MIDI-CI Profile:
Default Control Change Mapping

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PREFACE

Profile Configuration is part of the MIDI-Capability Inquiry (MIDI-CI) specification. Profiles define specific implementations of a set of MIDI messages chosen to suit a particular instrument, device type, or to accomplish a particular task. Two devices that conform to the same Profile will generally have greater interoperability between them than devices using MIDI without Profiles. Profiles increase interoperability and ease of use while lowering the need for manual configuration of devices by users. This document describes the Default Control Change Mapping Profile. For information on Profile Configuration mechanisms, please see the MIDI-Capability Inquiry specification and the Common Rules for MIDI-CI Profile Configuration specification.

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1. Introduction

1.1 Background

This Default Control Change Mapping Profile specification defines device requirements and MIDI implementation of a conforming device.

This Profile specification relies on mechanisms defined by the MIDI-CI (Capabilities Inquiry) specification. MIDI-CI allows devices to communicate their capabilities to each other. Devices can use that capabilities information to self-configure their MIDI connections and related settings. Profiles are a beneficial component in enabling intelligent auto-configuration between two devices.

Profiles define specific implementations of a set of MIDI messages chosen to suit a particular instrument, device type, or to accomplish a particular task. Two devices that conform to the same Profile will generally have greater interoperability between them than devices using MIDI without Profiles. Profiles increase interoperability and ease of use while lowering the need for manual configuration of devices by users.

Further information required for implementing this device Profile is found in the Common Rules for MIDI Profiles specification.

1.2 Executive Overview

Many MIDI devices are very flexible in configuration to allow a wide variety of interaction between devices in various applications. However, when 2 devices are configured differently, there can be a mismatch that reduces interoperability.

This Default Control Change Mapping Profile defines how devices can be set to a default state, aligned with core definitions of MIDI 1.0 and MIDI 2.0. In particular, devices with this Profile enabled have the assignment of Control Change message destinations/functions set to common, default definitions.

1.3 Related Documents

The Complete MIDI 1.0 Detailed Specification, Document Version 96.1, Third Edition, Association of Musical Electronics Industry, http://www.amei.or.jp/, and MIDI Manufacturers Association, https://www.midi.org/.

MIDI 2.0 Specification Overview, Association of Musical Electronics Industry, http://www.amei.or.jp/, and MIDI Manufacturers Association, https://www.midi.org/.

MIDI Capability Inquiry (MIDI-CI) Version 1.1, Association of Musical Electronics Industry, http://www.amei.or.jp/, and MIDI Manufacturers Association, https://www.midi.org/.

Common Rules for MIDI-CI Profiles, Version 1.0, Association of Musical Electronics Industry, http://www.amei.or.jp/, and MIDI Manufacturers Association, https://www.midi.org/.

Universal MIDI Packet Format (UMP) and MIDI 2.0 Protocol, Version 1.0, Association of Musical Electronics Industry, http://www.amei.or.jp/, and MIDI Manufacturers Association, https://www.midi.org/.

2. Device Requirements

2.1 General Requirements

While this Profile is enabled, a device has the assignment of controller message destinations/functions set to the common, default definitions. Details of destinations/functions are in Appendix A.

2.2 MIDI-CI Profile Configuration

This section defines the response to Profile Configuration messages including the Default Control Change Mapping Profile Identification.

MIDI-CI Profile Configuration Messages identify and control each Profile uniquely by the use of several fields in the Profile Configuration message. The Profile identifiers for this Default Control Change Mapping Profile are as follows:

Profile ID Byte 1	**0x7E** (Standard Defined Profile)
Profile ID Byte 2	**0x21** (Default Control Change Mapping Profile Number MSB)
Profile ID Byte 3	**0x00** (Default Control Change Mapping Profile Number LSB)
Profile ID Byte 4	**0x01** (Default Control Change Mapping Profile Version)
Profile ID Byte 5	**0xXX** (Default Control Change Mapping Profile Level*)

* Default Control Change Mapping Profile Level:

- 0x00 Some Implementation but Not to Minimum Requirements.
- 0x01 Meets Minimum Requirements

2.2.1 Profile Per MIDI Channel

This this Default Control Change Mapping Profile functions on a per-channel basis. In all Profile Configuration messages for this Profile, the Destination or Source field shall be set to values 0x00-0F = to/from MIDI Channels 1-16.

2.3 Enabling the Default Control Change Mapping Profile via the Set Profile On Message

When Default Control Change Mapping Profile Device receives a Set Profile On message, it shall assign the routing of all Control Change messages to the destinations/functions setting shown in Appendix A. These assignments shall remain fixed while the Profile is enabled.

Note: For the sake of clarity, those Control Change numbers shown in Appendix A with default functions (Sound Controllers and Effects) shall conform to the default function listed.

Note: MIDI specifications require that Registered Parameter Numbers (RPN), Registered Controllers, and Registered Per-Note Controllers are never used for any undefined purpose. Therefore, this Profile

assumes that mappings of those messages is correctly fixed in the Default Control Change Mapping Profile Device and implementation does not need to be defined as part of these Profile mechanisms.

2.4 Reset All Controllers (cc#0x79)

When a Default Control Change Mapping Profile device receives a Reset All Controllers message, it should set Control Change values to the Initial Values as defined in Appendix A.

2.5 Disabling the Default Control Change Mapping Profile via the Set Profile Off Message

When Default Control Change Mapping Profile Device receives a Set Profile Off message, the device may respond freely at the design of the manufacturer. Some devices may do nothing, some may return to a previous state, some may have some other response.

2.6 Disabling the Default Control Change Mapping Profile and Reporting Profile Disabled upon a Change of Configuration

If the Default Control Change Mapping Profile Device's assignment of Control Change message destination/function changes to a configuration that does not match the Default Control Change Mapping Profile, then the device shall send a Profile Disabled Report message.

This may occur when the user changes a setting on the device or when some other action causes the device to change its Control Change message destinations/functions.

2.7 Data Values

All values for messages in this document are expressed as the 7 bit and 14 bit values in the MIDI 1.0 Protocol. When using this Profile with the MIDI 2.0 Protocol with higher resolutions, values should be upscaled according to the guidelines in the Data Value Translations section of the Universal MIDI Packet Format (UMP) and MIDI 2.0 Protocol specification.

Appendix A. List of Control Change Message Destinations (and Reset Values)

Control Change Message			Value		Value to be Set by Reset All Controllers
Decimal	Hex	Function	Value	Used As	
0	0x00	Bank Select	0-127	MSB	Do Not Set
1	0x01	Modulation Wheel or Lever	0-127	MSB	0
2	0x02	Breath Controller	0-127	MSB	0
3	0x03	Undefined	0-127	MSB	Device Specific
4	0x04	Foot Controller	0-127	MSB	0
5	0x05	Portamento Time	0-127	MSB	0
6	0x06	Data Entry MSB	0-127	MSB	Do Not Set
7	0x07	Channel Volume (formerly Main Volume)	0-127	MSB	Do Not Set
8	0x08	Balance	0-127	MSB	64
9	0x09	Undefined	0-127	MSB	Device Specific
10	0x0A	Pan	0-127	MSB	Do Not Set
11	0x0B	Expression Controller	0-127	MSB	127
12	0x0C	Effect Control 1	0-127	MSB	0
13	0x0D	Effect Control 2	0-127	MSB	0
14	0x0E	Undefined	0-127	MSB	Device Specific
15	0x0F	Undefined	0-127	MSB	Device Specific
16	0x10	General Purpose Controller 1	0-127	MSB	Device Specific
17	0x11	General Purpose Controller 2	0-127	MSB	Device Specific
18	0x12	General Purpose Controller 3	0-127	MSB	Device Specific
19	0x13	General Purpose Controller 4	0-127	MSB	Device Specific

20	0x14	Undefined	0-127	MSB	Device Specific
21	0x15	Undefined	0-127	MSB	Device Specific
22	0x16	Undefined	0-127	MSB	Device Specific
23	0x17	Undefined	0-127	MSB	Device Specific
24	0x18	Undefined	0-127	MSB	Device Specific
25	0x19	Undefined	0-127	MSB	Device Specific
26	0x1A	Undefined	0-127	MSB	Device Specific
27	0x1B	Undefined	0-127	MSB	Device Specific
28	0x1C	Undefined	0-127	MSB	Device Specific
29	0x1D	Undefined	0-127	MSB	Device Specific
30	0x1E	Undefined	0-127	MSB	Device Specific
31	0x1F	Undefined	0-127	MSB	Device Specific
32	0x20	LSB for Control 0 (Bank Select)	0-127	LSB	Do Not Set
33	0x21	LSB for Control 1 (Modulation Wheel or Lever)	0-127	LSB	0
34	0x22	LSB for Control 2 (Breath Controller)	0-127	LSB	0
35	0x23	LSB for Control 3 (Undefined)	0-127	LSB	Device Specific
36	0x24	LSB for Control 4 (Foot Controller)	0-127	LSB	0
37	0x25	LSB for Control 5 (Portamento Time)	0-127	LSB	0
38	0x26	LSB for Control 6 (Data Entry)	0-127	LSB	Do Not Set
39	0x27	LSB for Control 7 (Channel Volume, formerly Main Volume)	0-127	LSB	Do Not Set
40	0x28	LSB for Control 8 (Balance)	0-127	LSB	64

41	0x29	LSB for Control 9 (Undefined)	0-127	LSB	Device Specific
42	0x2A	LSB for Control 10 (Pan)	0-127	LSB	Do Not Set
43	0x2B	LSB for Control 11 (Expression Controller)	0-127	LSB	127
44	0x2C	LSB for Control 12 (Effect control 1)	0-127	LSB	0
45	0x2D	LSB for Control 13 (Effect control 2)	0-127	LSB	0
46	0x2E	LSB for Control 14 (Undefined)	0-127	LSB	Device Specific
47	0x2F	LSB for Control 15 (Undefined)	0-127	LSB	Device Specific
48	0x30	LSB for Control 16 (General Purpose Controller 1)	0-127	LSB	Device Specific
49	0x31	LSB for Control 17 (General Purpose Controller 2)	0-127	LSB	Device Specific
50	0x32	LSB for Control 18 (General Purpose Controller 3)	0-127	LSB	Device Specific
51	0x33	LSB for Control 19 (General Purpose Controller 4)	0-127	LSB	Device Specific
52	0x34	LSB for Control 20 (Undefined)	0-127	LSB	Device Specific
53	0x35	LSB for Control 21 (Undefined)	0-127	LSB	Device Specific
54	0x36	LSB for Control 22 (Undefined)	0-127	LSB	Device Specific
55	0x37	LSB for Control 23 (Undefined)	0-127	LSB	Device Specific
56	0x38	LSB for Control 24 (Undefined)	0-127	LSB	Device Specific
57	0x39	LSB for Control 25 (Undefined)	0-127	LSB	Device Specific
58	0x3A	LSB for Control 26 (Undefined)	0-127	LSB	Device Specific
59	0x3B	LSB for Control 27 (Undefined)	0-127	LSB	Device Specific
60	0x3C	LSB for Control 28 (Undefined)	0-127	LSB	Device Specific

61	0x3D	LSB for Control 29 (Undefined)	0-127	LSB	Device Specific
62	0x3E	LSB for Control 30 (Undefined)	0-127	LSB	Device Specific
63	0x3F	LSB for Control 31 (Undefined)	0-127	LSB	Device Specific
64	0x40	Damper Pedal on/off (Sustain)	≤63 off ≥64 on	---	0
65	0x41	Portamento On/Off	≤63 off ≥64 on	---	0
66	0x42	Sostenuto On/Off	≤63 off ≥64 on	---	0
67	0x43	Soft Pedal On/Off	≤63 off ≥64 on	---	0
68	0x44	Legato Footswitch	≤63 Normal ≥64 Legato	---	0
69	0x45	Hold 2	≤63 off ≥64 on	---	0
70	0x46	Sound Controller 1 (default: Sound Variation)	0-127	LSB	Do Not Set
71	47	Sound Controller 2 (default: Timbre/Harmonic Intens.)	0-127	LSB	Do Not Set
72	48	Sound Controller 3 (default: Release Time)	0-127	LSB	Do Not Set
73	49	Sound Controller 4 (default: Attack Time)	0-127	LSB	Do Not Set
74	4A	Sound Controller 5 (default: Brightness)	0-127	LSB	Do Not Set
75	4B	Sound Controller 6 (default: Decay Time - see MMA RP-021)	0-127	LSB	Do Not Set
76	4C	Sound Controller 7 (default: Vibrato Rate - see MMA RP-021)	0-127	LSB	Do Not Set
77	4D	Sound Controller 8 (default: Vibrato Depth - see MMA RP-021)	0-127	LSB	Do Not Set
78	4E	Sound Controller 9 (default: Vibrato Delay - see MMA RP-021)	0-127	LSB	Do Not Set
79	4F	Sound Controller 10 (default undefined - see MMA RP-021)	0-127	LSB	Do Not Set

80	50	General Purpose Controller 5	0-127	LSB	Device Specific
81	51	General Purpose Controller 6	0-127	LSB	Device Specific
82	52	General Purpose Controller 7	0-127	LSB	Device Specific
83	53	General Purpose Controller 8	0-127	LSB	Device Specific
84	54	Portamento Control	0-127	LSB	Do Not Set
85	55	Undefined	---	---	Device Specific
86	56	Undefined	---	---	Device Specific
87	57	Undefined	---	---	Device Specific
88	58	High Resolution Velocity Prefix	0-127	LSB	Do Not Set
89	59	Undefined	---	---	Device Specific
90	5A	Undefined	---	---	Device Specific
91	5B	Effects 1 Depth (default: Reverb Send Level - see MMA RP-023) (formerly External Effects Depth)	0-127	---	Do Not Set
92	5C	Effects 2 Depth (formerly Tremolo Depth)	0-127	---	Do Not Set
93	5D	Effects 3 Depth (default: Chorus Send Level - see MMA RP-023) (formerly Chorus Depth)	0-127	---	Do Not Set
94	5E	Effects 4 Depth (formerly Celeste [Detune] Depth)	0-127	---	Do Not Set
95	5F	Effects 5 Depth (formerly Phaser Depth)	0-127	---	Do Not Set
96	60	Data Increment (Data Entry +1) (see MMA RP-018)	N/A	---	Do Not Set
97	61	Data Decrement (Data Entry -1) (see MMA RP-018)	N/A	---	Do Not Set
98	62	Non-Registered Parameter Number (NRPN) - LSB	0-127	LSB	127
99	63	Non-Registered Parameter Number (NRPN) - MSB	0-127	MSB	127

100	64	Registered Parameter Number (RPN) - LSB*	0-127	LSB	127
101	65	Registered Parameter Number (RPN) - MSB*	0-127	MSB	127
102	66	Undefined	---	---	Device Specific
103	67	Undefined	---	---	Device Specific
104	68	Undefined	---	---	Device Specific
105	69	Undefined	---	---	Device Specific
106	6A	Undefined	---	---	Device Specific
107	6B	Undefined	---	---	Device Specific
108	6C	Undefined	---	---	Device Specific
109	6D	Undefined	---	---	Device Specific
110	6E	Undefined	---	---	Device Specific
111	6F	Undefined	---	---	Device Specific
112	70	Undefined	---	---	Device Specific
113	71	Undefined	---	---	Device Specific
114	72	Undefined	---	---	Device Specific
115	73	Undefined	---	---	Device Specific
116	74	Undefined	---	---	Device Specific
117	75	Undefined	---	---	Device Specific
118	76	Undefined	---	---	Device Specific
119	77	Undefined	---	---	Device Specific

120	78	[Channel Mode Message] All Sound Off	0	---	Do Not Set
121	79	[Channel Mode Message] Reset All Controllers (See MMA RP-015)	0	---	Do Not Set
122	7A	[Channel Mode Message] Local Control On/Off	0 off, 127 on	---	Do Not Set
123	7B	[Channel Mode Message] All Notes Off	0	---	Do Not Set
124	7C	[Channel Mode Message] Omni Mode Off (+ all notes off)	0	---	Do Not Set
125	7D	[Channel Mode Message] Omni Mode On (+ all notes off)	0	---	Do Not Set
126	7E	[Channel Mode Message] Mono Mode On (+ poly off, + all notes off)	Note: This equals the number of channels, or zero if the number of channels equals the number of voices in the receiver.	---	Do Not Set
127	7F	[Channel Mode Message] Poly Mode On (+ mono off, +all notes off)	0	---	Do Not Set

Note: Default Control Change Mapping Profile Devices may use "Undefined" Controllers for any device-specific purpose without invalidating the Profile.

Note: When Value to be Set by Reset All Controllers is defined as "Device Specific", the Default Control Change Mapping Profile Device should use it's own default value for that Control Change or the Device may choose to ignore Reset All Controllers for that Control Change.

Appendix B. Recommended Response to Control Change Messages

The following are optional recommendations, outlining responses to some common Control Change messages.

1. Bank Select Control Change (cc#0/32)

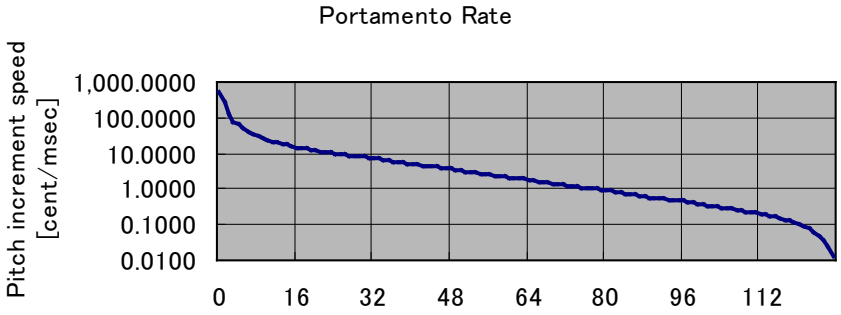
The Bank Select message shall not affect any change in sound until a subsequent Program Change message is received.

2. Portamento Time Control Change (cc#5/37)

Default Value: 0

Sets the pitch increment speed for the specified Channel when Portamento (cc#65) is on.

Pitch increment rate varies according to the recommended example shown below.



3. Channel Volume Control Change (cc#07/39)

Default Value: 100 (64H)

If the device creates a sound, the device should respond to CC #07. This controller controls the volume of all sounds on the specified MIDI Channel and thus the relative volume balance among the Channels.

Regarding the curve of volume change messages, the square of the value is proportional to the volume.

CC#7	Amplitude	Proportional To:
127	0 dB	127 x 127 = 16129
96	-4.9 dB	96 x 96 = 9216

64	-11.9 dB	64 x 64 = 4096
32	-23.9 dB	32 x 32 = 1024
16	-36.0 dB	16 x 16 = 256
0	-infinity	0 x 0x = 0

The formula used is: gain in dB = 40 * $\log_{10}$(CC7/127)

Note: The total Channel volume is not always determined only by Volume Control Change. The total volume may be dependent on Expression (cc#11), as well as the MIDI Master Volume Universal SysEx message which is used to set the overall volume of all Channels if the device supports those messages.

4. Pan Control Change (cc#10/42)

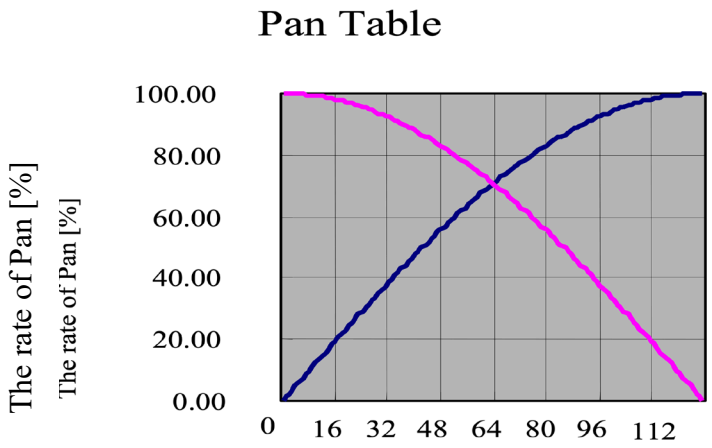
Default Value: 64 (center) (40H)

Sets the stereo position of the specified Channel.

This message will pan a sound anywhere in the stereo field from hard left (value = 0, 00H) to hard right (value = 127, 7FH).

It is not necessary to pan a Note that is currently sounding. However, if a currently sounding Note is panned, the panning shall be done without audible artifacts or clicks—no "zipper" noise.

A recommended example of the Pan curve is shown below:



The following formulas are recommended (see AMEI/MMA RP-037 for details):

Left Channel Gain [dB] = 20*log (cos (Pi/2* max(0,CC#10 - 1)/126)

Right Channel Gain [dB] = 20*log (sin (Pi /2* max(0,CC#10 - 1)/126)

5. Expression Control Change (cc#11/43)

Default Value: 127 (7FH)

Modifies the volume set by Channel Volume (cc#7) on the specified Channel. The resulting Channel volume is dependent on Volume (cc#7), Expression (cc#11), as well as the MIDI Master Volume Universal SysEx message that is used to set the overall volume of *all* Channels.

Note: Expression (cc#11) and Channel Volume (cc#7) are used for different purposes. Channel Volume (cc#7) should be used to set the overall volume of the Channel prior to music data playback as well as for mixdown fader-style movements, while Expression (cc#11) should be used during music data playback to attenuate the programmed MIDI volume (cc#7) data, thus creating diminuendos and crescendos. This enables a listener, after the fact, to adjust the relative mix of instruments without destroying the dynamic expression of that instrument.

In the curve of volume changes responding to the Expression value, the square of the value is proportional to the volume. An example of the amplitude relationship between volume and expression is shown below.

Examples:

CC#7	**CC#11**	**Amplitude**
127	127	0 dB
96	127	-4.9 dB
64	127	-11.9 dB
32	127	-23.9 dB
16	127	-36.0 dB
0	127	-infinity

CC#7	**CC#11**	**Amplitude**
127	96	-4.9 dB
127	64	-11.9 dB
127	32	-23.9 dB
127	0	-infinity
64	64	-23.8 dB
32	96	-28.8 dB

The formula used is: Gain in dB = $(40 * \log_{10}(cc7/127)) + (40 * \log_{10}(cc11/127))$

6. Hold1 (Damper or Sustain) Control Change (cc#64)

Default Value: 0 (OFF)

Turns Damper ON or OFF for the specified Channel. (Also known as “sustain pedal”.) Damper values between 0 and 63 are recognized as OFF, and values between 64 and 127 are recognized as ON (except if used as continuous or Half Pedal, below).

Default Control Change Mapping Profile Devices may also respond to Hold1 as a continuous controller. On a piano this is typically used for "Half Pedal" effects. A Damper pedal may send continuous values between minimum and maximum instead of just On/Off values sent by most typical momentary sustain pedals.

Default Control Change Mapping Profile Devices may also respond to re-damper (as in when a Damper pedal is stepped on immediately AFTER piano keys are released). This is typically used for pianos but some other devices or timbres may implement this function.

Response to the Damper controller should be similar to the behavior of the Damper foot pedal on a traditional piano. In terms of a traditional ADSR envelope, the Damper controller response shall be as follows:

- When a Note-Off (or a Note-On with a velocity of 0) is received and the Damper is ON, the Note-Off shall be deferred (ignored for now). When the Damper transitions from ON to OFF, any notes which have deferred Note-Offs should now respond to the note off, and the amplitude envelope should enter the Release stage, from wherever it was.

- When the Damper transitions from OFF to ON, notes currently sounding shall be unaffected. If the level of a note that has been released (either from a Note-Off, a Note-On with a velocity of 0, or from a Damper ON to OFF) is greater than the envelope Sustain level, the device should switch back to the Decay or Sustain portion of the envelope. If the note's current level is not greater than the Sustain level, the Damper's transition should be ignored.

- So, for example, an Organ note, having received a note-off followed by a Damper ON, will not be "caught" by the damper. A piano note, however, with its Sustain level of zero, would be "caught."

7. Portamento ON/OFF (cc#65)

Default Value: 0 (OFF)

Turns the Portamento effect ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

8. Sostenuto (cc#66)

Default Value: 0 (OFF)

Turns Sostenuto ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

Sostenuto is similar to Damper. It acts as a latch for currently held notes (those without any note-off message). When Sostenuto transitions from OFF to ON, notes already held won't be released until the later of a) when the note receives a note-off, or b) when Sostenuto transitions from ON to OFF. However, notes which are played (receive note-on message) while Sostenuto remains ON are unaffected.

9. Legato (cc#68)

Default Value: 0 (OFF)

Turns the Legato effect ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

Revision History

Date	Version	Changes
Nov. 26, 2020	1.0	Initial Version

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