

MZ-X300/MZ-X500 MIDI Implementation

CASIO COMPUTER CO., LTD.

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Part I

Overview

1 Product Configuration as a MIDI Device

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

1.1 System Section

The System Section manages the Instrument status and user data.

1.2 Performance Controller Section

The Performance Controller Section performs keyboard play and controller operations, and generates performance messages in accordance with phrase play, etc. Basically, generated performance messages are sent to external destinations while also being transmitted to the Sound Generator Section. The channel number of the sent channel message is in accordance with the Instrument's MIDI setting. For details about the MIDI setting, see the Instrument's User's Guide.

1.3 Sound Generator Section

The Sound Generator Section mainly performs receive of performance information and sound source setting information. It consists of a common part that does not depend on the channel and a musical instrument part that is independent of each channel.

1.3.1 Sound Generator Common Block

The common block consists of system effects, master control, etc. These can be controlled by mixer function, effect function, general universal system exclusive messages, or the Instrument's system exclusive messages or all.

1.3.2 Instrument Part Block

The instrument part section consists of a total of 16 instrument parts. The settings of each part can be changed using the mixer function, channel messages or Instrument's system exclusive messages or all. Part numbers 01 through 04 in particular are called zones, and zone settings can be used to modify operations. See the Instrument's User's Guide for details about zones.

The functions assigned to each part are shown below. The MIDI send channel and MIDI receive channel can be changed using the Instrument's MIDI settings.

Part number	MIDI Receive Ch	MIDI Transmit Ch	Assigned Function(Note)
01	1	01 - 16	Song Sequencer/Zone 1/SMF play/MIDI IN
02	2	01 - 16	Song Sequencer/Zone 2/SMF play/MIDI IN
03	3	01 - 16	Song Sequencer/Zone 3/SMF play/MIDI IN
04	4	01 - 16	Song Sequencer/Zone 4/SMF play/MIDI IN
05	5	5	Song Sequencer/SMF play/MIDI IN
06	6	6	Song Sequencer/SMF play/MIDI IN
07	7	7	Song Sequencer/SMF play/MIDI IN
08	8	8	Song Sequencer/SMF play/MIDI IN
09	9	9	Song Sequencer/SMF play/MIDI IN
10	10	10	Song Sequencer/SMF play/MIDI IN
11	11	11	Song Sequencer/SMF play/MIDI IN
12	12	12	Song Sequencer/SMF play/MIDI IN
13	13	13	Song Sequencer/SMF play/MIDI IN
14	14	14	Song Sequencer/SMF play/MIDI IN
15	15	15	Song Sequencer/SMF play/MIDI IN
16	16	16	Song Sequencer/SMF play/MIDI IN

Note: Song sequencer playback can be assigned to up to eight parts. See the Instrument's User's Guide for details.

2 Timbre Type Specific Operation

The sound source operation performed for a sound generator instrument receive message may depend on the value of the Timbre Type (see “About the Timbre Type” in “8 Program Change”) of each part's operation mode. For details, see the explanation for each message.

3 Controlling Send/Receive of MIDI Messages in Each Instrument Part

Send and receive of MIDI messages for each instrument part can be controlled by mixer function and global Instrument MIDI settings, Performance MIDI settings, NRPN messages, and Instrument-specific system exclusive messages. See the Instrument's User's Guide for details.

4 Conditions that Disable Message Send and Receive

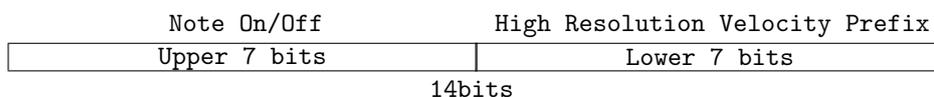
No MIDI messages at all can be sent or received while “Please Wait ...” is on the display.

Part II

Channel Message

MIDI Message Send by Controller These MIDI messages can be sent by assigning any control change from CC:00H to CC:65H, after touch, etc. to a controller (knob, slider, pedal, modulation, etc.) See the Instruments User's Guide for details.

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.



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 "7.21 High Resolution Velocity Prefix".

5 Note Off

Format

Message Format: 8nH kkH vvH
9nH kkH 00H(receive only)

n: MIDI Channel Number
kk: Key Number
vv: velocity

Transmit Sent when something is played on the keyboard or when play is performed using an arpeggio, etc. The key number changes in accordance with on the Transpose function and Octave Shift function.

Receive Receipt stops a note being sounded by a note on message.

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 "Instrument Velocity Resolution" at the beginning of part II.

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.

6 Note On

Message Format: 9nH kkH vvH

n: MIDI Channel Number
kk: Key Number
vv: Velocity

Transmit Sent when something is played on the keyboard or when play is performed using an arpeggio, etc. The key number changes in accordance with on the Transpose function and Octave Shift function.

Receive Receipt sounds a note of the corresponding instrument 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 "Instrument Velocity Resolution" at the beginning of part II.

7 Control Change

Message Format: BnH ccH vvH

n: MIDI Channel Number
cc: Control Number
vv: Value

For details about messages, see each section of this manual that covers them.

7.1 Bank Select (00H,20H)

Message Format: BnH 00H mmH (MSB)
BnH 20H llH (LSB)

n: MIDI Channel Number
mm: MSB Value(Note1)
ll: LSB Value(Transmit:00H, Receive:Ignored)

Note1: For details about the relationship between the MSB value and the tone, see the Tone List that comes with the Instrument.

Transmit Sent when a tone or stage setup number is selected.

Receive Receipt causes a change in the tone bank number stored in Instrument memory, but the tone is not actually changed until a Program Change message is received. For details, see “8 Program Change”.

The stage setup number can also be changed by the bank program. For details, see ”8 Stage Setup Number Switching by Bank Select Message and Program Change Message”. For details about stage setups, see the Instrument’s User’s Guide.

7.2 Modulation (01H)

Message Format: BnH 01H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the modulation wheel is operated.

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

7.3 Portamento Time(05H)

Message Format: BnH 05H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the portamento application time.

7.4 Data Entry (06H,26H)

Message Format: BnH 06H mmH (MSB)
BnH 26H llH (LSB)

n: MIDI Channel Number
mm: MSB Value
ll: LSB Value

Transmit Sent when there is a change to the parameter assigned to RPN, NRPN.

Receive Receipt changes the parameter assigned to RPN, NRPN.

7.5 Volume (07H)

Message Format: BnH 07H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the mixer part volume is changed.

Receive Receipt changes the mixer part volume.

7.6 Pan (0AH)

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 "26.5 Pan Setting Value Table" in "VII Setting Values and Send/Receive Values".

Transmit Sent when the pan of any part is changed.

Receive Receipt changes the pan of the corresponding part.

7.7 Expression (0BH)

Message Format: BnH 0BH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when Auto Accompaniment is used and during recorded song playback.

Receive Receipt changes the Expression value.

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

On this Instrument, these messages are used to control DSP operation.

Message Format:	BnH 10H vvH	DSP Parameter [1]
	BnH 11H vvH	DSP Parameter [2]
	BnH 12H vvH	DSP Parameter [3]
	BnH 13H vvH	DSP Parameter [4]
	BnH 50H vvH	DSP Parameter [5]
	BnH 51H vvH	DSP Parameter [6]
	BnH 52H vvH	DSP Parameter [7]
	BnH 53H vvH	DSP Parameter [8]

n: MIDI Channel Number
vv: Value

Receive Receipt changes the value of DSP Parameter [1 to 8] (7-bit parameter) assigned to the part specified by the MIDI Channel Number. Any message received that corresponds to the parameter of a number not being used by the currently selected DSP is ignored. Use NRPN to change DSP parameters from DSP Parameter [9] with a MIDI message. For details, see "7.25 NRPN". For details about each DSP parameter, see "VI DSP Parameter List".

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.

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

7.9 Hold1 (40H)

Message Format: BnH 40H vvH

n: MIDI Channel Number
vv: Value

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

Receive Receipt performs an operation equivalent to a sustain pedal operation.

Timbre Type Specific Operation This operation differs in accordance with the Timbre Type (see “About the Timbre Type” in “8 Program Change”) setting.

- Timbre Type: Melody,Hex Layer
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 、 26.2 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 、 26.3 Sustain 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 、 26.3 Sustain Pedal Setting Value Table、 in 、 VII Setting Values and Send/Receive Values.、

- Timbre Type: Drum

The received message does not affect sound source operation.

7.10 Portamento On/Off(41H)

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 “26.2 Off/On Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Transmit Sent when the portament on/off is changed.

Receive Receipt changes the portamento on/off setting.

7.11 Sostenuto (42H)

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 “26.2 Off/On Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

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

Receive Receipt performs an operation equivalent to a sostenuto pedal operation.

7.12 Soft (43H)

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 “26.2 Off/On Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

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

Receive Receipt performs an operation equivalent to a soft pedal operation.

7.13 Filter Resonance(47H)

Message Format: BnH 47H vvH

n: MIDI Channel Number

vv: Value

Receive Receipt changes the resonance intensity.

7.14 Release Time (48H)

Message Format: BnH 48H vvH

n: MIDI Channel Number

vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt makes a relative change in the time it takes for a note to decay to zero after a key is released.

7.15 Attack Time (49H)

Message Format: BnH 49H vvH

n: MIDI Channel Number

vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt makes a relative change in the time it takes for a note to rise to its maximum level.

7.16 Filter Cutoff (4AH)

Message Format: BnH 4AH vvH

n: MIDI Channel Number

vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes how the cut-off filter is applied.

7.17 Vibrato Rate (4CH)

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 the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the note vibrato rate.

7.18 Vibrato Depth (4DH)

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 the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the degree of pitch modulation.

7.19 Vibrato Delay (4EH)

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 the “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the time it takes until note vibrato starts.

7.20 Portamento Control(54H)

Message Format: BnH 54H vvH

n: MIDI Channel Number

vv: Source Key Number

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.

7.21 High Resolution Velocity Prefix (58H)

Message Format: BnH 58H vvH

n: MIDI Channel Number
vv: Value

Transmit Sends the lower seven bits of 14-bit Velocity when a key is pressed or released.

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 "Instrument Velocity Resolution" at the beginning of part II.

7.22 Reverb Send (5BH)

Message Format: BnH 5BH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the reverb send of any part is changed.

Receive Receipt changes the reverb send of the corresponding part.

7.23 Chorus Send (5DH)

Message Format: BnH 5DH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the chorus send of any part is changed.

Receive Receipt changes the chorus send of the corresponding part.

7.24 Delay Send (5EH)

Message Format: BnH 5EH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the delay send of any part is changed.

Receive Receipt changes the delay send of the corresponding part.

7.25 NRPN (62H,63H)

Message Format: BnH 62H 11H (LSB)
BnH 63H mmH (MSB)

n: MIDI Channel Number
ll: LSB Value
mm: MSB Value

7.25.1 Part Enable

Message Format: BnH 62H 00H
BnH 63H 22H
BnH 06H mmH
BnH 26H 11H

n: MIDI Channel Number
mm: Value (Note1)
ll: (Transmit:00H, Receive:Ignored)

Note1: For information about the relationship between setting values and send/receive values, see the "26.2 Off/On Setting Value Table" in "VII Setting Values and Send/Receive Values" of this document.

Transmit Sent when a mixer part on/off setting is changed.

Receive Receipt changes the mixer part on/off setting.

7.25.2 DSP Parameter

DSP parameters can be changed by NRPN. The relationship between each parameter and NRPN numbers is shown below.

Parameter	MSB	LSB	Notes
DSP Parameter [1]	23H	00H	
DSP Parameter [2]	23H	01H	
:	:	:	
DSP Parameter [16]	23H	0FH	

For details about each DSP parameter, see "VI DSP Parameter List".

7.25.3 Tone

Tone parameters can be changed by NRPN. The relationship between each parameter and NRPN numbers is shown below.

Hex Layer Edit

Parameter	MSB	LSB	Notes
Layer On/Off	5XH	00H	Note1
Octave Shift	5XH	01H	Note2
Pitch LFO Depth	5XH	02H	
Filter LFO Depth	5XH	03H	
Amp Volume	5XH	04H	
Amp Pan	5XH	05H	Note3
Amp LFO Depth	5XH	06H	
DSP On/Off	5XH	07H	Note1

Note: X 0 through 5 correspond respectively to Layers 1 through 6.

Note1: For information about the relationship between setting values and send/receive values, see “26.2 Off/On Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.27 Octave Shift Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note3: For information about the relationship between setting values and send/receive values, see “26.5 Pan Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Hex Layer Detune

Parameter	MSB	LSB	Notes
Detune	56H	00H	Note1

Note1: For information about the relationship between setting values and send/receive values, see “26.26 Hex Layer Detune Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

7.26 RPN (64H,65H)

Message Format: BnH 64H 11H (LSB)
 BnH 65H mmH (MSB)

n: MIDI Channel Number
 ll: LSB Value
 mm: MSB Value

7.26.1 Pitch Bend Sensitivity

Message Format: BnH 64H 00H
 BnH 65H 00H
 BnH 06H mmH
 BnH 26H 11H

n: MIDI Channel Number
 mm: MSB Value(00H - 18H)
 ll: LSB Value(Transmit:00H, Receive:Ignored)

Transmit Sent when Bend Range of any part is changed.

Receive Receipt changes Bend Range of the corresponding part.

7.26.2 Fine Tune

Message Format: BnH 64H 01H
 BnH 65H 00H
 BnH 06H mmH
 BnH 26H 11H

n: MIDI Channel Number
mm: MSB Value
ll: LSB Value

Transmit Sent when the fine tune of any part is changed.

Receive Receipt changes the fine tune of the corresponding part.

7.26.3 Coarse Tune

Message Format: BnH 64H 02H
 BnH 65H 00H
 BnH 06H mmH
 BnH 26H 11H

n: MIDI Channel Number
mm: MSB Value(28H - 58H)
ll: LSB Value(Transmit:00H, Receive:Ignored)

Transmit Sent when the coarse tune of any part is changed.

Receive Receipt changes the coarse tune of the corresponding part. Does not affect sound source operation when the Timbre Type (see “About the Timbre Type” in “8 Program Change”) is Drum.

7.26.4 Null

Message Format: BnH 64H 7FH
 BnH 65H 7FH

n: MIDI Channel Number

Transmit Sent when an RPN, NRPN message send operation is performed.

Receive Receipt de-selects RPN, NRPN.

7.27 All Sound Off (78H)

Message Format: BnH 78H 00H

n: MIDI Channel Number

Receive Receipt stops all voices that are sounding.

7.28 Reset All Controllers (79H)

Message Format: BnH 79H 00H

n: MIDI Channel Number

Transmit Sent when MIDI send related settings are changed.

Receive Receipt initializes each performance controller.

7.29 All Notes Off (7BH)

Message Format: BnH 7BH 00H

n: MIDI Channel Number

Receive Receipt releases (key release) all voices that are sounding.

7.30 Omni Off (7CH)

Message Format: BnH 7CH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received.

7.31 Omni On (7DH)

Message Format: BnH 7DH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received.

7.32 Mono (7EH)

Message Format: BnH 7EH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Sound Off is received.

7.33 Poly (7FH)

Message Format: BnH 7FH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Sound Off is received.

8 Program Change

Message Format: CnH ppH

n: MIDI Channel Number
pp: Program Number (Note1)

Note1: For details about the relationship between the program number and the tone, see the Tone List that comes with the Instrument.

Transmit Sent when a tone or stage setup number is selected.

Receive Receipt changes the ton of the corresponding part. The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message. Also note that receipt of this message also may change the Timbre Type that corresponds to the selected tone. For more information, see “About the Timbre Type” below.

The stage setup number can also be changed by the bank program. For details, see “Stage Setup Number Switching by Bank Select Message and Program Change Message” below.

About the Timbre Type Tones that are selected by each Instrument part have an attribute that depends on the sound source operation type. This attribute is called the “timbre type,” which is one of the types described below.

- Melody

This timbre type optimizes for normal melody tones. The damper pedal performs on/off operations.

- 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.

- LMPiano

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.

- Drum

This setting optimizes for drum sounds. The damper pedal does not function. The Hold1, Channel Coarse Tune, and Master Coarse Tune messages are ignored if they are received.

- Hex Layer

This setting optimizes for hex layer tones. The damper pedal performs on/off operations.

Stage Setup Number Switching by Bank Select Message and Program Change Message

The bank select message and program change message can be used to switch the stage setup number. The change target can be switched by the bank select MSB. The change target is specified by the program change number. The bank select LSB is ignored.

Change Target

Bank Select MSB

Stage Setup

70H

When Stage Set.Chg NRPN is enabled by Instrument settings, number switching by bank select and program change is ignored. For details about stage setups, see the Instrument's User's Guide.

9 Channel After Touch

Message Format: DnH vvH

n: MIDI Channel Number
vv: Value

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

10 Pitch Bend

Message Format: EnH llH mmH

n: MIDI Channel Number
ll: Value LSB
mm: Value MSB

Transmit Sent when the bender is operated.

Receive Receipt changes the pitch of the currently sounding note. The range of the pitch change depends on the Bend Range value setting.

Part III

System Message

11 Active Sensing

Message Format: FEH

Transmit Sent periodically when the MIDI sync mode is master.

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 this Instrument's sound source are released, the controller is reset, and the Active Sensing mode is exited.

12 System Exclusive Message

Message Format: FOH iiH ddH...F7H

ii: ID Number
dd: Device ID

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

ID Number The ID numbers handed by this Instrument are shown below.

ID Number	ID Name
44H	Casio Computer Co. Ltd
7EH	Non Real Time System Exclusive Message
7FH	Real Time System Exclusive Message

Device ID The device ID is used mainly for individual control of multiple devices. When a System Exclusive message is sent, the sending device sends messages that include a value that matches the device ID of the sending device. When a System Exclusive message is received, the receiving device receives only messages that include a value that matches the receiving device ID.

The device ID 7FH is a special value, and receipt is always performed whenever the device ID of either the receiving device or the message is 7FH.

Settings can be configured to change the Instrument's device ID.

12.1 Universal Real Time System Exclusive Message

Message Format: FOH 7FH ddH...F7H

dd: Device ID

12.1.1 Master Volume

Message Format: FOH 7FH ddH 04H 01H 11H mmH F7H

dd: Device ID
11: LSB Value(Receive:Ignored)
mm: MSB Value

Transmit Sent when the Master Volume is changed.

Receive Receipt changes the Master Volume.

12.1.2 Master Fine Tuning

Message Format: F0H 7FH ddH 04H 03H 11H mmH F7H

dd: Device ID
ll: LSB Value(Note1)
mm: MSB Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “26.6 Fine Tuning Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

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

Receive Receipt changes the tuning setting.

12.1.3 Master Coarse Tuning

Message Format: F0H 7FH ddH 04H 04H 11H mmH F7H

dd: Device ID
ll: LSB Value(Transmit:00H,Receive:Ignored)
mm: MSB Value(28H - 58H)

Transmit This message is sent when the Master Coarse Tune setting is changed.

Receive Receipt changes the Patch Master Coarse Tune parameter.

12.1.4 Reverb Type

Message Format: F0H 7FH ddH 04H 05H 01H 01H 01H 01H 01H 00H vvH F7H

dd: Device ID
vv: Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “26.7 Reverb Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the reverb type.

12.1.5 Reverb Time

Message Format: F0H 7FH ddH 04H 05H 01H 01H 01H 01H 01H 01H vvH F7H

dd: Device ID
vv: Value

Receive Receipt changes the Reverb duration.

12.1.6 Chorus Type

Message Format: F0H 7FH 7FH 04H 05H 01H 01H 01H 01H 02H 00H vvH F7H

dd: Device ID
vv: Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “26.8 Chorus Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the chorus type.

12.1.7 Modulation Rate

Message Format: F0H 7FH ddH 04H 05H 01H 01H 01H 01H 02H 01H vvH F7H

dd: Device ID
vv: Value

Receive Receipt changes the Chorus Rate.

12.1.8 Modulation Depth

Message Format: F0H 7FH ddH 04H 05H 01H 01H 01H 01H 02H 02H vvH F7H

dd: Device ID
vv: Value

Receive Receipt changes the chorus level setting.

12.1.9 Send To Reverb

Message Format: F0H 7FH ddH 04H 05H 01H 01H 01H 01H 02H 04H vvH F7H

dd: Device ID
vv: Value

Receive Receipt changes the Chorus Sent To Reverb setting.

12.2 Universal Non Real Time System Exclusive Message

Message Format: F0H 7EH ddH...F7H

dd: Device ID

12.2.1 GM System On

Message Format: F0H 7EH ddH 09H 01H F7H

dd: Device ID

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

12.2.2 GM System Off

Message Format: F0H 7EH ddH 09H 02H F7H

dd: Device ID

Receive Receipt changes the sound source setting to the Instrument presetting.

12.2.3 GM2 System On

Message Format: F0H 7EH ddH 09H 03H F7H

dd: Device ID

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.

12.3 Instrument-Specific System Exclusive Message

Message Format: F0H 44H ... F7H

This message can be used to send the Instrument memory status, for two-way transfer of special operation commands and user data, to perform sound source parameter operations, etc. For more information, see “IV Instrument-Specific System Exclusive Messages”.

Part IV

Instrument-Specific System Exclusive Messages

13 Format

This section explains the format of the Instrument-specific System Exclusive Messages. See “V Parameter List” for information about how parameter sets actually are transferred.

13.1 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

13.2 Basic Message Structure

”Individual Parameter Transfer” (single parameter transmission/reception) is a format of instrument-specific system exclusive message, which comprise a number of different messages for each operation.

The field in the system exclusive 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.

	SX	MAN	MOD	<i>dev</i>	<i>act</i>	<i>body (act Dependent part)</i>								EOX
						<i>cat</i>	<i>mem</i>	<i>pset</i>	<i>blk</i>	<i>prm</i>	<i>idx</i>	<i>len</i>	<i>data</i>	
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

13.3 Format of Each Field

13.3.1 SX : System Exclusive message Status

Format: 11110000B (F0H)

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

13.3.2 MAN : Manufacturer’s ID

Format: 01000100B (CASIO = 44H)

Indicates this Instrument’s manufacturer ID.

13.3.3 MOD : Model ID

Format: MSB 00010111B (17H)
LSB 00000010B (02H)

These two successive bytes (MSB, LSB) indicate the MZ-X300/MZ-X500 model ID.

13.3.4 dev : MIDI Device ID 00H - 7FH

Format: 0dddddddB

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

13.3.5 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.

13.3.6 cat : Category

Format: 0cccccccB

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
03H	Tone	A
05H	Melody	A
06H	Drum	A
09H	Hex Layer	A
0CH	Split	A
0EH	Wave Parameter	A

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

- ... Not Available

13.3.7 *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. Instrument-specific System Exclusive messages basically correspond to the user area only.

mem	Data Type	Meaning
1	User area	Read/write enabled

13.3.8 *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 (*mmmmmmnnnnnnnB*, Binary) being transferred.

13.3.9 *blk* Block Number

The block number is a supplementary number that specifies which block parameter is to be accessed when there are multiple blocks (instrument parts, etc.) that include parameters with the same ID within a single parameter set. The array structure of a block can be expressed up to 4 dimensions, and the size of a 1-dimensional array is expressed as 14 bits.

Format: index3 LSB 0iiiiiiiB
index3 MSB 0jjjjjjjB
index2 LSB 0kkkkkkkB
index2 MSB 0lllllllB
index1 LSB 0mmmmmmB
index1 MSB 0nnnnnnnB
index0 LSB 0ooooooooB
index0 MSB 0pppppppB

Note: Arranged in high dimension sequence.

1-dimension array block [*index0*]

1-dimension array block [*index0*]

Value	Meaning
00jjjjjjjiiiiiiiB	0000H
00llllllllkkkkkkkB	0000H
00nnnnnnnnmmmmmmB	0000H
00pppppppooooooooB	<i>index0</i>

2-dimension array block [index1][index0]

Value	Meaning
00jjjjjjjiiiiiiB	0000H
001111111kkkkkkkB	0000H
00nnnnnnnnmmmmmmB	index1
00ppppppppooooooB	index0

3-dimension array block [index2][index1][index0]

Value	Meaning
00jjjjjjjiiiiiiB	0000H
001111111kkkkkkkB	index2
00nnnnnnnnmmmmmmB	index1
00ppppppppooooooB	index0

4-dimension array block [index3][index2][index1][index0]

Value	Meaning
00jjjjjjjiiiiiiB	index3
001111111kkkkkkkB	index2
00nnnnnnnnmmmmmmB	index1
00ppppppppooooooB	index0

13.3.10 *prm* : Parameter ID

Format: LSB 0pppppppB
 MSB 0qqqqqqqB

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

13.3.11 *idx* : Data Index Number

Format: LSB 0iiiiiiiB
 MSB 0jjjjjjjB

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

13.3.12 *len* : Data Length

Format: LSB 01111111B
 MSB 0mmmmmmmmB

Individual Parameter Transfer 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.

13.3.13 *data* : Parameter Data

Individual Parameter Transfer

```
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. Data is repeatedly placed in an array of the size equivalent to len+1. For the structure of one data item, the length depends on the data bit width(Parameter List Size), as shown below.

Size	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 least significant digit of the first data byte, and the highest weighted bit is the most significant digit of the final data byte. 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 Parameter Data Size Limit Under the Instrument's System Exclusive message format, the size of a single message cannot exceed 48 bytes in all other cases. 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.

14 Individual Parameter Operations

There are two parameter unit operations: Individual Parameter Transfer and Individual Parameter Request. For one session, in response to an IPR (Individual Parameter Request) from an external device, this Instrument returns an IPS (Individual Parameter Send) or the session is concluded when the external device or this Instrument spontaneously sends an IPS. If this Instrument received an IPS, the value of the applicable parameter is changed. Depending on the function of a parameter, Individual Parameter Send may be used to issue a command to the Instrument and Individual Parameter Request may be used to check Instrument status information.

Data Receiver	Data Sender	Operation
IPR		Send Request(Optional)
	IPS	Data Transfer

15 Casio General System Exclusive

15.1 Format

Message Format: F0H 44H 7EH 7FH iiH cH ... ssH ... ppH ... ddH ... F7H

ii: Device ID (0x00...0x7F)
cc ...: Category ID
ss ...: Sub Category ID
pp ...: Parameter ID
dd ...: Data

15.2 Declared Variable Length of Category ID, Sub Category ID and Parameter ID

Category ID(cc...),Sub Category ID(ss...) and Parameter ID(pp...) is declared variable length.

However, because of System Exclusive, sixth bit instead of seventh bit is a flag representing continue to the next byte.

For example,

In case of

F0 44 7E 7F ii 00 01 41 02 dd ... F7

represents

Category ID = 0x00, Sub Category ID =0x01, Parameter ID = $(0x40 * 1) + 0x02 = 0x42$

Part V

Parameter List

This section explains the parameters that actually can be transferred by the Instrument.

16 Using the Parameter List

- Parameter field
Shows the parameter name.
- ID field
Shows the parameter ID as a hexadecimal number.
- R/W field
Shows “R” to indicate that an IPR (Individual Parameter Request) read operation (Read) is possible or “W” to indicate that an IPS (Individual Parameter Send) write operation is possible.
- Block field
Shows the bit field allocation of the block number. The bit field position is shown as a decimal format number.
- Size field
Shows the parameter bit width as a decimal format value.
- Array field
Shows the parameter array size as a hexadecimal value.
- Min-Def-Max field
Shows the minimum value, default value, and maximum value for parameter acquisition as a hexadecimal value.
- Description field
Explains the meaning of parameter values. Unless otherwise specified, setting values are all indicated in decimal format.

Note: Operation is not guaranteed for values other than those noted here.

17 Tone Parameter

These parameters configure tone settings.

17.1 DSP Parameter

These parameters configure tone DSP settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Algorithm	004E	R/W	55-0:0	14	01	0000-0000-3FFF	Algorithm Type
Parameter	004F	R/W		7	20	00-40-7F	0 - 127

17.2 LFO Parameter

These parameters configure tone LFO settings

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Pitch LFO Wave	0034	R/W	55-0:0	4	01	00-0F-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
Pitch LFO Rate	0035	R/W		7	01	00-40-7F	-64 - 0 - +63
Pitch LFO Delay	0036	R/W		7	01	00-40-7F	-64 - 0 - +63
Pitch LFO Rise	0037	R/W		7	01	00-40-7F	-64 - 0 - +63
Pitch LFO Depth	0038	R/W		7	01	00-40-7F	-64 - 0 - +63
Pitch LFO Modulation Depth	0039	R/W		7	01	00-48-7F	-64 - 0 - +63
Filter/Amp LFO Wave	003B	R/W		4	01	00-0F-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
Filter/Amp LFO Rate	003C	R/W		7	01	00-40-7F	-64 - 0 - +63
Filter LFO Delay	003D	R/W		7	01	00-40-7F	-64 - 0 - +63
Filter LFO Rise	003E	R/W		7	01	00-40-7F	-64 - 0 - +63
Filter LFO Depth	003F	R/W		7	01	00-40-7F	-64 - 0 - +63
Filter LFO Modulation Depth	0040	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp LFO Delay	0042	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp LFO Rise	0043	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp LFO Depth	0044	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp LFO Modulation Depth	0045	R/W		7	01	00-40-7F	-64 - 0 - +63

17.3 Pan Parameter

These parameters configure tone pan settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Dynamic Panning	004B	R/W	55-0:0	1	01	00-00-01	0...Off 1...On
Pan Position	004C	R/W		1	01	00-01-01	0...Pre 1...Post

17.4 Portamento Parameter

These are tone portamento operation setting parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Portamento Time	005D	R/W	55-0:0	7	01	00-00-7F	0 - 127
Portamento Mode	005E	R/W		2	01	00-00-02	0...Off 1...On 2...Legato
Legato OnOff	005F	R/W		1	01	00-00-01	0...off 1...on

17.5 ToneBlock Parameter

17.5.1 Basic Parameter

These parameters configure basic tone settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Name	0000	R/W	55-0:0	7	10	00-20-7F	Ascii Character
KeyOff Velocity Mode	0026	R/W		2	01	00-00-02	0...Key Off Velocity 1...Stored Key On Velocity 2...Both
Octave Shift	0027	R/W		3	01	02-04-06	-2 - 0 - +2
Volume	0029	R/W		7	01	00-64-7F	0 - 127
Chorus Send	0031	R/W		7	01	00-00-7F	0 - 127
Reverb Send	0032	R/W		7	01	00-28-7F	0 - 127
Delete Send	0033	R/W		7	01	00-00-7F	0 - 127
Stretch Tune	0049	R/W		4	01	00-00-0F	0...Off 1...Piano1 2...Piano2 3...Piano3 4...Piano4 5...Piano5 6...E.Piano1 7...E.Piano2

17.6 Tone Production Parameter

These parameters configure tone production settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Filter Touch Sense	0004	R/W	55-0:0	7	01	00-7F-7F	-64 - 0 - +63
Amp Touch Sense	0005	R/W		7	01	00-7F-7F	-64 - 0 - +63
Cutoff Offset	000C	R/W	55-0:0	8	01	00-80-FF	-128 - 0 - +127
Resonance Offset	000D	R/W		8	01	00-80-FF	-128 - 0 - +127
Filter Env Depth	000E	R/W		7	01	00-7F-7F	0 - 127

18 Melody Parameter

These parameters configure melody tone settings.

18.1 Velocity/Key Split Parameter (x8split)

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Velocity Range Low	0005	R/W		7	01	00-00-7F	Velocity Lower Limit
Velocity Range High	0006	R/W		7	01	00-7F-7F	Velocity Upper Limit
Key Range Low	0007	R/W		7	01	00-00-7F	Key Lower Limit
Key Range High	0008	R/W		7	01	00-7F-7F	Key Upper Limit

19 Drum Parameter

These parameters configure drum tone settings.

19.1 Instrument Parameter (x128instrument)

These parameters configure settings for each drum tone instrument.

19.1.1 Basic Parameter

These parameters configure basic settings for each drum tone instrument.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Assign Group	0000	R/W	6-0:Key #	7	01	00-00-7F	0 - 15 (0: Off)
Note Off Mode	0002	R/W		1	01	00-00-01	0...Off 1...0n

19.1.2 Pitch Parameter

These parameters configure pitch settings for each drum tone instrument.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Coarse & Fine Tune	0003	R/W	6-0:Key #	16	01	0000-0000-FFFF	S-----.- ----- S:sign bit -sssss.- ----- s:semitoneisemitonej -----c ccccccc c:cent = 100/512 cent resolution 0000000.0 00000000...original 0001100.0 00000000...For +1 octave 1110100.0 00000000...For -1 octave 0000001.0 00000000...For +100 cent(1 semitone) 1111111.0 00000000...For -100 cent(1 semitone) 0000000.1 00000000...For +50 cent 1111111.1 00000000...For -50 cent
Drum Inst Env Level Offset	000E	R/W	6-0:Key # 15-14:Step #	8	01	00-80-FF	-128 - 0 - +127
Drum Inst Env Rate Offset	000F	R/W		10	01	0000-0200-03FF	-512 - 0 - +511

19.1.3 Filter Parameter

These parameters configure filter settings for each drum tone instrument.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Cutoff	0006	R/W	6-0:Key #	8	01	00-80-FF	-128 - 0 - +127
Resonance	0007	R/W		8	01	00-80-FF	-128 - 0 - +127
Filter Envelope Depth	0008	R/W		7	01	00-7F-7F	0 - 127
Amp Env Initial Level	0012	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Attack Time	0013	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Attack Level	0014	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Decay Time	0015	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Decay Level	0016	R/W		8	01	00-80-FF	-128 - 0 - +127

19.1.4 Amp Parameter

These parameters configure amp settings for each drum tone instrument.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Volume	0009	R/W	6-0:Key #	7	01	00-7F-7F	0 - 127
Pan	000A	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp Env Initial Level	0017	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Attack Time	0018	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Attack Level	0019	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Decay Time	001A	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Env Decay Level	001B	R/W		8	01	00-80-FF	-128 - 0 - +127

19.1.5 Effect Parameter

These parameters configure effect settings for each drum tone instrument.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Chorus Send	000B	R/W	6-0:Key #	7	01	00-00-7F	0 - 127
Reverb Send	000C	R/W		7	01	00-28-7F	0 - 127
Delay Send	000D	R/W		7	01	00-00-7F	0 - 127
DSP On/Off	000E	R/W		1	01	00-01-01	0...0ff 1...0n

20 Hex Layer Parameter

These parameters configure hex layer tone settings.

20.1 Hex Layer Parameter

These parameters configure basic hex layer tone settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Volume	002D	R/W	55-0:0	7	01	00-64-7F	0 - 127
Detune	002E	R/W		5	01	00-00-1F	0 - 31
Pitch Lock	002F	R/W		1	03	00-00-01	0...Unlocked 1...Locked
Mode	0030	R/W		2	01	00-00-02	0...Normal Mode 1...Mono Mode 2...Bass Synth Mode

20.2 Hex Layer LFO Parameter

These parameters configure hex layer tone LFO settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
-----------	----	-----	-------	------	-------	-------------	-------------

20.3 Hex Layer Tone Edit Parameter (x6layer)

These are hex layer tone editing parameters.

20.3.1 Basic Parameter

These are hex layer tone editing basic parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Layer On/Off	0000	R/W	2-0:Layer #	1	01	00-01-01	0...0ff 1...0n
Start Trigger	0003	R/W		1	01	00-00-01	0...Key On 1...Key Off
Key Range Low	0004	R/W		7	01	00-00-7F	0 - 127
Key Range High	0005	R/W		7	01	00-7F-7F	0 - 127
Velocity Range Low	0006	R/W		7	01	00-00-7F	0 - 127
Velocity Range High	0007	R/W		7	01	00-7F-7F	0 - 127

20.3.2 Pitch Parameter

These are hex layer tone editing pitch parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Coarse Tune	000F	R/W	2-0:Layer #	7	01	00-40-7F	Added to key number as 0x40 center.
Fine Tune	0010	R/W		16	01	0000-0000-FFFF	S-----.- ----- S:sign bit -----c ccccccc c:cent = 100/512cent resolution 0000000.1 00000000...For +50 cent 1111111.1 00000000...For -50 cent

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Octave Shift	0011	R/W		3	01	02-04-06	-2 - 0 - +2
Key Follow	0012	R/W		8	01	00-C0-FF	-128 - 0 - +127
Key Follow Base	0013	R/W		7	01	00-3C-7F	C- - G9
Envelope Level	0014	R/W	2-0:Layer # 15-14:Step #	15	01	0000-0100-01FF	-256 - 0 - +255
Envelope Time	0015	R/W		7	01	0000-0000-007F	0 - 127
Split Shift	0016	R/W	2-0:Layer #	5	01	00-0C-18	-12 - 0 - +12

20.3.3 Filter Parameter

These are hex layer tone editing filter parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Filter LFO Layer Depth	000D	R/W		8	01	00-80-FF	0 - 255
Filter Type	0017	R/W	2-0:Layer #	3	01	00-00-04	0...LPP3 1...HPF 2...BPF 3...LPP1 4...LPP2
Cutoff	0018	R/W		7	01	00-7F-7F	0 - 127
Resonance	0019	R/W		7	01	00-00-7F	0 - 127
Filter Touch Sense	001A	R/W		7	01	00-7F-7F	0 - 127
Filter Low Key Follow	001B	R/W		8	01	00-80-FF	-128 - 0 - +127
Filter Low Key Follow Base	001C	R/W		7	01	00-3C-7F	C- - G9
Filter Envelope Depth	001D	R/W		7	01	00-7F-7F	0 - 127
Envelope Level	001E	R/W	2-0:Layer # 16-14:Step #	7	01	00-00-7F	0 - 127
Envelope Time	001F	R/W		7	01	00-00-7F	0 - 127
Filter High Key Follow	0027	R/W	2-0:Layer #	8	01	00-80-FF	-128 - 0 -127
Filter High Key Follow Base	0028	R/W		7	01	00-3C-7F	C- - G9

20.3.4 Amp Parameter

These are hex layer tone editing amp parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Amp LFO Layer Depth	000E	R/W		8	01	00-80-FF	0 - 255
Volume	0020	R/W	2-0:Layer #	7	01	00-64-7F	0 - 127
Pan	0021	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp Touch Sense	0022	R/W		7	01	00-7F-7F	0 - 127
Amp Low Key Follow	0023	R/W		8	01	00-80-FF	-128 - 0 - +127
Amp Low Key Follow Base	0024	R/W		7	01	00-3C-7F	C- - G9
Envelope Level	0025	R/W	2-0:Layer # 16-14:Step #	7	01	00-00-7F	0 - 127
Envelope Time	0026	R/W		7	01	00-00-7F	0 - 127
Amp High Key Follow	0029	R/W	2-0:Layer #	8	01	00-80-FF	-128 - 0 -127
Amp High Key Follow Base	002A	R/W		7	01	00-3C-7F	C- - G9
Filter Envelope Decay Time Key Follow	002B	R/W		7	01	00-40-7F	-64 - 0 - +63
Amp Envelope Decay Time Key Follow	002C	R/W		7	01	00-40-7F	-64 - 0 - +63

20.3.5 Effect Parameter

These are hex layer tone editing effect parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
DSP On/Off	0008	R/W	2-0:Layer #	1	01	00-01-01	0...0ff 1...0n
Reverb Send	0009	R/W		7	01	00-7F-7F	0 - 127
Chorus Send	000A	R/W		7	01	00-7F-7F	0 - 127
Delay Send	000B	R/W		7	01	00-7F-7F	0 - 127

21 Split Parameter

21.1 Wave Split Parameter (x16split)

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Key Low	001D	R/W	3-0:Split	7	01	00-00-7F	Key Lower Limit
Key High	001E	R/W		7	01	00-7F-7F	Key Upper Limit
Amp Offset	0022	R/W		8	01	00-80-FF	0x0... 0 times 0x80... 1.0 times 0xFF... 1.99 times

22 Inst Parameter

22.1 Basic Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Pitch Key Cent	0000	R/W	55-0:0	16	01	0000-0000-FFFF	S-----.- ----- S:sign bit -ssssss.- ----- s:semitone -----c ccccccc c:cent = 100/512, resolution 0000000.0 00000000 = original 0001100.0 00000000 = +1 octave 1110100.0 00000000 = -1 octave 0000001.0 00000000 = +100, 1111111.0 00000000 = -100, 0000000.1 00000000 = +50, 1111111.1 00000000 = -50,

23 Waveparam Parameter

23.1 Basic Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Pitch Key Cent	0001	R/W	55-0:0	16	01	0000-0000-FFFF	S-----.- ----- S:sign bit -ssssss.- ----- s:semitone -----c ccccccc c:cent = 100/512, resolution 0000000.0 00000000 = original 0001100.0 00000000 = +1 octave 1110100.0 00000000 = -1 octave 0000001.0 00000000 = +100, 1111111.0 00000000 = -100, 0000000.1 00000000 = +50, 1111111.1 00000000 = -50,

23.2 Wave Format Parameter

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Original Key	0006	R/W		7	01	00-3C-7F	Default C4

Part VI

DSP Parameter List

24 DSP Type List

This is a list of DSP types built into the Instrument.

DSP Number	DSP ID	Type
01	01H	Equalizer
02	02H	Compressor
03	03H	Limiter
04	04H	Enhancer
05	05H	Early Reflection
06	06H	Phaser
07	07H	Chorus
08	08H	Flanger
09	09H	Tremolo
10	0AH	Auto Pan
11	0BH	Rotary
12	0CH	Drive Rotary
13	0DH	LFO Wah
14	0EH	Auto Wah
15	0FH	Distortion
16	10H	Pitch Shifter
17	11H	Multi Chorus
18	12H	Ring Modulator
19	13H	Delay
20	14H	Piano Effect

25 DSP Parameter Set Type

DSP parameters can be changed by General Use Controllers 1 through 8, and NRPN. For details, see "7.8 General Use Controller 1 through 8" and "7.25 NRPN".

25.1 Equalizer

Parameter Number	Parameter Name	Notes
Parameter[1]	EQ1 Frequency	Note1
Parameter[2]	EQ1 Gain	Note2
Parameter[3]	EQ2 Frequency	Note1
Parameter[4]	EQ2 Gain	Note2
Parameter[4]	EQ3 Frequency	Note1
Parameter[5]	EQ3 Gain	Note2
Parameter[7]	Input Level	
Parameter[8]	Wet Level	
Parameter[9]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.10 EQ Frequency Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.11 EQ Gain Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.2 Compressor

Parameter Number	Parameter Name	Notes
Parameter[1]	Attack	
Parameter[2]	Release	
Parameter[3]	Depth	
Parameter[4]	Wet Level	
Parameter[5]	Dry Level	

25.3 Limiter

Parameter Number	Parameter Name	Notes
Parameter[1]	Limit	
Parameter[2]	Attack	
Parameter[3]	Release	
Parameter[4]	Wet Level	
Parameter[5]	Dry Level	

25.4 Enhancer

Parameter Number	Parameter Name	Notes
Parameter[1]	Low Frequency	
Parameter[2]	Low Gain	
Parameter[3]	High Frequency	
Parameter[4]	High Gain	
Parameter[5]	Input Level	
Parameter[6]	Wet Level	
Parameter[7]	Dry Level	

25.5 Early Reflection

Parameter Number	Parameter Name	Notes
Parameter[1]	Wet Level	
Parameter[2]	Feedback	
Parameter[3]	Tone	
Parameter[4]	Input Level	
Parameter[5]	Dry Level	

25.6 Phaser

Parameter Number	Parameter Name	Notes
Parameter[1]	Resonance	
Parameter[2]	Manual	Note1
Parameter[3]	LFO Rate	
Parameter[4]	LFO Depth	
Parameter[5]	LFO Waveform	Note2
Parameter[6]	Input Level	
Parameter[7]	Wet Level	
Parameter[8]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.12 LFO Wave Form1 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.7 Chorus

Parameter Number	Parameter Name	Notes
Parameter[1]	LFO Rate	
Parameter[2]	LFO Depth	
Parameter[3]	LFO Waveform	Note1
Parameter[4]	Feedback	Note2
Parameter[5]	Wet Level	
Parameter[6]	Polarity	Note3
Parameter[7]	Input Level	
Parameter[8]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.13 LFO Wave Form2 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note3: For information about the relationship between setting values and send/receive values, see “26.15 Polarity Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.8 Flanger

Parameter Number	Parameter Name	Notes
Parameter[1]	LFO Rate	
Parameter[2]	LFO Depth	
Parameter[3]	LFO Waveform	Note1
Parameter[4]	Feedback	Note2
Parameter[5]	Wet Level	
Parameter[6]	Input Level	
Parameter[7]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.12 LFO Wave Form1 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.9 Tremolo

Parameter Number	Parameter Name	Notes
Parameter[1]	LFO Rate	
Parameter[2]	LFO Depth	
Parameter[3]	LFO Waveform	Note1
Parameter[4]	Wet Level	
Parameter[5]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.14 LFO Wave Form3 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.10 Auto Pan

Parameter Number	Parameter Name	Notes
Parameter[1]	LFO Rate	
Parameter[2]	LFO Depth	
Parameter[3]	LFO Waveform	Note1
Parameter[4]	Manual	Note2
Parameter[5]	Wet Level	
Parameter[6]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.14 LFO Wave Form3 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.11 Rotary

Parameter Number	Parameter Name	Notes
Parameter[1]	Speed	Note1
Parameter[2]	Brake	Note2
Parameter[3]	Fall Accel	
Parameter[4]	Rise Accel	
Parameter[5]	Slow Rate	
Parameter[6]	Fast Rate	
Parameter[7]	Vibrato/Chorus	Note3
Parameter[8]	Wet Level	
Parameter[9]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.16 Slow/Fast Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.17 Rotate/Stop Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note3: For information about the relationship between setting values and send/receive values, see “26.18 Vibrato/Chorus Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.12 Drive Rotary

Parameter Number	Parameter Name	Notes
Parameter[1]	Overdrive Gain	
Parameter[2]	Overdrive Level	
Parameter[3]	Speed	Note1
Parameter[4]	Brake	Note2
Parameter[5]	Fall Accel	
Parameter[6]	Rise Accel	
Parameter[7]	Slow Rate	
Parameter[8]	Fast Rate	
Parameter[9]	Vibrato/Chorus	Note3
Parameter[10]	Wet Level	
Parameter[11]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.16 Slow/Fast Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.17 Rotate/Stop Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note3: For information about the relationship between setting values and send/receive values, see “26.18 Vibrato/Chorus Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.13 LFO Wah

Parameter Number	Parameter Name	Notes
Parameter[1]	Input Level	
Parameter[2]	Resonance	
Parameter[3]	Manual	
Parameter[4]	LFO Rate	
Parameter[5]	LFO Depth	
Parameter[6]	LFO Waveform	Note1
Parameter[7]	Wet Level	
Parameter[8]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.12 LFO Wave Form1 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.14 Auto Wah

Parameter Number	Parameter Name	Notes
Parameter[1]	Input Level	
Parameter[2]	Resonance	
Parameter[3]	Manual	
Parameter[4]	Depth	Note1
Parameter[5]	Wet Level	
Parameter[6]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” 26.4 -64 - 0 - +63 Setting Value Table of this document.

25.15 Distortion

Parameter Number	Parameter Name	Notes
Parameter[1]	Dist Gain	
Parameter[2]	Dist Level	
Parameter[3]	Dist Low	
Parameter[4]	Dist High	
Parameter[5]	Wah Type	Note1
Parameter[6]	Wah Depth	Note2
Parameter[7]	Wah Manual	
Parameter[8]	Routing	Note3
Parameter[9]	Amp	Note4
Parameter[10]	Wet Level	
Parameter[11]	Wet Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.9 Distortion Wah Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.4 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note3: For information about the relationship between setting values and send/receive values, see “26.19 Routing Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note4: For information about the relationship between setting values and send/receive values, see “26.20 Amp Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.16 Pitch Shifter

Parameter Number	Parameter Name	Notes
Parameter[1]	Pitch	Note1
Parameter[2]	High Damp	
Parameter[3]	Feedback	
Parameter[4]	Input Level	
Parameter[5]	Wet Level	
Parameter[6]	Dry Level	
Parameter[7]	Fine	Note2

Note1: For information about the relationship between setting values and send/receive values, see “26.21 Pitch Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.22 Pitch Shifter Fine Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.17 Multi Chorus

Parameter Number	Parameter Name	Notes
Parameter[1]	LFO Rate	
Parameter[2]	LFO Depth	
Parameter[3]	Wet Level	
Parameter[4]	Dry Level	

25.18 Ring Modulator

Parameter Number	Parameter Name	Notes
Parameter[1]	OSC Frequency	
Parameter[2]	LFO Rate	
Parameter[3]	LFO Depth	
Parameter[4]	Tone	
Parameter[5]	Wet Level	
Parameter[6]	Dry Level	

25.19 Delay

Parameter Number	Parameter Name	Notes
Parameter[1]	Delay Time	
Parameter[2]	Delay Ratio L	
Parameter[3]	Delay Ratio R	
Parameter[4]	Delay Level L	
Parameter[5]	Delay Level R	
Parameter[6]	Feedback Type	Note1
Parameter[7]	Feedback	
Parameter[8]	High Damp	
Parameter[9]	Delay Tempo Sync	Note2
Parameter[10]	Input Level	
Parameter[11]	Dry Level	
Parameter[12]	Wet Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.23 Feedback Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Note2: For information about the relationship between setting values and send/receive values, see “26.24 Delay Tempo Sync Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

25.20 Piano Effect

Parameter Number	Parameter Name	Notes
Parameter[1]	Lid Type	Note1
Parameter[2]	Reflection Level	
Parameter[3]	Input Level	
Parameter[4]	Wet Level	
Parameter[5]	Dry Level	

Note1: For information about the relationship between setting values and send/receive values, see “26.25 Lid Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Part VII

Setting Values and Send/ Receive Values

26 Setting Value Tables

26.1 0 - 127 Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 00H	00H	0
:	:	:
7FH - 7FH	7FH	127

26.2 Off/On Setting Value Table

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

26.3 Sustain Pedal Setting Value Table

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

26.4 -64 - 0 - +63 Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H	-64
:	:	:
40H	40H	0
:	:	:
7FH	7FH	+63

26.5 Pan Setting Value Table

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

26.6 Fine Tuning Setting Value Table

Transmit Value	Receive Value	Parameter
(LSB, MSB)		
(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

26.7 Reverb Type Setting Value Table

Transmit Value	Receive Value	Parameter
-	00H	Room
-	01H	Room
-	02H	Room
-	03H	Hall1
-	04H	Hall2
-	08H	Plate

26.8 Chorus Type Setting Value Table

Transmit Value	Receive Value	Parameter
-	00H	Light Cho
-	01H	Light Cho
-	02H	Chorus
-	03H	Chorus
-	04H	FB Chorus
-	05H	Flanger

26.9 DistortionWahType Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 14H	00H	LPF
15H - 29H	01H	C-Wah
2AH - 3FH	02H	V-Wah
40H - 54H	03H	Fat Wah
55H - 69H	04H	Light Wah
6AH - 7FH	05H	Heavy Wah

26.10 EQ Frequency Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 05H	08H	100Hz
06H - 0BH	09H	125Hz
0CH - 12H	0AH	160Hz
13H - 18H	0BH	200Hz
19H - 1FH	0CH	250Hz
20H - 25H	0DH	315Hz
26H - 2BH	0EH	400Hz
2CH - 32H	0FH	500Hz
33H - 38H	10H	630Hz
39H - 3FH	11H	800Hz
40H - 45H	00H	1.0kHz
46H - 4BH	01H	1.3kHz
4CH - 52H	02H	1.6kHz
53H - 58H	03H	2.0kHz
59H - 5FH	04H	2.5kHz
60H - 65H	05H	3.2kHz
66H - 6BH	06H	4.0kHz
6CH - 72H	07H	5.0kHz
73H - 78H	12H	6.0kHz
79H - 7FH	13H	8.0kHz

26.11 EQ Gain Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 04H	34H	-12
05H - 09H	35H	-11
0AH - 0EH	36H	-10
0FH - 13H	37H	-9
14H - 18H	38H	-8
19H - 1DH	39H	-7
1EH - 22H	3AH	-6
23H - 27H	3BH	-5
28H - 2DH	3CH	-4
2EH - 32H	3DH	-3
33H - 37H	3EH	-2
38H - 3CH	3FH	-1
3DH - 41H	40H	+0
42H - 46H	41H	+1
47H - 4BH	42H	+2
4CH - 50H	43H	+3
51H - 56H	44H	+4
57H - 5BH	45H	+5
5CH - 60H	46H	+6
61H - 65H	47H	+7
66H - 6AH	48H	+8
6BH - 6FH	49H	+9
70H - 74H	4AH	+10
75H - 79H	4BH	+11
7AH - 7FH	4CH	+12

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

26.12 LFO Wave Form1 Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 29H	00H	Sin
2AH - 54H	01H	Tri
55H - 7FH	02H	Random

26.13 LFO Wave Form2 Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 3FH	00H	Sin
40H - 7FH	01H	Tri

26.14 LFO Wave Form3 Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 29H	00H	Sin
2AH - 54H	01H	Tri
55H - 7FH	02H	Tra

26.15 Polarity Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 3FH	00H	-
40H - 7FH	01H	+

26.16 Slow/Fast Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 3FH	00H	Slow
40H - 7FH	01H	Fast

26.17 Rotate/Stop Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 3FH	00H	Rotate
40H - 7FH	01H	Stop

26.18 Vibrato/Chorus Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 11H	00H	Off
12H - 23H	01H	V1
24H - 35H	02H	C1
36H - 48H	03H	V2
49H - 5AH	04H	C2
5BH - 6CH	05H	V3
6DH - 7FH	06H	C3

26.19 Routing Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 1FH	00H	Dist
20H - 3FH	01H	Wah
40H - 5FH	02H	Wah-Dist
60H - 7FH	03H	Dist-Wah

26.20 Amp Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 06H	00H	Bypass
07H - 0EH	01H	PR Combo
0FH - 15H	02H	RV Combo
16H - 1DH	03H	JC Combo
1EH - 24H	04H	TW Combo
25H - 2CH	05H	DX Combo
2DH - 33H	06H	AC Combo
34H - 3BH	07H	MT Combo
3CH - 42H	08H	BG Combo
43H - 4AH	09H	MS Stack
4BH - 51H	0AH	TR Stack
52H - 59H	0BH	SL Stack
5AH - 60H	0CH	RF Stack
61H - 68H	0DH	EV Stack
69H - 6FH	0EH	Bass Combo1
70H - 77H	0FH	Bass Combo2
78H - 7FH	10H	Bass Stack

26.21 Pitch Setting Value Table

Receive Value	DSP Parameter Value	Parameter(quarter tone)
00H - 01H	28H	-24
02H - 04H	29H	-23
05H - 06H	2AH	-22
07H - 09H	2BH	-21
0AH - 0CH	2CH	-20
0DH - 0EH	2DH	-19
0FH - 11H	2EH	-18
12H - 13H	2FH	-17
14H - 16H	30H	-16
17H - 19H	31H	-15
1AH - 1BH	32H	-14
1CH - 1EH	33H	-13
1FH - 20H	34H	-12
21H - 23H	35H	-11
24H - 26H	36H	-10
27H - 28H	37H	-9
29H - 2BH	38H	-8
2CH - 2EH	39H	-7
2FH - 30H	3AH	-6
31H - 33H	3BH	-5
34H - 35H	3CH	-4
36H - 38H	3DH	-3
39H - 3BH	3EH	-2
3CH - 3DH	3FH	-1
3EH - 40H	40H	+0
41H - 42H	41H	+1
43H - 45H	42H	+2
46H - 48H	43H	+3
49H - 4AH	44H	+4
4BH - 4DH	45H	+5
4EH - 4FH	46H	+6
50H - 52H	47H	+7
53H - 55H	48H	+8
56H - 57H	49H	+9
58H - 5AH	4AH	+10
5BH - 5DH	4BH	+11
5EH - 5FH	4CH	+12
60H - 62H	4DH	+13
63H - 64H	4EH	+14
65H - 67H	4FH	+15
68H - 6AH	50H	+16
6BH - 6CH	51H	+17
6DH - 6FH	52H	+18
70H - 71H	53H	+19
72H - 74H	54H	+20
75H - 77H	55H	+21
78H - 79H	56H	+22
7AH - 7CH	57H	+23
7DH - 7FH	58H	+24

26.22 Pitch Shifter Fine Setting Value Table

Receive Value	DSP Parameter Value	Parameter(quarter tone/50)
00H	0EH	-50
01H	0FH	-49
02H	10H	-48
03H - 04H	11H	-47
05H	12H	-46
:	:	:
3CH - 3DH	3EH	-2
3EH	3EH	-1
3FH - 40H	40H	0
41H	41H	1
42H	42H	2
:	:	:
79H	6EH	46
7AH - 7BH	6FH	47
7CH	70H	48
7DH	71H	49
7EH - 7FH	72H	50

26.23 Feedback Type Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 3FH	00H	Stereo
40H - 7FH	01H	Cross

26.24 Delay Tempo Sync Setting Value Table

Receive Value	DSP Parameter Value	Parameter(beat)
00H - 11H	00H	Off
12H - 23H	01H	1/4
24H - 35H	02H	1/3
36H - 48H	03H	3/8
49H - 5AH	04H	1/2
5BH - 6CH	05H	2/3
6DH - 7FH	06H	3/4

26.25 Lid Type Setting Value Table

Receive Value	DSP Parameter Value	Parameter
00H - 29H	00H	Closed
2AH - 54H	01H	Semi Opened
55H - 7FH	02H	Full Opened

26.26 Hex Layer Detune Setting Value Table

Transmit Value	Receive Value	Parameter
MSB		
-	00H - 03H	0
-	04H - 07H	1
:	:	:
-	78H - 7BH	30
-	7CH - 7FH	31

26.27 Octave Shift Setting Value Table

Transmit Value	Receive Value	Parameter
MSB		
-	00H - 18H	-2
-	19H - 32H	-1
-	33H - 4BH	-0
-	4CH - 65H	+1
-	66H - 7FH	+2

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

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