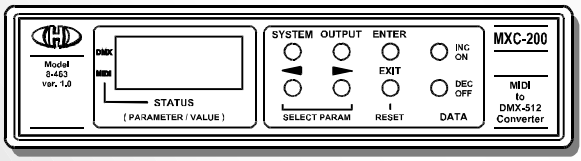
MXC-200

MIDI to DMX-512 Converter

Model 8-463
ver. 1



USER MANUAL

Contents

Manufacturer :
CHD Elektroservis
Nad kundratkou 27, 19000 Praha 9
Czech Republic

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

1. DEVICE DESCRIPTION

MXC-200 converter is a device that enables MIDI control of the lighting apparatus components controlled by DMX-512 standard. This allows to control lights from e.g. built-in sequencers of electronic keyboard instruments or manually directly from the keyboard instruments without the need of special DMX-512 compatible control panel. The converter is designed to control any DMX devices.

Features:

- The converter allows to control of up to 200 outputs - DMX channels
- Each of output has independently adjustable parameters (preheating, limitation, conversion etc.).
- Possible MIDI commands for the lighting apparatus control are Note On/Off, Key Aftertouch, Control Changes (CCs), NRPN (Non Registered Parameters) or specific SysEx messages.
- MIDI channel for MIDI communication is user selectable.
- An external switches (e.g. Foot Switches) can be connected for control of functions of the converter.
- All converter's activities are indicated on LCD during normal operation as well as during programming.
- All converter's activities are controlled by a user-programmable parameters that are stored in internal device's memory. All parameters are programmable manually from the device's panel so no special programming MIDI SysEx message are necessary.

1.1. DMX COMMUNICATION

DMX-512 standard is designed specifically to control stage lighting. It was created in the eighties in the United States Institute for Theater Technology, Inc. (USITT). The standard has been revised several times later.

Standard DMX-512 uses a very simple communication protocol (defined in the document USITT Engineering Commission) DMX512/1990 Digital Data Transmission Standard. Hardware solutions for communication circuits DMX-512 was taken from an industrial communication interface RS-485 (Electronic Industries Association standard EIA-422A and EIA-485).

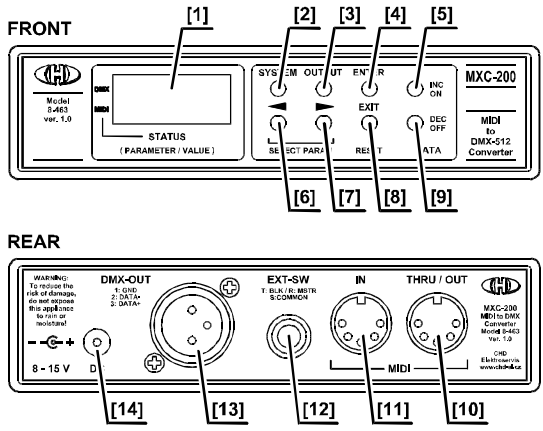
The MXC-200 comply to the above standards and is fully compatible with any DMX devices thus.

1.2. CONTROL ELEMENTS, INDICATORS AND CONNECTORS

Control and indication elements of the converter are located on the front panel, all connectors are on the rear panel of the device - see pic. 1:

[1] Display
[2] SYSTÉM edit button
[3] OUTPUT edit button
[4] ENTER button
[5] INC / ON button
[6] PREVIOUS button
[7] NEXT button
[8] EXIT / RESET button
[9] DEC / OFF button
[10] MIDI-THRU / OUT connector
[11] MIDI-IN connector
[12] External foot switches connector
[13] DMX-512 output
[14] DC Power supply connector

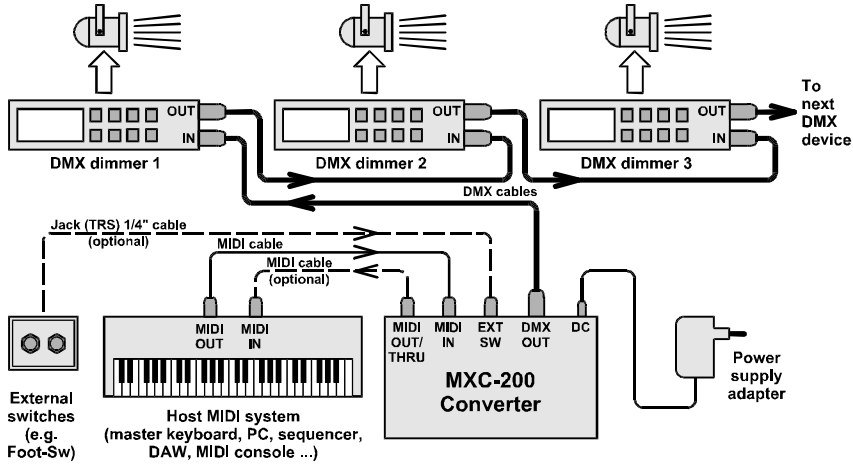
Pic.1 – Converter panels



2. DEVICE INSTALLATION

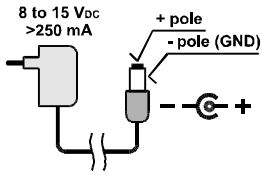
Example of MXC-200 connection to the MIDI system and DMX system is shown on pic. 2

Pic. 2 – Example of the converter connection



2.1. POWER SUPPLY ADAPTER CONNECTION

Pic. 3 – Power supply unit



Power supply for MXC-200 is provided from an external adapter connected to DC [14] connector. The connector is standard barrel type 5,5 / 2.1 mm. External DC adapter must be able to supply 250 mA at least in the voltage range of 8 to 15 volts. The voltage need not be stabilized. The adapter connector must have negative pole outside and positive pole inside - see pic. 3. Polarity of the power connector is also graphically displayed on the rear panel of the device.

Remark: *The device has a built-in protection against reverse polarity of supply voltage. If that occurs, the device doesn't work but it is not damaged.*

2.2. MIDI SYSTEM CONNECTION

MXC-200 is connected to the MIDI system using standard MIDI cables with DIN 41524 (5-pin 180°) connectors. Control data from the master MIDI system (sequencer, keyboard, PC, etc.) are incoming to the MIDI-IN [11] input. Thru-going data are available at the output MIDI-THRU/OUT [10].

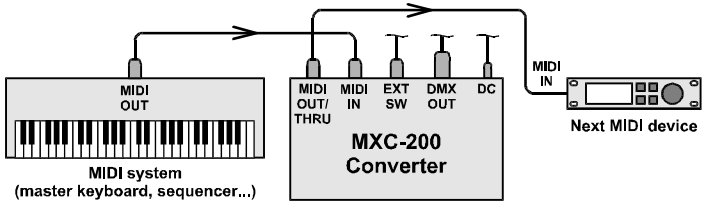
All MIDI data incoming to MIDI input of the interface are transferred to MIDI-THRU/OUT output of the interface without any changes (THRU function). It enables connection of next MIDI devices to host system without an additional Thru-Box etc. MIDI input of next MIDI device will be simply interconnected with MIDI-THRU/OUT output of the interface then (see pic. 4).

If there are no other devices controlled from the master MIDI system, only MIDI-IN cable is necessary (from MIDI system to MIDI-IN input of the converter). MIDI-THRU/OUT output of the converter remains unconnected (see pic. 5).

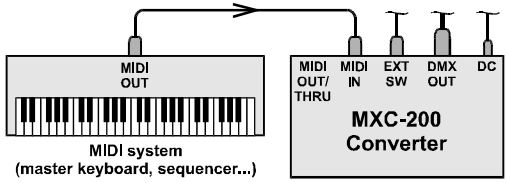
Except data from input MIDI-IN, own converter's System Exclusive messages can be transmitted to output MIDI-THRU/OUT. These Bulk Dump messages transfer memory banks content for archiving in PC, DAW etc. If that function is used, MIDI output MIDI-THRU/OUT of the converter must be

connected to MIDI input of MIDI master system (PC, DAW…) in which data from the memory will be archived (see pic. 6).

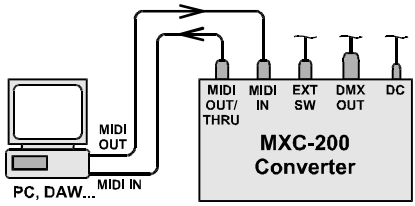
Pic. 4 – Connection to larger MIDI system for standard working mode



Pic. 5 – Connection to small MIDI system for standard working mode



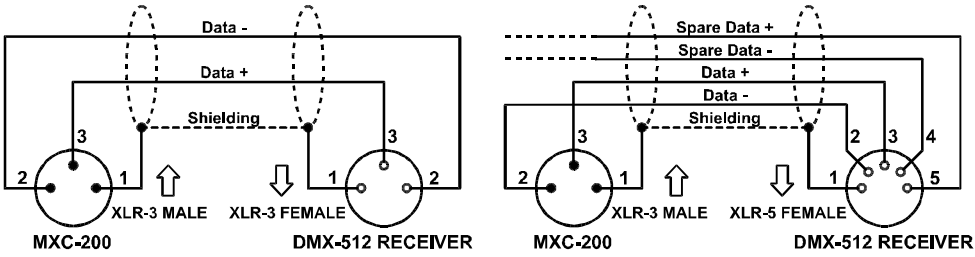
Pic. 6 – Connection to MIDI system for memory content transfer



2.3. DMX SYSTEM CONNECTION

To connect the MXC-200 converter to the DMX system is used DMX-OUT [13]. In accordance with the standard USITT (United States Institute for Theater Technology, Inc.) 5 pin XLR-type connector should be used. However, since the vast majority of producers of the DMX equipment does not comply the standard and uses only 3-pin XLR connectors, the 3-pin connector is used here too for easy interconnection.

Pic. 7 - DMX-512 cable wiring variants



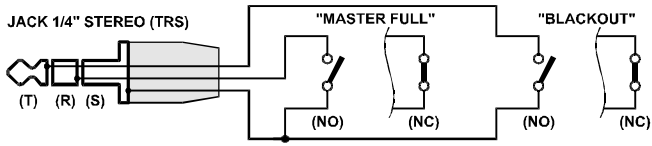
The DMX connection cable must be wired according the picture 7. If the cable is shielded 4-line, the spare data wires (i.e., auxiliary data lines "Spare +/-") from the XLR-5 connector remain unconnected – the converter does not work with them. For quick orientation, the wiring of the connector pins DMX-OUT [13] is also listed on the rear panel near to the DMX-OUT [13] connector.

2.4. EXTERNAL SWITCHES CONNECTION

Two external switches can be connected in the EXT-SW [12] stereo Jack 1/4" (TRS) – e.g. foot switches. These switches control "Blackout" and "Master Full" functions (see chapter 3.2). Contacts of the external switches may be NO type (Normally Open - disconnected in off position) or NC type (Normally Connected – connected in off position) – see pic. 8. MXC-200 recognizes the type of switches automatically.

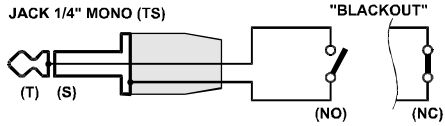
Remark: *Both switches must be connected and in off position during the device reset (i.e. when power supply adapter is connected to the device) if they are used! In other case, the converter cannot work with them correctly.*

Pic. 8 – Connection of two external switches



Only one external switch with mono Jack 1/4" (TS) can be connected to the EXT-SW [12] socket too. That switch controls only "Blackout" function (see chapter 3.2.). Contacts of the switch may be NO type or NC type as in previous case – see pic. 9.

Pic. 9 – Connection of one external switch



3. DEVICE OPERATION

Functional block diagram of the MXC-200 is shown on pic. 10 The signal from the MIDI bus coming in the MIDI input MIDI-IN [11] is supplied to the CPU and back to the MIDI-THRU/OUT [10] output via data merging unit – "Thru" function of the output.

The received data are filtered and acceptable data are converted to output values according to setting of system / output parameters. The result is converted to DMX signal which is transmitted to DMX-OUT [13] output.

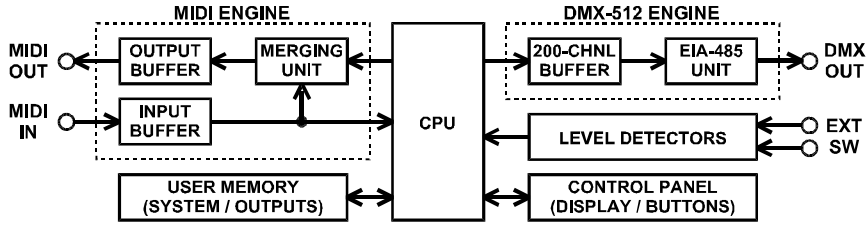
MIDI SysEx data generated by the CPU are fed to the data merging unit and then to MIDI-THRU/OUT [10] output – "Out" function of the output.

Status of external switches plugged into the EXT-SW [12] TRS connector is continuously monitored and their activation triggers the programmed functions.

All control and indicating elements are located on the front panel of the MXC-200. In normal operating mode, the MXC-200 works automatically according to commands received through MIDI bus and to the values of the parameters programmed by the user previously.

Note that the device has no power switch. It starts to work immediately after the power adapter connecting to DC [14] connector.

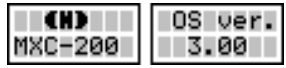
Pic. 10 - Functional block diagram



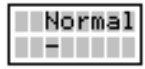
3.1. RESET SEQUENCE

The reset sequence starts automatically after power on, i.e. after connecting the converter to the power supply adapter. The setting of all converter's parameters is read from the internal memory during the reset sequence and all MXC-200 circuits are then set to the required state.

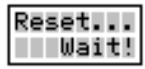
The device name and the operating system version number are shown on display [1] during the reset sequence.



After the execution of the reset sequence, MXC-200 goes into normal working mode.



During normal operation of the device, the reset sequence can be launched again manually by pressing the EXIT / RESET [8] button. Info about processed reset sequence is shown on display [1].



3.2. "BLACKOUT" AND "MASTER FULL" FUNCTIONS

These functions can be activated with external switches connected to EXT-SW [12] connector on rear panel of the device (see chapter 2.4).

"Blackout" function turns off the outputs (DMX channels) that have enabled this possibility with the output parameter "Accept Blackout" (see chapter 4.2.7.). The function is active whole time during the "Blackout" switch is on. Info about active "Blackout" function is shown on display [1].

Remark: *"Blackout" function can be activated also remotely with MIDI CC selected by user (see chapters 4.1.8 and 5.1).*

"Master Full" function simulates setting of "Master" controller (see chapter 4.1.7.) to maximal value. External switch has higher priority than received MIDI commands so changes of "Master" controller done by MIDI CC are ignored during the "Master Full" switch is on. The function cannot be launched if "Blackout" function is active – "Master Full" switch is ignored in that case. Info about active " Master Full" function is shown on display [1].

3.3. OPERATING MODES INDICATION

Current status of all operating modes of MXC-200 is displayed on the display [1] on the front panel of the device.

In the normal working mode, status of DMX circuits is indicated in upper row of the display [1] and status of MIDI circuits is displayed in lower row of the display [1].

DMX output activity is indicated with "**D**" symbol on the left in upper row of the display [1]. If all DMX channels transmit only the zero value, the symbol isn't shown. But, if at least one of used DMX channels value is greater than the zero the symbol is visible.

On the right in upper row of the display [1], activity of "Blackout" and "Master Full" functions is indicated – see table 1.

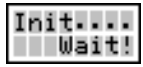
Table 1 – Indication of DMX circuits status in normal working mode		
Symbol	**Meaning**	**Duration**
Normal	Quiescent status – normal function of the converter	Whole time
MstFul	"Master Full" function active (activated with external switch)	During the function activity
BlkOut	"Blackout" function active (activated with external switch or with help of MIDI Control Changes)	During the function activity

MIDI input activity is indicated with "**M**" symbol on the left in lower row of the display [1]. Only MIDI data acceptable by the converter are indicated. MIDI data which only goes through are not. Presence of valid data on MIDI input is indicated by short blink (about 0,3 sec) of the square symbol. In the case of thicker data stream, individual pulses can melt and the symbol lights continuously then.

On the right in lower row of the display [1], receiving of MIDI System Exclusive messages for the converter control is indicated – see table 2.

Table 2 – Indication of MIDI circuits status in normal working modeo		
Symbol	**Meanig**	**Duration**
-	Quiescent status – no MIDI System Exclusive Message for the converter control is received	Whole time
SysEx	Valid MIDI System Exclusive Message was received from MIDI bus	ca 1,5 sec
Chsum?	Unknown or invalid MIDI System Exclusive Message was received from MIDI bus	ca 1,5 sec
Protct	Trying to write data into memory (SysEx – Bulk Dump Load) when memory protection is enabled	ca 1,5 sec

3.4. FACTORY RESET



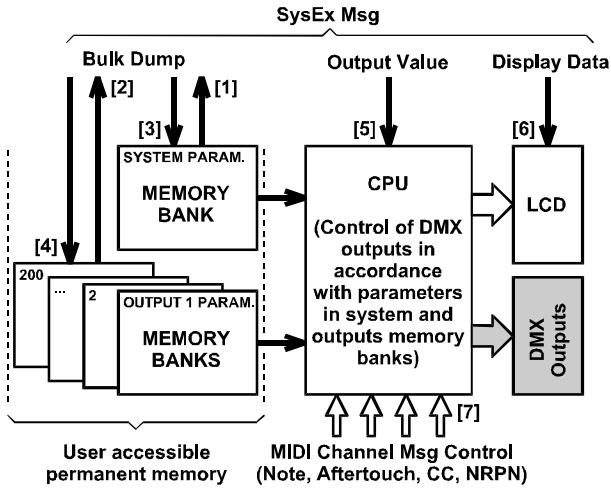
Parameters which controls all activities of MXC-200 are stored in user memory. This memory can be initialized - stored data can be deleted and replaced with the default values (so-called "Factory Reset"). "Factory Reset" values of parameter are shown in tables 3 and 4. To perform a complete memory initialization, press the buttons SYSTEM [2] and OUTPUT [3], keep them pressed and then connect the converter to the power supply adapter. After connecting the adapter, device's display shows the information about progress of the initialization ("Init… Wait") - now you can release both buttons. After the initialization is complete, the device automatically returns to normal working mode.

Table 3 – "Factory Reset" values of global system parameters		
Name	**Value**	**Description (also see next chapters)**
DMX Used Channels	24	Total number of used DMX channels is 24
DMX Channel Shift	1	DMX channels from 1 to 24 are used
MIDI Channel	16	MIDI commands are received on MIDI channel 16
MIDI Mode	CC	Outputs are controlled by MIDI Control Changes (CCs)
MIDI Shift	36	MIDI CC from #36 are used for control of outputs
MIDI Master CC Nr.	7	"Master" controller is MIDI CC #7
MIDI Blackout CC Nr.	16	"Blackout" function is controlled by MIDI CC #16
MIDI RAC CC	Ena	Reset All Controllers MIDI command is enabled
Autoreset	On	Automatic reset is enabled if an error occurs in MDI communication
LCD Contrast	20	Middle level of LCD contrast

Table 4 – "Factory Reset" values of parameters of DMX outputs		
Name	**Value**	**Description (also see next chapters)**
Default Value	0	Zero default value of the output after reset
Curve	Lin	Linear conversion curve (i.e. no conversion)
Preheat	0	No preheat
Limit	255	No limit
Accept Master	On	Control with "Master" controller allowed
Accept Blackout	On	Control with "Blackout" function allowed

4. PARAMETERS

Pic. 11 – Structure of user memory and control



Settings of the converter's parameters gives exactly how the device will convert MIDI data to DMX data during operation. The parameters are divided in two basic groups – system parameters and parameters of individual outputs. All parameters are fully programmable by user. Programmed values are stored in permanent internal memory of the converter. All parameters can be set in the editing operation mode by using the buttons on front panel of the MXC-200 or via MIDI System Exclusive Bulk Dump communication (see below).

Structure of internal memory of parameters is shown on pic. 11. All parameters are stored in memory banks. There is one memory bank for system parameters and 200 memory banks for individual outputs. Content of each of memory banks can be read ([1], [2]) or changed ([3], [4]) via Bulk Dump SysEx Messages (see description of System Exclusive communication in separate manual).

CPU of the converter receives control MIDI messages ([7]) and drives DMX outputs in dependence on values of the parameters read from the memory banks.

Remarks: *"Output Value" MIDI SysEx messages ([5]) can be also used for direct DMX outputs control as well as channel MIDI messages.*

With help of "Display Data" MIDI SysEx messages ([6]), display of the device can be controlled too. You can show any text on the display.

See description of System Exclusive communication in separate manual for details about these functions.

4.1. GLOBAL SYSTEM PARAMETERS

Global system parameters define the basic configuration of hardware circuits of the converter. Allowed range of values of parameters and values stored in memory during "Factory Reset" (see chapter 3.4.) are shown in tables 5 and 3.

Menu for editing of the global system parameters contains also two utilities ("Memory Protection" and "Bulk Dump") that do not set the values of parameters. They are used to protect the data against unwanted overwriting or to send the values of parameters stored in memory for archiving.

Table 5 – Global system parameters				
Parameter name	Parameter		Values	
	Meaning	Symbol	Range	Meaning
DMX Channels Used	Setting of total number of used DMX channels	DMX Used	24 ~ 200	?
DMX Cannels Shift	Setting of DMX channels shift - selection of the lowest used DMX channel	DMX Shft	1 ~ 489	1 → chnl 1 ~ 56 457 → chnl 457 ~ 512
MIDI Channel	Setting of MIDI channel (and SysEx "Device ID") for MIDI communication	MID Chnl	1 ~ 16	1 → MIDI chnl 1 16 → MIDI chnl 16
MIDI Mode	Selection of MIDI command type used for the converter control	MID Mode	Not N+A CC NRP	Not → Notes N+A → Notes + K. After CC → CCs NRP → NRPNs
MIDI Shift	Setting of MIDI commands shift - selection of the lowest used MIDI Note, CC or NRPN	MID Shft	0 ~ 72	0 → Note/CC 0 ~ 55 72 → Note/CC 72 ~ 127
MIDI Master CC Nr.	Selection of CC number for "Master" controller	CC Mastr	0 ~ 127 / Dis	0~127 → CC #0~#127 Dis → disabled
MIDI Blackout CC Nr.	Selection of CC number for "Blackout" controller	CC BlOut	0 ~ 127 / Dis	0~127 → CC #0~#127 Dis → disabled
MIDI RAC CC	Allowing of "Reset All Controllers" command receiving	CC RAC	Dis / Ena	Dis → disabled Ena → enabled
Autoreset	Automatic reset if an error in MIDI communication occurs	Auto-Rst	On / Off	Off → disabled On → enabled
LCD Contrast	Setting of LCD contrast	LCD Cont	0 ~ 32	0 → minimum 32 → maximum
Memory Protection	Utility - memory protection against unwanted data rewriting	MemoProt	Off / On	Off → disabled On → enabled
MIDI Bulk Dump	Utility – listing of internal user memory content as MIDI SysEx Msg	BulkDump	Whole System Out001 ~ 200	Whole – whole memory System – only system Out – output 1 ~ 200

4.1.1. SYSTEM PARAMETERS SETTING

To enter the system parameters editing mode, press the SYSTEM [2] button. Upper row of display [1] shows the parameter name and lower row of display [1] shows its current value.

For browsing through system parameters / utilities, use PREV [5] button (jump to the previous parameter / utility) and NEXT [7] button (jump to the next parameter / utility) – see table 5. If memory protection is on (default status after each reset of the converter), system parameters are not accessible for editing – menu contents only utilities. The memory protection must be set off before the system parameters are edited.

After required parameter is selected, its value can be set by DATA-INC [5] and DATA-DEC [9] buttons. Immediately after DATA-INC [5] button is pressed, the value is increased (or decreased if DATA-DEC [9] button is pressed) by one unit. If any of DATA-INC/DEC buttons is pressed and hold, the value is increased / decreased sequentially.

New value is shown on the right in lower row of display [1]. Validity of new value must be confirmed by pressing of ENTER [4] button. If editing of a parameter is cancelled without confirmation, MXC-200 ignores new parameter value and continues working with original value of a parameter.

After setting the new values of all required parameters, pressing the EXIT [8] button cancels editing mode – the device returns to normal working mode. It is also possible to switch to editing of output parameters by pressing the OUTPUT [3] button at any time.

4.1.2. "DMX CHANNELS USED" PARAMETER

The converter works with 24 DMX channels (outputs) at least and with 200 DMX channels (outputs) the most. Number of used DMX channels (outputs) is chosen with "DMX Channels Used" system parameter.

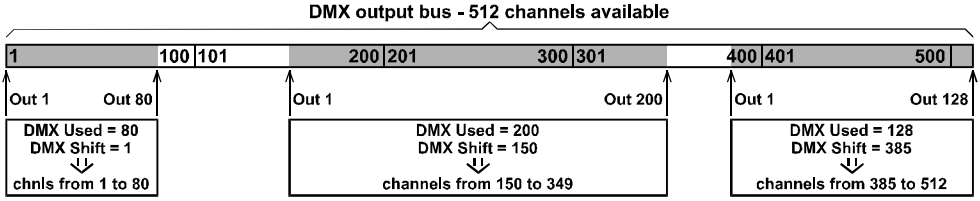
Remark: *Maximal possible number of used DMX channels (outputs) depends on setting of "MIDI Mode" system parameter. In "Note", "Note+Aftertouch" and "CC" modes, maximal number of used DMX channels is limited to 128. In "NRPN" mode, all 200 DMX channels are available.*

4.1.3. "DMX CHANNELS SHIFT" PARAMETER

Used DMX channels (outputs) are **always in one block** of consecutive DMX channels numbers. The "DMX Channels Shift" parameter chooses which numbers of the 512 possible DMX channels will be used. The parameter directly determines the number of the lowest used DMX channel to which data of the output 1 will be transmitted. Some examples of the shift of DMX channels block are shown on pic. 12.

Remark: *Maximal possible shift of DMX channels depends on setting of "DMX Channels Used" system parameter. It is from 313 for 200 used channels to 489 for 24 used channels.*

Pic. 12 - DMX SHIFT parameter examples



4.1.4. "MIDI CHANNEL" PARAMETER

The parameter specifies the MIDI channel on which the MXC-200 receives MIDI commands. It may be chosen from any of MIDI channels 1 to 16.

Remark: *Selected number of MIDI channel simultaneously serves as an device identification number for SysEx communication – see description of System Exclusive communication in separate manual for details.*

4.1.5. "MIDI MODE" PARAMETER

The converter enables to use four methods (types of MIDI commands) for control of DMX outputs. The parameter determines which type of MIDI commands is used:

Note On / Off (displayed as `Not`)

Block of up to 128 consecutive MIDI Notes ("Note On" and "Note Off" commands) is used for control of individual outputs. Velocity of "Note On" command is value sent to corresponding output. Velocity of "Note Off" command is ignored and zero value is always sent to correspond output.

Also Control Changes "ANO" (All Notes Off, CC #123) and "ASO" (All Sound Off, CC #120) are accepted. If any of these CCs is received, zero value is sent to all outputs.

Note On / Off + Key Aftertouch (displayed as N+A)

Same as in Note On / Off mode – "Note On", "Note Off", "ANO" (CC #123) and "ASO" (CC #120) are received and processed as described above.

More over, "Key Aftertouch" MIDI command is recognized too. Value of "Key Aftertouch" with acceptable note number is sent to corresponding output. Recognizing of "Key Aftertouch" command is not conditioned by activity of corresponding MIDI note ("Note On" command received previously).

Control Changes - CCs (displayed as CC)

Block of up to 128 consecutive MIDI Control Changes (CCs) is used for control of individual outputs. Value of acceptable CC number is sent to corresponding output.

Be sure that CCs assigned to "MIDI Master" and "MIDI Blackout" functions (see chapters 4.1.7 and 4.1.8) are not included in block of CCs used for individual outputs control. In that case, that CCs are used for the functions control preferably and they don't control an output!

Non Registered Parameters - NRPNs (displayed as NRP)

Block of up to 200 consecutive MIDI Non Registered Parameters (NRPNs) is used for control of individual outputs. Maximal possible range of numbers of non registered parameters is from 0 to 199.

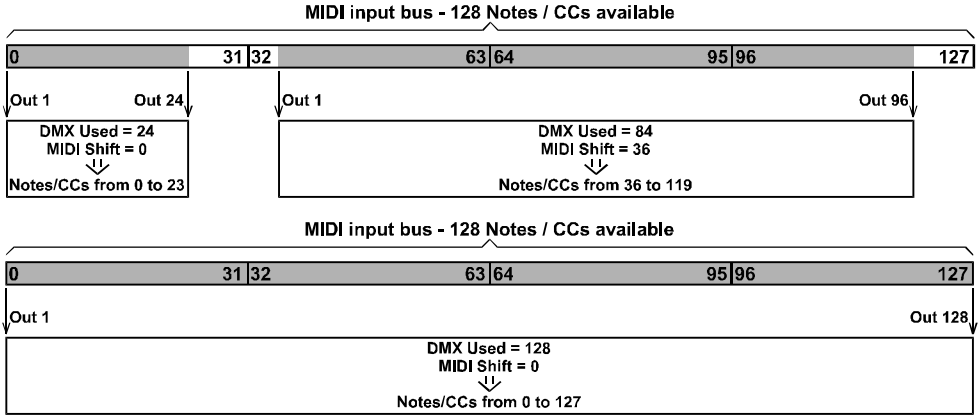
If "MIDI Mode" parameter is changed to "NRPN" mode (or after device reset when the "NRPN" mode was programmed as default previously), the converter waits for valid number of non-registered parameter first. The number is set with help of CC #99 (MSB) and CC#98 (LSB) first time – both these CCs must be sent to the converter before it is able to work with NRPN values. Next changes of chosen non-registered parameter number can be done with CC #99 (MSB) only or CC#98 (LSB) only.

After a NRPN activation, value of correspond output is set with CC #6 (Data Entry MSB) and CC #38 (Data Entry LSB). Since the device works with values 0 to 255, both CC #6 and CC #38 **must be always sent** in the order shown (i.e. MSB first, then LSB)! The complete value (0 to 255) is processed only after the LSB (CC #38) receiving. The device will not process a change of value in another case.

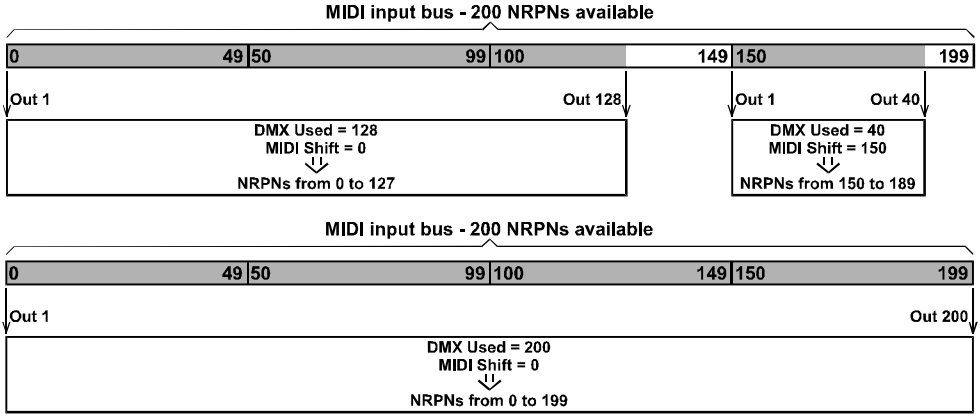
For NRPN deactivation if necessary, send CC #101 with value 127 and CC #100 with value 127 to the device. This is "Null NRPN" MIDI command.

Remark: *The parameter also affects the maximal number of available DMX channels (see chapter 4.1.2). In "Note", "Note+Aftertouch" and "CC" modes, maximal number of used DMX channels (outputs) is limited to 128. In "NRPN" mode, all 200 DMX channels (outputs) are available.*

Pic. 13 - MIDI SHIFT parameter examples for Notes and CCs



Pic. 14 - MIDI SHIFT parameter examples for NRPNs



4.1.6. "MIDI SHIFT" PARAMETER

Processed MIDI Notes, CCs and NRPNs are **always in one block** of consecutive numbers. The "MIDI Shift" parameter sets the number of MIDI Note, CC or NRPN from which MXC-200 start to respond - the parameter value determines the number of the lowest MIDI Note, CC or NRPN which will be used for DMX outputs control.

Some examples of the shift of MIDI Notes / CCs are shown on pic. 13 and examples of the shift of MIDI NRPNs are shown on pic. 14

Remark: *The parameter range depends on setting of "DMX Used Channels" (see chapter 4.1.2). If maximal possible number of used DMX channels is set (i.e. 128 or 200 in dependence on MIDI mode), the "MIDI Shift" parameter is always 0 and it cannot be increased because there is no area for a shift!*

4.1.7. "MIDI MASTER CC Nr." PARAMETER

MXC-200 has implemented the "Master Controller" function which allows simultaneous dimming or lighting of all required reflectors with a single controller. This function is controlled by selected MIDI Control Changes (CC). The parameter chooses number of CC for control of this function. Any of CCs from 0 to 127 can be chosen or "Master Controller" function can be disabled (parameter value "Dis").

If a CC is assigned to "Master Controller" function, its value affects all outputs with "Accept Master" parameter set to "On" (see chapter 4.2.6).

Remark: *The CC selected as Master controller is used for this function preferably and it is no longer processed! So this CC should not be included in the block of CCs used to outputs control in MIDI mode "CC" (see chapter 4.1.5).*

4.1.8. "MIDI BLACKOUT CC Nr." PARAMETER

The "Blackout" function allows the simultaneous turn-off of all outputs. If the function is activated, the outputs are immediately disabled and remain so until the "Blackout" function is cancelled. This function is controlled by selected MIDI Control Changes (CC). The parameter chooses number of CC for control of this function. Any of CCs from 0 to 127 can be chosen or "Blackout " function can be disabled (parameter value "Dis").

If a CC is assigned to “Blackout” function, its value affects all outputs with “Accept Blackout” parameter set to “On” (see chapter 4.2.7). Values of assigned CC from 0 to 63 are evaluated as “Off” status of “Blackout”, values from 64 to 127 as “On” status.

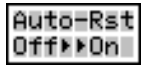
Remarks: *The CC selected as Blackout controller is used for this function preferably and it is no longer processed! So this CC should not be included in the block of CCs used to outputs control in MIDI mode “CC” (see chapter 4.1.5). Blackout function has also higher priority than Master function.*

Blackout function can be activated also with external switch (see chapter 3.2). External switch has higher priority than the CC.

4.1.9. "MIDI RAC CC" PARAMETER

The parameter enables (value “Ena”) or disables (value “Dis”) processing of received CC#121 “RAC” (Reset All Controllers) MIDI command. If disabled, received CC#121 is ignored. If enabled and CC#121 with value 0 is received, both functions “Master” and “Blackout” are turned to their inactive status - “Master” is set to maximum and “Blackout” is turned off.

4.1.10. "AUTORESET " PARAMETER



The parameter allows automatic reset if an error in MIDI communication occurs.

If the parameter is "On" and an error in MIDI communication occurs, the MIDI engine is reset automatically and no user interaction is required. Some MIDI data can be lost but the device continues its working.

If the parameter is “Off”, occurred error is processed standard way (see Appendix B.).

4.1.11. "LCD CONTRAST " PARAMETER

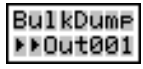
The parameter sets contrast of display [1]. The parameter value is from 0 to 32. Value equal to 0 sets minimal contrast, value equal to 32 sets maximal contrast.

4.1.12. "MEMORY PROTECTION" UTILITY

This utility allows to enable or disable the memory protection against unwanted overwriting of data stored in memory. When the protection is active (value “On”), it is not possible to edit both the system and output parameters. Programming of the parameters is allowed till after the protection is removed (value “Off”). Memory protection is always set “On” during the reset (turn-on) of the device.

Remark: *The active memory protection also disables receiving of MIDI Bulk Dump SysEx messages for changes of content of memory banks.*

4.1.13. "BULK DUMP" UTILITY



This utility allows to backup the entire content of user memory in a MIDI sequencer or a DAW in the form of MIDI Bulk Dump System Exclusive messages.

After selecting the utility in the system parameters menu, lower row of display [1] shows name of memory bank which will be transferred:

Whole memory (displayed as `Whole`)
Complete content of memory (i.e. system and all 200 output banks) will be transferred.

System memory bank (displayed as `System`)
Content of system memory bank will be transferred.

Output memory bank 1 to 200 (displayed as `Out`)
Content of one selected output memory bank (Out001 to Out200) will be transferred.

The data are transmitted to output MIDI-THRU/OUT [10] after ENTER [4] button is pressed. During the transfer progress, display [1] shows advice “Wait!”.

4.2. OUTPUTS PARAMETERS

Output parameters are independent for each of outputs - each of outputs (DMX channels) may to have individual settings of parameters. Before adjusting the output parameters, the memory protection must be disabled (see chapter 4.1.12). When you try to edit the outputs parameters with memory protection enabled, the converter does not respond to any changes and the display [1] shows warning message "Memory Protected”.

Table 6 – Parameters of the outputs

Parameter Name	Parameter		Values	
	Meaning	Symbol	Range	Meaning
Default Value	Setting of default value of the output after the device reset	Dflt	0 ~ 255	0 → output off 255 → max value
Conversion Curve	Selection of conversion curve of the output (see pic.9)	Curv	Lin 0/1 Lg1 ~ 6 Ex1 ~ 6 1 ~ 6 1 ~ 6	Lin → linear 0/1 → bi-stable (off / on) Lg → logarithmic Ex → exponential → “Z” curve → “S” curve
Preheat	Setting of minimal admissible value of DMX output	Preh	0 ~ 127	0 → no preheating 127 → max preheating
Limit	Setting of maximal admissible value of DMX output	Limt	128 ~ 255	128 → max limitation 255 → no limitation
Accept Master Function	"Master" controller enabled / disabled for the output	Mstr	Off On	Off → disabled On → enabled
Accept Blackout Function	"Blackout" function enabled / disabled for the output	BOut	Off On	Off → disabled On → enabled

4.2.1. OUTPUT PARAMETERS SETTING

To enter output parameters editing mode, pres the OUTPUT [3] button. Upper row of display [1] shows text “Output” and lower row of display [1] shows number of output selected for editing. Selection of output for editing can be done by DATA-INC [5] button (increasing of output number) and DATA-DEC [9] button (decreasing of output number). Selection of output number must be confirmed by pressing of ENTER [4] button. It is also possible to cancel editing by the EXIT [8] button.

After selection of output number is confirmed, upper row of display [1] shows number of selected output on the left and name of parameter for editing on the right. Lower row of display [1] shows current value of the parameter.

For browsing through output parameters, use PREV [5] button (jump to the previous parameter and NEXT [7] button (jump to the next parameter) – see table 6.

Parameter value can be set by DATA-INC [5] and DATA-DEC [9] buttons. Immediately after DATA-INC [5] button is pressed, the value is increased by one unit, or decreased by one unit if DATA-DEC [9] button is pressed. If any of DATA-INC/DEC buttons is pressed and hold, the value is increased / decreased sequentially.

New value is shown on the right in lower row of display [1]. Validity of new value must be confirmed by pressing of ENTER [4] button. If editing of a parameter is cancelled without confirmation, MXC-200 ignores new parameter value and continues working with original value of a parameter.

After setting the new values of all parameters, return to the selection of the output for editing is done by pressing EXIT [8] or OUTPUT [3] button. Now you can continue with setting of parameters of another output.

After setting of parameters of all required outputs, repeated pressing of EXIT [8] button cancels editing mode – the device returns to normal working mode.

It is also possible to switch to editing of system parameters by pressing the SYSTEM [2] button at any time.

4.2.2. "DEFAULT VALUE" PARAMETER

The parameter chooses default value of the output, i.e. the value at which the output is set during the device reset.

Parameter value can be from 0 to 255. The value determines directly value of corresponding output.

4.2.3. "CONVERSION CURVE" PARAMETER

To convert the input MIDI data to the output DMX data, it is possible to select none conversion (linear response), bi-stable conversion (on / off switch) or one of 24 predefined conversion curves – see pic. 15.

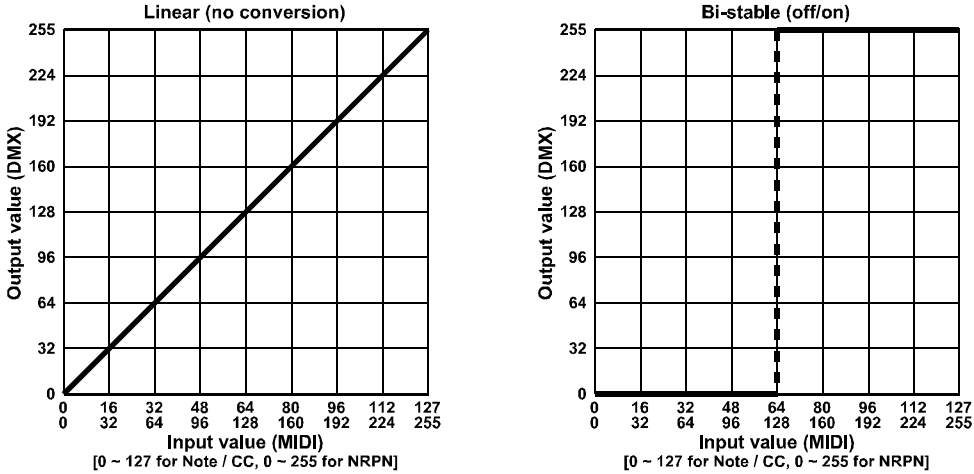
Linear response (no conversion) is universal for general purpose.

Choice of binary output (on / off switch) is suitable for DMX devices that are not controlled continuously, but are only switched on and off (e.g. fog machines, fireworks, etc.).

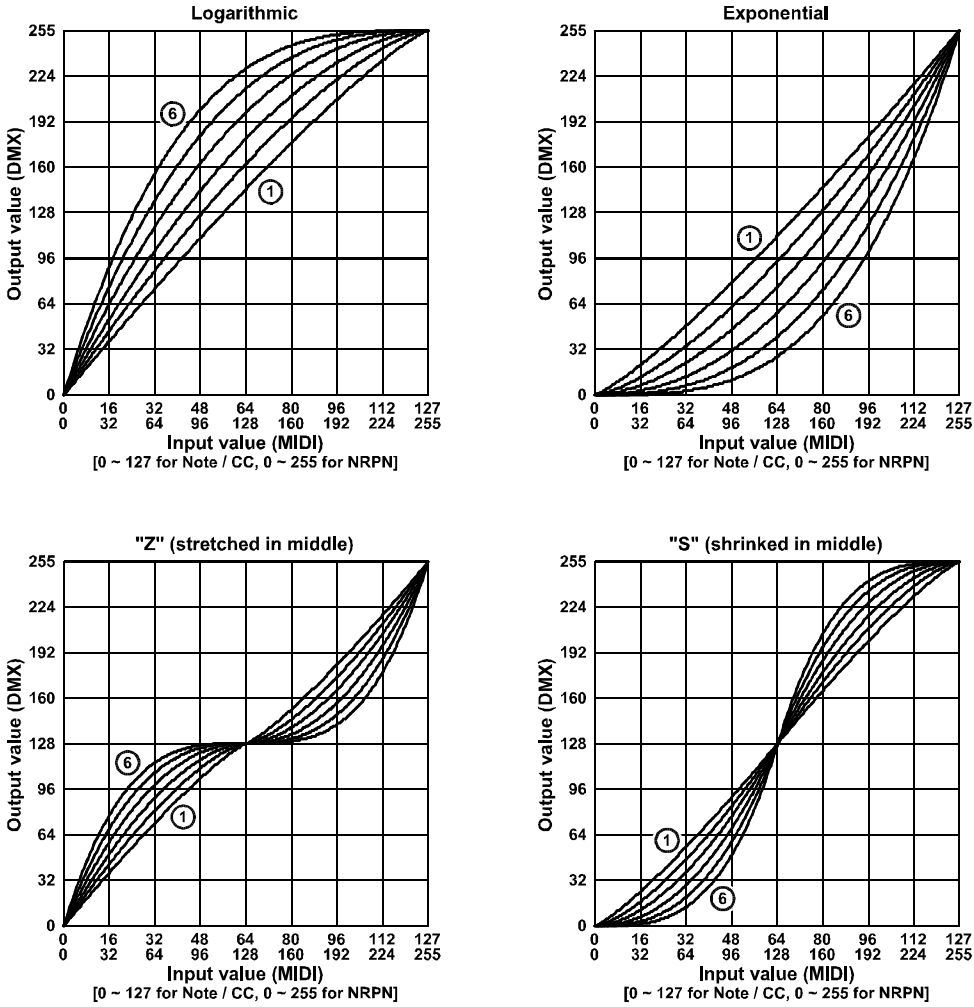
Appropriate Log or Exp conversion curve should be selected by the type of used light bulbs and the conversion features of the dimmer, to enable brightness changes of light bulbs as evenly as possible across the range of values of input MIDI control data.

"Z" type curves are stretched (they have increased sensitivity) in middle position of control and "S" type curves are shrinked (they have reduced sensitivity) in middle position of the control. They can be used e.g. for general management of moving lights.

Pic. 15 – Conversion curve shapes



Pic. 15 – Conversion curve shapes (continue)

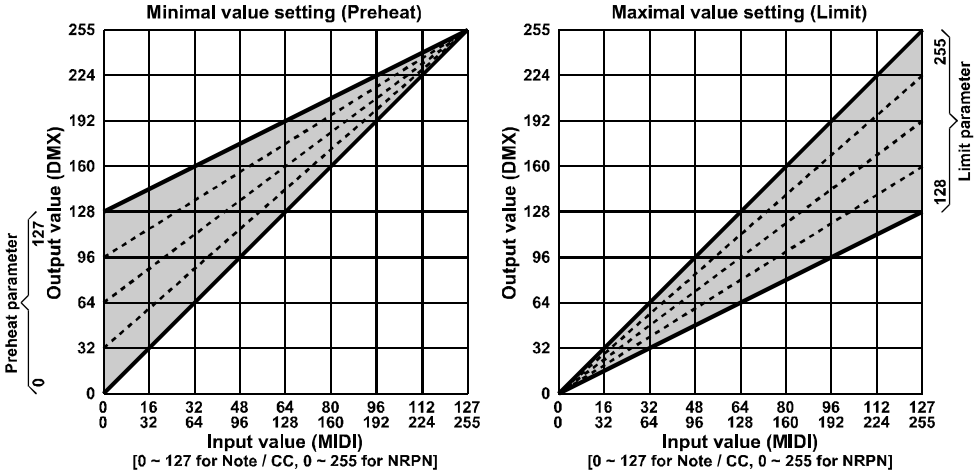


4.2.4. "PREHEAT" PARAMETER

By the "Preheat" parameter, you can specify a minimum value below which must never fall the value transmitted to the DMX output channel. This allows for example permanent bulb preheating and thus to extend its life several times.

Value of the parameter is from 0 to 127. The value corresponds directly to the minimal permitted value for the DMX output channel. Effect of the "Preheat" parameter on transmitted data shows pic 16.

Pic. 16 - "Preheat" and "Limit" parameters effect on transmitted DMX values



4.2.5. "LIMIT"PARAMETR

The parameter sets the maximum value transmitted to the corresponding DMX output channel, i.e. it is possible to limit the maximum brightness of the reflectors.

Value of the parameter is from 128 to 255. The value corresponds directly to the maximal permitted value for the DMX output channel. Effect of the "Limit" parameter on transmitted data shows pic 16.

4.2.6. "ACCEPT MASTER" PARAMETER

The parameter enables (symbol "On") or disables (symbol "Off") the influence of the "Master" controller for the DMX output channel.

It is suitable to enable the "Master" controller for DMX output channels used for control of dimmers. For control of movement of lights or speed of stroboscopes, the "Master" controller should be disabled rather.

4.2.7. "ACCEPT BLACKOUT" PARAMETER

The parameter enables (symbol "On") or disables (symbol "Off") the effect of the "Blackout" function for the DMX channel.

It is suitable to enable the "Blackout" controller for DMX output channels used for control of dimmers. For control of movement of lights or speed of stroboscopes, the "Blackout" controller should be disabled rather.

5. MIDI IMPLEMENTATION

MXC-200 recognizes MIDI Channel commands, Common System commands and System Exclusive messages. Channel commands are accepted only on MIDI channel selected by the system parameter "MIDI Channel".

5.1. CHANNEL COMMANDS

The MXC-200 recognizes MIDI Channel commands "Note Off", "Note On", "Key Aftertouch" and "Control Changes" respecting the “Running Status” mode. Acceptance of MIDI Channel commands depends on “MIDI Mode” system parameter (see chapter 4.1.5)

Note Off

“Note Off” MIDI commands are recognized only in "Note" or “Note+Aftertouch” MIDI modes (see chapter 4.1.5). Only note number (Note Nr) is accepted. Speed sensitivity (Velocity) is ignored.

It is accepted block of consecutive note numbers from the total range of note numbers (0 to 127) in dependence on “DMX Channels Used” and "MIDI Shift" system parameters setting. After acceptable “Note Off” command receiving, the corresponding output (DMX channel) is turned off.

Note On

“Note On” MIDI commands are recognized only in "Note" or “Note+Aftertouch” MIDI modes (see chapter 4.1.5). Both note number (Note Nr) and speed sensitivity (Velocity) are accepted.

It is accepted block of consecutive note numbers from the total range of note numbers (0 to 127) in dependence on “DMX Channels Used” and "MIDI Shift" system parameters setting. After acceptable “Note On” command receiving, its speed sensitivity (Velocity) value is sent to the corresponding output (DMX channel).

Key Aftertouch

“Key Aftertouch” MIDI commands are recognized only in “Note+Aftertouch” MIDI mode (see chapter 4.1.5). Both note number (Note Nr) and aftertouch value are accepted.

It is accepted block of consecutive note numbers from the total range of note numbers (0 to 127) in dependence on “DMX Channels Used” and "MIDI Shift" system parameters setting. After acceptable “Key Aftertouch” command receiving, its value is sent to the corresponding output (DMX channel).

Valid "Key Aftertouch” MIDI command is always accepted - regardless of whether the note number had forerun the Note-On command.

Control Changes (CCs)

MXC-200 recognizes normalized Control Changes (CCs) Nr. 6, 38, 98, 99, 100, 101, 120, 121 and 123 and some other CCs for control of outputs. All CCs are accepted only in dependence on setting of system parameters – see table 7.

CC #6 – Data Entry MSB

The CC is accepted only if "MIDI Mode" system parameter is set to "NRPN". It determines MSB of value for output selected previously with CCs #99 and #98 (see chapter 4.1.5 for details).

CC #38 – Data Entry LSB

The CC is accepted only if "MIDI Mode" system parameter is set to "NRPN". It determines LSB of value for output selected previously with CCs #99 and #98 (see chapter 4.1.5 for details).

CC #99 and #98 – Non-Registered Parameter Number (NRPN)

The CCs are accepted only if "MIDI Mode" system parameter is set to "NRPN". This pair of CCs determines number (CC #99 value is MSB and CC #98 value is LSB) of selected output for next control of the output level via CCs #6 and #38 (see chapter 4.1.5 for details).

CC #101 and #100 – Registered Parameter Number (RPN)

The CCs are accepted only if "MIDI Mode" system parameter is set to "NRPN". If this pair of CCs is received, it stops sensitivity to CCs #6 and #38 – they don’t change value of an output yet.

CC #120 – All Sound Off (ASO)

Controller is accepted only if "MIDI Mode" system parameter is set to "Note" or “Note+Aftertouch”. Always when this controller is received (its value must be zero), all outputs are set to minimal value (according to "Preheat" parameter - see chapter 4.2.4).

Table 7 – Acceptable CC overview				
CC Nr.	**Name / Function**	**Valid value**	**Acceptable in MIDI Mode(s)**	**Remarks**
6	Data Entry MSB Standard MIDI function	0 ~ 127	"NRPN"	Only values 0 to 255 are acceptable. Higher values are corrected to 255.
38	Data Entry LSB Standard MIDI function	0 ~ 127	"NRPN"	
98	NRPN LSB Standard MIDI function	0 ~ 127	"NRPN"	Only NRPNs 0 to 199 can be used for outputs control. All other cause "NRPN Null" status.
99	NRPN MSB Standard MIDI function	0 ~ 127	"NRPN"	
100	RPN LSB Standard MIDI function	0 ~ 127	"NRPN"	All RPNs cause "NRPN Null" status.
101	RPN MSB Standard MIDI function	0 ~ 127	"NRPN"	
120	ASO Standard MIDI function	0 = ASO 1~127 = invalid	"Note" and "Note+Aftertouch"	
121	RAC Standard MIDI function	0 = RAC 1~127 = invalid	All modes	Can be enabled or disabled by "MIDI RAC CC" parameter
123	ANO Standard MIDI function	0 = ANO 1~127 = invalid	"Note" and "Note+Aftertouch"	
@ Master CC	Own CC – "Master" Master function control	0 ~ 127	All modes	Any CC# can be chosen or can be disabled by "MIDI Master CC Nr." parameter
@ Blackout CC	Own CC – "Blackout" Blackout function control	0 ~ 63 = Off 64 ~ 127 = On	All modes	Any CC# can be chosen or can be disabled by "MIDI Blackout CC Nr." parameter
@ …	Own CCs – "Out value" Individual outputs control	0 ~ 127	"CC"	Block of CC# - starting number corresponds to "MIDI Shift" parameter

CC #121 – Reset All Controllers

If this CC is received (its second databyte must be zero) and its receiving is enabled with (see chapter 4.1.9), the "Master" controller is immediately set to the highest value and the "Blackout" controller is turned off. If the converter works in "CC" mode (see chapter 4.1.5), values of individual outputs remain unchanged.

CC #123 – All Notes Off

The CC is accepted only in MIDI mode "Note" (see chapter 4.1.5). Always when this controller is received (its value must be zero), all outputs are set to minimal value (according to "Preheat" parameter - see chapter 4.2.4).

CC #[@ Master CC Nr.]

The CC selected by the system parameter "Master CC Nr." (see chapter 4.1.7) works as the main regulator for all enabled outputs (see the output parameter "Accept Master" – chapter 4.2.6). Value of the controller may be in full range of 0 to 127.

CC #[@ Blackout CC Nr.]

The CC selected by the system parameter "Blackout CC Nr." (see chapter 4.1.8) controls the "Blackout" function for all enabled outputs (see the output parameter "Accept Blackout" – chapter 4.2.7). The Blackout function is off for values from 0 to 63 and active for values from 64 to 127 of this CC.

CC #[@ MIDI Shift ~ @ (MIDI Shift + DMX Channels Used)]

If the converter works in "CC" mode (see chapter 4.1.5), block of consecutive MIDI CCs is accepted. Number of the first controller in the block is defined by the "MIDI Shift" system parameter and range of the block is defined by the "DMX Channels Used" system parameter. Values of these CCs will then control level of individual outputs (DMX channels) of the converter.

5.2. SYSTEM COMMANDS

MXC-200 recognizes only the System Reset. Always when System Reset is received, the reset sequence is launched (as well as after switching MXC-200 on - see chapter 3.1 or after manual reset done by EXIT/RESET [8] button). Then the device returns to normal working mode automatically.

5.3. SYSTEM EXCLUSIVE COMMUNICATION

MXC-200 has a MIDI System Exclusive communication implemented, which allows remote set up and storing in memory of all the parameters (Data Load) and can also request the actual list of parameter values (Data Request / Data Save). Special MIDI System Exclusive messages allows to control the device's display directly – it is possible to show any text on it.

Detailed description of the System Exclusive communication is in a separate manual.

6. EXAMPLE OF PARAMETERS SETTING

Let's have two beams each of them with four RGB LED lamp as an example. Both beams use 14 DMX channels for control – see table 8.

Table 8 – Device example

DMX Chnl	Control
n	Lamp 1 – Red
n+1	Lamp 1 – Green
n+2	Lamp 1 – Blue
n+3	Lamp 2 – Red
n+4	Lamp 2 – Green
n+5	Lamp 2 – Blue
n+6	Lamp 3 – Red
n+7	Lamp 3 – Green
n+8	Lamp 3 – Blue
n+9	Lamp 4 – Red
n+10	Lamp 4 – Green
n+11	Lamp 4 – Blue
n+12	Common – Blinking (0~223 – blink, 224~255 = off)
n+13	Common – Brightness

- We want to control all lamps of both beams independently. So 28 outputs (DMX cannels) will be necessary for control - we must set the **"DMX Used"** system parameter to 28.
- The beams are controlled independently so we must set different DMX address on them. First beam (marked A) will have starting DMX address 1 and the second beam (marked B) will have starting DMX address 15 so that the addresses do not overlap. The **"DMX Shift"** system parameter will be set to 1 – then the converter will send data to DMX channels 1 to 28.
- All MIDI command used for the beams control are located at MIDI channel Nr. 1 - we must set the **"DMX Channel"** system parameter to 1.
- We want to use MIDI Non Registered Parameters for the beams control – the **"MIDI Mode"** system parameter will be set to "NRPN".
- First 28 NRPNs should be used for the beams control so the **"MIDI Shift"** system parameter will be set to 0.
- After that setting, NRPN 0 controls output 1 which is directed to DMX channel 1, NRPN 1 controls output 2 directed to DMX channel 2, etc. up to NRPN 27 which controls output 28 directed to DMX channel 28.
- Since the beams have their own controller for common brightness control, we don't use "Master" controller – the **"MIDI Master CC Nr."** system parameter will be set to "Disable".
- There should be possibility of usage of Blackout function for all lamps. The function should be controlled via CC #119. So we must set the **"MIDI Blackout CC Nr."** system parameter to 119.
- We want the MIDI security command RAC to be acceptable – the **"MIDI RAC CC"** system parameter will be set to "Ena".

After the system parameters setting, parameters for individual outputs should be set.

- After reset, all lamps should be off. So it is necessary to set the **"Default Value"** output parameter to 0 for all outputs that control the lamps – i.e. for outputs Nr. 1 to 12 and Nr. 15 to 26.
- After reset, the beams should not blink – common controller Blinking of both beams must be off, i.e. value 224~255. So it is necessary to set the **"Default Value"** output parameter to 255 for outputs Nr. 13 and 27.
- After reset, common controller Brightness of both beams should be full, i.e. value 255. So it is necessary to set the **"Default Value"** output parameter to 255 for outputs Nr. 14 and 28.
- None of the beams controllers requires a conversion of values so the **"Conversion Curve"** output parameter will be set to "Lin" for all outputs Nr. 1 to 28.
- None of the beams controllers requires a preheating or limitation so the **"Preheat"** output parameter will be set to 0 and **"Limit"** output parameter will be set to 255 for all outputs Nr. 1 to 28.
- Since we don't use the "Master" controller, its acceptation by outputs is not necessary – the **"Accept Master"** output parameter will be set to "Off" for all outputs Nr. 1 to 28.
- The "Blackout" controller is used for all lamp but it should not affect common controllers Blinking and Brightness of the beams. So the **"Accept Blackout"** output parameter will be set to "Off" for outputs Nr. 13, 14, 27 and 28 and to "On" for outputs Nr. 1 to 12 and 15 to 26.

Table 9 – Result of example setting

Controller	Affected DMX Chnls	Controlled function
NRPN #0	1	Beam A / Lamp 1 – Red
NRPN #1	2	Beam A / Lamp 1 – Green
NRPN #2	3	Beam A / Lamp 1 – Blue
NRPN #3	4	Beam A / Lamp 2 – Red
NRPN #4	5	Beam A / Lamp 2 – Green
NRPN #5	6	Beam A / Lamp 2 – Blue
NRPN #6	7	Beam A / Lamp 3 – Red
NRPN #7	8	Beam A / Lamp 3 – Green
NRPN #8	9	Beam A / Lamp 3 – Blue
NRPN #9	10	Beam A / Lamp 4 – Red
NRPN #10	11	Beam A / Lamp 4 – Green
NRPN #11	12	Beam A / Lamp 4 – Blue
NRPN #12	13	Beam A / Common – Blinking
NRPN #13	14	Beam A / Common – Brightness
NRPN #14	15	Beam B / Lamp 1 – Red
NRPN #15	16	Beam B / Lamp 1 – Green
NRPN #16	17	Beam B / Lamp 1 – Blue
NRPN #17	18	Beam B / Lamp 2 – Red
NRPN #18	19	Beam B / Lamp 2 – Green
NRPN #19	20	Beam B / Lamp 2 – Blue
NRPN #20	21	Beam B / Lamp 3 – Red
NRPN #21	22	Beam B / Lamp 3 – Green
NRPN #22	23	Beam B / Lamp 3 – Blue
NRPN #23	24	Beam B / Lamp 4 – Red
NRPN #24	25	Beam B / Lamp 4 – Green
NRPN #25	26	Beam B / Lamp 4 – Blue
NRPN #26	27	Beam B / Common – Blinking
NRPN #27	28	Beam B / Common – Brightness
CC #119	1~12, 15~26	Blackout for all lamps
CC #121	1~12, 15~26	Reset of Blackout function

After that setting of all parameters, the beams will be controlled in accordance with table 9.

7. TECHNICAL SPECIFICATION

Supply voltage :	external power supply unit - DC 8 V to 15 V
Consumption :	250 mA max
Protection :	protected against reversal of supply voltage polarity
Connector of supply adapter :	standard, coaxial, diameter 5,5 / 2.1 mm
MIDI bus :	according to MIDI Manufacturer Association standards
MIDI connectors :	2x DIN 41524 (5 pins / 180°)
DMX bus :	according to USITT and EIA-485 standards
DMX connector :	XLR female, 3 pins
Number of DMX channels :	24 min / 200 max, controlled independently
Transit data delay :	MIDI IN → OUT : max. 1 ms, typ. 0,4 ms MIDI IN → DMX : max. 1 ms, typ. 0,6 ms
Dimensions :	140 mm (width) x 35 mm (height) x 105 mm (depth)
Weight :	approx. 250 g
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 %

8. WARRANTY CONDITIONS

Equipment comes with **thirty-month warranty** starting from the date of 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 incorrect supply voltage,
- inputs or outputs overloading by connecting the signals source or load source with not-corresponding characteristics etc.,
- faulty equipment operation, which is in conflict with instructions referred-to in the operating manual,
- mechanical damage caused by customer during transportation or usage of equipment,
- unprofessional interference with the equipment or by equipment modification without manufacturer’s approval.

APPENDICES

A. MIDI IMPLEMENTATION CHART

Device : **MXC-200** Date : 11 / 2017

Model : **8-463** Version : 1.0

Function		Transmission	Reception	Remarks
Basic	Default	X	1~16	[1])
Channel	Changed	X	1~16	[1])
Mode	Default	X	Mode 3	Not Altered
	Messages	X	X	
Note Number		X	0~127	[2])
Velocity	Note ON	X	O	
	Note OFF	X	X	
After	Key's	X	O	[2])
Touch	Channel's	X	X	
Pitch Bender		X	X	
Control Changes	6, 38	X	O	Data Entry MSB, LSB [2])
	99, 98	X	O	NRPN MSB, LSB [2])
	101, 100	X	O	RPN MSB, LSB [2])
	120	X	O	All Sound Off [2])
	121	X	O	Reset All Controllers [2])
	@Master CC	X	O	Master function [2])
	@Blackout CC	X	O	Blackout function [2])
	@...	X	O	up to 128 selectable CCs [2])
Program Change		X	X	
System Exclusive		O	O	See description
System	Song Position	X	X	
Common	Song Select	X	X	
	Tune	X	X	
System	Clock	X	X	
Real Time	Command	X	X	
Others	Local ON/OFF	X	X	
	All Notes Off	X	O	[2])
	Active Sensing	X	X	
	Reset	X	O	

Notes : [1]) Can be changed by user

[2]) depend on setting of device's parameters

Mode 1 : **OMNI ON, POLY** Mode 2 : **OMNI ON, MONO** **O** : Yes

Mode 3 : **OMNI OFF, POLY** Mode 4 : **OMNI OFF, MONO** **X** : No

B. ERROR MESSAGES

In some extreme cases, an error can occur during the device operation where correct processing of data is not allowed. In such case, the device stops its operation.

Error Err.16 doesn't allow correct processing of incoming MIDI data. Further steps depend on "Autoreset" system parameter setting (see chapter 4.1.10): If the parameter is On, the device resets itself automatically and then it returns to normal working mode. If the parameter is off, the error is processed the same way as others.

All other errors except Err.16 don't allow automatic reset. If they occur, it is necessary to turn the device off and then on again (i.e. to disconnect the power adapter and then to connect it again).

Table 10 – Error messages

Display indication	Error	
	Message	Description
Err. 1	EEPROM-MALFUNCTION	Damaged (not working) parameter memory
Err. 2	EEPROM-BUSY-TIMEOUT	Slow parameter memory
Err. 4	EEPROM-FAIL-CELL	Damaged memory cell of the parameter memory
Err. 16	MIDI-IN-FIFO-OWERFLOW	MIDI communication buffer overflows
Err. 32	DMX-UNIT-BUSY-TIMEOUT	Transmitting DMX unit busy (too much data)
Err. 64	DMX-UNIT-MALFUNCTION	DMX unit does not communicate with the CPU

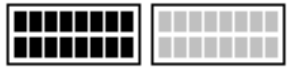
C. HARDWARE TESTS

Operating system of MXC-200 contains routines for checking of functionality of own hardware. Tests can be done if the device does not work properly with MIDI system etc.

Before the start of the test routines, both external switches of "Blackout" and "Master Full" functions must be connected to jack EXT-SW [12] and they both must be in off position.

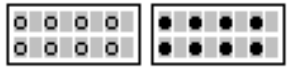
For enter into testing mode, press PREV [6] and NEXT [7] buttons simultaneously and hold them pressed. Then turn the device on – connect power supply adapter. After that, all dots are displayed on device's display. Now PREV [6] and NEXT [7] buttons can be depressed.

a) Display test



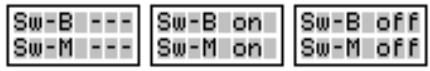
Test of display is launched automatically immediately after entering into testing mode. All dots or blank area are displayed alternately on all positions of the display (all dots luminous or all dots hidden). Continue to next test occurs automatically after any button is pressed.

b) Button test



Status of each of buttons is displayed as circular symbol on the display [1]. This symbol is blank before a button is pressed and it will be filled after a button pressing. Continue to next test occurs automatically after all eight buttons are pressed.

c) External switches test



Display [1] shows status of external switches (B = Blackout, M = Master Full). Now it is necessary to turn on and then back off both switches. Actual status "on" / "off" is indicated for each of switches independently. If both switches work properly, continue to next test occurs automatically after about 1,5 sec.

d) Test of LCD contrast control

Level of LCD contrast can be changed during this test. Actual level of the contrast is shown on display [1] and it can be changed in range from 0 to 32 with help of DATA-INC [5] and DATA-DEC [9] buttons on the device panel.

For continue to next test, it is necessary to press ENTER [4] button.

e) MIDI circuits test

Standard MIDI cable (with DIN 41524 connectors on both ends) is necessary for execution of this test routine. Interconnect input MIDI-IN [11] and output MIDI-THRU/OUT [10] of the device with help of this cable. Be sure that the cable is not damaged so that results of the test is correct.

Until MIDI input is not interconnected with MIDI output, symbol of interrupted cable is shown on display [1]. Connection of MIDI input with MIDI output changes the symbol to not-interrupted cable.

If symbol of interrupted cable is still displayed after MIDI input is interconnected with MIDI output, MIDI circuits of the device are not working correctly.

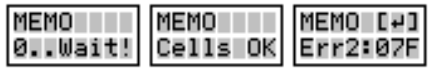
For continue to next test, it is necessary to press ENTER [4] button.

f) DMX circuits test

Output DMX-OUT [13] of the device is activated during this test routine. The testing procedure transmits adjustable value to DMX channels 1 to 200. Value transmitted to DMX channels (the value is the same for all 200 channels) is shown on display [1] and it can be changed in range from 0 to 255 with help of DATA-INC [5] and DATA-DEC [9] buttons on the device panel.

For continue to next test, it is necessary to press ENTER [4] button.

g) User memory test

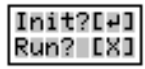


During the user memory test is in progress (about 15 sec), display [1] shows number of just checked page of the memory (0 to 7) and advice “Wait!”. After the test is finished, result of the test is displayed in lower row of display [1]:

If the memory works correctly, information “Cells OK“ is displayed and the device continues automatically to next step.

If a defective memory cell is detected during the test, the test is canceled and information "ErrX:YYY" is displayed, where “X” is number of detected error type and “YYY” is address of the defective memory cell in hexadecimal form. In that case, continue to next step must be confirmed by ENTER [4] button.

h) End of testing mode



After all tests are finished, display [1] show questions "Init?" and "Run?“. Now it is possible to launch complete initialization of the device (Factory Reset of all parameters) by pressing of ENTER [4] button. After the initialization, the device comes to normal working mode. Or it is possible to skip initialization procedure and to continue to normal working mode by pressing of EXIT [8] button. In that case, original values of all parameters remain in internal memory.

If no error occurs during testing procedures, the device is fully functional and it should to work with MIDI and DMX systems correctly. If any hardware malfunction was detected during testing procedures, the device must be repaired in specialized workshop.