



MPA

Firmware Version 1.4

User Manual

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Additional documentation available at:

<http://highlyliquid.com/support/>

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1.0 Overview

The MPA can activate its outputs in response to incoming MIDI note, controller ("CC"), program change, channel pressure, pitch wheel, MIDI clock, or start/stop/continue messages.

The MIDI response and initial state of each output is customized via the **SysEx Configuration Message**.

2.0 SysEx Configuration

2.1 Overview

A MIDI System Exclusive (SysEx) message can be used to independently configure each of the MPA outputs.

- A single SysEx message configures the entire MPA.
- Settings are retained when the MPA is disconnected from a power supply.
- Upon receipt of a properly formatted configuration message, the Activity LED (LED2) blinks 3 times. Any additional MIDI data is discarded during this period (approximately 1.5 seconds).

2.2 Message Format

Figures 2-1, 2-2, 2-3, 2-4, and 2-5 show the format for the SysEx Configuration Message. The message consists of 6 main sections: header, potentiometer configuration, logic configuration,

potentiometer power-up positions, logic power-up states, and footer.

Each hex value *ch* specifies a MIDI channel as described in Table 2-1. Each potentiometer output receives an independent channel setting, while the logic outputs are configured as a group under a common channel setting.

Each potentiometer output receives an independent output mode (*pm*). The meaning of each value *cn* depends on the value of the corresponding *pm*. See Table 2-2.

Each logic output receives an independent output mode (*lm*). The meaning of each value *nn* depends on the value of the corresponding *lm*. See Table 2-3.

The power-up position of each MPA potentiometer output is specified by values *x0–x3*. The power-up state of each logic output is specified by values *q0–q7*. For *q0–q7*, a value of 00h specifies a power-up state of “off” (0V), and a value of 01h specifies a power-up state of “on” (5V). See Figure 2-4 and Figure 2-5.

2.3 Examples

The configuration shown in Figure 2-6 allows control of each potentiometer output via pitch bend messages from a different channel 8–11. Logic outputs are controlled by MIDI notes 0–7 on a channel specified by the DIP switch.

The configuration shown in Figure 2-7 allows control of each potentiometer via a different controller (mod wheel, breath controller, effect control 1, effect control 2) on channel 1. Logic outputs 0–5 are set to “inverted note trigger” mode for notes 0–5 on channel 5. Logic outputs 6 and 7 are configured for MIDI Clock to DIN-Sync conversion.

2.4 Factory Default Configuration

The MPA ships with a “factory default” configuration that can be expressed as a SysEx configuration message. See Figure 2-8.

Figure 2-1: SysEx Configuration Message Format (Hex)

Header (5 bytes)	Output Configuration		Power-Up State		Footer (1 byte)
F0 00 01 5D 01	<i>Potentiometer Configuration</i> (12 bytes: see Table 2-2)	<i>Logic Configuration</i> (17 bytes: see Table 2-3)	<i>Potentiometer Positions</i> (4 bytes: see Figure 2-4)	<i>Logic States</i> (8 bytes: see Figure 2-5)	F7

Figure 2-2: Potentiometer Configuration

Potentiometer 0	Potentiometer 1	Potentiometer 2	Potentiometer 3
<i>ch pm cn</i>	<i>ch pm cn</i>	<i>ch pm cn</i>	<i>ch pm cn</i>

Figure 2-3: Logic Configuration

All Logic Outputs	Logic 0	Logic 1	Logic 2	Logic 3	Logic 4	Logic 5	Logic 6	Logic 7
<i>ch</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>	<i>lm nn</i>

Figure 2-4: Potentiometer Power-Up Positions

Potentiometer 0 Position	Potentiometer 1 Position	Potentiometer 2 Position	Potentiometer 3 Position
<i>x0</i>	<i>x1</i>	<i>x2</i>	<i>x3</i>

Figure 2-5: Logic Power-Up States

Logic 0 State	Logic 1 State	Logic 2 State	Logic 3 State	Logic 4 State	Logic 5 State	Logic 6 State	Logic 7 State
<i>q0</i>	<i>q1</i>	<i>q2</i>	<i>q3</i>	<i>q4</i>	<i>q5</i>	<i>q6</i>	<i>q7</i>

Table 2-1: MIDI Channel

<i>ch</i> (Hex)	Channel Setting
00	Channel is specified by positions 1-4 of DIP switch SW1. See Table 3-1.
01	Channel 1
02	Channel 2
03	Channel 3
04	Channel 4
05	Channel 5
06	Channel 6
07	Channel 7
08	Channel 8
09	Channel 9
0A	Channel 10
0B	Channel 11
0C	Channel 12
0D	Channel 13
0E	Channel 14
0F	Channel 15
10	Channel 16

Table 2-2: Potentiometer Modes

<i>pm</i> (Hex)	Mode Description	<i>cn</i>
00	Note Number The note number of the most recent Note On message sets the wiper position.	Ignored
01	Note Velocity The velocity of the most recent Note On message sets the wiper position.	Ignored
02	Controller The controller (CC command) specified by <i>cn</i> sets the wiper position.	Controller number (hex)
03	Program Change The current program # sets the wiper position.	Ignored
04	Channel Pressure Wiper position is set by Channel Pressure messages.	Ignored
05	Pitch Wheel Wiper position is set by the Pitch Wheel.	Ignored

Table 2-3: Logic Modes

<i>mm</i> (Hex)	Mode Description	<i>nn</i>
00	Note Trigger Output is "on" for the duration of a corresponding MIDI note, and "off" otherwise.	Note number (hex)
01	Inverted Note Trigger Output is "off" for the duration of a corresponding MIDI note, and "on" otherwise.	Note number (hex)
02	Note Toggle Output state is toggled & latched upon receipt of a corresponding Note On message.	Note number (hex)
03	Program Change Bit 0 Output state corresponds to bit 0 of the current program number.	Ignored
04	Program Change Bit 1 Output state corresponds to bit 1 of the current program number.	Ignored
05	Program Change Bit 2 Output state corresponds to bit 2 of the current program number.	Ignored
06	Program Change Bit 3 Output state corresponds to bit 3 of the current program number.	Ignored
07	Program Change Bit 4 Output state corresponds to bit 4 of the current program number.	Ignored
08	Program Change Bit 5 Output state corresponds to bit 5 of the current program number.	Ignored
09	Program Change Bit 6 Output state corresponds to bit 6 of the current program number.	Ignored
0A	Sync: Run MIDI Start and Continue messages latch output at 5V. MIDI Stop message latches output at 0V.	Ignored
0B	Sync: 24 ppq 1 pulse per MIDI Clock. Pulse length: approximately 2ms.	Ignored
0C	Sync: 8 ppq Pulse every 3 MIDI Clocks. Pulse length: approximately 2ms.	Ignored
0D	Sync: 4 ppq Pulse every 6 MIDI Clocks. Pulse length: approximately 2ms.	Ignored
0E	Sync: 2 ppq Pulse every 12 MIDI Clocks. Pulse length: approximately 2ms.	Ignored
0F	Sync: 1 ppq Pulse every 24 MIDI Clocks. Pulse length: approximately 2ms.	Ignored
10	Controller (CC) On/Off Controller values 0-63 set output to 0V. Controller values 64-127 set output to 5V.	Controller number (hex)
11	Note Trigger (Any Note Number) Output is "on" for the duration of a any MIDI note, and "off" otherwise.	Ignored
12	Inverted Note Trigger (Any Note Number) Output is "off" for the duration of any MIDI note, and "on" otherwise.	Ignored
13	Note Toggle (Any Note Number) Output state is toggled & latched upon receipt of any Note On message.	Ignored

Figure 2-6: Example: Pitch Bend & Note Trigger

SysEx Data (Hex)	Meaning
F0 00 01 5D 01	Fixed Header
08 05 00	Potentiometer 0: Channel 8, Pitch Bend
09 05 00	Potentiometer 1: Channel 9, Pitch Bend
0A 05 00	Potentiometer 2: Channel 10, Pitch Bend
0B 05 00	Potentiometer 3: Channel 11, Pitch Bend
00	Logic Outputs: Channel set by DIP switch
00 00	Logic Output 0: Note Trigger, Note #0
00 01	Logic Output 1: Note Trigger, Note #1
00 02	Logic Output 2: Note Trigger, Note #2
00 03	Logic Output 3: Note Trigger, Note #3
00 04	Logic Output 4: Note Trigger, Note #4
00 05	Logic Output 5: Note Trigger, Note #5
00 06	Logic Output 6: Note Trigger, Note #6
00 07	Logic Output 7: Note Trigger, Note #7
3F 3F 3F 3F	Potentiometer Outputs 0–3: Power-Up Position: 63
00 00 00 00 00 00 00 00	Logic Outputs 0–7: Power-Up State: “Off” (0V)
F7	Fixed Footer

Figure 2-7: Example: CC, Inverted Note Trigger, MIDI Clock to DIN-Sync

SysEx Data (Hex)	Meaning
F0 00 01 5D 01	Fixed Header
01 02 01	Potentiometer 0: Channel 1, Mod Wheel (CC # 1)
01 02 02	Potentiometer 1: Channel 1, Breath Controller (CC # 2)
01 02 0C	Potentiometer 2: Channel 1, Effect Control 1 (CC # 12)
01 02 0D	Potentiometer 3: Channel 1, Effect Control 2 (CC # 13)
05	Logic Outputs: Channel 5
01 00	Logic Output 0: Inverted Note Trigger, Note #0
01 01	Logic Output 1: Inverted Note Trigger, Note #1
01 02	Logic Output 2: Inverted Note Trigger, Note #2
01 03	Logic Output 3: Inverted Note Trigger, Note #3
01 04	Logic Output 4: Inverted Note Trigger, Note #4
01 05	Logic Output 5: Inverted Note Trigger, Note #5
0A 00	Logic Output 6: Sync: Run
0B 00	Logic Output 7: Sync: 24ppq
00 00 00 00	Potentiometer Outputs 0–3: Power-Up Position: 0
01 01 01 01 01 01 00 00	Logic Output Power Up States: 0–5: On (5V); 6–7: Off (0V)
F7	Fixed Footer

Figure 2-8: Factory Default Configuration

SysEx Data (Hex)	Meaning
F0 00 01 5D 01	Fixed Header
00 02 00	Potentiometer 0: Channel set by DIP switch, CC #0
00 02 01	Potentiometer 1: Channel set by DIP switch, CC #0
00 02 02	Potentiometer 2: Channel set by DIP switch, CC #0
00 02 03	Potentiometer 3: Channel set by DIP switch, CC #0
00	Logic Outputs: Channel set by DIP switch
00 3C	Logic Output 0: Note Trigger, Note #60 (Middle C)
00 3D	Logic Output 1: Note Trigger, Note #61
00 3E	Logic Output 2: Note Trigger, Note #62
00 3F	Logic Output 3: Note Trigger, Note #63
00 40	Logic Output 4: Note Trigger, Note #64
00 41	Logic Output 5: Note Trigger, Note #65
00 42	Logic Output 6: Note Trigger, Note #66
00 43	Logic Output 7: Note Trigger, Note #67
3F 3F 3F 3F	Potentiometer Outputs 0–3: Power-Up Position: 63
00 00 00 00 00 00 00 00	Logic Outputs 0–7: Power-Up State: “Off” (0V)
F7	Fixed Footer

3.0 DIP Switch Channel Selection

MPA outputs configured without an explicit MIDI channel (*ch* value 00h) will respond to MIDI events only on the MIDI channel specified by positions 1–4 of DIP switch SW1. See Table 3-1.

Changes to SW1 settings become active only upon power-up. The MPA must be power-cycled for changes to take effect.

The settings of SW1 positions 5—8 are ignored.

Table 3-1: MIDI Channel Selection

MIDI Channel	SW1 Setting			
	1	2	3	4
1	off	off	off	off
2	off	off	off	on
3	off	off	on	off
4	off	off	on	on
5	off	on	off	off
6	off	on	off	on
7	off	on	on	off
8	off	on	on	on
9	on	off	off	off
10	on	off	off	on
11	on	off	on	off
12	on	off	on	on
13	on	on	off	off
14	on	on	off	on
15	on	on	on	off
16	on	on	on	on

4.0 Activity Indicator LED

The Activity Indicator LED (LED2) performs the following functions:

- **Self-Test:** Upon power-up, the LED lights briefly before normal operation begins.
- **Configuration Update Indication:** When the MPA receives a correctly formatted SysEx configuration message, the LED blinks 3 times.
- **Output Activity Indication:** When the MPA receives a MIDI message that affects any of the MPA outputs, the LED will blink. Other MIDI messages will not cause an activity indication.