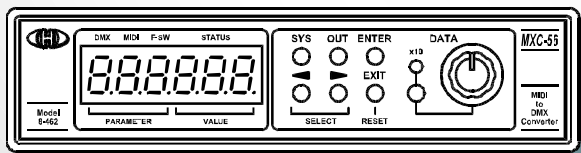


MXC-56

MIDI to DMX-512 Converter

**Model 8-462
ver. 1.0**



USER'S GUIDE



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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 or Control Changes or System Exclusive Messages 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 switch (e.g. Foot Switch) can be connected to The MXC-56 with user definable function. 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).

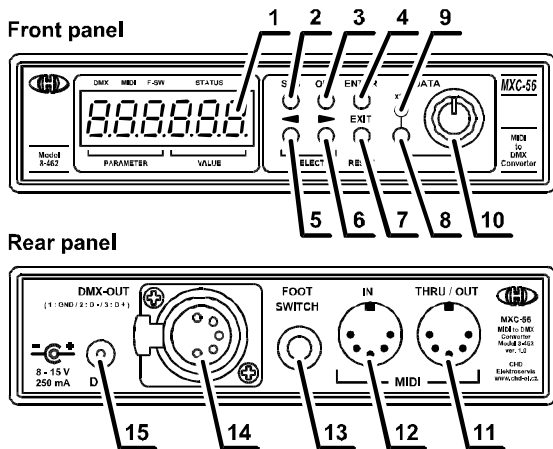
MXC-56 comply to the above standards and is fully compatible with any DMX devices thus.

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] PREVIOUS button
- [6] NEXT button
- [7] EXIT / RESET button
- [8] DATA x10 button
- [9] LED DATA x10
- [10] DATA dial
- [11] MIDI OUT
- [12] MIDI IN
- [13] External foot switch connector
- [14] DMX-512 output
- [15] Power supply connector

Fig.1 – Converter panels



1.3. DEVICE FUNCTIONS

Functional block diagram of the MXC-56 is shown in figure 2. The signal from the bus coming in the MIDI input MIDI-IN [12] is supplied to the CPU and through it back to the output MIDI-THRU/OUT [11] - "Thru" function of the output.

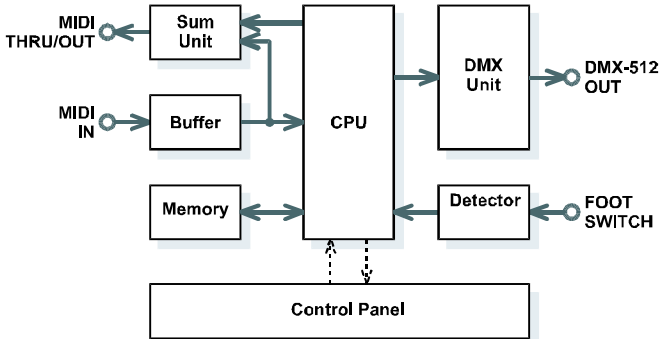
The received data for MXC-56 are filtered and then converted according to the setting system parameters and output parameters and the resulting data is transferred to the DMX signals, which are transmitted to Output DMX-OUT [14].

MIDI SysEx data generated by the CPU are fed to the sum circuit and the output MIDI-THRU/OUT [11] - the "Out" function.

Status of external Foot Switch plugged into the jack FOOT-SWITCH [13] is continuously monitored and its activation triggers the programmed functions.



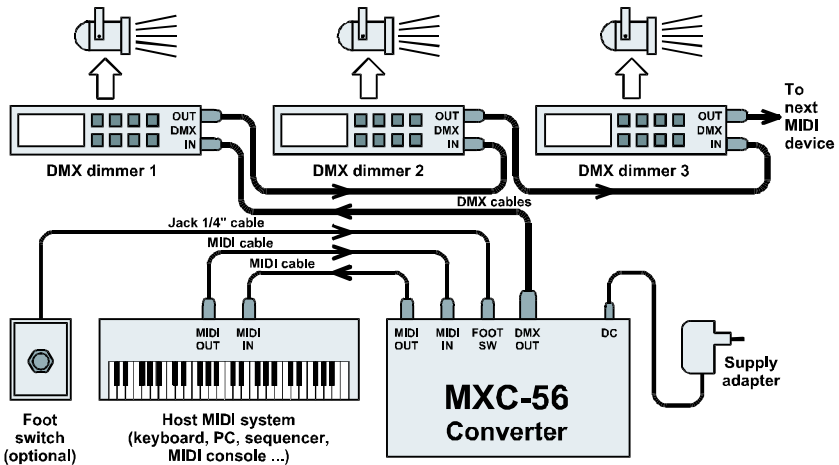
Fig. 2 - Functional block diagram



2. DEVICE SETUP

MXC-56 connection to the MIDI system and DMX system is shown in Figure 3

Fig. 3 – System connection

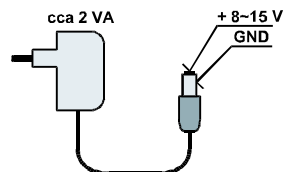


2.1. POWER SUPPLY

Power supply for MXC-56 is provided from an external adapter connected to connector DC [15]. The connector is standard 6 / 2.1 mm. External DC adapter must be able to supply min. 250 mA in the range of 8 to 15 volts, the voltage may not be stabilized (the recommended type of power adapter - MW0903GS, MW1203GS).

The adapter connector must have negative outside and positive inside - see Figure 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.

Fig. 4 – Power supply



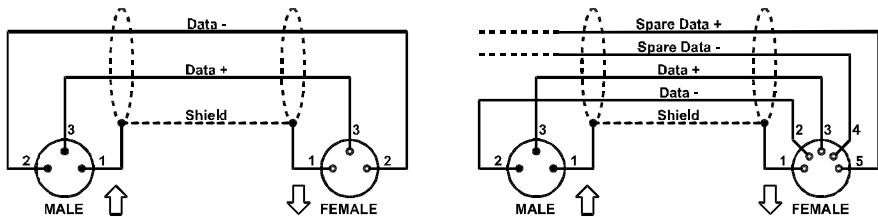
2.2. MIDI SYSTEM CONNECTION

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 control, PC, etc.) are coming to the input MIDI-IN [12], through data mixed with its own MIDI data generated by the converter is available at the output MIDI-THRU/OUT [11].

2.3. DMX SYSTEM CONNECTION

To connect the MXC-56 converter to the DMX system is used DMX-OUT [14]. In accordance with the standard USITT (United States Institute for Theater Technology, Inc.) should be used XLR-type connector - 5 pin. 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 Figure 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 [14] also listed on the rear panel next to the MXC-56 connector DMX-OUT [14].

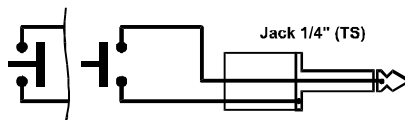
Fig. 5 - DMX-512 cable wiring variants



2.4. EXTERNAL FOOTSWITCH

An external switch can be connected in the FOOT SW [13] type Jack 1/4"(mono) (such as Foot Switch), its function is defined by the system parameter "Foot Switch Function" settings (see chapter 4.1.8.). The external switch may have the switching type (type NO – disconnected when not used) and normally closed (NC type – connected when not used) contact. MXC-56 recognizes the type of switches automatically during the reset sequence.

Fig. 6 – External switch wiring



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 [15]. 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 AC 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 is displayed. After the execution of the reset sequence MXC-56 turns into normal working mode.

In normal operating mode can be reset sequence run manually by pressing the EXIT / RESET [7] or MIDI command "System Reset".



3.2. OPERATING MODES INDICATORS

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

3.2.1. NORMAL MODE

In the normal operating mode the right side of the display shows the symbols as explained in Table 1. The left of the display indicates the status of DMX output, MIDI bus and an external switch (see below).

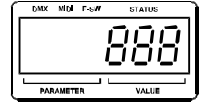
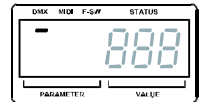


Table 1 – Normal mode indicators

Symbol	Description	Time
-	Idle state - the normal function of the converter	permanently
MSL	Active function " Master Full " (activated by external switch)	throughout activity
BLN	Active Function "Blackout On" (activated by an external switch or MIDI CC)	throughout activity
SYH	Valid System Exclusive Message from MIDI bus received	approx. 2 seconds
???	Unknown (invalid) System Exclusive Message from MIDI bus received	approx. 2 seconds
Prt	Trying to edit parameters or to write data into memory when memory protection enabled	approx. 2 seconds

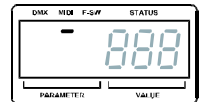
3.2.2. DMX OUTPUT ACTIVITY INDICATION

DMX output Activity indicates the "DMX" segment of the display . If all DMX channels transmit only the basic minimum value (see parameter description "Preheat"), the segment is off. But, if at least one DMX channel value is greater than the minimum, the segment is on.



3.2.3. MIDI INPUT ACTIVITY INDICATION

The activity of MIDI input indicates "MIDI" segment of the display. The data on MIDI input is indicated by a flash of a segment of about 0.3 seconds. In the case of thicker stream individual pulses can melt and the segment lights continuously.



3.2.4. EXTERNAL SWITCH ACTIVITY INDICATION

Status of external switch is displayed by the "F-SW" segment of the display. If the switch is inactive, the segment is off. When active the segment lights throughout its activities.





3.3. MEMORY RESET

Parameters of MXC-56, are stored in user memory. This memory can be initialized - delete the value stored in and replace with the default values (so-called "Factory Reset"). "Factory Reset" parameter values are shown in Table 2. To perform a complete memory initialization press the button SYS [2] and ENTER [4], keep it pressed and then connect the converter to the power supply (adapter). After connecting the adapter the display shows the information about the readiness for the initialization ("Init?") - Now you can release both buttons. After releasing the buttons the initialization is started. After that the device automatically switches to normal working mode.

Table 2 – "Factory Reset" values

System parameters		
Name	Value	Description
DMX Shift	1	DMX channels 1 – 56 used
MIDI Channel	16	MIDI at MIDI channel 16
MIDI Mode	CTR	Output kontrol by MIDI Control Changes
MIDI Shift	36	Control Changes 36 - 91 used for outputs
MIDI Master CC Nr.	7	"Master" controller is MIDI Control Changes 7
MIDI Blackout CC Nr.	16	"Blackout" function controlled by MIDI Control Changes 16
Foot Switch Function	BLK	External switch activates "Blackout " function
Output parameters (same for all 56 outputs !)		
Name	Vakue	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	YES	"Master" controller allowed
Accept Blackout	YES	"Blackout" function allowed

4. PARAMETERS

All parameters are fully user programmable. Programmed values are stored in internal memory.

"MIDI Bulk Dump" utility can backup the contents of internal memory in MIDI sequencer (see below). Parameters can be set in the editing modes by using the controls on the front panel of the MXC-56 or any time during operation via MIDI System Exclusive communication. Parameters are divided into two groups - the global system parameters and individual parameters of individual outputs.

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 "Factory Reset" (see chapter 3.3.) Stated clearly in Table 3 and 2

Menu for editing of the global system parameters contains also two utilities ("Memory Protect" 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..

**Table 3 – Global system parameters**

Parameter name	Parameter		Values		
	Description	Symbol	Range	Symbol	Values
DMX Shift	DMX channel shift, e.g. select the number of the lowest used DMX channel	<i>dnh</i>	1 ~ 457	<i>457</i>	1 → channels 1 ~ 56 457 → channels 457 ~ 512
MIDI Channel	MIDI channel (and "Device ID") for MIDI communication	<i>nch</i>	1 ~ 457	<i>16</i>	1 → MIDI chn1 16 → MIDI chn16
MIDI Mode	Selects the MIDI command type for the converter control	<i>mod</i>	Notes Controllers	<i>not</i> <i>ctr</i>	not → Notes ctr → Control Changes
MIDI Shift	Adjusts the MIDI command shift povelú, e.g. select the number of the lowest used MIDI note or MIDI CC	<i>nsh</i>	1 ~ 457	<i>72</i>	0 → notes / CC 0 ~ 55 72 → notes / CC 72 ~ 127
MIDI Master CC Nr.	Selects the number of "Master" controller	<i>nst</i>	0 ~ 127	<i>127</i>	0 → CC 0 127 → CC 127
MIDI Blackout CC Nr.	Selects the number of "Blackout" controller	<i>blf</i>	0 ~ 127	<i>127</i>	0 → CC 0 127 → CC 127
Foot Switch Function	External footswitch function select	<i>fsw</i>	Blackout Master	<i>blf</i> <i>nst</i>	blk → "Blackout" function MSt → "Master" function
Memory Protection	Utilita – memory write protection	<i>prt</i>	Off On	<i>off</i> <i>on</i>	OFF → protection off On → protection on
MIDI Bulk Dump	Utility sends the MIDI SysEx Msg Bulk dump	<i>dunp ?</i>	Start the bulk dump with ENTER button		

4.1.1. SYSTEM PARAMETERS ADJUSTMENTS

To enter the system parameters edit mode press the SYS [2] button. Left side of the display [1] shows the parameter symbol, the right side its current value.

For browsing through system parameters use PREV buttons [5] (jump to the previous parameter) and NEXT [6] (jump to the next parameter). For editing of the system parameters the memory protection must be set off.

Parameter value can be set by rotary encoder DATA [10]. Rotating the encoder to the left decrements the number, turning right increments the output. If the button x10-DATA [8] is simultaneously pressed during the rotation of the encoder the number of output is decremented or incremented by ten. This is possible only if the LED x10 DATA [9] lights - for some of the parameters the ± 10 change function is not available. If the newly set value is different from the current value (the current parameter value under which converter actually works), an indication flashes. Setting of the new value must be confirmed by pressing the ENTER button [4].

After setting the new values of all required parameters pressing the EXIT [7] button to exit the edit mode.

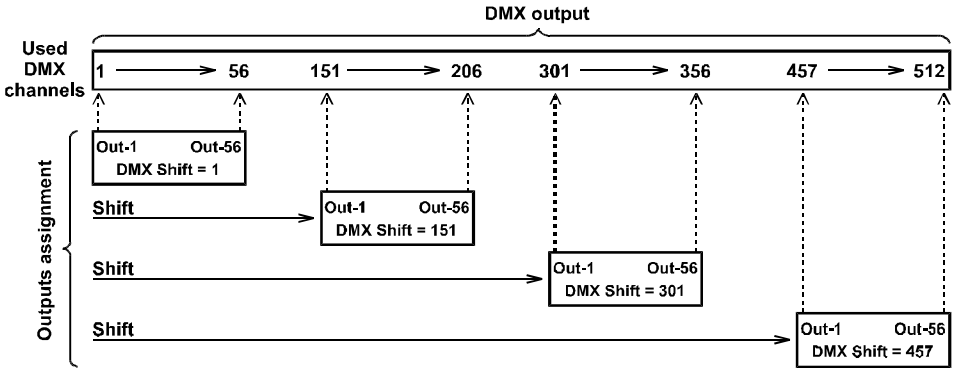
It is also possible to switch to edit output parameters of by pressing the OUT [3] at any time.

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 used by the lowest DMX channel (i.e. shift of DMX channels). Graphical representation of the DMX block is shown in Fig. 7.



Fig. 7 - 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

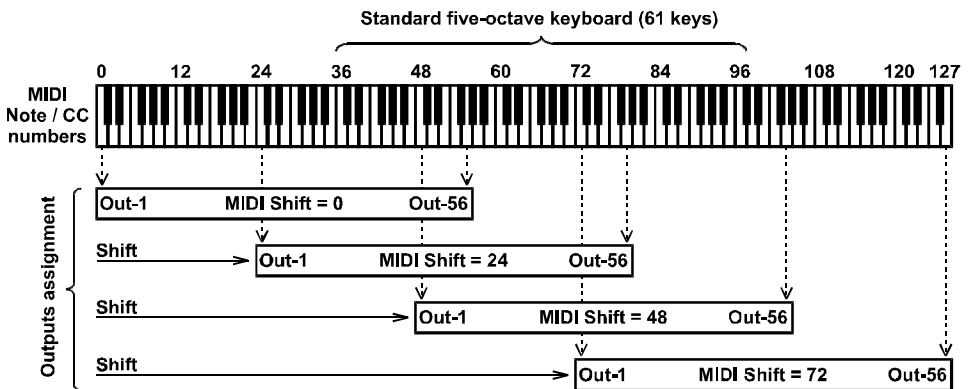
MXC-56 can use MIDI commands Note On / Off + Key Aftertouch and Control Changes (MIDI controllers) to control outputs. This parameter determines which of these types of MIDI commands is used.

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 "Controllers" mode converter accepts MIDI Control Change commands for controllers numbers chosen by "MIDI Shift" parameter (see below).

4.1.5. "MIDI SHIFT" PARAMETER

Obr. 8 - 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 to control the MXC-56. Graphic representation of valid control block of MIDI notes / controllers is shown in fig. 8.

4.1.6. "MIDI MASTER CC Nr." PARAMETER

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

If any of these is selected by "MIDI Master Controller" parameter, the transmitted values of DMX channels is directly proportional to the value of selected MIDI controller. When the value of the selected controller is equal to zero, in all used DMX channels is transmitted a minimum value, for the value equal 127 are then transmitted values given by control MIDI commands for individual channels to the used DMX channels.

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 output thus!

4.1.7. "MIDI BLACKOUT CC Nr." PARAMETER

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

As a controller of the "Blackout" function for the selected outputs can be used any MIDI controller (Control Changes) - 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 parameter "MIDI Mode" is selected by Control Changes and the number of "MIDI CC Nr Blackout" 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" may also be activated by an external switch accordingly to the system configuration parameter "Foot Switch Function".

4.1.8. "FOOT SWITCH FUNCTION" PARAMETER

Parameter selects function of an external switch connected to the connector-FOOT SW [13]. You can choose one of two functions:

In the "Blackout" function pressing of an external switch turn off the outputs that have with the parameter "Accept Blackout" (see chapter 4.2.7.) response to "Blackout" controller enabled. Function is the same and fully equivalent

In the "Master" function pressing of the external switch simulates controller settings "Master" to the maximum value. External switch has a higher priority, so that, changes of the controller "Master" by using MIDI commands are ignored when external switch is pressed.

4.1.9. "MEMORY PROTECTION" UTILITY

This utility allows to enable or disable the memory protection of user parameters against overwriting of stored data. 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 parameters menu the display request "Dump?". By pressing the ENTER button start the transmit of the data to the output MIDI-OUT [11]. All the outputs data and the global system data are transmitted. The actual transfer progress is shown on the display.

4.2. OUTPUTS PARAMETERS

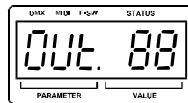
Output parameters are valid for one output only. Each output may therefore have individual settings of all parameters. Before adjusting the output parameters the memory protection must be disabled (see the system parameter "Memory Protection"). When you try to edit the outputs parameters with memory protection enabled, the converter does not respond to any changes and the display shows warning message (symbol "Prt" = Protected).

Table 4 – Parameters of the outputs

Parameter name	Parameter		Values		
	Description	Symbol	Range	Symbol	Description
Default Value	Set the default value of the output after the device is switched on (reset)	DEF.	0 ~ 127	0 127	0 → output off 127 → max. value
Curve	Output curve (see pic.9)	CUR.	Lin 0-1 Lg1 ~ Lg6 Ex1 ~ Ex6 S1 ~ S5 Z1 ~ Z5	Lin 0-1 LG EH r r	0 → output off
Preheat	Minimal value of the output (preheat)	PRE.	0 ~ 127	0 127	0 → no preheat 127 → max. preheat
Limit	Maximum output limiter (limiter)	LIM.	255 ~ 128	255 128	255 → no limit 128 → max. limit
Accept Master	Enable /disable "Master" control of the output	AMS.	No Yes	no YES	No → Disabled Yes → Enabled
Accept Blackout	Enable /disable „Blackout“ function of the output	ABL.	No Yes	no YES	No → Disabled Yes → Enabled

4.2.1. OUTPUT PARAMETERS SETTINGS

To enter edit mode, pressing the OUT [3] button. Left part of the display [1] shows "OUT" symbol and the right part the number of output. First select by the rotary encoder DATA [10] the number of output whose parameters will be edited. Rotating the encoder to the left decrements the number of units, turning right increments the number of output unit. If there is simultaneously pressed the button DATA x10 [8] while rotating encoder, the number of output is decremented or incremented by multiple of ten. To confirm the selected output press the ENTER button [4] or exit the diting mode by pressing the EXIT [7] button.



When the output is selected the left side of the display shows the symbol of the edited parameter the right part shows its current value. Parameter value can be set by rotary encoder DATA [10]. Rotating the encoder, while pressing the button DATA x10 [8], changes the value by ± 10 - this feature is indicated by LED DATA x10 [9]. If the newly set value is different from the current parameter value, the displayed value is flashing. Setting of new value must be confirmed by pressing the ENTER button [4].

To browse system parameters press PREV [5] (jump to the previous parameter) and NEXT [6] (jump to the next parameter) buttons according to table 4.

By pressing EXIT [7] and OUT [3], after setting the new values of all parameters of the output, return to the selection of the output for editing. Now you can continue adjust the parameters of another output.



After setting all the parameters of the outputs editing mode should be stopped. This is done by pressing the EXIT [7] button repeatedly.

4.2.2. "DEFAULT VALUE" PARAMETER

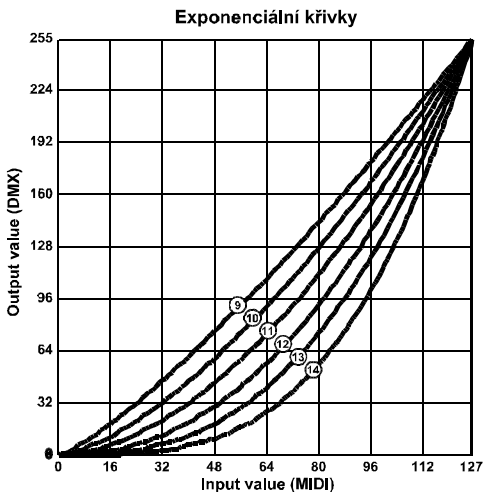
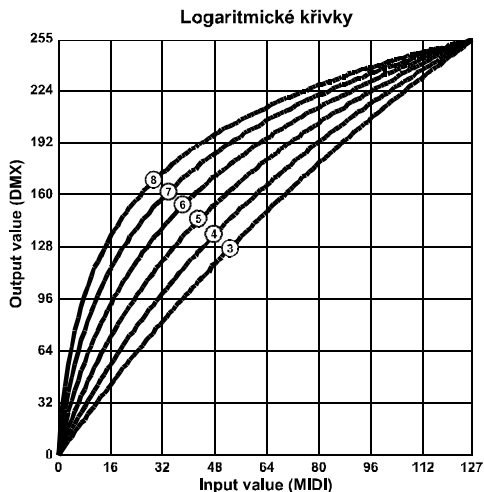
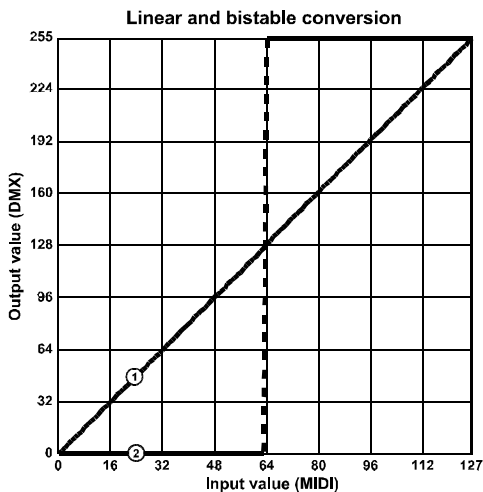
Parameter "Default Value" chooses default value of the output, i.e. the value at which the output is set during the reset sequence.

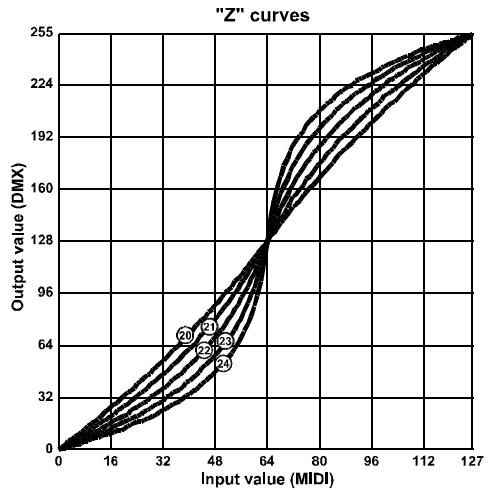
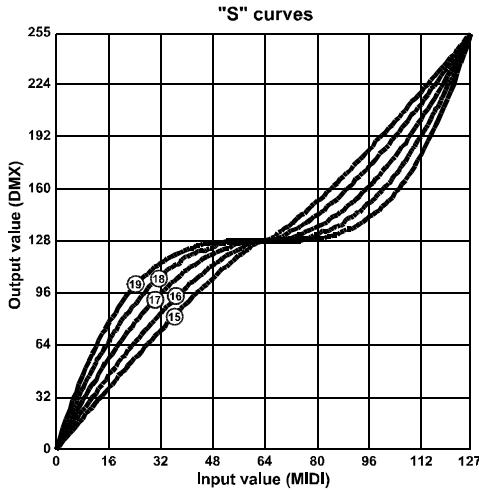
Parameter can take values from 0 to 127, parameter directly corresponds to the input value for the corresponding MIDI output. At the level 0 is the output parameter off, at the parameter value 127 has output a maximum possible value.

4.2.3. "CURVE" PARAMETER

Fig. 9 – 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 |

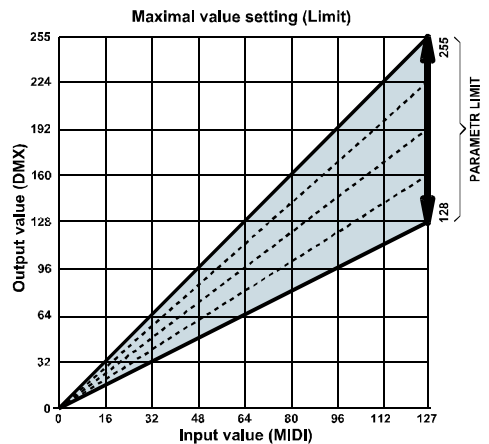
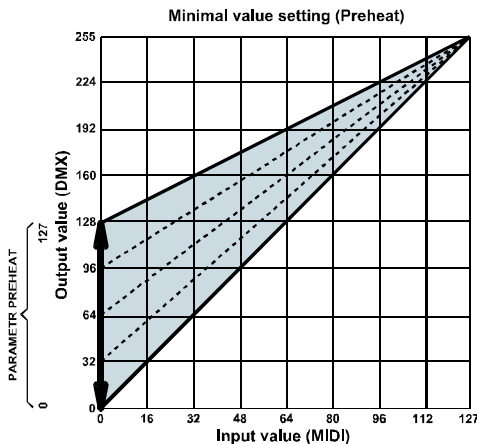




To convert the input MIDI data to the output DMX data is possible to select one of the twenty-two predefined transfer curves, linear, or double state transfer (on / off switch).

Conversion dependencies are shown in the graph in Figure 9. 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 (eg. 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 eg. for general management of moving lights.

Obr. 10 - "Preheat" and "Limit" parameters impact on transmitted DMX values





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. This allows for example permanent bulb preheat and thus extend its life several times during blinking.

Parameter can have values from 0 to 127, value of parameter directly corresponds to the minimum permitted value for the DMX channel. 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 Fig 10.

4.2.5. "LIMIT"PARAMETR

"Limit" parameter sets the maximum value transmitted to the corresponding DMX channel, ie. it is possible to limit the maximum brightness of the reflectors.

Parameter can have values of 0 to 127. The value indicates the amount of the limitation of the maximum transmitted to DMX. The value 0 sets no limitation, while 127 is for the maximum limitation (maximum value transmitted to DMX is given by the following formula: $DMX = 255 - Limit$, ie. $255 - 128$). Graphically, the impact of the "Limit" parameter is shown in Fig 10.

4.2.6. "ACCEPT MASTER" PARAMETER

Parameter enables (the symbol "Yes") or disables (symbol "No") the "Master" controller changes for to the DMX channel. To enable "Master" controller is suitable for outputs (DMX channels) used to control 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 or disables the effect of the value transmitted to the DMX channel by the "Blackout" function. Enable "Blackout" is suitable for outputs (DMX channels) controlling dimmers. For outputs (DMX channels) controlling the movement of lights or speed of stroboscopes, is suitable to disable the "Blackout" controller.

5. MIDI IMPLEMENTATION

MXC-56 recognizes the channel commands, the 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 status byte (Running Status).

Note On

Enabling Note-On command is subject to setting up a system parameter "MIDI Mode" to "Note". There are accepted two values when receiving the command "Note On". The note number (Note Nr) and speed sensitivity (Velocity). From the total range of note numbers (0 to 127) is always accepted only 56 consecutive notes. Note number of the first accepted note determines the parameter "MIDI Shift" (see also Figure 8). Speed sensitivity (Velocity) gives a value that will be sent to the corresponding output.

Note Off

Enabling of Incoming 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 is switched off.

Key Aftertouch

Enabling Note-Off 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 received a valid command, the corresponding output is set to the value of Key Aftertouch command (second databyte command).

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

Control Changes

MXC-56 accepts normalized controllers Nr. 120, 121 and 123:

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 (his second databyte must have value 0) all outputs are set to default values.

Control Changes Nr. 121 - Reset All Controllers

If this MIDI controller is received (the second databyte must have value 0) 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 (depending on the parameter "Default Value" of each output).

Control Changes Nr. 123 - All Notes Off

Controller is accepted only in the "Note" MIDI mode (see the system parameter "MIDI Mode"). When receiving the controller (his second databyte must have value 0) all outputs are set to default values.

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 "Accept Master"). The value of the controller (second databyte MIDI Msg) may be in full range of 0 to 127

Control Changes Nr. @ Blackout CC Nr.

Controller selected by system parameter "Blackout CC Nr" controls the "Blackout" function. For the values of 0 to 63 the function is disabled, the values of 64 to 127 activate the "Blackout" function.

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

If the converter operates in "Controller" mode (see the system parameter "MIDI Mode"), in addition to the above-described MIDI controllers is accepted block of additional 56 consecutive MIDI controllers. Number of the first controller in the block is defined by the system parameter "MIDI Shift" (see also Figure 8), these controllers will control individual outputs of the converter.

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 receiving "System Reset" MIDI command the reset sequence is launched (as well as after switching MXC-56 - see chapter 3.1) and then the device returns to normal working mode.

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 (Load Data) and can also request the actual list of parameter values (Data Request / Data Save).

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.



6. 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, 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 independently controlled
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 : 10 / 2008

Model : **8-462**

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	
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 ²⁾
	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) Depend on "MIDI Mode" and "MIDI Shift" setting				
3) CC Nr. depend on system parametrers setting				

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

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 5).

Table 5 – 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

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).

C. HARDWARE TESTS

The device has implemented test utilities for its hardware circuits. Before the start of the test utilities plug the external foot switch in jack-FOOT SW [13]. To activate the test function press the buttons PREVIOUS [5] and NEXT [6] and power on the device - plug the power adapter connector in. The display [1] will light the various segments - it is possible to release both buttons at this moment.

a) Display test

At all positions of the display [1] sequentially light up each segment. Along with the dots the LED x10 [9] will light up. The test is finished by pressing any key.

b) Button test

If you press any button, the display [1] lit segment corresponding to approximate position of the button on the panel, which confirms the functionality of a button. After verifying the functionality of all seven buttons the device automatically proceed to the next test.

c) Rotary coder test

The display [1] shows the number "00" in the middle and the LED x10 [9] lights. Rotating the rotary encoder to the right the indicated number of unit increments, turning the encoder to the left decrements the number of units. If there is simultaneously pressed the button x10-DATA [8], the indicated number is incremented or decremented by multiples of ten. After reaching the limit (30 to the right respectively -30 to the left) the brackets symbol will be displayed left resp. right on the display [1] and remains permanently visible. After reaching both limits (i.e., two brackets are displayed) the device will automatically proceed to the next test.

d) Foot switch test

The display [1] shows the symbol "Sv". Press and release the external switch. Correct contact is indicated by the symbol "On" on the display, the release is indicated by the IOff symbol. If the foot switch works correctly the display [1] after a while shows symbol "OK" and automatically proceed to the next test.

e) MIDI interface test

The display [1] displays the symbol "Mid-Er" (i.e., MIDI - Error). Connect MIDI connectors MIDI-IN [12] and MIDI-OUT/THRU [11] with MIDI cable. If there is a correct connection the display show "Mid-ok". The test is finished by pressing EXIT [7].



f) DMX interface test

The display [1] shows the symbol "DMX" in its left part and numbers 0 to 127 in the right part, which indicates the zero and the maximum possible value for DMX output [14], to DMX channels 1 to 56. The transmitted value can be changed by rotary encoder DATA [10] on the unit or by the multiples of ten, with simultaneously pressed x10-DATA [8] button. The test is finished by pressing EXIT [7].

g) CPU memory test

During the testing of RAM CPU the display [1] shows the symbol "CPU" on the left. After completing the test, the right side of the display shows the result: If the CPU memory is correct - "ok" and it automatically proceed to the next test. If there is a CPU memory error the displays shows flashing symbol "-er" (Error). Proceeding to the next test is only possible by pressing the confirmation button EXIT [7].

h) EEPROM parameter memory test

During testing of the EEPROM the left prt of the display [1] shows the symbol "MEM". After completing the test, the right part of the display shows the result. If the memory is correct, display the symbol "ok" and automatically continues. If there is an error in the memory a flashing symbol "Er" (Error) appears and it is necessary to press the confirmation button UP [5] to proceed.

After the execution of all tests, the display prompts "Init?". You can now press the ENTER button [4] to perform a complete initialization of the device (Factory Reset all parameters), after which the device enters a normal working mode, or you can press the EXIT button [7] to skip the inicalization procedures and continue the normal operating mode. In this case, the internal memory save the user`s preset parameters.

