

CT-X3000/CT-X8000IN/CT-X3100/CT-X5000/CT-X9000IN/CT-X5100 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. 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 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 is divided into A, B, C group for every 16 parts, and it consists of a total of 48 parts. The settings of each part can be changed using channel messages or Instrument's system exclusive messages or all. Of these, only the C group can be controlled by external channel messages.

The functions assigned to each part are shown below.

Port	Part number	MIDI Receive Ch	MIDI Transmit ch	Assigned Function	Details
A	01	-	1-16	Upper1	-
A	02	-	1-16	Upper2	-
A	03	-	1-16	Lower1	-
A	04	-	1-16	Lower2	-
A	05	-	1-16	Auto Harmonize	-
A	06	-	6	-	-
A	07	-	7	-	-
A	08	-	8	Metronome	-
A	09	-	9	Accomp	Percussion
A	10	-	10	Accomp	Drum
A	11	-	11	Accomp	Bass
A	12	-	12	Accomp	Chord1
A	13	-	13	Accomp	Chord2
A	14	-	14	Accomp	Chord3
A	15	-	15	Accomp	Chord4
A	16	-	16	Accomp	Chord5

Port	Part number	MIDI Receive Ch	MIDI Transmit Ch	Assigned Function	Details
B	17	-	-	Recorder	System Track Upper1
B	18	-	-	Recorder	System Track Upper2
B	19	-	-	Recorder	System Track Lower1
B	20	-	-	Recorder	System Track Lower2
B	21	-	-	Recorder	Track1 Auto Harmonize
B	22	-	-	-	-
B	23	-	-	-	-
B	24	-	-	Pre count	-
B	25	-	-	Phrase Pad1	-
B	26	-	-	Phrase Pad2	-
B	27	-	-	Phrase Pad3	-
B	28	-	-	Phrase Pad4	-
B	29	-	-	Recorder	System Track Phrase Pad1
B	30	-	-	Recorder	System Track Phrase Pad2
B	31	-	-	Recorder	System Track Phrase Pad3
B	32	-	-	Recorder	System Track Phrase Pad4

Port	Part number	MIDI Receive Ch	MIDI Transmit Ch	Assigned Function	Details
C	33	1	-	MIDI/Auto Play/Recorder	Recorder Solo Track1
C	34	2	-	MIDI/Auto Play/Recorder	Recorder Solo Track2
C	35	3	-	MIDI/Auto Play/Recorder	Recorder Solo Track3
C	36	4	-	MIDI/Auto Play/Recorder	Recorder Solo Track4
C	37	5	-	MIDI/Auto Play/Recorder	Recorder Solo Track5
C	38	6	-	MIDI/Auto Play/Recorder	Recorder Solo Track6
C	39	7	-	MIDI/Auto Play/Recorder	Recorder Solo Track7
C	40	8	-	MIDI/Auto Play/Recorder	Recorder Solo Track8
C	41	9	-	MIDI/Auto Play/Recorder	Recorder Solo Track9
C	42	10	-	MIDI/Auto Play/Recorder	Recorder Solo Track10
C	43	11	-	MIDI/Auto Play/Recorder	Recorder Solo Track11
C	44	12	-	MIDI/Auto Play/Recorder	Recorder Solo Track12
C	45	13	-	MIDI/Auto Play/Recorder	Recorder Solo Track13
C	46	14	-	MIDI/Auto Play/Recorder	Recorder Solo Track14
C	47	15	-	MIDI/Auto Play/Recorder	Recorder Solo Track15
C	48	16	-	MIDI/Auto Play/Recorder	Recorder Solo Track16

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 global Instrument MIDI settings 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 “「Wait ...」, 「Bye」” is on the display.

Part II

Channel Message

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.

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.

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 11H (LSB)

n: MIDI Channel Number
mm: MSB Value(Note1)
11: 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 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”.

7.2 Modulation (01H)

Message Format: BnH 01H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when the modulation wheel or assignable button is operated by setting.

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

Transmit Sent when portamento time is used.

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 mixer part volume is used. Sent when MIDI setting of Accomp Out set to ON and when automatic accompaniment is used.

Receive Receipt changes the 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 “18.5 Pan Setting Value Table” in “VI Setting Values and Send/Receive Values”.

Transmit Sent when mixer part pan is used. Sent When MIDI setting of Accomp Out set to ON and when automatic accompaniment is used.

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 Transmitted by setting when Expression Pedal is connected to this Instrument. Sent when MIDI setting of Accomp Out set to ON and when automatic accompaniment is used.

Receive Receipt changes the Expression value.

7.8 Hold1 (40H)

Message Format: BnH 40H vvH

n: MIDI Channel Number
vv: Value

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 “ 18.2 Off/On Setting Value Table ” in “ VI 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 rateFor information about the relationship between setting values and send/receive values, see “ 18.3 Sustain Pedal Setting Value Table ” in “ VI 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 notesee “ 18.3 Sustain Pedal Setting Value Table ” in “ VI Setting Values and Send/Receive Values. ”
- **Timbre Type: Drum**
The received message does not affect sound source operation.

7.9 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 “18.2 Off/On Setting Value Table” in “VI 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.

7.10 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 “18.2 Off/On Setting Value Table” in “VI 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.

7.11 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 “18.2 Off/On Setting Value Table” in “VI 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.

7.12 Filter Resonance(47H)

Message Format: BnH 47H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the resonance intensity.

7.13 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

Transmit It will be changed when sustain is used and when setting is changed.(CT-X3000/CT-X3100/CT-X5000/CT-X5100)

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

7.14 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI 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.

7.15 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

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

7.16 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the note vibrato rate.

7.17 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the degree of pitch modulation.

7.18 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 “18.4 -64 - 0 - +63 Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

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

7.19 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.

7.20 Reverb Send (5BH)

Message Format: BnH 5BH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when mixer part reverb send is operated. Sent when GM tone is selected, when MIDI setting of Accompaniment Out set to ON and when automatic accompaniment is used.

Receive Receipt changes the reverb send of the corresponding part.

7.21 Chorus Send (5DH)

Message Format: BnH 5DH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when mixer part chorus send is operated. Sent when Chorus type is selected, when MIDI setting of Accompaniment Out set to ON and when automatic accompaniment is used.

Receive Receipt changes the chorus send of the corresponding part.

7.22 Delay Send (5EH)

Message Format: BnH 5EH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when mixer part delay send is operated. Sent when Delay type is selected, when GM tone is selected, when MIDI setting of Accomp Out set to ON and when automatic accompaniment is used.

Receive Receipt changes the delay send of the corresponding part.

7.23 RPN (64H,65H)

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

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

7.23.1 Pitch Bend Sensitivity

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

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

Transmit Sent when calling Registration.

Receive Receipt changes Bend Range of the corresponding part.

7.23.2 Fine Tune

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

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

Transmit Sent when calling Registration.

Receive Receipt changes the fine tune of the corresponding part.

7.23.3 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 calling Registration.

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.

7.23.4 Null

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

n: MIDI Channel Number

Transmit Sent when change settings related to MIDI transmission.

Receive Receipt de-selects RPN, NRPN.

7.24 All Sound Off (78H)

Message Format: BnH 78H 00H

n: MIDI Channel Number

Receive Receipt stops all voices that are sounding.

7.25 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.

7.26 All Notes Off (7BH)

Message Format: BnH 7BH 00H

n: MIDI Channel Number

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

7.27 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.

7.28 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.

7.29 Mono (7EH)

Message Format: BnH 7EH 00H

n: MIDI Channel Number

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

7.30 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.

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.

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.

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.

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 7FH...F7H

ii: ID Number

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
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44H	Casio Computer Co. Ltd
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7EH	Non Real Time System Exclusive Message
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7FH	Real Time System Exclusive Message
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12.1 Universal Real Time System Exclusive Message

Message Format: FOH 7FH 7FH...F7H

12.1.1 Master Volume

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

11: LSB Value(Receive:Ignored)

mm: MSB Value

Receive Receipt changes the Song Volume.

12.1.2 Master Fine Tuning

Message Format: FOH 7FH 7FH 04H 03H 11H mmH F7H

11: LSB Value(Note1)

mm: MSB Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “18.6 Fine Tuning Setting Value Table” in “VI 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 7FH 04H 04H 11H mmH F7H

11: LSB Value(Transmit:00H,Receive:Ignored)

mm: MSB Value(28H - 58H)

Receive Receipt changes the Patch Master Coarse Tune parameter.

12.1.4 Reverb Type

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 “18.7 Reverb Type Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

Transmit Sent when Reverb Type is changed.

Receive Receipt changes the reverb type.

12.1.5 Reverb Time

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

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

vv: Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “18.8 Chorus Type Setting Value Table” in “VI Setting Values and Send/Receive Values” of this document.

Transmit Sent when Chorus Type is changed.

Receive Receipt changes the chorus type.

12.1.7 Modulation Rate

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

Receive Receipt changes the Chorus Rate.

12.1.8 Modulation Depth

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

Receive Receipt changes the chorus level setting.

12.1.9 Send To Reverb

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

Receive Receipt changes the Chorus Sent To Reverb setting.

12.2 Universal Non Real Time System Exclusive Message

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

12.2.1 GM System On

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

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

12.2.2 GM System Off

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

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

12.2.3 GM2 System On

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

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 00011001B (19H)
LSB 00000001B (01H)

These two successive bytes (MSB, LSB) indicate the CT-X3000/CT-X8000IN/CT-X3100/CT-X5000/CT-X9000IN/CT-X5100 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. However, this Instrument does not have a unique Device ID, so please use only 7FH for sending and receiving.

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: 0mmmmmmmmB

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 0mmmmmmmmB

This field is a 2-byte (LSB, MSB) value indicating the number of the parameter set (mmmmmmmmnnnnnnnB, 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 0mmmmmmmmB
index1 MSB 0nnnnnnnnB
index0 LSB 0ooooooooB
index0 MSB 0ppppppppB

Note: Arranged in high dimension sequence.

1-dimension array block [index0]

1-dimension array block [index0]

Value	Meaning
00jjjjjjjiiiiiiiB	0000H
00llllllllkkkkkkkB	0000H
00nnnnnnnnmmmmmmmmB	0000H
00ppppppppooooooooB	index0

2-dimension array block [index1][index0]

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

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

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

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

Value	Meaning
00jjjjjjjiiiiiiiB	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 ToneBlock Parameter

17.1.1 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
Oct Shift	002B	R/W		3	01	02-04-06	-2 - 0 - +2
Line Select	002C	R/W		1	01	00-00-01	0...Direct

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
							1...DSP
Level	002D	R/W		7	01	00-64-7F	0 - 127
Chorus Send	0038	R/W		7	01	00-00-7F	0 - 127
Reverb Send	0039	R/W		7	01	00-28-7F	0 - 127
Delay Send	003A	R/W		7	01	00-00-7F	0 - 127

Part VI

Setting Values and Send/ Receive Values

18 Setting Value Tables

18.1 0 - 127 Setting Value Table

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

18.2 Off/On Setting Value Table

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

18.3 Sustain Pedal Setting Value Table

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

18.4 -64 - 0 - +63 Setting Value Table

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

18.5 Pan Setting Value Table

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

18.6 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

18.7 Reverb Type Setting Value Table

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

18.8 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

Part VII

MIDI Implementation Notation

19 Value Notation

19.1 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

19.2 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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