts open at rest as well as those closed at rest.

The foot switches and foot controllers are not included with the LMK4+ and have to be ordered separately if required. A suitable foot switch is the DOEPFER VFP2, a suitable foot controller is the DOEPFER FP5. The LMK4+ will work without the foot switches and foot controllers, although the corresponding functions will not be available to the user in that case. If you are not using VFP2 or FP5 you may find the pinout of the ext. input jacks in the appendix B as well as the type of potentiometer required for the foot controller.

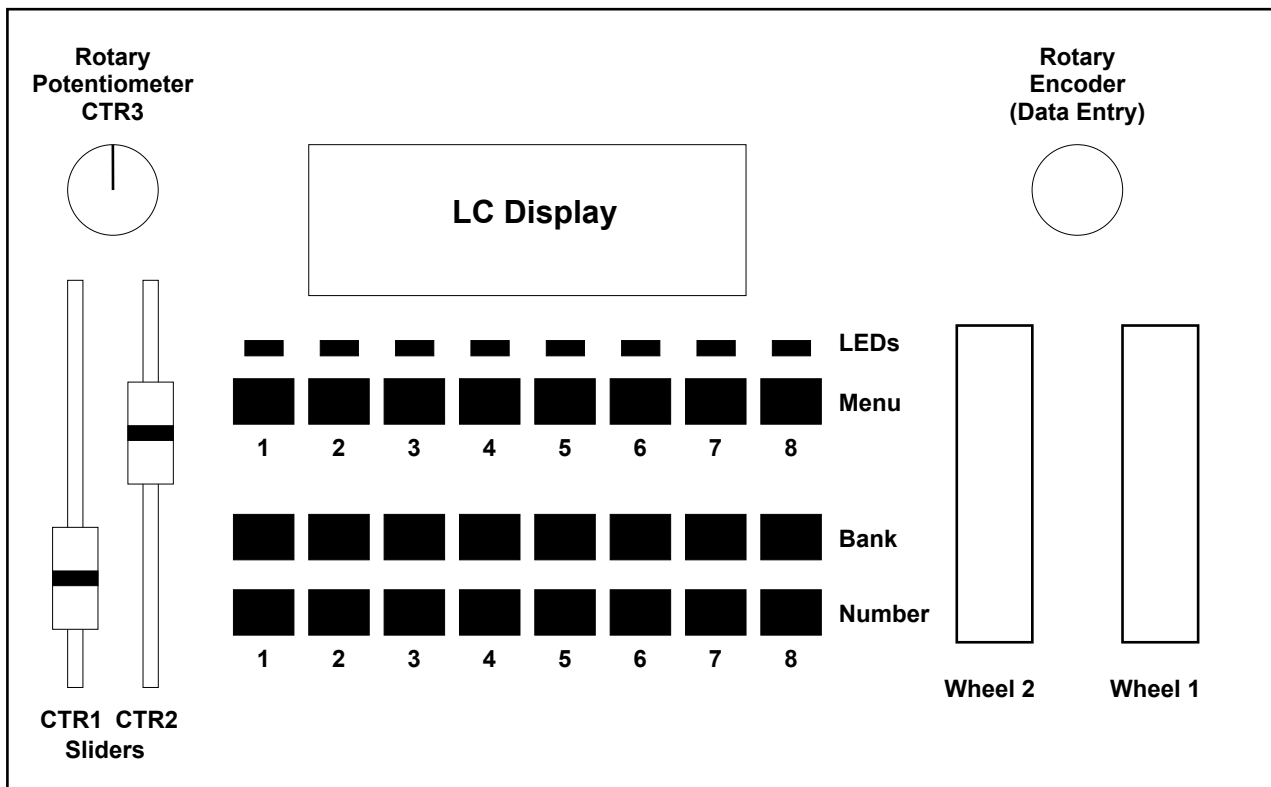
For details regarding assignment of MIDI functions to the foot controllers (e.g. volume, sustain, soft pedal and so on) refer to chapter 2.3.5 Controller Assign / Activate.

## 1.4 Controls

The LMK4+ features the following controls and displays:

- Illuminated display with two rows of 16 characters each
- 24 buttons in three rows of 8 buttons each  
Upper row: MENU-buttons  
Middle row: BANK-buttons  
Lower row: NUMBER-buttons
- 8 LED's (serving as indicators for the MENU-buttons)
- 2 Wheels (one spring-loaded)
- 2 Sliders
- 1 Rotary potentiometer
- 1 Rotary encoder (Data-entry dial)

The two wheels, the two sliders and the rotary potentiometer can be used for any MIDI-function desired by the user (e.g. any continuous MIDI controller). The rotary encoder (data-entry dial) is primarily used for data entry purposes.



### Adjustment of LC-Display

The display can be adjusted by means of 2 potentiometers, one for contrast and one for background illumination. If you wish to change the factory settings insert a thin, insulated screwdriver into the holes to the left and right of the display and adjust the potentiometers to the desired settings.

In addition LMK4+ is equipped with a **monophonic After Touch** sensor below the keys that is activated if you put pressure on the keys pressed down. The After Touch sensor of the LMK4+ is treated like any other controller (i.e. like wheels, sliders ....). This means it is not limited to send MIDI after touch data but can be used for any MIDI-function desired by the user (e.g. any continuous MIDI controller).

## 1.5 Operating and Safety Instructions

Please follow the given instructions for use of the instrument because this will guarantee correct instrument operation. Due to the fact that these instructions touch on Product Liability, it is absolutely imperative that they be read carefully. Any claim for defect will be rejected if one or more of the items was observed. Disregard of the instructions can endanger warranty.

- The instrument may only be used for the purpose described in this operating manual. Due to safety reasons, the instrument must never be used for other purposes not described in this manual. If you are not sure about the intended purpose of the instrument please contact an expert.
- The case (flight case) is not a packing suitable for shipment but the case of the instrument. If you want to ship the instrument via mail, UPS, rail, forwarding agency or others you always must use the original packaging. Therefore, you should keep the original packaging.
- The instrument has to be shipped only in the original packaging. Any instruments shipped to us for return, exchange, warranty repair, update or examination must be in their original packaging! Any other deliveries will be rejected. Therefore, you should keep the original packaging and the technical documentation.
- The instrument may only be operated with the voltage written on the power input on the rear panel. Before opening the case disconnect the power plug.
- All eventual modifications must only be carried out by a qualified person who will follow the valid safety instructions. Every modification should be carried out only at the manufacturer or an authorized service company. Any modification not released by the manufacturer leads to the extinction of the operation permission.
- With the introduction of a third person the warranty will be lost. In case of a destroyed warranty seal, any warranty claim will be rejected.
- The instrument must never be operated outdoors but only in dry, closed rooms. Never use the instrument in a humid or wet environment nor near inflammables.
- No liquids or conducting materials must get into the instrument. If this should happen the instrument must be disconnected from power immediately and be examined, cleaned and eventually be repaired by a qualified person.
- Never subject the instrument to temperatures above +50°C or below -10°C. Before operation the instrument should have a temperature of at least 10°C. Do not place the instrument into direct sun light. Do not install the instrument near heat sources.
- Keep the top side of the instrument free in order to guarantee proper ventilation, otherwise the instrument could be overheated. Never place heavy objects on the instrument.
- All cables connected with the instrument must be checked periodically. If there is any damage the cables must be repaired or replaced by an authorized person.
- Transport the instrument carefully, never let it fall or overturn. Make sure that during transport and in use the instrument has a proper stand and does not fall, slip or turn over because persons could be injured.
- Never use the instrument in the immediate proximity of interfering electronic devices (e.g. monitors, computers) since this could create disturbances within the instrument and corrupt memory data.
- The exchange of electronic parts (e.g. EPROMs for software update) is allowed only if the instrument is disconnected from power supply.
- When using the instrument in Germany, the appropriate VDE standards must be followed. The following standards are of special importance: DIN VDE 0100 (Teil 300/11.85, Teil 410/11.83, Teil 481/10.87), DIN VDE 0532 (Teil 1/03.82), DIN VDE 0550 (Teil 1/12.69), DIN VDE 0551 (05.72), DIN VDE 0551e (06.75), DIN VDE 0700 (Teil 1/02.81, Teil 207/10.82), DIN VDE 0711 (Teil 500/10.89), DIN VDE 0860 (05.89), DIN VDE 0869 (01.85). VDE papers can be obtained from the VDE-Verlag GmbH, Berlin.

## 2. OPERATION (Software)

### 2.1 Switching the Keyboard ON

When the keyboard is switched ON a message regarding the software version will appear on the display for several seconds (e.g. "LMK4 V1.00"). In addition the LED's will flicker for several seconds. After that the keyboard will go into preset-mode (see below for details) and will call up preset no. 1.

*NOTE: When the keyboard is activated for the very first time, the presets will contain random values since the RAM contains random data. In order to completely initialize the keyboard (i.e. to set all 128 presets to the same standard values) you have to follow the procedure described in the appendix. Normally it is not necessary to initialize the memory as this is performed during the final check of the device in the factory.*

### 2.2 Menu Structure

There are 8 menus available. They are selected via the 8 uppermost buttons. These are referred to as MENU-buttons. Pressing one will access the corresponding menu. The LED's serve as visual indicators of the menu selected. You leave a menu simply by pressing another MENU-button. The 8 MENU-buttons correspond to the following menus (from left to right):

- |   |                                   |
|---|-----------------------------------|
| 1 | <b>PRESET</b>                     |
| 2 | <b>PROGRAM CHANGE</b>             |
| 3 | <b>REALTIME/MASTER CHANNEL</b>    |
| 4 | <b>SPLIT</b>                      |
| 5 | <b>CONTROLLER ASSIGN/ACTIVITY</b> |
| 6 | <b>USER DEFINED CONTROLLERS</b>   |
| 7 | <b>PRESET PARAMETERS/NAME</b>     |
| 8 | <b>PANIC</b>                      |

When the keyboard is switched on it will always go to the PRESET-menu. In the next few paragraphs we will briefly discuss the functions of each of the 8 menus, followed by the operating procedure for each menu.

#### 1: PRESET

The LMK4+ keyboard allows the storage and recalling of up to 128 complete keyboard settings, referred to as "presets". Each preset contains data about all 8 keyboard zones with their respective MIDI-channels, transpositions, allocation and activation of controllers, velocity-response curves, program numbers, volumes, preset-name, etc. The PRESET-menu is used to call up or store the presets. The detailed description of the PRESET-menu also includes information on the MIDI-DUMP-function of the LMK4+.

#### 2: PROGRAM CHANGE / BANK SELECT

This menu serves to send program numbers (MIDI-program change instructions) and bank select data (i.e. MIDI controller #0 and #32) in direct mode to select the programs and banks of the MIDI-instrument(s) connected to the LMK4+. The program change and bank select instructions are transmitted via the MIDI-master-channel selected at the time (also refer to menu 3).

Independent of this, in menu 4 each of the 8 keyboard zones can be assigned a program and bank number which is sent on the MIDI-channel of the keyboard zone when PRESET is called up (see menu 4: SPLIT).

#### 3: REALTIME / MASTER-CHANNEL

This menu is used to directly transmit MIDI-realtime information (i.e. START, STOP, CONTINUE, CLOCK) and to select the MIDI-master-channel on which the LMK4+ transmits the direct-mode program changes and bank select data.

## 4: SPLIT

The LMK4+ handles up to 8 different keyboard areas (split areas, split zones, split range) simultaneously. Overlaps of the zones are possible (i.e. some keys are used by more than one zone). Each zone is assigned a MIDI channel and to one of the 2 MIDI outputs. The SPLIT-menu is used to define the parameters of each of the 8 keyboard zones. The SPLIT-parameters are as follows:

- LOWER and UPPER key
- MIDI channel
- MIDI output 1 or 2 or both
- Transposition
- Velocity-response curve
- Aftertouch curve
- Program number
- Bank Select number (= Controllers #0 and #32)
- Volume

In addition in this menu is defined if the zone is used for the (internal) keyboard or the (external) MIDI input.

## 5: CONTROLLER ASSIGN/ACTIVITY

This menu has 2 different functions:

- Assignment of controllers (i.e. Sliders, Wheels, After Touch etc.) to MIDI-functions
- Activation of the controllers in the keyboard zones

First, each controller is assigned a particular MIDI-function (i.e. pitch bend, modulation, volume, sustain, etc.). Then the user can decide for each individual keyboard zone whether or not the respective controller is active in that keyboard zone, i.e. whether or not the corresponding data of the controller will be transmitted on the MIDI channel and MIDI output of that keyboard zone.

## 6: USER DEFINED CONTROLLERS

In this menu user-selected controllers (UD1...UD8), which can be used in menu 5, are defined.

## 7: PRESET PARAMETERS/NAME

In this menu the following preset-parameters are defined:

- Name of the preset
- Preset-pointer (=Number of the next preset reached when switching presets with footswitch)
- Realtime parameters of the preset (i.e. transmission of START, STOP, CONTINUE or none of these when the preset is called up)
- Scale Black Parameter (Adjustment of velocity-response of the black keys)
- Manual DUMP-function (Dumps contents of Preset-memory via MIDI)
- Transferring the volatile memory data into the non-volatile memory after receiving a MIDI dump
- ATP-Parameter (Positive/negative pitch-bend when aftertouch-sensor has been assigned to pitch-bend-function)

## 8: PANIC

This menu provides a PANIC-button which can be used in any operational mode. In addition, the menu also provides 16 "pseudo-panic-buttons" (for the 16 MIDI-channels) to be used in the event of one of the instruments connected to the LMK4+ not recognizing the "ALL NOTES OFF"-instruction.

## 2.3 DETAILED DESCRIPTION OF MENUS

### 2.3.1 Preset (1)

This menu is entered by pressing the leftmost MENU-button. Switching the keyboard ON will also activate this menu. It serves to call up and store presets. A preset is the sum of all information defining a keyboard configuration. All data about the 8 keyboard zones (i.e. external input or internal keyboard, UPPER/LOWER key, MIDI channel, Output, Transposition, Velocity and After Touch table, active controllers, Program number, Bank number, Volume), master-channel, tempo (MIDI clock), allocation of controllers, desired realtime-instructions during preset call-up, preset pointer and preset name. 128 such presets can be defined by the user and stored for call-up in the PRESET-menu.

After pressing the PRESET-menu-button the following message appears on the display:

**PRS:XXX / PRESET-NAME**  
**B:0YY / N:00Z / >PPP**

The upper row lists the preset number selected (XXX=1...128) on the left, the name of the preset selected is shown on the right. The lower row indicates the bank number on the left (YY=1...8), the number within that particular bank is shown in the middle (Z=1...8) and the preset pointer is displayed on the right (PPP=1...128). The preset pointer shows the number of the preset which the LMK4+ will jump to when the presets are switched via one of the footbuttons (assuming this option is being utilized).

Each bank consists of 8 presets. A bank is selected via one of the 8 BANK-buttons, the number within the bank is chosen by means of one of the 8 NUMBER-buttons. With this method only 64 presets are available (8 BANK-buttons x 8 NUMBER-buttons = 64 combinations). So the PRESET-menu-button itself is used to switch between the presets 1...64 and 65...128. The button has to be pressed to toggle between the two ranges.

*Note: The term "bank" used in this context has nothing to do with the MIDI program bank that is selected by the MIDI controllers #0 and #32. The MIDI association introduced the MIDI bank term after we used this term for the bank/number structure of our keyboards. For details regarding the MIDI bank term refer to chapter 2.3.2 PROGRAM CHANGE / BANK SELECT.*

#### **Call-up of a Preset**

The two bottom rows of buttons on the LMK4+ are used to call up a preset from the PRESET-menu. The upper row of buttons is used to select the bank number, the lower row to select the number within the bank. Each bank consists of 8 presets. In combination with the PRESET-menu-button for toggling between 1...64/65...128 all 128 presets can be addressed.

A preset is called up if one of the 8 NUMBER-buttons has been pressed after selecting the bank with one of the 8 BANK-buttons and selecting the range 1...64/65...128 with the PRESET-menu-button. Using the BANK-buttons or PRESET-menu-button alone will call-up the preset. Following this procedure each of the 128 presets can be called up directly.

Once a preset has been called up it is loaded into the so-called work-memory. This memory always contains the preset currently active. Only the values contained in the work-memory can be modified via the other menus. In order to modify a preset it has to be called up and loaded into the work-memory, modified while residing in the work memory and then be stored again in its modified form.

*When a preset is called up the content of the work memory is overwritten. Similarly, when storing the content of the work-memory in one of the preset-memory locations, the old preset stored there is overwritten.*

In addition a preset can be called-up by receiving a suitable Program Change message at the MIDI input. The MIDI channel of the Program Change message has to match to master channel of the LMK4+ adjusted in menu 3 and the preset change via MIDI input must be active (details see chapter 2.3.3: REAL TIME / MASTER CHANNEL). If the presets of the LMK4+ seem to alter automatically check if incoming Program Change messages are the reason for this behaviour.

If you do not want to alter the presets via incoming Program Change messages deactivate this function in menu 3.



## Storing a Preset

The data of the work-memory can be stored via the PRESET-menu. It can be placed in one of the 128 preset-memory locations by pressing the PRESET-menu-key and the PANIC-menu-key (first and last menu-button) simultaneously. The following message appears on the display:

### **STORE MODE OK?**

Also, all 8 LED's will be illuminated as a warning! Next the desired BANK-button and possibly the PRESET-menu-button (to alter the range 0...64/65...128) to be pressed, followed by a NUMBER-button. The content of the work-memory is now stored into the preset-memory location thus selected.

*CAUTION! Any preset stored at that location will be overwritten, i.e. it will be irretrievably lost! Store presets only in locations that do not contain presets which are still needed. If any MENU-button is accidentally pressed the LED's will go off and the storage process will NOT take place.*

## Storing/Downloading of the Preset-memory contents via MIDI (DUMP/REQUEST)

In order to store or download the content of one or all presets via MIDI the LMK4+ must be connected via MIDI In and MIDI Out to a MIDI-capable computer with appropriate "Dump"-software capable of requesting, storing and transmitting data to and from the LMK4+ (e.g. PC or MAC with MIDI interface, ATARI ST). MIDI-OUT 1 of the LMK4+ is connected to MIDI-IN of the computer, MIDI-OUT of the computer is connected to MIDI-IN of the LMK4+.

*Note: During data transmission of any kind between computer and LMK4+ no other data can be transferred (like Note on/off, Controller, Program Change). So it does not make sense to play on the keyboard or to operate one of the controllers during a data transmission.*

There are three ways to store preset-data via MIDI:

### **1. Manual dump of all presets (TRANSMIT-MULTI-DUMP)**

This feature is covered by a menu-item in menu 7 ("PARAMETERS"). When pressing the fourth BANK-button while in main menu 7, all stored data in the LMK4+ is dumped via MIDI-OUT in accordance with the Exclusive System Specifications of LMK4+. MIDI-OUT of the computer and MIDI-IN of the LMK4+ do not have to be connected in this case. However, the computer must be in the appropriate standby-mode in order to properly receive and store the incoming data.

### **2. Requesting dump of all presets via MIDI-IN (TRANSMIT-MULTI-DUMP)**

This option requires the sending of a DUMP-request by the computer to the LMK4+ via MIDI-IN. Once the LMK4+ receives the request it dumps the content of the entire PRESET-memory via MIDI-OUT 1 (again in accordance with the exclusive system specs). Except for the fact that it is triggered by an external request this data-dump is identical to the manual dump described in the previous paragraph.

### **3. Dump-request for a single preset (TRANSMIT-DUMP)**

Identical to item 2 except only the data for one preset is transmitted (as opposed to the content of the entire preset-memory).

There are two options to load data from hardisk/diskette into the LMK4+:

### **1. Downloading new data for the entire preset-memory (RECEIVE-DUMP)**

Note: This function will overwrite all preset-data stored in the LMK4+ at the time. If the existing data hasn't been saved yet on disk/diskette, this must be done prior to using this function or loss of all old data will result. After receiving the dump the data are stored in the volatile memory (RAM) of the LMK4+ and are automatically transferred to the non-volatile part of the memory (EEPROM). This process requires about 2 minutes. During this period it is not possible to play on the keyboard or operate one of the controllers or to receive MIDI data. A message in the display informs about the state of memory transfer.

### **2. Downloading data for a single preset (RECEIVE-DUMP)**

Same as item 1, except that only a single preset is being overwritten. After receiving the single dump the data are stored in the volatile memory (RAM) of the LMK4+. A external Store message must follow the dump to transfer the data to the non-volatile memory. Alternatively a manual memory transfer has to be carried out (see chapter 3.3.7).

If an error is detected during the transmission ("Checksum error"), it is immediately interrupted and every second LED flashes as a visual indication of an error. By pressing any MENU-button one can return to normal operating mode. Since error checks occur after each individual preset-data transmission, at most only one preset can contain incorrect data.

It is possible to receive dumps from the preceding keyboard LMK3 but in this case only the first 64 presets are received and a error message after receiving preset 64 appears.

The System Exclusive specification of the LMK4+ is available free of charge from our internet pages ([www.doepfer.com](http://www.doepfer.com)) or in printed form if you send us 5 international reply coupons.

## 2.3.2 Program Change / Bank Select (2)

This menu is called up by pressing the second MENU-button from the left. It is used to send MIDI Program-Change and Bank-Select (Controller #0/32) messages directly to the MIDI-instruments connected to the LMK4+. Data transmission takes place via the MIDI-master-channel and output selected at the time (also refer to 2.3.3).

The following message appears on the display:

**BANK: 00Y / NR: 00Z  
VVV\_WWW (CC): XXX**

The abbreviation correspond to the following values:

00Y Bank, selected with the middle row of buttons (has nothing to do with MIDI program bank)  
00Z Number, selected with the lower row of buttons  
VVV Data value for MIDI Controller 0, adjustable with the left slider  
WWW Data value for MIDI Controller 32, adjustable with the right slider  
CC MIDI channel, defined in menu 3 (master channel)  
XXX from bank/number buttons or rotary encoder resulting transmitted Program Change number

### ***Sending a Program-Change-Message***

The program-number (XXX) is selected via the two bottom rows of buttons or via the rotary encoder. When using the buttons the upper row selects the memory bank (00Y), the lower row the number (00Z) within the bank. The term "bank" used in this context has nothing to do with the MIDI program bank (see note in chapter 2.3.1). Each bank contains 8 numbers. This accounts for  $8 \times 8 = 64$  combinations = 64 programs. However, MIDI allows for 128 Program-numbers. Therefore the PROGRAM-button also serves to toggle between the first 64 program-numbers (1...64) and the remaining 64 Program-numbers (65...128). The resulting program-number (XXX) takes into account the offset adjusted via the PROGRAM-button.

Calling up a MIDI-program-number can only be accomplished by sequentially pressing the PROGRAM-button (if necessary), a BANK-button and a NUMBER-button. Pressing only PROGRAM and/or BANK will not work. This way each of the 128 programs can be called up directly, without having to go through other programs in between.

Alternatively the Program-Change messages can be send by using the rotary encoder. In this case only the resulting Program-number appears in the display. The values of bank and number (00Y, 00Z) are not refreshed in this case.

### ***Sending a Bank-Select-Message***

The MIDI-Bank-Select-Message uses the MIDI-controllers #0 and #32 to define one of 16384 Program-Banks. The complete bank instruction consists of a controller #0 event followed by a controller #32 event. Thus up to 16384 (=128 x 128) different program banks theoretically are available. A program change instruction following the bank select instruction selects one of 128 sounds (programs) within the selected bank. Thus up to 2097152 (= 128 x 16384) sounds theoretically are available. Of course no MIDI expander is able to produce 2097152 different sounds. If your expander, synthesizer or sampler recognizes the program bank instruction can be found in the MIDI implementation chart of the unit.

The data values for Controller #0 and #32 are set with the sliders. The left slider corresponds to Controller #0, the right to Controller #32. Both values appear in the display (VVV, WWW). Please refer to the user's guides of the

devices connected to LMK4+ if the bank message is supported and which values for Controller #0/32 are used. Normally only a few combinations of controller #0 and #32 are allowed to select one of the program banks available. Some manufacturers also use only Controller #0 or #32 to select a program bank. Other manufacturers designate this function as page, page select or variation.

If the sliders are assigned to other MIDI functions in menu 5 these are temporarily turned off during the Program/Bank menu is selected as the sliders are used for Controller#0/#32 data. As soon as the Program/Bank menu is left these functions are activated again.

All Program-Change and Bank-Select messages in this menu are sent on the MIDI-master-channel defined in menu 3.

Program-Change, Controller#0 and #32 can be defined for each split zone separately and stored in the presets. See chapter 2.3.4 for details.

### 2.3.3 Realtime / Master-Channel (3)

This menu is selected by pressing the third MENU-button from the left. It is used to send MIDI-Realtime messages and to select the MIDI-master-channel.

**REALTIME / M\_CHAN**  
**S/T/C/K/ - / - / - /P**

The bottom line is a symbolic representation of the functions which can be activated in this menu via the BANK-buttons. The 8 letters and blank spaces correspond to the 8 BANK-buttons. A function is activated by pressing the appropriate BANK-button. The abbreviations are as follows:

**S= Start**  
**T= Stop**  
**C= Continue**  
**K= Clock**  
**P= Panic**

The first four functions are suitable for controlling sequencers, drum-machines and other devices controlled by MIDI-Realtime messages. When pressing the keys for START, STOP or CONTINUE, the corresponding MIDI-instruction is immediately sent. If the START or CONTINUE function was selected, then the upper line of the display will show the tempo in BPM (Beats per minute). The tempo can be adjusted between 50 and 250 BPM by means of the rotary encoder (data-entry dial). Tempo is one of the parameters of PRESET and is stored in the preset-memory. If the tempo is to be modified without first sending START or CONTINUE instructions, the CLOCK-button must be pressed (fourth button from left in the middle row). The tempo currently set will be displayed on the upper line of the display and can be changed via the rotary encoder.

If the PANIC-button is pressed, "ALL NOTES OFF"-instructions are sent on all 16 MIDI-channels and all controllers are initialized. When using this "internal" panic-button one remains inside the menu.

Pressing the third MENU-button once more allows the selection of the MIDI-master-channel and the related functions. The MIDI-master-channel is the channel on which the program change-instructions are sent in direct mode (see chapter 2.3.2). It does not affect any other functions.

The lower line of the display will read:

**MCHN: YYYYYYY : XX**

YYYYYYY is one of the following 4 choices that can be adjusted together with the MIDI-master-channel XX via the rotary encoder:

<b>POUT1&amp;2</b>	<b>external Preset call-up active / Outputs 1&amp;2</b>
<b>POUT1&amp;0</b>	<b>external Preset call-up active / Output 1</b>
<b>POUT0&amp;2</b>	<b>external Preset call-up active / Output 2</b>
<b>OUT1&amp;2</b>	<b>external Preset call-up turned off / Output 1&amp;2</b>

In case of POUT... (first 3 choices) the Preset call-up via incoming MIDI Program-Change messages on the Master-channel is active. If a suitable MIDI Program-Change message appears at the MIDI input of the LMK4+ the new preset is chosen. The incoming Program-number is identical to the Preset-number.

In case of OUT1&2 the Preset call-up option is turned off. The presets cannot be switched by incoming Program-change messages.

The combination of numbers 1&2, 1&0, 0&2 displays on which of the MIDI outputs the messages of menu 2 (i.e. Program-Change and Bank-Select messages in direct mode) are sent. If these messages should appear on both MIDI outputs 1&2 is chosen. If only one output is desired 1&0 (only output 1) or 0&2 (only output 2) is selected.

If you operate the rotary encoder at first the MIDI channel 1...16 within one mode is passed through. Exceeding channel 16 the next mode is displayed. Falling short of 1 the previous mode is chosen.

The Master-channel/Preset call-up/output option is one of the parameters of PRESET and is stored in the preset-memory.

The bottom row of buttons is not used in this menu (i.e. the NUMBER-buttons).

## 2.3.4 Split (4)

This menu is selected by pressing the fourth menu-switch from left. It is used to define the split-parameters in the 8 keyboard zones. The following message appears in the display:

**ZONE : 00X**  
**L/U/C/T/D/A/P/V**

The 8 BANK-buttons are used to select one of the 8 keyboard zones. The number of the zone (00X) selected will appear in the top line of the display. The lower line of the display is a symbolic representation of the functions which can be activated in this menu via the NUMBER-buttons. The 8 characters correspond to the 8 buttons. A function is activated by pressing the appropriate switch. The abbreviations are as follows:

**L** L **Lower key of the keyboard zone**  
**U** U **Upper key of the keyboard zone**  
**C** C **(MIDI-) Channel, source (int./ext.) and MIDI-output of the keyboard zone**  
**T** T **Transposition of the keyboard zone**  
**D** D **Dynamic table (= Velocity response table) for the keyboard zone**  
**A** A **Aftertouch table for the keyboard zone**  
**P** P **Program/Bank-number for the keyboard zone**  
**V** V **Volume for the keyboard zone**

Once a function has been selected via the corresponding NUMBER-button it is confirmed on the display. The value currently set will be shown to the right of the function name.

In order to change one of the parameters selected with the NUMBER-buttons, the rotary encoder (data-entry dial) has to be used. For example, to adjust the Volume for of a keyboard zone one has to select the zone with one of the BANK-buttons, followed by selection of the VOLUME-function through pressing the right NUMBER-button. The desired value is then set with the rotary encoder and will be shown on the bottom line of the display.

The **UPPER** and **LOWER** key parameters can also be adjusted via the keyboard. After pressing a key (=lowest key) on the keyboard while in the LOWER KEY-submenu, the program will immediately jump to the UPPER KEY-submenu. After another keyboard-key is pressed (=highest key) the program jumps to the CHANNEL-submenu.

In the submenu **CHANNEL** the MIDI-channel, the source and the MIDI-outputs for the zone are adjusted. By repeated pressing of the submenu button (= number button 3) the following combination can be selected:

**XX / O: Y&Z**

XX is the source for the zone. Y and Z represent the MIDI-outputs 1 and 2 on which the MIDI messages of the zone in question are passed through.. For the characters XX the following combinations can be selectet:

<b>IN</b>	<b>internal keyboard of the LMK4+</b>
<b>EA</b>	<b>external MIDI-input in ALL mode</b>
<b>EO</b>	<b>external MIDI-input in OMNI mode</b>
<b>EM</b>	<b>external MIDI-input in MONO mode</b>

If the external MIDI-input is selected as source for the zone 3 different modes have to be distinguished:  
The **ALL** mode (EA) does not change the MIDI-channel of the incoming note events. The parameters LOWER, UPPER, TRANSPOSE and DYNAMIK take effect to the incoming note messages. This means that the incoming note number to must be between LOWER and UPPER, are transposed with the TRANSPOSE value and pass through the velocity curve (DYNAMIK). This mode should be selected if the incoming note messages should remain unchanged to a great extent. With the following settings the incoming note messages will not be modified: LOWER=0, UPPER=127, TRANSPOSE=0, DYNAMIK=1.

The **OMNI** mode is nearly identical to the ALL mode but the MIDI channel of the incoming note messages is set to the MIDI channel of the zone. In OMNI mode the parameters LOWER, UPPER, TRANSPOSE, DYNAMIK and CHANNEL are effective.

The **MONO** mode is identical to the OMNI mode with one exception: incoming note messages are processed only if the MIDI channel of the incoming note messages corresponds to the MIDI channel of the keyboard zone.

Incoming note events with another MIDI channel are ignored. In this mode the MIDI input of the LMK4+ acts as a MIDI channel filter.

For the numbers X&Y the following combinations can be selected:

<b>O:1&amp;0</b>	<b>only MIDI-output 1 for this zone</b>
<b>O:0&amp;2</b>	<b>only MIDI-output 2 for this zone</b>
<b>O:1&amp;2</b>	<b>both MIDI-outputs for this zone</b>
<b>O:0&amp;0</b>	<b>none of the MIDI-outputs (i.e. zone is turned off)</b>

This assignment affects also the internal controllers (wheels, sliders, rotary potentiometer, after touch, foot switches and foot controllers) but not via MIDI incoming controller messages.

*Note: The MIDI-input of the LMK4+ is intended for a second keyboard, synthesizer or base pedal. It is not suitable for large MIDI data streams like those coming from a sequencer or computer. In this case there may occur timing problems or loss if MIDI messages as the incoming MIDI data has to be merged with the MIDI data of the LMK4+. For such applications an external MIDI-merger (like the DOEPFER MMR4/4) should be used. Moreover one has to consider that incoming MIDI data may be multiplied by a factor 8 if the MIDI input is routet to all zones. If there is already a considerable data rate on the input the maximum tranfer limit of MIDI may be exceeded at the output(s)..*

The **TRANSPOSE**-sub-menu permits entering the desired transposition by means of two keyboard-keys, as opposed to using the data-entry dial. After pressing the first key the following message appears in the lower line of the display:

**"TRSP.REF.:->"**

followed by the number (i.e. MIDI-code) of the keyboard-key just pressed. The abbreviation stands for "Transposition Reference Key". Next, the second key is pressed, the transposition then being calculated with reference to the first key that was pressed. For example, if one wishes to transpose a zone one octave higher one presses any desired key on the keyboard, followed by the same key in the next higher octave.

In the two submenus **DYNAMIC** (Velocity-response curves) and **AFTER TOUCH** curves the velocity-response curves and aftertouch curves are adjusted with the data-entry dial. Appendix A of this manual contains information about the 64 curves available for velocity-response, as well as for the 8 aftertouch curves. Graphical representations of these curves can also be found in appendix.

In the sub-menu **PROGRAM/BANK** the program-number and bank-number (i.e. MIDI-controller #0/#32) for a keyboard zone are set. Details regarding program-number and bank-number you will find in chapter 2.3.2 PROGRAM/BANK.

If the display shows the message "STORE" on the upper right when the PROGRAM/BANK-button is pressed, then the function in question is presently activated. This means that the program-number and bank-numbers entered will be stored in the preset and will be sent when the preset is called up (see Menu 1: PRESET). If this is not desired in a given keyboard zone, then the function can be disabled by pressing the PROGRAM/BANK-button once more. The message "STORENO" will then appear on the upper right of the display to indicate that program-number and bank-number will not be sent when the preset is called up. The PROGRAM/BANK-button can be used to toggle between "STORE" and "STORENO".

The actual Program-number is set to the desired value (1...128) via the data-entry dial, the Bank-number via the sliders. The left slider adjusts MIDI-controller #0, the right slider is responsible for MIDI-controller #32 (data range is 0...127). The messages will be sent via MIDI-OUT using the MIDI-channel and output(s) of the selected keyboard zone, thus providing immediate feedback to the user with respect to program-number and bank-number.

The display shows in the bottom line the values of Controller #0 (adjusted by left slider), Controller #32 (right slider), MIDI-channel (in brackets) and Program-number (adjusted via data entry). During a later call-up of a preset the values for Program, Controller #0 and #32 are transmitted only if STORE is selected for the zone.

Please note that not all expanders (or synthesizers, samplers, etc.) are capable of utilizing the bank-function. If an instrument controlled via the LMK4+ does not have this feature, then the option cannot be used.

In the sub-menu **VOLUME** the volume for a keyboard zone is set. Regarding STORE/STORENO the same hints as for PROGRAM/BANK are valid i.e. one toggles with the VOLUME-button between STORE and STORENO and activates/deactivates the sending of the volume message for the zone during call-up of a stored preset.

The actual volume is set to the desired level (1...128) via the data-entry dial. It will be sent via MIDI-OUT over the MIDI-channel and MIDI-output of the selected keyboard zone, thus providing immediate feedback to the user with respect to volume. Please note that especially elder expanders (or synthesizers, samplers, etc.) may not be capable of utilizing the volume-function. If an instrument controlled via the LMK4+ does not have this feature, then the option cannot be used.

Setting the volume for a keyboard zone has a second meaning: it also determines the maximum volume-level which can be attained for that zone with any controller. If the volume function is assigned to a controller (Slider, Wheel, Foot controller etc.) and is activated in the keyboard zone in question, then the range of values for volume data sent for this zone will be between 0 and the volume-value entered by the user. This is what we call "proportional volume control".

Example: The volume for zone 1 is set to 100, that for zone 2 is set to 70 and that for zone 3 is set to 127. The volume-values sent (e.g. by an external foot-controller that is activated in zone 1, 2 and 3) for zone 1 will thus be 0...100, those for zone 2 will be 0...70, those for zone 3 will be 0...127 assuming of course that the controller in question has been assigned to VOLUME and that the function has been activated for all three zones. This allows proportional volume-adjustment in different zones with one controller. If the full range of volume-values is desired for all zones, then the volume must be set to 127 for each zone.

If a keyboard zone is not to be activated (i.e. fewer than 8 keyboard zones are required/desired) the lower and upper key(s) of the zone(s) are set to zero with the data-entry dial. No MIDI note event data will then be sent into those zones (note on, note off). However, these zones not used by the keyboard can be utilized to send program-numbers or volume-data. This may be useful to switch programs e.g. on drum-computers or effect-processors.

If a zone should be completely turned off the "0&0"-function in the CHANNEL-submenu should be used. In this case no MIDI messages are sent from the zone in question, even no controllers or Program-change.

## 2.3.5 Controller Assign/Activate (5)

This menu is selected by pressing the fifth MENU-button from the left. The menu has 2 functions. The first is the assignment of controllers to the standard MIDI-functions ("Assign"- function). The second is the activation of the controllers in the various keyboard zones ("Activate"-function).

When entering this menu one reaches the "**Activate**"-portion first. The following message appears on the display:

**ZONE : 00Y**  
**CONTR.X ON/OFF**

Next to the word "ZONE" appears the number 00Y of the keyboard zone last selected in the SPLIT-menu. The activation of the controllers in the CONTROLLER ASSIGN/ACTIVATE-menu always refers to the zone previously selected in the SPLIT-menu.

The BANK-buttons are for the various controllers (i.e. wheels, sliders, data entry, external footcontrollers and footswitches, aftertouch). The following controllers are allocated to the 8 BANK-buttons (starting on the left and showing the abbreviations seen on the display):

<b>Spring-loaded modulation wheel</b>	<b>WHEEL1</b>
<b>Non-spring-loaded modulation wheel</b>	<b>WHEEL2</b>
<b>External variable foot controller 1</b>	<b>E.CTR1</b>
<b>External variable foot controller 2</b>	<b>E.CTR2</b>
<b>Slider 2</b>	<b>CTR2</b>
<b>Aftertouch sensor</b>	<b>ATOUCH</b>
<b>Slider 1</b>	<b>CTR1</b>
<b>Rotary potentiometer</b>	<b>CTR3</b>

The NUMBER-buttons are for the switch-controllers (double footswitch). The following controllers are allocated to these buttons (starting at the left and showing the abbreviations seen on the display):

<b>Footswitch 1</b>	<b>EX.SW1</b>
<b>Footswitch 2</b>	<b>EX.SW2</b>

The other six NUMBER-buttons are not used since the LMK4+ only uses the two footswitches above.

If one of the 10 buttons used for controller assignment purposes is pressed the display will show the abbreviation of the controller on the left of the lower line, followed by an arrow-symbol (->). The function currently assigned to that controller is also indicated (see below for abbreviations). On the right side of the lower display line will be the word "ON" or "OFF", depending on whether or not the controller in question is activated in the keyboard zone currently being worked in. Repeated pressing of the switch representing that particular controller allows for switching back and forth between "ON" and "OFF". If a footswitch has been assigned to the LINK-function (LNK) one can activate this function only in zone 1 since it is a global parameter which can not be set differently for the various keyboard zones. If an attempt is made to activate the LINK-function in zones 2-8, then the message "LINK IMPOSSIBLE" will appear in the display.

The assignment of a controller to a MIDI-function can NOT be changed in this portion of the menu since it represents a global parameter for the entire preset, not just for a particular keyboard zone! Pressing the fifth MENU-button again calls up the "**Assign**"- portion of the menu. It is here that controllers are assigned to the various MIDI-functions. The following message appears on the display:

**ASSIGN CONTROLLERS**  
**TO MIDI EVENT**

These settings, as mentioned above, have global meaning for the entire preset, not just a single keyboard zone. The assignment of controllers to MIDI-functions is identical for all 8 keyboard zones. As discussed earlier, it is possible to choose whether or not a controller will be active in a given keyboard zones. This is done in the "Activate"-portion of this menu.

The 8 BANK-buttons and the 2 leftmost NUMBER-buttons once again represent the same controllers as in the "Activate"-portion of this menu.

After one of the 10 controllers has been selected, the lower line of the display will once again show that controller's abbreviation followed by an arrow-symbol (->) and the current assignment to a MIDI-function. The assignment of the controller can now be changed by means of the data-entry dial.

*REMEMBER: The new assignment will be a global parameter for the entire preset!*

The following standard MIDI-functions can be assigned to the various controllers (with abbreviations):

<b>Pitch Bend</b>	<b>PIT</b>
<b>Portamento</b>	<b>POR</b>
<b>Aftertouch</b>	<b>ATO</b>
<b>Data Entry</b>	<b>ENT</b>
<b>Modulation</b>	<b>MOD</b>
<b>Volume</b>	<b>VOL</b>
<b>Breadth-Controller</b>	<b>BRE</b>
<b>Panorama</b>	<b>PAN</b>

In addition there are 8 user-defined controllers (UD1...UD8) which are explained in section 2.3.6.

The assignment of the selected controller to a MIDI-function is accomplished by turning the data-entry dial. The assigned function will appear in the display to the right of the arrow symbol (in abbreviated form). Example: WHEEL1 -> PIT.

The external footswitches can be assigned to the following MIDI-standard-functions (with abbreviations):

<b>Sustain</b>	<b>SUS</b>
<b>Portamento ON/OFF</b>	<b>POO</b>
<b>Soft-Pedal</b>	<b>SOF</b>
<b>Sostenuto</b>	<b>SOS</b>
<b>Preset-Switchover</b>	<b>LNK</b>

In addition they can be assigned to 3 additional, as yet undefined controllers (FR2...FR4) and the 8 user-defined controllers (UD1...UD8).

The first 4 functions in the above list are standard MIDI-controllers. The fifth function (LNK=Link) is not a MIDI-controller. It is the internal switchover function for the 128 LMK4+ presets. If the LINK-function is assigned to a footswitch, then the next preset in the preset-queue will be selected when the footswitch is used (also refer to PRESET-POINTER-display in menu 1 and PRESET-POINTER-adjustment in menu 7). If, while stepping through the queue, a preset is selected where the footswitch controls a function other than LINK, then the queue would end here and the footswitch could no longer switch to the next preset. Instead it would control whatever function has been assigned to it in this particular preset, for example SUSTAIN.

The assignment of the footswitch to a MIDI-controller or to the LINK-function is accomplished by means of the data-entry dial. The assigned controller-function will appear in abbreviated form next to the arrow symbol in the display. Example: EX.SW2->SUS.

We would like to point out one more time that the assignment of the controllers and the after-touch sensor to the various MIDI-functions is identical for all keyboard zones of a preset. It certainly wouldn't make much sense if the same controller simultaneously had two different functions in two different keyboard zones of the same preset (for example VOLUME and PITCH BEND).

Since the assignment of controllers to MIDI-functions is done only once for each preset, this particular portion of the menu was placed behind the activation of the controllers in terms of operational procedure. Controllers are activated separately for each keyboard zone. If controllers were to be assigned prior to activation, one would have to go through the assignment menu prior to each activation. This might create the false impression that controllers can be assigned independently for each keyboard zone.

*Note: One should only activate controllers which are actually present and are being used, since otherwise the possibility of random controller data being sent out exists. For example, if a pedal is assigned to VOLUME in a given keyboard zone and has been activated even though no pedal is connected to the LMK4+, then the volume can go to some random level while playing. The aftertouch sensor, the two wheels and the sliders should also be activated only if they are actually utilized in a preset within a given zone. Please avoid to assign two controllers the same function and activate them in the same zone. For example, if you assign both slider 1 and external controller 2 to the volume function and activate both in zone 1, there will occur problems because volume can be changed as well with slider 1 as with external controller 2. The result may be jumps in volume or even continuous volume messages alternating from slider 1 and external controller 2. There would be a constant conflict between the inputs from the two controllers. If your instrument seems to be sending random data for pitch-bend and/or aftertouch, or seems to be sending random controller data, please check if 2 controllers have accidentally been assigned to the same function.*



A special case is the assignment of the after-touch-sensor to pitch-bend. There is a global parameter in menu 7 (PARAMETERS), called ATP (Aftertouch-to-Pitch) which determines whether the pressure exerted on the keys has a positive or negative effect on pitch-bend. Without pressure the pitch-bend value of 64 is sent (\$40 Hexadecimal). If ATP is positive, increasing pressure on the keys causes the pitch-bend values 64...127 (\$40...\$7F Hex) to be sent; a negative ATP results in values 64...0 (\$40...\$00 Hex).

### 2.3.6 User-Defined MIDI-Controllers

This menu is selected by pressing the sixth MENU-button from the left. It is used to define the 8 user-specific MIDI-controllers UD1...UD8. The following message appears on the display:

**UD-MIDI CONTR.**  
**1/2/3/4/5/6/7/8**

The lower line of the message is a symbolic representation of the 8 UD-controllers. They can be activated via the BANK-buttons. The NUMBER-buttons have no function in this menu. After pressing one of the 8 BANK-buttons the following message appears on the lower display-line:

**USERDEF (00X):YYY**

X stands for 1...8, depending on which BANK-button was pressed. YYY represents the controller-number which is to be assigned to the user-defined controllers UD1..UD8. This number can be adjusted between 0 and 127 with the data-entry dial. The widely used standard MIDI-controller-numbers have already been used for the various standard controllers (see below). If the instrument connected to the LMK4+ uses a special controller-number for a particular function, then that number can be selected and assigned to a controller here.

*Please note that controllers above number 121 represent MIDI-channel-mode messages, for example LOCAL ON/OFF, ALL NOTES OFF, etc. They should be used with caution.*

All user-defined controllers are preset-parameters and are being stored in each preset. Different UD-controllers can be defined for different presets. The following standard controllers are already being utilized:

CONTR#	FUNCTION (ABBREV.)	REMARKS
-	Pitch Bend (PIT)	Intrinsic function, belongs not really to MIDI controllers
-	After Touch (ATO)	Intrinsic function, belongs not really to MIDI controllers
1	Modulation (MOD)	continuous controller
2	Breath Controller (BRE)	continuous controller
5	Portamento Time (POR)	continuous controller
6	Data Entry (ENT)	continuous controller
7	Volume (VOL)	continuous controller
10	Panorama (PAN)	continuous controller
CONTR#	FUNCTION (ABBREV.)	REMARKS
64	Sustain (SUS)	switch controller
65	Portamento On/Off (POO)	switch controller
66	Sostenuto (SOS)	switch controller
67	Soft Pedal (SOF)	switch controller

The data range for continuous controllers is 0...127, for switch (or digital) controllers 0/127 (only one of the two values: 0 or 127).

### 2.3.7 Parameters/Name

This menu is selected by pressing the seventh MENU-button from left. In this menu all those global parameters are set which would not fit into the other menus. These include the **Preset-pointer**, the **Realtime-instructions** during preset-callup, the **ATP**-parameter, the **velocity-response reduction factor of the black keys**, the **Preset name**, the **manual dump** and the **Memory transfer** from volatile to the non-volatile part after a receive dump. Only the five leftmost BANK-buttons are used in this menu.

The first is used to adjust the **Preset-pointer**. This is the number of the next preset activated when presets are switched over via the footswitch, assuming one of the two footswitches has been assigned to the LINK-function in

the preset presently active (see CONTROLLER ASSIGN/ACTIVATE for details). When the switch is pressed the following message will appear on the display:

### **LINK TO PRES > YYY**

YYY is the number of the next preset activated when presets are switched over. The number is set to the desired value via the data-entry dial. It is also possible to form loops since there are no restrictions on the setting of the preset-pointer. Just remember that one of the footswitches must be assigned to the LINK-function in the preset being jumped to, otherwise it will be impossible to jump to the next preset via the footswitch.

*Note: When pressing the link-footswitch the display will show the new preset number only if the PRESET-menu (leftmost MENU-button) is selected. If another menu is selected the new preset number is not displayed even though the new preset is called up.*

The second BANK-button from left activates the realtime-instructions (START, STOP, CONTINUE) when selecting a preset. The following message will appear on the lower line of the display:

### **REALTIME-MSG : YYY**

YYY can be any of the following:

<b>NIX</b>	No realtime-instruction at preset-selection	MIDI-clock is stopped
<b>STA</b>	START-instruction during preset-selection	MIDI-clock is sent
<b>STO</b>	STOP-instruction during preset-selection	MIDI-clock is stopped
<b>CNT</b>	CONTINUE-instruction during preset-selection	MIDI-clock is sent

The data-entry dial is used to select between those four options. If STA or CNT is selected, then the LMK4+ will send the realtime-instruction (STA or CNT) and MIDI-clock-data with the tempo stored in the preset. These instructions are sent after the up to 8 program-numbers, controllers #0 and #32 (bank) and the volume-values for the 8 keyboard zones. If NIX or STO is selected no MIDI-clock-signal is sent. If the clock-signal should continue to be sent when a new preset is selected (without START), then CON must be selected. If the tempo is to be maintained in the new preset, then the tempo of the new preset must be set to the same value as that of the previous preset. Otherwise a tempo change will take place when the new preset is selected.

The third BANK-button from left adjusts the velocity-response reduction factor of the black keys. Because of their shorter leverage the black keys have a higher velocity-response than the white keys, with key pressure being equal. In this menu item one can set a parameter which reduces the velocity-response of the black keys in comparison to the white keys. The following will appear on the lower line of the display:

### **SCALE BLACK: XXX**

XXX represents a value between 0...127, to be set with the data-entry dial. 127 means that black and white keys are being treated equal, 0 would completely suppress the black keys. Experience has shown a value of about 120 to be best. SCALE BLACK is a global parameter of the LMK4+, i.e. it is valid for all presets and does not need to be entered for each one separately.

The fourth BANK-button manually triggers a dump of the entire content of the preset-memory. The following message appears on the lower line of the display:

### **SEND SYS-EX BULK**

At the same time the 8 LED's are counting up the presently transmitted preset-numbers in binary form. Triggering the dump obviously is useful only if an appropriate receiver is present (i.e. sequencer, computer with MIDI-Dump software) which can store the data and subsequently return it to the LMK4+. A more detailed description of the DUMP-function can be found in the section on the PRESET-menu.

The fifth BANK-button sets the so-called ATP-parameter, ATP standing for after touch-to-pitch. This parameter determines if pressure on the keys has a positive or negative effect on pitch-bend when the aftertouch sensor has been assigned to the pitch-bend function. The following message will appear on the lower line of the display:

### **ATP/ON+/OFF-: XXX**

XXX stands for "ON" or "OFF". The fifth BANK-button can be used to toggle between "ON" and "OFF". "ON" means a positive effect of key pressure on pitch-bend, "OFF" causes a negative effect. The ATP-parameter is

global, i.e. once set it is valid for all presets stored in the LMK4+. Of course the parameter is meaningful only if the aftertouch sensor has been assigned to the pitch-bend function.

The last BANK-button triggers the Memory transfer from volatile to the non-volatile part after a receive dump. Before the transfer is performed the following message appears in the display:

**STORE ALL PRE-  
SETS TO EEPROM?**

Also, all 8 LED's will be illuminated as a warning! Only if the BANK-button No. 8 is pressed once again the transfer is performed. Pressing any other Bank-button stops the process.

The transfer from volatile (RAM) to non-volatile memory (EEPROM) is necessary only after a receive dump from an editor or dump-program. After the receive dump the data is stored only in the volatile memory section of the LMK4+ (RAM). To keep the information after power off the data must be transferred to the non-volatile memory section of the LMK4+ (EEPROM). Normally the transferring program will trigger the memory transfer automatically by sending a Store-command via MIDI. Only if the program used does not support this feature the manual transfer has to be performed. The memory transfer process requires about 2 minutes. During this period it is not possible to play on the keyboard or operate one of the controllers or to receive MIDI data. A message in the display informs about the state of memory transfer.

Pressing MENU-button 7 once more will select the submenu for **naming presets**. On the upper line of the display the current name of the preset is shown. The 8 BANK-buttons correspond to the 8 characters of the name. To change a character one must press the corresponding BANK-button and then turn the data-entry dial. All capital letters, the numbers 0 through 9 and some special characters are available.

### **2.3.8 Panic**

This menu is selected by pressing the rightmost MENU-button. The PANIC-function can be used under any operational conditions. Pressing the PANIC-menu-button while in another menu will cause immediate exit from that menu.

The PANIC-menu also provides 16 Pseudo-panic-buttons for the 16 MIDI-channels. The BANK-buttons represent pseudo-panic-buttons 1 through 8, the NUMBER-buttons represent pseudo-panic-buttons 9 through 16, from left to right. These panic-buttons do not cause an ALL NOTES OFF-instruction to be sent. Instead 128 individual NOTE OFF-instructions are sent for all 128 possible notes of the MIDI-channel in question. This function is required for MIDI-instruments which do not recognize the ALL NOTES OFF-instruction. Such instruments would not respond to the 'normal' panic-button, since it only provides the ALL NOTES OFF-instruction. A PANIC-function which buttons off all 128 notes on all 16 channels via NOTE OFF-instructions will unfortunately cause MIDI-Overflow in almost all MIDI-instruments. In most cases a message like "MIDI-BUFFER FULL" or similar would appear on the display. This is the reason for the introduction of the 16 pseudo-panic-buttons on the LMK4+, since they effectively prevent this problem.

## **APPENDIX A: Explanation of the velocity-response curves and aftertouch curves.**

When defining the parameters of the keyboard zones one can select among 64 velocity-response curves and 8 aftertouch curves. In the following paragraph the reasons for this feature shall be discussed briefly.

The special MIDI-chip used inside the LMK2 to poll the key-contacts uses the time difference required by the switch-contact to derive the velocity response (or dynamics-value). The relationship between measured time difference and velocity is one of inverse proportion, i.e. doubling the time causes the velocity-response to be halved. However, this is not the response one is used to from a piano. Thus the option of adjusting the keyboard's velocity-response via response curves was created.

In the case of non-adjusted velocity-response (Curve 1) most people feel that the high values start too early and that there is insufficient resolution in the lower range. There are several tables which more or less compensate for this. The higher the number of the table (2...8) the more the velocity-response is moved upward, i.e. the harder one must press the keys to obtain a given velocity-response. Tables 9...12 represent alternative velocity-response curves, i.e. the dynamics rise even faster than in the inverse proportional curves. Tables 13...28 contain various linear, logarithmic and exponential characteristic curves with start- or end-response. Table 16, for example, sends a response value of at least 16. However, the rise of the response starts only at minimum key-pressure and ends at a maximum value of 100.

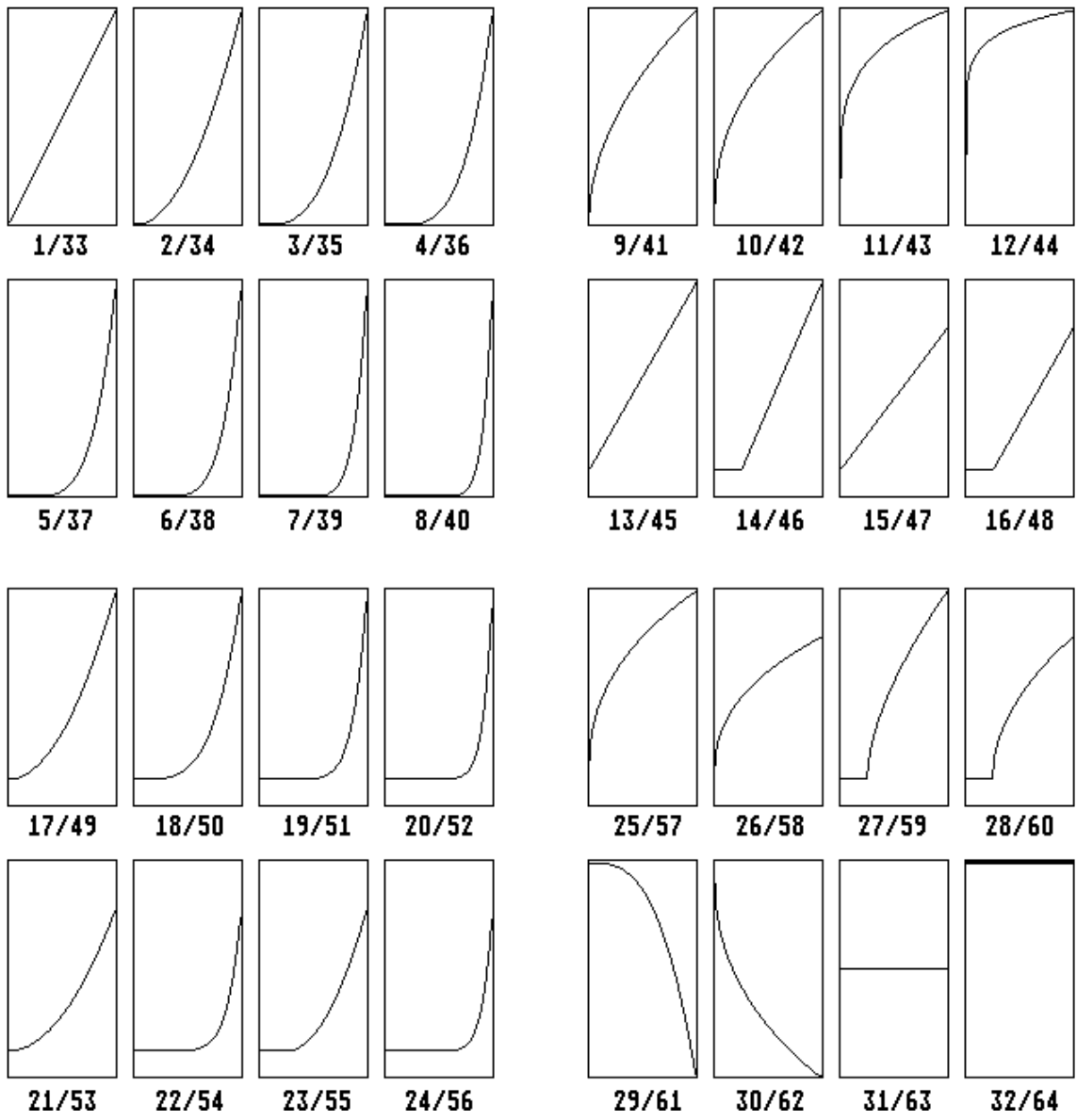
Tables 29 and 30 contain reversed characteristic-curves, i.e. the velocity-response values decrease as the keys are pressed harder. This seemingly illogical feature can be used for key-pressure-controlled blend-over effects ("Crossfade"). For this application one expander (or sound) is controlled with a 'normal' curve (1...28), another with with a reversed curve (29 or 30). This is done by defining the same UPPER/LOWER key-values for two different keyboard zones, but using different velocity-response curves and MIDI-channels for those two zones. Depending on how hard the keys are pressed one expander will now become louder, while the other expander will simultaneously become more quiet. The velocity-response characteristics will to some extent also depend on the type of expander being used, since different instruments have different characteristics.

The velocity response curves 33-64 are identical to the curves 1-32 with one little exception. If a key is pressed very slow the curves 1-32 produce a small velocity value (normally 1) whereas the curves 33-64 will send a velocity value of 0 (this is defined as note off). The main reason for the curves 33-64 is that many expanders produce an audible sound if they receive a note on event with velocity 1. But this is not the behaviour of a real piano. A real piano will produce no sound in this case. So if you want to achieve the behaviour of a real piano you have to select one of the velocity response curves 33-64 rather than 1-32. Therefore the curves 33-64 are called "Piano Mode velocity response curves".

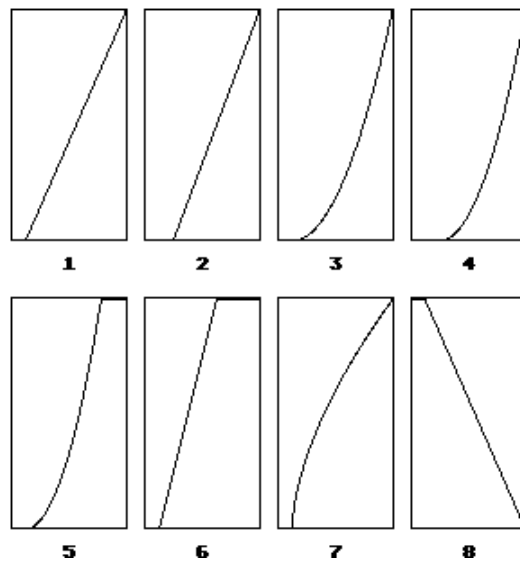
Velocity-response is to some extent also dependant upon the expander being used. There are significant differences in the characteristics of different expanders. Some expanders also include various velocity-response curves of their own. The 32 (64) curves included with the LMK4+ generally permit sufficiently good adjustment of the velocity-response characteristics.

The LMK4+ also provides 8 aftertouch curves. In general, the same comments apply to these as to the velocity-response curves. Curve 1 is linear. In curves 2...4 the high aftertouch values appear earlier, meaning that the lower range of the aftertouch is more sensitive. Curves 5 and 6 have a minimum (5) and a maximum value (6), respectively, for the aftertouch characteristic. Curve 8 is an inverted function, i.e. the aftertouch value decreases with increasing pressure on the keys.

Graphical representations of the various curves can be found on the next page.

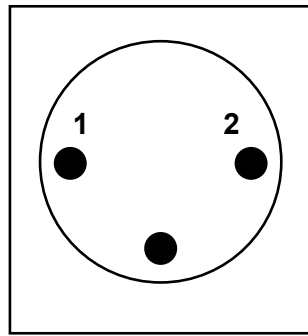


**VELOCITY-RESPONSE CURVES**



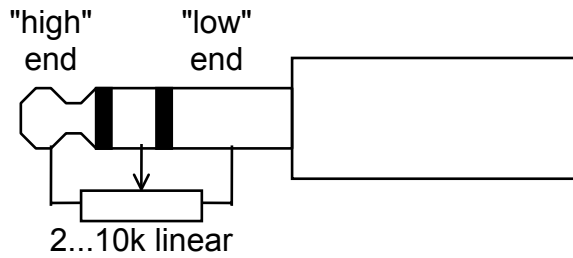
**AFTERTOUCH-RESPONSE CURVES**

## Appendix B: Pin Assignment of the Jack Sockets

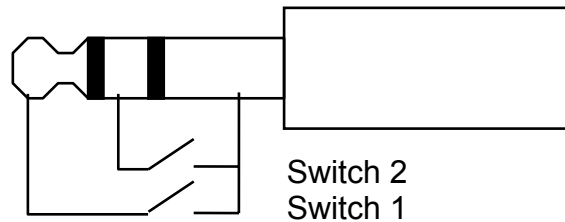


### Power Supply

1 = +7...12V DC  
2 = GND



### Foot Controller (EXT.CTRL. 1/2)



### Foot Switches (SWITCHES)

## Appendix C: Conversion table Bank/Numbers to Decimal System

		NUMBER BUTTON							
		1	2	3	4	5	6	7	8
BANK-BUTTON WITHOUT OFFSET	1	1	2	3	4	5	6	7	8
	2	9	10	11	12	13	14	15	16
	3	17	18	19	20	21	22	23	24
	4	25	26	27	28	29	30	31	32
	5	33	34	35	36	37	38	39	40
	6	41	42	43	44	45	46	47	48
	7	49	50	51	52	53	54	55	56
	8	57	58	59	60	61	62	63	64
BANK-BUTTON WITH OFFSET	1	65	66	67	68	69	70	71	72
	2	73	74	75	76	77	78	79	80
	3	81	82	83	84	85	86	87	88
	4	89	90	91	92	93	94	95	96
	5	97	98	99	100	101	102	103	104
	6	105	106	107	108	109	110	111	112
	7	113	114	115	116	117	118	119	120
	8	121	122	123	124	125	126	127	128

## Appendix D: Quick reference table of functions

Key Functions	Mode
<div style="text-align: center;"> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">PRESET</div> </div> <p style="text-align: right; margin-right: 20px;">Store</p> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Bank</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Nr.</div> </div> <p style="text-align: center;">Toggle 1-64/65-128</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">PROGRAM</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Bank</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Nr.</div> </div> <p style="text-align: center;">Toggle 1-64/65-128</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">REAL TIME / M-CHAN.</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Function</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">-</div> </div> <p style="text-align: center;">Adjust Clock with (D)</p> <p style="text-align: center;">Toggle between Real Time and Master Channel</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">SPLIT</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Zone</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Function</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">           LOWER KEY UPPER KEY CH/OUT TRANSPOSE VEL. TAB. AFT. TAB. PRG/BANK VOLUME         </div> </div>	

Key Functions	Mode
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">CTR.ACTIV. /ASSIGN</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">           WHEEL1 WHEEL2 E.CTR1 E.CTR2 SLIDE1 AFT.T. SLIDE2 ROT.P.         </div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">           E.SW1 E.SW2 - - - - - -         </div> </div> <div style="text-align: right; font-size: 2em;">}</div> <div style="text-align: right;">CONTR. on/off</div> <p style="text-align: center;">Toggle between Assign and Activate</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">USER DEF. CONTR.</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">UD1 UD2 UD3 UD4 UD5 UD6 UD7 UD8</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">- - - - - - - -</div> </div> <p style="text-align: center;">Adjust desired controller# with (D)</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">PARAM./ NAME</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">LINK R.Time Black Dump AT.Pol. - - Mem.Tr</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">-</div> </div> <p style="text-align: center;">Toggle to NAME</p>	
<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">PANIC</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">1 2 3 4 5 6 7 8</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">Pseudo Panic Buttons</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div> <div style="text-align: right;">9 10 11 12 13 14 15 16</div> </div>	

(D) = Data Entry

## Appendix E: Initialization of the LMK4+

One must operate the two right-hand menu buttons PARAM.NAME and PANIC simultaneously for several seconds while connecting the power supply. Then the message "EEPROM-SETUP" appears in the upper line of the display. Operating the first menu button (PRESET) starts the set-up routines and the message in the display changes to "INIT PRESETS". Operating the data entry knob changes the 3 digit display in the lower row. Three different data ranges have to be distinguished:

000: Initialization of the ADC reference voltages  
001...064: Initialization of a single preset (only 1 - 64 is possible)  
064...127 Initialization of all 128 presets

The first case (000) is used to reset the reference voltages for the analog-to-digital converters (ADC) to the factory values. That's required only if the continuous controllers output only a share of the full data range 0...127 or if only the extreme values (0 and 127) are sent.

The second case (001...064) can be used to initialize a single preset (1...64).

The third case (065...127) is used to initialize the complete preset memory. The procedure lasts about 1 second per preset, i.e. about 2 minutes for the complete procedure. In the display the number of the currently initialized preset is shown.

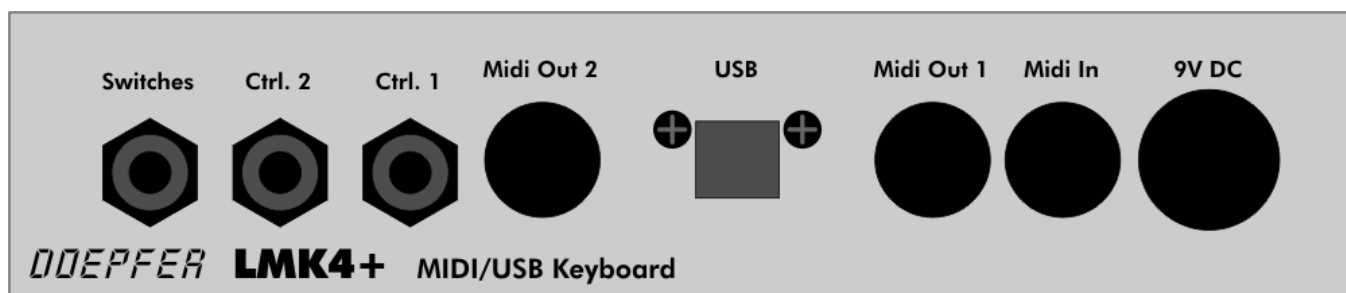
During initialization these values are entered into the preset memories in question:

whole keyboard zone 1, only zone 1 active, midi channel 1, no transpose, velocity table 1, no controllers active, no program numbers or volume data active in the preset, preset name "INITPRES"

*Use these functions very cautiously while operating the LMK4+ ! Any previously entered preset-values will be irretrievably lost! Use this function only if you wish to erase all presets !*

## Appendix F: USB Version

The new version of LMK4+ is equipped with an additional USB interface. Compared to the user's manual one of the two Midi Out 1 sockets and one of the two Midi Out 2 sockets have been replaced by an USB socket. This causes no significant limitation as the Midi out sockets of the former version were simply connected by pairs. The USB output transmits the same data as Midi Out 1 ("Midi over USB"). It is not possible to power the unit via USB because of the required supply current !



**USB version of the back panel**