Contents
Authoring Guideline
For MA-5 Authoring Tool
< MLD (L) Edition >

Version 2.3.0

2006/02/27

YAMAHA CORPORATION

❀YAMAHA

Contents

Revision History

Ver.	Date	Description
2.3.0	2006/02/27	First edition.

1. Outline

This document stipulates a guideline for authoring SMF (Standard Midi File) that makes maximum data of Yamaha's synthesizer LSI for mobile phone, MA-5 when authoring the contents for terminals equipped with MA-5 by using Authoring Tool.
Authoring Tool reads SMF in accordance with this document and converts into carrier format. Operations when reading SMF other than the one described in this document are not guaranteed. Although MIDI sequencer application software for authoring SMF in accordance with this document is not designated, the requirements include the capability of entry of events described here.

【Note】 <u>About the numberial notation</u>
In this documentation, the data values are described in decimal numbers and hexadecimal numbers.
In hexadecimal numbers, a letter "H" (Hexadecimal) follows the numerical value. Moreover, "n" expresses the arbitrary integers. When you input at data value, refer to the following Table 1.

Table 1 Correspondence table between Decimal numbers and Hexadecimal numbers

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
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

2. Notes in SMF Production

2.1. SMF Format

Be sure to use Standard MIDI File Format 0. When using "*Format 1*", conversion to "*Format 0*" is performed internally; however, it is not a thing which guarantees the perfect conversion.

2.2. MIDI Channel

MIDI channels from 1 to 16 can be used.
MIDI channels of SMF which is taken by MA-5 Authoring Tool are divided into four tracks in MLD; and they are allocated as follows.

First track → "*1 to 4*", Second track → "*5 to 8*", Third track → "*9 to 12*", and Fourth track → "*13 to 16.*"

【Note】 In MLD, a blank in trucks is not accepted. For example, data using only MIDI channel 9 always output not only a truck3 but also empty truck 1 and 2. For that reason, we recommend you to use from MIDI channel 1, if you like to save a capacity of creating data.

2.3. Synthesizer Mode and Number of Sound Generation

2.3.1. When AL channels are not used

MA-5 Authoring Tool has three modes, FM 32 mode, FM 16 mode, and ALL64 mode. The number of the maximum simultaneous sound generation in each mode is shown in Table 2.

Table 2   Number of the Maximum Simultaneous Pronunciation in each mode

	FM synthesizer	WT synthesizer	Stream	Total
FM16 mode	16	16	2	34
FM32 mode	32	16	2	50
ALL64 mode	32	32	0	64

FM 16 mode can use a total of 34 voices, FM 32 mode can use a total of 50 voices, and ALL64 mode can use a total of 64 voices.
  ・ FM 16 mode can use 4-operator voice and 2-operator voice.
  ・ FM 32 mode and ALL64 mode can use 2-operator voice only.

Although data can be used by poly-mode in one MIDI channel, be sure to not exceed maximum simultaneous sound generation in all MIDI channels. When tones which exceed the maximum simultaneous sound generation are input, MA-5 Authoring Tool silences notes of tones that are generated before by giving priority to the ones that arrives later.
Mode change can be set in "*Preference*" of Authoring Tool.
For details, see "*MA-5 Authoring Tool User's Manual*."

2.3.2. When AL channel is used

When AL channel is designated in AL channel designation, the numbers of sound generation become as follows.

Table 3 Number of sound generation with AL channel

	AL	FM synthesizer	WT synthesizer	Stream	Total
FM16 mode	1	15	15	2	33
FM32 mode	1	31	15	2	49

This is for using both FM synthesizer and WT synthesizer, when AL channels are used.
For ALL64 mode, AL channel cannot be used.

2.4. Tempo

The range of Tempo is from 20 to 255.
When there is no designation for tempo, tempo is interpreted as "*a crotchet = 120*" and used. MA-5 Authoring Tool supports to the tempo change in music.

2.5. Time Base

In MA-5 Authoring Tool, time base of MLD is interpreted as fixed value 48; in addition a tick number can be founded with the following formula.

*(tick numbers of MLD) = ((tick numbers of SMF) *(Time base of MLD)) / (Time base of SMF)*

2.6. Channel Attribution

As the Channel attributes, Normal channel and Drum channel are provided. These attributes can be changed by bank select. When there is no designation in bank select specifically, channel 10 is treated as a Drum channel, and other channels are treated as normal channels.

3. Applicable MIDI Events

MA-5 Authoring Tool covers the following MIDI events and ignores other events. There is no event which must be designated.

Table 4 Use MIDI Event List

MIDI Event Name	Format
NoteOn	**9nH kkH vvH**
NoteOff	**8nH kkH vvH**
Bank Select	**BnH 00H mmH (MSB)** **BnH 20H llH (LSB)**
Modulation Depth	**BnH 01H vvH**
Channel Volume	**BnH 07H vvH**
Panpot	**BnH 0AH vvH**
Expression	**BnH 0BH vvH**
Hold1 (Damper)	**BnH 40H vvH**
Data Entry	**BnH 06H mmH (MSB)** **BnH 26H llH (LSB）**
RPN	**BnH 64H llH (LSB)** **BnH 65H mmH (MSB)**
Mono Mode On	**BnH 7EH 01H**
Poly Mode on	**BnH 7FH 00H**
Filter Brightness	**BnH 4AH vvH**
Filter Resonance	**BnH 47H vvH**
Program Change	**CnH ppH**
Pitch Bend	**EnH llH mmH**
Tempo	**FFH 51H 03H ttH ttH ttH**
Playback Start / End Position	**FFH 06H 03H 51H 30H 30H (Q00)** **FFH 06H 03H 51H 30H 46H (Q0F)**
Playback Start / End Position	**FFH 07H 05H 53H 54H 41H 52H 54H (START)** **FFH 07H 04H 53H 54H 4FH 50H (STOP)**
Copyright Display	**FFH 02H lenH textH**
AL Channel Designation	**FFH 7FH 06H 43H 02H 01H 01H chH flagH**
Channel Status Designation	**FFH 7FH 14H 43H 02H 00H 04H csH csH …**
Master Volume	**F0H 7FH 7FH 04H 01H llH mmH F7H**
User Event	**F0H 43H 79H 06H 7FH 10H dataH F7H**
Stream PCM Wave Panpot	**F0H 43H 79H 06H 7FH 0BH idH clH dataH F7H**
Stream PCM Sound Generation Designation	**F0H 43H 79H 06H 7FH 07H dataH F7H**

3.1. NoteOn

9nH   kkH   vvH

    n: Channel number 0 to 15 (0H to FH)
    kk: Note number 0 to 114 (0H to 72H) 440Hz of A=69
    vv: Key velocity (1 to 127): it is interpreted as NoteOff when key velocity is "0."

In a relevant channel, sound generation by keys of designated note number is started. When relevant channel is a normal channel, keys of note numbers between 21 and 114 are generated. Note numbers 0 to 20 and 115 to 127 are ignored.

When a relevant channel is drum/Stream PCM channels, keys of note numbers 13 to 91 indicates a sound generation start for Drum, and 0 to 12 and 92 to 110 indicates a sound generation start for Stream PCM. Note numbers from 111 to 127 are ignored.

Velocity curve follows the following formula.

40log (vel/127) [dB]

3.2. NoteOff

8nH   kkH   vvH

    n: Channel number 0 to 15 (0H to FH)
    kk: Note number 0 to 127 (0H to 72H) 440Hz of A=69
    vv: Key velocity is ignored.

In a relevant channel, sound generation is ended by key of designated channel numbers. When relevant channels are Drum/Stream PCM channel, key of note numbers 0 to 12 and 92 to 110 indicates a sound generation termination of Stream PCM.

【Note】 In MA-5 Authoring Tool, when a time interval (gate-time) between Note-on and Note-off is 1 tick or less, it is interpreted a gate time as 1 tick and is generated. However, when a gate-time of Stream PCM is 1 tick or less, it is ignored. In addition, be sure to do not generate the same note delicately in the same channel. Overlapped note sound generation may not be performed as an input SMF. For that case, be sure to arrange such as using different channel etc.

3.3. Control Change

3.3.1. Bank Select

BnH   00H   mmH (MSB)
BnH   20H   llH (LSB)

n: Channel number 0 to 15 (0H to FH)
mm: MSB value of bank number 0 to 127 (00H~7FH)
ll: LSB value of bank number 0 to 127 (00H~7FH)

Initial setting value: 0/0

Bank of designated channel is set.
As a general rule, be sure to use in the range shown below.
In case of Melody,
BankSelectMSB: 124, BankSelectLSB: 0 to 9, ProgramChange: 0 to 127
In case of Drum (Percussion),
BankSelectMSB: 125, BankSelectLSB: 0, ProgramChange: 0 to 9 (1 to 10)

Refer to the following table for the interpretation about the bank which exceeds these ranges.

Table 6 Bank Select Supporting Table

MSB	Category	LSB										
		0	1	2	3	4	5	6	7	8	9	10 to 127
0 to 121	Depending on channel	Except channel 10: displacement to User Melody Channel 10: displacement to User Drum1										
122, 124	Normal	Default Melody	User Melody	User Voice								Displacement to User Melody
123, 125	Drum/ Stream PCM	Bank LSB is interpreted as 0 even in any number.(*)										
126, 127	Depending on channel	Except channel 10: displacement to User Melody Channel 10: displacement to User Drum 1										

*: In case of Bank MSB 125, voice to use is determined by Program Change. For details, see "*3.4 Program Change*."

Even if a bank select is received, voice of latest program change is valid until a next program change is received.
In each channel, channels become a drum channel by designating a program change after a drum bank is designated. Moreover, channels become a FM normal channel by designating a program change after a normal bank is designated.
In addition, bank selects depends on program change in case of Drum/Stream PCM channel. For details about this dependences, see the section about Program change described later in this document.
When multiple bank selection exists, the latest message (last one on the time axis) is processed preferentially.

By designating Bank MSB 0x7D (:125), the relevant channel becomes Drum/Stream PCM channel. When drum set is changed with program change, the instrument of drum is changed to the one that corresponds to the voice map. About Stream PCM, even if any of program change comes, the relation between Note number and Stream Wave ID corresponds uniquely as shown in Table 8. Furthermore, Stream Wave ID which can be registered in MLD is up to 32.
For details about voices which can be set by Bank select and Program change, see "3.4 Program Change."

Table 7 Correspondence of Note# of drum/stream PCM bank

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

3.3.2. Modulation Depth

BnH   01H   vvH

n: Channel number 0 to 15 (0H to FH)
vv: Vibrato value 0 to 127 (00H to 7FH)

Initial setting value: 0

It designates the depth of vibrato (LFO pitch modulation) of designated channels.
The relation between the value and depth of vibrato is shown in Table 8. The depth of vibrato here shows the multiple for vibrato depth that is set for each voice.

Table 8 Relation between vibrato value and depth

Vibrato value	Depth of vibrato
0	OFF
1 to 31	x 1
32 to 63	x 2
64 to 95	x 4
96 to 127	x 8

When the relevant channel is Drum/Stream PCM channel, it is invalid to note numbers 0 to 12 and 92 to 110. (Fixed to 0)

3.3.3. Channel Volume

BnH   07H   vvH

n: Channel number 0 to 15 (0H to FH)
vv: Control value 0 to 127 (00H to 7FH)

Initial setting value: 100 (64H)

Channel volume set a volume balance between channels in a message which designates a volume of relevant channels as its objective.
When a relevant channel is a Drum/Stream PCM channel, Channel Volume becomes invalid to note number0 to 12 and 92 to 110.

Formula: Gain[dB] = 20*log((vv)^2/127^2)

【**Note**】 Be sure to control a waveform which is assigned into StreamPCM individually with velocity.

3.3.4. Pan pot

BnH   0AH   vvH

n: Channel number 0 to 15 (0H to FH)
vv: Control value 0 to 127 (00H to 7FH)

Initial setting value: 64 (40H) [Center]

It designates a position of stereophonic sound field in designated channel. The positioning is made between the left end (vv=0) and right end (vv=127) of the stereophonic sound field by using the following formulas.
When a relevant channel is a Drum/Stream PCM channel, Panpot becomes invalid to note number 0 to 12 and 92 to 110.

Formulas: Left Channel Gain[dB] = 20*log(cos(π/2*(vv)/127)
Right Channel Gain[dB] = 20*log(sin(π/2*(vv)/127)

【**Note**】 Since the last panpot setting is ignored as a glitch if panpot setting for same channel is operated at same time, be sure to avoid such operation.

3.3.5. Expression

BnH   0BH   vvH

n: Channel number 0 to 15 (0H to FH)
vv: Control value 0 to 127 (00H to 7FH)

Initial setting value: 127 (7FH)

It designates the change of volume that was set by channel volume in relevant channel.
When the relevant channel is drum/stream PCM channel, it is invalid for note numbers 0 to 12 and 92 to 110.

【Note】 Although both cc#7 and cc#11 is for volume control; however, their purposes are different. cc#7 is used for mix-down by volume of whole music that is set before a playback of music data or by fader. cc#11 is used to adjust the volume for music expression etc.

Formula: Gain[dB] = 40*log (cc#11/127)

3.3.6. Hold 1 (Damper)

BnH   40H   vvH

n: Channel number 0 to 15 (0H to FH)
vv: Control value (00H to 7FH)

Initial setting value: 0

Designates on/off of damper (sustain pedal) of relevant channels. Off is designated when the value is 0 to 63, or on is designated when the value is 64 to 127.
When the relevant channel is drum/stream PCM channel, it is invalid for note numbers 0 to 12 and 92 to 110. (fixed to 0)

【Note】 When Note-off is received by damper-on, Note-off is held. When damper is converted from "On" to "Off", delayed Note-off is executed, and volume envelop is shifted to release.

【Note】 Since the sustain may not work even if the gate time makes "hold-on" to the excessive short note, please take measures such as extension of release of sound.

【Note】 When Damper-on and Note-off exists simultaneously, effect may not work effectively. This is caused from a reason that Damper-on and Node-off cannot be simultaneously processed according to the hardware's convenience. In this case, be sure to designate a Damper-on before 10msec or more from Note-off.

3.3.7. Data Entry

BnH	06H	mmH (MSB)
BnH	26H	llH (LSB)

n: Channel number 0 to 15 (0H to FH)
mm: Data value MSB 0 to 127 (00H to 7FH)
ll: Data value LSB 0 to 127 (00H to 7FH)

Initial setting value: 0/0

This is used to input the value of RPN (MSB/LSB). For details, see the section about "RPN."

3.3.8. RPN

BnH	64H	llH (LSB)
BnH	65H	mmH (MSB)

n: Channel number 0 to 15 (0H to FH)
ll: Parameter number LSB 0 to 127 (00H to 7FH)
mm: Parameter number MSB 0 to 127 (00H to 7FH)

Initial setting value: 127/127 (7FH/7FH)

This is used to designate a parameter number of RPN.

In MA-5 Authoring Tool, PRN designation is used only for a designation of pitch bend sensitivity. In order to designate a pitch-bend sensitivity, PRN is used with combining data entries as follows. Set a pitch-bend sensitivity on data entry after LSB/MSB of PRN is set to "0."

BnH	64H	00H / BnH	65H	00H	(RPN parameter designation)
BnH	06H	mmH / BnH	26H	llH	(data entry)

n: Channel number 0 to 15 (0H to FH)
mm: Data value MSB 0 to 24 (00H to 18H)
ll: Data value LSB (fixed to 0)

Initial setting value: 2/0 (2 half-tones)

Perform a setting of pitch bend sensitivity. MSB of data entry shows the sensitivity in halftones, and LSB of data entry shows the sensitivity in cents. For example, when MSB=01 and LSB=00, the sensitivity becomes ± 1 halftones. (Overall ranges of change are 2 halftones.)

3.3.9. Mono Mode On

BnH   7EH   01H

n: Channel number 0 to 15 (0H to FH)

Changes the relevant channel into mono-mode.
In case of Drum channel, this message is ignored. In addition, be sure to do not designate this message during Note-on.

Note of polyphonic performs a slur process when a channel is during mono-mode. Simultaneous sound generation of multi-tones in mono-mode and/or a short sound generation specification of the interval which can be considered that is simultaneous are prohibited. The time interval which can be considered that is simultaneous is 1.5msec.

3.3.10. Poly Mode On

BnH   7EH   00H (MSB)

n: channel number 0 to 15 (0H to FH)

Changes the relevant channel into Poly-mode.
Since default of each MIDI channel is Poly-mode, use this message when returning Poly-mode from mono-mode.
Be sure to do not designate this message during Note-on.

3.3.11. Filter Brightness

BnH   4AH   vvH

n: MIDI channel 0 to 15 (0H to FH)
vv: Control value 0 to 127 (00H to 7FH)   Default: 64 (40H) (Center)

This message is used when changing a filter cutoff frequency.
When it is in a state (Sustain) of Fc3 of filter EG, this message becomes valid. Cutoff frequency of Fc3 is changed according to the value of vv. In order to obtain its effects, be sure to set the setting of Filter EG so that a sustain part becomes long in time.

3.3.12. Filter Resonance

BnH   47H   vvH

n: MIDI channel 0 to 15 (0H to FH)
vv: Control value 0 to 127 (00H to 7FH)   Default: 64 (40H) (Center)

Controls the resonance of filter.

3.4. Program Change

CnH   ppH

n: Channel number 0 to 15 (0H to FH)
pp: Program number 0 to 127 (00H to 7FH)

Initial setting value: 0

When a relevant channel is set as a normal channel, voice is selected from bank designated by bank select. When a relevant channel is set as a Drum channel, Drum-set is selected. At this time, the following voices are selected by program change.

Table 8 Bank Select Correspondence Table (Drum/Stream Channels)

MSB	Category	Program Number				
		0	1	2	3~9	10~127
123, 125	Drum/ Stream PCM	Default Drum1	Default Drum2	User Drum	User Voice	Displacement to User Drum

There are following voices which can be used in MA-5 Authoring Tool.

- Default voice: default setting voice in MA-5 Authoring Tool
  - Default Melody
  - Default Drum1
  - Default Drum2

- User voice: voice which is edited on MA-5 Authoring Tool
  - User Melody (voice bank which is displaced from outside the scope of Melody designation).
  - User Drum (voice bank which is displaced from outside the scope of f Drum designation).
  - Other user voices

【Note】 Voice Map; "*Default Melody"*, "*Default Drum1*", "*Default Drum2*" are displayed on Voice Map. If voice which is not in Voice Map is designated, the operation is not guaranteed.

Be sure to insert a program change in the next of a bank selection on a head of each channel. Program change in music has no effect on note being pronounced in the channel. It becomes valid from the next Note-on.
In case of Mono-mode, program change under sound generation is prohibited especially.

3.5. Pitch Bend

EnH   llH   mmH

n: Channel number 0 to 16 (0H to FH)
ll: Bend value LSB 0 to 127 (00H to 7FH)
mm: Bend value MSB 0 to 127 (00H to 7FH)

Initial setting value (Bend value LSB) (Bend value MSB): 0/64 (00H/40H) (center)

This message changes the pitch of relevant channel up or down. Pitch Bend interprets only MSB; conversely, Pitch Bend is not changed when only LSB is changed. Pitch Bend to downward become its maximum by MSB:0; in addition, Pitch Bend to upward become it maximum by MSB:127. The initial value of change width (pitch bend sensitivity) is ± 2 halftones. Pitch Bend range can be set up by 0/0 in PRN.

When the relevant channel is drum/stream PCM channel, it becomes invalid to note numbers 0 to 12 and 92 to 110.

3.6. Meta Events

3.6.1. Tempo

FFH   51H   03H   ttH   ttH   ttH

tt   tt   tt: length of quarter notes (μ sec)

Tempo can be designated to any positions since it corresponds to tempo change in music. In addition, Moreover, in MA-5 Authoring Tool, the range of tempo is the minimum value of 20 (2DH, C6H, C0H) and the maximum value of 255 (03H, 97H, 1EH). In addition, the value which is lower than the minimum value is converted to the minimum value of 20, and the value which exceeds the maximum value is converted to the maximum value of 255.

3.6.2. Playback Start/End Position

FFH   06H   03H   51H   30H   30H   (Q00)
FFH   06H   03H   51H   30H   46H   (Q0F)

Playback start/end position is described as a Maker of meta-events.
In MA-5 Authoring Tool, this event is converted into the playback start/end position of MLD.
4 to 6 bytes (51H 30H 30H) of playback start position is expressed as "Q00" (Capital letter) in ASCII.
4 to 6 bytes (51H 30H 46H) of playback end position is expressed as "Q0F" (Capital letter) in ASCII.
Be sure to insert a pair of "Q00" and "Q0F" in music.

When there are no "Q00" and "Q0F", a playback start position is input to a head of music, and a playback end position is input to an end of music automatically. When authoring contents for Samsung mobile terminal, it is not necessary to designate a playback start/end position.

3.6.3. CuePoint

Start Point	FFH 07H 05H 53H 54H 41H 52H 54H (START)

CuePoint is inserted into a start position in music. When a setup bar line is prepared, be sure to insert immediately after it. The data in a setup bar line is inserted at the same time as a start point.
In addition, when a playback start position is omitted, a starting point becomes a playback start position.
Be sure not to specify during Note-on.

Stop Point	FFH 07H 04H 53H 54H 4FH 50H (STOP)

CuePoint is inserted into an end of music.
The event which exists behind a stop point is ignored.
Be sure not to specify during Note-on

3.6.4. Display of Copyright

FFH   02H   lenH   textH

len : bytes number of text data (variable length presentation)
text: text data

By describing copyright information, copyright can be inputted.

3.7. Sequencer Specific Meta Event

3.7.1. AL Channel Designation

FFH   7FH   06H   43H   02H   01H   01H   chH   flagH

Designates AL channel.
  ch   : 0…15   : AL Synthesizer Channel
          16 or more   : Ignores this message
  flag : 1   : Valid
          : 1 or less   : Ignores this message

When two or more AL channel specification is designated, AL channel setup which appeared first in time becomes effective.
Be sure to set an AL channel specification to the head of music: Position "Measure : Beat : Tick (0 : 0 : 0)" in Time 0.
Operation in which AL channel was set other than Time 0 is not guaranteed.
AL channel is interpreted as monophonic. Be sure to create contents in consideration of this point.

3.7.2. Channel Status Designation

Channel Status FFH   7FH   14H   43H   02H   00H   04H   csH   csH

cs: VS/LED setting value (16 fixation) from channel 1 to 16

Table 9 Channel Status Setting Value

Setup Value	VS	LED
0	OFF	OFF
1	OFF	ON
2	ON	OFF
3	ON	ON

Channel Status Information is specified. VS and LED of channels 1 to 16 are specified according to Table 10.
cs needs 16 bytes.

3.8. Universal System Exclusive Message

3.8.1. Master Volume

| F0H | 7FH | 7FH | 04H | 01H | llH | mmH | F7H |

   ll: Master Volume LSB
   mm: Master Volume MSB 0 to 127 (00H to 7FH)

  Initial setting value: 100 (64H)

Volume setting of the final stage of synthesizer output is performed.
Be sure to designate 0 for the LSB. (LSB is ignored)

Formula: $Gain[dB]=40*\log(MSB/127)$

【Note】 When SMF which has no Master volume is received, it becomes $40\log(76/127)=9dB.$

3.9. System Exclusive Message

Performs definition of items such as voice setting and waveform setting specific to each device exclusively.

3.9.1. User Event

F0H   43H   79H   06H   7FH   10H   dataH   F7H

Designates a User event.

data: Interruption Number 0~15 (0H~FH)

Be sure to insert to the timing which wants to generate a user event in a Java game etc. This message is disregarded when data is 16 or more.

3.9.2. Stream PCM Wave Panpot

F0H   43H   79H   06H   7FH   0BH   idH   clH   dataH   F7H

Id: WaveID 1 to 32 (1H~20F)
cl: panpot designation(0), clear (1), pan off (2)
data: panpot value 0 to 127(00H~7FH)

Designates panpot of relevant stream PCM waveform. Data=0 means left end, and 127 means right end.
Channel panpot is considered as invalid when receiving this message. (As for waveforms that are not designated by this message, the setting of channel panpot is used) After receiving this message, wave panpot designation is given priority even if receiving channel panpot as far as Clear is not issued by this message.
By designating 1 for CL, all of wave panpot settings that have been received are returned to channel panpot.
Moreover, by designating 2 to CL, pan pot designation is turned off and pronunciation at 0dB is performed.

3.9.3. Stream PCM Sound Generation Number Specification

F0H   43H   79H   06H   7FH   07H   dataH   F7H

data: number of Stream PCM Sound Generation 0 to 2 (1H~2H)

Designates the number of simultaneous pronunciation of Stream PCM. Even if Stream PCM is registered, when the number of pronunciation are limited by this message, pronunciation of Stream PCM is restricted.
When Stream PCM is not used, RAM in LSI can be used effectively by specifying "0".
When Stereo Stream is designated, be sure to specify "1".

4. Notes on Stream PCM Setting

4.1. Panpot used in Stream

As a means to set up the panpot in Stream PCM, there are a method of setting by the channel Panpot by control change and the setting method by the stream PCM wave Panpot.

4.1.1. Control by Channel Panpot

When using Channel Panpot, common Panpot is set up also to a different stream. When an applicable channel is a drum channel, the same Panpot is set up similarly. If Channel Panpot is specified during the sound generation of Stream, change of Panpot will be reflected from the point.
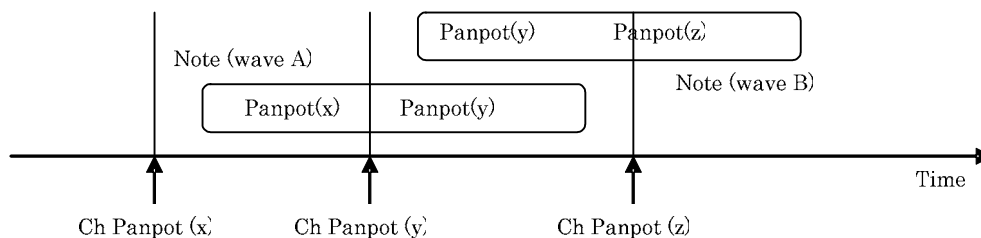
Figure 1 Setting with channel panpot

4.1.2. Control by StreamPCM Wave Panpot

StreamPCM Wave Panpot is used to control Panpot which became independent to different Stream. Use StreamPCM Wave Panpot by the drum channel to set a high-hat and a Bass-drum as another normal position. StreamPCM Wave Panpot cannot be changed during sound generation. (between Note-On and Note-off.) It is reflected from the next note-on.
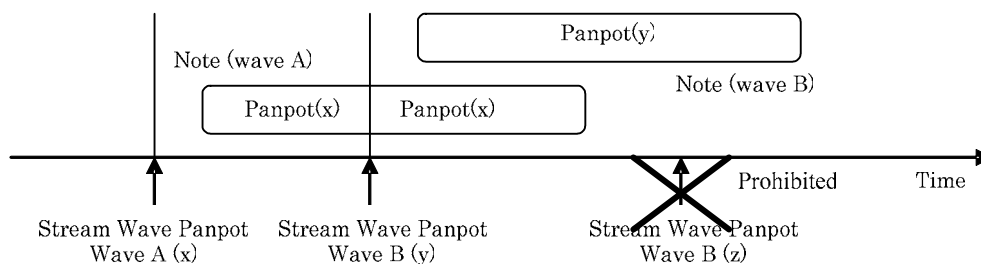
Figure 2 Setting with Stream PCM wave panpot

5. Note at the time of AL voice is in used

Please use AL voice in the designated MIDI channel by the AL channel designation.
If you use AL voice in the MIDI channel, which is other than AL channel designation, the tones are generated by the voice which is not filtered. And if AL voice is set to NOISE, it may become unexpected voice.

Simultaneous pronunciation in AL channel and pronunciation with short interval which can be considered as simultaneous pronunciation are prohibited.
Time interval which is considered as simultaneous pronunciation is 1.5msec or less. This is the same regulation as that in Mono-mode.
When there is such note, the last note is taken as a valid one and is converted.

6. Other Notes

6.1. Volume Designation and Note Message

In MA-5 Authoring Tool, be sure not to place a note event at the same time of volume designation because it may cause defects; for instance, the attack of sound may be lost or noise may be generated. In order to avoid these defects, be sure to have 22msec or more time period after volume specification, and then place a note event. When change of volume is especially intensive, it makes this problem occur more easily. As well as volume change in music, even if the setting of turning down volume at the head of music is performed and a note message is placed at time 0, it becomes a factor of noise similarly. When creating a music which makes fade-in with low volume, be sure to place a note message after more than 22 msec elapsed from time 0.
On the contrary, in the case of top volume at time 0, it will operate normally. Relevant messages that need volume designation are Master volume, Channel volume, Expression, Panpot, and Stream PCM Wave Panpot.
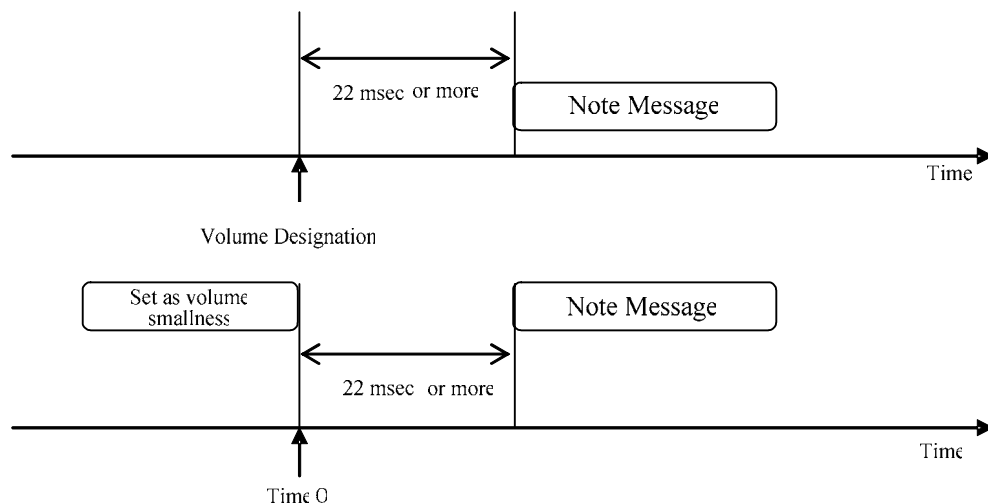
【Note】 When the above-mentioned problem is not improved, be sure to extend the interval between volume designation and a note message. The formula about the time (msec) and tick in SMF is shown below.

Formula : (tick number of SMF)= ((Temp) *(Time of SMF)*(division of SMF)) / (60*1000)

E.g.) When time in SMF is 22msec with "(Temp) = 160" and "(division of SMF) = 480", "(tick number of SMF) = 28" is found based on the above-mentioned formula.

6.2. Restriction of the Number of usable Voice

In a melody voice, the total of the kind of program change which can be used in one music is 127. Be sure to use it 127 or less. Moreover, in a drum voice, the total of the kind of note message which can be used in a piece of music is 128. Be sure to use it 128 or less.
The above-mentioned restriction is the total of the kind of voice which can be used in a piece of music.
In use of the voice exceeding the restriction, defects of which voice can not be pronounced may occur.
Please understand the situation.

6.3. Event Density Limitation

In MA-5 Authoring Tool, there are event density restrictions: the maximum event density is 1000 or less byte/sec. and Average event density is 500 or less byte/sec. SMF which exceeds the restrictions is not convertible to MLD.
It is calculated by Note event (6Byte), Program change (2Byte), Control change (3Byte), Pitch bend (3Byte), and Exclusive message (Byte number of data part and 2(F0, F7) Byte). Unit is [Byte/sec].

6.4. Mono mode-on / Restriction for Maximum Simultaneous Sound Generation

In MA-5 authoring system, if any of channels are using mono mode-on, authoring of MLD which exceeds the number of maximum simultaneous pronunciation is prohibited.
At this time, an error message "*over the maximum number of voices*" is displayed.
Be sure to avoid it by reducing the number of simultaneous pronunciation so that the number restrictions of the maximum simultaneous pronunciation may not be exceeded, and without using mono mode-on, etc.
For details about the number of the maximum simultaneous pronunciation, refer to "2.3 Synthesizer Mode and Number of Sound Generation."

6.5. Vibration and LED

In MA-5 Authoring Tool, vibration and LED are controllable for every track.
We recommend you to use this function at track which note is not pronounced more moderately than track which note is always pronounced. And, please create the track which inputted only the specified note to use this vibration and LED effectively especially (For example, the track of only the high hat portion of drum).

About vibration, when the gate time of the note of synchronous assignment channel is short, the effect may be unable to be seen. And when the interval of note and note is short, it may be unable to check that the swing has stopped. These are based on the response characteristic of the vibrating motor. The length of gate time and the interval of notes should be set up in consideration of this.

Please check the operation of vibration and LED by actual playback.

【Note】 When note out-of -range pronunciation exists in the designated channel for vibration or LED synchronization, vibration and LED functions do not operate to the out-of-range note. When the warning message, "*out-of-range note exists in the designated channel for synchronization*" is displayed, be sure to confirm operations of vibration and LED with the targeted real device.

7. Note at the time of WT voice setting

7.1. Note on One shot Playback

When a setting of WT voice is set as "*LoopPoint=EndPoint*," a playback is performed only once without looping. This is called "One-shot-Playback." According to this LoopPoint setting, conditions like that *the output value of the whole music is distorted and volume becomes small* may appear.

7.1.1. Cause

When Loop Point and End Point are the same, intermediate value between the sample value of Loop Point (=End Point) and the sample value of the next (Note) keeps on outputting in the synthesizer LSI. If volume does not decrease by the setting of EG, the intermediate value becomes DC (Direct current) component. The signal of other voices is added to this DC. Therefore, when two or more sounds of this WT voice is generated (Maximum of 16 notes), components of DC is increased; in addition, distortion is occurred in the place beyond the maximum (minimum) of a digital signal. In some cases, distortion may not be distinguished depending on the conditions: how the DC component is included or music, so it is necessary to verify the voice using mobile phone.

7.1.2. Measure

There are the following two measures:
A way to select the Loop point so that DC component is not output.
A way to adjust the setting of EG so that DC component does not keep on outputting.

We recommend you to use both of them as the measures.

7.1.3. Setting Method of Loop Point

Since it is used for one-shot playback when Loop Point is selected at the same point as End Point, Loop Point and End Point are supposed to be set at the end of waveform data in many cases.

In 4bitADPCM, set the Loop Point (=End Point) to the last sample of waveform data and then confirm the sample value and the previous sample value. The intermediate value between the two sample values becomes DC component. Since the intermediate value varies depending on playback conditions, confirm that absolute value of both values is smaller than 1000.

In 8bitPCM, set the Loop Point (=End Point) to the previous sample of the last one of waveform data and confirm the sample vale and the last sample value.

When the absolute value of the sample value exceeds 1000, seek a place where the absolute value of consecutive two samples is smaller than 1000 and set the Loop Point (=End Point).

7.1.4. Processing of Waveform Data

When a place where the absolute value of consecutive two samples is smaller than 1000 cannot be found in the appropriate position, processing with the waveform edit software so that the last of waveform becomes 0 is the most reliable way.
Use some ways such as fadeout so as not to cause sudden changes.
Addition of two "0" in the case of 8bitPCM and eight "0" in the case of 4bitADPCM would be better.

7.1.5. Setting Method of EG

Change the setting of EG so that it does not meet the following three kinds of conditions.
These conditions are the setting for which EG does not close (time is taken to close EG).
XOF＝1 and SR≤1
XOF＝1 and DR＝0 and SL≠0
XOF＝0 and RR≤1

When using the EG for one-shot, set "0" to XOF so that EG becomes rectangular.
Set parameters as follows **AR=15, DR=0, SL=0, SR=0, and RR=15** to make the EG rectangular.
Set the time when waveform playback ends to the timing of NoteOff.

7.1.6. Note when Hold1 is used

Note that similar phenomenon may occur when Hold 1 (Damper and Sustain) is used.

7.1.7. Check with an Actual Device (Mobile-Phone)

After the above mentioned measures, verify that no matter occurs by playing it back in mobile phone.

7.2. Note about a Loop Setup of WT

Here are the cautions for the loop setting of WT.
Normally, for the setting of the Loop, set near the zero-cross point and set a point where waveform becomes periodically as the Loop Point or the Stop Point. It is necessary for the waveform between the Loop Point and End Point to have positive value and negative value well-balanced.
On the contrary, for example, when the Loop is set so that only positive value is looped, DC value is included, so when multiple tones are overlapped, the same phenomenon as described in the "Note on One shot Playback" may occur.

When performing the Loop setting, set the Loop Point so that positive value and negative value are included well-balanced.

8. Voice Map

8.1. MA-5 Default Melody Voice Map (GM Level1 conformity)

Bank MSB	0 Preset		Bank MSB	0 Preset	
Pch#	Inst	Typ	Pch#	Inst	Typ
0	GrandPno	FM	64	SprnoSax	FM
1	BritePno	FM	65	Alto Sax	FM
2	E.GrandP	FM	66	TenorSax	FM
3	HnkyTonk	FM	67	Bari.Sax	FM
4	E.Piano1	FM	68	Oboe	FM
5	E.Piano2	FM	69	Eng.Horn	FM
6	Harpsi.	FM	70	Bassoon	FM
7	Clavi.	FM	71	Clarinet	FM
8	Celesta	FM	72	Piccolo	FM
9	Glocken	FM	73	Flute	FM
10	MusicBox	FM	74	Recorder	FM
11	Vibes	FM	75	PanFlute	FM
12	Marimba	FM	76	Bottle	FM
13	Xylophon	FM	77	Shakhchi	FM
14	TubulBel	FM	78	Whistle	FM
15	Dulcimar	FM	79	Ocarina	FM
16	DrawOrgn	FM	80	SquareLd	FM
17	PercOrgn	FM	81	Saw.Lead	FM
18	RockOrgn	FM	82	CaliopLd	FM
19	ChrchOrg	FM	83	ChiffLd	FM
20	ReedOrgn	FM	84	CharanLd	FM
21	Acordion	FM	85	Voice Ld	FM
22	Harmnica	FM	86	Fifth Ld	FM
23	TangoAcd	FM	87	Bass &Ld	FM
24	NylonGtr	FM	88	NewAgePd	FM
25	SteelGtr	FM	89	Warm Pad	FM
26	Jazz Gtr	FM	90	PolySyPd	FM
27	CleanGtr	FM	91	ChoirPad	FM
28	Mute.Gtr	FM	92	BowedPad	FM
29	Ovrdrive	FM	93	MetalPad	FM
30	Dist.Gtr	FM	94	Halo Pad	FM
31	GtrHarmo	FM	95	SweepPad	FM
32	Aco.Bass	FM	96	Rain	FM
33	FngrBass	FM	97	SoundTrk	FM
34	PickBass	FM	98	Crystal	FM
35	Fretless	FM	99	Atmosphr	FM
36	SlapBas1	FM	100	Bright	FM
37	SlapBas2	FM	101	Goblins	FM
38	SynBass1	FM	102	Echoes	FM
39	SynBass2	FM	103	Sci-Fi	FM
40	Violin	FM	104	Sitar	FM
41	Viola	FM	105	Banjo	FM
42	Cello	FM	106	Shamisen	FM
43	ContraBs	FM	107	Koto	FM
44	Trem.Str	FM	108	Kalimba	FM
45	Pizz.Str	FM	109	Bagpipe	FM
46	Harp	FM	110	Fiddle	FM
47	Timpani	FM	111	Shanai	FM
48	Strings1	FM	112	TnklBell	FM
49	Strings2	FM	113	Agogo	FM
50	Syn.Str1	FM	114	SteelDrm	FM
51	Syn.Str2	FM	*1 115	WoodBlok	FM
52	ChoirAah	FM	*2 116	TaikoDrm	FM
53	VoiceOoh	FM	*3 117	MelodTom	FM
54	SynVoice	FM	*4 118	Syn.Drum	FM
55	Orch.Hit	FM	*4 119	RevCymbl	FM
56	Trumpet	FM	120	FretNoiz	FM
57	Trombone	FM	121	BrthNoiz	FM
58	Tuba	FM	*5 122	Seashore	FM
59	Mute.Trp	FM	*6 123	Tweet	FM
60	Fr.Horn	FM	*7 124	Telphone	FM
61	BrasSect	FM	*7 125	Helicptr	FM
62	SynBras1	FM	*6 126	Applause	FM
63	SynBras2	FM	*5 127	Gunshot	FM

*1 : 50cent/halftone, #69 = F#4
*2 : 50cent/halftone, #69 = A2
*3 : 50cent/halftone, #69 = C#4
*4 : 50cent/halftone
*5 : 20cent/halftone
*6 : 5cent/halftone
*7 : 10cent/halftone
The voice, which is set to Pch# with "*", is treated as drum voice by key control judging. (User Bank is also)

(*)Type: FM : FM (2-operator / 4-operator)
Setting of FM mode: FM4-op voice at FM16 voice mode / FM2-op voice at FM32 voice mode

8.2. MA-5 Default Drum1 Voice MAP

Bank MSB	0	
Pch#	0	
Note#	Inst	Typ
24	Seq Click H	FM
25	Brush Tap	FM
@ 26	Brush Swirl	FM
27	Brush Slap	FM
@ 28	Brush Tap Swirl	FM
@ 29	Snare Roll	FM
30	Castanet	FM
31	Snare L	P
32	Sticks	FM
33	Bass Drum L	P
34	Open Rim Shot	FM
35	Bass Drum M	P
36	Bass Drum H	P
37	Closed Rim Shot	FM
38	Snare M	P
39	Hand Clap	FM
40	Snare H	P
41	Floor Tom L	P
42	Hi-Hat Closed	P
43	Floor Tom H	P
44	Hi-Hat Pedal	P
45	Low Tom	P
46	Hi-Hat Open	P
47	Mid Tom L	P
48	Mid Tom H	P
49	Crash Cymbal 1	P
50	High Tom	P
51	Ride Cymbal 1	P
52	Chinese Cymbal	P
53	Ride Cymbal Cup	FM
54	Tambourine	FM
55	Splash Cymbal	P
56	Cowbell	FM
57	Crash Cymbal 2	P
58	Vibraslap	FM
59	Ride Cymbal 2	P
60	Bongo H	FM
61	Bongo L	FM
62	Conga H Mute	FM
63	Conga H Open	FM
64	Conga L	FM
65	Timbale H	FM
66	Timbale L	FM
67	Agogo H	FM
68	Agogo L	FM
69	Cabasa	FM
70	Maracas	FM
@ 71	Samba Whistle H	FM
@ 72	Samba Whistle L	FM
73	Guiro Short	FM
74	Guiro Long	FM
75	Claves	FM
76	Wood Block H	FM
77	Wood Block L	FM
78	Cuica Mute	FM
79	Cuica Open	FM
80	Triangle Mute	FM
81	Triangle Open	FM
82	Shaker	FM
83	Jingle Bells	FM
84	Bell Tree	FM

Only the voice attached "@" is react to KeyOff.
Exclusion allotment of Key#42, #44, #46
Exclusion allotment of Key#71, #72
Exclusion allotment of Key#73, #74
Exclusion allotment of Key#78, #79
Exclusion allotment of Key#80, #81

(*)Type: FM : FMF4 (2-operator / 4-operator), P: PCM
Setting of FM mode: FM4-op voice at FM16 voice mode / FM2-op voice at FM32 voice mode

8.3. MA-5 Default Drum2 Voice MAP

Bank MSB	0	
Pch#	0	
Note#	Inst	Typ
24	Seq Click H	FM
25	Brush Tap	FM
@ 26	Brush Swirl	FM
27	Brush Slap	FM
@ 28	Brush Tap Swirl	FM
@ 29	Snare Roll	FM
30	Castanet	FM
31	Snare L	FM
32	Sticks	FM
33	Bass Drum L	FM
34	Open Rim Shot	FM
35	Bass Drum M	FM
36	Bass Drum H	FM
37	Closed Rim Shot	FM
38	Snare M	FM
39	Hand Clap	FM
40	Snare H	FM
41	Floor Tom L	FM
42	Hi-Hat Closed	FM
43	Floor Tom H	FM
44	Hi-Hat Pedal	FM
45	Low Tom	FM
46	Hi-Hat Open	FM
47	Mid Tom L	FM
48	Mid Tom H	FM
49	Crash Cymbal 1	FM
50	High Tom	FM
51	Ride Cymbal 1	FM
52	Chinese Cymbal	FM
53	Ride Cymbal Cup	FM
54	Tambourine	FM
55	Splash Cymbal	FM
56	Cowbell	FM
57	Crash Cymbal 2	FM
58	Vibraslap	FM
59	Ride Cymbal 2	FM
60	Bongo H	FM
61	Bongo L	FM
62	Conga H Mute	FM
63	Conga H Open	FM
64	Conga L	FM
65	Timbale H	FM
66	Timbale L	FM
67	Agogo H	FM
68	Agogo L	FM
69	Cabasa	FM
70	Maracas	FM
@ 71	Samba Whistle H	FM
@ 72	Samba Whistle L	FM
73	Guiro Short	FM
74	Guiro Long	FM
75	Claves	FM
76	Wood Block H	FM
77	Wood Block L	FM
78	Cuica Mute	FM
79	Cuica Open	FM
80	Triangle Mute	FM
81	Triangle Open	FM
82	Shaker	FM
83	Jingle Bells	FM
84	Bell Tree	FM

Only the voice attached "@" is react to KeyOff.
Exclusion allotment of Key#42, #44,
Exclusion allotment of Key#71, #72
Exclusion allotment of Key#73, #74
Exclusion allotment of Key#78, #79
Exclusion allotment of Key#81, #81

(*)Type: FM : FM (2-operator / 4-operator)
Setting of FM mode: FM4-op voice at FM16 voice mode / FM2-op voice at FM32 voice mode