

General Notice

When using this document, keep the following in mind:

1. This document is confidential. By accepting this document you acknowledge that you are bound by the terms set forth in the non-disclosure and confidentiality agreement signed separately and /in the possession of SEGA. If you have not signed such a non-disclosure agreement, please contact SEGA immediately and return this document to SEGA.
2. This document may include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new versions of the document. SEGA may make improvements and/or changes in the product(s) and/or the program(s) described in this document at any time.
3. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without SEGA'S written permission. Request for copies of this document and for technical information about SEGA products must be made to your authorized SEGA Technical Services representative.
4. No license is granted by implication or otherwise under any patents, copyrights, trademarks, or other intellectual property rights of SEGA Enterprises, Ltd., SEGA of America, Inc., or any third party.
5. Software, circuitry, and other examples described herein are meant merely to indicate the characteristics and performance of SEGA'S products. SEGA assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the examples describe herein.
6. It is possible that this document may contain reference to, or information about, SEGA products (development hardware/software) or services that are not provided in countries other than Japan. Such references/information must not be construed to mean that SEGA intends to provide such SEGA products or services in countries other than Japan. Any reference of a SEGA licensed product/program in this document is not intended to state or simply that you can use only SEGA'S licensed products/programs. Any functionally equivalent hardware/software can be used instead.
7. SEGA will not be held responsible for any damage to the user that may result from accidents or any other reasons during operation of the user'S equipment, or programs according to this document.

NOTE: A reader's comment/correction form is provided with this document. Please address comments to :

SEGA of America, Inc., Developer Technical Support (att. Evelyn Merritt)
150 Shoreline Drive, Redwood City, CA 94065

SEGA may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.



SEGA OF AMERICA, INC.
Consumer Products Division

Standard MIDI File: Saturn

Converter Specification

Doc. #ST-66-121593

1.0 Change History	2
2.0 Preference Settings	3
3.0 Events to be Converted	4
4.0 When an Error is Output	4
Structure of Output Files	5
Resolution	6
Number of Tracks Used	6
Header Flags	6
Format of Temp Tracks	7
Format of Non-Tempo Tracks (Regular Tracksa)	8
5.0 Abbreviation Rules	20

READER CORRECTION/COMMENT SHEET

Keep us updated!

If you should come across any incorrect or outdated information while reading through the attached document, or come up with any questions or comments, please let us know so that we can make the required changes in subsequent revisions. Simply fill out all information below and return this form to the Developer Technical Support Manager at the address below. Please make more copies of this form if more space is needed. Thank you.

General Information:

Your Name _____ Phone _____

Document number ST-66-121593 Date _____

Document name Standard MIDI File: Converter Specifications

Corrections:

Chpt.	pg. #	Correction

Questions/comments: _____

Where to send your corrections:

Fax: (415) 802-1717
Attn: Evelyn Merritt,
Developer Technical Support

Mail: SEGA OF AMERICA
Attn: Evelyn Merritt,
Developer Technical Support
150 Shoreline Dr.
Redwood City, CA 94065

REFERENCES

In translating/creating this document, certain technical words and/or phrases were interpreted with the assistance of the technical literature listed below.

SEGA Confidential

October 7, 1993

Katsutaka Nitta, Sound Development Section, Software Engineering Department

Description	Page
Change History	2
Preference Settings	3
Events to be Converted	4
When an Error is Output	4
Structure of Output Files	5
Resolution	6
Number of Tracks Used	6
Header Flags	6
Format of Tempo Tracks	7
Format of Tracks Other Than Tempo Tracks (Regular Tracks)	8

Description	Page
00 - 7fH: Note On	9
81H: Rest	10
82H: Reserve	11
83H: Reference	12
84H: Loop Start	13
8EH: End Of Track	14
91H: Poly-Key Pressure	14
92H: Program Change	14
93H: Channel Pressure	15
94H: Pitch Bend (14-Bit Expression)	16
95H: Pitch Bend (7-Bit Expression)	16
A0H: Control Change	17
A1H: Modulation	17
A2H: Breath Control	
A3H: Foot Control	
A4H: Main Volume	
A5H: Panpot	
A6H: Expression	
B0H - B7H: Extend Gate Time	18
B8H - BFH: Extend Step Time	19
Abbreviation Rules	20

1.0 Change History

September 20, 1993 Ver. 1.1

- Added a fade compression mode for pitch bend and changed the contents of the header flag accordingly.
- Changed the tempo track from 8-byte units to 6-byte units.
- Added a command used in the regular tracks and provided the Extend Gate (Step) Time command in stages for each amount of extension.

October 4, 1993 Ver. 1.2

- Of the commands used in the regular tracks, the Jump, Call, and Return commands were eliminated and the Reference command provided in their place. The Loop Start and Reserve commands were added.
- The allocation of command numbers was changed to reflect a statistical classification.
- Changed the Step Time abbreviation rule for Note On and various events. Until now, Step Time was abbreviated only when Note On was the same as the preceding Note On and Step Time, but this has been changed to the preceding event and is not limited to Note On. Further, if the preceding event and Step Time are the same for other events, as well, Step Time is omitted and the 7th bit of the data byte is set to ON.
- Technical explanations necessary for data restoration have been provided where needed.

October 7, 1993 Ver. 1.21

- The abbreviation rules for the top byte of events (command number) and the Step Time have been clarified.
- Typographical errors were corrected.

November 1, 1993, Ver. 1.3

- Music piece = file size (bytes 4 and 5) was inserted in the output file header.



2.0 Preference Settings

The operation of this converter is determined by the configuration (preference setting) program M6CNF.EXE, which exists separately from the converter. The following operations can be set.

- Whether a temporary file is output or not.
- Whether ASCII format or binary format is used for output files.
- Output events other than those to be converted (meta events other than tempo) as comments. (This is valid only when the output file is in ASCII format. Also, comments are output only in temporary files.)
- Allow pitch bend to fade before saving, or save it without fading.

These are all Y or N switches; when M6CNF.EXE is started, they are opened {Translator's Note: Due to copy quality, it was difficult to distinguish "opened." It may be "heard."} in order and the responses are saved in the above order as Y or N in a text file called M6CNV.CNF. The converter reads these text files, which determine its operation.

The converter outputs both temporary files and complete files. Their differences are described below.

- Temporary files (extension: .TMP; Macintosh files are truncated after the 8th character)
 - Output only when output is allowed by the configuration program.
 - Output only when output is displayed as ASCII format and it has been instructed that events other than those to be converted to be output as comments, events other than those to be converted will be output as comments.
- Complete files (extension: .CNV; Macintosh files are truncated after the 8th character)
 - These are always output regardless of what is set by the configuration program. They do not include events other than those to be converted, which are not even output as comments. Repeated detection is already completed. Therefore the Reference command is included. (If a repeat is not found, then of course the Reference command is not included.)

The configuration program does currently exist, but it is planned to eliminate it and include it as one window in the converter program to facilitate setting by way of a menu.

3.0 Events to Be Converted

Of the events included in a standard MIDI file, those that are converted by the converter are listed in the following table. These are converted with no fading as long as saving with fade of Pitch Bend has not been specified in the preference settings.

Event Description	Status Before Conversion	Conversion	Remarks
Note On/Off	9nH , 8nH	Yes	Note Off is replaced by Gate Time.
Poly-Key Pressure	AnH	Yes	
Control Change	BnH	Yes	
Program Change	CnH	Yes	Must exist at the top of each track.
Channel Pressure	DnH	Yes	
Pitch Wheel Change	EnH	Yes	Expressed with 7 bits and 14 bits
System Message	F0H - FEH	No	Exclusive, or Start, Stop, Song Position, etc.
Meta Event	FFH	Yes	Only tempo.

Meta Event is valid only for items for which tempo has meaning and is included in the tempo track. Also, in regular tracks no meta event undergoes conversion.

4.0 When an Error Is Output

When the following conditions are not satisfied, the converter outputs an error message and stops the conversion operation.

- The standard MIDI file prior to conversion does not include a system message. System messages include Song Position Pointer, System Exclusive, Song Select, etc.
- The number of events included in a standard MIDI file prior to conversion is less than 6143 events per track. However, a slightly smaller number of events is output after conversion (this is because Note Off is absorbed in Gate Time of Note On). Similarly, the number of meta events is less than 256, and the length of 1 meta event cannot exceed 127 bytes.
- The standard MIDI file must be of type #1. Future versions will be compatible with type #0 files, but compatibility with type #2 files is not planned.
- The preference setting file (M6CNV.CNF) and the standard MIDI file to be converted must be in the same directory as the converter program (M6CNV.EXE). This is a requirement left over from when the MS-DOS converter and the source files were used in common. This will be changed in the future.
- No more than one Loop Start command (31st Control Change) can exist in each track.
- A Program Change must be present at the top of each track. However, empty tracks do not require a Program Change.



Structure of Output Files

Offset from top	Description	Number of bytes	Notes
0	Resolution	2	
2H	Number of tracks used	1	
3H	Header flag	1	
4H	Number of bytes of this tune	2	File size
6H	(Reserved)	2	For future expansion
8H	Tempo track offset address	2	
0AH	Track #1 offset address	2	
Undefined	Track #2...	2	
Undefined	...	2	
Undefined	Track #n offset address	2	
Undefined	Tempo track, tempo data	Undefined	
Undefined	Track #1, play data	Undefined	
Undefined	Track #2...	Undefined	
Undefined	...	Undefined	
Undefined	Track #n play data	Undefined	

Each is explained later in the next few pages.

Resolution

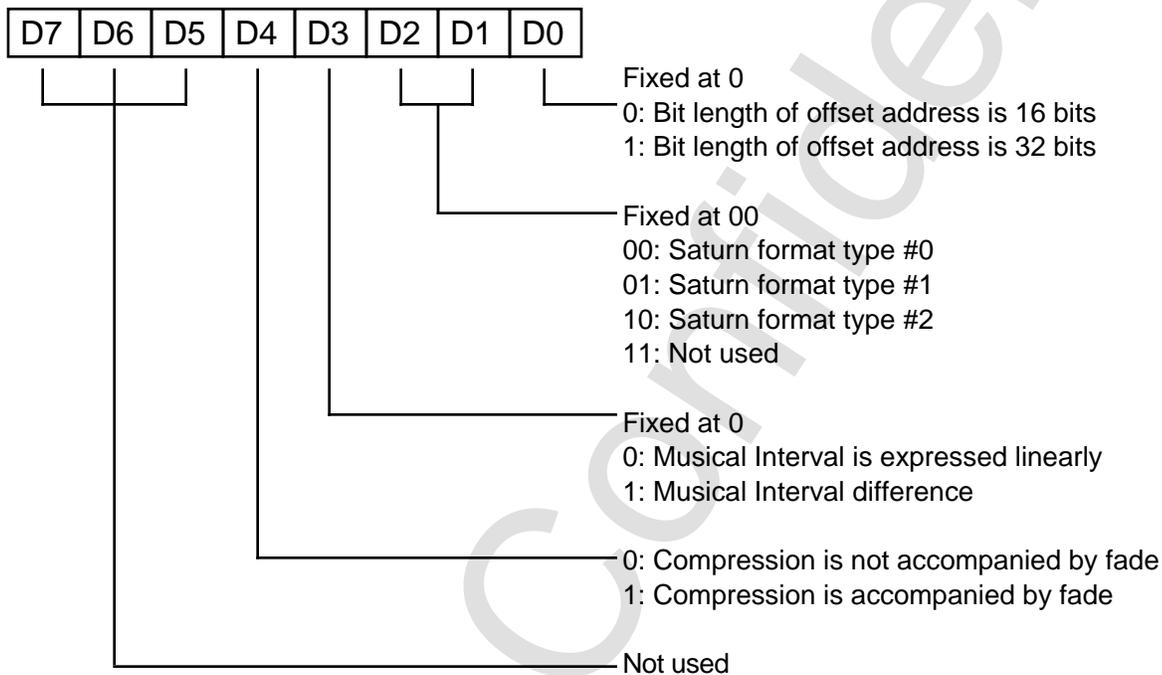
The resolution is the number of counts per quarter note of the original MIDI data. It is expressed with 2 bytes in most significant (MS) and least significant (LS) order.

Number of Tracks Used

The number of tracks used is the number of tracks of the Saturn format data after conversion, including the tempo track.

Header Flags

Header Flags indicate the attributes of the overall data.



D4 indicates whether or not the pitch bend data is faded during conversion. In the case of pitch bend, the change width is normally saved in 14 bits, but it can also be recorded using only the upper 7 bits. In that case, this D4 becomes "1."

Because a pitch bend that has been faded and a pitch bend that has not been faded have different command numbers, the sound source driver does not need to look at D4 of the header flag to perform judgment.



Format of Tempo Tracks

Position	Description	
+0 byte	Upper byte of tempo value	
2	Lower byte	
3	Least significant byte	
4	Upper byte of count number	Duration until next tempo change
6	Lower byte	
7	Least significant byte	

Written in 6-byte units. The tempo value is expressed in the same way as in standard MIDI files, and indicates the number of microseconds per beat. Because no command expressing the track end is inserted in the tempo track, the end must be determined by calculating the size of the tempo track from the number of offset bytes of the header.

There are items in the MIDI sequencer that do not output a tempo when the tempo (BPM) is 120 tunes. In this case the converter does not output the information tempo 120, and because the tempo track is output empty (size is 0 bytes), caution is required on the play side.

Loop and Tempo Changes

Loops must be specified independently for each track. In other words, a common loop cannot for all tracks be specified. Therefore the tempo cannot be changed in a loop.

In a standard MIDI file a loop command is not defined, but loops are required when actually composing. When defining a loop command, one common for all tracks and those independent for each track cannot exist together—for example, when the ranges of an overall loop and of track-independent loops overlap. Also, a complex loop may result in a different tune being played during play while composing on a MIDI sequencer and after conversion.

From the standpoint of effectiveness, track-independent loops are considered more versatile, and therefore loops common to all tracks have not been included.

Therefore, because tempo changes are not done independently for each track, the tempo cannot be changed as independent loops for each track are put together.

Format of Non-Tempo Tracks (Regular Tracks)

The following commands and events exist and are saved together in regular tracks. Those items in the original standard MIDI file are events, and Reserve, Extend Gate (Step) Time, and so on are commands (there is no clear distinction). These are explained in the following tables.

- 00 - 7F: Note On
- 80 - 8F: Control rests and play flow
- 90 - 9F: MIDI events other than Control Changes
- A0 - AF: Make Control Changes and Control Changes used with high-frequency independent events
- B0 - BF: Gate/Step extension

*Skipped numbers exist as other events in the conversion operation in the converter memory. 80H is Note Off, 90H is Note On, and 8FH is a deleted event (event omitted by the Reference command). FFH is also skipped.

Top Byte	Description
Less than 7FH	Note On
Fixed at 80H	(Skipped, cannot be used)
81H	Rest
82H	Reserve
83H	Reference
84H	Loop Start
85H	(Not used)
86H	(Not used)
87H	(Not used)
88H	(Not used)
89H	(Not used)
8AH	(Not used)
8BH	(Not used)
8CH	(Not used)
8DH	(Not used)
8EH	End of Track
8FH	(Skipped, cannot be used)

Top Byte	Description
90H	(Skipped, cannot be used)
91H	Poly-Key Pressure
92H	Program Change
93H	Channel Pressure
94H	Pitch Bend (14-bit expression)
95H	Pitch Bend (7-bit expression)
96H	(Not used)
97H	(Not used)
98H	(Not used)
99H	(Not used)
9AH	(Not used)
9BH	(Not used)
9CH	(Not used)
9DH	(Not used)
9EH	(Not used)
9FH	(Not used)

Top Byte	Description
A0H	Control change
A1H	Modulation
A2H	Breath control
A3H	Foot control
A4H	Main volume
A5H	Panpot
A6H	Expression
A7H	(Not used)
A8H	(Not used)
A9H	(Not used)
AAH	(Not used)
ABH	(Not used)
ACH	(Not used)
ADH	(Not used)
AEH	(Not Used)
AFH	(Not Used)

Top Byte	Description
B0H	Extend Gate Time 200H
B1H	400H
B2H	600H
B3H	800H
B4H	A00H
B5H	C00H
B6H	E00H
B7H	1000H
B8H	Extend Step Time 100H
B9H	200H
BAH	400H
BBH	600H
BCH	800H
BDH	1000H
BEH	1800H
BFH	2000H

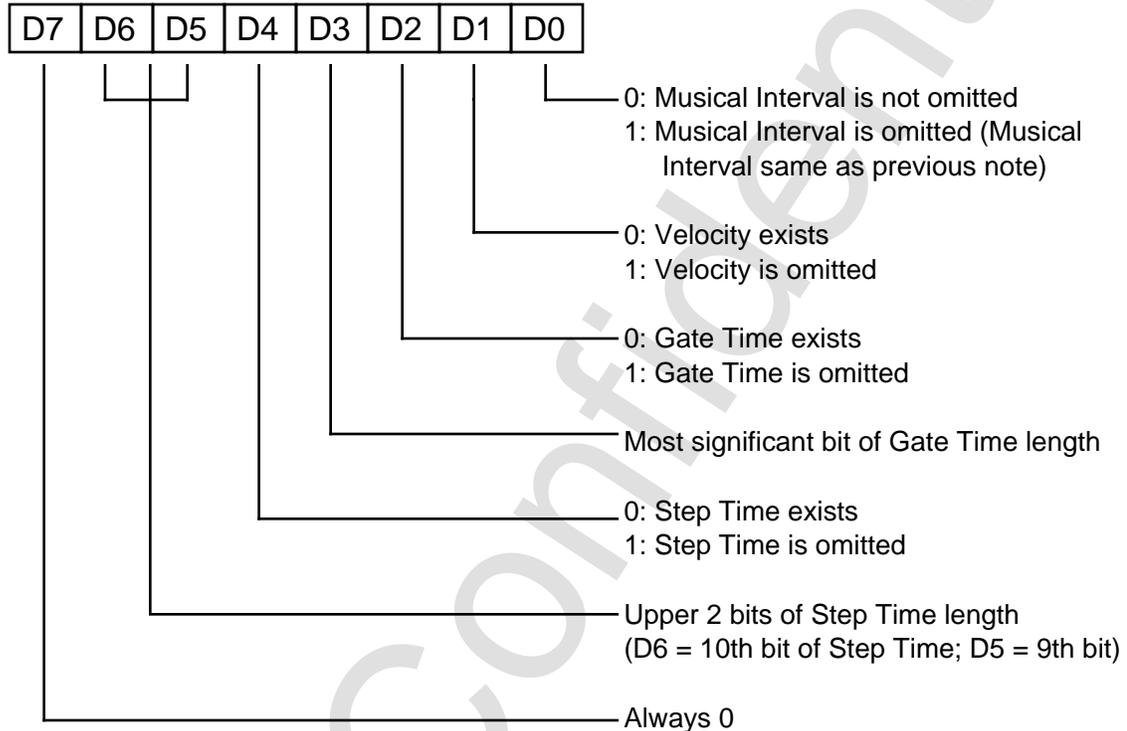
Top Byte	Description
C0H	(Not Used)
C1H	(Not Used)
C2H	(Not Used)
C3H	(Not Used)
C4H	(Not Used)
C5H	(Not Used)
C6H	(Not used)
C7H	(Not used)
C8H	(Not used)
C9H	(Not used)
CAH	(Not used)
CBH	(Not used)
CCH	(Not used)
CDH	(Not used)
CEH	(Not used)
CFH	(Not used)



00 - 7FH: Note On

Status (1 byte)	Interval (1 byte)	Velocity (1 byte)	Gate Time (1 byte)	Step Time (1 byte)
--------------------	----------------------	----------------------	-----------------------	-----------------------

Status includes the status of subsequent data. Each bit has meaning.



The Musical Interval, Velocity, and Gate Time are omitted when they are the same as the previous note (meaning Note On, not the preceding event).

The Step Time is omitted when it is the same as the preceding event (not limited to the preceding Note On).

The Musical Interval and Velocity are expressed with 7 bits, as in MIDI.

The Gate Time is 9 bits long to match the information in Status, and the Step Time is 10 bits long. If these are insufficient for certain note lengths, the Extend Gate (Step) Time command can be put in front of the Note on.

If Gate time and Step time are omitted, of course, the Extend gate (step) time command is not output. These are not omitted, however, if there is the same data as the preceding event at the top of an event group referenced by the Reference command in a complete file (file in which repetition is detected), and therefore Note On takes on a 5-byte length.

81H: Rest

81H (1 byte)	Step (1 byte)
-----------------	------------------

If the time until the first event to be converted is not zero at the top of a track, this command is inserted at the top of the track. Because this command exists only at the top of a track, and no more than one exists in one track, the 2nd-byte Step Time of this command is not omitted.



82H: Reserve

82H (1 byte)	Number of Repetitions (1 byte)
-----------------	--------------------------------------

To avoid outputting an event each time the same event (except Note On) is repeated three or more times, this Reserve command is used to reduce the amount of data by reserving all in advance.

The Reserve command is used to omit the top byte of the second and subsequent events after some event is output without the top byte being omitted (it is possible that Step Time may be omitted). Some examples follow.

```

95H , 40H , 01H      ;Pitch Bend ( Value = 64 )
82H , 06H            ;Reserve ( Reserved 4 events )
42H , 05H            ;Pitch Bend ( Value = 66 )
50H , 08H            ;Pitch Bend ( Value = 80 )
55H , 04H            ;Pitch Bend ( Value = 85 )
60H , 05H            ;Pitch Bend ( Value = 96 )

```

In principle, commands to be reserved are limited to those that appear repeatedly, like those shown in the following table.

Top Byte	Description	Reserved	Top Byte	Description	Reserved
7FH or less	Note On	No	A0H	Control change	Yes
81H	Rest	No	A1H	Modulation	Yes
82H	Reserve	No	A2H	Breath control	Yes
83H	Reference	No	A3H	Foot control	Yes
84H	Loop Start	No	A4H	Main volume	Yes
8EH	End of Track	No	A5H	Panpot	Yes
91H	Poly-key Pressure	Yes	A6H	Expression	Yes
92H	Program Change	Yes	B0H-B7H	Extend Gate Time	No
93H	Channel Pressure	Yes	B8H-BFH	Extend Step Time	No
94H	Pitch Bend (14 bits)	Yes			
95H	Pitch Bend (7 bits)	Yes			

* The Extend Gate (Step) Time command is not reserved, which means that no matter how many times the command is repeated, it is not omitted. It is possible that the Extend Gate (Step) Time command will be inserted in intervals in which other events are omitted by the Reserve command.

* It is possible for multiple Extend Gate (Step) Time commands to appear in succession, but because this is only a 1-byte command with no data or Step Time other than the command byte, it becomes meaningless if it is omitted, and therefore it is not subjected to reserve. Furthermore, due to the converter program provisions, it is not possible even to know how many Extend Gate (Step) Time commands there are until actual output to the file. Therefore there is no means of reserving it. (A command already written to a file cannot be reserved.)

83H: Reference

83H (1 byte)	Byte position from top of track for upper byte of top event of referenced event group	Lower byte	Number of events referenced (1 byte)
-----------------	---	------------	---

This command does not appear in a temporary file; it appears only in complete files. The command reduces the amount of data by omitting the second and subsequent events when the same event group (three events or more) appears multiple times in a track.

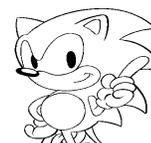
The two bytes following the command number 83H indicate the position of the reference destination. As explained earlier, the reference destination must be positioned before the command.

The last byte indicates the number of events to be referenced. The maximum number of events is 255. The Extend Gate (Step) Time command is not counted in the number of events. All other events are counted in the number of events.

None of the data is omitted from the top event of the event group specified in the reference destination of this command. That is,

- It is not reserved by the Reserve command
- It is not subject to Step Time omission (all events, not only Note On)
- It is not subject to omission of Musical Interval, Velocity, or Gate time

When the events at the reference destination become the object of the Extend Gate (Step) Time command (described later in this document), the reference destination of the Reference command becomes the position of the first Extend Gate (Step) Time command. Therefore a special data restoration operation is not required to read only the specified number of events from the reference destination.



84H: Loop Start

84H (1 byte)	Step (1 byte)
-----------------	------------------

This command indicates the start position of an endless loop. Because this is not automatically judged and inserted, the user must clearly specify the starting point of the loop. When the user inserts a no. 31 Control Change (not yet defined in the MIDI standard) during editing on a MIDI sequencer, the converter converts it to this command.

If the play program reads 8EH (End of Track) in data that has been converted by the converter and 84H (Loop Start) appears before the end of the track, the program returns to that point and continues play.

If multiple Number 31 Control Changes appear in one track, the converter displays an error message and stops the conversion process. Therefore there can be no more than one of these commands in one track in a converted file. Furthermore, the existence of no more than one of these commands means that it will not be affected by the Reference command or the Reserve command. Therefore the starting point of the loop will not be omitted by the Reference command or the Reserve command.

Loop and Tempo Changes

Loops must be specified independently for each track. In other words, a common loop cannot be specified for all tracks. Therefore the tempo cannot be changed in a loop.

In a standard MIDI file a loop command is not defined, but loops are required when actually composing. When defining a loop command, one common for all tracks and those independent for each track cannot exist together— for example, when the ranges of an overall loop and of track-independent loops overlap. Also, a complex loop may result in a different tune being played during play while composing on a MIDI sequencer and after conversion.

From the standpoint of effectiveness, track-independent loops are considered more versatile, and therefore loops common to all tracks have not been included.

Therefore, because tempo changes are not done independently for each track, the tempo cannot be changed as independent loops for each track are put together.

8EH: End of Track

8EH (1 byte)

This command indicates the end of a track.

91H: Poly-Key Pressure

91H (1 byte)	Interval (1 byte)	Value (1 byte)	Step (1 byte)
-----------------	----------------------	-------------------	------------------

Musical Interval and Value are expressed with 7 bits, which is the same as in the MIDI standard.

When the duration (Step Time) until the next event is the same as in the preceding event (including Note On), Step is omitted. In this case, the 7th bit of Musical Interval is set to ON. As a result, the numerical value of Musical interval becomes greater than 80H.

92H: Program Change

92H (1 byte)	Tone Number (1 byte)	Step (1 byte)
-----------------	-------------------------	------------------

Tone Number is expressed with 7 bits, which is the same as in the MIDI standard.

The duration (Step Time) until the next event is omitted when it is the same as in the preceding event (including Note On). In this case, the 7th bit of Tone Number is set to ON. As a result, the numerical value of Tone Number becomes greater than 80H.



93H: Channel Pressure

93H (1 byte)	Value (1 byte)	Step (1 byte)
-----------------	-------------------	------------------

Value is expressed with 7 bits, which is the same as in the MIDI standard.

The duration (Step Time) until the next event is omitted when it is the same as in the preceding event (including Note On). In this case, the 7th bit of Value is set to ON. As a result, the numerical value of Value becomes greater than 80H.

94H: Pitch Bend (14-Bit Expression)

94H (1 byte)	Value Upper Byte (MS)	Lower Byte (LS)	Step (1 byte)
-----------------	-----------------------------	--------------------	------------------

This command is not output when fade compression of Pitch Bend is specified in the preference settings. Value is expressed with two 7-bit bytes, which is the same as in the MIDI standard (expression in the MIDI standard, however, is replaced with an upper byte and a lower byte).

The duration (Step Time) until the next event is omitted when it is the same as in the preceding event (including Note On). In this case, the 7th bit of the Value upper byte is set to ON. As a result, the numerical value of the Value upper byte becomes greater than 80H.

95H: Pitch Bend (7-Bit Expression)

95H (1 byte)	Value (1 byte)	Step (1 byte)
-----------------	-------------------	------------------

This command is output only when fade compression of Pitch Bend is specified in the preference settings. D4 of the header flag becomes "1" at that time.

Value is expressed with 7 bits, which is the upper byte of the two 7-bit bytes normally used for Pitch Bend expression in MIDI. Only -64 to +63 can be expressed, but since most of the keyboards available on the market output only about 64 steps up and down anyway, there should be no problem with fade in actual use when only the upper byte is used.

The duration (Step Time) until the next event is omitted when it is the same as in the preceding event (including Note On). In this case, the 7th bit of Value is set to ON. As a result, the numerical value of Value becomes greater than 80H.



A0H: Control Change

A0H (1 byte)	Controller Type (1 byte)	Value (1 byte)	Step Time (1 byte)
-----------------	-----------------------------	-------------------	-----------------------

Value is expressed with 7 bits, which is the same as in the MIDI standard. Step time (duration until the next event) is omitted when it is the same as in the preceding event (including Note On). In this case, the 7th bit of Controller Type is set to ON. As a result, the numerical value of Controller Type becomes greater than 80H.

There are many types of controllers, but those most commonly used are defined as independent events. This makes it possible to express Control Change in 3 bytes instead of the normal 4 bytes.

The following table lists the Control Changes that are independent events.

Top Byte of Event	Controller
A1H	Modulation
A2H	Breath control
A3H	Foot control
A4H	Main volume
A5H	Panpot
A6H	Expression

A1: Modulation
 A2: Breath control
 A3: Foot control
 A4: Main volume
 A5: Panpot
 A6: Expression

A1H - A6H (1 byte)	Value (1 byte)	Step Time (1 byte)
-----------------------	-------------------	-----------------------

Controllers often used from A0H (Control Change) have become independent events.

B0H - B7H: Extend Gate Time

B0H - B7H
(1 byte)

Extends the Gate Time of the Note On appearing last. Note On events can only have a 9-bit Gate Time. Therefore, in the case of a Note On event with a Gate Time longer than can be expressed with 9 bits, this command must be used to extend the Gate Time of the next Note On event.

This Extend Gate Time command is not output before events other than Note On. Also, the Extend Gate Time command is not output before Note On events for which Gate Time is omitted, regardless of the length of the Gate Time of the Note On.

The amount of extension is provided in stages, each of which is an independent command, as shown in the following table.

Command Number	Length of Extension (Hex)	(Decimal)
B0H	200H	512
B1H	400H	1024
B2H	600H	1536
B3H	800H	2048
B4H	A00H	2560
B5H	C00H	3072
B6H	E00H	3584
B7H	1000H	4096



B8H - BFH: Extend Step Time

B8H - BFH
(1 byte)

Extends the Step Time of the immediately following event. The expression width of Step Time is 10 bits for Note On events and 8 bits for other events. The amounts of Step Time expressed by these widths are 3FFH and FFH, respectively. In the case of a Step Time that must be longer than this, the Extend Step Time command is used to extend the Step Time of the next event.

Because Note On events can be expressed with Step Times up to 3FFH even without extension, an extension of less than 400H is not possible before Note On events.

The Extend Step Time command is not output before events for which Step Time is omitted, regardless of the length of the Step Time of the event

The amount of extension is provided in stages, each of which is an independent command, as shown in the following table.

Command Number	Length of Extension (Hex)	(Decimal)
B8H	100H	256
B9H	200H	512
BAH	400H	1024
BBH	600H	1536
BCH	800H	2048
BDH	1000H	4096
BEH	1800H	6144
BFH	2000H	8192

5.0 Abbreviation Rules

The top byte (command number) of events and the Step Time are not omitted in the following cases.

- Top event of event groups referenced by the Reference command
- Next event following the Reference command
- Next event following the Loop Start command
- Top of each track
- Next event following the Rest command

These cases may occur simultaneously. It is also possible that the ranges of event groups referenced by the Reference command may overlap.

In cases other than those above, the Step Time may be omitted when it is the same as the preceding event. In this case, the 7th bit of the data byte following the top byte (command number) of the event is set to ON

If the preceding event and event number are the same in cases other than those above, and if the event is other than Note On, the top byte (command number) of the event may be omitted by the Reserve command.

