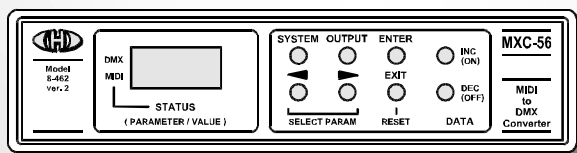


MXC-56

MIDI to DMX-512 Converter

**Model 8-462
ver. 2.0**



USER MANUAL



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Contents

	page
1. Device description	3
1.1. DMX communication	3
1.2. Control elements, indicators and connectors	3
1.3. Device functions	4
2. Device installation	4
2.1. Power supply adapter connection	5
2.2. MIDI system connection	5
2.3. DMX system connection	5
2.4. External switches connection	5
3. Device operation	6
3.1. Reset sequence	6
3.2. "Blackout" and "Master Full" functions	6
3.3. Operating modes indication	7
3.3.1. Normal working mode indication	7
3.3.2. DMX output activity indication	7
3.3.3. MIDI input activity indication	7
3.4. Memory reset	8
4. Parameters	8
4.1. Global system parameters	9
4.1.1. System parameters settings	10
4.1.2. "DMX Shift" parameter	10
4.1.3. "MIDI Channel" parameter	11
4.1.4. "MIDI Mode" parameter	11
4.1.5. "MIDI Shift" parameter	11
4.1.6. "MIDI Master CC Nr." parameter	11
4.1.7. "MIDI Blackout CC Nr." parameter	12
4.1.8. "LCD Contrast" parameter	12
4.1.9. "Memory Protection" utility	12
4.1.10. "Bulk Dump" utility	12
4.2. Outputs parameters	13
4.2.1. Output parameters settings	13
4.2.2. "Default Value" parameter	14
4.2.3. "Preheat" parameter	14
4.2.4. "Limit" parameter	15
4.2.5. "Curve" parameter	16
4.2.6. "Accept Master" parameter	16
4.2.7. "Accept Blackout" parameter	16
5. MIDI implementation	16
5.1. Channel commands	17
5.2. System commands	19
5.3. System Exclusive communication	19
6. Technical specification	20
7. Warranty conditions	20
Appendices	
A. MIDI implementation chart	21
B. Error messages	22
C. Hardware tests	22

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1. DEVICE DESCRIPTION

MXC-56 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 (dimmers, LED lights, moving heads, fog machines etc.).

Standard channel commands either Note On / Off + Key Aftertouch or Control Changes can be used for MIDI communication (MIDI channel is selectable). MXC-56 converter allows the control of up to 56 DMX channels with independent adjustable parameters. The converter works one way, data from DMX-512 can not be transmitted back to the MIDI messages.

An external switches (e.g. Foot Switches) can be connected to the MXC-56. These switches control some functions of the converter.

All MXC-56 activities are controlled by a user-programmable parameters. Various combinations of parameter settings can be stored in internal memory.

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).

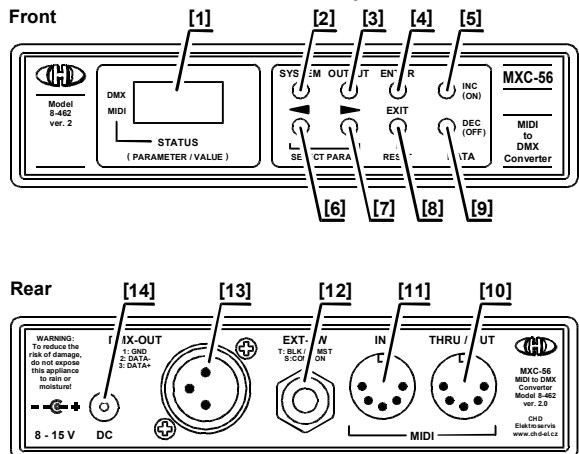
MXC-56 comply to the above standards and is fully compatible with any DMX devices thus.

1.2. CONTROL ELEMENTS, INDICATORS AND CONNECTORS

Control and indication elements of the MXC-56 converter are located on the front panel, all connectors are on the rear panel of the device as shown in figure 1:

- [1] Display
- [2] SYSTEM 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 switch connector
- [13] DMX-512 output
- [14] Power supply connector

Pic.1 – Converter panels





1.3. DEVICE FUNCTIONS

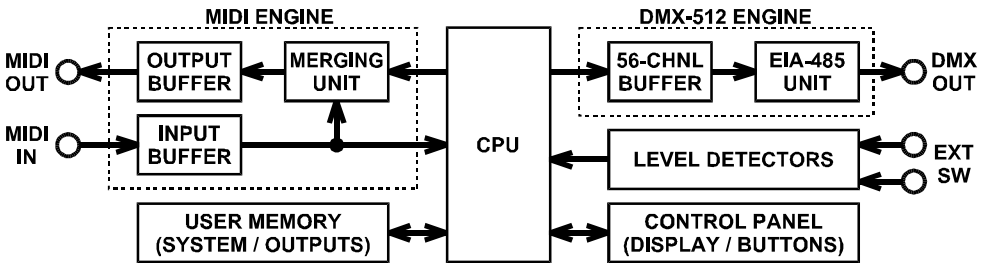
Functional block diagram of the MXC-56 is shown on pic. 2 The signal from the bus coming in the MIDI input MIDI-IN [11] is supplied to the CPU and through it back to the output MIDI-THRU/OUT [10] - "Thru" function of the output.

The received data for MXC-56 are filtered and then converted according to the setting system parameters and output parameters and the resulting data is converted to the DMX signals, which are transmitted to output DMX-OUT [13].

MIDI SysEx data generated by the CPU are fed to the sum circuit and the output MIDI-THRU/OUT [10] - the "Out" function.

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

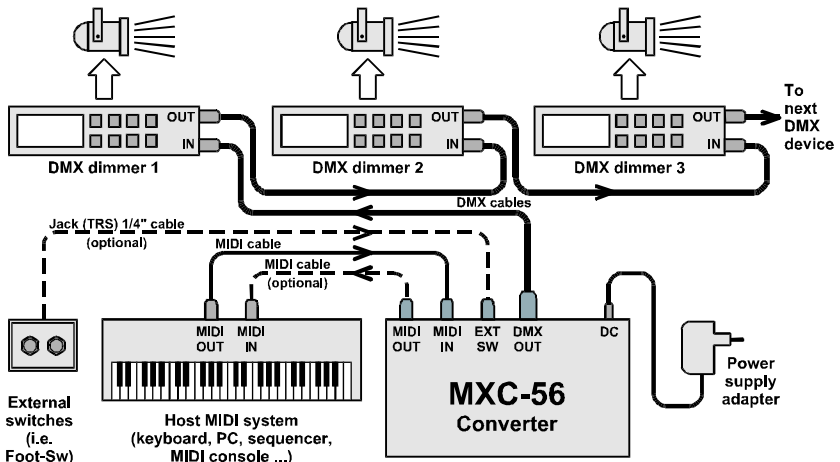
Pic. 2 - Functional block diagram



2. DEVICE INSTALLATION

Example of MXC-56 connection to the MIDI system and DMX system is shown on pic. 3

Pic. 3 – Example of system connection

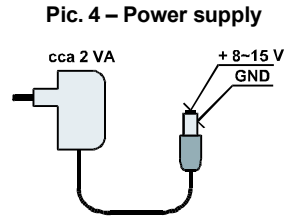




2.1. POWER SUPPLY ADAPTER CONNECTION

Power supply for MXC-56 is provided from an external adapter connected to coaxial connector DC [14]. The connector is standard 6 / 2.1 mm. External DC adapter must be able to supply 200 mA at least in the voltage range of 8 to 15 volts, the voltage may not be stabilized.

The adapter connector must have negative outside and positive inside - see pic. 4. Polarity of the power connector is also graphically displayed on the rear panel. MXC-56 has a built-in protection against reverse polarity supply voltage. If that occurs, the device doesn't work but it is not damaged.



Pic. 4 – Power supply

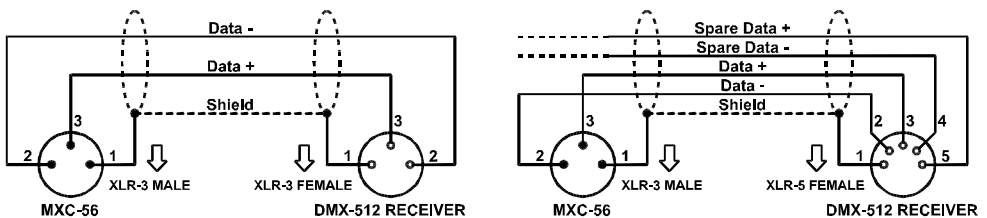
2.2. MIDI SYSTEM CONNECTION

MXC-56 is connected to the MIDI system using standard MIDI cables with DIN 41524 (5-pin 180°) connectors. Data from the master system (sequencer, keyboard, PC, etc.) are coming to the input MIDI-IN [11]. Thru-going data mixed with own MIDI data generated by the converter is available at the output MIDI-THRU/OUT [10]. If it isn't necessary to control next MIDI devices from master system, only MIDI cable from output of master system to input of MXC-56 has to be connected. Output MIDI-THRU/OUT [10] of MXC-56 stays unconnected in this case.

2.3. DMX SYSTEM CONNECTION

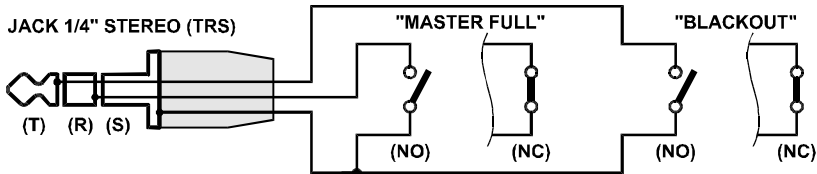
To connect the MXC-56 converter to the DMX system is used DMX-OUT [13]. In accordance with the standard USITT (United States Institute for Theater Technology, Inc.) Should be used 5 pin XLR-type connector. However, since the vast majority of producers of the DMX equipment does not comply the standard and uses only 3-pin XLR connectors, the 3-pin connector is used. The DMX connection cable must be wired according the picture 5. If the cable is 4-line, the auxiliary data line (i.e., signals "Spare +/-") from the XLR-5 connector is not used – converter does not use it. For quick orientation is the wiring of the connector pins DMX-OUT [13] also listed on the rear panel next to the MXC-56 connector DMX-OUT [13].

Pic. 5 - DMX-512 cable wiring variants

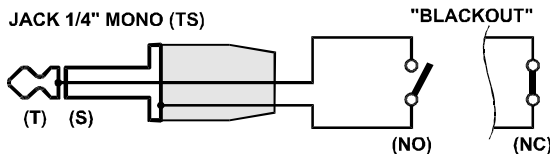


2.4. EXTERNAL SWITCHES CONNECTION

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. 6.. MXC-56 recognizes the type of switches automatically during the reset sequence. Attention – both switches must be in off position during the device reset!

Pic. 6 – 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. 7.

Pic. 7 – Connection of one external switch

3. DEVICE OPERATION

All control and indicating elements are located on the front panel of the MXC-56. The device has no power switch, it starts to work immediately after connecting the power adapter to DC [14]. In normal operating mode MXC-56 works automatically according to received commands through MIDI bus and the values of the parameters programmed by the user.

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 parameters is read from the internal memory during the reset sequence and all circuits are then MXC-56 set to the required state. During the reset sequence the device name and the operating system version number are shown on display. After the execution of the reset sequence MXC-56 turns into normal working mode.

In normal operating mode, reset sequence can be launched manually by pressing the EXIT / RESET [8] or by MIDI command "System Reset".

3.2. "BLACKOUT" AND "MASTER FULL" FUNCTIONS

These functions can be activated with help of external switches connected to EXT-SW [12] connector on rear panel of the device (see chapter 2.4). "Blackout" function can be activated also remotely, with help of MIDI CC selected by user (see chapters 4.1.7. and 5.1.).

"Blackout" function turns off the outputs (DMX channels) that have enabled this possibility with the parameter "Accept Blackout" (see chapter 4.2.7.). The function is active whole time the "Blackout" switch is on.

"Master Full" function simulates setting of "Master" controller (see chapter 4.1.6.) 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 can't be launched if "Blackout" function is active. "Master Full" switch is ignored in that case.



3.3. OPERATING MODES INDICATION

Current status of all operating modes of MXC-56 is displayed on the display [1] on the front panel of the device.

3.3.1. NORMAL WORKING MODE INDICATION

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

3.3.2. DMX OUTPUT ACTIVITY INDICATION

DMX output activity is indicated with square symbol on the left in upper row of the display [1]. If all DMX channels transmit only the basic minimum value (see description of parameter "Preheat"), the symbol isn't shown. But, if at least one DMX channel value is greater than the minimum, 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)	Whole time
BlkOut	"Blackout" function active (activated with external switch or with help of MIDI Control Changes)	Whole time

3.3.3. MIDI INPUT ACTIVITY INDICATION

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

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 mode

Symbol	Meaning	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. MEMORY RESET**

Parameters which controls all activities of MXC-56 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 table 3. To perform a complete memory initialization, press the buttons SYSTEM [2] and OUTPUT [3], keep it 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 parameters

System parameters		
Name	Value	Description
DMX Shift	1	DMX channels from 1 to 56 used
MIDI Channel	16	MIDI commands received on MIDI channel 16
MIDI Mode	Ctr	Outputs controlled by MIDI Control Changes
MIDI Shift	36	Control Changes Nr. from 36 to 91 used for control of outputs
MIDI Master CC Nr.	7	"Master" controller is MIDI Control Changes Nr. 7
MIDI Blackout CC Nr.	16	"Blackout" function controlled by MIDI Control Changes Nr. 16
LCD Contrast	16	Middle level of contrast
Output parameters (same for all 56 outputs !)		
Name	Value	Description
Default Value	0	Zero default value of the output after reset
Curve	Lin	Linear curve
Preheat	0	No preheat
Limit	255	No limit
Accept Master	On	"Master" controller allowed
Accept Blackout	On	"Blackout" function allowed

4. PARAMETERS

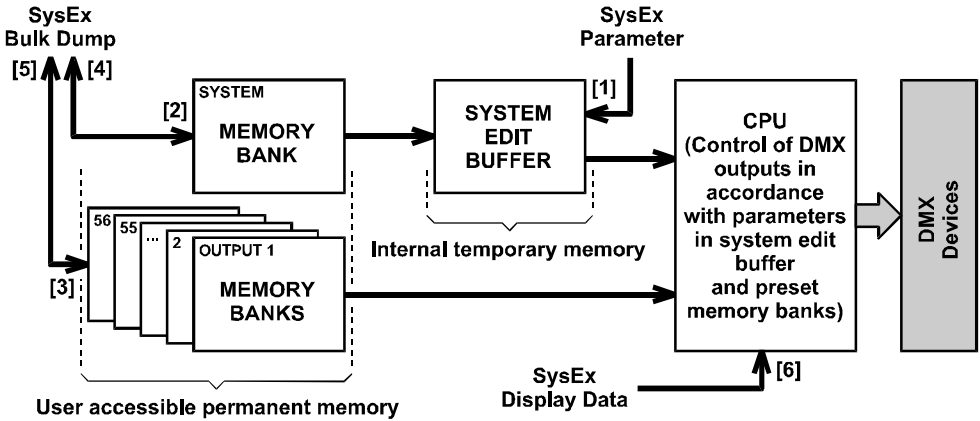
Settings of parameters affects significantly operation of the device during conversion of MIDI data to DMX data. The parameters are divided in two basic groups – system parameters and parameters of outputs. Meaning of all parameters is described bellow. All parameters are fully programmable by user. Programmed values are stored in internal memory. Parameters can be set in the editing modes by using the controllers on front panel of the MXC-56 or any time during the device operation via MIDI System Exclusive communication.

Structure of internal memory is shown on pic. 8. All parameters are stored in memory banks - there is one memory bank for system parameters and 56 memory banks for individual outputs. Content of memory banks can be read ([4], [5]) or changed ([2], [3]) via Bulk Dump SysEx Messages (see description of System Exclusive communication).

System parameters in edit buffer can be changed ([1]) during the device operation with help of Change Parameter SysEx Messages (see description of System Exclusive communication). However, these changes are temporary only. Content of edit buffer is kept only until the device is switched on or until reset is executed.

With help of System Exclusive messages, display of the device can be controlled too ([6] - see description of System Exclusive communication).

Pic. 8 – Structure of user memory



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 4 and 3.

Table 4 – Global system parameters

Parameter name	Parameter		Values	
	Meaning	Symbol	Range	Meaning
DMX Shift	Setting of DMX channels shift - selection of the lowest used DMX channel	"DMX Shft"	1 ~ 457	1 → chnl 1 ~ 56 457 → chnl 457 ~ 512
MIDI Channel	Setting of MIDI channel (and "Device ID") for MIDI communication	"MID Chnl"	1 ~ 16	1 → MIDI chnl 1 16 → MIDI chnl 16
MIDI Mode	Selection of MIDI command type for the converter control	"MID Mode"	Not / Ctr	Not → Note + Key After Ctr → Control Changes
MIDI Shift	Setting of MIDI commands shift - selection of the lowest used MIDI note or MIDI CC	"MID Shft"	0 ~ 72	0 → Note/CC 0 ~ 55 72 → Note/CC 72 ~ 127
MIDI Master CC Nr.	Selection of number of "Master" controller	"CC Mastr"	0 ~ 127	0 → CC 0 127 → CC 127
MIDI Blackout CC Nr.	Selection of number of "Blackout" controller	"CC Blout"	0 ~ 127	0 → CC 0 127 → CC 127
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"	All System Output 1 ~ 56	Selection of memory bank for data listing



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 or to send the values of parameters stored in memory..

4.1.1. SYSTEM PARAMETERS ADJUSTMENTS

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 4. If memory protection is on, system parameters are not accessible for editing – menu contents only utilities. The memory protection must be set off before the system parameters are edited.



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 up until boundary value is not achieved.

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-56 ignores new parameter value and continues working with original value of a parameter.

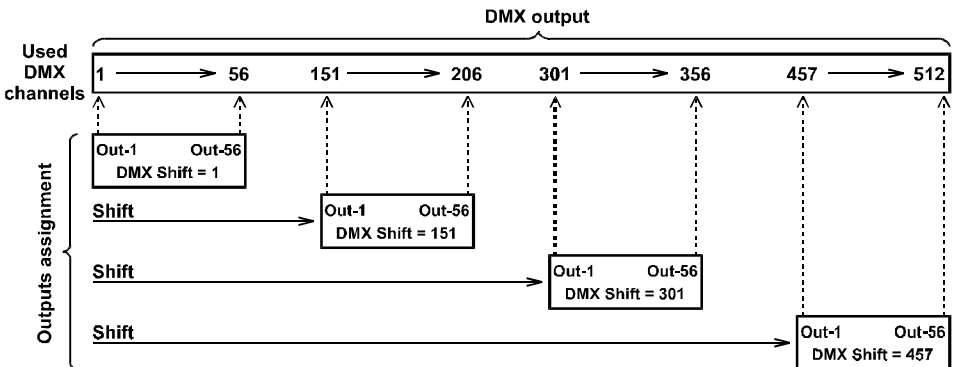
After setting the new values of all required parameters, pressing the EXIT [8] button cancels editing mode – the device returns to normal working mode.

It is also possible to switch to editing of output parameters by pressing the OUTPUT [3] button at any time.

4.1.2. "DMX SHIFT" PARAMETER

MXC-56 uses block of fifty-six consecutive DMX channels. Parameter "DMX Shift" can choose which of the 512 possible DMX channels will be used. Parameter directly determines the number of the lowest used DMX channel (i.e. shift of DMX channels). Graphical representation of the DMX block is shown on pic. 9.

Pic. 9 - DMX SHIFT parameter





4.1.3. "MIDI CHANNEL" PARAMETER

Parameter specifies the MIDI channel on which the MXC-56 receives MIDI commands. It may be chosen from any of MIDI channels 1 to 16. Selected number of MIDI channels simultaneously serves as an device identification number (Device ID) for SysEx communication (00h to 0Fh).

4.1.4. "MIDI MODE" PARAMETER

MXC-56 can use MIDI commands Note On / Off + Key Aftertouch or Control Changes (MIDI controllers) to control of DMX output. This parameter determines which of these types of MIDI commands is used.

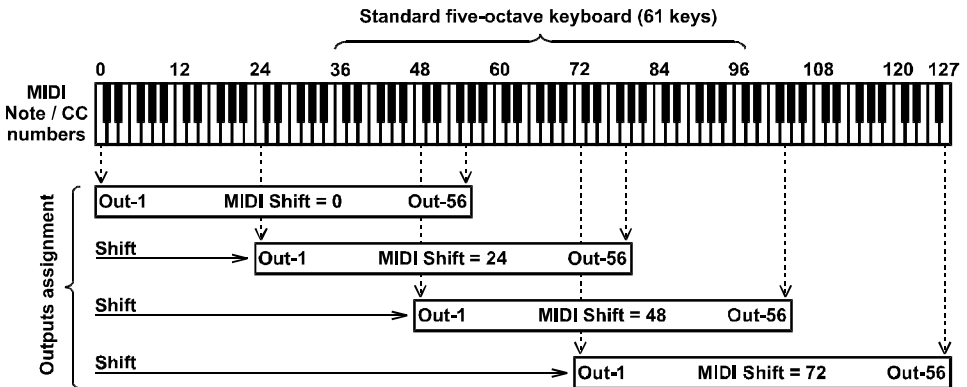
If the "Note" mode is selected a block of fifty-six consecutive MIDI notes is used to control the outputs. In "Note" mode, converter accepts MIDI commands Note-On, Note-Off and Key Aftertouch for note numbers chosen by "MIDI Shift" parameter (see below).

If the "Controller" mode is selected a block of fifty-six consecutive MIDI controllers is used to control the outputs. In "Controller" mode, converter accepts MIDI Control Change commands for controllers numbers chosen by "MIDI Shift" parameter (see below).

4.1.5. "MIDI SHIFT" PARAMETER

MXC-56 converter can process a block of fifty-six consecutive MIDI notes / controllers of the total potential range of 128 notes / controllers. The parameter "MIDI Shift" set the number from which MIDI note / controller MXC-56 start to respond - the parameter value determines the number of the lowest MIDI note / controller in the block, which will be used for DMX outputs control. Graphic representation of valid control block of MIDI notes / controllers is shown on pic. 10.

Pic. 10 - MIDI SHIFT Parameter



4.1.6. "MIDI MASTER CC Nr." PARAMETER

In order to use a simultaneous dimming or lighting of all required reflectors with a single controller, the operating system of MXC-56 has implemented the "Master Controller" function. Any of MIDI controllers (Control Changes) may be used as the main regulator for simultaneous controlling of all the selected outputs (see description of output parameter "Accept Master").



For allowed outputs, values transmitted to DMX channels are directly proportional to the value of selected "MIDI Master Controller". When the value of the "MIDI Master Controller" is equal to zero, minimal value (see description of output parameter "Preheat") is transmitted to all used DMX channels. For the value of the "MIDI Master Controller" equal 127, values given by control MIDI commands for individual outputs are then transmitted to the used DMX channels.

The parameter can take values from 0 to 127, parameter directly defines the number of MIDI controller to be used as a "Master" controller.

Attention! If the Control Changes is selected by parameter "MIDI Mode" and the number of "MIDI Master Controller" is included in the block of controllers used to control outputs, the controller will be used primarily as a "Master" controller and not to control the corresponding output thus!

4.1.7. "MIDI BLACKOUT CC Nr." PARAMETER

The "Blackout" function allows the simultaneous turn-off of all selected outputs (see description of output parameter "Accept Blackout"). If the function is activated, the selected outputs are immediately disabled and remain so until the "Blackout" function is cancelled.

Any of MIDI controllers (Control Changes) may be used as the controller for the "Blackout" function. The parameter can take values from 0 to 127 and the value of the parameter directly determines the number of MIDI controller that will be used as a "Blackout" controller.

Attention! If the Control Changes is selected by parameter "MIDI Mode" and the number of "MIDI Blackout Controller" is included in the block of controllers used to control outputs, the controller will be used primarily as a "Blackout" controller and will not control the corresponding output thus! Similarly, the "Blackout" controller has higher priority than the "Master" controller - if the "Master" and the "Blackout" has assigned the same MIDI controller, this controller will control only the "Blackout" function!

Note: The "Blackout" function may also be activated by an external switch.

4.1.8. "LCD CONTRAST " PARAMETER

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

4.1.9. "MEMORY PROTECTION" UTILITY

This utility allows to enable or disable the memory protection against unwanted overwriting of user parameters data stored in memory. When the protection is active (value On) it is not possible to edit the parameters and received System Exclusive message for change of parameter values are also ignored. During the reset (turn-on) of MXC-56 memory protection is always activated.

4.1.10. "BULK DUMP" UTILITY

The last item in the system parameters menu is an utility "MIDI Bulk Dump". This utility allows to backup the entire contents of user memory in MIDI sequencer in the form of MIDI System Exclusive messages.

After selecting the utility in the system parameters menu, lower row of display [1] shows name of memory bank whose content will be transferred: "All", "System", "Output 01" to "Output 56". Required memory bank can be selected by DATA-INC [5] and DATA-DEC [9] buttons. If "All" is selected, complete content of user memory will be transferred (system bank and all 56 output banks). 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 valid for one output only. Each of outputs may therefore to have individual settings of all parameters. Before adjusting the output parameters, the memory protection must be disabled (see the system parameter "Memory Protection"). When you try to edit the outputs parameters with memory protection enabled, the converter does not respond to any changes and the display shows warning message "Memory Protected".

Table 5 – 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	"Deflt"	0 ~ 127	0 → output off 127 → max value
Curve	Selection of conversion curve of the output (see pic.9)	"Curve"	Lin 0/1 Lg1 ~ 6 Ex1 ~ 6 ~ 1 ~ 5 ~ 1 ~ 5	Lin → linear 0/1 → bi-stable Lg → logarithmic Ex → exponential ~ → "S" curve ~ → "Z" curve
Preheat	Setting of minimal admissible value of DMX output	"Preht"	0 ~ 127	0 → no preheating 127 → max preheating
Limit	Setting of maximal admissible value of DMX output	"Limit"	128 ~ 255	128 → max limitation 255 → no limitation
Accept Master	"Master" controller enabled / disabled for the output	"Mastr"	Off On	Off → disabled On → enabled
Accept Blackout	"Blackout" function enabled / disabled for the output	"BlOut"	Off On	Off → disabled On → enabled

4.2.1. OUTPUT PARAMETERS SETTINGS

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 (DMX channel) 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 / utility) – see table 5.

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 up until boundary value is not achieved.

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-56 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, parameters, 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

Parameter "Default Value" chooses default value of the output, i.e. the value at which the output is set during the reset sequence.

Parameter can take values from 0 to 127, parameter directly corresponds to the input value for the corresponding MIDI output. At the level 0 is the output parameter off, at the parameter value 127 has output a maximum possible value.

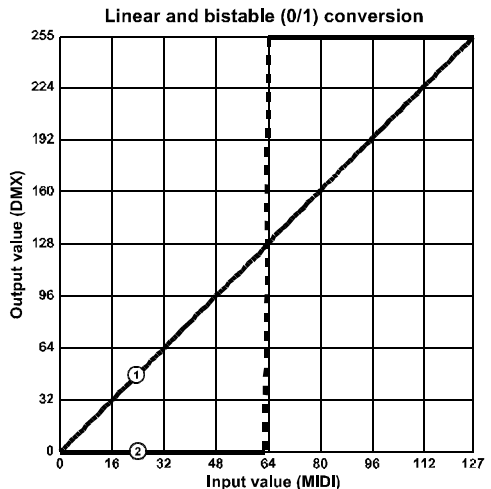
4.2.3. "CURVE" PARAMETER

To convert the input MIDI data to the output DMX data, it is possible to select one of the twenty-two predefined transfer curves or linear or bi-stable (on / off switch) transfer.

Conversion dependencies are shown in the graphs on pic. 11. Appropriate 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. 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.). "S" type curves have a reduced sensitivity in the central position of control and "Z" type curves have a reduced sensitivity in the extreme positions of the control. They can be used e.g. for general management of moving lights.

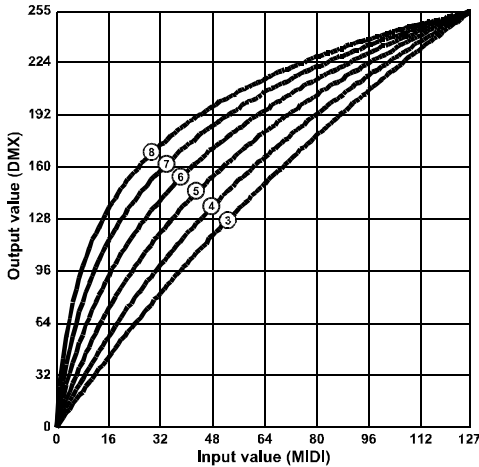
Pic. 11 – Curve shapes

- | | |
|--------------------|--------------------|
| (1) Linear | (13) Exponential 5 |
| (2) 0 / 1 | (14) Exponential 6 |
| (3) Logarithmic 1 | (15) "S" curve 1 |
| (4) Logarithmic 2 | (16) "S" curve 2 |
| (5) Logarithmic 3 | (17) "S" curve 3 |
| (6) Logarithmic 4 | (18) "S" curve 4 |
| (7) Logarithmic 5 | (19) "S" curve 5 |
| (8) Logarithmic 6 | (20) "Z" curve 1 |
| (9) Exponential 1 | (21) "Z" curve 2 |
| (10) Exponential 2 | (22) "Z" curve 3 |
| (11) Exponential 3 | (23) "Z" curve 4 |
| (12) Exponential 4 | (24) "Z" curve 5 |

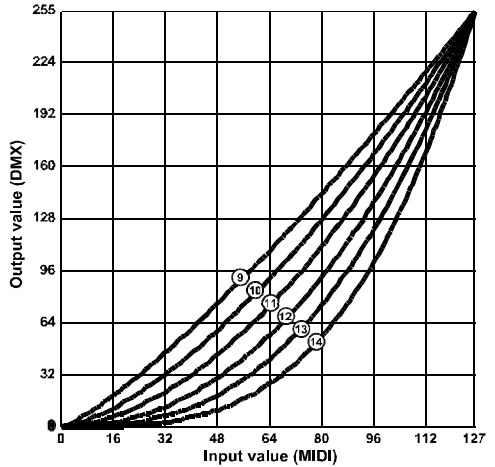




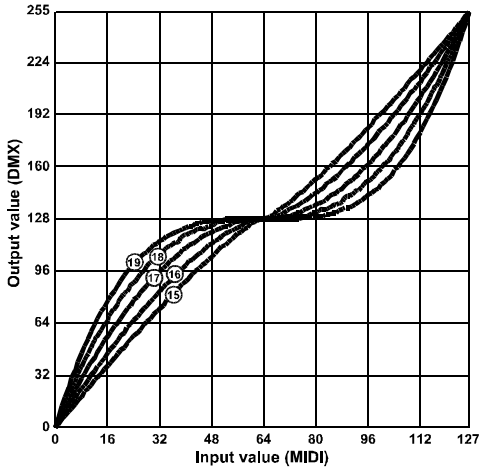
Logarithmic curves



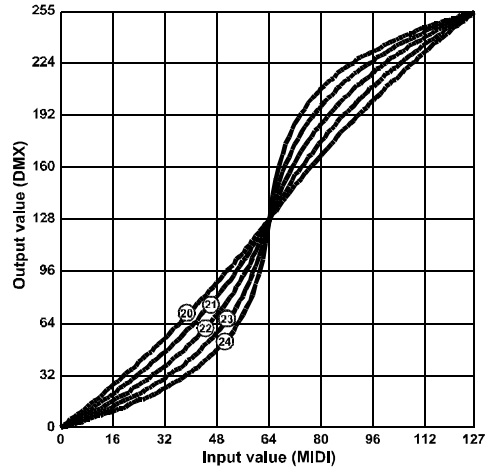
Exponential curves



"S" curves



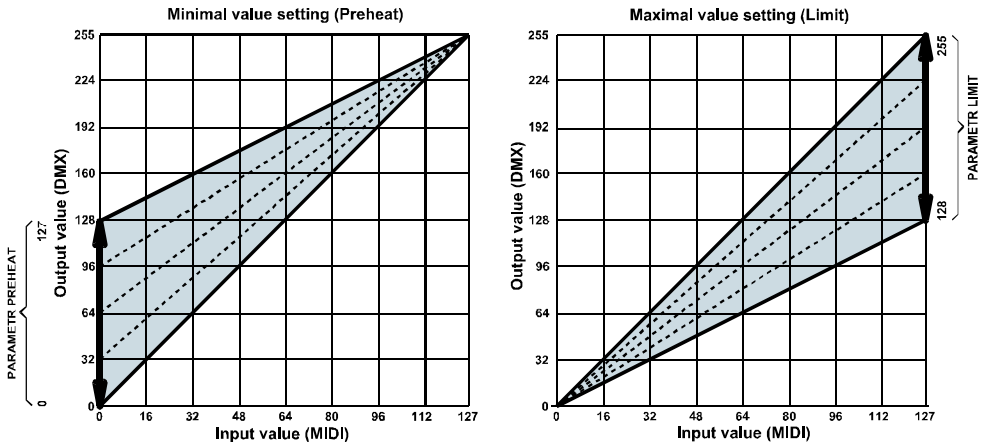
"Z" curves



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 channel (output). This allows for example permanent bulb preheating and thus to extend its life several times during blinking.

Parameter can have values from 0 to 127, value of parameter directly corresponds to the minimal permitted value for the DMX channel (output). At 0 level the preheat parameter is off, value 127 is for maximum preheat. For the graphical description of the "Preheat" parameter impact on transmitted data see pic 12.

Pic. 12 - "Preheat" and "Limit" parameters impact on transmitted DMX values

4.2.5. "LIMIT"PARAMETR

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

Parameter can have values from 128 to 255, value of parameter directly corresponds to the maximal permitted value for the DMX channel (output). The value 255 sets no limitation, while 128 is for the maximum limitation. For the graphical description of the "Limit" parameter impact on transmitted data see pic 12.

4.2.6. "ACCEPT MASTER" PARAMETER

Parameter enables (symbol "On") or disables (symbol "Off") the effect of the "Master" controller for the DMX channel. It is suitable to enable "Master" controller for outputs (DMX channels) used for control of dimmers. For outputs (DMX channels) controlling the movement of lights or speed of stroboscopes, is suitable to disable the "Master" controller.

4.2.7. "ACCEPT BLACKOUT" PARAMETER

Parameter enables (symbol "On") or disables (symbol "Off") the effect of the "Blackout" function for the DMX channel. It is suitable to enable "Blackout" function for outputs (DMX channels) used for control of dimmers. For outputs (DMX channels) controlling the movement of lights or speed of stroboscopes, is suitable to disable the "Blackout" function.

5. MIDI IMPLEMENTATION

MXC-56 recognizes MIDI channel commands, common system commands and System Exclusive MIDI messages. Channel commands are accepted only on MIDI channel selected by the system parameter "MIDI Channel".

**5.1. CHANNEL COMMANDS**

MXC-56 recognizes MIDI channel commands "Note Off", "Note On", "Key Aftertouch" and "Control Changes" respecting the "Running Status" mode.

Note On

Enabling of Note-On command is subject to setting up a system parameter "MIDI Mode" to "Note". There are accepted the note number (Note Nr) and speed sensitivity (Velocity). It is always accepted only 56 consecutive notes from the total range of note numbers (0 to 127). Note number of the first accepted note determines the parameter "MIDI Shift" (see also pic. 10). Speed sensitivity (Velocity) gives a value that will be sent to the corresponding output. Example of velocity conversion to DMX channel value is in table 6.

Table 6 – Conversion of Velocity, Key Aftertouch and CC to DMX channel value

Value of Velocity, Aftertouch, CC	Output value of DMX channel	Value of Velocity, Aftertouch, CC	Output value of DMX channel	Value of Velocity, Aftertouch, CC	Output value of DMX channel	Value of Velocity, Aftertouch, CC	Output value of DMX channel
0	0	32	64	64	129	96	193
1	2	33	66	65	131	97	195
2	4	34	68	66	133	98	197
3	6	35	70	67	135	99	199
4	8	36	72	68	137	100	201
5	10	37	74	69	139	101	203
6	12	38	76	70	141	102	205
7	14	39	78	71	143	103	207
8	16	40	80	72	145	104	209
9	18	41	82	73	147	105	211
10	20	42	84	74	149	106	213
11	22	43	86	75	151	107	215
12	24	44	88	76	153	108	217
13	26	45	90	77	155	109	219
14	28	46	92	78	157	110	221
15	30	47	94	79	159	111	223
16	32	48	96	80	161	112	225
17	34	49	98	81	163	113	227
18	36	50	100	82	165	114	229
19	38	51	102	83	167	115	231
20	40	52	104	84	169	116	233
21	42	53	106	85	171	117	235
22	44	54	108	86	173	118	237
23	46	55	110	87	175	119	239
24	48	56	112	88	177	120	241
25	50	57	114	89	179	121	243
26	52	58	116	90	181	122	245
27	54	59	118	91	183	123	247
28	56	60	120	92	185	124	249
29	58	61	122	93	187	125	251
30	60	62	124	94	189	126	253
31	62	63	126	95	191	127	255

Note: Conversion of values is valid only for linear conversion (Curve =1), no preheating (Preheat = 0) and no limitation (Limit = 255)



Note Off

Enabling of Note-Off command is, the same as the Note-On command, subject to setting up a system parameter "MIDI Mode" to "Note". Again, it is accepted only 56 consecutive notes accordingly to the setting of the system parameter "MIDI Shift". Always when received a valid command, the corresponding output (DMX channel) is switched off.

Key Aftertouch

Enabling of Key Aftertouch command, like the previous commands, is enabled by setting up a system parameter "MIDI Mode" to "Note". Again, it is accepted only 56 consecutive notes accordingly to the system parameter "MIDI Shift". Always when a valid command is received, the corresponding output (DMX channel) is set to the value of Key Aftertouch command (second databyte of the command). Example of Key Aftertouch conversion to DMX channel value is in table 6.

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

Control Changes

MXC-56 recognizes normalized controllers Nr. 120, 121 and 123. Excepting these controllers, the device accepts some other controllers in dependence on setting of system parameters.

Control Changes Nr. 120 - All Sound Off

Controller is accepted only in MIDI mode "Note" (see the system parameter "MIDI Mode"). Always when this controller is received (its second databyte must be zero), all outputs are set to default values (according to "Default Value" parameter of individual output).

Control Changes Nr. 121 - Reset All Controllers

If this MIDI controller is received (its second databyte must be zero), the "Master" controller is immediately set to the highest value and the "Blackout" controller is disabled. If the converter works in "Controller" mode (see the system parameter "MIDI Mode"), all outputs are set to default values (according to "Default Value" parameter of individual output).

Control Changes Nr. 123 - All Notes Off

Controller is accepted only in MIDI mode "Note" (see the system parameter "MIDI Mode"). Always when this controller is received (its second databyte must be zero), all outputs are set to default values (according to "Default Value" parameter of individual output).

Control Changes Nr. @ Master CC Nr.

Controller selected by the system parameter "Master CC Nr" works as the main regulator for all enabled outputs (see the output parameter "Accept Master"). The value of the controller (second databyte) may be in full range of 0 to 127.

Control Changes Nr. @ Blackout CC Nr.

Controller selected by the system parameter "Blackout CC Nr" controls the "Blackout" function. The function is disabled for values from 0 to 63 and active for values from 64 to 127.

Control Changes Nr. @ MIDI Shift ~ @ MIDI Shift + 55

If the converter works in "Controller" mode (see the system parameter "MIDI Mode"), in addition to the above-described MIDI controllers, block of additional 56 consecutive MIDI controllers is accepted. Number of the first controller in the block is defined by the system parameter "MIDI Shift" (see also pic. 10). These controllers will control individual outputs (DMX channels) of the converter. Example of the controllers conversion to DMX channel value is in table 6.



5.2. SYSTEM COMMANDS

MXC-56 recognizes only the command System Reset (status byte FFh) of the common system commands (Common System Messages). Always when System Reset is received, the reset sequence is launched (as well as after switching MXC-56 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-56 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 – it is possible to show any text.

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

For the simple creation of custom SysEx Messages for setting MXC-56 please use the software generator supplied on the accompanying CD-ROM by which you can generate any SysEx messages for MXC-56.

Example of control of the device's display with help of SysEx messages is recorded in demonstration MIDI file "MXC56_demo_text.mid" (on the accompanying CD-ROM). The file contains set of SysEx commands for displaying of own texts. So that the file is accepted, the device must be in normal working mode!





6. TECHNICAL SPECIFICATION

Supply voltage :	external power supply unit - DC 8 V to 15 V
Consumption :	200 mA max
Protection :	protected against reversal of supply voltage polarity
Connector of supply adapter :	standard, coaxial, diameter 6 / 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 :	56, 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 %

7. 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****MIDI IMPLEMENTATION CHART**Device : **MXC-56**

Date : 1 / 2012

Model : **8-462**

Version : 2.0

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	
Touch	Channel's	X	X	
Pitch Bender		X	X	
Control Changes	@...	X	O	56x ²⁾
	@Master CC	X	O	³⁾
	@Blackout CC	X	O	³⁾
	120	X	O	All Sound Off
	121	X	O	Reset All Controllers
Program Change		X	X	
System Exclusive		O	O	See description
System Common	Song Position	X	X	
	Song Select	X	X	
	Tune	X	X	
System Real Time	Clock Command	X	X	
Others	Local ON/OFF	X	X	²⁾
	All Notes Off	X	O	
	Active Sensing	X	X	
	Reset	X	O	
Notes : ¹⁾ Can be changed by user				
²⁾ Range depends on "MIDI Mode" and "MIDI Shift" setting				
³⁾ CC Nr. depends on system parameters setting				

Mode 1 : **OMNI ON, POLY**Mode 2 : **OMNI ON, MONO****O** : YesMode 3 : **OMNI OFF, POLY**Mode 4 : **OMNI OFF, MONO****X** : No



B. ERROR MESSAGES

If the operation of MXC-56 fails to work, the program is stopped and the operator is informed of this situation on the display by "Err symbol. The number after the symbol determines the type of error occurred (see Table 7).

Always when the system errors occur the device is permanently blocked. Re-entry into operation is possible by switching the device off and on again (disconnecting the power adapter).

Table 7 – 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-OVERFLOW	MIDI communication buffer overflow
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-56 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].

For enter into testing mode, press PREV [6] and NEXT [7] buttons and hold them pressed. Then turn the device on – connect 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.



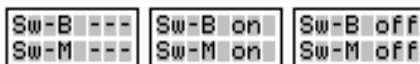
b) Button test

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.



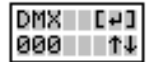
Until MIDI input is not interconnected with MIDI output, symbol of interrupted cable is shown on display [1]. Connection of MIDI input with MIDI output changes the symbol to not-interrupted cable.

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

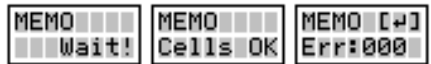
Output DMX-OUT [13] of the device is activated during this test routine. The testing procedure transmits adjustable value to DMX channels 1 to 56. Value transmitted to DMX channels 1 to 56 is shown on display [1] and it can be changed in range from 0 to 255 with help of DATA-INC [5] and DATA-DEC [9] 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 1,5 sec), display [1] shows advice "Wait!". After the test is finished, result of the test is displayed in lower row of display [1]:

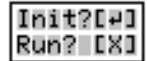


If the memory works correctly, information "Cells OK" is displayed and the device continues automatically to next step.

If a defective memory cell is detected during the test, the test is canceled and information "Err:xxx" is displayed, where "xxx" is address of the defective memory cell. 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.

