CTK-2000/CTK-3000/LK-220/LK-105
MIDI Implementation

CASIO COMPUTER CO., LTD.

Contents

Part I
MIDI Message Overview

1 Product Configuration as a MIDI Device

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

1.1 Performance Controller Section

The Performance Controller Section performs keyboard play and controller operations, and generates performance messages in accordance with auto 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 Instrument's instrument part number.

MIDI Output Performance Information

The following describes the performance information that is output and is not output as MIDI signals.

- Output performance
  - Keyboard play by the performer
  - Auto accompaniment
- Non-output performance
  - Demo performance
  - Song playback
  - Lesson function
  - Music Challenge

1.2 Sound Generator Section

The Sound Generator Section consists of a channel-independent common block and an independent instrument part specific to each channel. Mainly it receives performance information and sound source setting information.

1.2.1 Sound Generator Common Block

The common block consists of system effects, mixer master control, etc. A number of the parameters of these items can be controlled by universal system exclusive messages.

1.2.2 Instrument Part Block

The instrument parts of the sound generator can be operated or their settings can be changed with channel messages. The 32 instrument parts of this Instrument are divided between Group A and Group B, each of which has 16 instrument parts. Only Group B can be controlled by external channel messages. As shown in the following table, there is a fixed relationship between channel message receive channel numbers and instrument parts.

Number	Name	Channel	Assigned Function
00	A01	1	Keyboard
01	A02	2	—
02	A03	3	—
03	A04	4	—
04	A05	5	—
05	A06	6	Guide Sound
06	A07	7	Guide Voice
07	A08	8	Metronome
08	A09	9	Auto Accompaniment (Percussion)
09	A10	10	Auto Accompaniment (Drum)
10	A11	11	Auto Accompaniment (Bass)
11	A12	12	Auto Accompaniment (Chord 1)
12	A13	13	Auto Accompaniment (Chord 2)
13	A14	14	Auto Accompaniment (Chord 3)
14	A15	15	Auto Accompaniment (Chord 4)
15	A16	16	Auto Accompaniment (Chord 5)
16	B01	1	MIDI/Auto Performance Functions
17	B02	2	MIDI/Auto Performance Functions
18	B03	3	MIDI/Auto Performance Functions
19	B04	4	MIDI/Auto Performance Functions
20	B05	5	MIDI/Auto Performance Functions
21	B06	6	MIDI/Auto Performance Functions
22	B07	7	MIDI/Auto Performance Functions
23	B08	8	MIDI/Auto Performance Functions
24	B09	9	MIDI/Auto Performance Functions
25	B10	10	MIDI/Auto Performance Functions
26	B11	11	MIDI/Auto Performance Functions
27	B12	12	MIDI/Auto Performance Functions
28	B13	13	MIDI/Auto Performance Functions
29	B14	14	MIDI/Auto Performance Functions
30	B15	15	MIDI/Auto Performance Functions
31	B16	16	MIDI/Auto Performance Functions

2 Timbre Type Specific Operation

The sound source operation performed for a received message depends on the current Timbre Type value (see "11.1 About the Timbre Type), which is the operation mode of each sound generator instrument part. For details, see the explanation for each message.

3 Conditions that Disable Message Send and Receive

All MIDI messages send and receive is disabled during auto play by the Instrument.

Part II
Channel Message

4 Receive Channel

The channel number of the channel message received by each part is shown in the table under "1.2.2 Instrument Part Block".

5 Send Channel

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

6 Note Off

Format

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

Send
Sent when something is played on the keyboard or when auto accompaniment is used.

Receive
Received by Instrument parts corresponding to MIDI. The velocity value is ignored.

7 Note On

Format

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

Send
Sent when something is played on the keyboard.

Receive
Received by Instrument parts corresponding to MIDI.

8 Polyphonic Key Pressure

Format

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

Send
This message is not sent by this Instrument.

Receive
This message is not received by this Instrument.

9 Control Change

Format

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

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

Receive
Receipt changes the pedal and other performance conditions, and Instrument settings.

9.1 Bank Select (00H, 20H)

Format

Message Format:	BnH 00H mmH (MSB) BnH 20H llH (LSB)	
n:	MIDI Channel Number	
mm:	MSB Value (Note1)	
ll:	LSB Value	
	Send	00H
	Receive	Ignored

Note 1:
For details about the relationship between the MSB value and the tone, see the Tone List that comes with the Instrument.

Send
Sent when a tone is selected. The LSB value is always 00H.

Receive
Receipt causes a change in the tone bank number stored in Instrument memory, but the tone is not actually changed until a Program Change message is received.
For details, see "11 Program Change". The LSB value is ignored.

9.2 Modulation (01H)

Format

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

Send
This message is not sent by this Instrument.

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

9.3 Data Entry (06H, 26H)

Format

Message Format:	BnH 06H mmH (MSB) BnH 26H llH (LSB)
n:	MIDI Channel Number
mm:	MSB Value
ll:	LSB Value

Send
Sent when there is a change to the parameter assigned to RPN. This Instrument does not have a parameter that corresponds to NRPN.

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

9.4 Volume (07H)

Format

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

Send
Sent when auto accompaniment is used.

Receive
Receipt changes the volume of the corresponding part.

9.5 Pan (0AH)

Format

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

Note 1:
For information about the relationship between setting values and send/receive values, see "19.3 Pan Setting Value Table" in "Part IV Setting Values and Send/Receive Values".

Send
Sent when auto accompaniment is used.

Receive
Receipt changes the pan setting of the corresponding part.

9.6 Expression (0BH)

Format

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

Send
Sent when auto accompaniment is used.

Receive
Receipt changes the Expression value.

9.7 Hold1 (40H)

Format

Message Format:	BnH 40H vvH
n:	MIDI Channel Number
vv:	Value (Note1)

Note 1:
For information about the relationship between setting values and send/receive values, see the "19.1 Off/On Setting Value Table" in "Part IV Setting Values and Send/Receive Values" of this document.

Send
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 "11.1 About the Timbre Type") setting.

- Timbre Type: Melody
  Sustain off/on control is performed in accordance with the value of the received message.
- Timbre Type: Drum
  The received message does not affect sound source operation.

9.8 Sostenuto (42H)

Format

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

Note 1:
For information about the relationship between setting values and send/receive values, see the "19.1 Off/On Setting Value Table" in "Part IV Setting Values and Send/Receive Values" of this document.

Send

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

Receive

Receipt performs an operation equivalent to a sostenuto pedal operation.

9.9 Soft (43H)

Format

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

Note 1:
For information about the relationship between setting values and send/receive values, see the "19.1 Off/On Setting Value Table" in "Part IV Setting Values and Send/Receive Values" of this document.

Send

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

Receive

Receipt performs an operation equivalent to a soft pedal operation.

9.10 Reverb Send (5BH)

Format

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

Send
Sent when auto accompaniment is used.

Receive
Changes Reverb Send.

9.11 NRPN (62H, 63H)

Format

Message Format:	BnH 62H llH (LSB) BnH 63H mmH (MSB)
n:	MIDI Channel Number
ll:	LSB Value
mm:	MSB Value

Send
This message is not sent by this Instrument.

Receive
This Instrument does not have a corresponding NRPN message.

9.12 RPN (64H, 65H)

Format

Message Format:	BnH 64H llH (LSB) BnH 65H mmH (MSB)
n:	MIDI Channel Number
ll:	LSB Value
mm:	MSB Value

9.12.1 Pitch Bend Sensitivity

Format

Message Format:	BnH 64H 00H BnH 65H 00H BnH 06H mmH BnH 26H llH	
n:	MIDI Channel Number	
mm:	MSB Value 0 - 12	
ll:	LSB Value	
	Send	00H
	Receive	Ignored

Send
Sent when the Bend Range is changed on the CTK-3000.

Receive
Receipt changes Bend Range.

9.12.2 Fine Tune

Format

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

Send
This message is not sent by this Instrument.

Receive
Receipt changes Channel Fine Tune.

9.12.3 Coarse Tune

Format

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

Send
This message is not sent by this Instrument.

Receive
Receipt changes Channel Coarse Tune. Does not affect sound source operation when the Timbre Type is Drum.

9.12.4 Null

Format

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

Send
Sent after the Bend Range is changed on the CTK-3000.

Receive
Receipt deselects RPN.

9.13 All Sound Off (78H)

Format

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

Send
Sent when Local is set to OFF on the Instrument.

Receive
Receipt stops all voices that are sounding.

9.14 Reset All Controllers (79H)

Format

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

Send
Sent when MIDI send related settings are changed on the Instrument.

Receive
Receipt initializes each performance controller.

10 Mode Message

10.1 All Notes Off (7BH)

Format

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

Send
Sent when MIDI send related settings are changed on the Instrument, or when auto play is stopped, etc.

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

10.2 Omni Off (7CH)

Format

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

Send
This message is never sent.

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

10.3 Omni On (7DH)

Format

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

Send
This message is never sent.

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

10.4 Mono (7EH)

Format

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

Send
This message is never sent.

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

10.5 Poly (7FH)

Format

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

Send
This message is never sent.

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

11 Program Change

Format

Message Format:	CnH ppH
n:	MIDI Channel Number
pp:	Program Number (Note1)

Note 1:
For details about the relationship between the program number and the tone, see the Tone List that comes with the Instrument.

Send
Sent when a tone is selected.

Receive
Receipt of this message changes the tone of the part that corresponds to the MIDI channel.
The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message.
Also note that receipt of this message also may change the Timbre Type that corresponds to the selected tone. For more information, see "11.1 About the Timbre Type" below.

11.1 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.
- 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.

12 Channel Aftertouch

Format

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

Send
These messages are never sent.

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

13 Pitch Bend

Format

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

Send
Sent when a pitch bender operation is performed on the CTK-3000.

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 Messages

14 Timing Clock

Format

Message Format:	F8H

Send
Sent when auto accompaniment is used.

Receive
This message is not received by this Instrument.

15 Start

Format

Message Format:	FAH

Send
Sent when auto accompaniment is used.

Receive
This message is not received by this Instrument.

16 Stop

Format

Message Format:	FCH

Send
Sent when auto accompaniment is used.

Receive
This message is not received by this Instrument.

17 Active Sensing

Format

Message Format:	FEH

Send
This message is never sent.

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

18 System Exclusive Message

Format

Message Format:	F0H....F7H

This Instrument sends and receives universal system exclusive messages.

18.1 Universal Realtime System Exclusive Message

Format

Message Format:	F0H 7FH....F7H

18.1.1 Master Volume

Format

Message Format:	F0H 7FH 7FH 04H 01H llH mmH F7H
ll:	LSB Value
mm:	MSB Value

Send
This message is never sent.

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

18.1.2 Master Fine Tuning

Format

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

Note 1:
For information about the relationship between setting values and send/receive values, see "19.4 -100 - 0 - +99 Setting Value Table" in "Part IV Setting Values and Send/Receive Values" of this document.

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

Receive
Receipt changes the tuning setting.

18.1.3 Master Coarse Tuning

Format

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

Send
Sent when Transpose is changed.

Receive
Receipt changes the Transpose parameter. Does not affect sound source operation when the Timbre Type is Drum.

18.1.4 Reverb Parameter

Format

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

Time Format

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

Note 1:
For information about the relationship between setting values and send/receive values, see "19.5 Reverb Time Setting Value Table" in "Part IV Setting Values and Send/Receive Values" of this document.

Send
Sent when the Reverb duration is changed.

Receive
Receipt changes the Reverb duration.

18.1.5 GM System Message

GM System On Format

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

Send
This message is never sent.

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

GM System Off Format

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

Send
This message is never sent.

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

18.1.6 GS Message

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

Send
This message is never sent.

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

Part IV
Setting Values and Send/ Receive Values

19 Setting Value Tables

19.1 Off/On Setting Value Table

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

19.2 -64 - 0 - +63 Setting Value Table

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

19.3 Pan Setting Value Table

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

19.4 -100 - 0 - +99 Setting Value Table

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

19.5 Reverb Time Setting Value Table

Transmit/Receive Value	Parameter
00H	Off
0CH	1
18H	2
24H	3
30H	4
3CH	5
48H	6
54H	7
60H	8
6CH	9
72H	10

Part V
MIDI Implementation Notation

20 Value Notation

20.1 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

20.2 Binary Notation

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

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

CASIO

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

MA0901-A