

PX-130/730/830, AP-220/420
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, Sound Generator Section, and Performance Controller Section described below.

Each of these sections sends and receives specific MIDI Messages in accordance with its function.

- System Section
 - Device settings
 - Function status
- Sound Generator Section
 - Common
 - * Sound generator common section
 - * System effects
 - * Brilliance adjustment function
 - * Mixer master
 - Parts
 - * Sound generator instrument parts
 - * DSP (insertion effects)
 - * Mixer channel
- Performance Controller Section
 - Keyboard
 - Pedal and other real-time controllers
 - Auto play function

1.1 System Section

The System Section consists of a sound generator (sound source), a performance controller part (performance), and functions that are not directly related to Instrument play. In addition to manipulating Instrument setting parameters, this section is also used to exchange information.

1.2 Sound Generator Section

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

1.2.1 Sound generator common section

The common section consists of 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.

1.2.2 Parts

The settings of the sound generator parts can be changed using Instrument-specific system exclusive messages. This Instrument consists of 48 parts. Of these, channel messages can be used to perform note on operations and to change settings of only the C Group (C01 through C16).

The relationships between the channel message receive channel and part number are fixed, as shown in “1.2.3 Part Assignments”.

1.2.3 Part Assignments

Part Number	Part Name	MIDI Receive Ch	MIDI Send Ch	Assigned Function	Description
00	A01	-	01 (Note1)	Keyboard	Upper1 (main) (Right-side keyboard in the Duet Mode)
01	A02	-	02	Keyboard	Upper2 (Layer)
02	A03	-	03	Keyboard	Lower1 (Split) (Left-side keyboard in the Duet Mode)
03	A04	-	-	-	-
04	A05	-	05	Recorder Play	Track1 main
05	A06	-	06	Recorder Play	Track1 layer
06	A07	-	07	Recorder Play	Track1 split
07	A08	-	-	Metronome/Count	-
08	A09	-	-	-	-
09	A10	-	-	-	-
10	A11	-	-	-	-
11	A12	-	-	-	-
12	A13	-	-	-	-
13	A14	-	-	-	-
14	A15	-	04	Recorder Play	Track2
15	A16	-	-	-	-
16	B01	-	-	Song Play	Ch.01
17	B02	-	-	Song Play	Ch.02
18	B03	-	-	Song Play	Ch. 03 (Left hand track)
19	B04	-	-	Song Play	Ch. 04 (Right hand track)
20	B05	-	-	Song Play	Ch.05
21	B06	-	-	Song Play	Ch.06
22	B07	-	-	Song Play	Ch.07
23	B08	-	-	Song Play	Ch.08
24	B09	-	-	Song Play	Ch.09
25	B10	-	-	Song Play	Ch.10
26	B11	-	-	Song Play	Ch.11
27	B12	-	-	Song Play	Ch.12
28	B13	-	-	Song Play	Ch.13
29	B14	-	-	Song Play	Ch.14
30	B15	-	-	Song Play	Ch.15
31	B16	-	-	Song Play	Ch.16
32	C01	01	-	MIDI	Ch.01
33	C02	02	-	MIDI	Ch.02
34	C03	03	-	MIDI	Ch.03
35	C04	04	-	MIDI	Ch.04
36	C05	05	-	MIDI	Ch.05
37	C06	06	-	MIDI	Ch.06
38	C07	07	-	MIDI	Ch.07
39	C08	08	-	MIDI	Ch.08
40	C09	09	-	MIDI	Ch.09
41	C10	10	-	MIDI	Ch.10
42	C11	11	-	MIDI	Ch.11
43	C12	12	-	MIDI	Ch.12
44	C13	13	-	MIDI	Ch.13
45	C14	14	-	MIDI	Ch.14
46	C15	15	-	MIDI	Ch.15
47	C16	16	-	MIDI	Ch.16

Note 1:

Can be changed by the Keyboard Channel setting.

1.3 Performance Controller Section

The Performance Controller Section consists of keyboard, pedal and other real-time controllers, as well as blocks that generate auto performance and other performance information.

These messages are transmitted to the sound generator in accordance with operations, while they are also being sent out as MIDI messages.

The channel number of the sent message is in accordance with Instrument's part number.

1.3.1 MIDI Send by Auto Performance

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 performance operation, those messages are not covered in detail here.

2 Conditions that Disable Message Send and Receive

All MIDI message send and receive is temporarily disabled in all of the following cases.

- During instrument startup
- During SD card formatting (PX-830, AP-420)
- During user data initialization
- Immediately after the recorder is exited
- While storage is selected as the USB device mode

3 Timbre Type Specific Operation

The operation that is performed for a received message depends on the current Timbre Type setting (see "11.1 About 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 Send Channel

For information about the MIDI channels of the channel messages that are sent when this Instrument is played, see “1.2.3 Part Assignments”.

Note, however, that the MIDI channel of the performance information that corresponds to the keyboard main part can be changed by the Keyboard Channel setting value.

5 Receive Channel

For information about the MIDI channel numbers of channel messages received by each part, see “1.2.3 Part Assignments”.

The MIDI channel number of a channel message that changes DSP settings also coincides with the MIDI channel of the part using the DSP. A channel message is not received by a part that is turned off by the Part Enable Parameter value explained under “20.7 Part Parameters”.

6 Note Off

Format

	Send	Receive
Message Format :	8nH kkH vvH	8nH kkH vvH 9nH kkH 00H
n :	MIDI Channel Number	
kk :	Key Number	
vv :	40H	Ignored

Send

Sent when a key is released.

Receive

Recognized as key release information. 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 a key is pressed.

Receive

Recognized as key press information.

8 Polyphonic Key Pressure

Format

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

Send

This message is not sent by this Instrument.

Receive

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 a pedal or another controller operation is performed, when settings are changed, when the tone is changed, or when an auto performance or other operation is performed.

Receive

Receipt changes the controller and settings that correspond to the control number.

9.1 Bank Select (00H)

Format

Message Format :	BnH 00H mmH (MSB) BnH 20H llH (LSB)
n :	MIDI Channel Number
mm :	Value
ll :	Send: 00H, Receive: Ignored

Send

Sent when a tone is selected.

For information about numbers, see the Tone List in the User's Guide.

Receive

Receipt switches the tone bank number stored in Instrument memory. Note, however, that the tone is not changed until a Program Change message is received.

For details, see "11 Program Change".

For information about numbers, see the Tone List in the 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 voice 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 Portamento Time (05H)

Format

Message Format :	BnH 05H vvH
n :	MIDI Channel Number
vv :	Value

Send

This message is not sent by this Instrument.

Receive

Receipt changes the time it takes until pitch reaches the target portamento effect pitch.

9.4 Data Entry (06H, 26H)

Format

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

Send

Sent when there is a change in the parameters assigned to NRPN and RPN.
For details about information assigned to parameters that correspond to NRPN and RPN, see “9.19 NRPN” and “9.20 RPN”.

Receive

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

9.5 Volume (07H)

Format

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

Send

Sent when layer balance is adjusted.

Receive

Receipt changes the volume of the corresponding part.

9.6 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 “26.3 Pan Setting Value Table” in “Part VII Setting Values and Send/Receive Values”.

Send

Sent in the following cases.

- When Music Library play is stopped

Receive

Receipt changes the pan setting of the corresponding part.

9.7 Expression (0BH)

Format

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

Send

This message is not sent by this Instrument.

Receive

Receipt changes the Expression value.

9.8 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 “21.3 DSP Parameters”. 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 in the range of 0 to 127, but the range 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.

Conversion to the parameter setting value from the value received with the message can be represented in general terms by the expression shown below.

$$\text{Parameter Setting Value} = \text{Parameter Minimum Value} + (\text{Parameter Maximum Value} - \text{Parameter Minimum Value}) \times \frac{\text{Received Value}}{127}$$

For details about Parameter 7 of each DSP, see the explanations under “VI DSP Parameter List”.

9.9 Hold1 (40H)

Format

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

Send

Sent in the following cases.

- 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 Timber 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 “26.1 Off/On Setting Value Table” in “Part VII Setting Values and Send/Receive Values”.
- Timbre Type: Piano or LM Piano
Continuous control of the following is performed in accordance with the value of the received message.
 - Piano note decay rate
 - Resonance characteristics and decay rate of Acoustic Resonance effect resonance note
- Timbre Type: Drum
The received message does not affect sound source operation.

9.10 Portamento Switch (41H)

Format

Message Format :	BnH 41H vvH
n :	MIDI Channel Number
vv :	Value (Notel)

Note 1:

For information about the relationship between setting values and send/receive values, see the “26.1 Off/On Setting Value Table” in “Part VII Setting Values and Send/Receive Values”.

Send

This message is not sent by this Instrument.

Receive

Receipt can be use to switch portamento between enabled (On) and disabled (Off).

9.11 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 “26.1 Off/On Setting Value Table” in “Part VII Setting Values and Send/Receive Values”.

Send

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

Receive

Receipt performs an operation equivalent to a sostenuto pedal operation.

9.12 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 “26.1 Off/On Setting Value Table” in “Part VII Setting Values and Send/Receive Values”.

Send

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

Receive

Receipt performs an operation equivalent to a soft pedal operation.

9.13 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 “26.2 -64 - 0 - +63 Setting Value Table” in “Part VII 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.

9.14 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 “26.2 –64 - 0 - +63 Setting Value Table” in “Part VII 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.

9.15 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 “26.2 –64 - 0 - +63 Setting Value Table” in “Part VII 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.

9.16 Portamento Control (54H)

Format

Message Format:	BnH 54H vvH
n:	MIDI Channel Number
kk:	Source Note Number

Send

This message is not sent by this Instrument.

Receive

Receipt of this message first stores the Source Note Number for the next note. When the next Note On is received, the portamento effect is applied to the note using this Source Note Number as the pitch start point and the Note On event key number as the end point. If there already is a note being sounded by Source Note Number at this time, the new note on is not performed and the portamento effect is applied to the pitch of the note being sounded. That is to say that legato play is performed.

9.17 Reverb Send (5BH)

Format

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

Send

This message is not sent by this Instrument.

Receive

Receipt changes Reverb Send.

9.18 Chorus Send (5DH)

Format

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

Send

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

Receive

Receipt changes Chorus Send.

9.19 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 message is not received by this Instrument.

9.19.1 Assignable Functions to NRPN

This Instrument does not assign any parameters to NRPN.

9.20 RPN (64H, 65H)

Format

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

The following are the parameters assigned to RPN by this Instrument.

9.20.1 Pitch Bend Sensitivity

Format

Message Format :	BnH 64H 00H 65H 00H 06H mmH 26H 11H
n :	MIDI Channel Number
mm :	Value 0 - 24
ll :	Send: 00H, Receive: Ignored

Send

This message is not sent by this Instrument.

Receive

Receipt changes Pitch Bend Sensitivity.

9.20.2 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.

9.20.3 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.

9.20.4 Modulation Depth

Format

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

Send

This message is never sent.

Receive

Receipt changes the Vibrato Modulation Depth for the tone that is currently selected by the applicable part.

9.20.5 Null

Format

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

Send

This message is never sent.

Receive

Receipt deselects RPN.

9.21 All Sound Off (78H)

Format

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

Send

Sent when an SD card is inserted or removed, and when an SD card operation is performed. (PX-830, AP-420)

Receive

Receipt stops all voices that are sounding.

9.22 Reset All Controllers (79H)

Format

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

Send

Sent in the following cases.

- When the keyboard channel is changed
- When a recorder function is used

Receive

Receipt initializes each performance controller.

10 Mode Messages

10.1 All Notes Off (7BH)

Format

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

Send

Sent in the following cases.

- When the keyboard channel is changed
- When a recorder function is used

Receive

Receipt 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 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.

For information about numbers, see the Tone List in the User's Guide.

Receive

Receipt changes the tone.

The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message.

For information about the program number of the actually selected tone, see the Tone List in the User's Guide.

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 Timbre Type" below.

11.1 About 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 “21.1 Basic Parameters”, there are four Timbre Types settings: Melody, LM Piano, Piano, and Drum. The operation for a received channel message differs according to the Timbre Type.

- **Timbre Type: Melody**
This Timbre Type is for normal melody tones. The damper pedal performs on/off operations.
- **Timbre Type: Piano or LM (Linear Morphing) Piano**
This Timbre Type is 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. The method for producing sound in response to the note messages also is different from that of the melody Timbre Type, and operation is optimized for piano.
- **Timbre Type: Drum**
This Timbre Type is for drum sounds. The method for producing sound is optimized for drums. The damper pedal and sostenuto pedal do not work for sounds that do not recognize Note Off. The tuning setting also does not affect this Timbre Type.

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 “24.1 Monaural Tone DSP” use only one DSP line, while the tones under “24.2 Stereo Tone DSP” use two DSP lines. For information about tones that use DSP, see “23 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 newly selected tone.

11.2.3 Use of the Same DSP Line by Multiple Parts

When all of the settings below are the same for multiple parts that select tones that use DSP, the same DSP line is assigned to all of the parts in order to maximize DSP line availability. Note, however, that with the PX-830 and AP-420, a DSP cannot be shared simultaneously between parts A01 through B16, and parts C01 through C16.

- 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

This message is not sent by this Instrument.

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 Change

Format

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

Send

This message is not sent by this Instrument.

Receive

Receipt of this message changes the pitch of the currently sounding voice. Pitch bend change sensitivity 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
11:	Value LSB
mm:	Value MSB

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 “26.3 Pan Setting Value Table” in “Part VII 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
ll :	Value LSB (Note1)
mm :	Value MSB (Note1)

Note 1:

For information about the relationship between setting values and send/receive values, see “26.4 –100 - 0 - +99 Setting Value Table” in “Part VII Setting Values and Send/Receive Values” of this document.

Send

This message is sent when the tuning setting is changed.

Receive

Receipt changes the Master Fine Tune8 parameter of Patch.

Acoustic Resonance Actions

Acoustic Resonance acoustic characteristics also alter Fine Tune of the strings that simulate resonance in accordance with the Master Fine Tune8 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 11H mmH F7H
ll :	Send: 00H, Receive: Ignored
mm :	Value MSB

Send

This message is never sent.

Receive

Receipt changes the Patch Master Coarse Tune 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 “26.5 Reverb Type Setting Value Table” in “Part VII 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

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 “26.6 Chorus Type Setting Value Table” in “Part VII 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

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

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

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

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

1 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. Also, the Scale Tune Enable setting shown under “20.7 Part Parameters” for parts C01 through C16 become zero, which disables the temperament (scale) function.

GM System Off Format

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

Send

This message is never sent.

Receive

Receipt returns the 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 Messages

Format

Message Format:	F0H 44H 15H 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

This section explains the format of the Instrument-specific System Exclusive Messages. See “Part V Parameter List” for information about what type of data can actually be sent.

16.1 Message Classifications

Basically, the operation that corresponds to Instrument-specific system exclusive messages is parameter data transfer. The following operations can be performed from an external device using this parameter transfer message.

- Modification of an individual Instrument parameter
- Import of an individual Instrument parameter value

In addition to parameters being used as device setting values, some parameters act as commands when received by the Instrument and as device status information when sent from the Instrument.

The following table shows the parameter category for each type of transfer.

FunctionSection	Parameter Category	Description
System	System	Commands, Instrument status
	Setup	Instrument basic settings
Sound Generator	Patch	Soundsourcecommonsettings (systemeffects, master settings, etc.) Soundsourcepart settings (tone selection, mixing, tuning, etc.)
	Tone	Tone parameter, DSP settings
	Scale Tune	Scale Tune Table
Music Player	Music Library	User song data

16.2 Basic Message Structure

Since Instrument-specific System Exclusive messages are sent and received on an individual parameter basis, the Individual Parameter Transfer method is used, and a number of message types are provided to suit specific operations. 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	
IPR	Y	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	Y

16.3 Field Formats

16.3.1 SX : System Exclusive Message Status

Format:	11110000B (F0H)
---------	-----------------

This is the System Exclusive Message status byte established by the MIDI standard.

16.3.2 MAN : Manufacturer's ID

Format:	01000100B (CASIO = 44H)
---------	-------------------------

Indicates this Instrument's manufacturer ID.

16.3.3 MOD : Model ID

Format:	MSB	00010101B (15H)
	LSB	00000010B (02H)

These two successive bytes (MSB, LSB) indicate the PX-130, 330, 730, 830, and AP-220, 420, 620 model ID.

16.3.4 dev : MIDI DeviceID 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:	0aaaaaaaaB
---------	------------

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

aaaaaaaaB	Action	Function
00H	IPR	Individual Parameter Request
01H	IPS	Individual Parameter Send

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.

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
00H	System	A
01H	Setup	A
02H	Patch	A
03H	Tone	A
21H	Music Library	F

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

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

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. Basically, Instrument-specific System Exclusive messages are valid for user area data only.

mem	Data Type	Meaning
0	User area	Read/write enabled
1	Preset area	Read/write disabled

16.3.8 *pset* : Parameter Set Number

Format:	LSB	0nnnnnnnB
	MSB	0mmmmmmB

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)	0jjjjjjjB	0kkkkkkkB (MSB)
---------	-----------------	-----------	-----------------

When there are multiple parameters with the same ID inside the same category, as with the mixer channel volume setting for example, the block number required to specify to which block data belongs is specified as: kkkkkkjjjjjiiiiiiB (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 with 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 abbcddd (Binary).

Example 2:

parameter [A][B]

With an A=3 (2bit), B=200 (8bit) 2-dimensional array parameter, the block bit fields are allocated as: Block = 0000000 000aab bbbbbb (Binary).

16.3.10 prm : Parameter ID

Format:	LSB	0ppppppppB
	MSB	0qqqqqqqqB

The Parameter ID indicates the parameter type. (See “Part V Parameter List”.)

When transferring individual parameters individually (as opposed to bulk transfer), this field is used to identify the parameter by its parameter ID.

16.3.11 idx : Data Index Number

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

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

16.3.12 len : Data Length

Format:	0llllllllB
---------	------------

The value of this field specifies the size of the parameter value stored in the data field. Data length indicates the length of the array being transferred minus 1 when the parameter contains a character string or other similar array structure.

16.3.13 data : Parameter Data

Format:	index0	0dddddddB (0eeeeeeeB) (0fffffffB) (0gggggggB) (0hhhhhhhB)
	index1	0dddddddB (0eeeeeeeB) (0fffffffB) (0gggggggB) (0hhhhhhhB)
	index2	0dddddddB (0eeeeeeeB) (0fffffffB) (0gggggggB) (0hhhhhhhB)
	:	:
	indexN	0dddddddB (0eeeeeeeB) (0fffffffB) (0gggggggB) (0hhhhhhhB)

Parameter data indicates the parameter value.

The data array size is $len + 1$. For a one data item structure, 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]

Single Message Size Limit

With the Instrument’s system exclusive message format, the size of a single message cannot exceed 48 bytes.

The data size and the array size, however, can cause a packet to exceed 48 bytes when transferring a single parameter array. In this case, the IPS and IPR message data length and data index number values can be modified to enable division of a single parameter value into multiple messages so it can be sent that way.

16.3.14 EOX : End of System Exclusive Message

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

This is the End of System Exclusive Message status byte established by the MIDI standard.

17 Parameter Transfer

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

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

Depending on the function of a parameter, Individual Parameter Send may be used to issue a command to the Instrument or Individual Parameter Request may be used to check Instrument status information.

17.1 Two-way Communication

17.1.1 Example : Data send in response to send request to the Instrument

<u>Data Receiver</u>	<u>Data Sender</u>	<u>Operation</u>
	IPR →	Send Request
	← IPS	Data Transfer

17.2 One-way Communication

17.2.1 Example : Data send to Instrument from external source

<u>Data Sender</u>	<u>Data Receiver</u>	<u>Operation</u>
	→ IPS	Data Transfer

17.2.2 Example : Data send resulting from Instrument operation

<u>Data Receiver</u>	<u>Data Sender</u>	<u>Operation</u>
	← IPS	Data Transfer

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.

18 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.

18.1 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...PX-130 1...PX-330 2...PX-730 3...PX-830 4...reserved 5...AP-220 6...AP-420 7...AP-620

19 Setup Parameter

Setup Parameters put a device into the setup mode.

19.1 MIDI Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Midi Device Id	006D	R/W	000000	7	01	00-7F-7F	0-127

20 Patch Parameters

The main function of patch parameters is to configure the settings of the sound source of a device.

20.1 Master Tune Parameters

These parameters configure the Master Tuning Settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Fine Tune8	0001	R/W	000000	8	01	00-80-FF	-100 - 0 - +99 (cent)
Master Coarse Tune	0002	R/W	↑	7	01	00-40-7F	-24 - 0 - +24 (semitone)
Stretch Tune Enable	0003	R/W	↑	1	01	00-01-01	0...Disable 1...Enable

20.2 Master Mixer Parameters

These parameters configure the Master settings of the mixer.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Volume	0012	R/W	000000	7	01	00-7F-7F	0-127
Master Pan	0013	R/W	↑	7	01	00-40-7F	-64 - 0 - +63
Acou Reso To Chorus	0016	R/W	↑	7	01	00-00-7F	0-127
Acou Reso To Reverb	0018	R/W	↑	7	01	00-00-7F	0-127
Acou Reso Return	0019	R/W	↑	7	01	00-40-7F	0-127
Chorus To Reverb	001D	R/W	↑	7	01	00-00-7F	0-127
Chorus Return	001E	R/W	↑	7	01	00-40-7F	0-127
Reverb Return	0025	R/W	↑	7	01	00-40-7F	0-127
Dsp Cancel	0028	R/W	↑	1	01	00-00-01	0...Normal 1...Cancel

20.3 System Chorus Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	0050	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Type	0051	R/W	↑	7	01	00-02-0F	1-16 (Notel)
Rate	0052	R/W	↑	7	01	00-0B-7F	0-127
Depth	0053	R/W	↑	7	01	00-21-7F	0-127
Feedback	0054	R/W	↑	7	01	00-00-7F	0-127
Tone	0055	R/W	↑	7	01	00-4B-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 “26.6 Chorus Type Setting Value Table”.

20.4 System Reverb Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	0080	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Type	0081	R/W	↑	7	01	00-04-0F	1-16 (Note1)
Feedback	0082	R/W	↑	7	01	00-40-7F	0-127
Er Level	0083	R/W	↑	7	01	00-40-7F	0-127
Damp	0084	R/W	↑	7	01	00-67-7F	0-127
Tone	0085	R/W	↑	7	01	00-65-7F	0-127

Note 1:

Selects the System Reverb preset type. Receipt of GM/GS Reset selects Hall2. This is the value of this Type is also linked to each of the System Reverb parameters and to the System Reverb Return Level parameter, and changes them to prescribed values. For details about the preset type list, see “26.5 Reverb Type Setting Value Table”.

20.5 System Acoustic Resonance Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cancel	0030	R/W	000000	1	01	00-00-01	0...Normal 1...Cancel
Tuning	0031	R/W	↑	7	01	00-40-7F	-100-0-+99(cent) (Note1)
Damper Pedal	0032	R/W	↑	7	01	00-00-7F	0-127 (Note2)
Wet Level Max	003B	R/W	↑	16	01	0000-0800-7FFF	0x0000-0x7FFF (Note3)
Low Boost Freq	003C	R/W	↑	16	01	0000-0A00-4000	0x0000-0x4000
Low Boost Level	003D	R/W	↑	16	01	0000-7FFF-7FFF	0x0000-0x7FFF
High Cut Freq	003E	R/W	↑	16	01	0000-2F00-7FFF	0x0000-0x7FFF

Note 1:

Changing this parameter configures the Tuning setting of System Acoustic Resonance. When the Instrument’s Master Fine Tune8 setting is changed, this parameter is reset to the Master Fine Tune8 value.

Note 2:

Changing this parameter performs a Damper Pedal operation on System Acoustic Resonance. When the damper pedal of the part being used by System Acoustic Resonance is operated, this parameter is reset to the depth of the damper pedal operation.

Note 3:

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

20.6 Brilliance Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Type	00A0	R/W	000000	7	01	00-00-01	0...For Speaker 1...For Phones
Mid6 Gain	00AE	R/W	↑	7	01	00-0C-18	-12-0-+12 (Brilliance) (Note1)

Note 1:

Selects Master EQ mid 6 (Brilliance) gain. See “26.8 Brilliance Gain Setting Value Table”.

20.7 Part Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Part Enable	00E0	R/W	20-6: 0 5-0: Part #	1	01	00-01-01	0...Off 1...On
Tone Num	00E1	R/W	↑	14	01	0000-0000-3FFF	0-16383
Fine Tune	00E2	R/W	↑	7	01	00-40-7F	-100 - 0 - +99 (cent)
Coarse Tune	00E3	R/W	↑	7	01	28-40-58	-24-0-+24 (semitone)
ScaleTuneEnable	00E4	R/W	↑	1	01	00-00-01	0...Disable 1...Enable
Volume	00E5	R/W	↑	7	01	00-64-7F	0-127
Acmp Volume	00E6	R/W	↑	7	01	00-7F-7F	0-127
Pan	00E7	R/W	↑	7	01	00-40-7F	-64 - 0 - +63
Cho Send	00E8	R/W	↑	7	01	00-00-7F	0-127
Rev Send	00E9	R/W	↑	7	01	00-28-7F	0-127
Acou Reso Send	00EA	R/W	↑	7	01	00-00-7F	0-127
Bend Range	00EC	R/W	↑	7	01	00-02-18	0-24

21 Tone Parameters

21.1 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	↑	4	01	00-00-0F	0...Melody 1...Piano 2...Drum 3...reserved 4...LM Piano
Timbre Num	0002	R/W	↑	14	01	0000-0000-3FFF	0-16383
Oct Shift	0003	R/W	↑	3	01	02-04-06	-2 - 0 - +2
Line Select	0004	R/W	↑	1	01	00-00-01	0...Direct 1...DSP
Level	0005	R/W	↑	7	01	00-7F-7F	0-127
Touch Sens	0006	R/W	↑	7	01	00-7F-7F	-64 - 0 - +63
Sys Fx Send Override	0007	R/W	↑	1	01	00-00-01	0...No (Notel) 1...Yes
Cho Normal Send	0008	R/W	↑	7	01	00-00-7F	0-127
Cho Deep Send	0009	R/W	↑	7	01	00-00-7F	0-127
Rev Send	000A	R/W	↑	7	01	00-28-7F	0-127
Acou Reso Send	000B	R/W	↑	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.

21.2 LFO Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Vib Wave	000D	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...Dependsonoriginal
Vib Rate	000E	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Delay	000F	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Rise	0010	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Auto Depth	0011	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib Mod Depth	0012	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Vib After Depth	0013	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Wave	0014	R/W	↑	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...Dependsonoriginal
Lfo Rate	0015	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Delay	0016	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Rise	0017	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Auto Depth	0018	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil Mod Depth	0019	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Fil After Depth	001A	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Delay	001B	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Rise	001C	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Auto Depth	001D	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp Mod Depth	001E	R/W	↑	7	01	00-40-7F	-64 - 0 - +63 (Notel)
Lfo Amp After Depth	001F	R/W	↑	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.

21.3 DSP Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	002D	R/W	000000	7	10	00-20-7F	Ascii Character
Algorithm	002E	R/W	↑	14	01	0000-0000-3FFF	Serial Number (Notel)
Cho Normal Send	002F	R/W	↑	7	01	00-00-7F	0-127
Cho Deep Send	0030	R/W	↑	7	01	00-00-7F	0-127
Rev Send	0031	R/W	↑	7	01	00-28-7F	0-127
Acou Reso Send	0032	R/W	↑	7	01	00-00-7F	0-127
Parameter7	0034	R/W	↑	7	20	00-40-7F	0-127
Parameter16	0035	R/W	↑	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 “24 DSP Algorithm ID Tables”.

21.4 Scale Tune

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Note	0000	R/W	000000	8	0C	00-80-FF	-128 - 0 - 127 Array : Note 0....C 1....C# 2....D 3....D# 4....E 5....F 6....F# 7....G 8....G# 9....A 10...A# 11...B
A Key Mode	0001	R/W	↑	1	01	00-00-01	0...Relative 1...Absolute

22 Music Library Parameters

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	↑	32	01	00000000-00000000-00FFFFFF	0-0xFFFFFFFF
Size	0002	R	↑	32	01	00000000-00000000-00FFFFFF	0-0xFFFFFFFF

Part VI

DSP Parameter List

23 Tone with DSP List

This is a list of tones that use DSP.

Tone Number	Tone Name	Mono/Stereo	DSP Algorithm
1	GRAND PIANO MODERN	Stereo	Wide 3Band EQ
2	GRAND PIANO CLASSIC	Stereo	Wide 3Band EQ
8	VIBRAPHONE	Mono	Tremolo

24 DSP Algorithm ID Tables

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

24.1 Monaural Tone DSP

ID	Algorithm	Input	Output	Parameter Set Type
0001	Tremolo	Mono	Mono	Tremolo/Auto Pan

24.2 Stereo Tone DSP

ID	Algorithm	Input	Output	Parameter Set Type
2017	Wide 3Band EQ	Stereo	Stereo	Wide 3Band EQ

25 DSP Parameter Set Types

This section describes the DSP parameter combination patterns of each algorithm specified in the “Parameter Set Type” column of “24 DSP Algorithm ID Tables”.

Note:

The characteristics of a DSP are different depending on the tone, even if the same algorithm is used. Because of this, the same algorithm may not produce the same effect for different tones.

25.1 Tremolo/Auto Pan

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

25.2 Wide 3Band EQ

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 “26.7 Wide Band Equalizer Mid Frequency Setting Value Table”.

Note 2: See “26.9 DSP Equalizer Gain Setting Value Table”.

Part VII

Setting Values and Send/Receive Values

26 Setting Value Tables

26.1 Off/On Setting Value Table

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

26.2 -64 - 0 - +63 Setting Value Table

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

26.3 Pan Setting Value Table

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

26.4 -100 - 0 - +99 Setting Value Table

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

26.5 Reverb Type Setting Value Table

Transmit / Receive Value	Parameter	Panel Number
00H	Room1	-
01H	Room2	1
02H	Room3	-
03H	Hall1	3
04H	Hall2	2 (default)
05H	Plate1	-
06H	Delay	-
07H	Panning Delay	-
08H	Plate2	-
09H	Plate3	-
0AH	Large Room1	-
0BH	Large Room2	-
0CH	Stadium1	4
0DH	Stadium2	-
0EH	Long Delay	-
0FH	Long Panning Delay	-

26.6 Chorus Type Setting Value Table

Transmit / Receive Value	Parameter	Panel Number
00H	Chorus1	1
01H	Chorus2	-
02H	Chorus3	2 (default)
03H	Chorus4	-
04H	Feedback Chorus	-
05H	Flanger1	-
06H	Short Delay	-
07H	Short Delay FB	-
08H	Soft Chorus	-
09H	Bright Chorus	-
0AH	Deep Chorus	3
0BH	Flanger2	4
0CH	Flanger3	-
0DH	Flanger4	-
0EH	Short Delay Modulation	-
0FH	Short Delay Modulation FB	-

26.7 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

26.8 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).

26.9 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 VIII

MIDI Implementation Notation

27 Value Notation

27.1 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 decimal values 0 through 127, which are often used in MIDI messages.

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

27.2 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

CASIO®

CASIO COMPUTER CO.,LTD.
6-2, Hon-machi 1-chome
Shibuya-ku, Tokyo 151-8543, Japan

MA0910-A