MIDI2DMX
BASIC

solid state MIDI to DMX converter

wwww.midi2dmx.eu

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From the authors

Artistic and stage activity is like others aspects of our life - competition on the market is everywhere. On the free market the winner is who delivers the same service and/or product with lower price. But better product for the same price needs better tools.

Currently we would like to present small and smart device, which may be very useful in any activity where spectators would like to listen good music and see attractive stage lightning.

MIDI2DMX converter is designed for easy control over lights and all others DMX devices (fog/smoke generators, lasers, heads etc.) on the stage. Full control over DMX devices is realized using MIDI - very good known protocol in the music area. User do not needs anymore expensive DMX devices - consoles, mixers and qualified personnel as well. Total control with full synchronization between music and lights - everything is possible now.

Three simple questions:
1) Are you working in the MIDI environment?
2) Do you would like to have full control over DMX devices in the MIDI environment?
3) Do you think, that money for DMX devices may have better target?

If Your answers are 3 times YES, it means that this is time to buy MIDI2DMX converter. Fully professional MIDI messages to DMX control converter.

MIDI2DMX is the first around the world – such a functional, small and inexpensive device, offering fully synchronised control over lights in the sound control environment.

MD&CW Team

Introduction

MIDI2DMX is professional, based on the 16 MIPS micro controller converter, which translates MIDI messages to DMX control signals in real time. You may use it wherever you need control DMX stage devices from the MIDI environment. MIDI2DMX enables access and control of all 512 channels of the DMX protocol with the natural synchronization with the music. Additionally you may use standard MIDI sequencers and mixers to generate all stage events with any kind of DMX controlled equipment (lasers, fog/smog generators, heads, PAR's etc.)

The control over DMX devices is realized by standard MIDI channels messages Note On and Control Change. Each NO and CC message holds the information about used MIDI channel, note frequency (NO) or controller number (CC) and value of the control (velocity for NO). Note number (frequency) in NO mode or controller number in CC mode are available as the numbers in the range 0-127 and may be used to choose DMX channel in the range 1-128. Because of 512 DMX channels we need additional information to have access to channels above 128. This is made by classic data banking techniques. To select needed bank of the 128 DMX channels, this device uses MIDI channel number. Details of the bank selecting techniques are explained in mode descriptions further in this manual. Value of the MIDI message (i. e. Velocity for NO) is used as a value for chosen DMX channel.
DMX control standard uses 256 values for each channel, the range is 0-255. MIDI message format accepts 128 values only, in the range 0-127. Because of this difference, value from the MIDI message is multiplied by 2, and therefore final range available for DMX channel is 0-254 (255 levels).

Due to consistency of the control while using Note On and Control Change messages and due to control rules of the DMX equipment, this device uses Note On (or Control Change) with velocity equal to 0 (zero) to "switch off" light in the corresponding channel. Each value (Velocity) in the DMX channel (0 or higher) will stay fixed until next message for this DMX channel will be received.

MIDI Note Off message is used in [DMX4 - L&S/ILF] mode. The abbreviation L&S is from Light and Sound, ILF is polish abbreviation for this mode. Details are explained below.

MIDI2DMX converter has special User Mode as well [Mode 9]. Using this mode user can prepare various variants of the DMX control signals - fixed, dynamic, active on notes range etc. Using special software, called DMXUser, preparing of the controls is easy. Details below.

Top view

yellow LED (left) **- [MIDI IN]** - incoming MIDI messages, yellow
red LED (middle) **- [PWR] - power**
green LED (right) **- [DMX OUT] -** outgoing DMX data

[MODE SWITCH] – is located on the side of the box.

Controls

From let to right:

1. **[MIDI OUT] -** MIDI output, same as input but electrically refreshed
2. **[MIDI IN] -** MIDI input
3. **[DMX out]**
4. **[9-24V AC/DC 1.5W]** - power plug, AC or DC, 9-24V range, polarity not important

Work modes [MODE]

0 - Mode DMX128 Note On [DMX128 NO]

Controls 1÷128 DMX channels using notes (Note On message).
After receiving Note On message (code 09H), velocity value is multiplied by 2 and applied for the channel determined by note number.
In this mode MIDI2DMX device uses MIDI messages from one MIDI channel only.
Active MIDI channel should be set on [MIDI Ch. Sw.], where MIDI channels in range 1÷16 are represented by positions 0÷F.

1 - Mode DMX256 Note On [DMX256 NO]

Controls 1÷256 DMX channels using notes (Note On message).
After receiving Note On message (code 09H), velocity value is multiplied by 2 and applied for the channel determined by note number and MIDI Channel.
DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Note On messages in the 15. MIDI channel controls DMX channels in range 129÷256

2 - Mode DMX384 Note On [DMX384 NO]

Controls 1÷256 DMX channels using notes (Note On message).
After receiving Note On message (code 09H), velocity value is multiplied by 2 and applied for the channel determined by note number and MIDI Channel.
DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Note On messages in the 15. MIDI channel controls DMX channels in range 129÷256
- Note On messages in the 14. MIDI channel controls DMX channels in range 257÷384

3 - Mode DMX512 Note On [DMX512 NO]

Controls 1÷256 DMX channels using notes (Note On message).
After receiving Note On message (code 09H), velocity value is multiplied by 2 and applied for the channel determined by note number and MIDI Channel.
DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Note On messages in the 15. MIDI channel controls DMX channels in range 129÷256
- Note On messages in the 14. MIDI channel controls DMX channels in range 257÷384
- Note On messages in the 13. MIDI channel controls DMX channels in range 385÷512

4 - Mode DMX128 Control_Change [DMX128 CC]

Controls 1÷128 DMX channels using Control Change message.

After receiving Control Change message (code 0BH), velocity value is multiplied by 2 and applied for the channel determined by controller number.

In this mode MIDI2DMX device uses MIDI messages from one MIDI channel only.

Active MIDI channel should be set on [MIDI Ch. Sw.], where MIDI channels in range 1÷16 are represented by positions 0÷F.

5 - Mode DMX256 Note On/Control_Change [DMX256 NO/CC]

Controls 1÷256 DMX channels using Control Change message.

After receiving Note On message (code 09H) in MIDI Channel 16, velocity value is multiplied by 2 and applied for the DMX channel determined by note number.

After receiving Control Change message (code 0BH) in MIDI Channel 15, controller value is multiplied by 2 and applied for the DMX channel determined by controller number and MIDI Channel.

DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Control Change messages in the 15. MIDI channel controls DMX channels in range 129÷256

6 - Mode DMX384 Note On/Control_Change [DMX384 NO/CC]

Controls 1÷384 DMX channels using Control Change message.

After receiving Note On message (code 09H) in MIDI Channel 16, velocity value is multiplied by 2 and applied for the DMX channel determined by note number.

After receiving Control Change message (code 0BH) in MIDI Channel 14 or 15, controller value is multiplied by 2 and applied for the DMX channel determined by controller number and MIDI Channel.

DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Control Change messages in the 15. MIDI channel controls DMX channels in range 129÷256
- Control Change messages in the 14. MIDI channel controls DMX channels in range 257÷384

7 - Mode DMX512 Note On/Control_Change [DMX512 NO/CC]

Controls 1÷512 DMX channels using Control Change message.

After receiving Note On message (code 09H) in MIDI Channel 16, velocity value is multiplied by 2 and applied for the DMX channel determined by note number.

After receiving Control Change message (code 0BH) in MIDI Channel 13, 14 or 15, controller value is multiplied by 2 and applied for the DMX channel determined by controller number and MIDI Channel.

DMX Channel range is determined by MIDI Channel:
- Note On messages in the 16. MIDI channel controls DMX channels in range 1÷128
- Control Change messages in the 15. MIDI channel controls DMX channels in range 129÷256
- Control Change messages in the 14. MIDI channel controls DMX channels in range 257÷384
- Control Change messages in the 13. MIDI channel controls DMX channels in range 385÷512

8 - Manual control all DMX channels [DMX512 - Ctrl]

All DMX channels (1÷512) are set to value determined by MIDI channel switch in step 16 - 0=0, 1=16, 2=32, ... F=256 (maintenance/service mode).

9 – DMX User Mode [DMX512 -UM]

All DMX channels (1÷512) are individually controlled accordingly to rules set by user. For details see User Mode chapter.

A - DMX channels on 25% [DMX512 - 25%]

All DMX channels (1÷512) are set to value 64 - 25% (maintenance/service mode).

B - DMX channels on 50% [DMX512 - 50%]

All DMX channels (1÷512) are set to value 128 - 50% (maintenance/service mode).

C - DMX channels on 75% [DMX512 - 75%]

All DMX channels (1÷512) are set to value 192 - 75% (maintenance/service mode).

D - DMX channels on 100% [DMX512 - 100%]
All DMX channels (1÷512) are set to value 255 - 100% (maintenance/service mode).
E – MIDI control all DMX channels [DMX512 Note=0]
Device receives messages Note ON for note #0 in MIDI channel #16 only. All DMX channels (1÷512) are set to Velocity value multiplied by 2.

F - Light & Sound mode for 4 channels PAR LED [DMX4 - L&S/ILF]
Devices analyses incoming MIDI Note On/Note Off messages on all MIDI channels and prepares control signals for color lights in 4 DMX channels.
Details:
PAR lamp is constantly switched on - DMX value in channel #1 is set to 128 (50%).
Dynamic control is achieved by incoming MIDI messages. Messages Note On (09H) are setting DMX value according to current velocity, Note Off (08H) sets DMX value equal to 0.
According to the note number (frequency) device sets appropriate DMX channel:
- DMX #2 channel, usually Red, notes range 0÷35
- DMX #3 channel, usually Green, notes range 36÷71
- DMX #4 channel, usually Blue, notes range 72÷127

Control Software - MIDI2DMX Control Center

MIDI2DMX PRO has own PC (Windows) software which controls internal functions. This software is the same for both versions of MIDI2DMX devices - BASIC and PRO. Screens below shows main form of the application before software has identified the device version. There are 4 tabs with settings for each type of the device. Currently unused functions will be hidden after proper device identification.

First screen shows **User Mode channels settings** tab, described later in **User Mode** section.
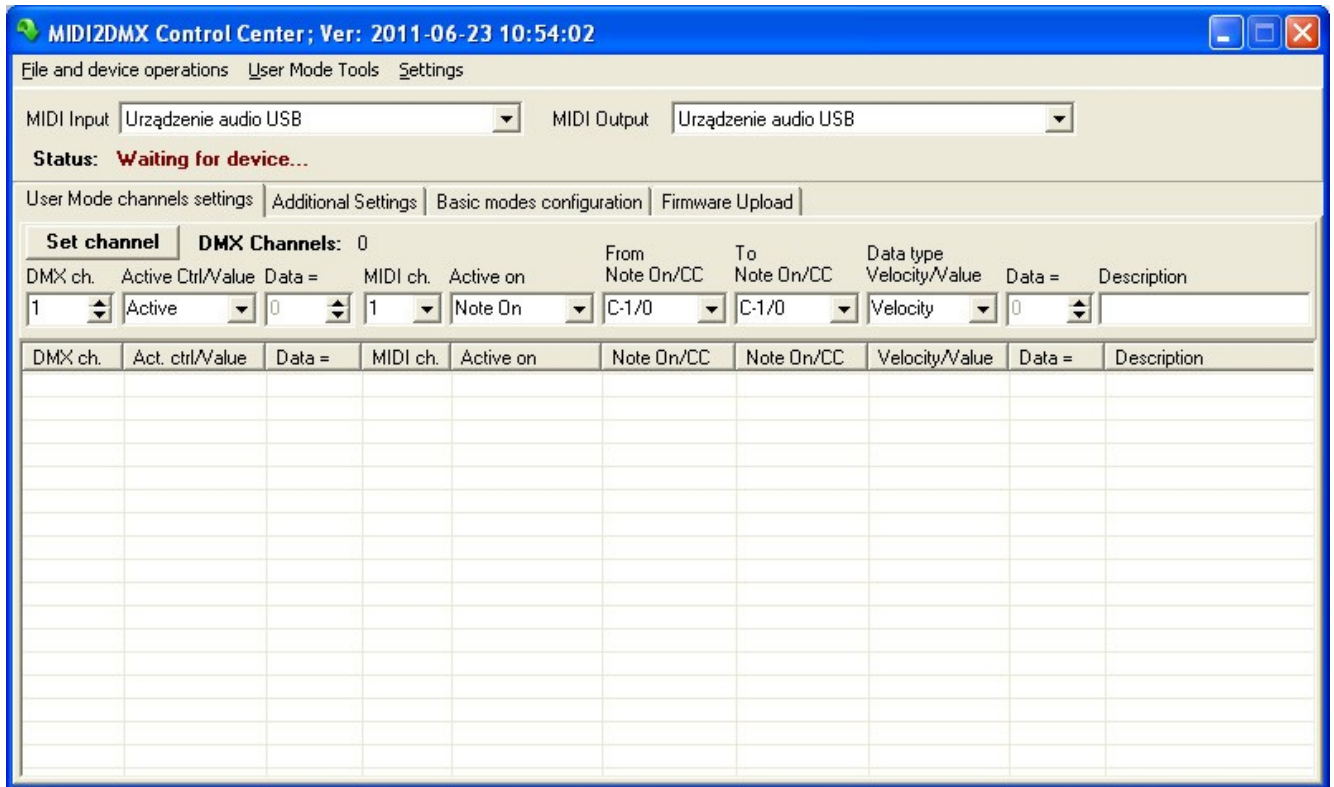
Preparing device to work with MIDI2DMX Control Center expect two MIDI connections between device and MIDI interface in "closed loop" fashion. It means that MIDI IN from device should be connected to MIDI OUT of the computer's MIDI interface and device's MIDI OUT should be connected to MIDI IN connector of the computer's interface.

**Additional Settings** tab shows functions available for each type of the devices (BASIC & PRO).
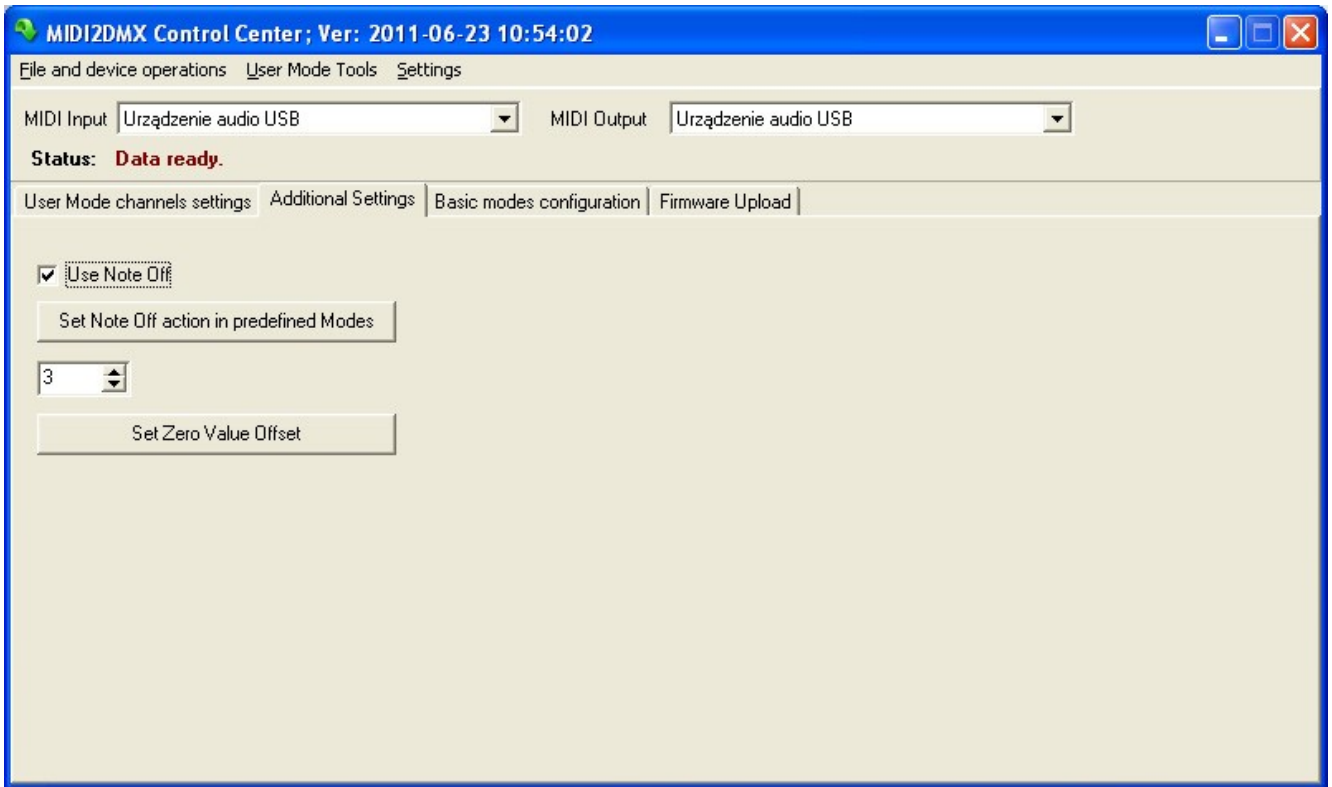
Use Note Off - DMX channel value is set using Note On Velocity or Control Change value. The user may also activate Note Off function which works like Note On with velocity equals 0 (zero). This setting is active for predefined modes (0-7) and for User Mode **[8 - DMX512 UM]**.

Set Zero Value Offset - some MIDI controllers don't send zero value as a Velocity or Control Change channel number.
In this case this is impossible to switch off particular channel in User Mode. Setting Zero Value Offset to 3 means that all incoming value data will be decreased by 3 and than multiplied by 2 as a DMX channel value. It means that Velocities or CC channel numbers 1,2,3 will become value 0 to switch off current DMX channel. Maximum value 127 is reduced by 3 as well.
Available range is from 0 to 10.

Basic modes configuration tab is for use with MIDI2DMX Basic device only.
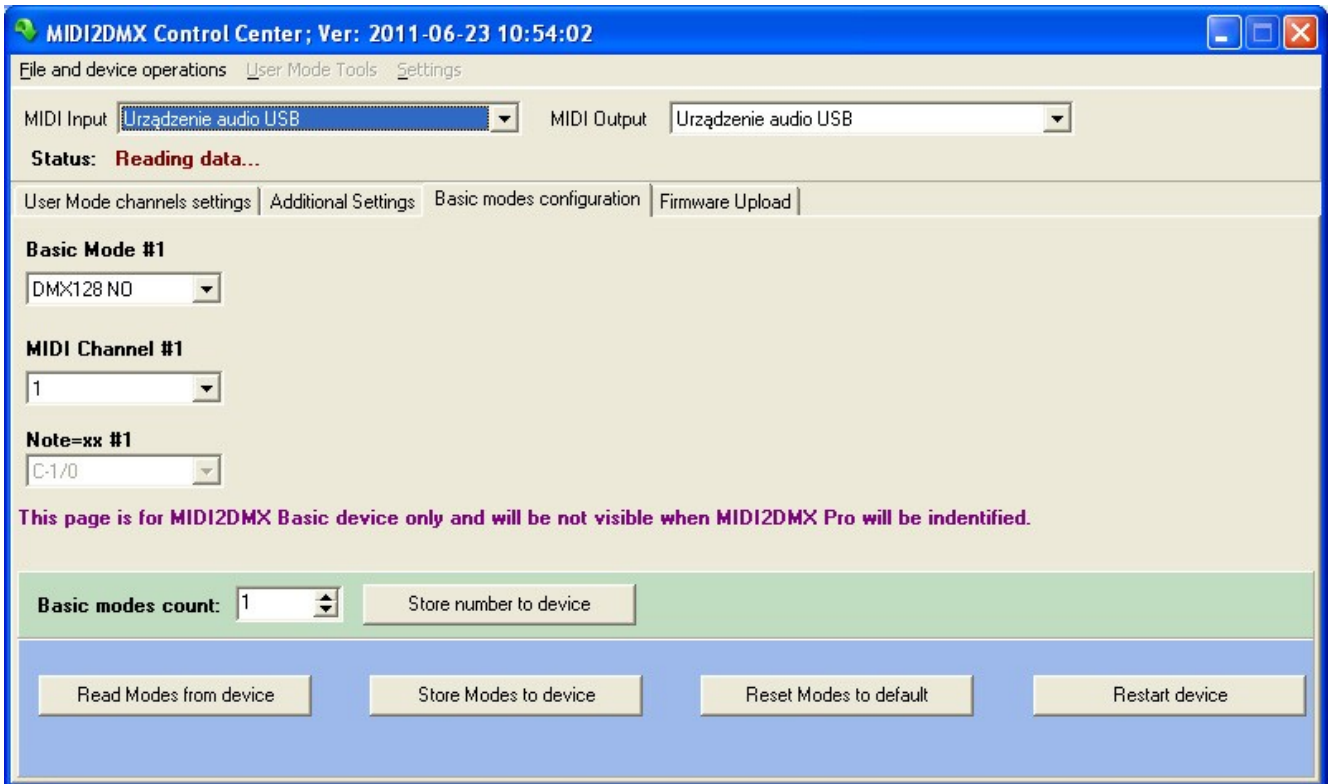
Firmware Upload tab controls functions like device identification, firmware upload etc.

Screen below shows **Firmware Upload** tab after identification of the device and software versions.
Message **Going to work...** appears when **Firmware upload mode** was set to **Read BL & FW Version.**
Then, after power up, data is fetched from the device and the device enters the normal working mode.
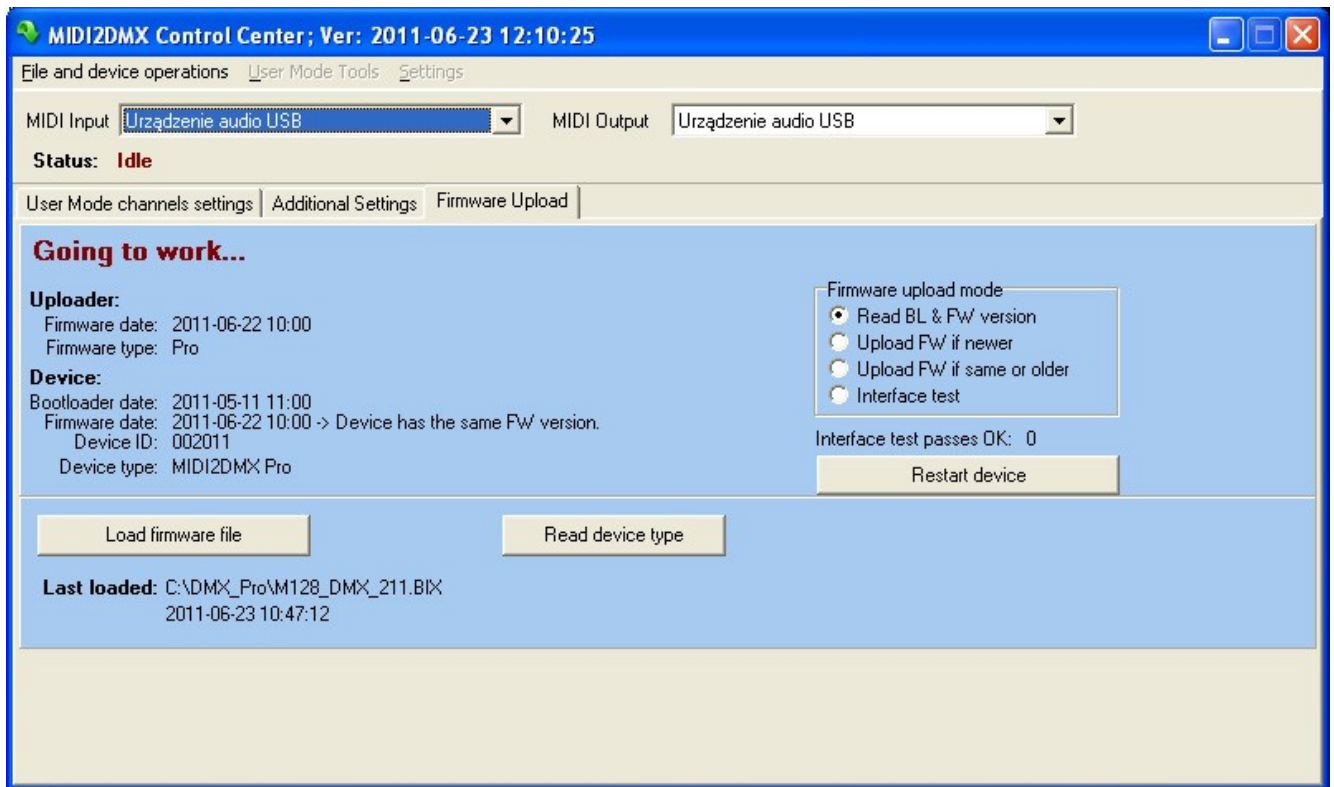

In general most operations on this tab are active during power-up of the device, however in the User Mode [Mode 8] user can restart device using **Restart device** button.
Before firmware upgrade user should point firmware file (extension *.BIX) for upgrade.

While upgrading firmware errors may occurs. In the section **Firmware upload problems** user will find some important notices and solutions.

Firmware upload

Screens below shows messages during firmware upload. Each block's number is displayed during upload process, preceded by message **Upload INIT**..., which appears after power up.
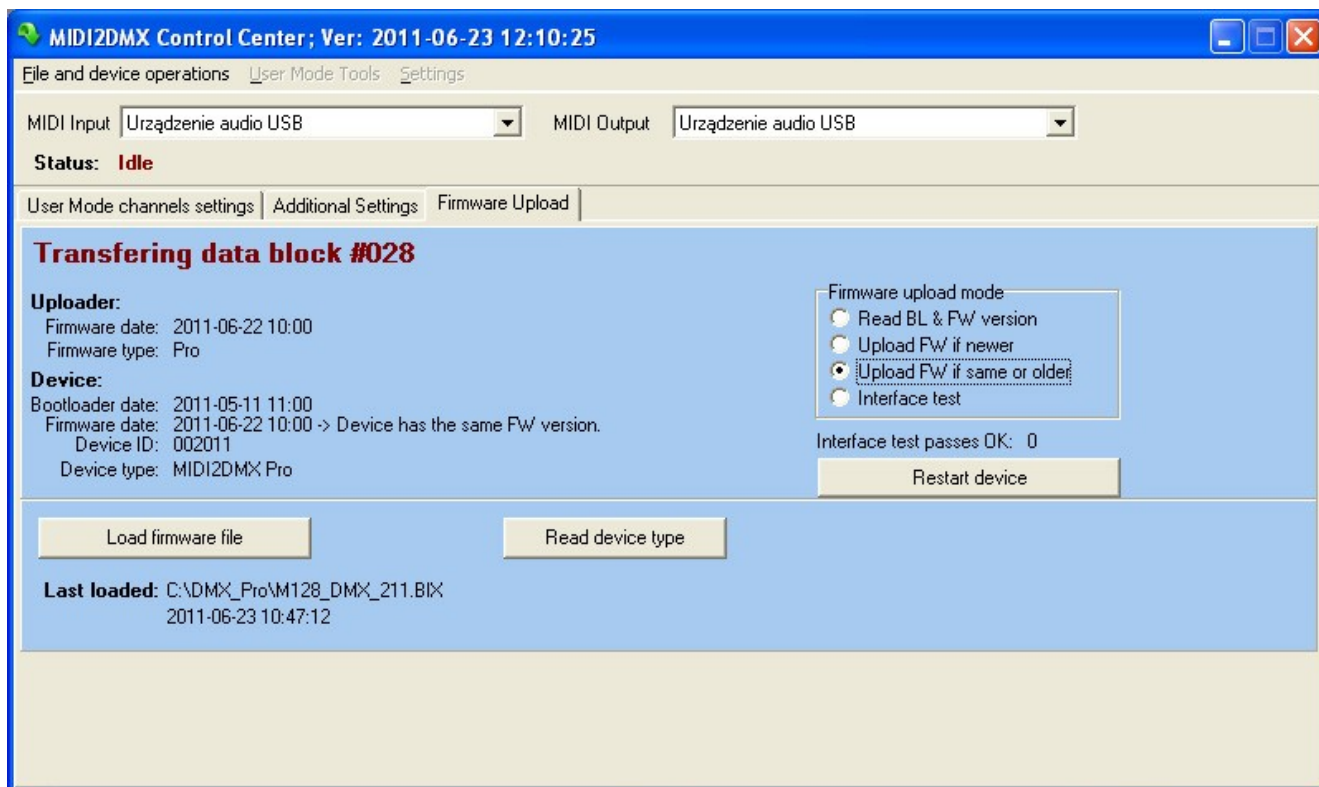
If something goes wrong, user sees a screen like the one below. If this message appears always after block #001, user may be almost sure that used USB-MIDI interface has limitation of the SYSEX command length. In other cases the USB bus or the computer may be currently too busy.
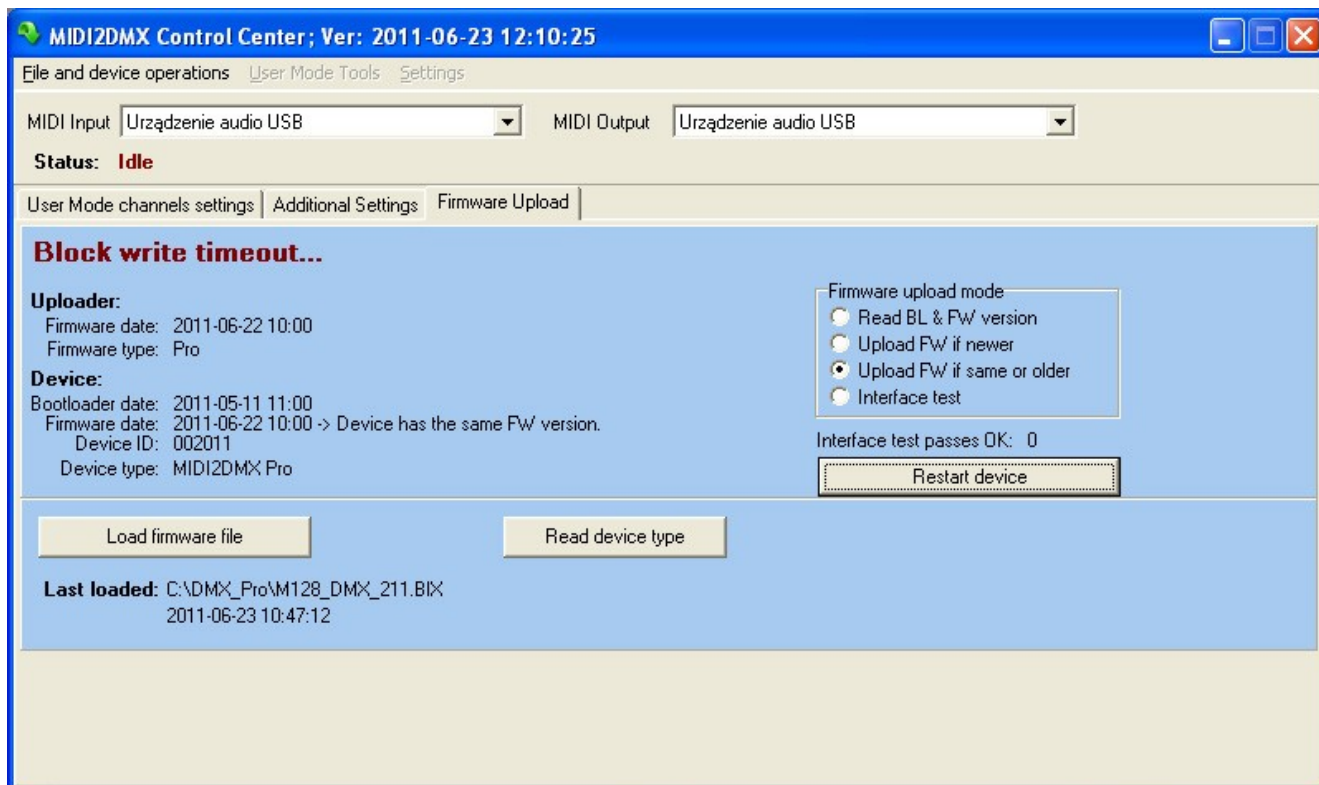
Firmware upload problems

Firmware upload process is prepared as safe as possible and cannot destroy the device. However the device should not be disconnected from power during the upgrading process.

If upgrade process finishes without success, device can't work in normal modes because of only partially loaded software. The bootloader works without any problem anytime, so user should repeat upgrade process using settings **Firmware upload mode.** Although if the partially loaded firmware shows newer version from broken upgrade process, **Upload FW if same or older** should be chosen before next upgrade attempt.

USB-MIDI Interfaces problems

Firmware upload requires that the USB bus is not busy during the process.
Some multi-port USB-MIDI devices can't serve messages as fast as needed for firmware upload.
Additionally there are a lot of cheap USB-MIDI interfaces where there is a limitation of SYSEX messages length.
In this case firmware upload isn't possible as well and user should change interface.

Before the firmware upload a test of the interface is recommended. Simple interface test will be performed when user chooses **Interface test** and powers up the device.

Configuring the device

The only way to configure the MIDI2DMX Basic is through the MIDI2DMX Control Center software (MIDI2DMX_CC.exe). The same software is used to configure the MIDI2DMX Pro.
In MIDI2DMX Basic one can choose and define 1. do 5. basic work modes, which then can be sequentially selected using [MODE SWITCH] on the side of the box. One can also edit the DMX User Mode (MODE 8). Configuration is possible only in a specified state of the device for unrestricted acces tho this mode could provoke unwanted reactions for SYSEX messages.
During normal working state the device uses only two dedicated SYSEX messages which serve to switch it into a config mode and reboot.

Switchin on the config mode.
Method 1.
Switch off the power, connect converter's [MIDI IN] to the computer's MIDI OUT socket and the converter's [MIDI OUT] to the computer's MIDI IN. Plugging into the [DMX OUT] has no influence on the device in the programming mode, and all the DMX channels are off.
Etapy włączenia trybu konfiguracji:
1. Make proper MIDI connections.
2. Press and hold [MODE SWITCH]
3. Turn on the power.
4. Wait for the startup routine, described in the **Device state** section.
5. After single flash of the LEDs the software recognizes a button press and shows it. LEDs [PWR] (red) and [MIDI OUT] (green) flash alternately. After each state change of these LEDs, yellow [MIDI IN] LED flashes.
6. In this state the [MODE SWITCH] can be released.

From now on the device is in the config mode – [PWR] LED (red) flashes in 1 sec. Intervals. After each state change of the [PWR] LED (red) there's a short flash of the [DMX OUT] LED (green). [MIDI IN] LED (yellow) shows incoming MIDI messages.

Method 2.
Connect all wires as described in **Method 1** part then turn on the power and wait for the device to reach a normal working state. In **Firmware Upload** tab press **Read device type** button. After succesful read-out press **Enter Programming Mode for MIDI2DMX Basic**.
(See proper state on the screenshot below)
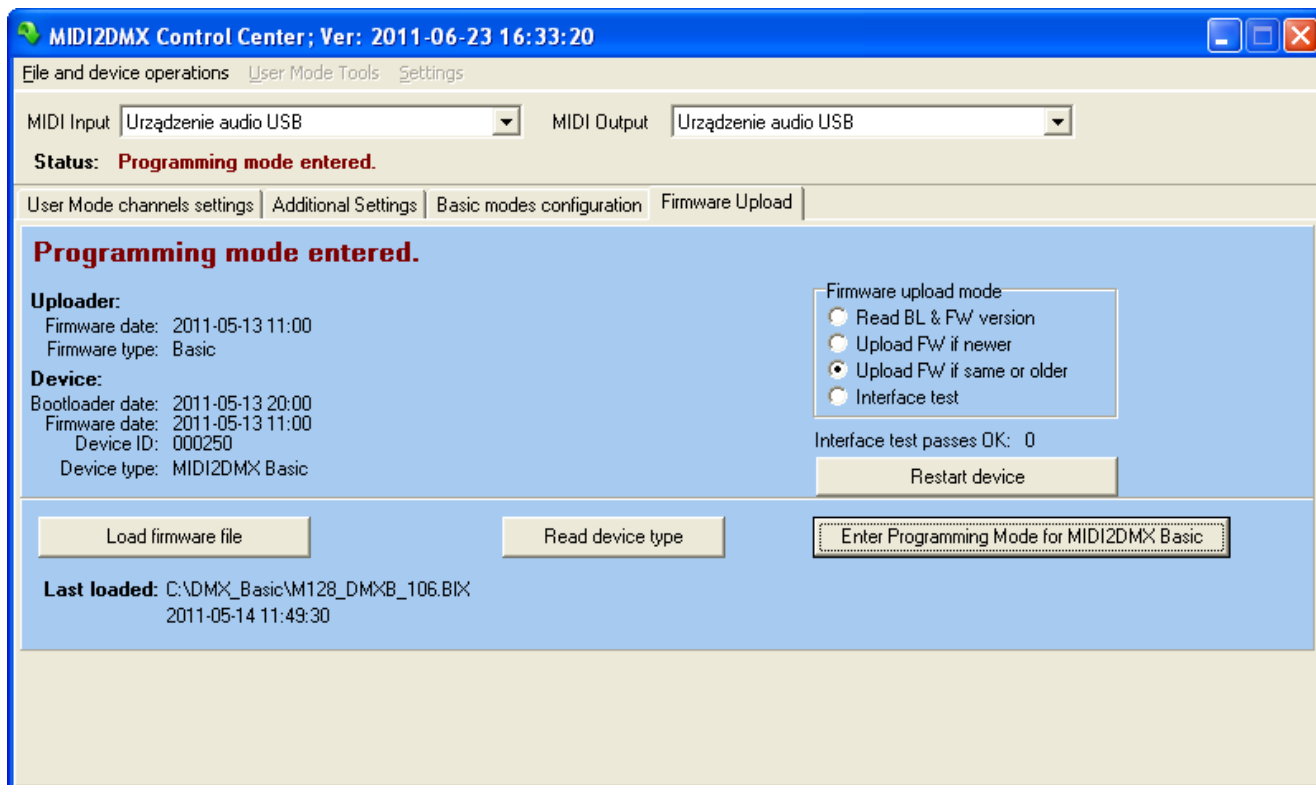
Switching off the config mode.

To switch off the config mode simply restart the device. Either by pressing the **Restart device** button in the **Basic modes configuration** (or **Firmware Upload)** tab or by powering down the device. And then powering up again.

Basic modes selection

Unlike the MIDI2DMX Pro, the BASIC version is not fitted with hardware switches. Therefore the user should choose the most common modes, for his purposes, and store them in the device's memory.

MIDI2DMX Basic can store up to 5 modes which are sequentially selected by pressing the MODE SWITCH. At the button press all LEDs turn off and after ca 1 sec. The MIDI IN (yellow LED) starts flashing. The LED flashes every 0,5 sek., and the flashes count corresponds with the selected mode's number. Each button press rises up one mode till the 5th. And then the cycle repeats from mode 1. Any other signals (from MIDI in and outgoing messages) are turned off so there's no possibility of a mistake.

The maximum number of preconfigured modes is 5 but the user can define less.

After the startup the last selected mode is remembered. After each config change the default mode is 1 (Basic Mode #1).
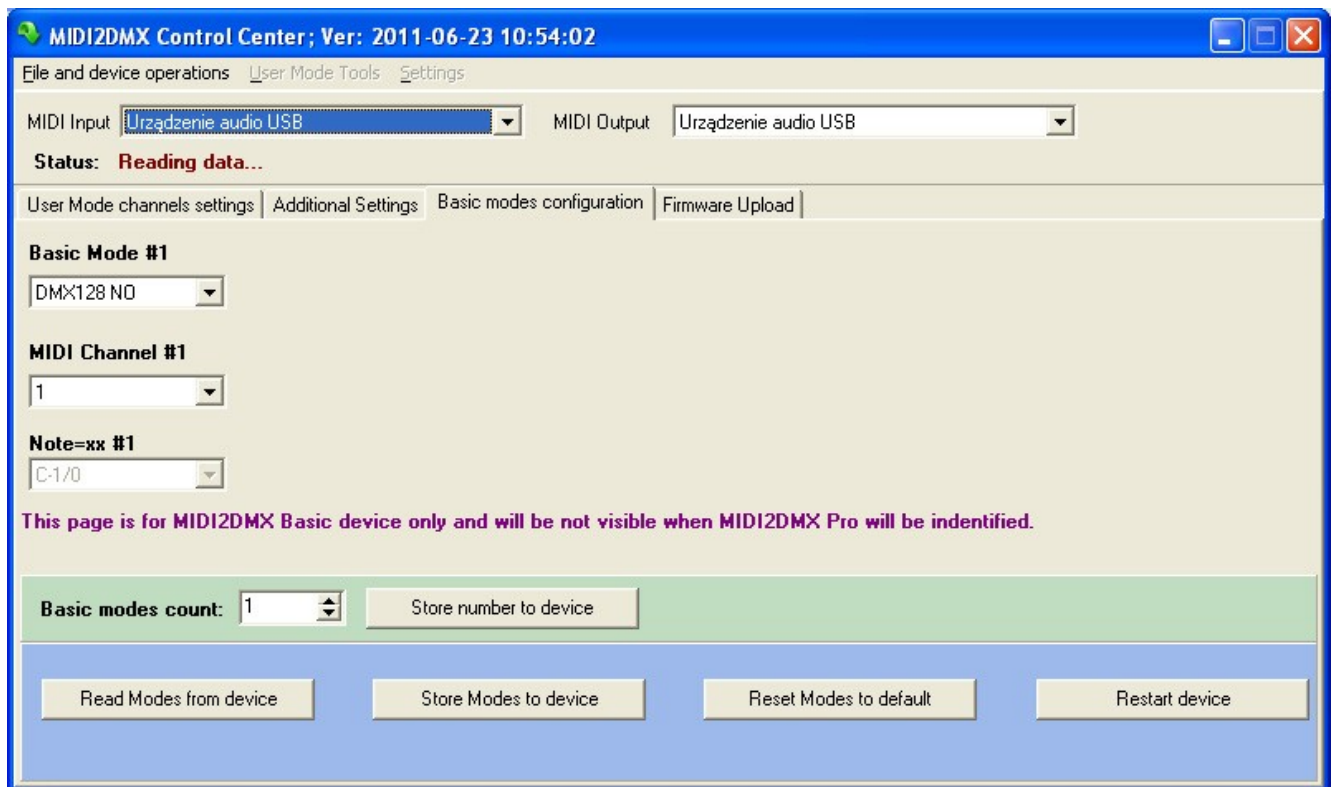

The above screen shows **Basic modes configuration** tab after the application start before the current set up is read from the device.

Depending on number of defined basic modes editing controls for each will show. In modes which demand MIDI channel or note number, respective controls will show (MIDI Channel #N and Note=xx #N.)

The number of available modes is set by the **Basic modes count**, and the written to the device by the **Store number to device** button. After each change the screen goes to the initial state so **Read Modes from device** has to be pressed to show current state.

Reset Modes to default button returns the device to the default factory settings (4 modes.)
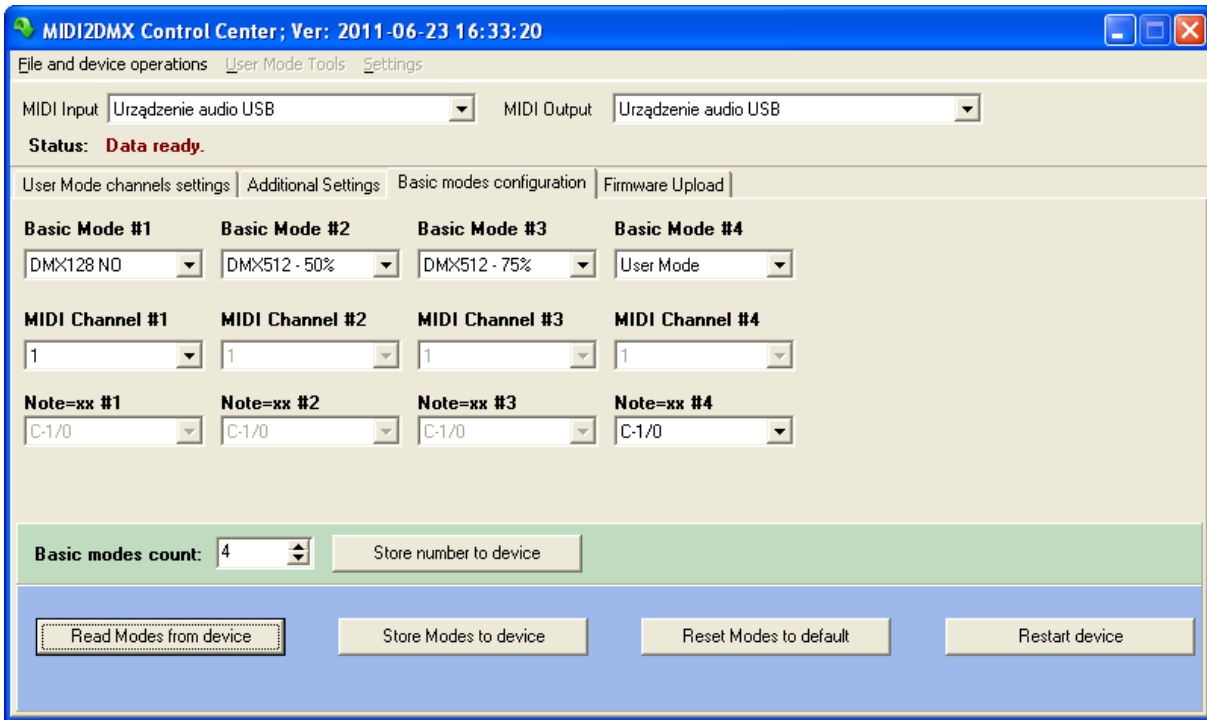
All 5 modes will be stored in the memory, no matter how many are in the actual use.

User Mode

All DMX channels (1÷512) are individually controlled accordingly to rules prepared by user. Using special software called DMXUser, each user can define a special control set for control DMX Channels. Prepared data may be read from device, written back to device and stored in disk file for future use.
Each DMX channel settings can be written separately to device and during this operation the rest of the settings stays unchanged. Using commands from standard menu user can clear all data in device, prepare empty data for all DMX channels for future edit, save edited data to disk, read data from and write data to device.

Screen below shows user interface of the special DMXUser software. Table shows sample sets of the control data included in DMXUser_sample_1.csv file, available with software.

There is 5 modes of control and accordingly to selected mode, DMX channel lines will highlighted with user defined color. Screen below shows DMXUser settings dialog (Menu: Settings -> Colors) where control modes are shown. When mouse pointer will be moved over the dialog items, the hints will be displayed.

Control modes

Note On Active
Selected DMX channel will be activated with value of Velocity multiplied by 2, when device receives Note On message in selected MIDI channel and defined notes range. This kind of control on the sample screen is set for DMX channel #4, MIDI channel is 16 and note range is from C-1 to E-1.

Note On Value
Selected DMX channel will be activated with value defined in the last column 'Data =' of the table. Current Velocity value of the incoming message will be ignored. This kind of control is visible for DMX channels #2, #3, #8, #10, #11 and #12 with various sets of value and notes range.

Control Change Active
Selected DMX channel will be activated with controller value multiplied by 2 of controller number, when device receives Control Change message in selected MIDI channel and defined controller number range. This kind of control on the sample screen is set for DMX channel #7, MIDI channel is 16 and controller number range is only one - from 1 to 1. Controller number is shown after slash with note symbol C#-1/1.

Control Change Value
Selected DMX channel will be activated with value defined in the last column "Data =" of the table. Current controller value of the incoming message will be ignored. This kind of control is visible for DMX channel #6.

DMX Always Value
Selected DMX channel will be active always with value selected. On the sample screen DMX channels #1, #5 and #9 are set to this mode. Channel #1 will always be active with value 51 (ca 20%), channel #5 with value 127 (50%), and channel #9 with value 255 (100%).

Control table columns description

DMX ch. - number of DMX channel

Act. ctrl/Value - selection of control type between dynamic (Active control) and fixed (Value) . Active control uses incoming data as a control signal for selected channel, when Value is selected, this DMX channel will be controlled using only value set in next column - 'Data ='.

MIDI ch. - selects MIDI channel used for control of this DMX channel.

Active On - selects MIDI message which activates this DMX Channel, available values are Note On and Control Change.

From Note On/CC - selects start of the range in which current DMX channel will be active. Maximum range is 12 notes or controller numbers.

To Note On/CC - selects end of the range in which current DMX channel will be active. Selected note/controler number is the last one active in the range.

Data type Velocity/Value - selects final control value for current DMX channel. If 'Velocity' is in use, value for DMX channel will be set as received Velocity value multiplied by 2 (NO) or contoler value multiplied by 2 if CC message is selected for this DMX channel. If 'Value' is in use, control value for DMX channel will be fixed as set in last column 'Data ='.

Important notes to User Mode

There is a difference between preprogrammed modes (0-7) and User Mode while servicing Note Off message. In this mode Note Off signal is used to reset DMX channel data to 0 (i. e. switch off lights). Remember that in modes 0-7 to switch off DMX channel, message Note On with Velocity = 0 must be used.

This kind of control is very useful for MIDi drums and helps a lot in controlling lights as well.

While using Control Change messages in User Mode, controller number equal 0 must be used to reset DMX channel value.

Work modes - MIDI/DMX channels service summary

Work mode	Active MIDI Channels	Available DMX channels
Mode 0 [DMX128 NO]	One from 16. MIDI channels determined by software	1-128
Mode 1 [DMX256 NO]	16 15	1-128 129-256
Mode 2 [DMX384 NO]	16 15 14	1-128 129-256 257-384
Mode 3 [DMX512 NO]	16 15 14 13	1-128 129-256 257-384 385-512
Mode 4 [DMX128 CC]	One from 16. MIDI channels determined by software	1-128
Mode 5 [DMX256 NO/CC]	16 [Note ON] 15 [Control Change]	1-128 129-256
Mode 6 [DMX384 NO/CC]	16 [Note On] 15 [Control Change] 14 [Control Change]	1-128 129-256 257-384
Mode 7 [DMX512 NO/CC]	16 [Note On] 15 [Control Change] 14 [Control Change] 13 [Control Change]	1-128 129-256 257-384 385-512
Mode 8 [User Mode]	1-16 [Note On] 1-16 [Control Change]	1-512

Technical data:

Power:	9-24 AC/DC, 2.1/5.5 mm plug, polarity not important
Power consumption:	ca. 1,5W
Dimensions:	100x85x30 mm
Weight:	ca. 200 g
Enclosure:	aluminum casing with plastic caps

MIDI Input:	DIN-5 socket, optical isolated
MIDI Output:	DIN-5 socket, optical isolated, signal electrically regenerated
DMX Output:	XLR 3 (F) socket

MIDI IN->OUT latency: Time of one MIDI frame - 0,29 ms

LED signals:

MIDI In LED	–	yellow, blink - MIDI message has been received, any channel
DMX Out LED	–	green, blink - DMX target channel was set
	–	green, constant - DMX manual control mode #8
PWR LED	–	red, 1 sec. blink - power good, micro controller in normal condition
	–	red, constant, low intensity - probably to small power voltage, check power source
	–	red, constant, high intensity or off after blinking - software problem, micro controller hangs up, reset required (power off, then power on again)

Power On LED signals sequence:

Phase 1.

PWR LED	–	red, constant, low intensity ca 0,2 sec.

Phase 2.

DMX Out LED	–	green, constant
PWR LED	–	red, constant, high intensity
MIDI In LED	–	yellow, blinks 3 times - device is waiting for firmware upgrade.

Phase 3.

DMX Out LED,
PWR LED,

MIDI In LED	–	blinks 2 times - device is going to normal mode

Producer

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MIDI Implementation Card

Function	DMX channels access	Active MIDI channels	Notes
Basic Default Chanel Changed	1-128 1-512	1-16 13-16	DMX channels selecting and controlling. Number of active MIDI channels depends of mode.
Mode Default Messages Altered	X X X	X X X	
Note True Voice Number	1-128 1-512	1-16 13-16	DMX channel number
Velocity Note ON Note OFF	1-128 1-512 X	1-16; 13-16 X	DMX channel value
After Key's Touch Channel	X X	X X	
Pitch Bend	X	X	
Control Change	1-128 129-512	1-16 13-15	DMX channels selecting and controlling. Number of active MIDI channels depends of mode.
Program Change	X	X	
System Exclusive	X	0	Firmware upgrade
System Song Position Pointer Common Song Sel Tune Request	X X X	X X X	
System Clock Real Time Commands	X X	X X	
Aux All Sounds Off Messages Reset All Controllers Local ON/OFF All Notes OFF Active Sensing System Reset	X X X X X X	X X X X X X	
Notes: 0 - Yes X - No			