

PX-320 MIDI Implementation

CASIO COMPUTER CO., LTD.

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Part I

MIDI Message Overview

1 Product Configuration as a MIDI Device

As a MIDI device, the instrument consists of the System Section, Performance Controller Section, and Sound Generator Section described below. Each of these sections can send and receive specific MIDI Messages in accordance with its function.

- System Section
 - Device Settings
- Sound Generator Section
 - Common
 - * Sound Generator Common Block
 - * System Effect Block
 - * Master Effect Block (Brilliance Function)
 - * Mixer Master Block
 - Channel Independent
 - * Instrument Parts
 - * Insertion Effect Block
 - * Mixer Channel Independent Block
- Performance Controller Section
 - Keyboard
 - Pedal and other real-time controllers
 - Auto Accompaniment and Auto Accompaniment function

1.1 System Section

The System Section is divided between a sound generator and functions that are not directly related to Instrument play. In addition to manipulating Instrument setting parameters, this section is also used to exchange commands and information. For example, parameters can be initialized upon receipt of a System Section MIDI message, and memory use information can be sent.

1.2 Performance Controller Section

The Performance Controller Section consists of the keyboard, pedal and other real-time controllers, as well as blocks that generate auto accompaniment, auto performance, and other performance information. An operation causes the corresponding message to be transmitted to the sound generator and to be sent from MIDI OUT. The channel number of the sent message is in accordance with Instrument's part number.

1.3 Auto Accompaniment and Auto Performance MIDI Send

This document includes information for each type of information that describes what operation causes the message to be sent. However, since there are so many messages sent by an auto accompaniment or auto performance operation, those messages are not covered herein.

1.4 Sound Generator Section

The Sound Generator Section consists of a common part that does not depend on the channel and a part that specific to each channel. Mainly it receives performance information and performs operations.

1.4.1 Sound Generator Common Block

The common section consists of a sound generator setting blocks that do not depend on the sound generator part, such as system effects, mixer master control, etc. These can be controlled by system exclusive messages that are basically exclusive to this particular instrument, but several parameters also can be controlled by general universal system exclusive messages.

1.4.2 Part Block

The parts of the sound generator can be operated and their settings can be changed with Instrument-specific system exclusive messages and channel messages. This function consists of 32 parts, but channel messages can control only Group B. The following table shows the fixed relationships between the part numbers and channel numbers of channel messages.

Part Number	Part Name	MIDI Channel	Assigned Function	Description
00	A01	01	Keyboard	Main (Right keyboard in the Duet Mode)
01	A02	02	Keyboard	Layered
02	A03	03	Keyboard	Split (Left keyboard in the Duet Mode)
03	A04	04	-	
04	A05	05	Sequencer playback	Keyboard track main
05	A06	06	Sequencer playback	Keyboard track layered
06	A07	07	Sequencer playback	Keyboard track split
07	A08	08	-	
08	A09	09	Metronome/Count	
09	A10	10	Accompaniment	Drums
10	A11	11	Accompaniment	Bass
11	A12	12	Accompaniment	Chords 1
12	A13	13	Accompaniment	Chords 2
13	A14	14	Accompaniment	Chords 3
14	A15	15	Sequencer playback	Solo track
15	A16	16	-	-
16	B01	01	MIDI/Music Library Channel01	
17	B02	02	MIDI/Music Library Channel02	
18	B03	03	MIDI/Music Library Channel03	Music Library left-hand data
19	B04	04	MIDI/Music Library Channel04	Music Library right-hand data
20	B05	05	MIDI/Music Library Channel05	
21	B06	06	MIDI/Music Library Channel06	
22	B07	07	MIDI/Music Library Channel07	
23	B08	08	MIDI/Music Library Channel08	
24	B09	09	MIDI/Music Library Channel09	
25	B10	10	MIDI/Music Library Channel10	
26	B11	11	MIDI/Music Library Channel11	
27	B12	12	MIDI/Music Library Channel12	

28	B13	13	MIDI/Music Library Channel13	
29	B14	14	MIDI/Music Library Channel14	
30	B15	15	MIDI/Music Library Channel15	
31	B16	16	MIDI/Music Library Channel16	

2 Conditions that Disable Message Send and Receive

All MIDI message send and receive is temporarily disabled while any one of the following processes is in progress.

- Demo data performance in progress
- Music Library data performance in progress
- SD memory card format in progress

3 Timbre Type Specific Operation

The operation that is performed for a received message depends on the current Timbre Type value (see "11.1 About the Timbre Type"), which is the operation mode of each sound generator part. Applicable information is provided in the explanations for each message.

Part II

Channel Message

4 Receive Channel

The channel number of the channel message received by each part is shown in the table under "1.4.2 Part Block". The channel number of a channel message that changes the settings of a DSP coincides with the channel of the part that is using the DSP.

5 Send Channel

Basically, the MIDI channel of the channel message sent when the Instrument is played coincides with the MIDI channel of the part being played. Note, however, that the MIDI channel of the performance information that corresponds to the keyboard main part is the Keyboard Channel setting value.

6 Note Off

Format

Message Format :	9nH kkH 00H (receive only) 8nH kkH **H
n :	MIDI Channel Number
kk :	Key Number
** :	Ignored

Send

Sent when something is played on the keyboard.

Receive

Received over MIDI channels that correspond to each part. A part that is turned off by the Part Enable Parameter value explained under "21.7 Part Parameter" is not received. The velocity value is ignored.

7 Note On

Format

Message Format :	9nH kkH vvH
n :	MIDI Channel Number
kk :	Key Number
vv :	Velocity

Send

Sent when something is played on the keyboard.

Receive

Received over MIDI channels that correspond to each part. A part that is turned off by the Part Enable Parameter value explained under "21.7 Part Parameter" is not received.

8 Polyphonic Key Pressure

Format

Message Format :	AnH kkH vvH
n :	MIDI Channel Number
kk :	Key Number
vv :	Pressure Value

Send Operation

This message is not sent by this Instrument.

Receive Operation

This message is not received by this Instrument.

9 Control Change

Format

Message Format :	BnH ccH vvH
n :	MIDI Channel Number
cc :	Control Number
vv :	Value

Send

Sent when the Instrument's pedal is operated or when Instrument settings are changed.

Receive

Receipt changes the Instrument mode or the corresponding parameter.

9.1 Bank Select (00H)

Format

Message Format :	BnH 00H vvH (MSB) BnH 20H **H (LSB)
n :	MIDI Channel Number
vv :	Value
** :	Ignored

Send

Sent when a tone is selected. See the Tone List in the Instrument's User's Guide for details.

Receive

Receipt causes a change in the tone bank number stored in Instrument memory, but the tone is not actually changed until a Program Change message is received.

For details, see "11 Program Change" in this document, and the Tone List in the Instrument's User's Guide.

9.2 Modulation (01H)

Format

Message Format :	BnH 01H vvH
n :	MIDI Channel Number
vv :	Value

Send

This message is not sent by this Instrument.

Receive

Receipt adds, to the tone being sounded, modulation of a depth specified by the value. In the case of a tone that already has modulation applied, receipt of this message increases the modulation depth. The modulation effect differs according to the tone being used.

9.3 Data Entry (06H,26H)

Format

Message Format :	BnH 06H vvH (MSB) BnH 26H vvH (LSB)
n :	MIDI Channel Number
vv :	Value

Send

This message is not sent by this Instrument.

Receive

Receipt changes the parameter assigned to RPN. This Instrument does not have a parameter that corresponds to NRPN.

9.4 Volume (07H)

Format

Message Format :	BnH 07H vvH
n :	MIDI Channel Number
vv :	Value

Send

Sent when metronome volume or layer balance is adjusted.

Receive

Receipt changes the volume of the corresponding part.

9.5 Pan (0AH)

Format

Message Format :	BnH 0AH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.5 Pan Setting Value Table" in "Part VIII Setting Values and Send/Receive Values".

Send

This message is sent at initialization.

Receive

Receipt changes the pan setting of the corresponding part.

9.6 Expression (0BH)

Format

Message Format :	BnH 0BH vvH
n :	MIDI Channel Number
vv :	Value

Send

Sent when there is a change in the Expression value by an accompaniment function.

Receive

Receipt changes the Expression value.

9.7 General Use Controllers 1 through 8 (10H through 13H, 50H through 53H)

These messages are used to control DSP operation.

Format

Message Format :	BnH 10H vvH BnH 11H vvH BnH 12H vvH BnH 13H vvH BnH 50H vvH BnH 51H vvH BnH 52H vvH BnH 53H vvH	DSP Parameter7 [0] DSP Parameter7 [1] DSP Parameter7 [2] DSP Parameter7 [3] DSP Parameter7 [4] DSP Parameter7 [5] DSP Parameter7 [6] DSP Parameter7 [7]
n :	MIDI Channel Number (Note1)	
vv :	Value	

Send

This message is not sent by this Instrument.

Receive

Receipt change the value of Parameter7 [0-7] (7-Bit Parameter) explained under "22.3 DSP Parameter".

Any message received that corresponds to the parameter of a number not being used by the currently selected DSP is ignored.

Note 1: Received values and parameter setting values

The range of the value of each DSP Parameter 7 array element depends on the selected DSP or array number. Unlike manipulation of a DSP parameter using a System Exclusive Message, a value received by this control change message is always a value from 0 to 127, but the value is changed in accordance with the setting range of the applicable parameter setting. Because of this, it is impossible for a value to be outside of the range of the applicable parameter setting. Conversion from the value received with the message to the parameter setting value is performed can be represented in general terms by the expression shown below.

$$ParameterSetting\ Value = ParameterMinimum\ Value + (ParameterMaximum\ Value - ParameterMinimum\ Value) \times \frac{Received\ Value}{127}$$

For details about Parameter 7 of each DSP, see the explanations under "VII DSP Parameter List".

9.8 Hold1 (40H)

Format

Message Format :	BnH 40H vvH
n :	MIDI Channel Number
vv :	Value

Send

Sent when a pedal that has a sustain (damper) function is operated.

Receive

Receipt performs an operation equivalent to a sustain (damper) pedal operation.

Timbre Type Specific Operation

This operation differs in accordance with the Timbre Type (see "11.1 About the Timbre Type") setting.

- Timbre Type: Melody
Sustain off/on control is performed in accordance with the value of the received message. For information about the relationship between setting values and send/receive values, see the "28.1 Off/On Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.
- Timbre Type: Piano
Continuous control of the piano tone decay rate and the decay rate of Acoustic Resonance effect resonance is performed in accordance with the value of the received message.
- Timbre Type: Drum
The received message does not affect sound source operation.

Acoustic Resonance

When a part that is using Acoustic Resonance receives this message, the resonance characteristics of Acoustic Resonance are continually altered in accordance with the message value.

9.9 Sostenuto (42H)

Format

Message Format :	BnH 42H vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see the "28.1 Off/On Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

Sent when a pedal that has a sostenuto function is operated.

Receive

Receipt performs an operation equivalent to a sostenuto pedal operation.

9.10 Soft (43H)**Format**

Message Format :	BnH 43H vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see the "28.1 Off/On Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

Sent when a pedal that has a soft function is operated.

Receive

Receipt performs an operation equivalent to a soft pedal operation.

9.11 Vibrato Rate (4CH)**Format**

Message Format :	BnH 4CH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.4 -64 - 0 - 63 Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

This message is not sent by this Instrument.

Receive

Receipt changes the vibrato rate of the tone that is currently selected by the applicable part.

9.12 Vibrato Depth (4DH)**Format**

Message Format :	BnH 4DH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.4 -64 - 0 - 63 Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

This message is not sent by this Instrument.

Receive

Receipt changes the vibrato auto depth of the tone that is currently selected by the applicable part.

9.13 Vibrato Delay (4EH)**Format**

Message Format :	BnH 4EH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.4 -64 - 0 - 63 Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

This message is not sent by this Instrument.

Receive

Receipt changes the vibrato auto delay of the tone that is currently selected by the applicable part.

9.14 Reverb Send (5BH)**Format**

Message Format :	BnH 5BH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

Sent when a GM tone is selected.

Receive

Changes Reverb Send.

9.15 Chorus Send (5DH)**Format**

Message Format :	BnH 5DH vvH
n :	MIDI Channel Number
vv :	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is sent at initialization, when the panel tone selection is changed, and when a chorus on/off operation is performed.

Receive

Changes Chorus Send.

9.16 NRPN (62H,63H)**Format**

Message Format :	BnH 62H vvH (LSB) BnH 63H vvH (MSB)
n :	MIDI Channel Number
vv :	Value

Send

This message is not sent by this Instrument.

Receive

This Instrument does not have a corresponding NRPN message.

9.17 RPN (64H,65H)**Format**

Message Format :	BnH 64H vvH (LSB) BnH 65H vvH (MSB)
n :	MIDI Channel Number
vv :	Value

9.17.1 Pitch Bend Sensitivity**Format**

Message Format :	BnH 64H 00H 65H 00H 06H mmH 26H **H
n :	MIDI Channel Number
mm :	Value 0 - 24
** :	Ignored

Send

This message is not sent by this Instrument.

Receive

Receipt changes Pitch Bend Sensitivity.

9.17.2 Fine Tune

Format

Message Format :	BnH 64H 01H 65H 00H 06H mmH 26H 11H
n :	MIDI Channel Number
mm :	Value MSB
ll :	Value LSB

Send

This message is not sent by this Instrument.

Receive

Receipt changes Channel Fine Tune.

9.17.3 Coarse Tune

Format

Message Format :	BnH 64H 02H 65H 00H 06H mmH 26H 00H
n :	MIDI Channel Number
mm :	Value

Send

This message is not sent by this Instrument.

Receive

Receipt changes Channel Coarse Tune.

9.17.4 Modulation Depth

Format

Message Format :	BnH 64H 05H 65H 00H 06H mmH 26H 00H
n :	MIDI Channel Number
mm :	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the vibrato modulation depth of the tone that is currently selected by the applicable part.

9.17.5 Null

Format

Message Format :	BnH 64H 7FH 65H 7F
n :	MIDI Channel Number

Send

This message is never sent.

Receive

Receipt deselects RPN.

9.18 All Sound Off (78H)**Format**

Message Format :	BnH 78H 00H
n :	MIDI Channel Number

Send

Sent when an SD memory card is inserted or removed, or when a memory card operation is performed.

Receive

Receipt stops all voices that are sounding.

9.19 Reset All Controllers (79H)**Format**

Message Format :	BnH 79H 00H
n :	MIDI Channel Number

Send

This message is sent when the keyboard channel is changed and when the recorder function is used.

Receive

Receipt initializes each performance controller.

10 Mode Message**10.1 All Notes Off (7BH)****Format**

Message Format :	BnH 7BH 00H
n :	MIDI Channel Number

Send

This message is sent when a Music Library or recorder operation is performed.

Receive

Receipt of any of this message releases the currently sounding voice (same as releasing the keyboard key).

10.2 Omni Off (7CH)

Format

Message Format :	BnH 7CH 00H
n :	MIDI Channel Number

Send

This message is never sent.

Receive

Receipt of any of this message releases the currently sounding voice (same as releasing the keyboard key).

10.3 Omni On (7DH)

Format

Message Format :	BnH 7DH 00H
n :	MIDI Channel Number

Send

This message is never sent.

Receive

Receipt of this message releases the currently sounding voice (same as releasing the keyboard key).

10.4 Mono (7EH)

Format

Message Format :	BnH 7EH 00H
n :	MIDI Channel Number

Send

This message is never sent.

Receive

Receipt of this message stops the currently sounding voice.

10.5 Poly (7FH)

Format

Message Format :	BnH 7FH 00H
n :	MIDI Channel Number

Send

This message is never sent.

Receive

Receipt of this message stops the currently sounding voice.

11 Program Change

Format

Message Format :	CnH ppH
n :	MIDI Channel Number
pp :	Program Number

Send

Sent when a tone is selected. See the "Tone List" of the Instrument's User's Guide for details about program numbers.

Receive

Receipt of this message changes the tone of the part that corresponds to the MIDI channel.

The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message. See the Tone List in the Instrument's User's Guide for information about actually selecting tones, etc. Also note that receipt of this message may also change the Timbre Type parameter at the same time. For more information, see "11.1 About the Timbre Type" below.

11.1 About the Timbre Type

The tone selected by each part of this Instrument has a "Timbre Type" parameter that specifies the type of sound source for the tone. As explained under "22.1 Basic Parameters", there are three Timbre Type settings: Melody, Piano, and Drum. The following explains how each of these operates.

- Timbre Type: Melody
This timbre type optimizes for normal melody tones. It performs damper pedal on/off operation.
- Timbre Type: Piano
This setting optimizes for piano tones. The decay rate of the voice being sounded and Acoustic Resonance effect characteristics are continually altered in accordance with the damper pedal position.
- Timbre Type: Drum
This setting optimizes for drum sounds. The damper pedal does not function.

11.2 DSP Assignments During Tone Selection

11.2.1 DSP Line Structure

Though the Instrument has four DSP lines that can be used simultaneously, selecting a tone that uses DSP causes the required number of DSP lines to become reserved so the tone is configured with the requisite DSP.

Tones listed under "26.1 Monaural Tone DSP" use only one DSP line, while the tones under "26.2 Stereo Tone DSP" use two DSP lines.

For information about tones that use DSP, see "25 Tone with DSP List".

11.2.2 DSP Line Assignment

Selecting multiple tones with DSP at the same time creates the possibility that there will not be enough DSP lines. In this case, the last selected tone with DSP is given priority. Some DSP line(s) already being used will be released so they can be assigned to the last selected tone.

11.2.3 Use of the Same DSP Line by Multiple Parts

When multiple parts that select tones that use DSP and all of the following settings are the same, the same DSP line is assigned to all of the parts in order to maximize DSP line availability.

- Tone Number
- Part Volume
- Part Pan
- All DSP parameters

After the same DSP line is assigned to different parts as described here, Part Volume, Pan, Reverb Send, Chorus Send, Acoustic Resonance Send, and all DSP parameter settings are common to all parts. Note that changing the settings on any part will also affect all of the other parts that are sharing the DSP line. To assign the parts to a different DSP line, you need to change one of the parameters listed above before selecting the tone.

12 Channel Aftertouch

Format

Message Format :	DnH vvH
n :	MIDI Channel Number
vv :	Value

Send

These messages are never sent.

Receive

Receipt of this message adds modulation to the voice that is sounding. The modulation effect differs according to the tone being used.

13 Pitch Bend

Format

Message Format :	EnH llH mmH
n :	MIDI Channel Number
ll :	Value LSB
mm :	Value MSB

Send

These messages are never sent.

Receive

Receipt changes the pitch of the currently sounding note. The change depends on the pitch bend sensitivity configured with RPN.

Part III

System Messages

14 Active Sensing

Format

Message Format:	FEH
-----------------	-----

Send

This message is never sent.

Receive

Once this message is received, the Active Sensing mode is entered. If no MIDI message is received for a specified amount of time, voices being sounded by the Instrument's sound source are released, the controller is reset, and the Active Sensing mode is exited.

15 System Exclusive Message

Format

Message Format:	F0H . . . F7H
-----------------	---------------

The Instrument sends and receives standard universal system exclusive messages, and system exclusive messages that have Instrument-specific formats.

15.1 Universal Realtime System Exclusive Message

Format

Message Format:	F0H 7FH . . . F7H
-----------------	-------------------

15.1.1 Master Volume

Format

Message Format:	F0H 7FH 7FH 04H 01H 11H mmH F7H
ll:	Value LSB (Note1)
mm:	Value MSB (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the Master Volume parameter. Note that the Master Volume parameter cannot be changed with an Instrument operation.

15.1.2 Master Balance

Format

Message Format :	F0H 7FH 7FH 04H 02H 11H mmH F7H
ll :	Value LSB (Note1)
mm :	Value MSB (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.5 Pan Setting Value Table" in "Part VIII Setting Values and Send/Receive Values".

Send

This message is never sent.

Receive

Receipt changes the Master Pan parameter. Note that the Master Pan parameter cannot be changed with an Instrument operation.

15.1.3 Master Fine Tuning

Format

Message Format :	F0H 7FH 7FH 04H 03H 11H mmH F7H
mm :	Value MSB (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.6 -100 - 0 - 99 Setting Value Table" in "Part VIII Setting Values and Send/Receive Values" of this document.

Send

This message is sent when the tuning setting is changed.

Receive

Receipt changes the Fine Tune parameter.

Acoustic Resonance Actions

Acoustic Resonance acoustic characteristics also alter Fine Tune of the strings that simulate resonance in accordance with the Master Fine Tune value. Because of this, receipt of this message may cause the resonance interval to change temporarily.

15.1.4 Master Coarse Tuning

Format

Message Format :	F0H 7FH 7FH 04H 04H 00H mmH F7H
ll :	Value LSB
mm :	Value MSB

Send

Sent when Transpose is changed.

Receive

Receipt changes the Transpose parameter.

15.1.5 Reverb Parameter

Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 01H ppH vvH F7H
pp :	Parameter
vv :	Value

Type Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 01H 00H vvH F7H
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.7 Reverb Type Setting Value Table" in "Part VIII Setting Values and Send/Receive Values".

Send

This message is sent when the System Reverb Type setting is changed.

Receive

Receipt changes the Reverb Type parameter.

Time Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 01H 01H vvH F7H
vv :	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the Reverb Time parameter.

15.1.6 Chorus Parameter

Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H ppH vvH F7H
pp :	Parameter
vv :	Value

Type Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 00H vvH F7H
vv :	Value (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see "28.8 Chorus Type Setting Value Table" in "Part VIII Setting Values and Send/Receive Values".

Send

This message is sent when the System Chorus Type setting is changed.

Receive

Receipt changes the System Chorus Type parameter.

Rate Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 01H vvH F7H
vv:	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the System Chorus Rate parameter.

Depth Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 02H vvH F7H
vv:	Value (Note1)

Note 1:

The setting value matches the value that is sent and received.

Send

This message is never sent.

Receive

Receipt changes the System Chorus Depth parameter.

Feedback Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 03H vvH F7H
vv:	Value (Note1)

Note 1:

The setting value is the same as the value that is sent.

Send

This message is never sent.

Receive

Receipt changes the System Chorus Feedback parameter.

Send To Reverb Format

Message Format :	F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 04H vvH F7H
vv:	Value (Note1)

Note 1:

The setting value is the same as the value that is sent.

Send

This message is never sent.

Receive

Receipt changes the Chorus Send To Reverb parameter.

15.1.7 GM System Message

GM System On Format

Message Format :	F0H 7EH 7FH 09H 01H F7H
------------------	-------------------------

Send

This message is never sent.

Receive

Receipt puts the sound source into a GM sound source mode.

GM System Off Format

Message Format :	F0H 7EH 7FH 09H 02H F7H
------------------	-------------------------

Send

This message is never sent.

Receive

Receipt returns the Instrument's sound source to its power on default settings.

GM2 System On Format

Message Format :	F0H 7EH 7FH 09H 03H F7H
------------------	-------------------------

Send

This message is never sent.

Receive

Though the Instrument does not support GM2, receipt of the GM2 System On message has the same result as receipt of the GM System On message.

15.1.8 GS Message

Message Format :	F0H 41H ddH 42H 12H 40H 00H 7FH 00H 41H F7H
Note:	dd (Device ID) is ignored.

Send

This message is never sent.

Receive

Receipt performs the same operation as when the GM System On message is received.

15.2 Instrument-Specific System Exclusive Message**Format**

Message Format:	F0H 44H 12H 01H...F7H
-----------------	-----------------------

Most Instrument parameters and user data, and some operation commands can be controlled using this message.

For more information, see "Part IV Instrument-Specific System Exclusive Messages".

Part IV

Instrument-Specific System Exclusive Messages

16 Format

16.1 Message Classifications

The SysEx operation of this Instrument is basically a parameter data transfer operation. The following operations can be performed from an external device using this parameter transfer message.

- Change of a specific Instrument parameter value
- Batch change of multiple Instrument parameter values
- Import of a specific Instrument parameter value
- Batch import of multiple Instrument parameter values

Parameters can be used for more than just device setting values. There are parameters when writing data that operate as commands, and parameters when reading data that indicate the status of the Instrument. The following table shows the parameter category for each type of transfer.

Function Section	Parameter Category	Description
System	System	Commands, Instrument status
	Setup	Instrument basic settings
Sound Generator	Patch	Sound source common settings (system effects, master settings, etc.) Sound source part settings (tone selection, mixing, tuning, etc.)
	Tone	Tone parameter, DSP settings
Music Player	Music Library	User song data

16.2 Basic Message Structure

Instrument-specific system exclusive message operation can be broadly divided between two methods: Individual Parameter Transfer (single parameter send/receive) and Bulk Parameter Set Transfer (batch parameter send/receive). Each method includes a number of different messages. The field in the SysEx message that specifies the message type is the action (act) field. The format of the "body" part of the message depends on the "act" value.

The table below shows the body format for each action of Instrument-specific system exclusive messages. An actual message consists of the items indicated by "Y", from left to right.

act	SX	MAN	MOD	dev	act	body (Depends on act)										EOX	
						cat	mem	pset	blk	pkt	prm	idx	len	data	img		sum
NOP	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	-	-	-	Y
IPR	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y	-	-	-	Y
IPS	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	-	-	Y
OBR	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
OBS	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	-	-	Y	-	Y	Y	Y
HBR	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
HBS	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	-	-	Y	-	Y	Y	Y
ACK	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
BSY	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
RJC	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
EOD	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
EOS	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y
ERR	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y

16.3 Format of Each Field

16.3.1 SX : System Exclusive Message Status

Format:	11110000B
---------	-----------

System Exclusive message Status = FOH

16.3.2 MAN : Manufacturer's ID

Format:	01000100B
---------	-----------

Manufacturer's ID = 44H (CASIO)

16.3.3 MOD : Model ID

Format:	00010101B (MSB)	00000001B (LSB)
---------	-----------------	-----------------

The Model ID of the series to which the Instrument belongs is shown by two consecutive bytes (MSB, LSB). (PX-200/PX-800/AP-500/PX-120/PX-720/PX-320 Model ID MSB = 15H, LSB = 01H)

16.3.4 dev : MIDI Device ID 00H-7FH

Format:	0dddddddB
---------	-----------

The contents of this field in a received message are compared with the Model's MIDI Device ID, and receipt of the incoming message is allowed only when the two IDs match. The default value for this field is 10H. When a message containing 7FH is received, receipt of the message is always allowed, regardless of the Instrument's ID setting.

MIDI Device ID is a Patch Parameter, and it can be changed with a System Exclusive Message. In this case, the Device ID of the MIDI System Exclusive Message must be set to 7FH before it is sent.

16.3.5 *act* : Action

Format:	0aaaaaaB
---------	----------

aaaaaaB = Action

This field indicates the operation of the Instrument-specific System Exclusive Message.

aaaaaaB	Action	Function
00H	NOP	No Operation
01H	IPR	Individual Parameter Request
02H	IPS	Individual Parameter Send
03H	OBR	Oneway Bulk Parameter Set Request
04H	OBS	Oneway Bulk Parameter Set Send
05H	HBR	Handshake Bulk Parameter Set Request
06H	HBS	Handshake Bulk Parameter Set Send
0AH	ACK	Acknowledge
0BH	BSY	Busy
0CH	RJC	Reject
0DH	EOD	End of Data
0EH	EOS	End of Session
0FH	ERR	Error

NOP: No Operation

No operation is performed when this action is received.

IPR: Individual Parameter Request

Indicates an individual parameter value send request message. When the Instrument receives this action, it uses an IPS message to return the specified parameter value.

IPS: Individual Parameter Send

Indicates an individual parameter value send message. When the Instrument receives this action, it rewrites the value specified by the data field with the specified parameter value.

OBR: Oneway Bulk Parameter Set Request

Indicates a send request message using parameter set image one-way mode. When the Instrument receives this action, it uses an OBS message to return the specified parameter set.

Though OBR is defined as a series common format, one-way mode transfer is not supported by this Instrument.

OBS: Oneway Bulk Parameter Set Send

Indicates a parameter set image send message using one-way mode. The parameter set to be transferred is divided into multiple packets when it is greater than a prescribed size. The packets are transferred at fixed intervals.

Though OBS is defined as a series common format, one-way mode transfer is not supported by this Instrument.

HBR: Handshake Bulk Parameter Set Request

Indicates a send request message using the parameter set image handshake mode. When the Instrument receives this action, it uses an HBS message to return the specified parameter set.

HBS: Handshake Bulk Parameter Set Send

Indicates a parameter set image send message using handshake mode. The parameter set to be transferred is divided into multiple packets when it is greater than a prescribed size. The packets are transferred in accordance with handshake mode.

ACK: Acknowledge

Indicates a message used by the receiver during parameter set handshake mode transfer to convey to the sender that it is ready for send of the next packet. The cat, mem, and pset fields indicate the value carried by the last received message.

BSY: Busy

Indicates a message to convey to the requester that the Instrument cannot send back data after a parameter set one-way mode or handshake mode send request is received. The cat, mem, and pset fields indicate the value carried by the last received message.

RJC: Reject

Indicates a message to convey to the other side that an ongoing parameter set one-way mode or handshake mode send or receive session was interrupted. The cat, mem, and pset fields indicate the value carried by the last received message.

EOD: End of Data

Indicates a message to convey to the receiver that a one-way mode or handshake mode serial packet transfer for sending a sub-session (one parameter set) is complete. The cat, mem, and pset fields indicate the value carried by the last received message.

EOS: End of Session

Indicates a message to convey to the receiver that a one-way mode or handshake mode serial parameter set transfer session send, which was launched by some operation, is complete. The cat, mem, and pset fields indicate the value carried by the last received message.

ERR: Error

Indicates a message to convey to the sender that the checksum or message format of the previous packet was not correct when receiving a parameter set with handshake mode. The cat, mem, and pset fields indicate the value carried by the last received message.

16.3.6 *cat* : Category

Format:	0ccccccB
---------	----------

0ccccccB = Category (7bit)

The category indicates the categories of data handled by the System Exclusive Message. The ID number (ID) of the Category is indicated on the left, while the communication operation (Action) is indicated on the right.

Category		Transfer		
ID (c)	Parameter Set	Individual Parameter	One Way Bulk	Handshake Bulk
00H	System	A	-	-
01H	Setup	A	-	A
02H	Patch	A	-	A
03H	Tone	A	-	A
21H	Music Library	F	-	A

A... Available (Also including when only some parameters are available.)

F... File Information (Not the data itself. Name, size, and other file information only.)

-... Not Available

16.3.7 *mem* : Memory Area ID

Format:	0mmmmmmB
---------	----------

Specifies the memory area that is the object of the parameter transfer. The following are defined for this Instrument.

Mem	Type
0	User area (rewriting allowed)
1	Preset area (rewriting not allowed)

16.3.8 *pset* : Parameter Set Number

Format:	OnnnnnnB (LSB)	0mmmmmmB (MSB)
---------	----------------	----------------

This field is a 2-byte (LSB, MSB) value indicating the number of the parameter set (mmmmmmnnnnnnB, Binary) being transferred.

16.3.9 *blk* : Block Number

This supplementary number specifies which block is the object when there are multiple blocks within the same parameter set.

Format:	0iiiiiiiB (LSB)	0jjjjjjB	0kkkkkkB (MSB)
---------	-----------------	----------	----------------

In the cases when there are multiple parameters in a category with the same ID (such as the mixer channel volume setting), for example, the block number required in order to specify the block where the data belongs is indicated as kkkkkkkjjjjjjiiiiiiB (Binary).

When the parameter block has a multi-dimensional array structure, bit 21 of the block number is divided into prescribed bit fields based on the rules explained below.

Block Bit Field Division

- Case 1
When an array has three or fewer nesting levels and the number of arrays in each dimension is 128 or less, they are assigned below the three 7-bit fields. Unused regions are filled will zeros.

Example:

parameter [A] [B] [C]

With a 3-dimensional array parameter that consists of A=8 (3 bits), B=5 (3 bits) and C=10 (4 bits), the block bit fields are allocated as: Block = 0000aaa 000bbb ccccccc (Binary).

- Case 2
When Case 1 conditions are not satisfied, the minimal number of fields required for each number of arrays is reserved from the lower bit of the block. Unused regions are filled will zeros.

Example 1:

parameter [A] [B] [C] [D]

With a 4-dimensional array parameter that consists of A=3 (2 bits), B=4 (2 bits), C=3 (2 bits) and D=4 (2 bits) like the one shown above, the block bit fields are allocated as: Block = 0000000 00000a abbccdd (Binary).

Example 2:

parameter [A] [B]

A=3 (2 bits), B=200 (8 bits)

With a 2-dimensional array parameter like the one shown above, the block bit fields are allocated as: Block = 0000000 000aab bbbbbbb (Binary).

16.3.10 *pkt* : Packet Number

Format:	0iiiiiiiB (LSB)	0jjjjjjjB	0kkkkkkkB (MSB)
---------	-----------------	-----------	-----------------

This is the divided packet number kkkkkkkkjjjjjjjiiiiiiB (Binary) for transferring a single parameter set.

16.3.11 *prm* : Parameter ID

Format:	0pppppppB (LSB)	0qqqqqqqB (MSB)
---------	-----------------	-----------------

The Parameter ID indicates the parameter type. When transferring parameters (see "Part V Parameter List" below) individually (as opposed to bulk transfer), this field is used to identify the parameter being transferred by its parameter ID.

16.3.12 *idx* : Data Index Number

Format:	0iiiiiiiB
---------	-----------

The data index number indicates the first array number of the array from which transfer starts.

16.3.13 *len* : Data Length

Format:	0lllllllB
---------	-----------

Data length indicates the transfer array length minus 1 for individual parameter transfer when the parameter contains a character string or other similar array structure.

In the case of bulk parameter set transfer, data length indicates the number of data words (16-bit data) included within a packet minus 1.

16.3.14 *data* : Parameter Data

Format:	0dddddddB	(0eeeeeeeB)	(0ffffffffB)	(0gggggggB)	(0hhhhhhhB)
		:	:		

Parameter data indicates the parameter value. Data that is the size of the number of arrays equivalent to *len* + 1 follows. For the structure of one data item, the length depends on the data bit width, as shown below.

dddddB + 1	Number of Data
1 - 7	1
8 - 14	2
15 - 21	3
22 - 28	4
29 - 32	5

Each block of data is packed from the lowest order byte first. In the case of multiple-byte data, the lowest weighted bit is the LSB of the first "data" block, and the highest weighted bit is the MSB of the final "data" block. The following shows an example of how data would be divided for transfer in the case of 32-bit data.

	7	6	5	4	3	2	1	0
data0:	0	[bit06]	[bit05]	[bit04]	[bit03]	[bit02]	[bit01]	[bit00]
data1:	0	[bit13]	[bit12]	[bit11]	[bit10]	[bit09]	[bit08]	[bit07]
data2:	0	[bit20]	[bit19]	[bit18]	[bit17]	[bit16]	[bit15]	[bit14]
data3:	0	[bit27]	[bit26]	[bit25]	[bit24]	[bit23]	[bit22]	[bit21]
data4:	0	0	0	0	[bit31]	[bit30]	[bit29]	[bit28]

16.3.15 *img* : Parameter Set Image

Format:	0dddddddB	0cccccccB	000000abB
---------	-----------	-----------	-----------

For a bulk data transfer operation, the parameter set data to be transferred is read sequentially in 16-bit units starting from the top address. Read values are divided into 3-byte segments as shown below, and then sent in sequence.

The following is the conversion format, which is the same as the individual parameter 16-bit transfer detailed above.

16-bit Memory Image

```

MSB: abccccccB
LSB: cdddddddB
    ↓
data0: 0dddddddB
data1: 0cccccccB
data2: 000000abB

```

Parameter Set Packet Division

The maximum image size of the parameter set that can be sent with one packet is 128 bytes. When data that exceeds 128 bytes is transferred, data is always divided into 128-byte units, except for the final packet. Because of this, the data in received packets can be stored in an area the size of $[Parameter\ Set\ Start\ Address] + [Packet\ Number] \times 128$.

The *img* length is the *img* length indicated by *len* multiplied by 3. This means that the data length is always a multiple of 3. Note, however, that a parameter set of 128 bytes or less can be sent using a single packet, and anything greater than 128 bytes is divided among multiple packets. This means that the maximum length "*data*" field is $128/2 \times 3 = 192$ bytes.

Only one parameter set can be transferred per session, and data from different parameter sets cannot be mixed within a single packet, even when sending multiple parameter sets. Different parameter sets are always divided into separate packets.

16.3.16 *sum* : Check Sum

Format:	0sssssssB
---------	-----------

In this case, this "*sum*" field contains a value, which, when added to the total value of the "*img*" field, makes the lower seven bits 0.

The receiving side checks if this is true, and performs error handling (re-request, etc.) if it is not.

16.3.17 EOX : End of System Exclusive Message

Format:	11110111B
---------	-----------

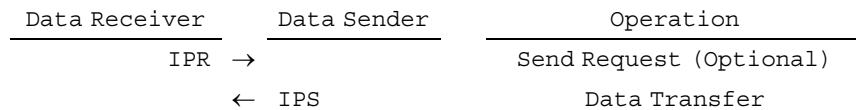
(End of System Exclusive message Status = F7H)

17 Individual Parameter Operations

There are two parameter unit operations: Individual Parameter Transfer and Individual Parameter Request.

For one session, in response to an IPR (Individual Parameter Request) from an external device, this Instrument returns an IPS (Individual Parameter Send) or the session is concluded when the external device or this Instrument spontaneously sends an IPS. If this Instrument received an IPS, the value of the applicable parameter is changed.

An Individual Parameter Send can also be used to issue some command to the Instrument, and the Individual Parameter Request can be used to check Instrument status information.



See "Part V Parameter List" for information about how parameters can actually be sent.

18 Parameter Set Transfer Modes

18.1 Communication Modes

18.1.1 One-way and Handshake

Parameter Sets can be transferred by bulk dump using the message exchange types described below.

- One-way mode Parameter Set send/receive
- One-way mode Parameter Set send request send/receive
- Handshake mode Parameter Set send/receive
- Handshake mode Parameter Set send request, receive rejected, error notification send/receive

With the one-way mode, the sending device sends data and ends the session without regard to the response of the receiving device. This mode is best for one-way transfers from a sequencer or similar device. With the handshake mode, the sending device sends the data and then waits for a response from the receiving device before advancing to the next session. This is a high-speed mode in which there is no time wasted waiting.

Important!

Though the one-way mode format is defined, there is no Parameter Set category that corresponds to this Model. This is because the time required to write to flash memory is indefinite, which makes it necessary to maintain a very long interval between packets and makes communication impossible for all practical purposes.

See "VI Parameter Set List" for information about how Parameter Sets are actually allocated. In order to ensure maximum speed for bulk dumping of Parameter Sets, the data format is different from the data format used for Individual Parameter Send. Data is transferred as-is, using the Model's memory image.

18.1.2 Session and Subsession

Subsession

One Parameter Set can be transferred per subsession. Subsession transfers one Parameter Set or data that is broken down into multiple packets for transfer, with EOD (End of Data) sent at the end to terminate the send.

Data is divided into multiple packets when a single Parameter Set is larger than a certain size. The Packet Number in the packet's *index* field is used to indicate the sequential position of a packet relative to the other packets. Even if Parameter Sets are small, they cannot be grouped together and sent as a single packet. A Parameter Set delimiter is always treated as a packet delimiter for transfer.

Session

One Parameter Set or multiple Parameter Sets can be transferred by one session. A session can consist of one subsession or multiple subsessions, with EOS (End of Session) sent at the end to terminate the send.

Regardless of whether there is a single Parameter Set or multiple Parameter sets, an actual bulk dump always takes the form of a session, never a subsession only.

18.2 One-way Mode Communication Flow

A session starts with the receiving device sending a request using an OBR, or with the sending device sending OBS data. The session ends after transfer of all the data in the parameter set being transferred by the sending device is complete.

Data is divided into multiple packets of 256 bytes or less each, and transfers them at fixed intervals (20 msec).

A final EOD informs the receiving device when the session is ended.

Data Receiver (External Device)	Data Sender (This Instrument)	Operation
OBR →		SendRequest (Optional)
←	OBS (20 msec or greater interval)	Data Transfer
←	OBS (20 msec or greater interval)	Data Transfer
←	OBS (20 msec or greater interval)	Data Transfer
:		
:		
←	EOD	End of Data
:		
Other subsessions		
:		
←	EOS	End of Session

18.3 Handshake Mode Communication Flow

A session starts with the receiving device sending a request using a HBR, or with the sending device sending HBS data. The sending device does not send the next packet until it receives an ACK from the receiving device. The maximum wait time of at least 2000 msec is reserved. Failure of a response to arrive within the wait time (at least 2000 msec) is treated as a timeout error, and data communication is terminated.

The sending device resends the last data if the receiving device returns an ERR (error) due to checksum mismatch, incompatible data structure, or some other reason. If an error repeats a number of times (undefined), either the sending device or the receiving device sends an RJC to terminate the session.

A session ends after the sending device sends all the parameter sets, and sends a final EOD in response to an ACK (ACK) from the sending device.

<u>Data Receiver</u>		<u>Data Sender</u>	<u>Operation</u>
HBR	→		Send Request (Optional)
	←	HBS	Data Send
ACK	→		Acknowledge
	←	HBS	Data Send
ACK	→		Acknowledge
	:		
	:		
ACK	→		Acknowledge
	←	EOD	End of Data
	:		
	Other subsessions		
	:		
	←	EOS	End of Session

The same packet is resent when a checksum mismatch or incompatible data structure error is detected.

<u>Data Receiver</u>		<u>Data Sender</u>	<u>Operation</u>
HBR	→		Send Request (Optional)
	←	HBS	Data Send
ACK	→		Acknowledge
	←	HBS	Data Send
ERR	→		Error
	←	HBS	Data Resend
	:		
	:		
ERR	→		Error
	←	EOD	End of Data
	:		
	Other subsessions		
	:		
	←	EOS	End of Session

RJC is sent to terminate the session in case ACK cannot be recognized.

Data Receiver	Data Sender	Operation
HBR →		Send Request (Optional)
	← HBS	Data Send
	:	Fixed amount of time elapses.
RJC ←		Rejection
	(Send Canceled)	

The session can be canceled for any reason by sending an RJC. RJC can be sent by the sending device or the receiving device. The bulk dump session is terminated immediately upon receipt of an RJC.

Data Receiver	Data Sender	Operation
HBR →		Send Request (Optional)
	← HBS	Data Send
ACK →		Acknowledge
	← HBS	Data Send
	:	
	:	
RJC →		Data Receive Rejected
	(Send Canceled)	

Data Receiver	Data Sender	Operation
HBR →		Send Request (Optional)
ACK →		Acknowledge
	← HBS	Data Send
ACK →		Acknowledge
	← HBS	Data Send
	:	
	:	
	← RJC	Data Receive Rejected
	(Send Canceled)	

BSY is returned to the external device when OBS, OBR, HBS, or HBR is sent while the Instrument mode is not suitable to perform bulk dump, etc. After BSY is received, the external device should wait until the Instrument enters a mode in which the session is enabled.

Data Receiver	Data Sender	Operation
OBR →		Send Request
	← BSY	Busy
	(Send Canceled)	

Data Receiver	Data Sender	Operation
OBS →		Data Send
← BSY		Busy
	(Send Canceled)	

Data Receiver	Data Sender	Operation
HBR →		Send Request
← BSY		Busy
	(Send Canceled)	

Data Receiver	Data Sender	Operation
HBS →		Data Send
← BSY		Busy
	(Send Canceled)	

See "Part VI Parameter Set List" for information about how parameter sets can actually be transferred.

Part V

Parameter List

How to Read the Tables

Number Base Notation

"Size" indicates the parameter value bit width as a decimal value.

The bit field position of "Block" as a decimal value.

Values used in the explanations under "Description" are all decimal values, unless specified otherwise.

Values other than those described above are all hexadecimal.

R/W Field

The R/W field indicates whether an IPR (Individual Parameter Request) read operation or IPS (Individual Parameter Send) write operation is enabled.

19 System Parameters

These parameters make it possible for an external device to check the status of the Instrument and for an external device to command some operation of the Instrument.

19.1 System Information Parameter

This parameter is a container for system information.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Model	0000	R	000000	7	01	00-00-7F	0...reserved
							1...PX-200
							2...PX-800
							3...AP-500
							4...PX-120
							5...PX-720
							6...PX-320
Version	0001	R	000000	7	01	00-00-7F	Version Number
Internal Timestamp	0002	R/W	000000	7	10	00-20-7F	Ascii Character
External Timestamp	0003	R/W	000000	7	10	00-20-7F	Ascii Character

19.2 Data Management Parameter

This is a message command computer-based data management software.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Seq Free Size	0021	R	000000	32	01	00000000-00000000-FFFFFFFF	Sequencer Song Byte Size
Ml Free Size	0022	R	000000	32	01	00000000-00030000-FFFFFFFF	Music Library Byte Size
Ml Max Size	0023	R	000000	32	01	00000000-00030000-FFFFFFFF	Music Library Byte Size
Delete Seq	0024	W	000000	7	01	00-00-7F	Sequencer Song Number
Delete Ml	0025	W	000000	7	01	00-00-7F	Music Library Number

20 Setup Parameter

Setup Parameters put a device into the setup mode.

20.1 MIDI Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Midi Device Id	0023	R/W	000000	7	01	00-7F-7F	0 - 127

21 Patch Parameters

21.1 Master Tune Parameter

These parameters configure Master Tuning settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Fine Tune	0000	R/W	000000	7	01	00-40-7F	-100 - 0 - +99 (cent)
Master Fine Tune8	0080	R/W	000000	8	01	00-80-FF	-100 - 0 - +99 (cent)
Master Coarse Tune	0001	R/W	000000	7	01	00-40-7F	-24 - 0 - +24 (semitone)

21.2 Master Mixer Parameter

These parameters configure the Master settings of the mixer.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Volume	0004	R/W	000000	7	01	00-7F-7F	0 - 127
Master Pan	0005	R/W	000000	7	01	00-40-7F	-64 - 0 - +63
Acou Reso To Chorus	0008	R/W	000000	7	01	00-00-7F	0 - 127
Acou Reso To Reverb	000A	R/W	000000	7	01	00-00-7F	0 - 127
Acou Reso Return	000B	R/W	000000	7	01	00-40-7F	0 - 127
Chorus To Reverb	000F	R/W	000000	7	01	00-00-7F	0 - 127
Chorus Return	0010	R/W	000000	7	01	00-40-7F	0 - 127
Reverb Return	0017	R/W	000000	7	01	00-40-7F	0 - 127
Dsp Cancel	001A	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel

21.3 System Chorus Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	002A	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Type	002B	R/W	000000	7	01	00-02-0F	1 - 16 (Notel)
Rate	002C	R/W	000000	7	01	00-03-7F	0 - 127
Depth	002D	R/W	000000	7	01	00-13-7F	0 - 127
Feedback	002E	R/W	000000	7	01	00-00-7F	0 - 127
Tone	002F	R/W	000000	7	01	00-7F-7F	0 - 127

Note 1:

Selects the System Chorus preset type. Receipt of GM/GS Reset selects Chorus3.

The value of this type is also linked to System Chorus parameters, and to the Chorus Send to Reverb and System Chorus Return Level parameters, and its setting causes these parameters to change to prescribed values.

For details about the preset type list, see "28.8 Chorus Type Setting Value Table".

21.4 System Reverb Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	003C	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Type	003D	R/W	000000	7	01	00-04-0F	1 - 16 (Note1)
Feedback	003E	R/W	000000	7	01	00-40-7F	0 - 127
Er Level	003F	R/W	000000	7	01	00-40-7F	0 - 127
Damp	0040	R/W	000000	7	01	00-40-7F	0 - 127
Tone	0041	R/W	000000	7	01	00-7F-7F	0 - 127

Note 1:

Selects the System Reverb preset type. Receipt of GM/GS Reset selects Hall2.

This type is also linked to System Reverb parameters, and to the System Reverb Return Level parameter, and its setting causes these parameters to change to prescribed values.

For details about the preset type list, see "28.7 Reverb Type Setting Value Table".

21.5 System Acoustic Resonance Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	001B	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Tuning	001C	R/W	000000	7	01	00-40-7F	-100-0-+99 (cent) (Note1)
Damper Pedal	001D	R/W	000000	7	01	00-00-7F	0 - 127 (Note2)
Wet Level Min	0025	R/W	000000	16	01	0000-1333-7FFF	0x0000 - 0x7FFF (Note3)
Wet Level Max	0026	R/W	000000	16	01	0000-5800-7FFF	0x0000 - 0x7FFF (Note4)
Low Boost Freq	0027	R/W	000000	16	01	0000-2000-4000	0x0000 - 0x4000
Low Boost Level	0028	R/W	000000	16	01	0000-4000-7FFF	0x0000 - 0x7FFF
High Cut Freq	0029	R/W	000000	16	01	0000-4000-7FFF	0x0000 - 0x7FFF

Note 1:

Changing this parameter configures the Tuning setting of System Acoustic Resonance.

When the Instrument's Master Fine Tune setting is changed, this parameter is reset to the Master Fine Tune value.

Note 2:

Changing this parameter performs a Damper Pedal operation on System Acoustic Resonance.

When the Damper Pedal parameter of the part being used by System Acoustic Resonance is manipulated, this parameter is reset to the manipulated Damper Pedal depth.

Note 3:

The value is set when the damper pedal is completely released.

Note 4:

The value is set when the damper pedal is completely depressed.

21.6 Brilliance Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Type	0047	R/W	000000	7	01	00-00-01	0...For Speaker 1...For Phones
Mid6 Gain	0055	R/W	000000	7	01	00-0C-18	-12-0-+12 (Brilliance) (Note1)

Note 1:

Selects Master EQ mid 6 (Brilliance) gain. See "28.11 Brilliance Gain Setting Value Table".

21.7 Part Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Part Enable	0068	R/W	4-0:PartNumber	1	01	00-01-01	0...Off 1...On
Tone Num	0069	R/W	↑	14	01	0000-0000-3FFF	0 - 16383
Fine Tune	006A	R/W	↑	7	01	00-40-7F	-100 - 0 - +99 (cent)
Coarse Tune	006B	R/W	↑	7	01	28-40-58	-24-0-+24 (semitone)
Volume	006C	R/W	↑	7	01	00-64-7F	0 - 127
Acmp Volume	006D	R/W	↑	7	01	00-7F-7F	0 - 127
Pan	006E	R/W	↑	7	01	00-40-7F	-64 - 0 - +63
Cho Send	006F	R/W	↑	7	01	00-00-7F	0 - 127
Rev Send	0070	R/W	↑	7	01	00-28-7F	0 - 127
Acou Reso Send	0071	R/W	↑	7	01	00-00-7F	0 - 127
Bend Range	0073	R/W	↑	7	01	00-02-18	0 - 24

22 Tone Parameters

22.1 Basic Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	0000	R/W	000000	7	10	00-20-7F	Ascii Character
Timbre Type	0001	R/W	000000	4	01	00-00-0F	0...Melody 1...Piano 2...Drum
Timbre Num	0002	R/W	000000	14	01	0000-0000-3FFF	0 - 16383
Oct Shift	0003	R/W	000000	3	01	02-04-06	-2 - 0 - +2
Line Select	0004	R/W	000000	1	01	00-00-01	0...Direct 1...DSP
Level	0005	R/W	000000	7	01	00-7F-7F	0 - 127
Touch Sens	0006	R/W	000000	7	01	00-7F-7F	-64 - 0 - +63
Sys Fx Send Override	0007	R/W	000000	1	01	00-00-01	0...No (Notel) 1...Yes
Cho Send	0008	R/W	000000	7	01	00-00-7F	0 - 127
Rev Send	0009	R/W	000000	7	01	00-28-7F	0 - 127
Acou Reso Send	000A	R/W	000000	7	01	00-00-7F	0 - 127

Note 1:

When a tone is selected whose Sys Fx Send Override parameter setting is "Yes", the send level setting value to the System Chorus, System Reverb, and System Acoustic Resonance of the part assigned to this tone is rewritten to the value that is stored by this tone.

22.2 LFO Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Vib Wave	000C	R/W	000000	4	01	00-00-0F	0...Sin 1...Tri 2...Saw Up 3...Saw Down 4...Pulse 1:3 5...Pulse 2:2 6...Pulse 3:1 15...Depends on original
Vib Rate	000D	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Delay	000E	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Rise	000F	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Depth	0010	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Mod Depth	0011	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib After Depth	0012	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Wave	0013	R/W	000000	4	01	00-00-0F	0...Sin 1...Tri 2...Saw Up 3...Saw Down 4...Pulse 1:3 5...Pulse 2:2 6...Pulse 3:1 15...Depends on original
Lfo Rate	0014	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Delay	0015	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Rise	0016	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Depth	0017	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Mod Depth	0018	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil After Depth	0019	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Delay	001A	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Rise	001B	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Depth	001C	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Mod Depth	001D	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp After Depth	001E	R/W	000000	7	01	00-40-7F	-64 - 0 - +63 (Notel)

Note 1:

The function of this parameter is to relatively change the original setting value of the tone. The parameter is set to the maximum value when the maximum is exceeded, and to the minimum when the minimum is exceeded.

22.3 DSP Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	002C	R/W	000000	7	10	00-20-7F	Ascii Character
Algorithm	002D	R/W	000000	14	01	0000-0000-3FFF	Serial Number (Notel)
Cho Send	002E	R/W	000000	7	01	00-00-7F	0 - 127
Rev Send	002F	R/W	000000	7	01	00-28-7F	0 - 127
Acou Reso Send	0030	R/W	000000	7	01	00-00-7F	0 - 127
Parameter7	0032	R/W	000000	7	20	00-40-7F	0 - 127
Parameter16	0033	R/W	000000	16	10	0000-8000-FFFF	0x0000 - 0xFFFF

Note 1:

This value is the DSP algorithm ID, which cannot be changed directly at the user level. Changing the DSP Type or Tone Number causes the algorithm ID of the original DSP to be copied automatically to this area. See "26 DSP Algorithm ID Table".

23 Music Library Parameter

This parameter is a container for Music Library related information.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	0000	R	000000	7	0C	20-20-7F	Ascii Character
Address	0001	R	000000	32	01	00000000-00000000-00FFFFFF	0 - 0xFFFFFFFF
Size	0002	R	000000	32	01	00000000-00000000-00FFFFFF	0 - 0xFFFFFFFF

Part VI

Parameter Set List

This list shows the parameter sets that can be transferred using System Exclusive Message Bulk Dump.

24 Music Library Parameter Set

System Exclusive Format

Field		Value
01	SYSEX	F0
02	MAN	44
03	MOD	15, 01
04	<i>dev</i>	00 - 7F
05	<i>act</i>	04 (HDS), 05 (HDR), 07 (Control)
06	<i>cat</i>	Music Library = 21
07	<i>mem</i>	0 = User
08	<i>pset</i>	Music Library Number to be transferred
09	<i>pkt</i>	See "IV Instrument-Specific System Exclusive Messages".
10	<i>len</i>	See "IV Instrument-Specific System Exclusive Messages".
11	<i>img</i>	See "IV Instrument-Specific System Exclusive Messages".
12	<i>sum</i>	See "IV Instrument-Specific System Exclusive Messages".
13	EOX	F7

Part VII

DSP Parameter List

25 Tone with DSP List

This is a list of tones that use DSP.

Tone Number	Tone Name	Mono/Stereo	DSP Algorithm
01	Panel GRAND PIANO MODERN	Stereo	Wide 3Band EQ
02	Panel GRAND PIANO CLASSIC	Stereo	Wide 3Band EQ
04	Panel ROCK PIANO	Stereo	Wide 3Band EQ
07	Panel 60'S E. PIANO	Mono	Tremolo
08	Panel ROCK ORGAN	Stereo	Drive Rotary
09	Panel JAZZ ORGAN	Stereo	Rotary
001	Various LA PIANO	Stereo	Wide 3Band EQ
003	Various MODERN PIANO	Stereo	Wide 3Band EQ
004	Various DANCE PIANO	Stereo	Wide 3Band EQ
005	Various STRINGS PIANO	Stereo	Eary Reflection
010	Various DYNO ELEC. PIANO	Mono	Auto Pan
013	Various POP ELEC. PIANO	Mono	Enhancer
015	Various CLAVI	Mono	Enhancer
018	Various VIBRAPHONE	Mono	Tremolo
020	Various DRAWBAR ORGAN	Stereo	Rotary
021	Various ROTARY DRAWBAR	Stereo	Rotary
022	Various ROTARY ORGAN	Stereo	Rotary
023	Various PERC. ORGAN	Stereo	Rotary
024	Various 70'S ORGAN	Stereo	Rotary
025	Various OVERDRIVE ORGAN	Mono	Distortion
026	Various TREMOLO ORGAN	Mono	Tremolo
029	Various NYLON STR. GUITAR	Stereo	Eary Reflection
030	Various STEEL STR. GUITAR	Stereo	Eary Reflection
032	Various CHORUS CLEAN GUITAR	Mono	Enhancer
033	Various OVERDRIVE GUITAR	Mono	Distortion
037	Various STRING ENSEMBLE	Stereo	Eary Reflection
038	Various SYNTH-STRINGS	Mono	EQ 3Band
042	Various TRUMPET	Mono	Enhancer
043	Various TROMBONE	Mono	Enhancer
044	Various STEREO BRASS	Stereo	Eary Reflection
058	Various NEW AGE	Mono	EQ 3Band

26 DSP Algorithm ID Table

The lists in this section show the DSP algorithms that are built into the Instrument.

26.1 Monaural Tone DSP

ID	Algorithm	Input	Output
0001	Tremolo	Mono	Mono
0002	3Band EQ	Mono	Mono
0008	Enhancer	Mono	Mono
000B	Auto Pan	Mono	Stereo
0011	Wide 3Band EQ	Mono	Mono
0013	Distortion	Mono	Mono

26.2 Stereo Tone DSP

ID	Algorithm	Input	Output
2001	3Band EQ	Stereo	Stereo
200B	Eary Reflection	Mix	Stereo
200C	Rotary	Mix	Stereo
200D	Drive Rotary	Mix	Stereo
2017	Wide 3Band EQ	Stereo	Stereo

27 DSP Parameter Table

The lists in this section show the parameters of each DSP algorithm.

27.1 Algorithm 0001 : Mono-Mono Tremolo Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Rate	00 - 7F	
Parameter7[01]	Depth	00 - 7F	

27.2 Algorithm 0002 : Mono-Mono 3Band EQ Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Low Freq	00 - 07	Note1
Parameter7[01]	Low Gain	34 - 4C	Note2
Parameter7[02]	Mid Freq	00 - 07	Note1
Parameter7[03]	Mid Gain	34 - 4C	Note2
Parameter7[04]	High Freq	00 - 07	Note1
Parameter7[05]	High Gain	34 - 4C	Note2

Note 1: See "28.9 Equalizer Mid Frequency Setting Value Table".

Note 2: See "28.12 DSP Equalizer Gain Setting Value Table".

27.3 Algorithm 0008 : Mono-Mono Enhancer Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7 [00]	Low Freq	00 - 7F	
Parameter7 [01]	Low Gain	00 - 7F	
Parameter7 [02]	Hi Freq	00 - 7F	
Parameter7 [03]	Hi Gain	00 - 7F	

27.4 Algorithm 000B : Mono-Stereo Auto Pan Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7 [00]	Rate	00 - 7F	
Parameter7 [01]	Depth	00 - 7F	

27.5 Algorithm 0011 : Mono-Mono Wide 3Band EQ Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7 [00]	Low Freq	00 - 0F	Note1
Parameter7 [01]	Low Gain	34 - 4C	Note2
Parameter7 [02]	Mid Freq	00 - 0F	Note1
Parameter7 [03]	Mid Gain	34 - 4C	Note2
Parameter7 [04]	High Freq	00 - 0F	Note1
Parameter7 [05]	High Gain	34 - 4C	Note2

Note 1: See "28.10 Wide Band Equalizer Mid Frequency Setting Value Table".

Note 2: See "28.12 DSP Equalizer Gain Setting Value Table".

27.6 Algorithm 0013 : Mono-Mono Distortion Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7 [00]	Gain	00 - 7F	
Parameter7 [01]	Low	00 - 7F	
Parameter7 [02]	High	00 - 7F	
Parameter7 [03]	Level	00 - 7F	

27.7 Algorithm 2001 : Stereo-Stereo 3Band EQ Parameter

Same as "27.2 Algorithm 0002 : Mono-Mono 3Band EQ Parameter".

27.8 Algorithm 200B : Mix-Stereo Early Reflection

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Wet Level	00 - 7F	
Parameter7[01]	Feedback	00 - 7F	
Parameter7[02]	Tone	00 - 7F	

27.9 Algorithm 200C : Mono-Stereo Rotary Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Speed	0 - 1	Note1
Parameter7[01]	Brake	0 - 1	Note2
Parameter7[02]	Fall Accel	00 - 7F	
Parameter7[03]	Rise Accel	00 - 7F	
Parameter7[04]	Slow Rate	00 - 7F	
Parameter7[05]	Fast Rate	00 - 7F	

Note 1: See "28.2 Slow/Fast Setting Value Table".

Note 2: See "28.3 Rotate/Brake Setting Value Table".

27.10 Algorithm 200D : Mono-Stereo Drive Rotary Parameter

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Overdrive Gain	00 - 7F	
Parameter7[01]	Overdrive Level	00 - 7F	
Parameter7[02]	Speed	0 - 1	Note1
Parameter7[03]	Brake	0 - 1	Note2
Parameter7[04]	Fall Accel	00 - 7F	
Parameter7[05]	Rise Accel	00 - 7F	
Parameter7[06]	Slow Rate	00 - 7F	
Parameter7[07]	Fast Rate	00 - 7F	

Note 1: See "28.2 Slow/Fast Setting Value Table".

Note 2: See "28.3 Rotate/Brake Setting Value Table".

27.11 Algorithm 2017 : Stereo-Stereo Wide 3Band EQ Parameter

Same as "27.5 Algorithm 0011 : Mono-Mono Wide 3Band EQ Parameter".

Part VIII

Setting Values and Send/Receive Values

28 Setting Value Tables

28.1 Off/On Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H - 3FH	Off
7FH	40H - 7FH	On

28.2 Slow/Fast Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H - 3FH	Slow
7FH	40H - 7FH	Fast

28.3 Rotate/Brake Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H - 3FH	Rotate
7FH	40H - 7FH	Brake

28.4 -64 - 0 - 63 Setting Value Table

Transmit/Receive Value	Parameter
00H	-64
01H	-63
:	:
40H	0
:	:
7EH	62
7FH	63

28.5 Pan Setting Value Table

Transmit/Receive Value	Parameter
00H	Left
:	:
40H	Center
:	:
7FH	Right

28.6 -100 - 0 - 99 Setting Value Table

Transmit/Receive Value	Parameter
(MSB-LSB)	
00H-00H	-100
:	:
40H-00H	0
:	:
7FH-7FH	99

28.7 Reverb Type Setting Value Table

Transmit/Receive Value	Parameter
00H	Room1
01H	Room2
02H	Room3
03H	Hall1
04H	Hall2
05H	Plate1
06H	Delay
07H	Panning Delay
08H	Plate2
09H	Plate3
0AH	Large Room1
0BH	Large Room2
0CH	Stadium1
0DH	Stadium2
0EH	Long Delay
0FH	Long Panning Delay

28.8 Chorus Type Setting Value Table

Transmit/Receive Value	Parameter
00H	Chorus1
01H	Chorus2
02H	Chorus3
03H	Chorus4
04H	Feedback Chorus
05H	Flanger1
06H	Short Delay
07H	Short Delay FB
08H	Soft Chorus
09H	Bright Chorus
0AH	Deep Chorus
0BH	Flanger2
0CH	Flanger3
0DH	Flanger4
0EH	Short Delay Modulation
0FH	Short Delay Modulation FB

28.10 Wide Band Equalizer Mid Frequency Setting Value Table

Parameter Value	Frequency
00H	100Hz
01H	130Hz
02H	160Hz
03H	200Hz
04H	300Hz
05H	400Hz
06H	600Hz
07H	800Hz
08H	1.0KHz
09H	1.3KHz
0AH	1.6KHz
0BH	2.0KHz
0CH	3.0KHz
0DH	4.0KHz
0EH	6.0KHz
0FH	8.0KHz

28.9 Equalizer Mid Frequency Setting Value Table

Parameter Value	Frequency
00H	1.0KHz
01H	1.3KHz
02H	1.6KHz
03H	2.0KHz
04H	3.0KHz
05H	4.0KHz
06H	6.0KHz
07H	8.0KHz

28.11 Brilliance Gain Setting Value Table

Parameter Value	Gain
00H	-12
01H	-11
02H	-10
03H	- 9
04H	- 8
05H	- 7
06H	- 6
07H	- 5
08H	- 4
09H	- 3
0AH	- 2
0BH	- 1
0CH	0
0DH	+ 1
0EH	+ 2
0FH	+ 3
10H	+ 4
11H	+ 5
12H	+ 6
13H	+ 7
14H	+ 8
15H	+ 9
16H	+10
17H	+11
18H	+12

Note: The gain value does not exactly correspond to decibels (dB).

28.12 DSP Equalizer Gain Setting Value Table

Parameter Value	Gain
34H	-12
35H	-11
36H	-10
37H	- 9
38H	- 8
39H	- 7
3AH	- 6
3BH	- 5
3CH	- 4
3DH	- 3
3EH	- 2
3FH	- 1
40H	0
41H	+ 1
42H	+ 2
43H	+ 3
44H	+ 4
45H	+ 5
46H	+ 6
47H	+ 7
48H	+ 8
49H	+ 9
4AH	+10
4BH	+11
4CH	+12

Note: The gain value does not exactly correspond to decibels (dB).

Part IX

MIDI Implementation Notation

29 Value Notation

29.1 Hexadecimal Notation

MIDI implementation sometimes requires that data be expressed in hexadecimal format. Hexadecimal values are indicated by the letter "H" after the value. The hexadecimal equivalents of decimal values 10 through 15 are expressed as the letters A through F. The table below shows the hexadecimal equivalents for the decimal values 0 through 127, which are often used for settings.

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
0	00H	32	20H	64	40H	96	60H
1	01H	33	21H	65	41H	97	61H
2	02H	34	22H	66	42H	98	62H
3	03H	35	23H	67	43H	99	63H
4	04H	36	24H	68	44H	100	64H
5	05H	37	25H	69	45H	101	65H
6	06H	38	26H	70	46H	102	66H
7	07H	39	27H	71	47H	103	67H
8	08H	40	28H	72	48H	104	68H
9	09H	41	29H	73	49H	105	69H
10	0AH	42	2AH	74	4AH	106	6AH
11	0BH	43	2BH	75	4BH	107	6BH
12	0CH	44	2CH	76	4CH	108	6CH
13	0DH	45	2DH	77	4DH	109	6DH
14	0EH	46	2EH	78	4EH	110	6EH
15	0FH	47	2FH	79	4FH	111	6FH
16	10H	48	30H	80	50H	112	70H
17	11H	49	31H	81	51H	113	71H
18	12H	50	32H	82	52H	114	72H
19	13H	51	33H	83	53H	115	73H
20	14H	52	34H	84	54H	116	74H
21	15H	53	35H	85	55H	117	75H
22	16H	54	36H	86	56H	118	76H
23	17H	55	37H	87	57H	119	77H
24	18H	56	38H	88	58H	120	78H
25	19H	57	39H	89	59H	121	79H
26	1AH	58	3AH	90	5AH	122	7AH
27	1BH	59	3BH	91	5BH	123	7BH
28	1CH	60	3CH	92	5CH	124	7CH
29	1DH	61	3DH	93	5DH	125	7DH
30	1EH	62	3EH	94	5EH	126	7EH
31	1FH	63	3FH	95	5FH	127	7FH

29.2 Binary Notation

When a MIDI implementation data value is expressed in binary, the letter "B" (for "binary") is affixed at the end of the value. The table below shows the binary equivalents for the decimal values 0 through 127, which are often used for settings.

Decimal	Hexadecimal	Binary
0	00H	00000000B
1	01H	00000001B
2	02H	00000010B
3	03H	00000011B
4	04H	00000100B
5	05H	00000101B
6	06H	00000110B
7	07H	00000111B
8	08H	00001000B
9	09H	00001001B
10	0AH	00001010B
11	0BH	00001011B
12	0CH	00001100B
13	0DH	00001101B
14	0EH	00001110B
15	0FH	00001111B
16	10H	00010000B
:	:	
125	7DH	01111101B
126	7EH	01111110B
127	7FH	01111111B

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