

PX245

# Sound to Light Converter

Manual



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*Manufacturer reserves the right to make modifications in order to improve device operation.*

# 1. GENERAL DESCRIPTION

Audio signal converter to DMX-512 protocol.

The PX245 is designed to synchronize music with lighting control. This advanced and customizable driver is the only solution of this type in the offer of the PXM company. Device was placed in a housing of a width of 6 standard module rails equipped with a color LCD screen. This allows to program and control operation of the equipment in more intuitively way.

The PX245 can be either controlled by DMX, or act independently. In this case, there are available 16 fully programmable configurations. Those configurations can also change the parameters of audio signal processing.

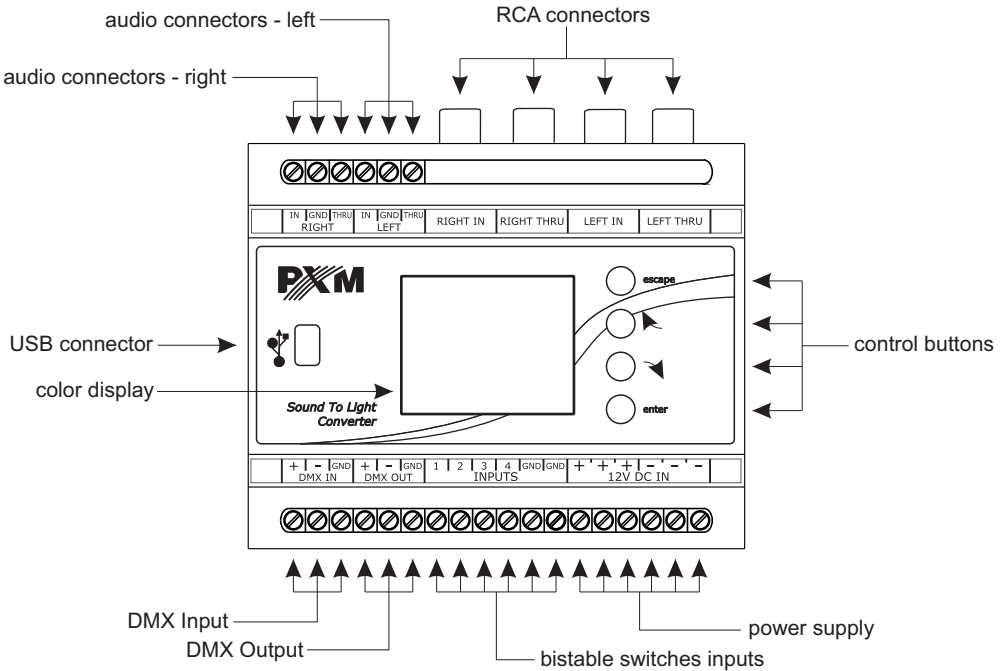
USB connection allows you to communicate with the computer, the PXM company has created a software to manage the device configuration setting from the level of a computer running under Microsoft Windows®.

# 2. SAFETY CONDITIONS

The PX245 is a device powered with safe voltage 12 V; however, during its installation and use the following rules must be strictly observed:





1. The device may only be connected to 12V DC current (stabilized voltage) with current-carrying capacity compatible with technical data.
2. All the conductors should be protected against mechanical and thermal damage.
3. In the event of any conductor damaging, it should be replaced with the one of the same parameters.
4. Connection of DMX signal should be made with shielded conductor.
5. If repairs and connections of outputs or DMX signal can only be made with switched off power supply.
6. PX245 should be strictly protected against contact with water and other liquids.
7. All sudden shocks - particularly dropping - should be avoided.
8. The device cannot be turned on in places with humidity exceeding 90%.
9. The device cannot be used in places with temperature lower than +2°C or higher than +40°C.
10. For cleaning use only a damp cloth.



### 3. DESCRIPTION OF THE CONNECTORS AND CONTROL ELEMENTS




### 4. NAVIGATING THE MENU

Programmable buttons allow navigating the menu. Each button is described on the right side and their use is as follows:

- 
**escape** - exits from the currently programmed parameter without saving the changes or goes to the upper level in the menu (pressing the „escape” button while being in main menu will cause to exit to the summary screen)
- 
**up** - scrolls up the menu or left (horizontal menu)
- 
**right** - scrolls back the menu or right (horizontal menu)
- 
**enter** - allows to enter the selected option and approve the set value

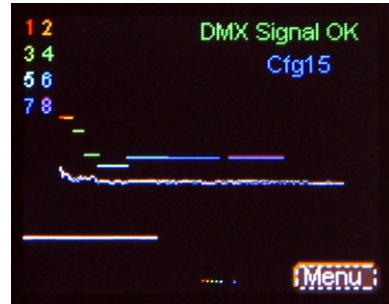
To change the value of selected parameter, you must choose on the screen button "+" or "-" using the button  or , and then using the **enter** button to change the value.

After that you need to save the settings before going level up, this will allow storing value in memory of the PX178. To do this, after moving to the screen button  you need to push enter

## 5. USE OF THE DEVICE

After switching on you will notice the main window visualizing options set on the controller. The main graph shows the frequency spectrum of the audio signal. In the bottom left corner a level-graph of audio signal in the real time is shown.

If the device receives the DMX signal a green message [DMX Signal OK] is displayed. If no DMX signal is detected at the input to the device on the screen a message [No DMX Signal] is displayed.



Description of other messages displayed on the [Menu] screen:

- **Cfg1, Cfg2, ..., Cfg16** - currently set music configuration, which controls working mode of the PX245 when no DMX signal is received;
- **Bypass** - message that informs about receiving by the device DMX-512 signal and transmitting it without any changes (the message is displayed instead the Cfg1, Cfg2, ..., Cfg16);
- **1, 2, 3, ..., 8** - following music streams are described with numbers in different colors and corresponding lines of proportional lengths as described below;
- **Horizontal lines** - their location and length correspond with threshold level and range of frequency of each music streams described with the number of the same color (graph covers the frequency range  $0 \div 8000$  Hz);
- **Vertical lines** - show DMX-512 signal value generated on a base of the music stream (maximum value corresponds with 255 DMX value).

## 6. MAIN MENU

After approving the [Menu] screen-button with „enter” button, the device's screen will display a submenu allowing you to select the available options. To program any of them you need to select the option you want and approve the choice by pressing „enter”. You will be moved to the feature menu screen, where you can set all available parameters in the function. Available options are visible on the screen below.



## 7. DEVICE PROGRAMMING

### 7.1. Music configurations

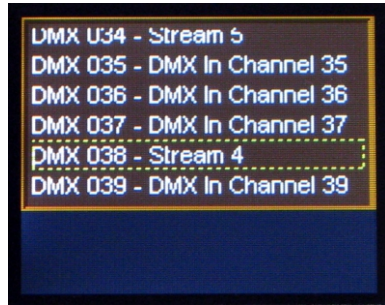
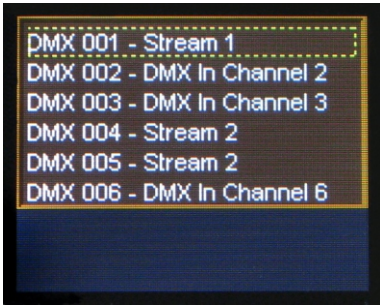
After selecting a first available option in the main menu, a screen as shown in picture below appears. The left column allows you to select one of 16 music configurations you want to edit.



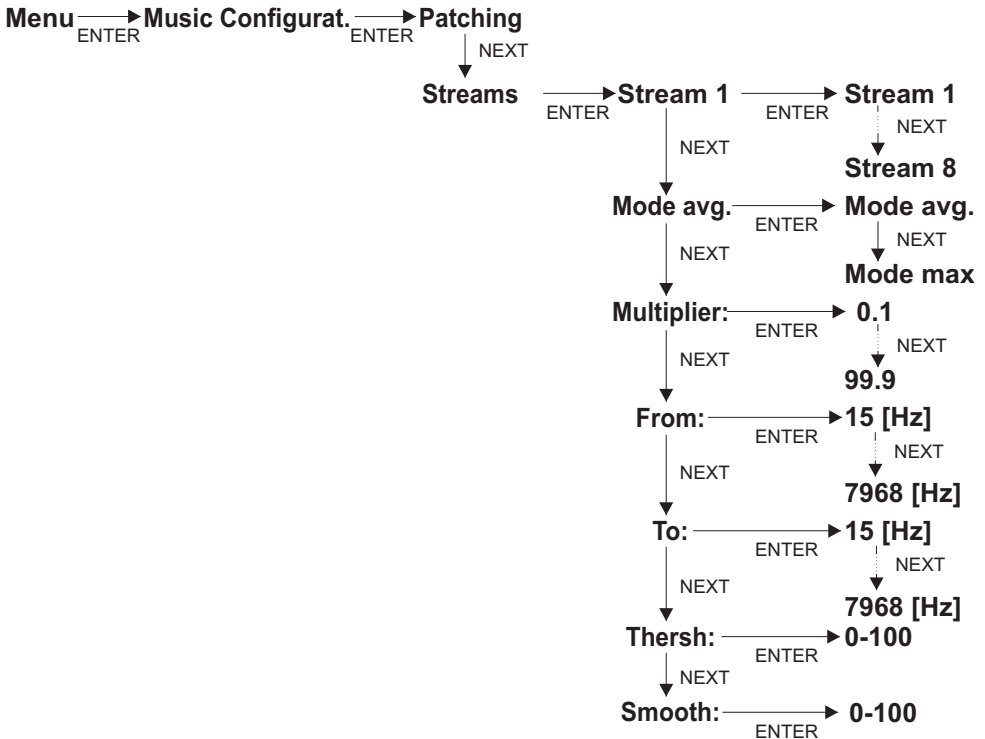
After selecting e.g. [Config 5] press „enter” to edit parameters of this music configuration. The edited configuration will be highlighted in blue (you can see it in the picture above on the right side).

In the right column you can select and change the following parameters:

- **Patching** - allows you to overwrite the DMX signal read from audio stream in the chosen configuration onto the following user-defined DMX output channels. In addition, the input DMX received from other devices can be prescribed to the appropriate output DMX signal channels according to your needs.



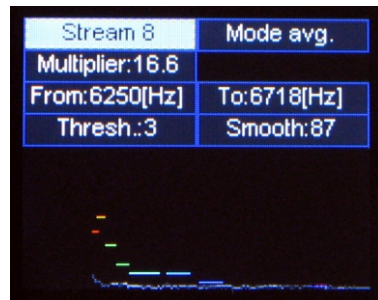
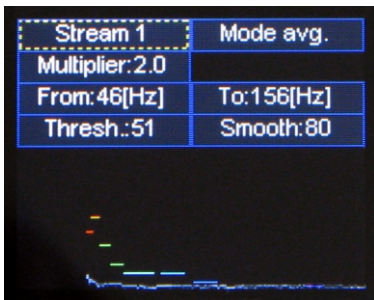
- **Streams** - this feature allows to define parameters of 8 music streams on the basis of which the PX245 converts audio stream into DMX-512 signal. The music stream should be treated as a filter that converts part of the audio signal spectrum to DMX-512 signal.



Below is a list of parameters programmed in this menu:

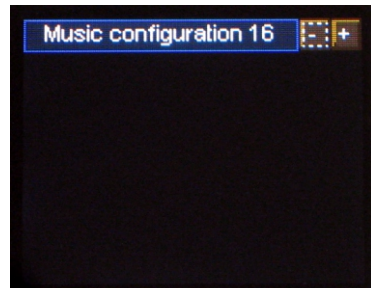
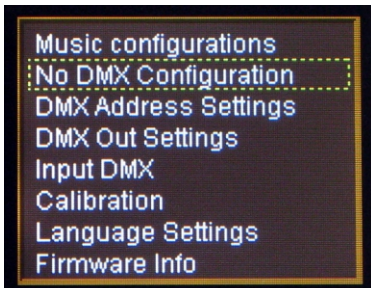
- 1) **Stream 1, ..., 8** - this parameter identifies the edited stream;
- 2) **Mode avg/max** - working mode of the converter from analog to DMX signal;  
In the MAX mode, the analog signal stream is converted in the following manner: the highest moment value of the signal spectrum in a given frequency range, which exceeds a threshold level is converted to the DMX signal. While the AVERAGE mode converts the analog to DMX signal, when the average value of the analog spectrum in the frequency range exceeds the predetermined threshold level;
- 3) **Multiplier** - it allows to strengthen or weaken the processed signal. Range from 0.0 to 100.0;
- 4) **From: ... To: .. [Hz]** - frequency range analyzed for defined stream, the parameters can be set in a range 15 -7968 [Hz];
- 5) **Thresh.** (threshold) - value of analogue spectrum, below which the PX245 does not process the analog signal to the DMX-512- this parameter can be set 0-512;
- 6) **Smooth** - smoothing the processed DMX signal in the range 0-256.

The menu view show the images below:



## 7.2. No DMX configuration

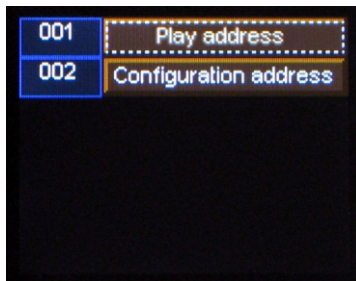
In this menu you can set, which of 16 available music configurations will be used when no DMX signal is received by the PX245.



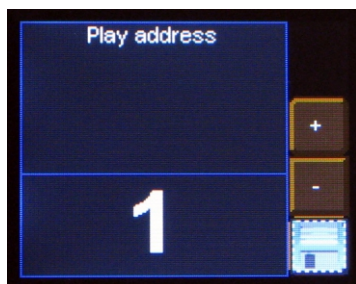



### 7.3. DMX Address Settings

[**DMX Address Settings**] option allows you to change DMX-512 channel, which controls playback and settings of the channel responsible for selection of configuration using external controller.



[**Play Address**] submenu allows you to set playback control channel. Playback is turned off for DMX values from range 0-127 and turned on for 128-255 values. Picture below shows a view of PX245 display after selecting [**Play address**] and pressing „enter” button.

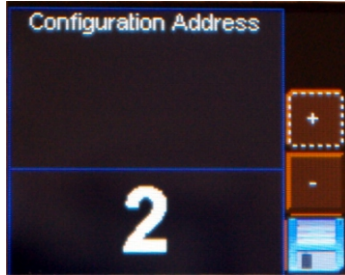


Remember to save values before leaving this submenu by selecting the  button and pressing „enter”

The values of the DMX-512 control signal for the selected by the user channel are described in the table below:

Playback control	DMX-512 signal value
OFF	0-127
ON	128-255

[**Configuration Address**] function is used to select the DMX channel controlling the pre-programmed music configuration changes in the device.



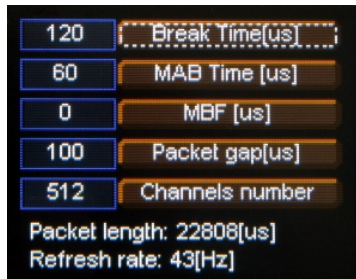
The values of the DMX-512 signal that controls changes of the currently set configuration of the music are presented in tables below:

Configuration number	DMX-512 signal value
Cfg1	0÷15
Cfg2	16÷31
Cfg3	32÷47
Cfg4	48÷63
Cfg5	64÷79
Cfg6	80÷95
Cfg7	96÷111
Cfg8	112÷127

Configuration number	DMX-512 signal value
Cfg9	128÷143
Cfg10	144÷159
Cfg11	160÷175
Cfg12	176÷191
Cfg13	192÷207
Cfg14	208÷223
Cfg15	224÷239
Cfg16	240÷255

## 7.4. DMX Out Settings

After selecting a submenu [**DMX Out Settings**] on the screen will show up the currently set parameters of DMX signal. This menu allow you to replace the parameters of the DMX-512 signal sent from a device. Default in the PX245 are set the values visible below.



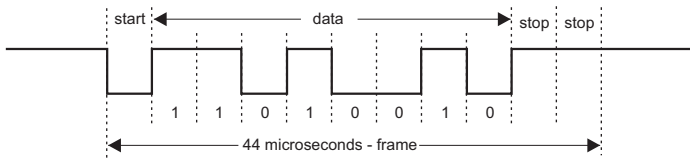
At the bottom of the screen is displayed the aggregate [**Packet length**] and [**Refresh rate**] for so configured parameters.

## DMX512 protocol - useful information

DMX512 protocol describes exactly the way according to which data is sent.

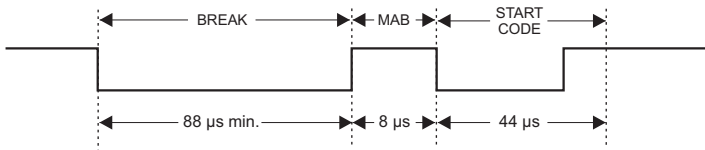
The basic element of each data transfer protocol is a low or high level of voltage on the line called a bit. Its duration in the DMX512 is exactly 4 microseconds. The set of such a few bits determines transmission code. In our case code length is 8 bits or a byte. This allows 256 different combinations - e.g. levels of brightness.

To a byte of data you need to add a few control bits to determine when a byte is starting, and when it ends. In the DMX512 there is one start bit and two stop bits. In this way we obtain a sequence of 11 bits called a frame.



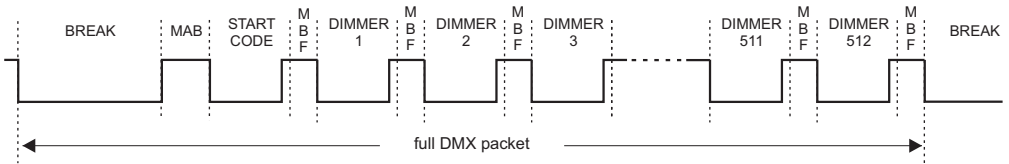
Because one frame contains full information about the DMX channel, to send all of 512 channels we need 512 frames. However, the receiver need to recognize when the entire transmission starts (i.e. which channel is first). That is way the transmission begins with the signal called BREAK. It have to last at least 88 microseconds. Another important signal is MARK AFTER BREAK (MAB). Its length was in the original specification allocated to 4 microseconds. But it quickly became apparent that many of the devices manufactured at that time had big trouble with catching up to such a short pulse. That is why in 1990 the change of the MAB to 8 microseconds was introduced. After transferring the MAB a controller is obliged to send a START CODE byte.

The creators of the DMX protocol reserved this byte to the so-called "future applications". It was planned to mark with it sending of 512 bytes to control dimmers or other receivers. However, since the beginning it was not exactly clear what it will be those "other" device, it was assumed that at the moment its value will be zero - and it stayed so. The starting byte must be zero. If not, the receiver should ignore all the subsequent bytes.



When you send a zero byte controller starts to send bytes with data, starting from the content of the first channel. The minimum number of channels permitted by the standard is 24 and a maximum of 512.

This means that even if we have a simple 6-channel lamp controller, the transmitter still have to send 24 DMX channels. The interval between each frame of data is marked as MARK BETWEEN FRAME (MBF) and can range from zero to 1 second. Thus, a complete DMX package looks as below:



Obviously, sending time of one DMX data set depends on the number of channels. For a minimum of 24 channels it is 1196 microseconds, and for a maximum of 512 channels it is 22 668 microseconds. Because of that, the maximum transmission change rate value is 836 Hz (for 24 channels), and in the second case only 44 Hz (for 512 channels). This is quite a serious limitation, whose effects can be observed during fast movements of e.g. a large number of scanning mirrors. Another quite important parameter is the minimum frequency of sending DMX packets. According to the standard the rate is 1Hz. This means that the interval longer then 1 second is considered as no DMX signal.

Unfortunately, creators of this protocol did not defined what should do in this case the receiver.

There are several possibilities:

- Maintain of the recently received DMX value,
- Immediate shutdown of device (BLACKOUT),
- Smooth device shutdown,
- During the lack of DMX it sends a previously predetermined value.

In the most applications a one of the first two solutions are used or the user is allowed to select the one of the options with appropriate software.

**NOTE:** Due to the lack of compliance with the DMX512 standard of multiple devices available on the market below options allow to select appropriate parameters of the output DMX signal to a specific device.

If you experience any problems, we recommend using bigger lengths of Break time, MAB, MBF, and packet gap.

**1. Break Time** allows to change the length of the interval between successive DMX packets. Break signal may take longer, but can not be less than 88 microseconds. Usually it lasts about 120-140 microseconds.


At the top of the screen next to the option name are visible important information that simplify setting an appropriate value.



To save the value before leaving level up in menu You need to select floppy disc button and press „enter”.




**2. MAB Time** (Mark after break) is the interval time that occurs in each package according to the standard DMX-512. The minimum value is 16 microseconds.

Remember to save values by selecting the button  and pressing *enter*




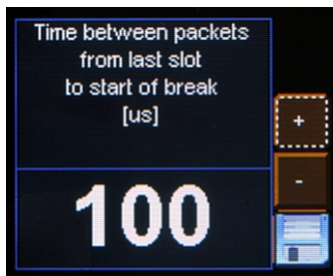
**3. MBF** (Mark Between Frame) - the amount of time (if any) between the end of one frame (end of the 2nd stop bit) and the start of the next - Mark Time Between Frames (MTBF) is the full name. Its length can range from 0 to 1000 microseconds, the shorter the better.



Remember to save values by selecting the button  and pressing „*enter*”

**4. Packet gap** - the amount of time between packets (from last slot to start of the break). Its length can range from 16 to 5000 microseconds.

Remember to save values by selecting the button  and pressing „*enter*”



**5. Channels number** - Using this feature, you can limit the number of channels sent from the PX245. The minimum value is 24 channels and the maximum is 512 (default).

## 7.5. Input DMX

This menu provides a graphical preview of DMX-512 signal received by the device.



### The presentation of DMX signal:

The value of DMX signal on a given channel is presented in the form white bar, the height of which varies proportionally according to the relation:

the greatest height - DMX value is 255, no bar - DMX value is 0.

DMX channels are described on the left side, respectively, 1, 129, 257, 385 for subsequent lines. In addition, each line is divided by dots, where red means another ten channels, and green additional 100 channels bigger value.

## 7.6. Calibration

Calibration should be made when audio cable is disconnected. You need only to approve chosen **[Set]** screen-button using „enter”.



This allows device to adapt to the audio line. Set screen-button using enter.

This allows device to adapt to the audio line.



It is recommended to perform the calibration when two parameters visible in bottom right corner of the screen next to the **[Set]** button differ by at least 10 units.

## 7.7. Language settings

Language Settings allow you to change the menu language. To do this select appropriate language using  or  buttons and press „enter”.



## 7.8. Firmware version

In this submenu you can check the firmware and bootloader version installed on the device. You can also restore the default settings implemented on the device.



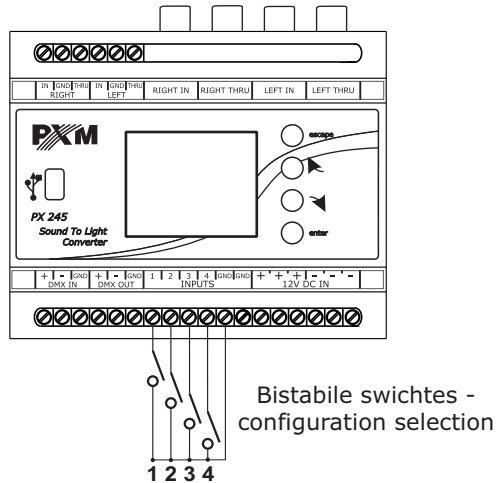
To restore default setting push „enter” button, then select the „Yes” button and again approve with „enter”. In the case of incorrect choosing this option, you can go back by selecting „No”, or go directly level up in menu by pressing „escape”.

**NOTE:** Please note that restoring the default settings will erase all configurations on the device!!!

## 8. CONNECTION DESCRIPTION OF BISTABLE INPUTS

To Sound to Light Converter you can also connect the switches to choose the music configuration of audio to the DMX signal conversion. This allows to change the currently selected configuration without DMX controller connected into the installation (and thus an external DMX control).

Schematic connection of bistable switches are shown below:



Bistable switches connected on the following inputs can change music configuration number. The values of set-up music configuration are read by the PX245 in a binary system, where first input is a value of 1, 2nd input - value 2, 3rd input - value 4 and 4th input - value of 8. How this feature operates is shown in the following tables:

Configuration number	Input switches			
	1	2	3	4
Cfg1	×			
Cfg2		×		
Cfg3	×	×		
Cfg4			×	
Cfg5	×		×	
Cfg6		×	×	
Cfg7	×	×	×	
Cfg8				×

Configuration number	Input switches			
	1	2	3	4
Cfg9	×			×
Cfg10		×		×
Cfg11	×	×		×
Cfg12			×	×
Cfg13	×		×	×
Cfg14		×	×	×
Cfg15	×	×	×	×
Cfg16	not possible			

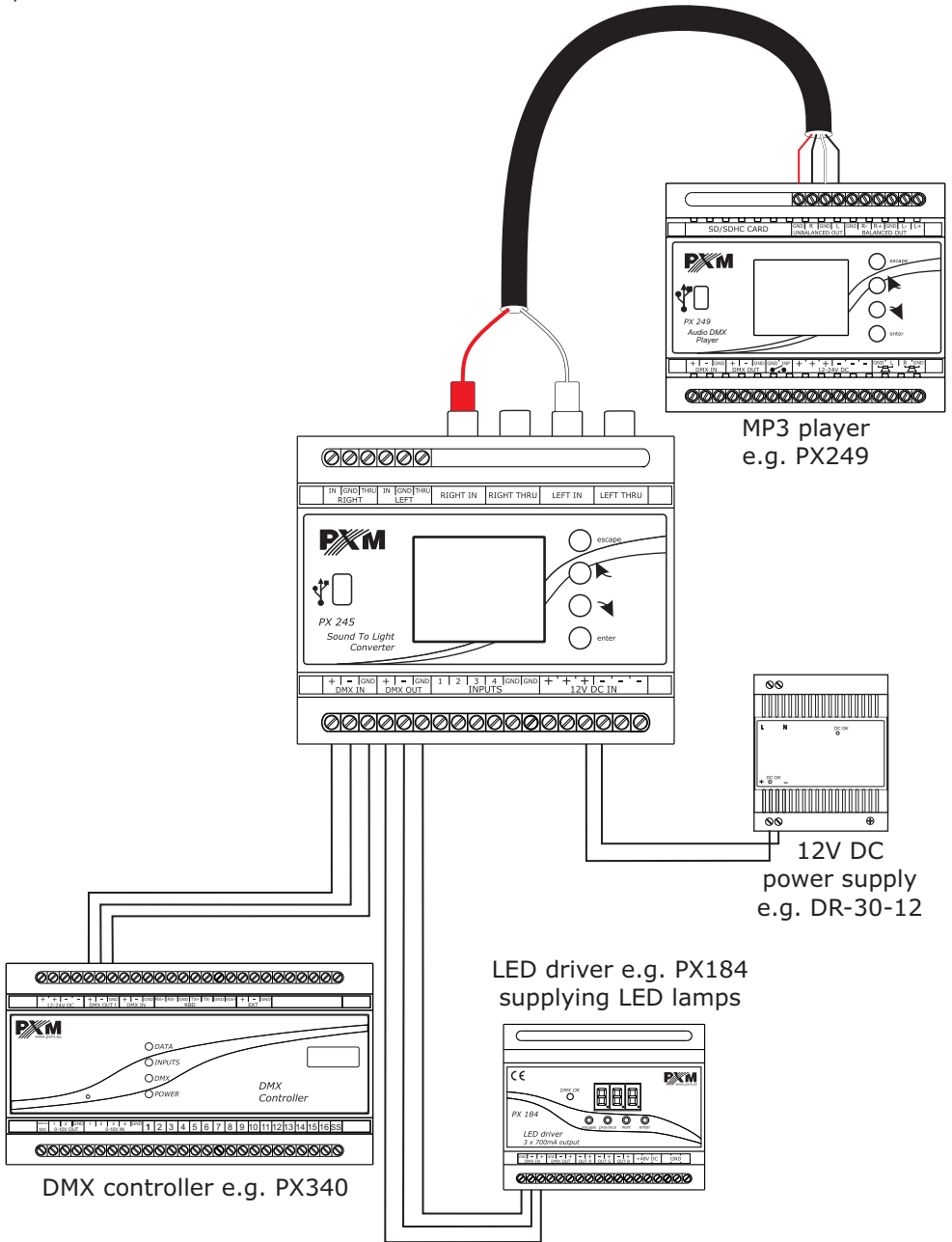
Turned On (shorting) inputs are shown in the tables in the form of crosses.

If you do not connect the DMX control signal or any bistable switches, the PX245 works with the music configuration set in **[No DMX Configuration]** menu.

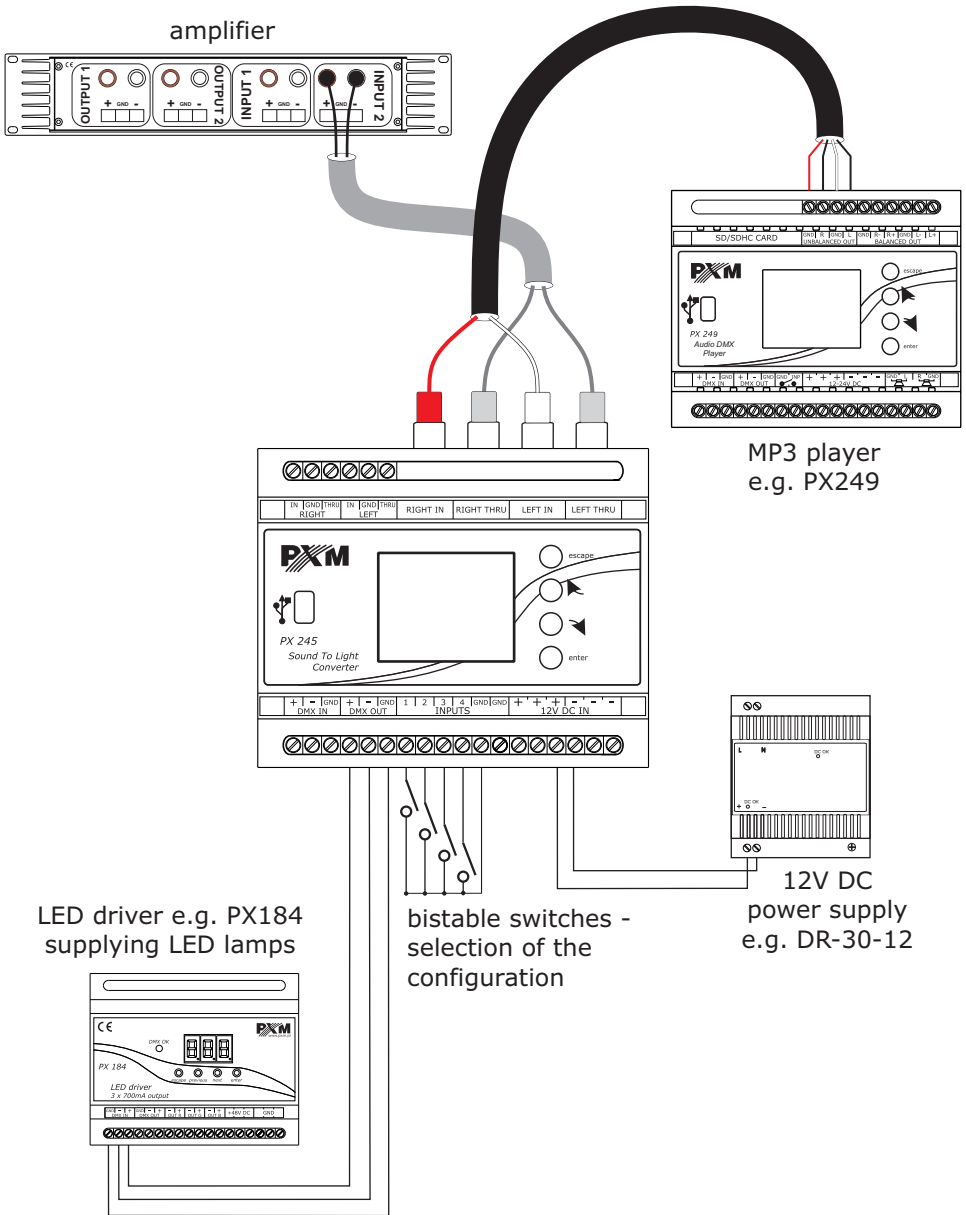


# 9. CONNECTION SCHEME

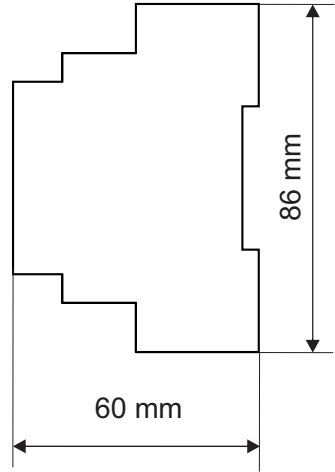
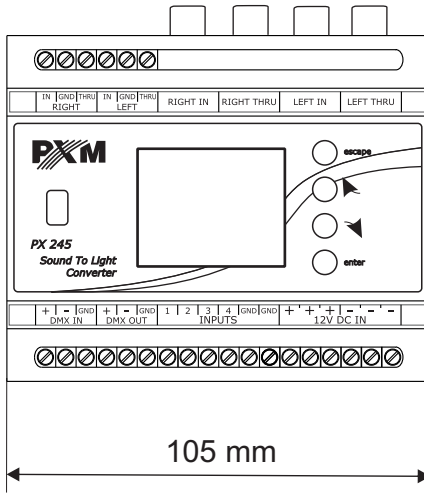
a) connection scheme with DMX control



b) bistable switches connection scheme, without DMX control



## 10. DIMENSIONS



## 11. TECHNICAL DATA

Type:	PX245
Power supply:	12V DC
DMX input:	1 (512 channels)
DMX output:	1 (512 channels)
Bistabile inputs:	4
Audio line input:	1
Sensitivity of line input:	200 mV(RMS) - 1,6 V(RMS)
Available configurable digital filters:	8
Filter sensitivity:	31 Hz - 8 kHz
Input connectors:	terminal blocks, RCA sockets, USB
Programmable configurations:	16
Configuration via PC:	YES
Dimensions:	Width: 105 mm (6-modules) Height: 86 mm Depth: 60 mm





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http://www.pxm.pl

## DECLARATION OF CONFORMITY according to guide lines 2004/108/WE

Name of producer: PXM s.c.

Address of producer: ul. Przemysłowa 12  
30-701 Kraków, Poland

*declares that the product:*

Name of product: **Sound to Light Converter**

Type: **PX245**

*answers the following product specifications:*

**EMC:**  
**PN-EN 55103-1**  
**PN-EN 55103-2**  
**PN-EN 61000-6-1**  
**PN-EN 61000-6-3**

*Additional information:*

All DMX512 inputs and outputs must be shielded and the shielding must be connected to the ground responding to the DMX connectors.

**PXM** s.c.

Danuta i Marek Żupnik  
30-701 Kraków, ul. Przemysłowa 12  
NIP 677-002-54-53

Kraków, 28.03.2011

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