Specification for SMAF/MA-3

Version 1.08

September 20, 2002

Yamaha Corporation

Contents

<Revision>

Ver.	Date	Description
0.9	June 18, '01	Channel Volume, Expression and Pitch Bend Message was changed to be invalid. Definition of Contents Type was added. TimeBase that is processed at installation side was changed. Bank Select processing at installation side was changed.
0.91	June.25, '01	Description of 7 bit encode was added. Limitation on the number of stream PCM registrations was added. Supplementary explanation of stream PCM reserve was added.
0.92	July.10, '01	Description about tone parameter was changed. Description about PhraseList was changed. Description about mono-mode and poly-mode was changed.
0.93	July.18, '01	Description about NoteOn (tie) was added.
0.94	July.26, '01	Stream PCM pair message was added.
0.95	July.31, '01	Incorrect description was changed. Description was added to stream PCM pair and note message.
0.96	Aug..3, '01	Description about decision of SMAF contents class was added.
0.97	September 7, 2001	Clerical error correction The bank select correspondence table of standard installation guideline was corrected. The unnecessary default value of standard installation guideline was deleted. The description about the note-on at Poly mode was changed. The description about Stream wave registration size limit was added. The description about the minimum music playback time was added.
0.98	September 20, 2001	The description about st and sp was added. The section number etc. was improved.
1.00	November 26. 2001	Stream wave registration frequency was changed. The number of drum voice registration was changed.
1.01	December 10, 2001	The description about st and sp was changed. The description about the note message of Gate Time '0' was added.
1.02	December 19, 2001	The description about the exception condition of Phrase List was added.
1.03	January 30, 2002	Pitch Bend was added to the initialization item of the reset all controller. Initial value was added to the control change message.
1.04	February.13, 2002	Key velocity was added to Initialization item of reset all controller. Clerical error correction
1.05	February.27, 2002	The description of tone parameter is changed. The judgment threshold value of short length error was changed.
1.06	May.29, 2002	The data length limitation of variable length expression information was added. The NoteOn message interpretation basis at the time of Stream PCM pronunciation was changed.
1.07	June.26, 2002	The clerical error and document appearance correction
1.08	September 20, 2002	3.2.7.4.10 RPN message interpretation description change

1. Outline of this document

This document defines subsets of SMAF aiming at synthesizer LSI "MA-3" for portable telephone.

This document consists of two parts including SMAF/MA-3 Standard Authentication Guideline that describes the subsets as definitions for authentication of SMAF/MA-3, and SMAF/MA-3 Standard Installation Guideline that describes the subsets as definitions for interpretation of SMAF/MA-3.

Since this document describes play system (Score Track Chunk) of SMAF, refer to specification for SMAF for other chunks.

For SMAF, format that suits to device is present. Discrimination of the format from conventional format (SMAF・MA-1/2) is made based on the Contents Type and Track number of Score Track Chunk.

To do it, classify the contents roughly into SMAF/MA-1/2 contents and SMAF/MA-3 contents according to Contents Type, and then decide the contents based on the track number (5 for SMAF/MA-3). To make data correctly reproduced, both of these information must be attached without inconsistencies. The method of discrimination of the contents according to Contents Type is described below.

Contents Type	SMAF contents class	Remark
0x00 to 0x2F	MA-1/2	MA-2 is reproduced preferentially for MA-1/2 simultaneously existing SMAF
0x30 or more, and lower 4 bits are "0" or "1"	MA-1/2	MA-2 is reproduced preferentially for MA-1/2 simultaneously existing SMAF
0x32 to 0x3F	MA-3	Standard is 0x32, 0x33. Others depend on carrier.
0x42 to 0x4F	MA-3	Standard is 0x32, 0x33. Others depend on carrier.
0x52 to 0x5F	MA-3	Standard is 0x32, 0x33. Others depend on carrier.

When SMAF/MA-3 contents were selected as a result of this decision, only Score Track Chunk of which track number is 5 is reproduced. (For discrimination of SMAF/MA-1/2, refer to " SMAF / MA-1 / MA-2", Specification for MA-3 Sound Format.)

2. SMAF/MA-3 Standard Authentication Guideline

Tools for authoring SMAF/MA-3 and other tools are to be used in accordance with this guideline to guarantee the reproduction. The following sections describes standard authentication guideline for SMAF/MA-3 of playing system of SMAF (Score Track Chunk)

2.1. Score Track Chunk

Uses Track Number = 5. Chunk ID is “MTR5”.

2.1.1. Format Type

Supports only 0x01 (Mobile Standard/Compress) and 0x02 (Mobile Standard/No compress).

2.1.2. Sequence Type

Supports only 0x00 (Stream-Sequence).

2.1.3. Timebase_D and Timebase_G

Use the same value for Timebase_D and Timebase_G. Of SMAF specifications, only the values shown in Table 1 are supported. Default is to be 0x02 (4ms).

Timebase_D,G	Description
0x02	4 msec(default)
0x03	5 msec
0x10	10 msec
0x11	20 msec

Table 1 Values of Timebase

2.1.4. Channel Status

Use channel status that is defined based on Mobile Standard. Surely set up Status for 16 channels.

2.1.4.1. Key Control Status

When operating key control, specify whether the applicable channel changes key.
Key control ON is enabled, but stream PCM is not enabled without regarding to this assignment.
In non-designated mode, it is to be enabled when normal is designated in bank select, or disabled when drum / stream PCM is designated.

2.1.4.2. Vibration Status

When controlling vibration by channel synchronization, specify the channel with which vibration synchronizes.

2.1.4.3. LED Status

When controlling LED blink by channel synchronization, specify the channel with which LED blink synchronizes.

2.1.4.4. Ch Type

It can be specified. However, implemented side disregards this value.

2.1.5. Seek & Phrase Info Chunk

Supports Start Point, Stop Point and Phrase List.

Start Point and Stop Point must exist as a set, and existence of either one is not allowed. When Start Point and Stop Point are present, music is reproduced only in the section between the points. When Start Point and Stop Point are not present, all Sequence Data Chunks are reproduced.

2.1.5.1. Phrase List

Corresponding tags are shown in Table 2.

Name	Tag name	Hex
A (A melody)	PA	0x50 0x41
B (B melody)	PB	0x50 0x42
E (ending)	PE	0x50 0x45
I (introduction)	PI	0x50 0x49
K (interlude)	PK	0x50 0x4B
S (sabi)	PS	0x50 0x53
R (refrain)	PR	0x50 0x52

Table 2 SMAF/MA3 Phrase List corresponding tags

The same tag is not to be placed in one chunk. Up to seven tags shown in Table 2 can be placed independently. These tags are used for phrase individual reproduction or at reproduction starting position.

2.1.6. Setup Data Chunk

The following sections describe exclusive events that are supported.

2.1.6.1. 7 bit encode

Conversion that makes the highest bit of data "0" to transmit a specific data as MIDI exclusive message is performed. This encoding method is shown in Figure 1. A byte that holds lacking MSB bit is placed every 8 bytes.

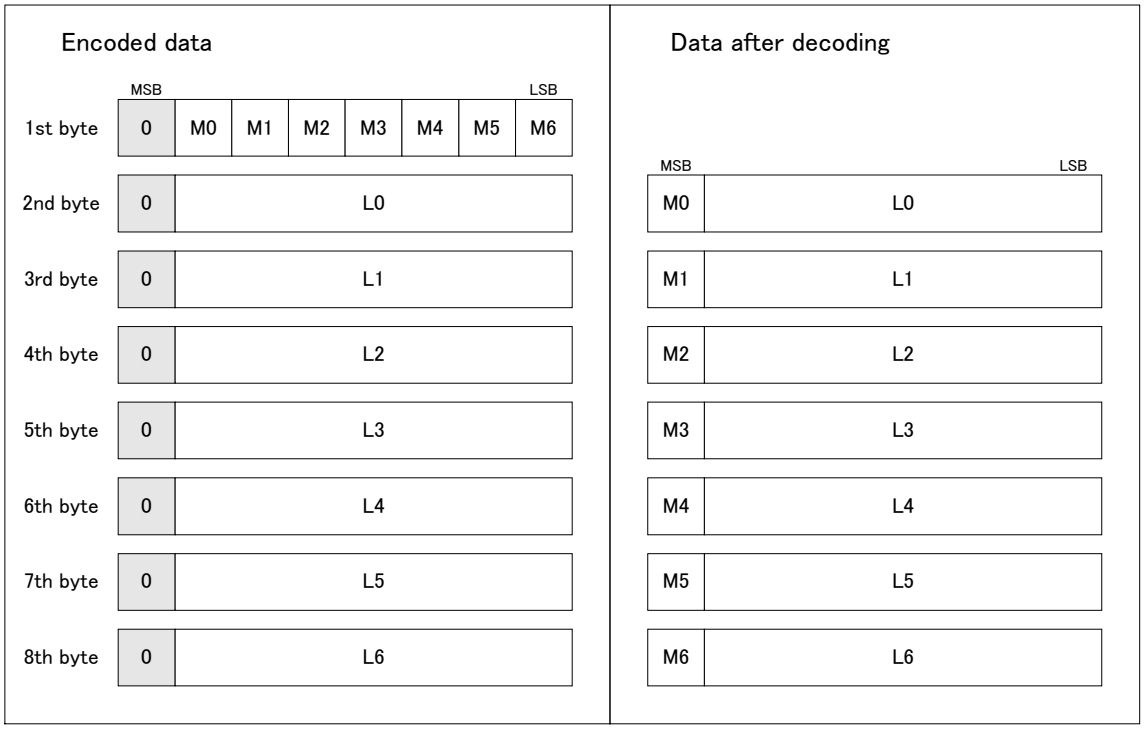

Figure 1 7 bit encoding

2.1.6.2. MA-3 native reset

0xF0 Size 0x43 0x79 0x06 0x7F 0x7F 0xF7

This is for deadening all voices that are generated and initializing all internal states.

2.1.6.3. Registration of tone parameters

0xF0 Size 0x43 0x79 0x06 0x7F 0x01 BM BL PC Note Flag data …0xF7

BM : Value of MSB of bank number (0x7C,0x7D)

BL : Value of LSB of bank number (0x00 to 0x7F)

PC : Program number (0x00 to 0x7F)

Note : Note number of drum instrument when drum bank (0x7D) is designated with MSB of bank number

Flag : FM/PCM change flag (0x00: FM, 0x01: PCM)

data: Tone parameter (7-bit-encoded and stored)

Registers tone parameters into bank number, program number and note number. Data section is stored by 7-bit-encoding data block string of FM (**Table 3**) or PCM（**Table 4**） with Flag. The data size is different between FM and PCM. (up to #17)

Key Number in **Table 3** shows reproduction key number for reproducing drum tone of FM.

Fs MSB and Fs LSB in **Table 4** shows reproduction frequency (0 to 48000) by using 2 bytes. Note of NoteOn is C3 (The key number is 60 when the A of 440Hz is the key number 69), and the waveform is reproduced with this reproduction frequency. Fs MSB shows MSB side (upper bytes) and Fs LSB shows LSB side (lower byte). Wave ID corresponds to waveform number of Registration of MA-3 tone waveform. RM differentiates between ROM waveform (1) and RAM waveform (0).

When Flag = 0 (FM tone):

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	
#1	0	Key Number							
#2	PANPOT					0	BO		
#3	LFO		PE	0	0	ALG			
#4	SR				XOF	0	SUS	KSR	OP1
#5	RR				DR				
#6	AR				SL				
#7	TL						KSL		
#8	0	DAM		EAM	0	DVB		EVB	
#9	MULTI				0	DT			
#10	WS					FB			
#11	SR				XOF	0	SUS	KSR	OP2
#12	RR				DR				
#13	AR				SL				
#14	TL						KSL		
#15	0	DAM		EAM	0	DVB		EVB	
#16	MULTI				0	DT			
#17	WS					0	0	0	
#18	SR				XOF	0	SUS	KSR	OP3
#19	RR				DR				
#20	AR				SL				
#21	TL						KSL		
#22	0	DAM		EAM	0	DVB		EVB	
#23	MULTI				0	DT			
#24	WS					FB			
#25	SR				XOF	0	SUS	KSR	OP4
#26	RR				DR				
#27	AR				SL				
#28	TL						KSL		
#29	0	DAM		EAM	0	DVB		EVB	
#30	MULTI				0	DT			
#31	WS					0	0	0	

Table 3 FM tone data string (for MA-3)

When Flag = 1 (PCM tone):

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
#1	Fs MSB							
#2	Fs LSB							
#3	PANPOT					0	0	PE
#4	LFO		0	0	0	0	MODE	
#5	SR				XOF	0	SUS	0
#6	RR				DR			
#7	AR				SL			
#8	TL						0	
#9	0	DAM		EAM	0	DVB		EVB
#10	Start Address offset (H)							
#11	Start Address offset (L)							
#12	Loop Point(H)							
#13	Loop Pont(L)							
#14	End Point(H)							
#15	End Point(L)							
#16	RM	Wave ID						

Table 4 PCM tone data string (for MA-3)

2.1.6.4. Registration of MA-3 tone waveform

0xF0 Size 0x43 0x79 0x06 0x7F 0x03 No Info data …0xF7

No : WaveID（0 to 127）

Info : Wave Mode(0: 4-bit ADPCM, 2: 8-bit Offset binary PCM,
3: 8-bit 2's comp PCM)
Bit other than these are to be set to "0". (*) 1 origin

data: tone waveform data (7-bit-encoded and stored)

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
#1		Wave ID						
#2	0	0	0	0	0	0	WaveMode	
#3	Tone waveform data							
#4								
:								

7-bit-Encoding from this point

Table 5 Tone waveform registration data string

Registers tone waveform data into applicable waveform number.

To generate the tone of this waveform, it is necessary to set the type of MA-3 tone parameter to PCM and to set the ID to ID of this message.

2.1.6.5. Registration of MA-3 FM basic waveform

0xF0 Size 0x43 0x79 0x06 0x7F 0x0C No data …0xF7

No: Waveform number（15,23,31）

data: Tone waveform data (7-bit-encoded and stored)

Registers basic waveform of user definition of FM by using applicable waveform number.

Waveform data is to be 16 bit data and 2's complement, and it to be Big Endian (upper bytes are placed first).

It is recommended to make the number of samples of data 1024. When it is less than 1024, insert "0s" at the system side to make it 1024. When it is more than 1024, only 1024 samples are read.

2.1.6.6. MA-3 stream PCM reserve

0xF0 0x43 0x79 0x06 0x7F 0x07 Data 0xF7

Data: No. of simultaneously generated tones of stream PCM（0x00 to 0x02）

Designates the number of generated tones of stream PCM that are used in music. For example, when "0x01" is designated, the tone is limited to only one stream PCM (mono) even if two stream PCMs are designed, and a tone that arrives later is generated preferentially.

2.1.7. Sequence Data Chunk

Each channel is to be in poly-mode in default. As note message, poly-description is allowed. However, since MA-3 uses FM16 tones basically, it is recommended to use 16 FM tones in total.

The following sections describe events that are supported. Reading side ignores other than this message. The initial set value that is described below is the default value that is used when event is not designated.

And for limitation of data production, Data length is obstructed to 3 bytes about Duration and Gate Time of the information which use variable length expression. The expression to 4Byte is performed about the variable length information except the above.

2.1.7.1. Note message（no velocity）

0x8n kk gt

n: channel number (0x0 to 0xF)

kk: note number (0x00 to 0x72) A of 440 Hz =69

gt: gate time (1 to 3 byte)

Performs starting of tone generation with key of designated note number in applicable channels. Velocity is to be 64 in default. The value of velocity at tone generation with Note message (velocity provided) is stored by channel. For tone generation with Note message（no velocity）, the tone generation is performed by using the value of velocity that is stored. The memory is cleared to default value by the reset all controller.

To prevent change of velocity in the loop, it is recommended to put the first note massage in the start point or start point of phrase list.

When applicable channel is drum/stream PCM channel, keys with note numbers 0 to 12 and 92 to 110 mean the starting of tone generation of stream PCM.

When there are note messages of which key numbers are the same number from the same channel and a part

The note message of Gate Timer ‘0’ is not pronounced.

2.1.7.2. Note message (velocity provided)

0x9n kk vv gt

n: channel number (0x0 to 0xF)

kk: note number (0x00 to 0x72) A of 440Hz=69

vv: key velocity

gt: gate time(1 to 3 byte)

Performs starting of tone generation with a key of designated note number in applicable channels. When an applicable channel is drum/stream PCM channel, Keys of note number 0 to 12 and 92 to 110 mean starting of tone generation of stream PCM.

* Key velocity initial value / 0x40

2.1.7.3. Program change message

0xCn pp

n: channel number (0x0 to 0xF)

kk: program number (0x00 to 0x7F)

Sets tones of designated channels.

When an applicable channel is set for normal channel, tones are selected from a bank that is designated by bank select. When an applicable channel is set for drum/stream PCM channel, drum set is selected.

For the tones that can be set in bank select and program change, refer to MA-3 tone map (attached material).

* Program-number initial value / 0x00

2.1.7.4. Control change message

2.1.7.4.1. bank select

0xBn 0x00 aa (MSB)

0xBn 0x20 bb (LSB)

n: channel number (0x0 to 0xF)

aa: MSB value of bank number (0x00,0x7C,0x7D)

bb: LSB value of bank number (0x00 to 0x7F)

Sets bank of designated channel.

(*) Voice built-in ROM after Program No.0x0A.

Table shows bank select that is processed by this format.

MSB	Format	Category	LSB									
			0	1	2	3	4	5	6	7	8	9	0x0A to 0x7F
0x00	GM1	Normal	Voice built-in ROM (Channel 9 is drum and others are normal)										
0x01 to 0x7B	not compatible	---	Voice built-in ROM (Channel 9 is drum and others are normal)										
0x7C	MA-3 Native	Normal	Default	User Voice									Voice built-in ROM
0x7D	MA-3 Native	Drum/ Stream PCM	User Voice (*)	not compatible									
0x7E, 7F	not compatible	---	Voice built-in ROM (Channel 9 is drum and others is normal)										

(*) Voice built-in ROM after Program No.0x0A.

Table 6 Bank select

It is recommended to process Bank MSB and Bank LSB as a set. Even if either one is receives, the receiving side reflects it, and Initial set value is used instead of the one that is not received. The change of the tone set is made at the time program change is received after transmitting the bank select.

When multiple bank selects exist, the latest message (the latter one on the time axis) is processed preferentially.

By designating Bank MSB 0x7D, applicable channels become drum/stream PCM channels.

When drum set is changed with program change, the instrument of drum is changed to the one that complies with tone map. As for stream PCM, the relationship between note number and Stream Wave ID is to be unique as shown in Table without regarding to program change. The maximum Stream Wave ID that can be defined with this format is 32.

For the tones that can be set with bank select and program change, refer to MA-3 tone map.

Note #	Definition	Assign
0	stream PCM	Stream Wave ID : 1
1		Stream Wave ID : 2
2		Stream Wave ID : 3
:		:
12		Stream Wave ID : 13
13	Drum Instrument	No Instrument
14		No Instrument
15		No Instrument
:		:
91		No Instrument
92	stream PCM	Stream Wave ID : 14
93		Stream Wave ID : 15
94		Stream Wave ID : 16
:		:
110		Stream Wave ID : 32

Table 7 Note# assignment of drum/stream PCM bank

* Bank number initial value / MSB:0x00, LSB:0x00

2.1.7.4.2. Modulation depth

0xBn 0x01 vv

n: channel number (0x0 to 0xF)

vv: value of vibrato (0x00 to 0x7F)

Designates depth of vibrato (LFO pitch modulation) of designated channel.

The relationship between value and depth of vibrato is shown in Table . The depth of vibrato here means the multiplication factor for the depth of vibrato that is set for each tone.

value of vibrato	depth of vibrato
0x00	OFF
0x01 to 0x1F	x 1
0x20 to 0x3F	x 2
0x40 to 0x5F	x 4
0x60 to 0x7F	x 8

Table 8 Relationship between value and depth of vibrato

When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110. (Fixed to 0x00)

* Modulation initial value / 0x00

2.1.7.4.3. Channel volume

0xBn 0x07 vv

n: channel number (0x0 to 0xF)

vv: value of control (0x00 to 0x7F)

This is a message that designates volume for applicable channels. It is provided for setting the volume balance between channels.

When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

* Channel volume initial value / 0x64

2.1.7.4.4. Pan

0xBn 0x0A vv

n: channel number (0x0 to 0xF)
vv: value of control (0x00 to 0x7F)

Designates stereophonic sound field position of designated channels.
When an applicable channel is drum/stream PCM channel, it is also valid for note number 0 to 12 and 92 to 110.

* Channel pan pot initial value / 0x40 (center)

2.1.7.4.5. Expression

0xBn 0x0B vv

n: channel number (0x0 to 0xF)
vv: value of control (0x00 to 0x7F)

Designates the change of volume that is set with Channel volume of applicable channels. This is used for changing the volume in the music.
When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

* Expression initial value / 0x7F (maximum)

2.1.7.4.6. Hold 1 (damper)

0xBn 0x40 vv

n: channel number (0x0 to 0xF)
vv: value of control (0x00 to 0x7F)

Designates on/off of damper（sustain pedal）of applicable channels. The value ranging from 0x00 to 0x3F designates off, and the one from 0x40 to 7F designates on. This function corresponds to redamper that is used for tones of piano system (returns to sustains section of envelope after NoteOff).
When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110. (Fixed to 0x00)

* Hold initial value / 0x00 (OFF)

2.1.7.4.7. Data entry

0xBn 0x06 aa (MSB)
0xBn 0x26 bb (LSB)

n: channel number (0x0 to 0xF)
aa: MSB of data value (0x00 to 0x7F)
bb: LSB of data value (0x00 to 0x7F)

This is used for inputting the value of RPN (MSB/LSB).

2.1.7.4.8. RPN

0xBn 0x64 aa (LSB)
0xBn 0x65 bb (MSB)

n: channel number (0x0 to 0xF)
aa: LSB of parameter No. (0x00 to 0x7F)
bb: MSB of parameter No. (0x00 to 0x7F)

This is used for designating parameter number of RPN.

* Initial value / MSB 0x7F, LSB 0x7F

2.1.7.4.8.1. 00H/00H: pitch bend sensitivity

0xBn 0x64 0x00 / 0xBn 0x65 0x00 (RPN parameter designation)
0xBn 0x06 aa / 0xBn 0x26 bb (Data entry)

n: channel number (0x0 to 0xF)
aa: MSB of data value (0x00 to 0x18)
bb: LSB of data value (fixed to 0x00)

Performs setting of sensitivity of pitch bend. MSB of Data entry shows sensitivity in halftones, a d LSB of Data entry shows sensitivity in cents. For example, when MSB=01, LSB=00, the sensitivity becomes ±1 halftone (the range of change is 2 halftones in total).

* Initial value / MSB 0x02, and LSB 0x00

2.1.7.4.9. All sound off

0xBn 0x78 0x00

n: channel number (0x0 to 0xF)

Performs deadening of sound of all voices during tone generation in applicable channels.

When an applicable channel is drum/stream PCM channel, it is also valid for note number 0 to 12 and 92 to 110.

2.1.7.4.10. Reset all controller

0xBn 0x79 0x00

n: channel number (0x0 to 0xF)

The following controllers are reset to initial value.

Controller	Name	Value
0x01	Modulation	0x00 (OFF)
0x0B	Expression	0x7F(MAX)
0x40	Hold1	0x00(OFF)
0x64	RPN LSB	0x7F (NULL)
0x65	RPN MSB	0x7F (NULL)
	Pitch Bend	MSB 0x40/LSB 0x00
	Key Velocity	0x40

Table 9 Set value for Reset all controller

Program change, bank select, Channel volume and Pan are not reset.

2.1.7.4.11. All Note Off

0xBn 0x7B 0x00

n: channel number (0x0 to 0xF)

Turns off all voices that are generated in applicable channels.

When an applicable channel is drum/stream PCM channel, it is also valid for note number 0 to 12 and 92 to 110.

2.1.7.4.12. Mono-mode on

0xBn 0x7E 0x01

n: channel number (0x0 to 0xF)

Turns off all voices that are generated in applicable channels, and changes applicable channels to mono-mode.

For drum/stream PCM channel, note number 13 to 91 ignores this message. When an applicable channel is drum/stream PCM channel, it is also invalid for note number 0 to 12 and 92 to 110.

Change of mode in music is prohibited.

When a channel is in mono-mode, the note of poly performs slur (legato) processing. When sound is deadened by DVA during generation of tone of note of the first tone in the slur processing, attack can be attached to the note of the second tone (retriggering).

* Initial value/OFF (poly mode)

2.1.7.4.13. Poly-mode on

0xBn 0x7F 0x00

n: channel number (0x0 to 0xF)

Turns off all voices that are generated in applicable channels, and changes applicable channels to poly-mode.

For drum/stream PCM channel, note number 13 to 91 ignores this message. When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

Like Mono-mode on, change of mode in music is prohibited.

* Initial value/ON (poly mode)

2.1.7.5. Pitch bend message

0xEn ll mm

n: channel number (0x0 to 0xF)

ll: LSB of bend value(0x00 to 0x7F)

mm: MSB of bend value (0x00 to 0x7F)

Changes pitch of applicable channels up or down. The initial value of the width of change (pitch bend range) is ±2 halftones.

0x00/0x00 maximizes downward pitch bend. 0x7F/0x7F maximizes upward pitch bend. The range of pitch bend can be set with 0x00/0x00 of RPN.

When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

* Initial value / MSB 0x40, and LSB 0x00

2.1.7.6. Exclusive message

The following sections, describes exclusive events that are supported.

2.1.7.6.1. MA-3 Master volume

0xF0 Size 0x43 0x79 0x06 0x7F 0x00 data 0xF7

data : Master volume value (0 to 127)

Initial set value: 0x2D

Performs setting of volume of synthesizer output final stage.

2.1.7.6.2 MA-3 stream PCM pair

0xF0 Size 0x43 0x79 0x06 0x7F 0x08 CL No1 No2 0xF7

CL: Pair designation (0x00) or pair cancellation (0x01)
No1: WaveID 1（0x01 to 0x20）
No2: WaveID 2（0x01 to 0x20）

Designates WaveID 1 and WaveID 2 as a apir. After receiving this message, tone generation of both WaveIDs can be controlled by performing NoteOn/Off of either WaveID. At this time, it is guaranteed that the tones of the two WaveIDs are generated simultaneously.

The pair of WaveID 1 and WaveID 2 are cancelled by designating clear for CL.

2.1.7.6.3 MA-3 stream PCM wave panpot

0xF0 Size 0x43 0x79 0x06 0x7F 0x0B ID CL data 0xF7

ID: WaveID（0x1 to 0x20）
CL: panpot designation (0x00), clear (0x01), pan-off (0x02)
data: panpot value (0x00 to 0x7F)

Designates panpot for individual waveforms in stream PCM of applicable channel. "0" indicate left end, and "127" indicates right end.

By receiving this message, channel panpot is made invalid. (Waveforms that are not designated by this message use setting of channel panpot.) After receiving this message, designation of wave panpot is given precedence if clear is not issued by this message even if channel panpot has bee received.

By designating 0x01 for CL, all wave panpot settings that have been received so far are returned to channel panpot.

* Initial value / synchronizing with channel volume

2.1.7.6.4 MA-3 interrupt setting

0xF0 Size 0x43 0x79 0x06 0x7F 0x10 Data 0xF7

Data: interrupt type (0 to 15)

Designates interrupt position on the sequence. The allocation interval of user event depends on the system, and it is desirable to open a certain amount of interval.

2.1.8 Stream PCM Data Chunk

2.1.8.1. Stream Wave Data Chunk

In Sequence Data Chunk, Stream Wave Data Chunk describes waveform data of Stream Wave ID# for Note# when drum/stream PCM is designated by bank select.

3 SMAF/MA-3 standard installation guideline

It is recommended that the middleware for playing SMAF/MA-3 is installed in accordance with the method of interpretation that is defined by this guideline.

Since this document describes only playing system (Score Track Chunk) of SMAF, refer to other materials for definition of other chunks.

3.1 SMAF/MA-3 data

It is possible to recognize SMAF/MA-3 data by using either of the following two methods.
It is necessary that the setting for MA-3 are made for both Contents Type and Track Number. If either one is not, SMAF/MA-3 data cannot be recognized as correct.

3.1.1. Contents Type

Contents Types are defined as follows.

0x32 : MA-3 FM16 tone melody contents
0x33 : MA-3 FM32 tone melody contents
0x34-0x3F : Reserved
0x42 : Karaoke contents that include MA-3 FM16 tone melody
0x43 : Karaoke contents that include MA-3 FM32 tone melody
0x44-0x4F : Reserved
0x52 : CM contents that include MA-3 FM16 tone melody
0x53 : CM contents that include MA-3 FM32 tone melody
0x54-0x5F : Reserved

3.1.2. Track Number

Track Number = 5 (MTR5) is used as track for MA-3.

3.2 Score Track Chunk

Track Number = 5 (MTR5) is used as track for MA-3.

20 bytes of Format Type, Sequence Type, Timebase_D, Timebase_G and Channel Status are necessary, and have to be set in the order designated in the body section. When these settings does not exist, the following data read cannot be performed correctly, and thus, an error is caused. The installation is to be made so that Seek & Phrase Info Chunk, Setup Data Chunk, Sequence Data Chunk and Stream PCM Data Chunk can be arranged in an arbitrary order.
Sequence Data Chunk is necessary. When it does not exist, the processing in Score Track Chunk is stopped, and an error is caused. And even if Sequence Data Chunk exists, when the playback time is 20 or less msecs, it does not reproduce as an error.

3.2.1. Format Type

Only 0x01 (Mobile Standard/Compress) and 0x02 (Mobile Standard/No compress) are supported.

When Format Type other than this is received, the processing in Score Track Chunk is stopped, and an error is caused.

3.2.2. Sequence Type

Only 0x00(Stream-Sequence) is supported.

When Sequence Type other than this is received, the processing in Score Track Chunk is stopped, and an error is caused.

3.2.3. Timebase_D and Timebase_G

The values of Timebase_D and Timebase_G are the same, and only the value of Table 1 in SMAF specifications is supported.

When Timebase other than this is received, the processing in Score Track Chunk is stopped, and an error is caused.

Timebase_D,G	Description
0x02	4 msec
0x03	5 msec
0x10	10 msec
0x11	20 msec
0x12	40 msec
0x13	50 msec

Table 10 Timebase

3.2.4. Channel Status

Key Control Status, Vibration Status and LED Status are supported. Ch Type is ignored.

When processing data that do not use 16 channels, it is necessary to be careful because status for 16 channels are set all the time.

3.2.4.1. Key Control Status

Designates whether applicable channels perform key change or not when performing key control.

The key control is valid when this is ON, but stream PCM becomes invalid without regarding to this assignment.

When no designation, this becomes valid when normal is designated by bank select, or becomes invalid when drum/stream PCM is designated.

When 0x3 (Reserved) is received, it is processed as 0x1 (OFF).

3.2.4.2. Vibration Status

When vibration control with channel synchronization is performed, this designates channels for which vibration is synchronized. When more than two channels are ON, the motor is set to ON if any one channel is generating tones.

3.2.4.3. LED Status

When LED on/off control with channel synchronization is performed, this designates channels for which LED on/off is synchronized. When more than two channels are ON, the LED on/off is set to ON if any one channel is generating tones.

3.2.4.4. Ch Type

Ignored

3.2.5. Seek & Phrase Info Chunk

Supports Start Point, Stop Point and Phrase List. Sub-sequence List is ignored even if it exists.
The values are not always present, and Start Point and Stop Point are not always present as a set.

3.2.5.1. Start / Stop point

When Start Point does not exist, the head of body of Sequence Data Chunk is used as Start Point. When Stop Point is not present, the next point after the last data of body of Sequence Data Chunk is designated as Stop Point.

The playback time of music becomes as the value which is subtracted the sum total of Duration to Start Point from the sum total of Duration to Stop Point to. Please note it will become an error if this playback time of music is 20 or less msec.

<The cautions on Start Point and Stop Point (EOS) setup>

The following describes the playback section in the case each information is set and not set.

st	sp	EOS	Playback time
no	no	no	The sum total of all Duration (All Gate Time protection)(*1)
no	no	Set	The sum total of Duration to EOS event (*2)
no	Set	no	The sum total of Duration to the event to which sp is set (*2)
no	Set	Set	The shorter one, either the playback time to sp or EOS. (*2)
Set	no	no	The sum total of Duration after the event to which st is set (All Gate Time protection)
Set	Set	Set	The playback time from st to either sp or EOS which is shorter (*2)

Table 11 The setting situation and the playback time relation of st, sp, and EOS.

(*1) When the sequence data has note-off after the last Duration, waits for the last note-off and ends the playback.

(*2) The playback is closed at this timing. The protection is not performed, even if Gate Time remains.

3.2.5.2. Phrase List

Shows section of Sequence Data.
Corresponding tags are shown in Table 12.

Name	Tag	Hex
A (melody A)	PA	0x50 0x41
B (melody B)	PB	0x50 0x42
E (ending)	PE	0x50 0x45
I (introduction)	PI	0x50 0x49
K (interlude)	PK	0x50 0x4B
S (sabi; Bridge)	PS	0x50 0x53
R (refrain)	PR	0x50 0x52

Table 12 Tags of SMAF/MA3 Phrase List

When other than these tags are present, they are ignored together with tangs that are present after that.
When two or more same tags are present in one chunk, the set value that exists in the end is to be used.
And when Phrase List asks for the starting position (time msec) and the end position (time msec), although the same rule as the above-mentioned st and sp is used the following exception processing is performed.

Information item	Exception condition	Usage
Starting position	Before st	Changes to 0.
	After music playback position (*1)	No information
	The head of Duration is not pointed out.	No information
	Un-setting up.	No information
End position	Before st	No information
	After music playback position (*1)	Changes to the music playback time.
	The head of Duration is not pointed out.	No information
	Un-setting up.	No information

Table 13 Exception condition and usage about Phrase List starting / end position

Note (*1) It is the earliest thing among sp, EOS, and the sequence data end.

3.2.6. Setup Data Chunk

The following sections describe exclusive events that are supported.

Evens other than these are ignored and are skipped. The order of appearance of the events is arbitrary.

3.2.6.1. MA-3 native reset

With regard to resources that are used for reproduction of this data, this deadens all voices of tones that are generated, and initializes all internal states to initial set value.

3.2.6.2. Registration of tone parameters

Tone parameters are registered into designated bank number, program number and note number.

Since the data are 7-bit-encoded, they are decoded for used.

Supports only tone parameters of bank number (MSB: 0x7C and LSB: 0x00 to 0x09, MSB: 0x7D and LSB: 0x00) and Program number (0x00 to 0x7F) that are defined in chapter 2. When other than these are received, they are ignored and are not registered.

For the tone parameters, up to 128 tones are to be registrable for normal tones and up to 127 tones are to be registrable for drum tones respectively, and when the registration of the same tones are present, they are given precedence in the order of arrival.

3.2.6.3. Registration of MA-3 tone waveform

Tone waveform data are registered into applicable waveform numbers.

3rd to 8th bits of Info are ignored. Since the data are 7-bit-encoded, they are decoded for use. When WaveID does not coincide with the value designated by the above tone parameters, it is ignored and is not registered.

3.2.6.4. Registration of MA-3 FM basic waveform

Basic waveform of FM user definition is registered into applicable waveform numbers.

Since the data are 7-bit-encoded, they are decoded for use. When it is less than 1024, insert "0s" at the system side to make it 1024. When it is more than 1024, omit some to make it 1024 samples.

When waveform numbers other than 15、23 and 31 are designated, they are ignored and are not registered.

3.2.6.5. MA-3 stream PCM reserve

Designates the number of tones generated with stream PCM that are used in the music. For example, when 0x01 is designated, and two stream PCMs are designated at the same time, it is limited to mono, and tones that arrives later are generated preferentially.

3.2.7. Sequence Data Chunk

The following sections describe events that are supported. The playback is not guaranteed, when events other than these are found.

The data values that are not mentioned expressly are to be processed with bit mask to prevent them from being out of range that can be designated. Moreover, the playtime is to be secured 20 or more msec on account of the playback.

Moreover, all bit patterns cannot be covered only in the event described below. The interpretation / skip rule for every status byte is described as below.

Status byte value	Interpretation / Skip rule
0x00 to 0x7F	Processes as an error by judging that there is no applicable event.
0x8n	Note On message of n channel (No velocity)
0x9n	Note On message of n channel (With velocity)
0xAn	Skips, as the data byte is 2Byte.
0xBn	The control change message to n channel
0xCn	The program change message to n channel
0xDn	Skips, as the data byte is 1Byte.
0xEn	The pitch bend message to n channel
0xF0	The exclusive message
0xF1 to 0xFE	Processes as an error by judging that there is no applicable event.
0xFF	NOP or EOS. When it is not which of them, either, it becomes an error.

Table 14 It interpretation/Skips rule for every status byte.

3.2.7.1. Note message（no velocity）

Performs starting of tone generation with keys of designated note number in applicable channels. However, No tone generation is performed when gate time is "0".

When an applicable channel is drum/stream PCM channel, Keys of note number 0 to 12 and 92 to 110 starts tone generation of stream PCM.

When tone generation periods overlap in the same channel with the same key number, and when channel mode is mono-mode, tie processing is made. It follows sequence when channel mode is poly-mode. Refer to the following figure.

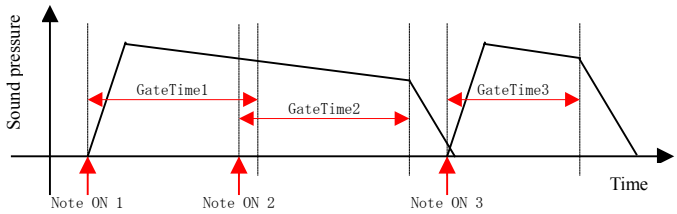

Figure 2 Change of sound pressure when GateTime overlaps (in MONO Mode)

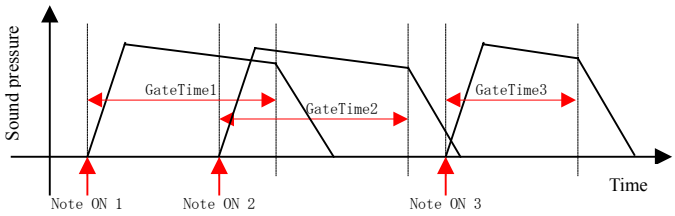

Figure 3 Change of sound pressure when GateTime overlaps (FM,WT pronunciation [in POLY Mode])

Note: All of the above notes are to be in the same channel and are to have the same key number.

Note: Drum/Stream Channel can be selected only by Poly mode. (Mono mode assignment is disregarded.)

3.2.7.2. Note message (velocity provided)

Performs starting of tone generation with keys of designated note number in applicable channels.

When an applicable channel is drum/stream PCM channel, Keys of note number 0 to 12 and 92 to 110 starts tone generation of stream PCM. Key velocity value is to be stored by channel for note message with no-velocity. This memory is cleared with.

This memory is cleared with (to be default value). Velocity value is not cleared when loop is performed.

No tone is generated when gate time is "0".

When tone generation period overlaps, the processing which is the same as the one for the above Note message（no velocity）is performed.

Velocity initial value: 0x40

3.2.7.3. Program change message

Sets tones for designated channels.

If the specified user tone of a bank number and a plug rum number is not registered, the tone of the applicable program number of a default tone with a built-in ROM is set up.

Program-number initial value: 0x00

3.2.7.4. Control change message

3.2.7.4.1. Bank select

Sets the bank of designated channels.

(*) Voice built-in ROM after Program No.0x0A.

Table 15 shows bank select that is handled by this format.

MSB	Format	Category	LSB										
			0	1	2	3	4	5	6	7	8	9	0x0A to 0x7F
0x00	GM1	Normal	Tones built in the ROM (drum in channel 9, or normal in other channels)										
0x01 to 0x7B	not compatible	---	Processed as tones built in the ROM (drum in channel 9, or normal in other channels)										
0x7C	MA-3 Native	Normal	User Voice										ROM built in normal tones
0x7D	MA-3 Native	Drum/ stream PCM	User Voice (*)	ROM built in normal tones									
0x7E, 7F	not compatible	---	Processed as tones built in the ROM (drum in channel 9, or normal in other channels)										

(*) Tones after Program No.0x0A are those built in the ROM.

Table 15 Bank select

Bank MSB and Bank LSB are not always set as a set. When only one of them is received, the one that is not received is set by using initial set value. Change of the tone set is made at the time program change is received.

When two or more bank selects are present, the latest message (later one on the time axis) is processed preferentially.

Channels for which Bank MSB 0x7C is designated becomes normal channels, and those for which Bank MSB 0x7D is designated becomes drum/stream PCM channels. As for stream PCM, note number and Stream Wave ID are related uniquely for any designation of program change as shown in Table **16**.

Note #	Definition	Assign
0	stream PCM	Stream Wave ID : 1
1		Stream Wave ID : 2
2		Stream Wave ID : 3
:		:
12		Stream Wave ID : 13
13	Drum Instrument	No Instrument
14		No Instrument
15		No Instrument
:		:
91		No Instrument
92	stream PCM	Stream Wave ID : 14
93		Stream Wave ID : 15
94		Stream Wave ID : 16
:		:
110		Stream Wave ID : 32

Table 16 Assignment of Note# on drum/stream PCM bank

When bank number MSB is designated to be 0x00, default tones built in the ROM are used without regarding to the value of LSB. When bank number MSB is designated as 0x7C and LSB as 0x00－0x09, and MSB as 0x7D and LSB as 0x00, the tones are user tones, it is necessary that tone parameters are set in the Setup Data Chunk. When user tone is not registered or non-compatible banks are designated, banks of ROM built-in default tones are used.

Default: 0x00 / 0x00

3.2.7.4.2. Modulation depth

Designates the depth of vibrato of designated channels (LFO pitch modulation).
When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110. (Fixed to 0x00)

Default: 0x00

3.2.7.4.3. Channel volume

Designates volume of applicable channels.
When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

Default: 0x64

3.2.7.4.4. Pan

Designates stereophonic sound field position of designated channels.
When an applicable channel is drum/stream PCM channel, it is valid for note number 0 to 12 and 92 to 110.

Default: 0x40 (Center)

3.2.7.4.5. Expression

Designated change of volume that is set with channel volume of applicable channels.
When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

Default: 0x7F

3.2.7.4.6. Hold 1 (damper)

Designates on/off of damper（sustain pedal）of applicable channels. A value in the range from 0x00 to 0x3F sets off, and a value in the range from 0x40 to 7F sets on. This corresponds to redamper that is used for piano tones. (After NoteOff, the play returns to sustain section of envelope.)

When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110. (Fixed to 0x00).

Default: 0x00

3.2.7.4.7. Data entry

This is used for inputting the value of RPN (MSB / LSB).

Default: 0x00 / 0x00

3.2.7.4.8. RPN

This is used for designating parameter number RPN.

Default: 0x7F / 0x7F

3.2.7.4.8.1. 00H/00H: pitch bend sensitivity

Performs setting of sensitivity of pitch bend. MSB of Data entry indicates sensitivity by halftone, and LSB of Data entry indicates sensitivity by cents. MSB of data value out of the range from 0x00 to 0x18 is to be ignored. LSB of data value is to be fixed to 0x00 even though any value is received.

MSB = 0 means that pitch bend is off. Pitch bend message after this message is issued is ignored. To cancel this, it is necessary to set a value other than "0" (0x01 to 0x18) into MSB.

Default: 0x02 / 0x00

3.2.7.4.9. All sound off

Performs deadening tones of all voices that are generated in applicable channels.

When an applicable channel is drum/stream PCM channel, it is to be valid also for note number 0 to 12 and 92 to 110.

3.2.7.4.10. Reset all controller

Performs resetting of the following controllers to their initial values.

Controller	Name	Value
0x01	Modulation	0x00 (OFF)
0x0B	Expression	0x7F(MAX)
0x40	Hold1	0x00(OFF)
0x64	RPN LSB	0x7F (NULL)
0x65	RPN MSB	0x7F (NULL)
	Pitch Bend	MSB 0x40/LSB 0x00
	Key velocity	0x40

Table 17 Set values for Reset All Controller

Program change, bank select, channel volume and pan are not reset.

* Initialization of RPN may be performed or it may not be performed. Specifically, it is not performed during playback but is performed during skip such as Seek.

3.2.7.4.11. All Note Off

Turns off all voices of tones that are generation in applicable channels.

When an applicable channel is drum/stream PCM channel, it is to be valid also for note number 0 to 12 and 92 to 110.

3.2.7.4.12. Mono-mode on

Changes applicable channels to mono-mode.

When object Channel is Drum/Stream PCM channel, registers the message, but does not reflect.

Change of mode in the music is prohibited.

When a channel is in mono-mode, slur (legato) processing performed for notes of poly. When note of first tone during slur processing is deadened by DVA, attack can be attached to the second note (retrigger).

Default: Poly mode

3.2.7.4.13. Poly-mode on

Changes applicable channels to poly-mode.

Like Mono-mode on, the change of the mode in the music is prohibited.

Note) The change to the poly mode and the mono mode is to be only 1 time for every Channel.

Note) Since Drum/Stream Channel is poly mode fixed, the mode change may not be reflected.

Note) Standard (default) is to be the poly mode.

Note) ”In the music” means the thing after the first note-on message.

3.2.7.5. Pitch bend message

Changes pitch of applicable channels up or down.

When an applicable channel is drum/stream PCM channel, it is to be invalid for note number 0 to 12 and 92 to 110.

For control message, when pitch bend sensitivity is set to "0", this message is ignored.

Default: 0x40 / 0x00

3.2.7.6. Exclusive message

The following sections describe exclusive events that are supported.

3.2.7.6.1. MA-3 Master volume

Performs setting of volume of synthesizer output final stage.

Default: 0x2D

3.2.7.6.2. MA-3 stream PCM pair

Designates a pair of streams of which tones are generated simultaneously. After receiving this message, NoteOn of either one can control tone generation of both streams. At this tie, it is guaranteed that generation of tone of the two streams is simultaneous.

The pair registration of designated streams is erased by designating clear for CL.

It is necessary to be careful when using this message because it may be ignored depending on the time of the issue. This message is ignored under the following conditions.

- When tones of either of the streams to be registered or cancelled are being generated.
- When IDs of the streams to be registered or cancelled are the same.
- When the value of the Stream ID is invalid (valid value: 0x01 to 0x31)

When a pair is cancelled, whether the pair has been registered or not is not judged. When sequence data are registered in the order as described below, it is necessary to take special care.

1. Registration of pair of Stream ID 1 and Stream ID 2
2. Cancellation of pair of Stream ID 1 and Stream ID 3
3. Note ON [Stream ID 1]
4. Note ON [Stream ID 2]

In this case, only the tone generation of Stream ID 1 is performed with initial Note ON, and with the next Note ON, tone generations of Stream ID 2 and Stream ID 1 are performed at the same time.

3.2.7.6.3. MA-3 stream PCM wave panpot

Designates panpot for individual waveforms in stream PCM of applicable channels.

The channel panpot is to be made invalid by receiving this message. (The waveforms that are not designated in this message are used for setting channel panpot.) Designation of wave panpot is given precedence if clearing with this message is not issued even if channel panpot is received after receiving this message.

When CL is 0x01, all wave panpot settings that have been received so far are returned to channel panpot. And by specifying 0x02 to CL, turn off the setting of panpot and pronunciation is made possible in 0dB.

Default: channel panpot

3.2.7.6.4. MA-3 user event

Specifies the position of the user event on the sequence.

3.2.7.7. NOP message

Performs nothing, even if this message is detected. Only Duration is reflected.

3.2.7.8. End of sequence

By detection of this message, regards it as the closure of sequence data. Mutes all channels with waiting for progress of Duration attached to the event and stops playback.

3.2.8. Stream PCM Data Chunk

This Chunk is for storing StreamWaveDataChunk mentioned as below. Other information is not stored in this Chunk.

3.2.8.1. Stream Wave Data Chunk

In Sequence Data Chunk, Stream Wave Data Chunk describes waveform data of Stream Wave ID# for Note# at the time drum/stream PCM is designated by bank select into each chunk.

Wave Numbers of other than 0x01 to 0x20 are ignored.

Note that the sampling frequency which can be registered changes with format (Base bit) of Wave Data.

Refer to following table. Furthermore, it is not registered when the playback time of whole Stream Data is 20 or less msec.

Wave format (Base bit)	Sound sample frequency lower limit	Sound sample frequency upper limit
4 bit	4000 Hz	24000 Hz
8 bit	4000 Hz	12000 Hz

Table 18 Relation between the sampling frequency which can be registered, and Base bit