PX-760/PX-860/AP-260/AP-460 MIDI Implementation

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Contents

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
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- Sound Generator Section
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  - Parts
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- Performance Controller Section
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  - 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 32 parts. Of these, channel messages can be used to perform note on operations and to change settings of only the B Group (B01 through B16). 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	01	-	MIDI/Song Play	Ch.01
17	B02	02	-	MIDI/Song Play	Ch.02
18	B03	03	-	MIDI/Song Play	Ch.03 (Left hand track)
19	B04	04	-	MIDI/Song Play	Ch.04 (Right hand track)
20	B05	05	-	MIDI/Song Play	Ch.05
21	B06	06	-	MIDI/Song Play	Ch.06
22	B07	07	-	MIDI/Song Play	Ch.07
23	B08	08	-	MIDI/Song Play	Ch.08
24	B09	09	-	MIDI/Song Play	Ch.09
25	B10	10	-	MIDI/Song Play	Ch.10
26	B11	11	-	MIDI/Song Play	Ch.11
27	B12	12	-	MIDI/Song Play	Ch.12
28	B13	13	-	MIDI/Song Play	Ch.13
29	B14	14	-	MIDI/Song Play	Ch.14
30	B15	15	-	MIDI/Song Play	Ch.15
31	B16	16	-	MIDI/Song Play	Ch.16

Note1 : 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   Auto Performance MIDI Send

This document describes what operation causes the transmission of each message. However, since there are so many kinds of messages sent by the SMF player (PX-860,AP-460), this function is not mentioned here as the operations.

2   Conditions that Disable Message Send and Receive

The main conditions when MIDI message send and receive are disabled by the Instrument are those described below.

- While storage is selected as the USB device mode(PX-760/PX-860/AP-260/AP-460)

3   Timbre Type Specific Operation

The operation that is performed for a received message depends on the current Timbre Type setting (see " 10.1 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 Channel Message Overview

4.1 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.

4.2 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" `19.6` Part Parameter".

4.3 Instrument Velocity Resolution

The upper seven bits of the 14-bit resolution correspond to the Note On/Off message, while the lower seven bits correspond to the High Resolution Velocity Prefix message. (Note1)

Note On/Off	High Resolution Velocity Prefix
Upper 7 bits	Lower 7 bits

14bits

    The initial default value for the lower 7 bits is 00H. Receipt of a High Resolution Prefix message causes the lower seven bits to be set, but note on/off is not performed.

    Receipt of a Note On/Off message causes the upper seven bits to be set with note on/off performed with 14-bit resolution Velocity.

    The High Resolution Velocity Prefix message corresponds the message immediately following the Note On/Off message, and the lower seven bits are cleared to 00H immediately following note on/off by the Note On/Off message. 7-bit resolution note on/off using only the Note On/Off message also continues to be supported.

    For details about each message, see "`5` Note Off", "`6` Note On", and "`8.17` High Resolution Velocity Prefix".

    Note1 ： The PX-760,AP-260 do not support Note Off Velocity. For these models, Velocity for send Note Off messages is a fixed value (40H). Velocity for receive Note Off messages is ignored. The High Resolution Velocity Prefix message is not sent or received for a Note Off message.

5 Note Off

Format

```
Message Format:   8nH kkH vvH
                  9nH kkH 00H(receive only)
            n:    MIDI Channel Number
           kk:    Key Number
           vv:    velocity
```

Send   Sent when a key is released.(Note1)
The key number changes in accordance with on the Transpose function and Octave Shift function.

Note1   :   The PX-760,AP-260 do not support Note Off Velocity. For these models, Velocity for send Note Off messages is a fixed value (40H). The High Resolution Velocity Prefix message is not sent for a Note Off message.

Receive   Receipt stops a note being sounded by a note on message. (Note1)
When a High Resolution Velocity Prefix message is received immediately prior to the Note Off message and the lower seven bits of the 14-bit Velocity are set, the 14-bit resolution note off of the note being sounded is performed.

For information about the relationship between the Note On/Off message and High Resolution Velocity Prefix message, see "4.3 Instrument Velocity Resolution".

Note off by making the Note On Velocity 00H is identical to note off by the combination of High Resolution Velocity prefix message 40H and Note Off Message 40H.

Note   :   This Instrument has a function that assumes connection of an external device that sends Note Off Velocity as a fixed value. Note Off Velocity 00H is replaced with 40H until a Note Off message with a Velocity value other than 00H is received. This function is enabled when the Instrument is turned on, and disabled by receipt of a Note Off message with a Velocity value other than 00H.

Note1   :   The PX-760,AP-260 do not support Note Off Velocity. Velocity for receive Note Off messages is ignored. The High Resolution Velocity Prefix message is not received for a Note Off message.

6   Note On

Format

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

Send   Sent when a key is pressed. The key number changes in accordance with on the Transpose function and Octave Shift function.

Receive   Receipt sounds a note of the corresponding part.
When a High Resolution Velocity Prefix message is received immediately prior to the Note On message and the lower seven bits of the 14-bit Velocity are set, the 14-bit resolution note on is performed.

For information about the relationship between the Note On/Off message and High Resolution Velocity Prefix message, see "4.3 Instrument Velocity Resolution".

7   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.

8   Control Change

Format

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

Send   Sent when the pedals or other controllers are operated, when the settings are changed, when the tone is changed, when the auto performance is played back, or when other functions are operated.

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

8.1   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 " 10 Program Change " . For information about numbers, see the Tone List in the User ' s Guide.

8.2 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.

8.3 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.

8.4 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" 8.20 NRPN " and" 8.21 RPN ".

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

8.5 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.

8.6 Pan (0AH)

Format

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

Note1 : For information about the relationship between setting values and send/receive values, see " 25.6 Pan Setting Value Table " in " 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.

8.7 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.

8.8 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            DSP Parameter7[0]
                 BnH 11H vvH            DSP Parameter7[1]
                 BnH 12H vvH            DSP Parameter7[2]
                 BnH 13H vvH            DSP Parameter7[3]
                 BnH 50H vvH            DSP Parameter7[4]
                 BnH 51H vvH            DSP Parameter7[5]
                 BnH 52H vvH            DSP Parameter7[6]
                 BnH 53H vvH            DSP Parameter7[7]
              n:  MIDI Channel Number
             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 " `20.3 Tone Dsp Parameter` " . Any message received that corresponds to the parameter of a number not being used by the currently selected DSP is ignored.

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.

$$\texttt{Parameter Setting Value} = \texttt{Parameter Minimum Value} + (\texttt{Parameter Maximum Value} - \texttt{Parameter Minimum Value}) * \left(\frac{\texttt{Received Value}}{127} \right)$$

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

8.9   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 " `10.1 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 " `25.1 Off/On Setting Value Table` " in " `VII Setting Values and Send/Receive Values` " .

- Timbre Type: Piano
  Continuous control of the following is performed in accordance with the value of the received message.

    – Piano note decay rate

  For information about the relationship between setting values and send/receive values, see " `25.2 Damper Pedal Setting Value Table` " in " `VII Setting Values and Send/Receive Values.` "

- Timbre Type: LM (Linear Morphing) 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 Damper Resonance effect resonance note

see " 25.2 Damper Pedal Setting Value Table " in " VII Setting Values and Send/Receive Values. "

- Timbre Type: Drum
  The received message does not affect sound source operation.

8.10 Portamento Switch (41H)

Format

Message Format:	BnH 41H vvH
n:	MIDI Channel Number
vv:	Value (Note1)

Note1 : For information about the relationship between setting values and send/receive values, see the " 25.1 Off/On Setting Value Table " in " 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).

8.11 Sostenuto (42H)

Format

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

Note1 : For information about the relationship between setting values and send/receive values, see the " 25.1 Off/On Setting Value Table " in " 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.

8.12 Soft (43H)

Format

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

Note1 : For information about the relationship between setting values and send/receive values, see the " 25.1 Off/On Setting Value Table " in " 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.

8.13   Vibrato Rate (4CH)

Format

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

Note1   :   For information about the relationship between setting values and send/receive values, see " 25.5 64 - 0 - +63 Setting Value Table " in " 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.

8.14   Vibrato Depth (4DH)

Format

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

Note1   :   For information about the relationship between setting values and send/receive values, see " 25.5 64 - 0 - +63 Setting Value Table " in " 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.

8.15   Vibrato Delay (4EH)

Format

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

Note1   :   For information about the relationship between setting values and send/receive values, see " 25.5 -64 - 0 - +63 Setting Value Table " in " 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.

8.16 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.

8.17 High Resolution Velocity Prefix (58H)

Format

Message Format:	BnH 58H vvH
n:	MIDI Channel Number
vv:	Value

Send   Sends the lower seven bits of 14-bit Velocity when a key is pressed or released. (Note1)

Receive   Receipt is handled, in combination with the following Note On/Off message, as the lower seven bits of 14-bit Velocity. (Note1)

For information about the relationship between the Note On/Off message and High Resolution Velocity Prefix message, see "4.3 Instrument Velocity Resolution".

Note1 : The PX-760,AP-260 do not support Note Off Velocity. For these models, Velocity for send Note Off messages is a fixed value (40H). Velocity for receive Note Off messages is ignored. The High Resolution Velocity Prefix message is not sent or received for a Note Off message.

8.18 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.

8.19 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.

8.20 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.

8.20.1 Assignable Functions to NRPN

This Instrument does not assign any parameters to NRPN.

8.21 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.

8.21.1 Pitch Bend Sensitivity

Format

```
Message Format:  BnH 64H 00H 65H 00H 06H mmH 26H llH
              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.

8.21.2   Fine Tune

Format

Message Format:	BnH 64H 01H 65H 00H 06H mmH 26H llH
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.

8.21.3   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.

8.21.4   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.

8.21.5   Null

Format

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

Send   This message is never sent.

Receive   Receipt deselects RPN.

9   Mode Message

9.1   All Sound Off (78H)

Format

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

Send   This message is not sent by this Instrument.

Receive   Receipt stops all voices that are sounding.

9.2   Reset All Controllers (79H)

Format

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

Send   Mainly sent in the following cases.

- When the keyboard channel is changed
- When a recorder function is used
- When the Duet mode is entered or exited
- When the Duet octave shift changed
- When the DEMO mode is entered or exited
- When USB memory is mounted

Receive   Receipt initializes each performance controller.

9.3   All Notes Off (7BH)

Format

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

Send Mainly sent in the following cases.

- When the keyboard channel is changed

- When a recorder function is used

- When octave shift changed

- When the DEMO mode is entered or exited

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

9.4 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).

9.5 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).

9.6 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.

9.7   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.

10   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 " 10.1 About Timbre Type " below.

10.1   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 " 20.1Tone 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
  This Timbre Type is for piano tones. The decay rate of the voice being sounded is seamlessly 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: LM (Linear Morphing) Piano
  This Timbre Type is for Linear Morphing piano tones. The decay rate of the voice being sounded and Damper Resonance effect characteristics are seamlessly 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.

10.2 DSP Assignments during Tone Selection

10.2.1 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. For information about tones that use DSP, see " 22 Tone with DSP List ".

10.2.2 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.

10.2.3 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.(Note1)

- Tone Number

- All DSP parameters

Note1 : Selecting the algorithms below add Part Volume and Part Pan to the above items.

ID	DSP Algorithm
0000	Rotary
0001	Drive Rotary
2002	Compressor
2003	Limitter

After the same DSP line is assigned to different parts as described here, Reverb Send, Chorus 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.

11 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.

12 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 Message

13 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.

14 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.

14.1 Universal Realtime System Exclusive Message

Format

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

14.1.1 Master Volume

Format

Message Format:	F0H 7FH 7FH 04H 01H llH mmH F7H
ll:	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.

14.1.2 Master Balance

Format

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

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

14.1.3 Master Fine Tuning

Format

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

Send   This message is sent when the tuning setting is changed.

Receive   Receipt changes the Master Fine Tune parameter of Patch.

14.1.4 Master Coarse Tuning

Format

Message Format:	F0H 7FH 7FH 04H 04H llH 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.

14.1.5 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)

Note1 : For information about the relationship between setting values and send/receive values, see " 25.8 Reverb Type Setting Value Table " in " 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.

14.1.6   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)

Note1 : For information about the relationship between setting values and send/receive values, see " 25.9Chorus Type Setting Value Table " in " 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.

14.1.7   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 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.

14.1.8 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.

14.2 Instrument-Specific System Exclusive Messages

Format

```
 Message Format:   F0H 44H 17H 01H....F7H
```

Most Instrument parameters and user data, and some operation commands can be controlled using this message. For more information, see " IV Instrument-Specific System Exclusive Messages ".

Part IV

Instrument-Specific System Exclusive Messages

15 Format

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

15.1 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.

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

15.2 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" Ⅰ", from left to right.

```
                          <-          body (Depends on act)        ->
          SX   MAN   MOD   dev   act   cat   mem   pset   blk   prm   idx   len   data   EOX
   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
```

15.3   Field Formats

15.3.1   SX : System Exclusive message Status

```
Format:   11110000B (F0H)
```

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

15.3.2   MAN : Manufacturer's ID

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

Indicates this Instrument ' s manufacturer ID.

15.3.3   MOD : Model ID

```
Format:   MSB   00010111B (17H)
          LSB   00000001B (01H)
```

These two successive bytes (MSB, LSB) indicate the PX-760,PX-860,AP-260,AP-460 Model ID.

15.3.4   *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.

15.3.5   *act* : Action

```
Format:   0aaaaaaaB
```

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

```
aaaaaaaB   Action   Function
     00H   IPR      Individual Parameter Request
     01H   IPS      Individual Parameter Send
```

IPR:Individual Parameter Request
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

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.

15.3.6 *cat* : **Category**

```
Format:   0cccccccB
```

`0cccccccB` = 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.)

15.3.7 *mem* : **Memory Area ID**

```
Format:   0mmmmmmmB
```

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

15.3.8 *pset* : **Parameter Set Number**

```
Format:   LSB   0nnnnnnnB
          MSB   0mmmmmmmB
```

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

15.3.9 *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:kkkkkkkjjjjjjjjiiiiiiiiB (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 abbccdd (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 bbbbbbb (Binary)`.

15.3.10   *prm* : **Parameter ID**

```
Format:   LSB   0pppppppB
          MSB   0qqqqqqqB
```

The Parameter ID indicates the parameter type. (See" 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.

15.3.11   *idx* : **Data Index Number**

```
Format:   0iiiiiiiB
```

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

15.3.12   *len* : **Data Length**

```
Format:   0lllllllB
```

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.

15.3.13 *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.

15.3.14 **EOX : End of System Exclusive Message**

```
Format:   11110111B
```

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

16 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.

16.1 Two-way Communication

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

```
Data Receiver          Data Sender       Operation
        IPR  ----->                     Send Request
             <-----  IPS                Data Transfer
```
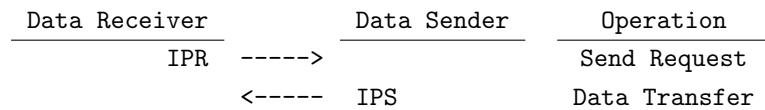
16.2 One-way Communication

16.2.1 Example : Data send to Instrument from external source

```
Data Sender            Data Receiver      Operation
        ----->  IPS                      Data Transfer
```

16.2.2 Example : Data send resulting from Instrument operation

```
Data Receiver          Data Sender       Operation
        <-----  IPS                      Data Transfer
```
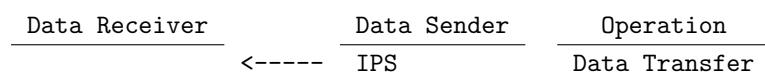
Part V
Parameter List

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.

17 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.

17.1 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	1...PX-760
							2...AP-260
							3...PX-860
							5...AP-460

18 Setup Parameter

Setup Parameters put a device into the setup mode.

18.1 MIDI Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Midi Device Id	004B	R/W	000000	7	01	00-7F-7F	0-127

19 Patch Parameters

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

19.1 Master Tune Parameters

These parameters configure the Master Tuning Settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Fine Tune	0001	R/W	000000	10	01	0000-0200-03FF	-100 - 0 - +99.8(cent)(1unit=100/512cents)
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

19.2 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
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

19.3 System Chorus Parameters

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 (Note1)
Rate	0052	R/W		7	01	00-03-7F	0-127
Depth	0053	R/W		7	01	00-13-7F	0-127
Feedback	0054	R/W		7	01	00-00-7F	0-127
Tone	0055	R/W		7	01	00-7F-7F	0-127

    Note1 : 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 " 25.9 Chorus Type Setting Value Table " .

19.4 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	00-13-19	1-26 (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	00-40-7F	0-127
Tone	0085	R/W		7	01	00-7F-7F	0-127

Note1 ： Selects the System Reverb preset type. Receipt of GM/GS Reset selects Standard Hall. 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 " 25.8 Reverb Type Setting Value Table " .

19.5　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)

Note1 ： Selects Master EQ mid 6 (Brilliance) gain. See " 25.11 Brilliance Gain Setting Value Table " .

19.6　Part Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Part Enable	00E0	R/W	20-6:　0	1	01	00-01-01	0...Off
			5-0:　Part #				1...On
Tone Num	00E1	R/W		14	01	0000-0000-3FFF	0-16383
Fine Tune	00E2	R/W		10	01	0000-0200-03FF	-100 - 0 -
							+99.8(cent)(1unit=100/512cents)
Coarse Tune	00E3	R/W		7	01	28-40-58	-24 - 0 - +24(semitone)
Scale Tune Enable	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

20 Tone Parameters

20.1 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
Tva Keyoff Touch Tbl	0007	R/W		7	01	00-02-7F	
Tva Rate Keyoff Depth	0008	R/W		7	01	00-7F-7F	-64 - 0 - +63
Tvf Keyoff Touch Tbl	0009	R/W		7	01	00-02-7F	
Tvf Rate Keyoff Depth	000A	R/W		7	01	00-7F-7F	-64 - 0 - +63
Kff Keyoff Touch Tbl	000B	R/W		7	01	00-02-7F	
Kff Rate Keyoff Depth	000C	R/W		7	01	00-7F-7F	-64 - 0 - +63
Sys Fx Send Override	000D	R/W		1	01	00-00-01	0...No (Note1)
							1...Yes
Cho Normal Send	000E	R/W		7	01	00-00-7F	0-127
Cho Deep Send	000F	R/W		7	01	00-00-7F	0-127
Rev Send	0010	R/W		7	01	00-28-7F	0-127

Note1 : When a tone is selected whose Sys Fx Send Override parameter setting is " Yes ", the send level setting value to the System Chorus and System Reverb of the part assigned to this tone is rewritten to the value that is stored by this tone.

20.2　LFO Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Vib 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
Vib Rate	0014	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Vib Auto Delay	0015	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Vib Auto Rise	0016	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Vib Auto Depth	0017	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Vib Mod Depth	0018	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Vib After Depth	0019	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Wave	001A	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...Depends on original
Lfo Rate	001B	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Fil Auto Delay	001C	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Fil Auto Rise	001D	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Fil Auto Depth	001E	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Fil Mod Depth	001F	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Fil After Depth	0020	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Amp Auto Delay	0021	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Amp Auto Rise	0022	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Amp Auto Depth	0023	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Amp Mod Depth	0024	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)
Lfo Amp After Depth	0025	R/W		7	01	00-40-7F	-64 - 0 - +63 (Note1)

Note1　: 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.

20.3　DSP Parameters

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	0035	R/W	000000	7	10	00-20-7F	Ascii Character
Algorithm	0036	R/W		14	01	0000-0000-3FFF	Serial Number (Note1)
Cho Normal Send	0037	R/W		7	01	00-00-7F	0-127
Cho Deep Send	0038	R/W		7	01	00-00-7F	0-127
Rev Send	0039	R/W		7	01	00-28-7F	0-127
Parameter7	003C	R/W		7	20	00-40-7F	0-127
Parameter16	003D	R/W		32	10	00000000-00000000-FFFFFFFF	0x0000-0xFFFF

Note1　:　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" 23 DSP Algorithm ID Tables" .

21 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

22 Tone with DSP List

This is a list of tones that use DSP.

22.1 PX-760,PX-860,AP-260,AP-460

Tone Number	Tone Name	Input/Output	DSP Algorithm
1	GRAND PIANO CONCERT	Stereo-Stereo	EQ 3Band
2	GRAND PIANO MODERN	Stereo-Stereo	EQ 3Band
4	GRAND PIANO MELLOW	Stereo-Stereo	EQ 3Band
5	GRAND PIANO BRIGHT	Stereo-Stereo	EQ 3Band
6	ELEC.PIANO 1	Stereo-Stereo	Auto Pan
9	60's E.PIANO	Stereo-Stereo	Tremolo
10	HARPSICHORD	Stereo-Stereo	EQ 3Band
11	VIBRAPHONE	Stereo-Stereo	Tremolo
15	JAZZ ORGAN	Mix-Stereo	Drive Rotary
16	ELEC.ORGAN 1	Mix-Stereo	Drive Rotary
17	ELEC.ORGAN 2	Stereo-Stereo	Tremolo

23 DSP Algorithm ID Tables

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

23.1 DSP Algorithm List

ID	Algorithm	Input	Output	Parameter Set Type
0000	Rotary	Mix	Stereo	Rotary
0001	Drive Rotary	Mix	Stereo	Drive Rotary
0002	Compressor Enhancer	Mix	Stereo	Compressor
2000	Thru	Stereo	Stereo	-
2001	EQ 3Band	Stereo	Stereo	EQ 3Band
2002	Compressor	Stereo	Stereo	Compressor
2003	Limiter	Stereo	Stereo	Limiter
2004	Enhancer	Stereo	Stereo	Enhancer
2005	Tremolo	Stereo	Stereo	Tremolo/Auto Pan
2006	Auto Pan	Stereo	Stereo	Tremolo/Auto Pan
2007	Early Reflection	Mix	Stereo	Early Reflection

24 DSP Parameter Set Types

This section describes the DSP parameter combination patterns of each algorithm specified in the " Parameter Set Type " column of " 23 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.

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24.1   Tremolo/Auto Pan

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

24.2   EQ 3Band

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

Note1   : See " 25.10 Equalizer Frequency Setting Value Table " .
Note2   : See " 25.12 DSP Equalizer Gain Setting Value Table " .

24.3   Compressor

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Depth	00 - 7F	
Parameter7[01]	Attack	00 - 7F	
Parameter7[02]	Release	00 - 7F	
Parameter7[03]	Level	00 - 7F	

24.4   Limiter

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Limit	00 - 7F	
Parameter7[01]	Attack	00 - 7F	
Parameter7[02]	Release	00 - 7F	
Parameter7[03]	Level	00 - 7F	

24.5   Early Reflection

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

24.6   Rotary

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	

Note1   : See " 25.3 Slow/Fast Setting Value Table " .
Note2   : See " 25.4 Rotate/Brake Setting Value Table " .

24.7   Drive Rotary

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	

Note1 : See " 25.3 Slow/Fast Setting Value Table " .
Note2 : See " 25.4 Rotate/Brake Setting Value Table " .

24.8   Enhancer

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	

24.9   Compressor Enhancer

Parameter Number	Parameter Name	Value	Notes
Parameter7[00]	Comp Depth	00 - 7F	
Parameter7[01]	Comp Attack	00 - 7F	
Parameter7[02]	Comp Release	00 - 7F	
Parameter7[03]	Comp Level	00 - 7F	
Parameter7[04]	Enh Low Freq	00 - 7F	
Parameter7[05]	Enh Low Gain	00 - 7F	
Parameter7[06]	Enh Hi Freq	00 - 7F	
Parameter7[07]	Enh Hi Gain	00 - 7F	

Part VII
Setting Values and Send/ Receive Values

25 Setting Value Tables

25.1 Off/On Setting Value Table

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

25.2 Damper Pedal Setting Value Table

PX-860,AP-460

Transmit Value	Receive Value	Parameter
00H	00H	Off
:	:	(continuous)
7FH	7FH	Full

PX-760,AP-260

Transmit Value	Receive Value	Parameter
00H	00H	Off
-	:	(continuous, receive only)
vvH	:	Half(Note1)
-	:	(continuous, receive only)
7FH	7FH	Full

Note1 : vvH = 40H

25.3 Slow/Fast Setting Value Table

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

25.4 Rotate/Brake Setting Value Table

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

25.5 −64 - 0 - +63 Setting Value Table

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

25.6 Pan Setting Value Table

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

25.7 Master Fine Tuning Setting Value Table

Transmit Value(LSB, MSB)	Receive Value	Parameter
(43H, 00H)	(00H, 00H) - (5FH, 00H)	415.5 Hz
(65H, 00H)	(60H, 00H) - (7FH, 00H)	415.6 Hz
(07H, 01H)	(00H, 01H) - (1FH, 01H)	415.7 Hz
(29H, 01H)	(20H, 01H) - (3FH, 01H)	415.8 Hz
:	:	:
(40H, 3FH)	(30H, 3FH) - (4FH, 3FH)	439.8 Hz
(60H, 3FH)	(50H, 3FH) - (6FH, 3FH)	439.9 Hz
(00H, 40H)	(70H, 3FH) - (1FH, 40H)	440.0 Hz
(20H, 40H)	(20H, 40H) - (3FH, 40H)	440.1 Hz
(40H, 40H)	(40H, 40H) - (5FH, 40H)	440.2 Hz
:	:	:
(54H, 7EH)	(50H, 7EH) - (6FH, 7EH)	465.6 Hz
(73H, 7EH)	(70H, 7EH) - (0FH, 7FH)	465.7 Hz
(11H, 7FH)	(10H, 7FH) - (2FH, 7FH)	465.8 Hz
(30H, 7FH)	(30H, 7FH) - (7FH, 7FH)	465.9 Hz

25.8 Reverb Type Setting Value Table

PX-860,AP-460

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
12H	Dutch Church
13H	Standard Hall
17H	Berlin Hall
18H	French Cathedral

PX-760,AP-260

Transmit/Receive Value	Parameter	PanelNumber
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	-

25.9   Chorus Type Setting Value Table

Transmit/Receive Value	Parameter	PanelNumber
00H	Chorus1	1
01H	Chorus2	-
02H	Chorus3	2
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	-

25.10 Equalizer 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	2.5KHz
0DH	3.2KHz
0EH	4.0KHz
0FH	5.0KHz

25.11 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).

25.12   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 VIII
MIDI Implementation Notation

26 Value Notation

26.1 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	1Hexadecimal	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

26.2 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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