

AP-710

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.

1.2 Performance Controller Section

The Performance Controller Section generates performance messages in accordance with keyboard play and pedal operations, 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 part number.

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 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 32 instrument parts. The settings of each part can be changed using channel messages or Instrument's system exclusive messages or all. 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	Part Name	MIDI Receive Ch	MIDI Send Ch	Assigned Function	Description
00	A01	-	01(Note1)	Keyboard	Upper1(Main)/ (Right-side keyboard in the Duet Mode)
01	A02	-	02	Keyboard	Upper2(Layer)
02	A03	-	03	Keyboard	Lower1(Split)/ (Left-side keyboard in the Duet Mode)
03	A04	-	-	-	
04	A05	-	05	Recorder Play	Track1 main
05	A06	-	06	Recorder Play	Track1 layer
06	A07	-	07	Recorder Play	Track1 split
07	A08	-	-	Metronome/ Count	
08	A09	-	-		
09	A10	-	-		
10	A11	-	-		
11	A12	-	-		
12	A13	-	-		
13	A14	-	-		
14	A15	-	04	Recorder Play	Track2
15	A16	-	-	-	-
16	B01	01	-	MIDI/Song Play	Ch.01
17	B02	02	-	MIDI/Song Play	Ch.02
18	B03	03	-	MIDI/Song Play	Ch.03 (Left hand track)
19	B04	04	-	MIDI/Song Play	Ch.04 (Right hand track)
20	B05	05	-	MIDI/Song Play	Ch.05
21	B06	06	-	MIDI/Song Play	Ch.06
22	B07	07	-	MIDI/Song Play	Ch.07
23	B08	08	-	MIDI/Song Play	Ch.08
24	B09	09	-	MIDI/Song Play	Ch.09
25	B10	10	-	MIDI/Song Play	Ch.10
26	B11	11	-	MIDI/Song Play	Ch.11
27	B12	12	-	MIDI/Song Play	Ch.12
28	B13	13	-	MIDI/Song Play	Ch.13
29	B14	14	-	MIDI/Song Play	Ch.14
30	B15	15	-	MIDI/Song Play	Ch.15
31	B16	16	-	MIDI/Song Play	Ch.16

Note1: Can be changed by Keyboard Channel setting.

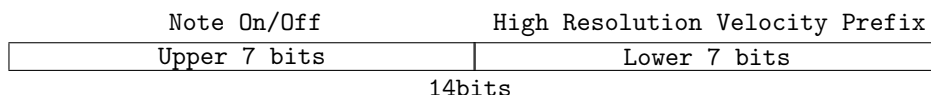
2 Conditions that Disable Message Send and Receive

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

Part II

Channel Message

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 "3 Note Off", "4 Note On", and "5.18 High Resolution Velocity Prefix".

3 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. 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.

4 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. 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.

5 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.

5.1 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 number is selected. For information about numbers, see the Tone List in the User's Guide.

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 "6 Program Change".

5.2 Modulation (01H)

Message Format: BnH 01H 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.

5.3 Portamento Time(05H)

Message Format: BnH 05H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the portamento application time.

5.4 Data Entry (06H,26H)

Message Format: BnH 06H mmH (MSB)
BnH 26H 11H (LSB)

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

Transmit Sent when there is a change to the parameter assigned to RPN. For details about information assigned to parameters that correspond to RPN, see "5.22 RPN". This Instrument does not have a parameter that corresponds to NRPN.

Receive Receipt changes the parameter assigned to RPN.

5.5 Volume (07H)

Message Format: BnH 07H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when layer balance or lower volume is adjusted.

Receive Receipt changes the part volume.

5.6 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 “18.4 Pan Setting Value Table” in “VII Setting Values and Send/Receive Values”.

Transmit Sent when Music Library play is stopped.

Receive Receipt changes the pan of the corresponding part.

5.7 Expression (0BH)

Message Format: BnH 0BH vvH

n: MIDI Channel Number

vv: Value

Receive Receipt changes the Expression value.

5.8 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.

5.9 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 “18.1 Off/On Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the portamento on/off setting.

5.10 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 “18.1 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.

5.11 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 “18.1 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.

5.12 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 “18.3 -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.

5.13 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 “18.3 -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.

5.14 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 “18.3 -64 - 0 - +63 Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the note vibrato rate.

5.15 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 “18.3 -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.

5.16 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 “18.3 -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.

5.17 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.

5.18 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. 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.

5.19 Reverb Send (5BH)

Message Format: BnH 5BH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when Music Library play (etc.) is operated.

Receive Receipt changes the reverb send of the corresponding part.

5.20 Chorus Send (5DH)

Message Format: BnH 5DH vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when Music Library play (etc.) is operated.

Receive Receipt changes the chorus send of the corresponding part.

5.21 NRPN (62H,63H)

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

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

5.21.1 Assignable Functions to NRPN

This Instrument does not assign any parameters to NRPN.

5.22 RPN (64H,65H)

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

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

5.22.1 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)

Receive Receipt changes Pitch Bend Sensitivity.

5.22.2 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

Receive Receipt changes Channel Fine Tune.

5.22.3 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)

Receive Receipt changes Channel Coarse Tune.

5.22.4 Null

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

n: MIDI Channel Number

Transmit Sent when an RPN message send operation is performed.

Receive Receipt de-selects RPN.

5.23 All Sound Off (78H)

Message Format: BnH 78H 00H

n: MIDI Channel Number

Receive Receipt stops all voices that are sounding.

5.24 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.

5.25 All Notes Off (7BH)

Message Format: BnH 7BH 00H

n: MIDI Channel Number

Transmit Sent when MIDI send related settings are changed.

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

5.26 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. Regardless of the reception of this message, the instrument always operates as Omni Off mode.

5.27 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. Regardless of the reception of this message, the instrument always operates as Omni Off mode.

5.28 Mono (7EH)

Message Format: BnH 7EH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received. Regardless of the reception of this message, the instrument always operates as Poly mode.

5.29 Poly (7FH)

Message Format: BnH 7FH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received. Regardless of the reception of this message, the instrument always operates as Poly mode.

6 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 number is selected.

Receive Receipt changes the tone 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.

6.1 DSP Assignments during Tone Selection

6.1.1 DSP Line Structure

Though the Instrument has four DSP lines that can be used simultaneously, selecting a tone that uses DSP causes the required number of DSP lines to become reserved so the tone is configured with the requisite DSP. For information about tones that use DSP, see “17 Tone with DSP List”.

6.1.2 DSP Line Assignment

Selecting multiple tones with DSP at the same time creates the possibility that there will not be enough DSP lines. In this case, the last selected tone with DSP is given priority. Some DSP line(s) already being used will be released so they can be assigned to the newly selected tone.

7 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.

8 Pitch Bend

Message Format: EnH llH mmH

n: MIDI Channel Number

ll: Value LSB

mm: Value MSB

Receive Receipt changes the pitch of the currently sounding note. Pitch bend change sensitivity depends on the pitch bend sensitivity configured with RPN.

Part III

System Message

9 Active Sensing

Message Format: FEH

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

10 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
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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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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. MIDI Device ID is one of Spec Parameter and can be changed by the System Exclusive Message. Device ID of MIDI System Exclusive Message in this case should be sent is set to 7FH.(Initial Value:7FH)

10.1 Universal Real Time System Exclusive Message

Message Format: FOH 7FH ddH...F7H

dd: Device ID

10.1.1 Master Volume

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

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

Receive Receipt changes the Master Volume.

10.1.2 Master Fine Tuning

Message Format: FOH 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 “18.5 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.

10.1.3 Master Coarse Tuning

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

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

Receive Receipt changes the Patch Master Coarse Tune parameter.

10.1.4 Reverb Type

Message Format: FOH 7FH ddH 04H 05H 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 “18.6 Reverb Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Transmit This message is sent when the reverb type is changed.This Instrument treats a hall simulator as a reverb.

Receive Receipt changes the reverb type.

10.1.5 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.

10.1.6 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 “18.7 Chorus Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

Transmit This message is sent when the chorus type is changed.

Receive Receipt changes the chorus type.

10.1.7 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.

10.1.8 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.

10.1.9 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.

10.2 Universal Non Real Time System Exclusive Message

Message Format: F0H 7EH ddH...F7H

dd: Device ID

10.2.1 GM System On

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

dd: Device ID

Receive Receipt puts the settings of sound source into the default of this instrument.

10.2.2 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.

10.2.3 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.

10.3 Instrument-Specific System Exclusive Message

Message Format: F0H 44H ... F7H

This message can be used to send the Instrument memory status and to perform sound source parameter operations, etc. For more information, see “IV Instrument-Specific System Exclusive Messages”.

Part IV

Instrument-Specific System Exclusive Messages

11 Format

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

11.1 Message Classifications

Basically, the operation that corresponds to Instrument-specific system exclusive messages is parameter data transfer.

The following operations can be performed from an external device using this parameter transfer message.

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

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

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

Function Section	Parameter Category	Description
System	System	Commands to the Instrument, Instrument stats
Performance Controller	Spec	Global settings, settings of each music engine
Sound Generator	Patch	Sound source common settings (system effects, master settings, etc.)

11.2 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 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	dev	act	body (act Depends on act)							EOX	
						cat	mem	pset	blk	prm	idx	len		data
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

11.3 Format of Each Field

11.3.1 SX : System Exclusive message Status

Format: 11110000B (FOH)

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

11.3.2 MAN : Manufacturer's ID

Format: 01000100B (CASIO = 44H)

Indicates this Instrument's manufacturer ID.

11.3.3 MOD : Model ID

Format: MSB 00010111B (17H)

LSB 00000010B (03H)

These two successive bytes (MSB, LSB) indicate the AP-710 model ID.

11.3.4 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.

11.3.5 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.

11.3.6 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
00H	System	A
02H	Patch	A
2AH	Spec	A

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

11.3.7 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.

mem	Data Type	Meaning
3	Work Area	Read/Write enabled

11.3.8 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 (mmmmmm-nnnnnnnnnB, Binary) being transferred.

11.3.9 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]

Value	Meaning
00jjjjjjjjiiiiiiiB	0000H
00llllllllkkkkkkkB	0000H
00nnnnnnnnmmmmmmB	0000H
00ppppppppooooooooB	index0

2-dimension array block [index1][index0]

Value	Meaning
00jjjjjjjjiiiiiiiB	0000H
00llllllllkkkkkkkB	0000H
00nnnnnnnnmmmmmmB	index1
00ppppppppooooooooB	index0

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

Value	Meaning
00jjjjjjjiiiiiiiB	0000H
001111111kkkkkkkB	index2
00nnnnnnnmmmmmmB	index1
00pppppppooooooooB	index0

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

Value	Meaning
00jjjjjjjiiiiiiiB	index3
001111111kkkkkkkB	index2
00nnnnnnnmmmmmmB	index1
00pppppppooooooooB	index0

11.3.10 *prm* : Parameter ID

Format: LSB 0pppppppB
 MSB 0qqqqqqqB

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

11.3.11 *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.

11.3.12 *len* : Data Length

Format: LSB 01111111B
 MSB 0mmmmmmB

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.

11.3.13 *data* : Parameter Data

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.

11.3.14 EOX : End of System Exclusive Message

Format: 11110111B (F7H)

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

12 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.

<u>Data Receiver</u>	<u>Data Sender</u>	<u>Operation</u>
IPR		Send Request(Optional)
	IPS	Data Transfer

Part V

Parameter List

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

13 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.

14 System Parameter

These parameters make it possible for an external device to check the status of the Instrument and for an external device to command some operation of the Instrument.

14.1 System Information Parameter

This parameter is a container for system information.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Model	0001	R	000000	7	01	00-00-7F	5...AP-710 6...GP-310 7...GP-510BP

15 Patch Parameter

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

15.1 Master Tune Parameter

These parameters configure the Master Tuning settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Master Fine Tune	0001	R/W	55-0:0	10	01	0000-0200-03FF	-100 - 0 - +99.8(cent)(1unit=100/512cent)
Master Coarse Tune	0002	R/W		7	01	00-40-7F	-24 - 0 - +24(semitone)

15.2 System Chorus Parameter

These parameters are for configuring system chorus settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Type	0050	R/W		7	01	00-02-0F	(Note1)
Rate	0051	R/W		7	01	00-03-7F	0-127
Depth	0052	R/W		7	01	00-13-7F	0-127
Feedback	0053	R/W		7	01	00-00-7F	0-127
Tone	0054	R/W		7	01	00-7F-7F	0-127

Note1: For information about the relationship between setting values and send/receive values, see Spec Number in “18.7 Chorus Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

15.3 System Reverb Parameter

These parameters are for configuring system reverb settings.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Type	0080	R/W	000000	7	01	00-13-1B	(Note1)
Time	0081	R/W		7	01	00-40-7F	0 - 127
Early Reflection	0082	R/W		7	01	00-40-7F	0 - 127
High Damp	0084	R/W		7	01	00-67-7F	0 - 127
Tone	0085	R/W		7	01	00-65-7F	0 - 127

Note1: For information about the relationship between setting values and send/receive values, see Spec Number in “18.6 Chorus Type Setting Value Table” in “VII Setting Values and Send/Receive Values” of this document.

15.4 Portamento Parameter

These are tone portamento operation setting parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Portamento Time	0064	R/W	55-0:0	7	01	00-00-7F	0 - 127
Portamento OnOff	0065	R/W		1	01	00-00-01	0...Off 1...On

16 Spec Parameter

These are system setting parameters.

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
Tuning	0001	R/W		10	01	010B-0200-0303	-245 - 0 - +259 (415.5Hz - 440.0Hz - 465.9Hz)
Stretch Tune	0002	R/W		4	01	00-00-07	0...Default 1...Upper1 2...Off 3...Piano1 4...Piano2 5...Piano3 6...E.Piano1 7...E.Piano2
Concert Play Volume	0015	R/W		7	01	00-7F-7F	0 - 127
Song Volume	0017	R/W		7	01	00-7F-7F	0 - 127
Audio Volume	0019	R/W		7	01	00-7F-7F	0 - 127
Transpose	0020	R/W		7	01	34-40-4C	-12 - 0 - +12
Octave Shift	0021	R/W		7	01	3E-40-42	-2 - 0 - +2
Keyboard Channel	0023	R/W		7	01	00-00-0F	0 - 15
Local Control	0024	R/W		1	01	00-01-01	0...Off 1...On
Hall Simulator	003D	R/W		4	01	00-06-0C	0 :OFF 1 :ROOM 2 :SALON 5 :DUTCH CHURCH 6 :STANDARD HALL 10 :BERLIN HALL 11 :FRENCH CATHEDRAL
Chorus	003F	R/W		4	01	00-00-04	0 :OFF 1 :Light Cho 2 :Chorus 3 :Deep Chorus 4 :Flanger
Brilliance	0040	R/W		7	01	3D-40-43	-3 - 0 - +3
Hammer Response	0041	R/W		4	01	00-00-0B	0 :Default 1 :OFF 2 11 :Type1-10
Lid Simulator	0042	R/W		4	01	00-00-04	0...Default 1...Closed 2...Semi Open 3...Full Open 4...Lid removed
Damper Resonance	0044	R/W		4	01	00-00-0B	0 :Default 1 :OFF 2 11 :Type1-10
Damper Noise	0045	R/W		4	01	00-00-0B	0 :Default 1 :OFF 2 11 :Type1-10
String Resonance	0046	R/W		4	01	00-00-0B	0 :Default 1 :OFF 2 11 :Type1-10
Half Pedal Position	004C	R/W		7	01	3E-40-42	-2 - 0 - +2
Volume Sync EQ	004D	R/W		4	01	00-02-03	0...OFF 1...Weak

Parameter	ID	R/W	Block	Size	Array	Min-Def-Max	Description
							2...Normal
							3...Strong
HeadPhone Mode	004E	R/W		4	01	00-01-01	0...OFF
							1...ON
Temperament Type	005B	R/W		5	01	00-00-10	0 - 16
Temperament Base Note	005C	R/W		4	01	00-00-0B	0 - 11 :C - B

Part VI

DSP Parameter List

17 Tone with DSP List

This is a list of tones that use DSP.

Tone Number	Tone Name
1	BERLIN GRAND
2	BERLIN GRAND MELLOW
3	BERLIN GRAND BRIGHT
4	HAMBURG GRAND
5	HAMBURG GRAND MELLOW
6	HAMBURG GRAND BRIGHT
7	VIENNA GRAND
8	VIENNA GRAND MELLOW
9	VIENNA GRAND BRIGHT
12	GRAND PIANO JAZZ
16	60's PIANO
18	VIBRAPHONE
22	JAZZ ORGAN
23	ELECTRIC ORGAN 1
24	ELECTRIC ORGAN 2

Part VII

Setting Values and Send/ Receive Values

18 Setting Value Tables

18.1 Off/On Setting Value Table

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

18.2 Sustain Pedal Setting Value Table

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

18.3 -64 - 0 - +63 Setting Value Table

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

18.4 Pan Setting Value Table

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

18.5 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

18.6 Reverb Type Setting Value Table

Transmit Value	Receive Value	Parameter
12H	12H	Dutch Church
13H	13H	Standard Hall
17H	17H	Berlin Hall
18H	18H	French Cathedral
1AH	1AH	Room
1BH	1BH	Salon

18.7 Chorus Type Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H	Light Cho
02H	02H	Chorus
0AH	0AH	Deep Chorus
0BH	0BH	Flanger

Part VIII

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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