

# DecaBox - DMX to MIDI Conversion

Lighting consoles can easily control nearly any type of MIDI gear.

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# Basic System Information

This firmware personality for the DecaBox receives DMX lighting data and generates a series of MIDI messages. It allows easy control of MIDI equipment, such as audio equipment, sound effects generators and other show control elements.



- The system ships with an international switching power supply. System power requirements are 9-12v DC, center positive, 200mA. The power supply connector has standard dimensions of 2.1mm x 5.5mm.
- MIDI data is sent via the 5 pin 'MIDI Out' jack.
- DMX lighting data is received on the Neutrik 5 pin XLR male jack. If necessary, a 5 pin to 3 pin adapter cable may be used to connect various upstream controllers.

The DecaBox USB port is used for firmware updates. *It does not transmit MIDI data.*

Originally, the lighting guys wanted to keep their wiring separate from the audio crew, who were using XLR-3 microphone cable; thus the 5 pin lighting data standard. However, in nearly every current implementation of DMX control only pins 1, 2 and 3 are used. The 5 pin connectors cost about \$2 more in quantity, so some manufacturers eschew them for less expensive 3 pin versions. Professional and touring gear still relies nearly exclusively on the 5 pin infrastructure. In either case, pin 1 is ground, pin 2 is 'data complement' or D- and pin 3 is 'data true' or D+.

# Output Modes

For convenience here, a PC-based DMX output utility was used to generate various DMX channel:value pairs.

Using the built-in LCD, set the operating mode and DMX start address for the system. Different modes require varying quantities of DMX data, as described below. In the charts below, 'Channel 1' means 'system start address'. So if the DecaBox is set to start address 10, channel 1 means channel 10. Make sense?

The word **channel** means something different in the MIDI and DMX worlds. A MIDI channel is most easily compared to a DMX universe. Messages in a single MIDI channel can contain note on / note off information, continuous controller data, patch change messages, etc. However, a single MIDI cable can contain data for all 16 MIDI channels while a DMX cable only controls a single universe [512 DMX channels] of data.

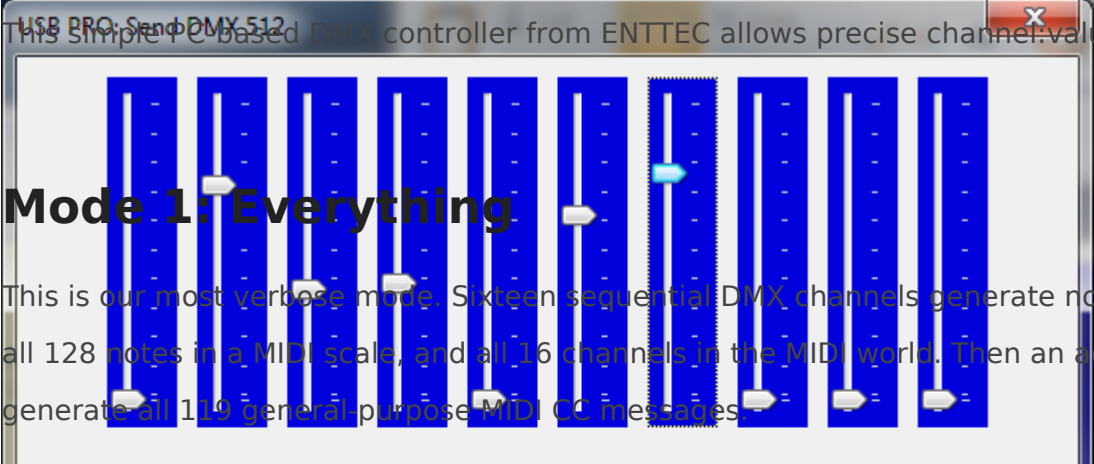
Also, MIDI is a **zero-based** system. That is, the first MIDI channel is '0' and the last is 15, or 'F' in hex code. Note values and velocities vary between [0 127] or [0x0 0x7F] in hex. In the screen captures below, hex, zero-based data is displayed.

USB PRO: Send DMX 512

This simple PC-based DMX controller from ENTTEC allows precise channel:value control for testing.

## Mode 1: Everything

This is our most verbose mode. Sixteen sequential DMX channels generate note on / note off pairs for all 128 notes in a MIDI scale, and all 16 channels in the MIDI world. Then an additional 119 channels generate all 119 general-purpose MIDI CC messages.

The image shows a screenshot of a software window titled "USB PRO: Send DMX 512". The window contains 16 vertical sliders, each representing a DMX channel. The sliders are blue with white handles. The first slider is highlighted with a yellow box. The text "Mode 1: Everything" is overlaid on the sliders. Below the sliders, there is a paragraph of text explaining the mode. The window has a standard Windows-style title bar with a close button (X) in the top right corner.

DMX Channels Required	135
DMX Channel	MIDI Output
1	MIDI channel 1, Note on / note off pairs, 128 total notes.
2	MIDI channel 2, Note on / note off pairs, 128 total notes.
...	
16	MIDI channel 16, Note on / note off pairs, 128 total notes.
17	MIDI CC #0, values [0 127].
...	...
Channel 136	MIDI CC #128, values [0 127].

TIMESTAMP	IN	PORT	STATUS	DATA1	DATA2	CHAN	NOTE	EVENT
0011FDBD	1	--	80	00	7F	1	C -1	Note Off
0011FEB6	1	--	90	01	7F	1	C#-1	Note On
0011FFB4	1	--	80	01	7F	1	C#-1	Note Off
00120016	1	--	90	02	7F	1	D -1	Note On
001200AD	1	--	80	02	7F	1	D -1	Note Off
0012010F	1	--	90	03	7F	1	Eb-1	Note On
00120208	1	--	80	03	7F	1	Eb-1	Note Off
00120270	1	--	90	04	7F	1	E -1	Note On
00120306	1	--	80	04	7F	1	E -1	Note Off
001203FF	1	--	90	05	7F	1	F -1	Note On
00120461	1	--	80	05	7F	1	F -1	Note Off
001204C9	1	--	90	06	7F	1	F#-1	Note On
0012055E	1	--	80	06	7F	1	F#-1	Note Off
00120656	1	--	90	07	7F	1	G -1	Note On
001206B9	1	--	80	07	7F	1	G -1	Note Off
001207B2	1	--	90	08	7F	1	G#-1	Note On
0012081A	1	--	80	08	7F	1	G#-1	Note Off
001208B0	1	--	90	09	7F	1	A -1	Note On
00120975	1	--	80	09	7F	1	A -1	Note Off
00121115	1	--	90	12	7F	1	F# 0	Note On
0012117D	1	--	80	3A	7F	1	Bb 3	Note Off
00121213	1	--	90	3E	7F	1	D 4	Note On
00121276	1	--	80	48	7F	1	C 5	Note Off
0012130C	1	--	90	4B	7F	1	Eb 5	Note On
001215C7	1	--	80	4B	7F	1	Eb 5	Note Off
001216C0	1	--	90	4C	7F	1	E 5	Note On
00121728	1	--	80	4C	7F	1	E 5	Note Off
001217BE	1	--	90	4D	7F	1	F 5	Note On
001218B7	1	--	80	4D	7F	1	F 5	Note Off
0012191A	1	--	90	4E	7F	1	F# 5	Note On
00121982	1	--	80	4E	7F	1	F# 5	Note Off
00121A7A	1	--	90	4F	7F	1	G 5	Note On
00121B11	1	--	80	4F	7F	1	G 5	Note Off
00121B73	1	--	90	50	7F	1	G# 5	Note On
00121C6C	1	--	80	50	7F	1	G# 5	Note Off
00121CD4	1	--	90	51	7F	1	A 5	Note On
00121D6A	1	--	80	51	7F	1	A 5	Note Off
00122A1D	1	--	90	57	7F	1	Eb 6	Note On
00122A7F	1	--	90	6A	7F	1	Bb 7	Note On
00122B16	1	--	80	6E	7F	1	D 8	Note Off
00122B7E	1	--	90	6F	7F	1	Eb 8	Note On
00122C14	1	--	90	77	7F	1	B 8	Note On
00122C77	1	--	80	77	7F	1	B 8	Note Off
00122DD7	1	--	90	78	7F	1	C 9	Note On
00122ED0	1	--	80	78	7F	1	C 9	Note Off
00122F32	1	--	90	79	7F	1	C# 9	Note On
00122FC8	1	--	80	79	7F	1	C# 9	Note Off
001230C1	1	--	90	7A	7F	1	D 9	Note On

Here DMX channel 1 fader was run somewhat smoothly from 0 to 100%. The entire MIDI scale, with some skipping due to how quickly the fader moved, is represented.

Monitor - Input									
TIMESTAMP	IN	PORT	STATUS	DATA1	DATA2	CHAN	NOTE	EVENT	
0013732C	1	--	B0	00	02	1	---	CC: Bank MSB	
0013738F	1	--	B0	00	04	1	---	CC: Bank MSB	
0013748D	1	--	B0	00	05	1	---	CC: Bank MSB	
00137874	1	--	B0	00	06	1	---	CC: Bank MSB	
0013796E	1	--	B0	00	08	1	---	CC: Bank MSB	
00137A6C	1	--	B0	00	0D	1	---	CC: Bank MSB	
00137ACE	1	--	B0	00	0E	1	---	CC: Bank MSB	
00137B65	1	--	B0	00	12	1	---	CC: Bank MSB	
00137BC7	1	--	B0	00	14	1	---	CC: Bank MSB	
00137C5E	1	--	B0	00	1A	1	---	CC: Bank MSB	
00137CC0	1	--	B0	00	1E	1	---	CC: Bank MSB	
00137D28	1	--	B0	00	22	1	---	CC: Bank MSB	
00137DBE	1	--	B0	00	2A	1	---	CC: Bank MSB	
00137E21	1	--	B0	00	2D	1	---	CC: Bank MSB	
00137EB7	1	--	B0	00	33	1	---	CC: Bank MSB	
00137F1A	1	--	B0	00	39	1	---	CC: Bank MSB	
00137FB0	1	--	B0	00	3E	1	---	CC: Bank MSB	
00138013	1	--	B0	00	47	1	---	CC: Bank MSB	
0013807B	1	--	B0	00	4F	1	---	CC: Bank MSB	
0013810F	1	--	B0	00	5B	1	---	CC: Bank MSB	
00138171	1	--	B0	00	64	1	---	CC: Bank MSB	
00138208	1	--	B0	00	6D	1	---	CC: Bank MSB	
0013826A	1	--	B0	00	73	1	---	CC: Bank MSB	
00138301	1	--	B0	00	7B	1	---	CC: Bank MSB	
00138369	1	--	B0	00	7F	1	---	CC: Bank MSB	

Here DMX channel 17 fader was moved. This corresponds to MIDI CC #0, 'Bank Select MSB.'

## Mode 2: Easy Note & CC Messages

Mode 2 is very compact: 2 sequential DMX channels generate all note on / note off pairs for MIDI channel 1 and MIDI CC #0.

DMX channels 2 required	
DMX channel	MIDI Output

1	MIDI channel 1, Note on / note off pairs, 128 total notes.
2	MIDI CC #0, values [0 127].

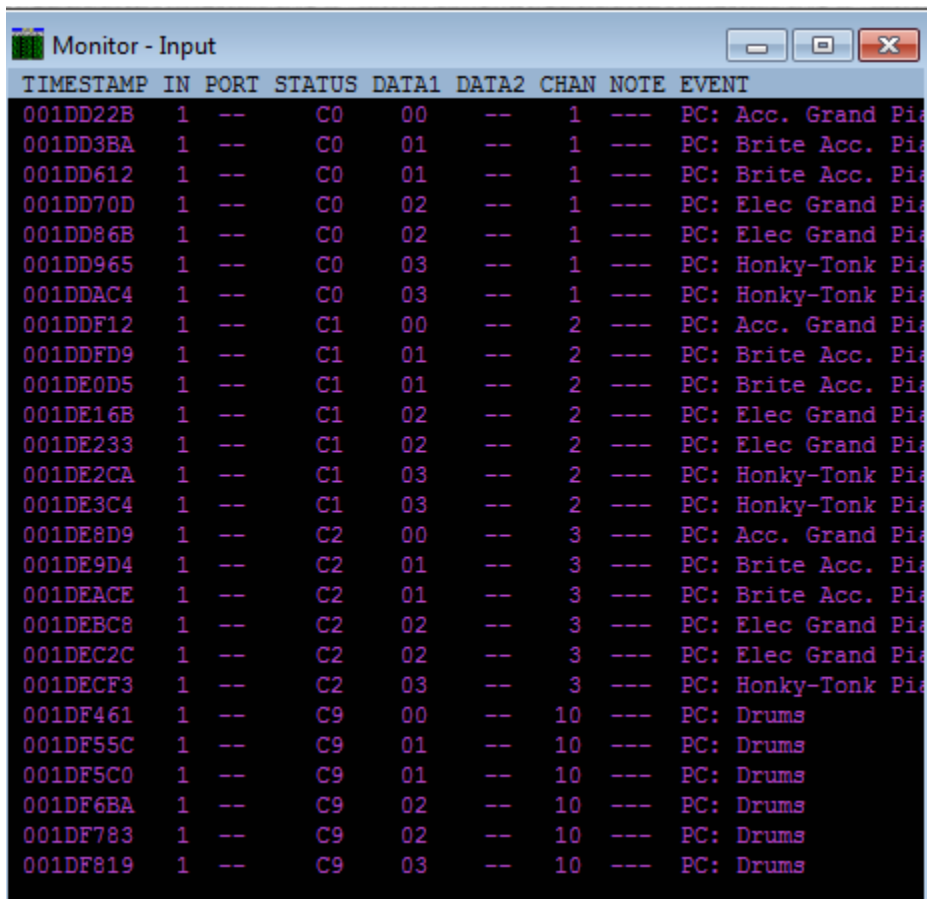
Monitor Input									
TIMESTAMP	IN	PORT	STATUS	DATA1	DATA2	CHAN	NOTE	EVENT	
0018A341	1	--	80	03	7F	1	Eb-1	Note	Off
0018A3A6	1	--	80	0F	7F	1	Eb 0	Note	Off
0018A43C	1	--	90	1A	7F	1	D 1	Note	On
0018A4A0	1	--	90	1F	7F	1	G 1	Note	On
0018A504	1	--	80	27	7F	1	Eb 2	Note	Off
0018A59A	1	--	90	43	7F	1	G 4	Note	On
0018A5FE	1	--	90	50	7F	1	G# 5	Note	On
0018A694	1	--	90	5C	7F	1	G# 6	Note	On
0018A6F9	1	--	80	66	7F	1	F# 7	Note	Off
0018A78F	1	--	80	74	7F	1	G# 8	Note	Off
0018A7F3	1	--	80	7E	7F	1	F# 9	Note	Off
0018A857	1	--	80	7F	7F	1	G 9	Note	Off
0018AFF5	1	--	B0	00	01	1	---	CC:	Bank MSB
0018B08C	1	--	B0	00	02	1	---	CC:	Bank MSB
0018B0F0	1	--	B0	00	16	1	---	CC:	Bank MSB
0018B186	1	--	B0	00	24	1	---	CC:	Bank MSB
0018B1EA	1	--	B0	00	30	1	---	CC:	Bank MSB
0018B24E	1	--	B0	00	3B	1	---	CC:	Bank MSB
0018B2E4	1	--	B0	00	47	1	---	CC:	Bank MSB
0018B349	1	--	B0	00	57	1	---	CC:	Bank MSB
0018B3DF	1	--	B0	00	6A	1	---	CC:	Bank MSB
0018B443	1	--	B0	00	76	1	---	CC:	Bank MSB
0018B4A7	1	--	B0	00	7F	1	---	CC:	Bank MSB

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MIDI Output	
MIDI channel 1, Note on / note off pairs, 128 total notes.	
MIDI channel 2, Note on / note off pairs, 128 total notes.	
3	MIDI CC #0, values [0 127].
...	...

## Mode 4: Program Change / Patch Change Messages

Simple, here. 16 DMX channels generate all patch change / program change messages on MIDI channels [1 16]

DMX Channels Required	16
DMX Channel	MIDI Output
1	MIDI program change, MIDI channel 1
...	...
16	MIDI program change, MIDI channel 16



TIMESTAMP	IN	PORT	STATUS	DATA1	DATA2	CHAN	NOTE	EVENT
001DD22B	1	--	C0	00	--	1	---	PC: Acc. Grand Pie
001DD3BA	1	--	C0	01	--	1	---	PC: Brite Acc. Pie
001DD612	1	--	C0	01	--	1	---	PC: Brite Acc. Pie
001DD70D	1	--	C0	02	--	1	---	PC: Elec Grand Pie
001DD86B	1	--	C0	02	--	1	---	PC: Elec Grand Pie
001DD965	1	--	C0	03	--	1	---	PC: Honky-Tonk Pie
001DDAC4	1	--	C0	03	--	1	---	PC: Honky-Tonk Pie
001DDF12	1	--	C1	00	--	2	---	PC: Acc. Grand Pie
001DDFD9	1	--	C1	01	--	2	---	PC: Brite Acc. Pie
001DE0D5	1	--	C1	01	--	2	---	PC: Brite Acc. Pie
001DE16B	1	--	C1	02	--	2	---	PC: Elec Grand Pie
001DE233	1	--	C1	02	--	2	---	PC: Elec Grand Pie
001DE2CA	1	--	C1	03	--	2	---	PC: Honky-Tonk Pie
001DE3C4	1	--	C1	03	--	2	---	PC: Honky-Tonk Pie
001DE8D9	1	--	C2	00	--	3	---	PC: Acc. Grand Pie
001DE9D4	1	--	C2	01	--	3	---	PC: Brite Acc. Pie
001DEACE	1	--	C2	01	--	3	---	PC: Brite Acc. Pie
001DEBC8	1	--	C2	02	--	3	---	PC: Elec Grand Pie
001DEC2C	1	--	C2	02	--	3	---	PC: Elec Grand Pie
001DECf3	1	--	C2	03	--	3	---	PC: Honky-Tonk Pie
001DF461	1	--	C9	00	--	10	---	PC: Drums
001DF55C	1	--	C9	01	--	10	---	PC: Drums
001DF5C0	1	--	C9	01	--	10	---	PC: Drums
001DF6BA	1	--	C9	02	--	10	---	PC: Drums
001DF783	1	--	C9	02	--	10	---	PC: Drums
001DF819	1	--	C9	03	--	10	---	PC: Drums

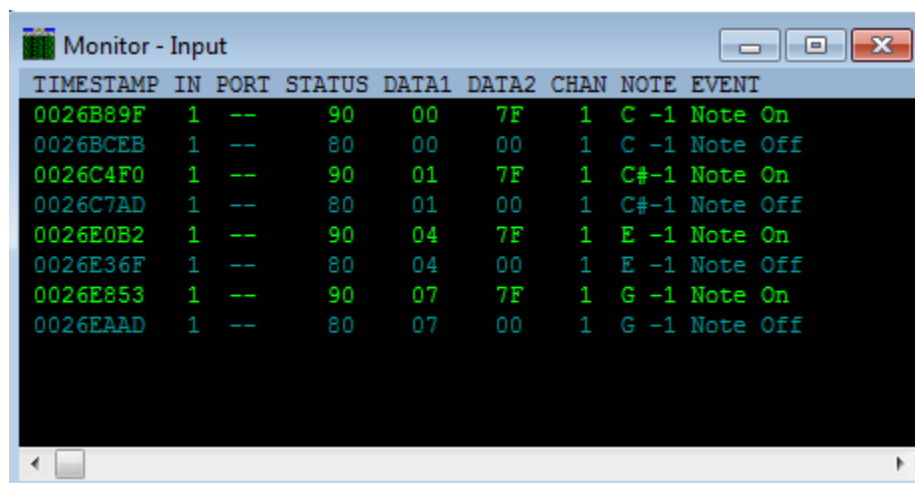


Mode 4 data, showing PC messages sent on MIDI channels 1, 2, 3 and 10.

## Mode 5: Note On / Note Off With Fixed Velocities

Simple, here. 128 DMX channels generate 'note on' messages when DMX values are 100% and 'note off' messages when values are 0%. A popular TV show requested this mode for triggering sound effects via bump buttons on a console.

DMX Channels Required	128
DMX Channel	MIDI Output
1 @ 100%	MIDI channel 1, MIDI note 1, ON
1 @ 0%	MIDI channel 1, MIDI note 1, OFF
...	...
128 @ 100%	MIDI channel 1, MIDI note 128, On



TIMESTAMP	IN	PORT	STATUS	DATA1	DATA2	CHAN	NOTE	EVENT
0026B89F	1	--	90	00	7F	1	C -1	Note On
0026BCEB	1	--	80	00	00	1	C -1	Note Off
0026C4F0	1	--	90	01	7F	1	C#-1	Note On
0026C7AD	1	--	80	01	00	1	C#-1	Note Off
0026E0B2	1	--	90	04	7F	1	E -1	Note On
0026E36F	1	--	80	04	00	1	E -1	Note Off
0026E853	1	--	90	07	7F	1	G -1	Note On
0026EAAD	1	--	80	07	00	1	G -1	Note Off

# Purchasing

If you've landed here via a web search, don't already own one of these systems, but would like to add one to your collection, our online store is here:

[www.response-box.com/gear/shop](http://www.response-box.com/gear/shop)

And our main site is here, which includes links to distributors, etc:

[www.response-box.com/gear](http://www.response-box.com/gear)