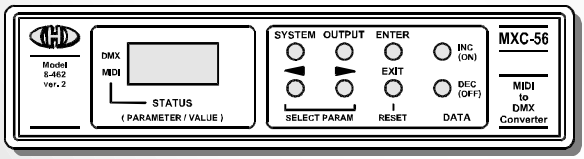
MXC-56

MIDI to DMX-512 Converter

Model 8-462
ver. 2.0



SYSTEM EXCLUSIVE COMMUNICATION

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1. SYSTEM EXCLUSIVE COMMUNICATION

MXC-56 converter disposes with system of System Exclusive communication which enables to receive and to transmit SysEx Messages for remote setting of all parameters. Also, it is possible to list actual values of parameters. These data can be archived in PC for example.

Special MIDI System Exclusive messages allows to control the device's display – it is possible to show own texts.

Software generator for simple creation of SysEx messages for control and programming of MXC-56 is available. Any message for the interface programming described below can be created with help of this generator. The generator is available on supplemental CD-ROM.

2. SYSEX MESSAGES STRUCTURE

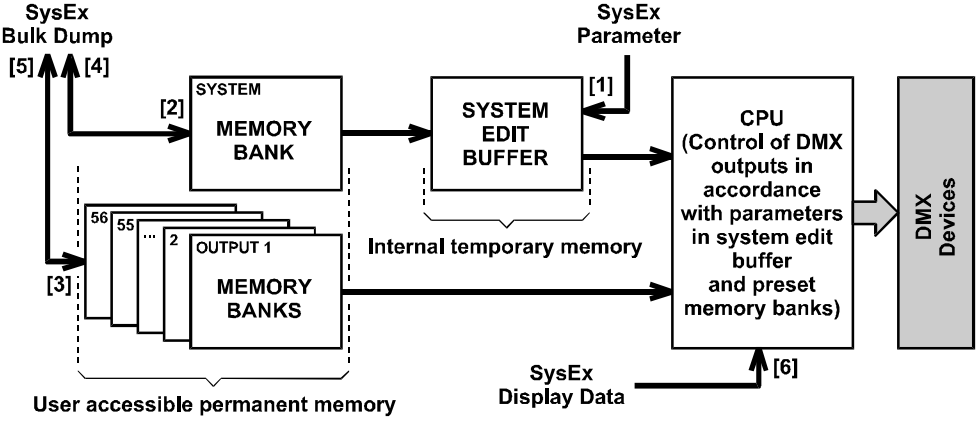
Structure of SysEx Msg is always :

F0h	Start SysEx
00h 20h 21h	Manufacturer ID
ii	Device ID (00h to 0Fh – corresponds to Nr. of selected MIDI channel, or universal 7Fh)
14h	Model ID
cc	Command (command type)
aa	Address (address of memory area)
dd...dd	Data (data of parameters)
xx	Checksum (seven-bit checksum of bytes from Model ID to Checksum)
F7h	End SysEx

Length of datablock "**dd…dd**" is variable in dependence on SysEx Msg type. Number of databytes in block can be 0 (SysEx Msg "Data Request" contain no databyte), 1, 2, 4, 8 or 16 byte (for SysEx Msg "Data Save / Load" and "Change System Parameter"). Checksum "**xx**" is created by standard method – seven-bit sum of bytes from "Model ID" to "Checksum" must be equal to zero. SysEx Msg is invalid and it is ignored by the device if this condition isn't satisfied.

3. COMMAND TYPES

Pic. 1 – Principle of System Exclusive communication



Command "**cc**" specifies device activity after whole message is received. Next specification of device activity is given by value of Address "aa" byte. Valid values of "**cc**" are :

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"**cc**" = 10h - Bulk Dump Data Request – inquiry for actual values of parameters
"**cc**" = 20h - Bulk Dump Data Save / Load – reply for "Data Reguest" or changes of parameters values
"**cc**" = 30h - Change System Parameter – temporary change of value of one system parameter
"**cc**" = 40h - Display – displaying of own data on device's display
"**cc**" = 50h - Service – testing and service procedures

4. "BULK DUMP DATA REQUEST" COMMAND

Form : **F0 00 20 21 ii 15 10 aa xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**xx**" = Checksum)

Actual values of parameters in internal device's memory can be checked by "Bulk Dump Data Request" command ("**cc**"=10h). Memory area is given by "**aa**" Address byte. Valid range is from 00h to 38h. "**dd**" databyte is not used in this type of SysEx Msg.

Immediately after "Bulk Dump Data Request" message is received, MXC-56 transmits "Bulk Dump Data Save / Load" message. Value of requested parameter is included in that message.

4.1. INQUIRY FOR SYSTEM PARAMETERS

Form : **F0 00 20 21 ii 15 10 38 xx F7 [hex]**
(where "**ii**" = Device ID, "**xx**" = Checksum)

If address "**aa**" = 38h, the message is inquiry for values of system parameters.

Immediately after valid message is received, MXC-56 transmits "Bulk Dump Data Save / Load" message. Values of system parameters are included in that message (see [4] on pic. 1).

4.2. INQUIRY FOR OUTPUT PARAMETERS

Form : **F0 00 20 21 ii 15 10 aa xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**xx**" = Checksum)

If address "**aa**" is from 00h to 37h, the message is inquiry for values of parameters of some output. Address then specifies number of requested output. "**aa**" = 00h represents output 1, "**aa**" = 01h represents output 2 etc. up to "**aa**" = 37h for output 56.

Immediately after valid message is received, MXC-56 transmits "Bulk Dump Data Save / Load" message. Values of parameters of requested output are included in that message (see [5] on pic. 1).

5. "BULK DUMP DATA SAVE / LOAD" COMMAND

Form : **F0 00 20 21 ii 15 20 aa dd…dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd…dd**" = databytes, "**xx**" = Checksum)

By transmitting of "Bulk Dump Data Save / Load" message to MXC-56, it is allowed to change values of system parameters or parameters of some of outputs in dependence on "**aa**" Address byte (see [2], [3] on pic. 1). Also, this SysEx Msg message is transmitted from MXC-56 as reply to "Bulk Dump Data Request" message (see [4], [5] on pic. 1). Valid range of "**aa**" is from 00h to 38h. Values of all system parameters or values of all parameters of one output are always transferred in datablock "**dd…dd**".

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5.1. LIST OF SYSTEM PARAMETERS

Form : **F0 00 20 21 ii 15 20 38 d1 d2 d3 d4 d5 d6 d7 d8 xx F7 [hex]**
(where "**ii**" = Device ID, "**dx**" = databyte, "**xx**" = Checksum)

If Address "**aa**" = 38h, the message contains values of all system parameters. Values of parameters are given by datablock "**d1…d8**" :

d1 + d2 → parameter "DMX Shift"
Databytes include 7-bit coded value of the parameter (**d1** is LSB, **d2** is MSB). Valid range is from 01h (LSB) / 00h (MSB) to 49h (LSB) / 03h (MSB).

d3 → parameter "MIDI Channel"
Value of databyte can be in range from 00h to 0Fh only. It correspond to parameter value from 1 to 16.

d4 → parameter "MIDI Mode"
Value of databyte can be only 00h or 01h. Value 00h corresponds to parameter setting "Note", value 01h corresponds to parameter setting "Controller".

d5 → parameter "MIDI Shift"
Databyte includes value of parameter directly. Valid range is from 00h to 48h.

d6 → parameter "Master CC Nr."
Databyte includes value of parameter directly, i.e. 00h to 7Fh.

d7 → parameter "Blackout CC Nr."
Databyte includes value of parameter directly, i.e. 00h to 7Fh.

d8 → parameter "LCD Contrast "
Databyte includes value of parameter directly, i.e. 00h to 20h.

5.2. LIST OF OUTPUT PARAMETERS

Form : **F0 00 20 21 ii 15 20 aa d1 d2 d3 d4 xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dx**" = databyte, "**xx**" = Checksum)

If address "**aa**" is from 00h to 37h, the message includes values of all parameters of output specified by Address "**aa**": "**aa**" = 00h for output 1, "**aa**" = 01h for output 2 etc. up to "**aa**" = 37h for output 56. Values of parameters are given by datablock "**d1…d4**":

d1 → parameter "Default Value"
Databyte includes value of parameter directly, i.e. 00h to 7Fh.

d2 → parameters "Conversion Curve", "Accept Master" and "Accept Blackout"
This databyte is organized as bits. Databyte has form: **0mbccccc** [bin]. Five least significant bits (**ccccc**) represent value of "Conversion Curve" parameter:

00000 [bin] = 00h → linear conversion
00001 [bin] = 01h → bi-stable conversion (0/1)
00010 [bin] = 02h to 00111 [bin] = 07h → logarithmic curve 1 to 6
01000 [bin] = 08h to 01101 [bin] = 0Dh → exponential curve 1 to 6
01110 [bin] = 0Eh to 10010 [bin] = 12h → "S"curve 1 to 5
10011 [bin] = 13h to 10111 [bin] = 17h → "Z"curve 1 to 5

Bit **b** represents value of "Accept Blackout" parameter. **b** = 0 is "Off", **b** = 1 is "On"
Bit **m** represents value of "Accept Master" parameter. **m** = 0 is "Off", **m** = 1 is "On"
The most significant bit of the databyte must be always zero.

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d3 → parameter "Preheat"
Databyte includes value of parameter directly, i.e. 00h to 7Fh.

d4 → parameter "Limit"
Databyte value from 00h to 7Fh corresponds to parameter value from 255 to 128. Mathematic expression for databyte value is: **d4 = 255 - (parameter)**

6. "CHANGE SYSTEM PARAMETER" COMMAND

Form : **F0 00 20 21 ii 14 30 aa dd…dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd…dd**" = datablok, "**xx**" = Checksum)

By transmitting of "Change System Parameter" command ("**cc**" = 30h) to MXC-56, it is allowed to change actual value of one system parameter (see [1] on pic. 1). Parameter is selected by "**aa**" Address. Newly engaged value isn't stored in permanent device's memory in this case. MXC-56 works with it only temporary (until the next device restart). Valid range of "**aa**" Address is from 00h to 06h. Datablok "**dd…dd**" includes two bytes (for "DMX Shift" parameter) or one byte (for all other parameters). The same conditions are valid for values of parameters as described in chapter 5.1.

aa = 00h → parameter "DMX Shift"
Two databytes in **dd…dd** block include 7-bit coded value of the parameter (order is LSB / MSB). Valid range is from 01h (LSB) / 00h (MSB) to 49h (LSB) / 03h (MSB).

aa = 01h → parameter "MIDI Channel"
One databyte **dd** includes value of parameter. Valid range is from 00h to 0Fh.

aa = 02h → parameter "MIDI Mode"
One databyte **dd** includes value of parameter. Valid range is from 00h to 01h.

aa = 03h → parameter "MIDI Shift"
One databyte **dd** includes value of parameter. Valid range is from 00h to 48h.

aa = 04h → parameter "Master CC Nr."
One databyte **dd** includes value of parameter. Valid range is from 00h to 7Fh.

aa = 05h → parameter "Blackout CC Nr."
One databyte **dd** includes value of parameter. Valid range is from 00h to 7Fh.

aa = 06h → parameter "LCD Contrast"
One databyte **dd** includes value of parameter. Valid range is from 00h to 20h.

7. "DISPLAY" COMMAND

Form : **F0 00 20 21 ii 14 40 aa dd…dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd…dd**" = datablok, "**xx**" = Checksum)

By transmitting of "Display" command ("**cc**" = 40h) to MXC-56, it is allowed to change actual content of device's display (see [6] on pic. 1). Valid range of "**aa**" Address is from 00h to 01h. Datablok "**dd…dd**" includes none or 16 bytes. These messages are accepted by the device only if the device operates in normal working mode.

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7.1. OWN DATA DISPLAYING - "SHOW DATA"

Form : **F0 00 20 21 ii 15 40 01 dd…dd xx F7 [hex]**
(where "**ii**" = Device ID, "**dd…dd**" = datablok, "**xx**" = Checksum)

If Address "**aa**" = 01h, the message is command for displaying of own data on device's display. Datablock always contains 16 databytes which specify characters on individual positions of the display. Order is: upper row from the left to the right (8 databytes) first and then lower row from the left to the right (8 databytes). All values must be in valid range (i.e. 20h to 7Dh - see table 3). Values out of range are automatically corrected to nearest possible values.

Table 1 – Characters for display (ASCII)

Data	Chr	Data	Chr	Data	Chr	Data	Chr	Data	Chr	Data	Chr
20h	space	30h	0	40h	@	50h	P	20h	‘	70h	P
21h	!	31h	1	41h	A	51h	Q	61h	a	71h	Q
22h	“	32h	2	42h	B	52h	R	62h	b	72h	R
23h	#	33h	3	43h	C	53h	S	63h	c	73h	S
24h	$	34h	4	44h	D	54h	T	64h	d	74h	T
25h	%	35h	5	45h	E	55h	U	65h	e	75h	U
26h	&	36h	6	46h	F	56h	V	66h	f	76h	V
27h	‘	37h	7	47h	G	57h	W	67h	g	77h	W
28h	(	38h	8	48h	H	58h	X	68h	h	78h	X
29h	)	39h	9	49h	I	59h	Y	69h	i	79h	Y
2Ah	*	3Ah	:	4Ah	J	5Ah	Z	6Ah	j	7Ah	Z
2Bh	+	3Bh	;	4Bh	K	5Bh	[	6Bh	k	7Bh	{
2Ch	,	3Ch	=	4Ch	L	5Ch	\	6Ch	l	7Ch	|
2Dh	-	3Dh	<	4Dh	M	5Dh	]	6Dh	m	7Dh	}
2Eh	.	3Eh	>	4Eh	N	5Eh	^	6Eh	n		
2Fh	/	3Fh	?	4Fh	O	5Fh	_	6Fh	o		

Attention – It is possible to write data to display only if the device operates in normal working mode. "Display" command is ignored in all other cases.

7.2. CANCELING OF OWN DATA DISPLAYING - "CANCEL"

Form : **F0 00 20 21 ii 15 40 00 xx F7 [hex]**
(where "**ii**" = Device ID,"**xx**" = Checksum)

If Address "**aa**" = 00h, the message is command for canceling of displaying of own data on device's display. Databyte "**dd**" is not used in that message at all.

Immediately after the message is received, own data on display are cleared and the display returns to normal displaying of working status of MXC-56.

8. "SERVICE" COMMAND

Form : **F0 00 20 21 ii 15 50 aa dd xx F7 [hex]**
(where "**ii**" = Device ID, "**aa**" = Address, "**dd**" = databyte, "**xx**" = Checksum)

SysEx Messages "Service" are assigned only for tests and debugging in production and for the service procedures of the converter. Their usage is not assumed in normal operation of the device.

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