MMB 4x4

MIDI

Merge Box

Model 8-255
ver. 1.0

MMB 4x4 MIDI MERGE BOX	PRESET / PARAM		UTILITY	SAVE	EDIT	EXIT	ENTER	SELECT	DATA
	NAME / VALUE					PANIC		PARAM / VALUE	

USER MANUAL

Content

Appendices

Manufacturer :

CHD Elektroservis
Nad kundratkou 27, 19000 Praha 9
Czech Republic

info@chd-el.cz
www.chd-el.cz

1. DEVICE DESCRIPTION

MMB 4x4 is programmable matrix of MIDI buses. It is opportune for using with small MIDI systems in studio as well as on stage during live performance. MMB 4x4 allows any combination of interconnection of four MIDI inputs with four MIDI outputs including merging of data from more inputs to one or more outputs and split of data from one input to more outputs. Transferred MIDI data can be filtered arbitrarily and independently on each of inputs and outputs.

All MMB 4x4's functions can be controlled by user with help of control elements on device's panel or with help of MIDI System Exclusive communication. Setting can be stored in permanent device's memory – up to 32 user preset banks are available. Content of memory can be archived in PC or sequencer with help of MIDI System Exclusive communication.

The device is equipped with some functions for friendly usage – user can check inherency of MIDI events or efficiency of data filters on inputs and outputs of the device, copying and clearing of content of memory banks can be proceeded etc.

1.1. CONNECTING SOCKETS, CONTROL AND INDICATION ELEMENTS

All control and indication elements are placed on front panel of the device. Power supply connector and MIDI sockets are on rear panel of the device – see pic. 1.

Pic. 1 – Panels of device

FRONT PANEL
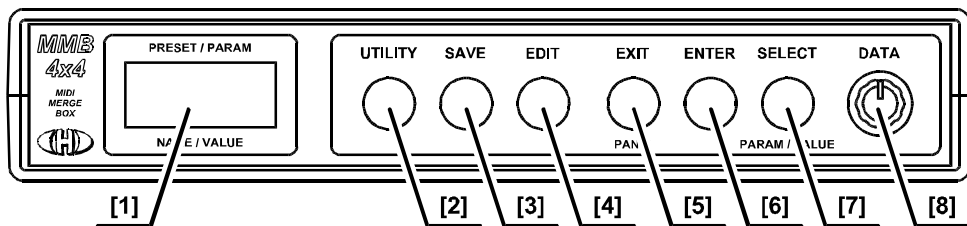
REAR PANEL
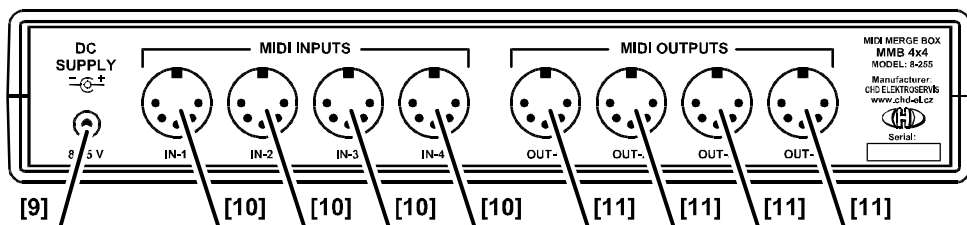
[1] Display 2x 8 characters
[2] EDIT button
[3] UTILITY button
[4] ENTER button
[5] SAVE button
[6] EXIT button
[7] SELECT button
[8] Rotary encoder DATA
[9] Power supply connector
[10] MIDI inputs 1 to 4
[11] MIDI outputs 1 to 4

1.2. DEVICE FUNCTION

Block schematic of device function is shown on pic. 2. Data from inputs MIDI-IN [10] comes to user configurable input filters of MIDI data, whose are working independently for each of inputs. Then the data go to bock of data mergers where it is possible to chose from what MIDI input to what MIDI output the dada will be transferred. If more than one input is chosen for one output, the data are merged in accordance with MIDI standards. Next user configurable filters are inserted before outputs MIDI-OUT [11]. They are working independently for each of outputs again.

Each of MIDI inputs and outputs is equipped with caching buffer. These buffers can keep up to 3840 data bytes so the data are not lost or distorted either if large amount of MIDI data is processed.

Pic. 2 – Functional block schematic of MMB 4x4
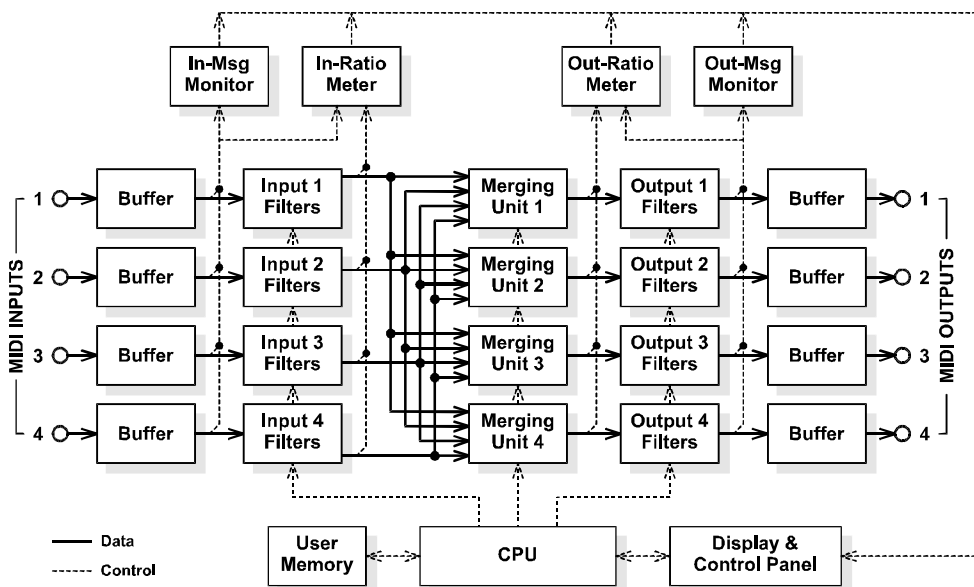
All activities of MMB 4x4 are controlled by parameters setting. There are two basic groups of the parameters that determine processing of the MIDI data – preset parameters and system (global) parameters. All parameters are user configurable and they can be stored in internal memory of MMB 4x4. One memory bank is available for system parameters, 32 memory banks is available for preset parameters. Structure of internal memory of MMB 4x4 is shown on pic. 3.

Preset parameters control function of filters and mergers of data. They are valid for only one preset. Always after a preset is activated, data from corresponding preset memory bank are read into edit buffer and here the parameters values can be changed. These changes are temporary only – they are lost when actual preset is changed or if the device is switched off. If the changes of parameters are about to be kept permanently, it is necessary to store new data from edit buffer back to a preset memory bank (see chapter 3.3. - Preset parameters storage mode).

System (global) parameters control hardware functions of MMB 4x4. They hold generally and independently on selected preset. During editing of system parameters, changes are executed straight in system memory bank.

Pic. 3 – Structure of MMB 4x4's internal memory
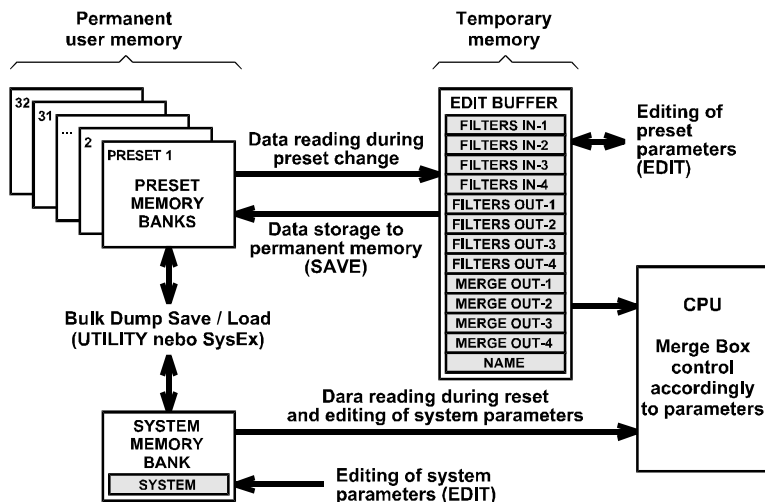
2. DEVICE INSTALLATION

2.1. CONNECTION TO MIDI SYSTEM

MMB 4x4 is connected to MIDI buses with help of standard MIDI cables terminated with DIN 41524 connectors (5 pin, 180°). Data from MIDI transmitters come to inputs MIDI-IN 1 to 4 [10], output data for MIDI receivers are outgoing from connectors MIDI-OUT 1 to 4 [11]. All inputs 1 to 4 and all outputs 1 to 4 are fully identical. If complement of four transmitters or four receivers of MIDI data is unnecessary, unused inputs / outputs of MMB 4x4 stay unconnected.

2.2. CONNECTION TO POWER SUPPLY ADAPTER

Device is powered from external DC power supply adapter connected to the DC SUPPLY [9] connector. Connector is of standard design (diameter 6 / 2,1 mm). External DC adapter must be able to continuously supply current up to approximately 200 mA, allowed range of power supply voltage is 8 to 15 volts. The voltage need not to be stabilized.

The connector of adapter must have positive pole on middle pin and negative pole on jacket (see pic. 4). The polarity of power supply connector is graphically illustrated on rear panel of the device. MMB 4x4 has built-in protection against supply voltage polarity reversal. If this happens, the device does not function but it does not lead to any damage of the device.

Pic. 4 – Supply adapter

cca 3 VA   +8 ~ +15 V   GND
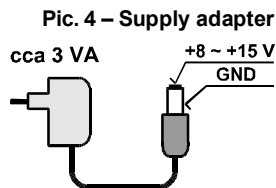
3. DEVICE OPERATION

MMB 4x4 communicates with user through display [1] and control elements on front panel of the device [2] to [8]. User is informed about the device status continuously and it is possible to change working modes and functions of the device. MMB 4x4 can be controlled remotely too – with help of MIDI System Exclusive Messages. Details are in description of MIDI SysEx communication.

MMB 4x4 has not main switch. It starts work immediately after power supply adapter is connected.

Pic. 5 – Structure of MMB 4x4 control
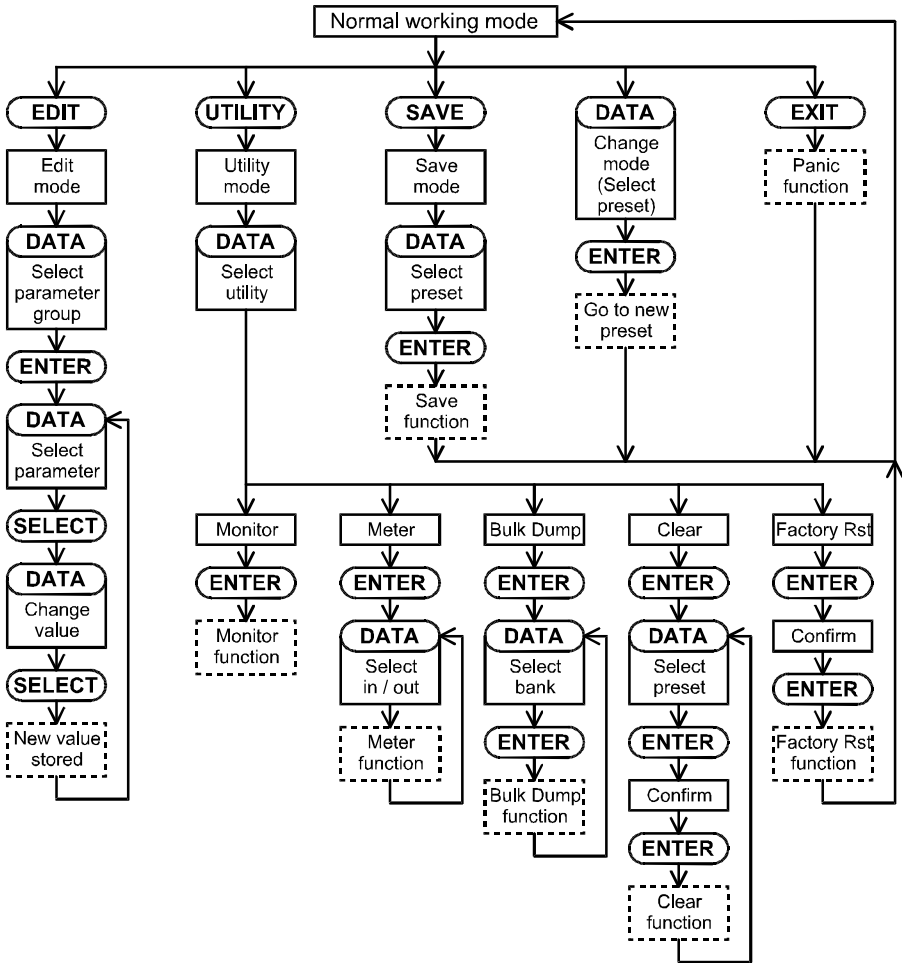
3.1. RESET SEQUENCE

Immediately after MMB 4x4 is switched on (i.e. after power supply adapter is connected to the device), reset sequence will pass. During this sequence, all device's circuits are set to basic status and initial values of parameters are read from user memory to edit buffer. Display shows name of the device and operating system version during reset sequence. After finishing of reset sequence, the device comes to normal working mode – see pic. 5.

3.2. NORMAL WORKING MODE

In normal working node, the device processes MIDI data in accordance with values of parameters of actually active preset. Number of actual preset and preset name are shown on display [1].

If a preset parameters were edited previously in edit buffer (see chapter Parameters Editing Mode – Preset Parameters), symbol "E" (Edited) is displayed ahead of preset number.

3.2.1. CHANGE OF ACTUAL PRESET

Change of actual preset can be done in normal working mode with help of rotary encoder DATA [8]. Arrow and number of new preset a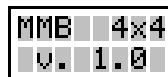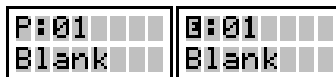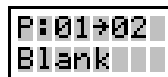re then displayed across the actual preset number. Simultaneously, name of new preset is shows in lower row of the display. Switching to new preset must be confirmed by pressing of ENTER [6] button.

It is also possible to change actual preset with help of MIDI System Exclusive command sent to any of inputs MIDI-IN [10] – see description of SysEx communication.

3.2.2. PANIC FUNCTION

If EXIT [5] button is pressed in normal working mode, "Panic" function is launched. Immediately after the function launching, all activities of the device are stopped and sequence of MIDI commands for reset of all follow-up devices is transmitted to all outputs MIDI-OUT 1 to 4 [11]. During transmitting of "Panic" sequence, display shows information about it. Sequence of "Panic" function commands is transmitted full or in short form in dependence on "Panic – Full Message" system parameter setting (see chapter 3.4.2. System parameters). MMB 4x4 returns to normal working mode after transmitting of "Panic" sequence is finished.

"Panic" function can be used in particular in case of software crash of MIDI system - when some tone generators hang for example.

3.3. PRESET PARAMETERS STORAGE MODE

If storing of parameters values from edit buffer (see chapter Parameters editing mode – Preset parameters) to permanent user memory is necessary, SAVE [3] button has to be pressed. By this, MMB 4x4 comes to data storage mode. Across the actual preset number, display shows arrows number of target preset to which the data from edit buffer will be stored. Choice of target preset can be done with help of rotary encoder DATA [8] and ENTER [6] button confirms it. Now the data are stored in new preset and display shows information about successful execution. Then MMB 4x4 returns automatically to normal working mode. Data storing can be anytime cancelled (without new data storing) by EXIT [5] button.
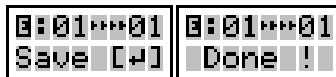
7

If there is a attempt to write data when memory protection is active (system parameter "Memory Protect", see chapter 3.4.2), the device stays in normal working mode and info about invalid operation is displayed for a moment.

Launching of storage mode isn't conditioned by previous editing of a parameter. Thus, preset parameters storage mode can be used for copying of presets too.

3.4. PARAMETERS EDITING MODE

All activities of MMB 4x4 during MIDI data processing run in accordance with user parameters setting. It is possible to set them in editing working mode of MMB 4x4. In this working mode, both preset and system parameters can be set. The device enters into editing mode after EDIT [4] button is pressed. Display [1] shows menu for selection of group of parameters whose will be edited. Requested group is chosen with help of rotary encoder DATA [8], name of selected group is displayed in lower row of display. Selection is then confirmed by pressing of ENTER [6] button. Button EXIT [5] cancels editing mode and the device returns to normal working mode.
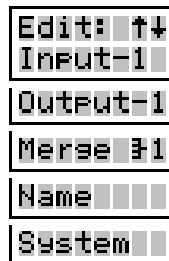
Parameters are divided to these four groups:

- **"Input-1"** to **"Input-4"** – preset parameters – control of input filters function
- **"Output-1"** to **"Output-4"** – preset parameters – control of output filters function
- **"Merge-1"** to **"Merge-4"** – preset parameters – control of data merging to particular outputs
- **"Name"** – preset parameter determining name of preset
- **"System"** – block of system (global) parameters

Changes of all preset parameters are executed only in edit buffer (see pic. 3). It means that MMB 4x4 is working in accordance with newly set parameters but the values are not stored in permanent memory. They are lost when actual preset is changed or if the device is switched off. Newly set values can be permanently stored to user memory in preset parameters storage mode. Changes of system parameters are stored to system memory bank automatically, immediately after a change occurs (see pic. 3). No next attendance of user is necessary.

3.4.1. PRESET PARAMETERS

Preset parameters are always valid for only one preset. In editing mode, values of preset parameters are set in edit buffer and MMB 4x4 works actually in accordance with these values. In editing menu, preset parameters are content in these groups: Input filters (**"Input-1"** to **"Input-4"**); Output filters (**"Output-1"** to **"Output-4"**); Merging of data from inputs to outputs (**"Merge-1"** to **"Merge-4"**); Name of preset (**"Name"**).

After entering into editing mode, required group is selected by rotary encoder DATA [8]. Name of selected group is shown in lower row of display. Choice of required group must be confirmed by pressing of ENTER [6] button. EXIT [5] button cancels editing mode - the device returns to normal working mode.

3.4.1.1. INPUT AND OUTPUT FILTERS

Filters of MIDI data enables to get out unnecessary MIDI commands from data stream. Each of inputs MIDI-IN 1 to 4 [10] (parameters group "Input-1" to "Input-4") and outputs MIDI-OUT 1 to 4 [11] (parameters group "Output-1" to "Output-4") has its own independent block of MIDI data filters. Selection of filter for editing executes rotary encoder DATA [8]. Name of filter is shown in upper row of display [1], actual value of the filter is displayed in lower row.

For change of filter value it is necessary to press SELECT [7] button and then to set new requested value by rotary encoder DATA [8]. Both original and new values are shown in lower row of display [1]. New value will be stored to edit buffer by repeated pressing of SELECT [7] button. Then it is possible to continue in selection of next filter. Setting of filter value can be cancelled anytime by pressing of EXIT [5] button.

`off →on`

Whole MIDI Channel (1 – 16)

There is 16 that parameters – one for each of MIDI channels. The parameters enable ("on") or disable ("off") transfer of all channel commands through the filter. If throughput is disabled, each of channel commands are filtered on corresponding MIDI channel.

`Chn1-01` `Chn1-16`

Channel Messages - Note On / Off

Parameter enables ("on") or disables ("off") transfer of channel commands "Note On" and "Note Off". If throughput is disabled, these commands are filtered on each of sixteen MIDI channels.

`Notes`

Channel Messages - Key & Channel Aftertouch

Parameter enables ("on") or disables ("off") transfer of channel commands "Key Aftertouch" and "Channel Aftertouch". If throughput is disabled, these commands are filtered on each of sixteen MIDI channels.

`K+ChAftr`

Channel Messages - Pitch Wheel

Parameter enables ("on") or disables ("off") transfer of channel command "Pitch Wheel". If throughput is disabled, this command is filtered on each of sixteen MIDI channels.

`PitchWhl`

Channel Messages - Program Change & Bank Select

Parameter enables ("on") or disables ("off") transfer of channel commands "Program Change", "Bank Select – LSB" (i.e. CC 0) and "Bank Select - MSB" (i.e. CC 32). If throughput is disabled, these commands are filtered on each of sixteen MIDI channels.

`PgmCh+BS`

Channel Messages - RPN & NRPN

Parameter enables ("on") or disables ("off") transfer of channel commands "Registered Parameter Number" (i.e. CC 99, CC 98), "Not Registered Parameter Number" (i.e. CC 101, CC 100), "Data Increment" (i.e. CC 96), "Data Decrement" (i.e. CC 97), "Data Entry - MSB" (i.e. CC 6) and "Data Entry - LSB" (i.e. CC 38). If throughput is disabled, these commands are filtered on each of sixteen MIDI channels.

`PgmCh+BS`

Channel Messages - Other Control Changes

Parameter enables ("on") or disables ("off")transfer of all other channel commands "Control Changes".If throughput is disabled, these commands are filtered on each of sixteen MIDI channels.

`Controls`

Common System Messages - MIDI Clock

Parameter enables ("on") or disables ("off") transfer of system MIDI command "MIDI Clock" (i.e. F8h).

`Clock`

9

Common System Messages - Transport (Start / Continue / Stop)

Parameter enables ("on") or disables ("off") transfer of system MIDI commands "Start" (i.e. FAh), "Continue" (i.e. FBh) and "Stop" (i.e. FCh).

`Transprt`

Common System Messages - MTC Qtr. Frame

Parameter enables ("on") or disables ("off") transfer of system MIDI commands "MTC Quartes Frame" (i.e. F1h xxh).

`MTC-QtrF`

Common System Messages - Song Position Pointer & Song Select

Parameter enables ("on") or disables ("off") transfer of system MIDI commands "Song Position Pointer" (i.e. F2h xxh xxh) and "Song Select" (i.e. F3h xxh).

`SPP+SS`

Common System Messages - Other Common System Messages

Parameter enables ("on") or disables ("off") transfer of all other system MIDI commands (i.e. "Tune Request" – F6h, "Active Sense" - FEh a "Reset" - FFh).

`OtherSys`

System Exclusive Messages - Real Time Commands

Parameter enables ("on") or disables ("off") transfer of real-time MIDI SysEx messages. If transfer is disabled, all SysEx messages with F0h 7Fh …F7h form will be filtered.

`Syx-RT`

System Exclusive Messages - Non Real Time Commands

Parameter enables ("on") or disables ("off") transfer of non real-time MIDI SysEx messages. If transfer is disabled, all SysEx messages with F0h 7Eh …F7h form will be filtered.

`Syx-NRT`

System Exclusive Messages - Other System Exclusive Messages

Parameter enables ("on") or disables ("off") transfer of all other MIDI SysEx messages. If transfer is disabled, all SysEx messages with F0h 00h~7Dh …F7h form will be filtered.

`OtherSyx`

3.4.1.2. DATA MERGING

Independently for each of outputs MIDI-OUT 1 to 4 [10], any combination of inputs MIDI-IN 1 to 4 [9] from that MIDI data will be transferred to the output can be set (parameters group "Merge-1" to "Merge-4"). After entering to editing of requested merging unit, digits 1 to 4 or dashes are shown on the right in lower row of display [1] and cursor blinks on position of digit 1. If a digit is displayed, data from corresponding input will be merged to edited output. If dash is displayed instead a digit, data from corresponding input will be ignored by merging unit. Rotary encoder DATA [8] enables shift of cursor to other position.

Permitting or prohibition of data transfer from input on actual position (i.e. displaying of digit / dash) can be set by rotary encoder DATA [8] after SELECT [7] button is pressed. New value will be stored to edit buffer by repeated pressing of SELECT [7] button. Then it is possible to continue in selection of next position. Setting can be cancelled anytime by pressing of EXIT [5] button.

`Mrg from`
`in →1-34`
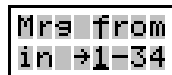
3.4.1.3. PRESET NAME

Each of presets can be named by user. The name can be up to eight characters long. After entering to name editing (parameter "Name"), name of actual preset is shown in lower row of display [1] and cursor blinks on first position of the name. It means that this character is prepared for editing. Shift of cursor position is performed by rotary encoder DATA [8].

It is necessary to press SELECT [7] button for editing of character on the cursor position. Now form of the cursor is different and chosen character can be changed with help of rotary encoder DATA [8] (see table 1). With help of ENTER [6] button, it is possible to jump to digits, lower cases or upper cases. After the requested character is selected, repeated pressing of SELECT [7] button returns the device to choice of position of character for editing. Setting can be anytime cancelled by EXIT [5] button.

Table 1 – Characters for display (ASCII)											
Data	Char.	Data	Char.	Data	Char.	Data	Char.	Data	Char.	Data	Char.
20h	space	30h	0	40h	@	50h	P	20h	'	70h	p
21h	!	31h	1	41h	A	51h	Q	61h	a	71h	q
22h	"	32h	2	42h	B	52h	R	62h	b	72h	r
23h	#	33h	3	43h	C	53h	S	63h	c	73h	s
24h	$	34h	4	44h	D	54h	T	64h	d	74h	t
25h	%	35h	5	45h	E	55h	U	65h	e	75h	u
26h	&	36h	6	46h	F	56h	V	66h	f	76h	v
27h	'	37h	7	47h	G	57h	W	67h	g	77h	w
28h	(	38h	8	48h	H	58h	X	68h	h	78h	x
29h	)	39h	9	49h	I	59h	Y	69h	i	79h	y
2Ah	*	3Ah	:	4Ah	J	5Ah	Z	6Ah	j	7Ah	z
2Bh	+	3Bh	;	4Bh	K	5Bh	[	6Bh	k	7Bh	{
2Ch	,	3Ch	=	4Ch	L	5Ch	\	6Ch	l	7Ch	|
2Dh	-	3Dh	<	4Dh	M	5Dh	]	6Dh	m	7Dh	}
2Eh	.	3Eh	>	4Eh	N	5Eh	^	6Eh	n		
2Fh	/	3Fh	?	4Fh	O	5Fh	_	6Fh	o		

3.4.2. SYSTEM PARAMETERS

System parameters are always valid independently on the actual preset settings – the change of the system parameters take effect the same way in all user presets.

Entering into editing of system parameters can be done by choice of "System" item in editing menu. Then rotary encoder DATA [8] selects parameter for editing. Name of selected parameter is shown in upper row of display [1], actual value of the parameter is shown in lower row. For change of the parameter value, it is necessary to press SELECT [7] button and then to set new requested value by rotary encoder DATA [8]. New value is stored into memory by repeated pressing of SELECT [7] button. Now next parameter for editing can be selected by rotary encoder DATA [8]. Setting of parameter value can be cancelled anytime by EXIT [5] button.

If memory protection is active ("Memory Protect" parameter is "on"), listing through system parameters and their changes are disabled. Editing of system parameters is allowed not until memory protection is switched off.

Memory Protect

Parameter enables ("on") or disables ("off") protection of internal MMB 4x4š memory against unwanted rewriting of stored data. If the protection is switched on, display [1] shows information about impossibility of data writing during any attempt to writing data to memory (preset storage, SysEx Msg Bulk Dump Load).

`MemPrtct`

Auto Reset

The parameter sets reaction to working error origination during MMB 4x4 operation. If the parameter is "on", device reset is executed automatically always when any working error occurs and then MMB 4x4 returns to normal working mode. If the parameter is "off", manual pressing EXIT [5] button is necessary for the error removing and for return to normal working mode.

`Auto-Rst`

Panic – Full Message

The parameter selects type of data transmitted to all outputs MIDI-OUT 1 to 4 [11] after "Panic" function is launched (see chapter Normal working mode – Panic function). If the parameter is "off"), only shorten sequence of MIDI commands is transmitted after "Panic" function is launched (see table 2). If the parameter is "on", full sequence of MIDI commands is transmitted (see table 3). This full sequence is useful for older MIDI devices that don't recognize MIDI commands implemented to MIDI specification subsequently (RAC, ASO etc.).

`Full Pan`

Table 2 – Data transmitted by Panic function – shorten sequence	
MIDI commands	
Name	**Data (hexadecimal)**
Common System: Stop	FC
Common System: Song Position Pointer = 0	F2 00 00
Channel 1: Ctrl Change (Omni Off, Poly On, ASO, RAC, ANO)	B0 7C 00 7F 00 78 00 79 00 7B 00
Channel 1: Pitch Wheel = 16384	E0 00 40
Channel 2: Ctrl Change (Omni Off, Poly On, ASO, RAC, ANO)	B1 7C 00 7F 00 78 00 79 00 7B 00
Channel 2: Pitch Wheel = 16384	E1 00 40
↓ the same for MIDI channels 3 to 16	…

| Table 2 – Data transmitted by Panic function – full sequence	
MIDI commands	
Name	**Data (hexadecimal)**
Common System: Stop	FC
Common System: Song Position Pointer = 0	F2 00 00
Channel 1: Ctrl Change (Omni Off, Poly On, ASO, RAC, ANO)	B0 7C 00 7F 00 78 00 79 00 7B 00
Channel 1: Pitch Wheel = 16384	E0 00 40
Channel 1: Note Off	80 00 40 01 40 ... 7F 40 (257 byte totally)
Channel 2: Ctrl Change (Omni Off, Poly On, ASO, RAC, ANO)	B1 7C 00 7F 00 78 00 79 00 7B 00
Channel 2: Pitch Wheel = 16384	E1 00 40
Channel 2: Note Off	81 00 40 01 40 ... 7F 40 (257 byte totally)
↓ the same for MIDI channels 3 to 16	…

MIDI Clock Indicator

Group of eight parameters "Clock-I1" to "Clock-I4" and "Clock-O1" to "Clock-O4" allows to enable ("on" value) or to disable ("off" value) indication of synchronization pulses (MIDI Clock) on individual inputs ("I") and outputs ("O") for "Monitor" utility.
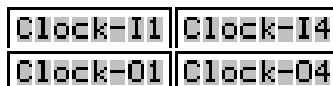
SysEx Data Pause

Group of four parameters "SxPause1" to "SxPause4" allows setting of maximal duration of pause between databytes of any MIDI System Exclusive message received on inputs MIDI-IN 1 to 4 [10]. Setting of proper pause duration can stop from collapse of data transfer through the device if the message isn't finished or if the message contents invalid databytes. Value of the parameter (i.e. 4 to 127) multiplied by 5 gives maximal allowed duration in milliseconds (i.e. 20 to 635).

LCD Contrast

Parameter sets requested contrast of display [1]. Values from 0 to 127 can be chosen. Higher value corresponds to higher contrast.

Device ID

Parameter sets identification number (Device ID), which will be used by MMB 4x4 for MIDI System Exclusive communication. However, independently on selected identification number, MMB 4x4 always recognizes messages with universal Device ID 127 (7Fh). Detailed description of MIDI System Exclusive communication is in stand-alone manual.
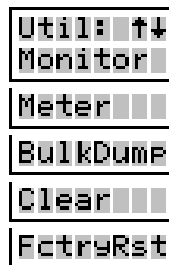
3.5. UTILITY

MMB 4x4 is equipped with some auxiliary functions (utilities) whose allows to follow throughput of MIDI data and to backup or to clear content of user memory of parameters.

The device enters into Utility mode after UTILITY [2] button is pressed. After that, name of Utility menu is shown in upper row of display [1] and name of selected utility is shown in lower row. Requested utility can be chosen with help of rotary encoder DATA [8]. ENTER [6] button launches selected utility.

Button EXIT [5] cancels Utility mode and the device returns to normal working mode.

3.5.1. MONITOR

"Monitor" utility enables to check presence of MIDI evens on individual MIDI inputs and outputs of the device. Numbers 1 to 4 are displayed on positions of inactive inputs and outputs. If some of inputs or outputs are just transferred a data (MIDI events), inversive digits are displayed.

Indication of clock pulses (MIDI Clock events) can be prohibited individually for each of input and output with help of system parameters "MIDI Clock Indicator" – see chapter 3.4.2.

3.5.2. METER

"Meter" utility allows to check amount of MIDI data before and across each of input and output block of filters. Selected input / output is indicated in upper row of display [1]. Selected input / output can be changed by rotary encoder DATA [8].

```
┌─────────┬─────────┐
│ Input-1 │ Output-4│
│ 017/005%│ 005/000%│
└─────────┴─────────┘
```

Lower row of display shows relative utilization of MIDI bus before / across block of filters. So efficiency of filters can be evaluated by comparison of these two values.

3.5.3. BULK DUMP

"Bulk Dump" utility allows to backup data from device's user memory in PC or sequencer. The data are in MIDI System Exclusive messages form. If these data are

```
┌──────────┬──────────┬──────────┐
│ Dump  ↑↓ │ Dump  ↑↓ │ Dump  ↑↓ │
│ All Data │ System   │ Preset01 │
└──────────┴──────────┴──────────┘
```

sent back to the device, original data are stored back to memory banks of MMB 4x4.

Lower row of display [1] shows memory area which content will be transmitted. It can be chosen with help of rotary encoder DATA [8]. If "All Data" is chosen, complete content of user memory will be transmitted. If "System" is chosen, only system parameters will be transmitted. If "Preset" is chosen, parameters of only one preset will be transmitted. Number of chosen preset is shown on display. Transmitting of chosen data starts after ENTER [6] button is pressed.

3.5.4. CLEAR PRESET

"Clear Preset" utility allows to initialize particular user presets – i.e. user values of parameters stored in selected preset will be replaced with default values (see table 5). Lower row of display [1] shows number of preset which parameter will

```
┌──────────┬──────────┐
│ Clear  ↑↓│ Are you  │
│ Preset01 │ sure ?   │
└──────────┴──────────┘
```

be cleared. Rotary encoder DATA [8] select the preset number, ENTER [6] button confirms the selection. MMB 4x4 bespeaks confirmation once more ("Are you sure ?") after that. Now the utility is launched by repeated pressing of ENTER [6] button or it can be cancelled by pressing of EXIT [5] button. In this case, MMB 4x4 returns to preset number selection.

Attention ! All data stored by user in selected preset are lost irrecoverably during the utility processing.

This utility can't be selected in utility menu if memory protection is switched on.

3.5.5. FACTORY RESET

"Factory Reset" utility sets MMB 4x4 to default status totally. Default values of all parameters are displayed in tables 4 and 5. After the utility selection, MMB 4x4 bespeaks confirmation ("Are you sure ?). Now the utility is launched by pressing of ENTER [6] button or it can be cancelled by pressing of EXIT [5] button. In this case, MMB 4x4 returns utility selection.

```
┌──────────┐
│ Are you  │
│ sure ?   │
└──────────┘
```

Attention ! All data stored by user in device's memory (all system and preset parameters) are lost irrecoverably during the utility processing.

This utility can't be selected in utility menu if memory protection is switched on.

Table 4 – Default values of system parameters (Factory Reset)		
Parameter name	Value	Meaning / function
Memory Protect	on	Protection active
Auto Reset	on	Automatic reset allowed
Panic - Full Message	off	Sekvence „Panic" transmitted in short form
MIDI Clock Indicator – In 1 ~ 4	off	„Monitor" utility doesn't show MIDI Clock
MIDI Clock Indicator – Out 1 ~ 4	off	„Monitor" utility doesn't show MIDI Clock
SysEx Data Pause 1 ~ 4	10	Max delay 50 ms
LCD Contrast	100	Setting of initial contrast of LCD
Device ID	31	ID number for SysEx communication

Table 5 – Default values of preset parameters (Factory Reset) – for all presets		
Parameter name	Value	Meaning / function
Filter In 1 ~ 4 / Whole Channel 1 ~ 16	on	Data transfer enabled
Filter In 1 ~ 4 / Channel Messages	on	Data transfer enabled
Filter In 1 ~ 4 / Common System Messages	on	Data transfer enabled
Filter In 1 ~ 4 / System Exclusive Messages	on	Data transfer enabled
Filter Out 1 ~ 4 / Whole Channel 1 ~ 16	on	Data transfer enabled
Filter Out 1 ~ 4 / Channel Messages	on	Data transfer enabled
Filter Out 1 ~ 4 / Common System Messages	on	Data transfer enabled
Filter Out 1 ~ 4 / System Exclusive Messages	on	Data transfer enabled
Merge 1 ~ 4	on/on/on/on	Merging of data from all inputs enabled
Name	„Blank"	Preset name

4. ERROR STATUS

In some extreme cases, a error can occur during the device operation and then correct processing of data is disallowed. In that case, MMB 4x4 stops working and display [1] shows number of error. There are two types of errors – working and fatal errors.

Fatal errors disable correct operation of CPU. In that case, processing of all data and reading of all control elements is stopped and display [1] shows info that the error is fatal. The only possibility how to return MMB 4x4 back to normal working mode is to switch the device off and on (disconnect power supply adapter and then connect it again).

Working errors occur if a caching buffer overflows. These errors don't block CPU operation, they only disallow correct transfer of data from inputs to outputs. For the error elimination and return to normal working mode, it is necessary to launch "Panic" function by pressing of EXIT [6] button. Of course, it is also possible to switch the device off and on as in previous case. Device reset and "Panic" function launching are done automatically (and the device returns to normal working mode after that) if any working error occurs and system parameter "Auto Reset" is on. No user action is then necessary.

5. SYSTEM EXCLUSIVE COMMUNICATION

MMB 4x4 disposes of quite large system of System Exclusive communication. It enables to receive and to transmit a SysEx Messages for remote setting of all parameters in edit buffer and memory banks and to list actual values of parameters or memory banks content - these data can be archived in PC for example.

Also, it is possible to work with memory banks (to store data from edit buffer or to change presets), to control display of MMB 4x4 directly and to launch system functions and utilities of the device.

Software generator for simple creation of SysEx messages for control and programming of MMB 4x4 is available on supplemental CD-ROM. Any necessary message can be created with the help of this generator.

A complete description of MIDI System Exclusive communication is in special stand-alone document.

6. TECHNICAL SPECIFICATION

Power supply
Supply voltage :	DC 8 - 15 V, need not to be stabilized
Consumption :	max 200 mA
Protection :	protection against reversal of supply voltage poles
Supply adapter connector :	standard, axial,, diameter 6 / 2,1 mm

Signal lines
MIDI buses :	4x MIDI-IN, 4x MIDI-OUT (connectors DIN41524, 5-pin / 180°)
Caching buffers size :	8x 3840 byte (for each of inputs and outputs)
Transit data delay :	from 0,4 ms to 1 ms conformably to data flow density and data type (valid for standard data flow)

Controls
Control elements :	rotary encoder + 6x nearetované tlačítko
Indication of working statuses :	backlit LCD, 2x 8 characters

Mechanical design
Dimensions :	225 mm (width) / 40 mm (height) / 180 mm (depth)
Weight :	ca 0,4 kg

Operating conditions
Electrical design :	under the regulations of the ČSN EN 60335-1+A55, ČSN EN 60335-2-45
EMC :	under the regulations of the ČSN EN 55014
Operating environment :	standard
Range of operating temperature :	+10 to +35 °C
Relative environmental humidity :	up to 85 %

Accessories
Printed manuals (User manual, description of MIDI System Exclusive communication, description of testing procedures) and CD ROM with documentation and support software

7. WARRANTY CONDITIONS

The equipment is provided with thirty-month warranty starting from the date of the equipment take-over by the customer. This date must be specified on warranty list together with dealer's confirmation.

During this period of time, all defects of equipment or its accessories, caused by defective material or faulty manufacturing, will be removed free of charge.

Warranty repair is asserted by the customer against the dealer.

Warranty period is to be extended for the time period, during which the product was under the warranty repair.

Relevant legal regulations take effect in case of cancellation of purchase contract.

Customer will lose the right for free warranty repair, if he will not be able to submit properly filled out warranty list or if the defects of the product had been caused by:
- unavoidable event (natural disaster),
- connecting the device to the incorrect supply voltage,
- inputs or outputs overloading by connecting signals source or load source with non-corresponding characteristics etc.,
- faulty equipment operation, which is at variance with the instructions referred-to in the operating manual,
- mechanical damage caused by consumer during transportation or usage of equipment,
- unprofessional interference with the equipment or by equipment modification without manufacturer's approval.

APPENDICES

A. Parameters editing

It is opportune to edit parameters in time when no data or minimal data are transmitted from MIDI data sources to MMB 4x4. If a changes are executed during a MIDI song playing, some commands transmitted from MMB 4x4 can be incomplete and some tones or controllers can stay "hanging" on follow-up devices. This status can be reliably ablated by launching of "Panic" function (see chapter 3.2.2).

B. Usage of filters of Common System commands Clock / Start / Continue / Stop

Application of these filters is important if data are merged from two or more transmitters whose use MIDI synchronization. In that case, it is necessary to choose only one transmitter as master and to filter synchronization commands for all other transmitters – with help of input filters of MMB 4x4.

If "MIDI Clock" pulses from more synchronization sources are merged, the result is mixture of unreasonable tempo data and MIDI receiver connected to that signal can behave absolutely indefinably.

C. Setting of system parameters SysEx Data Pause

Optimum value of parameter suitable for absolute majority of connected devices is up to 50 milliseconds. However it is necessary to choose 100 and more milliseconds for some MIDI data transceivers (e.g. Yamaha MDF-2, MDF-3). It is recommended to progress empirically when setting value of the parameter for particular device. Start by setting lower value and test data transmission. If error in transmission occurs, increase value of the parameter and test again, until data transmission is faultless.

Of course, it is also possible to set maximal parameter value when all data are transferred from all types of MIDI transmitters certainly. However, some noticeable delay can occur during data throughput.

D. Virtual division of **MMB 4x4 to more functionally independent units**

MMB 4x4 can work as two totally independent devices if necessary. Requested configuration is given by setting of preset parameters group "Merge-1" to "Merge-4" as show examples below.
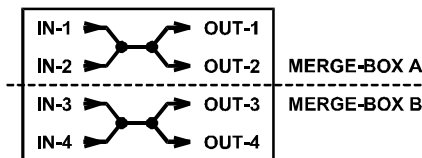
1) If the parameters are set:
　　Merge-1 = 1 2 - -
　　Merge-2 = 1 2 - -
　　Merge-3 = - - 3 4
　　Merge-4 = - - 3 4

Data from inputs 1 and 2 will be merged to outputs 1 and 2 and data from inputs 3 and 4 will be merged to outputs 3 and 4. MMB 4x4 then works as two independent Merge-Boxes with two inputs and two outputs.

Setting described in this example can be executed by replaying of MIDI file „D01.mid" (on supplemental CD-ROM) to MMB 4x4. For proper loading, MMB 4x4must be in normal working mode.
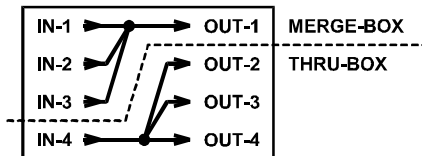
2) If the parameters are set:
　　Merge-1 = 1 2 3 -
　　Merge-2 = - - - 4
　　Merge-3 = - - - 4
　　Merge-4 = - - - 4

Data from inputs 1, 2 and 3 will be merged to output 1 and data from input 1 will be splitted to outputs 2, 3 and 4. MMB 4x4 then works as Merge-Box with three inputs and one output and as Thru-Box with one input and three outputs.

Setting described in this example can be executed by replaying of MIDI file „D02.mid" (on supplemental CD-ROM) to MMB 4x4. For proper loading, MMB 4x4must be in normal working mode.

E. Display control

Operating system of MMB 4x4 allows to control display with help of System Exclusive communication. Any text created by user can be shown on device's display. Detaily jsou uvedeny v popisu System Exclusive communication in detail.

Example of display control is recorded in MIDI file „D00.mid" (on supplemental CD-ROM). Replaying of this file to MMB 4x4 demonstrates that possibility.

F. Transit data delay

MIDI message consist of one, two or three bytes (except SysEx messages, however). MMB 4x4 must receive whole message at first so that it is possible to process the message. This causes specific delay during MIDI data transfer through the device. Since transfer of one byte takes 320 µs, in the worst case total delay of data is 960 µs maximally – i.e. less than one thousandth of second. That delay is absolutely imperceptible by human senses.

G. Data transfer through the device

The principle of merging of data from more serial buses with constant transfer rate into one bus with the same transfer rate implies that in case of data flow on input buses being dense, accumulation of data can take place. Output bus might not be able to handle the transmission in this case. MMB 4x4 is provided with large caching data buffers on each of MIDI inputs and outputs for this reason. These buffers capture data from this signal route for the duration of time period when controlling processor of MMB 4x4 processes data from other signal routes. The capacity of these buffers is substantial despite the fact sometimes the data can be delayed. In extreme cases the buffers can be overfilled. In case of one input bus being extremely loaded, it is therefore recommended to load other input buses lightly or not at all. This is of course applicable only for transmissions of extremely large data blocks, which can be for example SysEx memory dumps, transfer of sound samples (SDS) or MIDI files (MFD), and the like.

However, caching buffers cannot be realistically overfilled by standard musical data and eventual delay isn't imperceptible by human ears. Let us suppose following example – merging data from four sequencers, all of them transmit on all 16 channels. Four voiced accords in 8th notes are played on each channel of each sequencer, tempo is 120 BPM. Therefore 1024 tones sound during one second. In this example, Merge Box is used (while in "Running Status" mode) to 55 to 65 % of its capacity. There is still plenty of room for data.

But if the tempo will be doubled (240 BPM), some delay occurs since output bus would have to transfer about 130% of maximal possible amount of data. So exceeding data are stored to caching buffers and transmitting of that data is delayed. After a few seconds, caching buffers overflow and MIDI communication will totally collapse.