

Contents Authoring Guideline For MA-7 Authoring Tool <SMF Edition>

Version 1.6.0

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Yamaha Corporation

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Revision History

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1.1.0	2005/06/027	5.3. SetupMeasure Addition of this section. 6.1. NoteOff Addition on the explanation of the Note Number. 6.2. Note On Addition on the explanation of the Note Number. 6.3.1. Bank Select MSB/LSB Correction on the Bank Select Replacement List. 6.3.2. Modulation Addition of the table of Relations between control value and its depth. 6.3.13. RPN MSB/LSB Addition of the table of Setup value for RPN MSB/LSB. 6.3.13.1. Pitch Bend Sensitivity Correction the description of Data Entry LSB(II). 6.3.13.3. Coarse Tune Correction the description of Data Entry LSB(II). 6.3.17. Mono Mode On Addition of the description of DVA. 6.5. Pitch Bend Addition of Note. 6.7.2. Channel Status Setting Correction of the description of Channel Information arguments. 8. Appendix Addition of this chapter.
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		<p>9.8. Key Control Status Add this subject.</p> <p>9.9. Exclusive Message of Massive Length Add this subject.</p> <p>10. Appendix Delete this subject.</p>
1.3.0	2005/08/29	<p>5.3. Setup Measure Modified description.</p> <p>5.4. Tempo Modified minimum beat of a quarter note speed as 4.</p> <p>7.1. Example of Insertion to the Master Track Modified the example to Channel Status Setup.</p> <p>7.4. Native Meta Event Corrected of the miss-description; an entry example.</p> <p>7.5. Universal System Exclusive Corrected for miss-description; an entry example on Master volume.</p> <p>8.7.1. Channel Status Setting Added of the note for Setup Measure.</p> <p>9.1. Registration Data to the Contents Window Deleted of this subject.</p> <p>9.2.2. Loop Point / End Point Designation Deleted of this subject.</p> <p>9.6. Total Length after Conversion Added explanation about upper restriction range.</p> <p>9.9. RAM Size Restriction Added of this subject.</p>
1.4.3	2005/12/26	<p>5.3. Setup Measure Added explanation about cases of irregular setup and no setup.</p> <p>6.2. Total Length after Conversion Added of this subject.</p> <p>8.7.1. Channel Status Setting Added explanations to avoid implementing more than one event.</p> <p>9.1.1. Output Residue on PCM Voice Waveform Added a note.</p> <p>9.2. Filter EG Added the explanation about the rate setup when levels of adjacent EGs are same.</p>
1.5.1	2006/03/31	<p>Changed Copyright as 2005-2006.</p> <p>8.3.13.3. Coarse Tune Corrected typo.</p> <p>8.6.3. Rhythm Designation Corrected typo.</p> <p>9.10. Wide Parameter Added this subject.</p> <p>9.11. DRC Parameter Added this subject.</p>
1.5.2	2006/4/14	<p>8.3. Control Change, Table 3 An wrong value of RPN LSB was corrected.</p> <p>8.3.1. Bank Select MSB/LSB, Table 4, Footnote *5 Description of ATS-MA7-SMAF was added.</p> <p>8.3.11. Reverb Send Level A clerical error was corrected.</p> <p>8.3.12. Chorus Send Level A clerical error was corrected.</p> <p>9.9. RAM Size Restriction Description was added.</p>
1.6.0	2006/11/7	<p>6.1. The main window of the Authoring Tool was changed.</p> <p>8.7.1. Explanation for Note was changed.</p> <p>9.2. "FM Voice Output Deflection" was added as 9.2.</p> <p>9.20 "Wide parameter" was deleted.</p> <p>9.21 "DRC parameter" was deleted.</p>

1.Outline of this Document

This document stipulates a guideline for authoring SMF contents that elicits maximum performance of MA-7 for the terminals in which Yamaha synthesizer LSI for mobile phone: MA-7 is implementing.

MA-7 Authoring Tool reads a SMF in accordance with this document, and converts into SMF for MA-7.

Yamaha does not guarantee the operations in cases of reading SMF that is not defined in this document.

[Note] About the numerical notations

In this document, hexadecimal numbers or decimal numbers expresses data values.

In the case of hexadecimal numbers, a letter "H" (Hexadecimal) follows the numerical value.

Table 1 Contrast Table of Decimal and Hexadecimal

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.Recommended Sequencer Application

As a sequencer application for authoring SMF that is specified in this document, the followings are recommended.

- Yamaha SOL
- Yamaha SOL2
- Yamaha XGWorks ST

3.What's New in SMF/MA-7

3.1.Added Functions

3.1.1.Fine Tune/Coarse Tune

The function of Master Fine Tune, Master Coarse Tune, Fine Tune, and Coarse Tune are supported.

3.1.2.PCM Voice

3.1.2.1.Multi-Bank Support

The Multi-bank, which can assign different voices to each block made by dividing the keyboard into five, is supported.

Up to eight multi-bank voices can be registered to one content.

3.1.2.2.Pitch EG Support

Pitch EG is supported.

3.2.Changes of Function

3.2.1.Filter support in All Voices

Filter (AL) is supported in all voices.
Simultaneous use in all channels is also possible.

3.2.2.FM Voice

3.2.2.1.Frequency-Fix support in All Voices

Frequency-fix is supported in all FM voices.

3.2.2.2.Improvement of Operator EG Resolution

Resolution of operator EG is improved.

3.2.3.PCM Voice

3.2.3.1.Improvement of Amplitude EG Resolution

Resolution of amplitude EG is improved.

3.2.4.Improvement of Pitch Bend Resolution

Resolution of pitch bend is improved.

4.Notes on Authoring Environment

4.1.MIDI Device

In order to generate MA-7 sound from the sequencer software, you need to install Virtual MIDI Device.

5. Notes on Authoring SMF

5.1. SMF Format

Use SMF Format 0.

5.2. MIDI Channel

MA-7 supports MIDI events for 16 channels.

5.3. Setup Measure

If a setup measure is set correctly, the setup measure will be recognized, and its playback starts from the second measure.

If a setup measure isn't set correctly, this measure won't be recognized as a setup measure, and Authoring tool sets the setup measure at time zero automatically and moves the first measure in original SMF to the second measure.

If a setup measure isn't found, Authoring tool sets the setup measure at timeline zero automatically.

To be recognized the first measure as the setup measure, following messages and designated values should be implemented in SMF.

Setup Condition		
SMF Format	SMF Format 0	
Required Message	Beginning of the First Measure (Zero-timeline)	Tempo setup as 240
		Beat setup as 1/4
		"GM1 System ON"
	Beginning of the Second Measure	Tempo setup (Original tempo of the song)
		Beat setup (Original beat of the song)

5.4. Tempo

Only the range of 5BH 8DH 80H (quarter notes of 4) to 00H EAH 60H (quarter notes of 1000) becomes valid as the Set Tempo values.

If tempo is not designated, quarter note is assumed as 120. Tempo change during the music is available.

5.5. Channel Attribute

As the Channel attributes, Normal Channel and Drum Channel are provided. These attributes can be changed by Bank Select.

Unless the Bank Select is designated, channel #9 (channel #0 as beginning) is treated as a Drum Channel, and other channels are treated as Normal Channels.

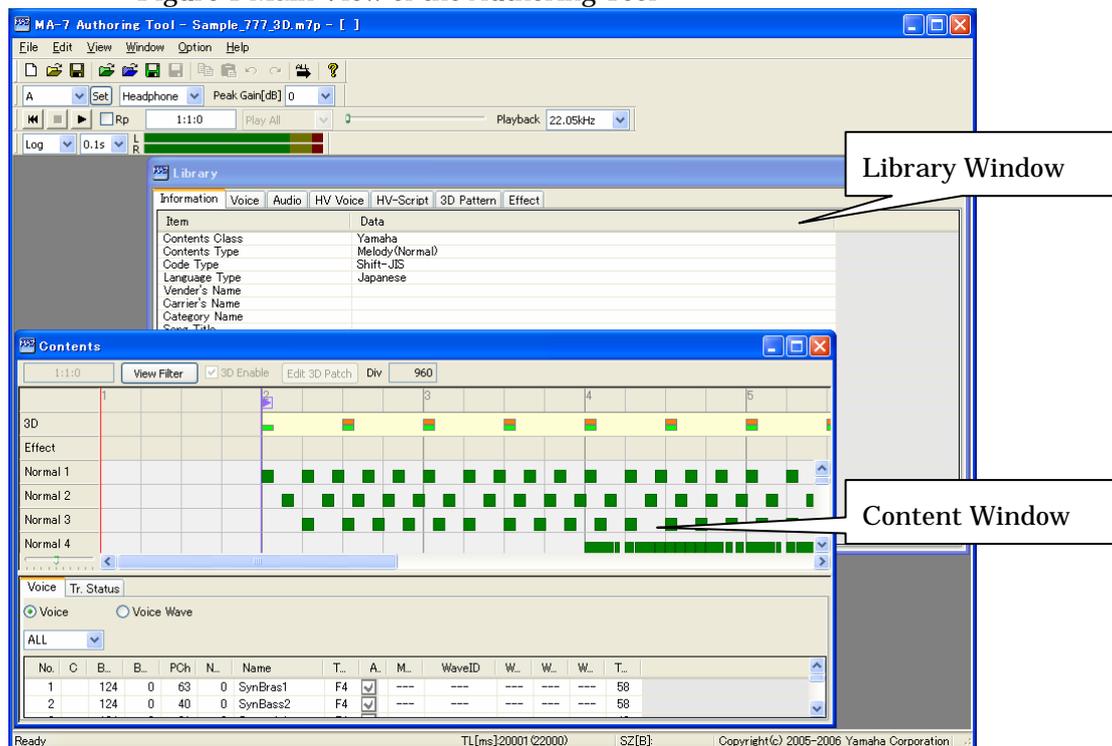
6.Operation of Authoring Tool and Work of SMF

The operation of Authoring Tool and the work of SMF in the main authoring work are explained below.

6.1.Authoring Tool

Authoring Tool has two sub-windows called Contents window and Library window. The Contents window is a window which displays the actual contents information collectively, lists are composed of a track view and some lists, and the list can be changed with tabs. The Library window is also composed of multiple lists and can be changed with tabs. On the Track View or each list, it is possible to edit registered events or parameters.

Figure 1 Main View of the Authoring Tool



6.2.Start the Application

When creating a SMF file, select "SMF" from Format Type of Type Setting dialog.

6.3.Voice Registration

6.3.1.Voice Registration to the Contents Window

When loading a SMF file, the Authoring Tool checks Bank Select and Program Change message in the file. If appropriate voices are found in the Library window, these data are automatically copied to the Contents window.

If the Bank Select or the Program Change is not appropriate, a substitution table is applied, and the Bank Select and the Program Change are added / changed following the substitution table (refer to “8.3.1. Bank Select MSB/LSB”).

Moreover, reloading the SMF file deletes the unused voices on the Contents window automatically.

6.3.2.Edit the Voice of Registered

Changing a parameter is available for the registered voice in the Voice Edit dialog by double-clicking the displayed voice name, however, a “Bank Select LSB:0” of a Normal Voice, or a “Program Change:0” of the Drum Voice cannot be edited.

6.3.3.Copy the Voice

Voices can be copied within the Library window; or between the Library window and the Contents window by Copy and Paste function on the menu, which appears by clicking the right button of a mouse on the Voice tab.

7.Message Insertion

An example of entering a meta-event and an exclusive message with a sequencer application is shown. Refer them with a template data (all_meta_exclusive.mid).

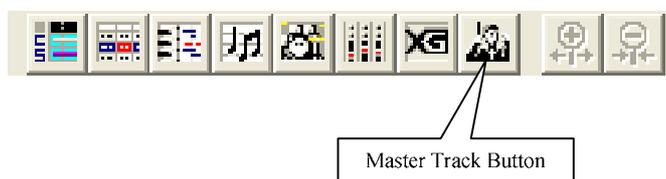
The following example of message entry are explained according to the method of a recommended sequencer application (refer to "2. Recommended Sequencer"). Because the recommended sequencer application includes the size data of a message automatically, you don't need to enter it.

Note that, this example may involve some differences which depends on sequencer application, such as a meta-event cannot be entered, or the exclusive input method differs.

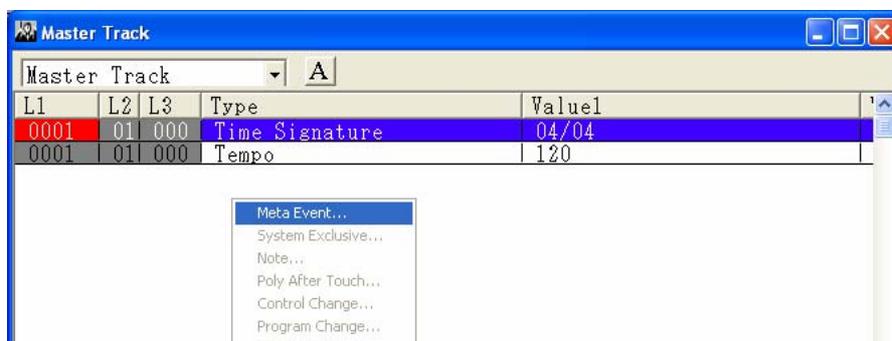
7.1.Insertion to the Master Track

Following is an example of inserting a Channel Status Setup event to a Master Track by the recommended sequencer "XGworks" (for the recommended sequencer, see "2. Recommended Sequencer"; and for the example details, see "Channel Status Setup" of "7.4. Native Meta Event".)

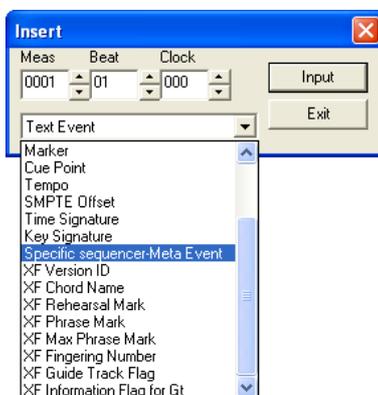
1. Click the Master Track Button () or select [Window] - [Master Track] to show Master Track window.



2. Click-right on the blank area in the Master Track window and select "Meta Event..." from the appeared menu.



3. Choose "Specific sequencer Meta Event" from the appeared dialog.



7.5. Universal System Exclusive

For details of following events, see “8.8. Universal System Exclusive.”

MIDI Events	Description
GM System ON/OFF	Track for the event:
	Arbitrarily track
	Event to be added:
	System Exclusive
	Entry Example: case, GM1 System ON 7EH 7FH 09H 01H F7H
Master Volume	Track for the event:
	Arbitrarily track
	Event to be added:
	System Exclusive
	Entry Example: case, 127 7FH 7FH 04H 01H 00H 7FH F7H
Master Fine Tune	Track for the event:
	Arbitrarily track
	Event to be added:
	System Exclusive
	Entry Example: case, 100 7FH 7FH 04H 03H 00H 64H F7H
Master Coarse Tune	Track for the event:
	Arbitrarily track
	Event to be added:
	System Exclusive
	Entry Example: case, 127 7FH 7FH 04H 03H 00H 7FH F7H

7.6. Native Exclusive

For details of following events, see “8.9. Native Exclusive”.

MIDI Events	Description
User Event	Track for the event:
	Arbitrarily track
	Event to be added:
	System Exclusive
	Entry Example: case, Assign user event #0. 43H 79H 06H 7FH 10H 00H F7H

8.Applicable MIDI Events

MA-7 converts following MIDI events shown in **Table 2**. MIDI events which are not described in this table are ignored.

Make sure to input note events (NoteOn/NoteOff). The initial setting values described below represents the default values in which MA-7 uses when the value is not designated in SMF.

Table 2 List of MIDI Events to Use

Name of MIDI Events		Forms
NoteOff		8nH kk vv
NoteOn		9nH kk vv
Control Change		BnH cn cv
	Bank select MSB/LSB	BnH 00H mm(MSB) BnH 20H ll(LSB)
	Modulation Depth	BnH 01H vv
	Data entry MSB/LSB	BnH 06H mm(MSB) BnH 26H ll(LSB)
	Channel Volume	BnH 07H vv
	Channel panpot	BnH 0AH vv
	Expression	BnH 0BH vv
	Hold1 (damper)	BnH 40H vv
	Filter resonance	BnH 47H vv
	Filter Brightness	BnH 4AH vv
	Dry Send Level	BnH 5AH vv
	Reverb Send Level	BnH 5BH vv
	Chorus Send Level	BnH 5DH vv
	RPN MSB/LSB	BnH 65H mm(MSB) BnH 64H ll(LSB)
	All Sound Off	BnH 78H 00H
	Reset All Controller	BnH 79H 00H
	All Note Off	BnH 7BH 00H
	Mono Mode On	BnH 7EH 01H
Program Change		CnH pp
Pitch Bend		EnH ll mm
Meta Event		FFH ...
	Track End Point	FFH 2FH 00H
	Tempo Designation	FFH 51H 03H hh mm ll
	Rhythm Designation	FFH 58H 04H nn dd cc bb
Native Meta Event		FFH 7FH Size 43H 02H 02H ...
	Channel Status Setting	FFH 7FH Size 43H 02H 02H 03H Ch0 Ch1 ... Ch31
Universal System Exclusive		F0H ...
	GM1 System ON	F0H Size 7EH 7FH 09H 01H F7H
	GM1 System OFF	F0H Size 7EH 7FH 09H 02H F7H
	GM2 System ON	F0H Size 7EH 7FH 09H 03H F7H
	Master Volume	F0H Size 7FH 7FH 04H 01H ll hh F7H
	Master Fine Tune	F0H Size 7FH 7FH 04H 03H ll mm, F7H
	Master Coarse Tune	F0H Size 7FH 7FH 04H 04H 00H vv F7H
Native Exclusive		F0H Size 43H 79H 06H 7FH ...
	User Event	F0H Size 43H 79H 06H 7FH 10H vv F7H

8.1.NoteOff

8nH, kk, vv

Description

KeyOff operates on the designated note number of the designated channel.

Argument

n	Channel number (0..15)
kk	Note number - Valid range of Normal Channel Note number on Normal Voice (0..114) - Valid range of Drum Channel Note number on Drum Voice (13..91)
vv	Key velocity “vv” is ignored.

8.2.Note On

9nH, kk, vv

Description

KeyON operates on the designated note number of the designated channel.

Argument

n	Channel number (0..15)
kk	Note number - Valid range of Normal Channel Note number on Normal Voice (0..114) - Valid range of Drum Channel Note number on Drum Voice (13..91)
vv	Velocity (0..127) vv = 0 is interpreted as NoteOff. Vol[dB] = $40 \times \log(vv/127)$. However, MUTE when vv=1.

Note

- Prosody may vary depending on program change number.
Refer MA-7 Authoring Tool Users Manual for the applicable program change number.
- In MA-7, even if more than two notes are attempted to generate sound simultaneously, the later output-sound lags its generation behind of the former one. Therefore, the simultaneous pronunciation in the same note number may cause its level-down according to the playback frequency.
- The note number of 115 or more is automatically deleted.

8.3.Control Change

BnH, cn, cv

Description

This message sets control change to the designated channel according to the control number.

Argument	n	Channel number (0..15)
	cn	Control number (0..127)
	cv	Control value (0..127)

Control number and its setting items are regulated as **Table 3**. Since the setting range of control value is defined for each control number, do not set any control value exceeding this range.

Table 3 Table for Control Number and Setting Item

Control number	Setting Item	Initial Value	Setting Range of Control Value
0(00H)	Bank select MSB	0	0~127(00H~7FH)
1(01H)	Modulation	0 [OFF]	0~127(00H~7FH)
6(06H)	Data entry MSB	-	0~127(00H~7FH)
7(07H)	Channel volume	100(64H)	0~127(00H~7FH)
10(0AH)	Channel panpot	64(40H) [center]	0~127(00H~7FH)
11(0BH)	Expression	127(7FH) [max.]	0~127(00H~7FH)
32(20H)	Bank select LSB	0	0~127(00H~7FH)
38(26H)	Data entry LSB	-	0~127(00H~7FH)
64(40H)	Hold1	0 [OFF]	0~127(00H~7FH)
71(47H)	Filter resonance	64(40H)	0~127(00H~7FH)
74(4AH)	Brightness	64(40H)	0~127(00H~7FH)
90(5AH)	Dray send level	127(7FH)	0~127(00H~7FH)
91(5BH)	Reverb send level	40(28H)	0~127(00H~7FH)
93(5DH)	Chorus send level	0	0~127(00H~7FH)
100(64H)	RPN LSB	127(7FH)	0~127(00H~02H)
101(65H)	RPN MSB	127(7FH)	0
120(78H)	All sound off	-	0
121(79H)	Reset all controller	-	0
123(7BH)	All note off	-	0
126(7EH)	Mono mode on	Poly-mode	1

8.3.1. Bank Select MSB/LSB

BnH, 00H, mm (MSB)

BnH, 20H, ll (LSB)

Description

This message sets bank in the designated channel. The actual timing of changing the voice is triggered by the program change message, “8.4. Program Change”

Argument

n Channel number (0..15)
 mm, ll Setting value (0..127)

Initial Value

While n=9 (channel number is “9”), mm=125, ll=0.
 While n≠9 (channel number isn’t “9”), mm=124, ll=1.

Note

Bank select MSB and Bank select LSB are recommended to use together.

The correspondence table of bank value replacement that the Authoring Tool replaces is shown in **Table 4**. Replacement is performed when loading SMF.

Table 4 Bank Select Replacement List

Normal /Drum	SMF Setup				Replaced Setup			Notes
	Bank MSB	Bank LSB	Program Change	Channel	Bank MSB	Bank LSB	Program Change	
Normal	124 or 122	0 to 9	0 to 127	0 to 15	124	0 to 9 (*3)	0 to 127 (*3)	RAM
		10	0 to 127	0 to 15		10	0 to 127 (*3)	ROM (*4)
		Except the above or not specified.	0 to 127	0 to 15		1	0 to 127 (*3)	RAM
Normal	121	0 to 127	0 to 127	0 to 15	124	10	0 to 127 (*3)	ROM (*4)
		Not specified	0 to 127	0 to 15		1	0 to 127 (*3)	RAM
Normal	Out of 120 to 125, or not specified.	0 to 127	0 to 127	Except 9	124	1	0 to 127 (*3)	RAM
		Not specified	0 to 127	Except 9		1	0 to 127 (*3)	RAM
Drum	125 or 123	0	0 to 9	0 to 15	125	0	0 to 9 (*3)	RAM
			10	0 to 15			10	ROM (*4)
			Except the above or not specified. (*2)	0 to 15			1	RAM
		Except the above or not specified.	0 to 9	0 to 15		0	0 to 9 (*3)	RAM
		Except the above or not specified. (*2)	0 to 15		0	1	RAM	
Drum	120	0 to 127	0 to 127	0 to 15	125	0	10	ROM (*4)
		Not specified	0 to 9	0 to 15		0	0 to 9 (*3)	RAM
			Except the above or not specified. (*2)	0 to 15			1	RAM
Drum	Except 120 to 125, or not specified.	0 to 127	0 to 9	9	125	0	0 to 9 (*3)	RAM
			Except the above or not specified. (*2)	9			1	RAM
		Not specified	0 to 9	9		0	0 to 9	RAM
			Except the above or not specified. (*2)	9			1	RAM

- *1 All numeric values are described with numbers which begin from zero.
- *2 Replacement is performed at the event timing of the head note message in the relevant channel.
- *3 The value as it is at SMF Setup is set.
- *4 When assigned a voice in ROM, the generated MA-7 SMF doesn't have voice properties. Therefore, note that the playback timbre changes up to the sound generator to be performed. (This does not go for ATS-MA-7-SMAF. As in the case with ROM voice unassigned, it is replaced by RAM voice.)

Correspondence between a bank select value (used in a tool) and a 14-bit value is shown in the following table.

In the sequencer application in which MSB and LSB are combined, set values in reference to **Table 5**.

Table 5 Bank Select in 14-bit notation

MSB	LSB	14-bit value
124	0	15872
	1	15873
	2	15874
	3	15875
	4	15876
	5	15877
	6	15878
	7	15879
	8	15880
	9	15881
125	0	16000

8.3.2.Modulation Depth

BnH, 01H, vv

Description

This message changes vibrato amount in the designated channel.

Argument

n Channel number (0..15)
 vv Control value (0..127)

Initial Value 0

Relation between control value and depth is shown in **Table 6**. Vibrato Depth in this table is the magnification against the vibration depth of each voice.

Table 6 Relations between control value and its depth

Control Value	Vibration Depth
0	OFF
1 to 31	× 1
32 to 63	× 2
64 to 95	× 4
96 to 127	× 8

8.3.3.Data Entry MSB/LSB

BnH, 06H, mm (MSB)**BnH, 26H, ll (LSB)**

Description	This message sets data entry. For the detail, refer to the section “8.3.13. RPN MSB/LSB.”	
Argument	n	Channel number (0..15)
	mm, ll	Setting value (0..127)
Initial Value	-	

8.3.4.Channel Volume

BnH, 07H, vv

Description	This message changes the volume in the designated channel. It aims at setting the volume balance between channels.	
Argument	n	Channel number (0..15)
	vv	Control value (0..127) Gain[dB] = $40 \times \log(vv/127)$, <Gain = MUTE if vv = 0>
Initial Value	100(64H)	

8.3.5.Channel Panpot

BnH, 0AH, vv

Description	This message sets the stereo positioning in the designated channel.	
Argument	n	Channel number (0..15)
	vv	Control value (0..127) Lch[dB] = $20 \times \log(\cos(\pi/2 \times vv/127))$, <Lch = MUTE if vv = 127> Rch[dB] = $20 \times \log(\sin(\pi/2 \times vv/127))$, <Rch = MUTE if vv = 0>
Initial Value	64(40H) [Center]	

8.3.6.Expression

BnH, 0BH, vv

Description

This message changes the volume in the designated channel.
It designates the volume shift set up with Channel Volume of the applicable channel.

Argument

n Channel number (0..15)
vv Control value (0..127)
Exp[dB] = $40 \times \log(vv/127)$, <Exp = MUTE if vv = 0>

Initial Value 127 (7FH) [maximum]

Note

There are two messages, Channel Volume and Expression, to control the volume.
Channel Volume is used at the top of the music data for the mix-down by volume setting or fader.
Expression is used in the music in order to add expression into the music by volume change.

8.3.7.Hold1 (damper)

BnH, 40H, vv

Description

This message changes the damper setting in the designated channel.
This message becomes active only in the voices where the damper is available.

Argument

n Channel number (0..15)
vv Damper setting (0..63:OFF, 64..127:ON)

Initial Value 0 [OFF]

Note

When receiving NoteOff in the status of "ON," NoteOff is suspended. When the status transits from "ON" to "OFF," the delayed NoteOff is executed, and the volume envelop transits to Release.

8.3.8.Filter Resonance

BnH, 47H, vv

Description

This message sets the strength of the filter resonance effect in the designated channel.
The resonance effect, pre-set in the voice, can be controlled by the designation of relative value (center 64). As the value becomes smaller, its effect becomes smaller. Also as the value becomes bigger, its effect becomes significant.
The effective range of Filter Resonance is -3dB to 20.25dB. If the value exceeds the range, the value will be replaced to the min or max of the range.

Argument

n Channel number (0..15)
vv Setting value (0..127)

Initial Value 64(40H)

8.3.9.Filter Brightness

BnH, 4AH, vv

Description

This message sets the filter cut-off frequency in the designated channel.
The cut-off frequency value, pre-set in the voice, can be controlled by the designation of relative value (center 64). As the value gets smaller, the frequency becomes lower, and the value gets bigger, the frequency becomes higher.
The effective range of Filter Brightness is 8 to 8184. If the value exceeds this range, the value will be replaced to the min or max of the range.

Argument

n Channel number (0..15)
vv Setting value (0..127)

Initial Value 64(40H)

8.3.10.Dry Send Level

BnH, 5AH, vv

Description

This message sets the level of LR-output and binaural-output in the designated channel.
 $\text{DrySendLevel}[\%] = (vv / 127) \times 100$

Argument

n Channel number (0..15)
vv Setting value (0..127)

Initial Value 127(7FH)

8.3.11.Reverb Send Level

BnH, 5BH, vv

Description

This message sets the input level of SFX1 effect in the designated channel.
 $\text{ReverbSendLevel}[\%] = (vv / 127) \times 100$

Argument

n Channel number (0..15)
vv Setting value (0..127)

Initial Value 40(28H)

8.3.12.Chorus Send Level

BnH, 5DH, vv

Description

This message sets the input level of SFX2 effect in the designated channel.
 $\text{ChorusSendLevel}[\%] = (vv / 127) \times 100$

Argument

n Channel number (0..15)
vv Setting value (0..127)

Initial Value 0

8.3.13.RPN MSB/LSB

BnH, 65H, mm (MSB)
BnH, 64H, ll (LSB)

Description

This message sets PRN number.
 For the details of the setup value for RPN MSB/LSB, see **Table 7**.

Argument

n Channel number (0..15)
 mm, ll RPN number (0..127)

Initial Value

mm = 127(7FH), ll = 127(7FH)

Table 7 Setup value for RPN MSB/LSB

RPN MSB	RPN LSB	Setup Contents
0	0	8.3.13.1. Pitch Bend Sensitivity
0	1	8.3.13.2. Fine Tune
0	2	8.3.13.3. Coarse Tune

8.3.13.1.Pitch Bend Sensitivity

BnH 65H 00H / BnH 64H 00H (RPN MSB/LSB)
BnH 06H mm / BnH 26H ll (Data Entry MSB/LSB)

Description

This message sets the sensitivity of pitch bend.
 Data Entry MSB (mm) indicates the sensitivity by 100 [cent].
 Data Entry LSB (ll) is ignored, unnecessary to be set.
 For example, mm=01 performs ± 1 semitone (100 cent), and the shift range is 2 semitones totally.

Argument

n Channel number (0..15)
 mm Data Entry value MSB (0..24)
 ll Data Entry value LSB (unnecessary)

Initial Value

mm =2 [2 semitones]

8.3.13.2.Fine Tune

BnH 65H 00H / BnH 64H 01H (RPN MSB/LSB)
BnH 06H mm / BnH 26H ll (Data Entry MSB/LSB)

Description

This message sets the tuning by the resolution of 100/8192[cent].
 mm/ll: 00H/00H (-8192).....40H/00H (0)7FH/7FH (+8191)
 Formula:
 Tuning value[cent] = 100× (((mm × 128) + ll) - 8192) / 8192)

Argument

n Channel number (0..15)
 mm Data Entry value MSB(0..127)
 ll Data Entry value LSB(0..127)

Initial Value

mm = 64 (40H), ll = 0 [Center]

Note

The combined value of Pitch Bend, Fine Tune, Coarse Tune, Master Fine Tune, and Master Coarse Tune is restricted within ±3[oct].

8.3.13.3.Coarse Tune

BnH 65H 00H / BnH 64H 02H (RPN MSB/LSB)
BnH 06H mm / BnH 26H ll (Data Entry MSB/LSB)

Description

This message sets the tuning by 100[cent].
 Data Entry LSB (ll) is ignored, unnecessary to be set.
 mm: 00H (-64) .. 40H (0) .. 7FH(+63)
 Formula: Tuning value [cent] = 100 × (mm - 64)

Argument

n Channel number (0..15)
 mm Data Entry value MSB (0..127)
 ll Data Entry value LSB (unnecessary)

Initial Value

mm = 64 (40H) [Center]

Note

The combined value of Pitch Bend, Fine Tune, Coarse Tune, Master Fine Tune, and Master Coarse Tune is restricted within ±3[oct].

8.3.14.All Sound Off

BnH, 78H, 00H

Description

This message mutes the sound in the designated channel

Argument

n Channel number (0..15)

Initial Value

-

8.3.15.Reset All Controller

BnH, 79H, 00H

Description

This message resets the control value in the designated channel.
 The event value shown in **Table 8** is set as their initial value.

Argument

n Channel number (0..15)

Initial Value

-

Note

The Reset All Controller message should be placed in the Setup Measure.

Table 8 Initial Value of Reset All Controller

Controller	MIDI Event	Initial Value
1 (01H)	Modulation	0 [OFF]
11 (0BH)	Expression	127 [MAX]
64 (40H)	Hold1	0 [OFF]
100 (64H)	RPN LSB	127 [NULL]
101 (65H)	RPN MSB	127 [NULL]
-	Pitch Bend	MSB = 64, LSB = 0
-	Key Velocity	64

8.3.16.All Note Off

BnH, 7BH, 00H

Description	This messages operates to KeyOff the all sound in the designated channel.	
Argument	n	Channel number (0..15)
Initial Value	-	

8.3.17.Mono Mode On

BnH, 7EH, 01H

Description	This message designates the monophonic pronunciation mode in the designated channel. Default value is set as polyphonic pronunciation mode. However, in the Drum designation, it is automatically interpreted as PolyModeOn, and MonoModeOn designation is ignored.	
Argument	n	Channel number (0..15)
Initial Value	Poly mode	
Note	This message is effective only before the first note in the applicable channel. It can not be changed during the music. When the channel is mono-mode, notes of poly are operated as slur (legato). If the sound is muted by DVA(*) during the first tone pronunciation of the of slur process, an attack (retrigger) is attached onto the second tone.	

- * DVA (Dynamic Voice Allocation) is the system which searches an unallocated voice (pronunciation slot) and allocates dynamically despite the part the voice belongs to, to enhance the resource efficiency of the voice synthesis. Because this synthesizes more voices simultaneously than the former system which voice allocation was fixed on each voice, this feature realizes to build powerful and thick expressed contents.

8.4.Program Change

CnH, pp

Description

This message sets the voice in the designated channel.
 When the applicable channel has been set as the normal channel, the voice is selected from the bank designated by bank select. When the applicable channel has been set as the drum channel, the drum set is selected.
 In ROM voice, FM voice and PCM voice are intermingled.
 User voice also can be assigned into either FM voice or PCM voice.
 Insert the Program Change message next to Bank Select message [*cf.* “8.3.1. Bank Select MSB/LSB”].

Argument

n Channel number (0..15)

pp Program number (0..127)

Initial Value

0

8.5.Pitch Bend

EnH, ll, mm

Description

This message shifts the pitch in the designated channel.
 The initial value of the shift-width (Pitch Bend Sensitivity) is 200[cent], and the value can be changed by “8.3.13.1Pitch Bend Sensitivity”

Argument

n Channel number (0..15)

ll Bend amount(LSB : 0..127)

mm Bend amount (MSB : 0..127)

mm/ll : 0/0 (-Max)..64/0 (0[cent])..127/127 (+Max)

Cent-linearly shift curve

Initial Value

mm = 64 (40H), ll = 0 [Center]

Note

The combined value of Pitch Bend, Fine Tune, Coarse Tune, Master Fine Tune, and Master Coarse Tune is restricted within ± 3 [oct].

8.6.Meta Event

This section defines the standard use meta-event. All meta-events which are not defined here are ignored.

8.6.1.Track End Point

FFH, 2FH, 00H

Description

This message designates the playback end point. Data after the end point is ignored. Without designating, it becomes the data end. The first setting is effective.

Argument

None

8.6.2.Tempo Designation

FFH, 51H, 03H, hh, mm, ll

Description

This message changes the playback speed (basic time = 1-TickTime).
 Standard time [us] = Tempo / resolution
 The resolution is indicated by the data included in the top of SMF.
 default : 500,000

Argument

hh/mm/ll $\text{BasicTime} [\mu\text{s}] = (\text{hh} \times 65,536) + (\text{mm} \times 256) + \text{ll}$

Initial Value

500,000 [μs]

8.6.3.Rhythm Designation

FFH, 58H, 04H, nn, dd, cc, bb

Description

This message designates the rhythm.
 This message does not affect to the pronunciation except in the Setup Measure.

Argument

nn Numerator.
 dd Denominator. 2 indicates a crotchet (quarter note), and 3 indicates a quaver (eighth note).
 cc Metronome designation.
 bb The number of demisemiquaver (thirty-second note) in one MIDI crotchet.

8.7. Native Meta Event

This is the Yamaha extend message starting with FFH, 7FH, *Size*, 43H, or 02H.

8.7.1. Channel Status Setting

FFH, 7FH, *Size*, 43H, 02H, 02H, 03H, Ch0, Ch1, ..., Ch31

Description

This message sets the channel status. Vibration and LED can be set in each track.

Argument

Size Data length (fixed as 36)

Ch0..31 Channel information

Choose channel setup from the following table.

Value	VS(Vibration Status)	LED-B (blue)	LED-G (green)	LED-R (red)
0 (00H)	OFF	OFF	OFF	OFF
4 (04H)	OFF	OFF	OFF	ON
8 (08H)	OFF	OFF	ON	OFF
12 (0CH)	OFF	OFF	ON	ON
16 (10H)	OFF	ON	OFF	OFF
20 (14H)	OFF	ON	OFF	ON
24 (18H)	OFF	ON	ON	OFF
28 (1CH)	OFF	ON	ON	ON
32 (20H)	ON	OFF	OFF	OFF
36 (24H)	ON	OFF	OFF	ON
40 (28H)	ON	OFF	ON	OFF
44 (2CH)	ON	OFF	ON	ON
48 (30H)	ON	ON	OFF	OFF
52 (34H)	ON	ON	OFF	ON
56 (38H)	ON	ON	ON	OFF
60 (3CH)	ON	ON	ON	ON

Initial Value 0

Note

This message should be placed at the Setup measure.

This message would be ignored unless the Setup Measure has been configured correctly.

Create the Setup Measure accurately referring “5.3. Setup Measure”.

Only one event can be implemented for one song.

This setup also can be placed by Authoring tool.

8.8.Universal System Exclusive

8.8.1.GM System ON/OFF

F0H, Size, 7EH, 7FH, 09H, 01H, F7H (GM1 System ON)

F0H, Size, 7EH, 7FH, 09H, 02H, F7H (GM1 System OFF)

F0H, Size, 7EH, 7FH, 09H, 03H, F7H (GM2 System ON)

Description

After mute has performed, the following initialization is performed;

- MaxGain=76 (-9dB)
- MasterVolume = 127(0dB)
- #Bank[all] = 0x79/0x00(n != 9), 0x78/0x00(n == 9)
- #Prog[all] = 0
- Poly[All] = 1
- ChVolume[all] = 100
- Panpot[all] = 64(Center)
- Mod[all] = 0(OFF)
- Exp[all] = 127(Max)
- Hold1[all] = 0(OFF)
- PitchBend[all] = 0x40:0x00 (0[cent])
- PitchBendRange[all] = 200[cent]
- RPN[all] =0x7F:0x7F
- MIP_MUTE[all]=FALSE
- FineTune = 0x40:0x00 (0[cent])
- CoaseTune = 0x40 (0[cent])

Argument

None

Note

Authoring Tool erases all “GM System ON/OFF” messages in the music, and inserts “GM1 System ON” message instead. (*cf.* “5.3. Setup Measure”)

Sound volume may differ from that with sequencer application, therefore, don’t insert “GM System ON/OFF” message in the music.

8.8.2.Master Volume

F0H, Size, 7FH, 7FH, 04H, 01H, ll, hh, F7H

Description

This message changes Master volume in the music.

Argument

Size Data Length (fixed as 7)
 ll Master volume lower level (0..127) is ignored.
 hh Master volume higher level (0..127)
 Gain[dB] = 40 × Log10(hh/127)[dB]

Initial Value

100 (64H)

8.8.3.Master Fine Tuning

F0H, Size, 7FH, 7FH, 04H, 03H, ll, mm, F7H

Description	This message sets the master fine tuning. The tuning from A440Hz in cents can be designated. Refer to “8.3.13.2 Fine Tune” for the formula.	
Argument	Size	Data Length (fixed as 7)
	ll	Data value LSB(0..127)
	mm	Data value MSB(0..127)
Initial Value	mm = 64 (40H), ll = 0 [Center]	
Note	The combined value of Pitch Bend, Fine Tune, Coarse Tune, Master Fine Tune, and Master Coarse Tune are limited within ± 3 [oct].	

8.8.4.Master Coarse Tune

F0H, Size, 7FH, 7FH, 04H, 04H, 00H, vv, F7H

Description	This message sets the master coarse tune. The tuning from A440Hz in 100 cents can be designated. Refer to “8.3.13.3 Coarse Tune” for the formula.	
Argument	Size	Data Length (fixed as 7)
	vv	Data value (0..127)
Initial Value	64(40H) [Center]	
Note	The combined value of Pitch Bend, Fine Tune, Coarse Tune, Master Fine Tune, and Master Coarse Tune are limited within ± 3 [oct].	

8.9.Native Exclusive

This is the Yamaha extend message starting with F0H, *Size*, 43H, or 79H.

8.9.1.User Event

F0H, Size, 43H, 79H, 06H, 7FH, 10H, vv, F7H

Description	When this message is issued, the event number is notified to the system. Only one UserEvent can be designated at the same time. The effective range is 0 to 15, and the messages exceeding this number are ignored.	
Argument	Size	Data Length (fixed as 7)
	vv	UserEvent number (0..15)
Initial Value	-	

9.Points to Remember

Due to constraints on specification, points to remember are as follows.
 Create your contents in consideration of these points to avoid effect on sound.
 And, be sure to check the sound of contents created.

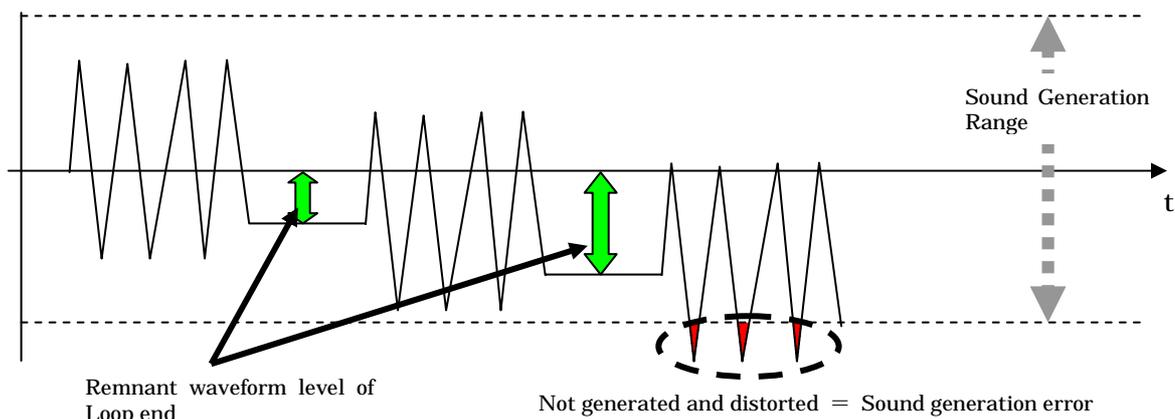
9.1.PCM Voice

9.1.1.Output Residue on PCM VoiceWaveform

Pay attention to the following phenomenon when creating a voice of PCM.

With no waveform loop (loop point equals to loop end), a waveform value is consecutively read based on the hardware specification when waveform read reached at the loop end. Therefore, if voice parameters are set: XOF = 1 or SR = 0 (or a setting for long decay time), or XOF = 0 and RR = 0 (or a setting for long decay time), this value is kept even after the NoteOff.

In this state, if a number of NoteOn with loud volume are overlapped, sound is subject to be distorted. And, when a voice with these kinds of waveform is generated many times, a value that is kept after the NoteOff becomes bigger by the number and causes distortion more easily.



To prevent this phenomenon, we recommend you to set waveform level as "0", or to adjust the Voice's Envelope to lose sound pressure level before the loop ends. Creation Guide Line of PCM Voices is shown in **Table 9**

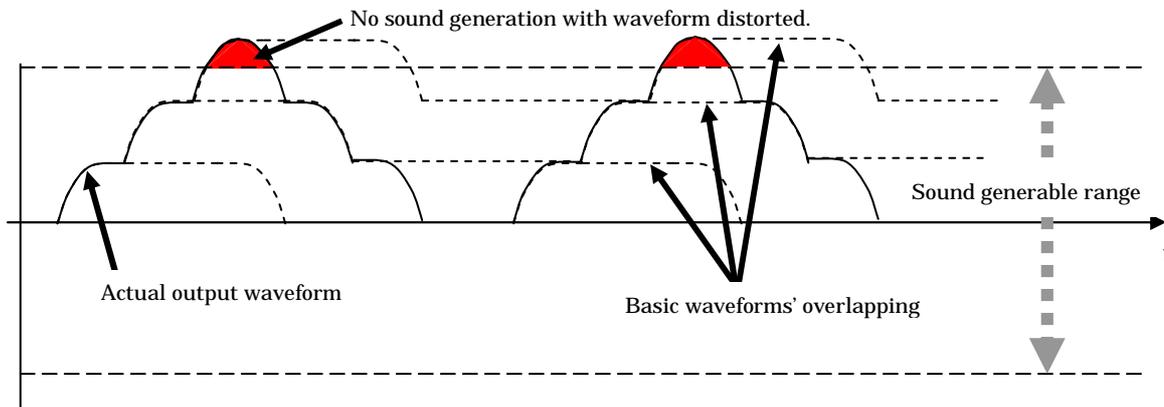
Table 9 PCM Voice Authoring Guide Line

Waveform Loop	What kinds of voice ?	Waveform level at the Loop end	XOF	DR	SR	RR	SUS	Point
×	One-shot or intermittent	0	free	free	free	free	free	No error occurs.
		not 0	on	not 0	not 0	free	off	Troubles may occur. Adjust DR and SR so that sound generated is muted before the loop end.
			off	free	free	not 0 the shorter, the better	off	
○	Continuous	0	off	free	0	not 0	free	No error occurs.
		not 0	off	free	0	not 0	free	No error occurs.
	Decay with Loop	0	free	free	free	free	free	No error occurs.
		not 0	free	free	Free	free	free	No error occurs.

free: Any setting can be made.

9.2.FM Voice Output Deflection

Waveforms of No.1, 2, 3, 5, 9, 10, 11, 13, 14, 17, 18, 19, 21, 22, 25, 26, 27, 29, and 30 out of the basic FM Voice's waveforms have a waveform that is made up of only positive components. When using these waveforms a lot, be sure to check its actual sound because the output waveform will be significantly distorted and this may cause noises.



9.3.Filter EG

When a cutoff frequency is low or resonance effect is great, DC components may remain even after the NoteOff. Check the actual sound generated because this condition may cause sound distortion.

As for the filter EG parameters, the change rate should be set as “31” to make the level of adjacent EGs same. Unless the change rate is “31,” the sound may not be generated correctly.

9.4.Pitch EG

As for the pitch EG parameters of PCM voice, the change rate should be set as “0” to make the level of adjacent EGs same.

Unless the change rate is “0,” the sound may not be generated correctly.

9.5.Volume Designation and Note Event

Do not place the note event on the same time as the volume designation with the Authoring Tool. If you do, noise may be generated and the attack of sound may disappears. If this becomes a concern, put a delay between a volume designation event and a note event.

The relevant volume designation events are master volume, channel volume, expression and panpot. This problem easily occurs especially when volume shifting is larger.

9.6.Event Density

When the number of events per unit time (event density) is high, the pronunciation may become abnormal.

Check it on the actual mobile phone, and adjust the event density if concern.

9.7.Total Length after Conversion

The total length after conversion is restricted within 20 msec to 2000 sec.

When exceeding this range, the tool treats it as an error and prohibits the conversion to SMF.

When authoring SMF, make sure the total length to keep within 20 msec to 2000 sec.

9.8.Key Control Status

The Key Control Status of the channel under following conditions is made into “OFF”;

1. The specified value of Bank Select MSB is only 125 (7DH), and Program Change message comes after this event.
2. The channel is 10 (09H), and its Bank Select MSB in 124 (7CH) or 122 (7AH) is not specified.
3. No note event.

The channel is 10 (09H), and its Bank Select MSB in 124 (7CH) or 122 (7AH) is not specified.

Channel is 10 (09H) channel and Bank Select MSB whose value is 124 (7CH) or 122 (7AH) is not presented.

These are identified as Drum or Stream PCM channel by MA-7 Authoring Tool

Except above channel, Key Control Statuses are made into “non-specified”.

9.9.Exclusive Message Extremely Long

Virtual MIDI Device won't work normal if there is extremely long (1kbyte, approximately) Exclusive Message in the SMF.

This sort of message should be prohibited to involve in the SMF.

9.10.RAM Size Restriction

The consumption of RAM size for the voice in the content is restricted as 16 kbytes (16,382 bytes) by the tool; when the size exceeds this range, the music cannot be playback exactly. Therefore, the voice exceeding 16,382 bytes should be avoided.

Under a content playback, RAM is reserved in 4-kbyte. Note that the size of 16 kbytes could not be used up depending on how to use it.

A.mid (5 kbytes)		B.mid (2 kbytes)		C.mid (4 kbytes)
Use (5 kbytes)	Not used (3 kbytes)	Use (2 kbytes)	Not used (2 kbytes)	Use (4 kbytes)
8kbytes is reserved because of exceeding 4 kbytes		4kbytes is reserved		4kbytes is reserved