General MIDI 2

February 6, 2007

Version 1.2a

Including PAN Formula, MIDI Tuning Changes and Mod Depth Range Recommendation

PREFACE

<u>Abstract:</u>

General MIDI 2 is a group of extensions made to General MIDI (Level 1) allowing for expanded standardized control of MIDI devices. This increased functionality includes extended sounds sets and additional performance and control parameters.

<u>New MIDI Messages:</u>

Numerous new MIDI messages were defined specifically to support the desired performance features of General MIDI 2. The message syntax and details are published in the Complete MIDI 1.0 Detailed Specification version 1999 (and later):

> <u>MIDI Tuning Bank/Dump Extensions (C/A-020)</u>
> <u>Scale/Octave Tuning (C/A-021)</u>
> <u>Controller Destination Setting (C/A-022)</u>
> <u>Key-Based Instrument Controll SysEx Messages (C/A-023)</u>
> <u>Global Parameter Control SysEx Message (C/A-024)</u>
> <u>Master Fine/Course Tuning SysEx Messages (C/A-025)</u>
> <u>Modulation Depth Range RPN (C/A-026)</u>

<u>General MIDI 2 Message:</u>

Universal Non-Realtime System Exclusive sub-ID #2 under General MIDI sub-ID #1 is reserved for General MIDI 2 system messages (see page 21 herein).

<u>Changes from version 1.0 to version 1.1:</u>

- o   Section 3.3.5: changed PAN formula per RP-036
- o   Section 4.7: Added new recommendations per RP-037

<u>Changes from version 1.1 to version 1.2:</u>

- o   Section 3.4.4: added recommendation for Mod Depth Range Response per RP-045
- o   V 1.2a is reformatted for PDF distribution

General MIDI 2 Specification (Recommended Practice)
RP-024 (incorporating changes per RP-036, RP-037, and RP-045)
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1. Definitions

In this document, all GM2 features are described as being either [required], [recommended], [optional] or [not allowed]. These terms are used to mean the following:

[required]

The information in this section must be implemented by the manufacturer in order to meet the GM2 specification.

[recommended]

The information in this section may be implemented by the manufacturer, but it is not required. If the feature is implemented, it must meet the specifications for the feature as defined in the GM2 specification. Implementation of the feature will allow further compatibility.

[optional]

The information in this section is neither recommended nor required. If the feature is implemented, it must meet the specifications for the feature as defined in the GM2 specification.

[not allowed]

A manufacturer may not implement this feature, because it would prevent GM2 compatibility.

2. General Requirements

2.1 Sound Source Type

Undefined. Each manufacturer can choose the most appropriate technology, as long as the GM2 requirements are met.

2.2 Number of Notes

[required]

The sound engine must be capable of supplying polyphony of 32 or more allocated notes simultaneously in any combination of desired sounds.

2.3 MIDI Channels

[required]

All 16 MIDI Channels must be addressable simultaneously.

2.4 Melody Channels and Rhythm Channels

[required]

A Melody Channel is a Channel that can select timbres or sounds from the GM2 Sound Set. These timbres are Programs in Bank 79H/xxH (79H/00H, 79H/01H, 79H/02H, etc.).

A Rhythm Channel is a Channel that can select timbres from the GM2 Percussion Sound Set. These timbres are Programs in Bank 78H/xxH.

Any Channel can be used as a Melody Channel, including Channel 10. Channels 10 and 11 can be used as Rhythm Channels (see Bank Select). Channel 10 defaults to a Rhythm Channel and Channel 11 defaults to a Melody Channel.

[optional]

Any Channel can be used as a Rhythm Channel by sending the Bank Select message 78H/xxH followed by a Program Change message. GM2 scores that use this optional message may be incompatible with some GM2 devices.

2.5 Modes

[required]

The initial mode for all MIDI Channels is MODE 3 (OMNI OFF, POLY). This mode is commonly called "Poly Mode" or "Polyphonic Mode" for a single Channel, but is also known as "Multi Mode" when applied to all Channels in a device.

Each Channel can play a different instrument (timbre or sound) and can respond to Channel Voice Messages (Note On, Note Off, Control Change, RPN, Channel Pressure, Program Change, Pitch Bend) and Channel Mode Messages individually.

Melody Channels also support MODE 4, (OMNI OFF, MONO) when M=1 only. Any other value of M is invalid, causing the Mode message to be ignored. This mode is commonly called "Mono Mode" or Monophonic Mode". Note: M=1 is the value byte for controller #126, which places the MIDI Channel into Mono Mode.

2.6 Timbres

[required]

All timbres described in both the GM2 Sound Set and GM2 Percussion Sound Set (Appendices A and B) must be provided.

Bank 79H/00H shall conform to the GM1 Sound Set.

Note numbers 35 – 81 (23H - 51H) in Program 1 of GM2 Rhythm Channel (Bank 78H/00H) shall conform to the GM1 Percussion Sound Set.

The Program numbers that are undefined by the GM2 Sound Set in Banks 78H/xxH and 79H/xxH are reserved for future expansion and may not be used until defined by MMA and AMEI.

[recommended]

If an undefined Program is selected in Banks 79H/xxH, the Program from Bank 79H/00H (the GM1 Sound Set) shall be played. Similarly, if an undefined Program in Bank 78H/00H is selected, Program 1 (the GM1 Drum Set) shall be used.

[optional]

Displayed timbre names can be different from the names on the list of GM2 Sound Set. Also, the same timbre can be used to support different Program Changes. For example, an identical timbre can be used for both basic timbre "41: Violin" and "42: Viola", but in higher-quality GM2 devices these two sounds will be noticeably different.

2.7 Pitch

2.7.1 Melody Channels (Tuned instruments)

2.7.1.1 Pitched instrument sounds

[required]

Initial tuning is set to equal temperament.

Middle C Note = Note number 60 (3CH).

Note number 69 (45H) is tuned to 440Hz (when fine tune, coarse tune, and pitch bend are set to center.)

Each Note shall play the correct pitch across its key range listed in the GM2 Sound Set (see Appendix A).

Within the key range of the GM2 Sound Set, each timbre shall have the appropriate sonic characteristics of the name of its instrument.

A Pitch Bend of +/-1 octave for all the Notes in a defined key range shall work correctly without aliasing, and Note numbers 36-96 shall sound with the correct pitch regardless of the key range listed in the GM2 Sound Set.

[optional]

Notes outside the key range may not necessarily have a pleasing sound, but they should play the correct pitch (no octave folding). The notes should be free of noisy distortions although the sound may lose its character outside the specified key range.

2.7.1.2 Effect sounds

[required]

Pitch and temperament are undefined. The normal Note number for the effect sound shall be in the octave corresponding to MIDI Note numbers 60-72.

[optional]

The pitch shall change by one semitone for each MIDI Note number. If the pitch of the effect can be reasonably identified, it shall be in tune with the MIDI Note number.

2.7.2 Rhythm Channels

[required]

A specific rhythm timbre is assigned to each key or Note number, but some note numbers are assigned to play silence (no sound at all).

2.8 Sound Generator Assignment

Regardless of its Channel, a new Note On is assigned to an unused sound generator. There is no Channel-specific priority defined. Manufacturers can decide how to assign sound generators for the following situations:

1. When a new Note On is received while all the sound generators of the sound source are already in use.
2. When one key is hit repeatedly.
3. When one key has multiple generators that are active simultaneously.

2.8.1 Rhythm Channels

[required]

Note Off messages are ignored on Rhythm Channels, with the exception of the ORCHESTRA SET (specifically, Note number 88) and the SFX SET (Note numbers 47-84).

Some percussion timbres require a mutually exclusive Note On/Off assignment. For example, when a Note On message for Note number 42 (Closed Hi Hat) is received while Note number 46 (Open Hi Hat) is sounding, Note number 46 is promptly muted and Note number 42 sounds.

The following combinations of timbres use mutually exclusive assignment:

<u>Standard Set</u>

 Closed HH (42) / Pedal HH (44) / Open HH (46)

 Short Whistle (71) / Long Whistle (72)

 Short Guiro (73) / Long Guiro (74)

 Mute Cuica (78) / Open Cuica (79)

 Mute Triangle (80) / Open Triangle (81)

 Scratch Push (29) / Scratch Pull (30)

 Mute Surdo (86) / Open Surdo (87)

<u>Analog Set</u>

 Analog CHH 1 (42) / Analog CHH 2 (44) / Analog OHH (46)

<u>Orchestra Set</u>

 Closed HH 2 (27) / Pedal HH (28) / Open HH 2 (29)

<u>SFX Set</u>

 Scratch Push (41) / Scratch Pull (42)

2.9 Effects

[required]

The whole device must have one chorus effect and one reverb effect. Each Channel must have its own adjustable send levels to the chorus and the reverb. A connection from chorus to reverb must be provided.

[recommended]

An example of the recommended design is shown below:
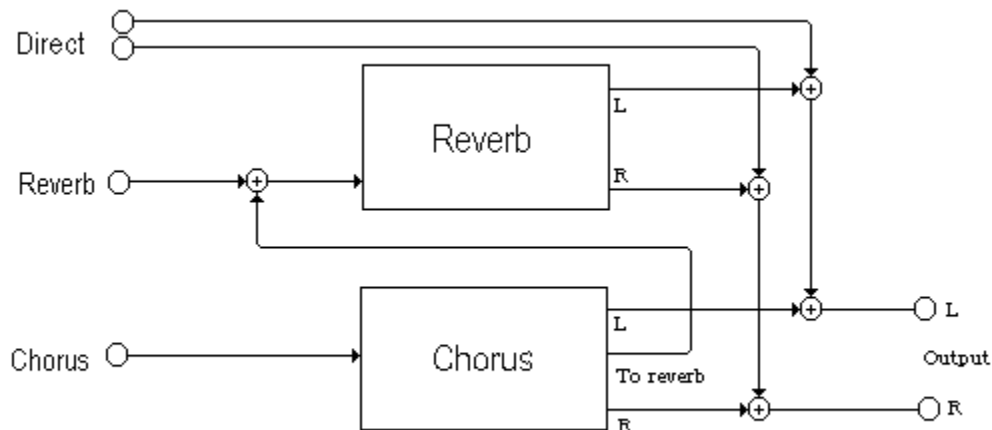
3. Response to MIDI Channel Messages

3.1 Note On/ Note Off

[required]

All Notes of every Bank and Program (all sounds/timbres) shall respond to velocity.

The velocity effect on volume is not defined.

3.2 Program Change Message

[required]

Default Value: 1 (00H)

(Note: Program Change messages in consumer documentation are normally one-based; therefore, the decimal value of 1 presented here, as the default, is equivalent to 00H.)

Sets the timbre for the specified Channel.

When the Channel is a Melody Channel, the timbre is selected from the Bank specified by Bank Select (using Bank Select 79H/xxH, with Bank 79H/00H corresponding to the GM1 sound set).

When the Channel is a Rhythm Channel (using Bank Select 78H/xxH, with Bank 78H/00H corresponding to the GM1 and GM2 Percussion Sound Sets [see Appendix B]), a Drum Set is selected with the Program Change.

[recommended]

Currently sounding Notes shall not be released or muted when a Program Change is received. Instead, they shall continue sounding with the timbre of the prior Program until a Note Off (or Note On with a velocity of 0) is received for that Note. All new Note On messages shall use the new timbre.

The GM2 device shall not change or reset the values of any Control Change, RPN, Pitch Bend, or Channel Pressure when a Program Change is received.

3.3 Control Change Messages

3.3.1 Bank Select (cc#0/32)

[required]

Default Value	- All Channels except Channel 10:	79H/00H
	- Channel 10:	78H/00H

Bank Select selects the desired Bank for the specified Channel. The first byte listed is the MSB, transmitted on cc#0. The second byte listed is the LSB, transmitted on cc#32. Banks are listed in the GM2 Sound Set table (Appendix A). Bank Select 79H/00H corresponds to the GM1 Sound Set, as defined in the GM1 Recommended Practice. Bank Select 78H/00H Program 1 (00H) corresponds to the GM1 Drum Set. (Note: Program Change messages in consumer documentation are normally one-based; therefore, the decimal value of 1 presented here is equivalent to 00H.)

The Bank Select message shall not affect any change in sound until a subsequent Program Change message is received.

Channels 10 and 11 are special in that they can function as a Melody Channel or a Rhythm Channel, depending upon the Bank Select message. On Channels 10 and 11, Bank Select 78H/xxH followed by a Program Change will cause the Channel to become a Rhythm Channel, using the Drum Set selected by the Program Change. Bank Select 79H/xxH followed by a Program Change will cause the Channel to become a Melody Channel, with the sound or timbre selected by the Program Change.

[recommended]

Currently sounding Notes shall not be released or muted when a Bank Select and Program Change is received. Instead, they shall continue sounding with the timbre of the prior Bank/Program until a Note Off (or Note On with a velocity of 0) is received for that Note. All new Note On messages use the new timbre.

[optional]

Any Channel can be used as a Rhythm Channel by sending the Bank Select message 78H/xxH followed by a Program Change message. GM2 scores that use this optional message may be incompatible with some GM2 devices.

3.3.2 Modulation Depth (cc#1)

[required]

Default Value: 0

Changes the vibrato (LFO pitch modulation) depth of the specified Channel.

The waveform of the LFO shall be a triangle wave or a sine wave.

The depth of change at the maximum value conforms to the value that is set by Modulation Depth Range (Vibrato Depth Range), described in section 3.4.4.

The vibrato depth controlled by Modulation Depth follows a curve that is linear in cents.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.3 Portamento Time (cc#5)

[required]

Default Value: 0

Sets the pitch increment speed for the specified Channel when Portamento (cc#65) is on.

Monophonic (MODE 4) Channels support portamento.

[recommended]

Pitch increment rate shall vary according to the recommended example shown below.
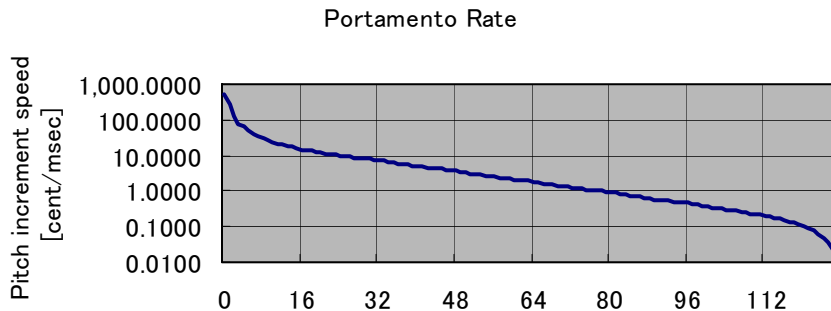
Portamento Rate

[optional]

Polyphonic (MODE 3) Channels also support portamento.

3.3.4 Channel Volume (cc#7)

[required]

Default Value: 100 (64H)

Changes the volume of all sounds on the specified MIDI Channel and thus the relative volume balance among the Channels. The resulting Channel volume is, however, also dependent on Expression (cc#11), as well as the MIDI Master Volume Universal SysEx message which is used to set the overall volume of *all* Channels.

Regarding the curve of volume change messages, the square of the value is proportional to the volume.

```
Example              CC#7      amplitude   proportional to
                     --------  ----------  ----------------------------
                     127        0 dB       127 x  127=   16129
                     96        - 4.9 dB     96 x  96 =    9216
                     64        -11.9 dB     64 x  64 =    4096
                     32        -23.9 dB     32 x  32 =    1024
                     16        -36.0 dB     16 x  16 =     256
                     0         - ∞          0 x   0 =      0
```

The formula used is: gain in dB = $40 * \log_{10}(cc7/127)$

3.3.5 Pan (cc#10)

[required]

Default Value: 64 (center) (40H)

Sets the stereo position of the specified Channel.

This message will pan a timbre on a Melody Channel anywhere in the stereo field from hard left (value = 0, 00H) to hard right (value = 127, 7FH).

When the specified Channel is a Rhythm Channel, this message will set the nominal (base) stereo position of the entire percussion set. This message cannot be used to pan an individual percussion instrument or sound effect. If panning of an individual percussion instrument or sound effect on a Rhythm Channel is required, its panning shall be set in advance using the Key-Based Instrument Controllers Universal Real-Time SysEx message (see section 4.8). The GM2 Percussion Sound Set table (Appendix B) shows recommended preset values. The Pan message will offset the values defined for the percussion set.

[recommended]

It is not necessary to pan a Note that is currently sounding. However, if a currently sounding Note is panned, the panning shall be done without audible artifacts or clicks—no "zipper" noise.

A recommended example of the Pan curve is shown below:

Pan Table
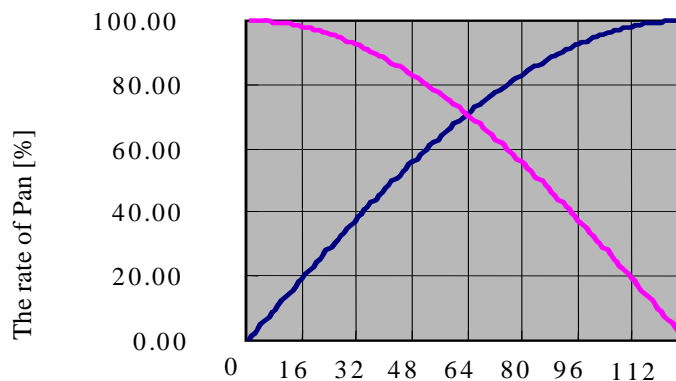
The following formulas are recommended (see AMEI/MMA RP-037 for details):

Left Channel Gain [dB] = 20*log (cos (Pi/2* max(0,CC#10 - 1)/126)

Right Channel Gain [dB] = 20*log (sin (Pi /2* max(0,CC#10 - 1)/126)

3.3.6 Expression (cc#11)

[required]

Default Value: 127 (7FH)

Modifies the volume set by Channel Volume (cc#7) on the specified Channel. The resulting Channel volume is dependent on Volume (cc#7), Expression (cc#11), as well as the MIDI Master Volume Universal SysEx message that is used to set the overall volume of *all* Channels.

Note: Expression (cc#11) and Channel Volume (cc#7) are used for different purposes. Channel Volume (cc#7) should be used to set the overall volume of the Channel prior to music data playback as well as for mixdown fader-style movements, while Expression (cc#11) should be used during music data playback to attenuate the programmed MIDI volume (cc#7) data, thus creating diminuendos and crescendos. This enables a listener, after the fact, to adjust the relative mix of instruments without destroying the dynamic expression of that instrument.

In the curve of volume changes responding to the Expression value, the square of the value is proportional to the volume. An example of the amplitude relationship between volume and expression is shown below.

Example	CC#7	CC#11	Total amplitude		CC#7	CC#11	Total amplitude
	127	127	0dB		127	96	- 4.9dB
	96	127	- 4.9dB		127	64	-11.9dB
	64	127	-11.9dB		127	32	-23.9dB
	32	127	-23.9dB		127	0	- ∞
	16	127	-36.0dB		64	64	-23.8dB
	0	127	- ∞		32	96	-28.8dB

The formula used is: Gain in dB = $(40 * \log_{10}(cc7/127)) + (40 * \log_{10}(cc11/127))$

3.3.7 Hold1 (Damper) (cc#64)

[required]

Default Value: 0 (OFF)

Turns Damper ON or OFF for the specified Channel. (Also known as "sustain pedal".) Damper values between 0 and 63 are recognized as OFF, and values between 64 and 127 are recognized as ON (except if used as Half Damper, below).

Piano and related timbres shall also respond to re-damper (as in when a Damper pedal is stepped on immediately AFTER piano keys are released).

[recommended]

Response to the Damper controller shall be similar to the behavior of the Damper foot pedal on a piano. In terms of a traditional ADSR envelope, the Damper controller response shall be as follows:

> - When a Note-Off (or a Note-On with a velocity of 0) is received and the Damper is ON, the Note-Off shall be deferred (ignored for now). When the Damper transitions from ON to OFF, any notes which have deferred Note-Offs should now respond to the note off, and the amplitude envelope should enter the Release stage, from wherever it was.

> - When the Damper transitions from OFF to ON, notes currently sounding shall be unaffected. If the level of a note that has been released (either from a Note-Off, a Note-On with a velocity of 0, or from a Damper ON to OFF) is greater than the envelope Sustain level, the device should switch back to the Decay or Sustain portion of the envelope. If the note's current level is not greater than the Sustain level, the Damper's transition should be ignored.

> - So, for example, an Organ note, having received a note-off followed by a Damper ON, will not be "caught" by the damper. A piano note, however, with its Sustain level of zero, would be "caught."

Rhythm Channels shall not respond to this message.

[optional]

A GM2 device may also respond to Hold1 as a continuous controller, in which case it acts as a Half-Damper.

3.3.8 Portamento ON/OFF (cc#65)

[required]

Default Value: 0 (OFF)

Turns the Portamento effect ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.9 Sostenuto (cc#66)

[required]

Default Value: 0 (OFF)

Turns Sostenuto ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

Sostenuto is similar to Damper. It acts as a latch for currently held notes (those without any note-off message). When Sostenuto transitions from OFF to ON, notes already held won't be released until the later of a) when the note receives a note-off, or b) when Sostenuto transitions from ON to OFF. However, notes which are played (receive note-on message) while Sostenuto remains ON are unaffected.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.10 Soft (cc#67)

[required]

Default Value: 0 (OFF)

Turns Soft controller ON or OFF for the specified Channel.

Values between 0 and 63 are recognized as OFF; values between 64 and 127 are recognized as ON.

The Soft controller causes new notes to be played at a slightly reduced volume and/or with a lowered cutoff frequency. It is required only for piano and related timbres.

[recommended]

Rhythm Channels shall not respond to this message.

[optional]

At the manufacturer's discretion, a low-pass filter may be imposed on new notes following receipt of a Soft controller ON in order to cause them to be perceived as being played at a lower volume.

3.3.11 Filter Resonance (Timbre/Harmonic Intensity cc#71)

[recommended]

Default Value: 64 (40H, no change)

Sets the strength of the resonance effect for filter(s) for the specified Channel. Exact behavior is left to the manufacturer's discretion.

Modifies the resonance parameter value that is preset in the timbre. The timbre shall recognize it as a relative change, where the center (null point) is 64. When the value is less than 64, the resonance becomes weaker. When the value is greater than 64, the resonance becomes stronger.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.12 Release Time (cc#72)

[recommended]

Default Value: 64 (40H, no change)

Controls the release time of the envelope for the specified Channel. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the time becomes shorter. When the value is greater than 64, the time becomes longer. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.13 Attack time (cc#73)

[recommended]

Default Value: 64 (40H, no change)

Controls the attack time of the envelope for the specified Channel. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the time becomes shorter. When the value is greater than 64, the time becomes longer. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.14 Brightness (cc#74)

[recommended]

Default Value: 64 (40H, no change)

Controls the cut-off frequency of filter(s) for the specified Channel.

Controls the preset cut-off frequency of the filter. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the frequency becomes lower. When the value is greater than 64, the cutoff frequency becomes higher. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.15 Decay Time (cc#75)

[New "Defaults for Sound Controllers", MIDI 1.0 Detailed Specification 1999 or later]

[recommended]

Default Value: 64 (40H, no change)

Controls the decay time of the envelope for the specified Channel. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the time becomes shorter. When the value is greater than 64, the time becomes longer. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.16 Vibrato Rate (cc#76)

[New "Defaults for Sound Controllers", MIDI 1.0 Detailed Specification 1999 or later]

 [recommended]

Default Value: 64 (40H, no change)

Controls the vibrato rate on the specified Channel relative to the sound's preset rate. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the vibrato rate becomes slower. When the value is greater than 64, the vibrato rate becomes faster. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.17 Vibrato Depth (cc#77)

[New "Defaults for Sound Controllers", MIDI 1.0 Detailed Specification 1999 or later]

 [recommended]

Default Value: 64 (40H, no change)

Controls the vibrato depth for the specified Channel. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the vibrato depth is reduced. When the value is greater than 64, the vibrato depth is increased. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.18 Vibrato Delay (cc#78)

[New "Defaults for Sound Controllers", MIDI 1.0 Detailed Specification 1999 or later]

 [recommended]

Default Value: 64 (40H, no change)

Controls the vibrato delay on the specified Channel. This is a relative parameter whose center (null point) is 64 (no change). When the value is less than 64, the delay time becomes shorter. When the value is greater than 64, the delay time becomes longer. Exact behavior is left to the manufacturer's discretion.

[recommended]

Rhythm Channels shall not respond to this message.

3.3.19 Reverb Send Level (cc#91)

[CC91 Defined – MIDI 1.0 Detailed Specification 1999 or later]

 [required]

Default Value: 40 Decimal (28H)

Sets the reverb send level for the specified Channel. The curve responding to the value shall be linear with respect to amplitude. Send level is 100% at value 127.

3.3.20 Chorus Send Level (cc#93)

[CC93 Defined - MIDI 1.0 Detailed Specification 1999 or later]

 [required]

Default Value: 0

Sets the chorus send level for the specified Channel. The curve responding to the value shall be linear with respect to amplitude. Send level is 100% at value 127.

3.3.21 Data Entry (cc#6/38)

[required]

Default Value: 0/0

Data Entry (MSB/LSB) is used on the specified Channel to adjust the value of the RPN that is selected using cc#100/101.

3.3.22 RPN LSB/MSB (cc#100/101)

[required]

Default Value: 7FH/7FH (NULL)

Selects parameter numbers for the RPN on the specified Channel.

3.4 RPN (Registered Parameter Numbers)

3.4.1 00H / 00H Pitch Bend Sensitivity

[required]

Default Value: 02H/00H = 2 semitones

Sets the sensitivity of Pitch Bend. The MSB of Data Entry represents the sensitivity in semitones and the LSB of Data Entry represents the sensitivity in cents. For example, a value of MSB=01, LSB= 00 means +/- 1 semitone (a total range of 2 semitones).

The GM2 device shall be able to accommodate at least +/-12 semitones.

 [recommended]

Rhythm Channels shall not respond to this message.

[optional]

LSB can be ignored.

3.4.2 00H / 01H Channel Fine Tuning

[required]

Default Value: 40H/00H

Resolution: 100/8192 cents

Range: 100/8192*(-8192) to 100/8192*(+8191)

Control Value		Displacement in cents from A440Hz
MSB	LSB	(MIDI Note Number 69)
00H	00H	100/8192*(-8192)
40H	00H	100/8192*(0)
7FH	7FH	100/8192*(+8191)

[recommended]

Rhythm Channels shall not respond to this message.

3.4.3 00H / 02H Channel Coarse Tuning

[required]

Default Value: 40H/00H

Resolution: 100 cents

Range: 100*(-64) to 100*(+63)

Control Value		Displacement in cents
MSB	LSB	from A440Hz (MIDI Note Number 69)
00H	XX	100*(-64)
40H	XX	100*(0)
7FH	XX	100*(+63)

The GM2 device shall be able to accommodate at least +/- 12 semitones.

[recommended]

This transposition function can be implemented by shifting the MIDI Note numbers internal to the synthesizer.

Rhythm Channels shall not respond to this message.

3.4.4 00H / 05H Modulation Depth Range (Vibrato Depth Range)

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Modulation Depth Range RPN"]

[required]

Default Value: 00H/40H (+/-50 cents)

Sets the peak value of Vibrato or LFO Pitch change amount from the basic pitch set by the Modulation Depth controller (cc#1). See section 3.3.2.

The value "1" of MSB of the Data Entry corresponds to a semitone, and "1" of LSB corresponds to 100/128 Cents. For example, MSB = 01H, LSB = 00H means that the Mod Wheel will modulate a maximum of +/- one semitone of vibrato depth (that is, two semitones peak to peak, or one semitone from the center frequency in either direction). Another example, MSB = 00H, LSB = 08H means that the vibrato depth will be 6.25 cents in either direction from the center frequency.

[recommended]

Rhythm Channels shall not respond to this message.

Devices should be able to pitch change a minimum of 6 semitones (+/-600 cents).

> (Note: This range is only intended to apply to GM2 devices. In the case of other device specifications that are based upon and reference this specification, implementers should consult the referencing specification for the appropriate range value).

3.4.5 7FH / 7FH (RPN NULL)

[required]

When this RPN is received, the GM2 device will ignore Data Entry until the RPN is set to a valid value.

3.5 Channel Mode Messages

3.5.1 All Sound Off (cc#120)

[required]

Value: 0

When this message is received, all the Notes sounding on the specified Channel are immediately released and the sound is muted as quickly as possible without producing a click or other audible noise.

3.5.2 Reset All Controllers (cc#121)

[required]

Default Value: 0

When value is 00H, this message resets the status of controllers and other messages in the table below on the specified channel as follows:

CC#	nn	Name	Value
1	01H	Modulation	0 (off)
11	0BH	Expression	7FH (maximum)
64	40H	Hold1 (Damper)	0 (off)
65	41H	Portamento	0 (off)
66	42H	Sostenuto	0 (off)
67	43H	Soft	0 (off)
100	64H	RPN LSB	7FH (null)
101	65H	RPN MSB	7FH (null)
-		Channel pressure	0 (off)
-		Pitch bend change	40H/00H (center)

Program Change, Bank Select (0/32), Channel Volume (7), Pan (10), Portamento Time (5), Reverb Send Level (91) and Chorus Send Level (93) are NOT reset.

3.5.3 All Notes Off (cc#123)

[required]

Value: 0

Turns off all Notes sounding on the specified Channel.

3.5.4 Omni Mode Off (cc#124)

[required]

Value: 0

Turns off all Notes sounding on the specified Channel. Does NOT change the mode (this is because Omni mode is not supported in GM2).

3.5.5 Omni Mode On (cc#125)

[required]

Value: 0

Turns off all Notes sounding on the specified Channel. Does NOT change the mode (this is because Omni mode is not supported in GM2).

3.5.6 Mono Mode On (Poly Mode Off) (cc#126)

[required]

Default Value: 1

On melody Channels, should turn off all Notes sounding on the specified Channel and switches the operation to Mode 4.

Responds only to M=1, where M is the number of Channels specified in the value byte.

On rhythm Channels, should turn off all Notes sounding on the specified Channel; however, the receiver may or may not change modes.

3.5.7 Poly Mode On (Mono Mode Off) (cc#127)

[required]

Value: 0

Turns off all Notes sounding on the specified Channel and switches the operation to Mode 3.

3.6 Pitch Bend

[required]

Default Value: 40H/00H (center)

Adjusts the Pitch up or down on the specified Channel. Default sensitivity (range) is +/- 2 semitones. 00H/00H specifies maximum pitch bend down. 7FH/7FH specifies maximum pitch bend up. Pitch Bend Sensitivity can be adjusted using RPN 00H/00H.

[recommended]

Rhythm Channels shall not respond to this message.

3.7 Channel Pressure

[required]

Default value: 0

Alters modulation, pitch, brightness, and/or amplitude for the specified Channel, depending on the sound or timbres being controlled. The amount of modification is the sum of the value established with the Controller Destination Setting (see Section 4.6.1) and the default setting of the timbre.

[recommended]

Rhythm Channels shall not respond to this message.

4. Universal System Exclusive Messages

4.1 Master Volume

[required]

Default Value: 7FH/7FH

Sets the overall volume of the entire device. As with cc#7 and cc#11, the square of the value is proportional to the volume. See the curve definition given earlier for cc#7 in section 3.3.4.

4.2 Master Fine Tuning

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Master Fine/Coarse Tuning"]

[required]

Default Value: 40H/00H

Sets the overall fine-tuning of the entire device. When Master Fine and Coarse Tuning are at their default settings, the tuning of Note number 69 will be A440Hz (in the absence of Pitch Bend or other pitch altering controllers).

[recommended]

Master Fine Tuning will not alter sounds assigned to Rhythm Channels.

4.3 Master Coarse Tuning

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Master Fine/Coarse Tuning"]

[required]

Default Value: 40H/00H

Sets the overall Coarse tuning of the entire device. The Master Coarse Tuning message has a range of +63/-64 semitones. For a GM2 device, the range shall be at least +/-12 semitones.

[recommended]

Master Coarse Tuning will not alter sounds assigned to Rhythm Channels.

4.4 Reverb Parameters

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Global Parameter Control"]

[required]

The Global Parameter Control Universal Real-Time SysEx Message can be used to control the system-wide parameters of the Reverb unit.

```
F0 7F <device ID> 04 05 01 01 01 01 01 [pp vv] ... F7

    F0 7F           Universal Real-Time SysEx header
    <device ID>     ID of target device (7F = all devices)
    04              sub-ID#1 = DEVICE CONTROL
    05              sub-ID#2 = GLOBAL PARAMETER CONTROL
    01              Slot Path Length = 1
    01              Parameter ID Width = 1
    01              Value Width = 1
    01              Slot Path MSB = 1
    01              Slot Path LSB = 1 (Effect 0101: Reverb)
    pp              Parameter to be controlled.
    vv              Value for the parameter.
    F7              EOX
```

Although this is a real-time message, it shall only be used at the start of playback for a song or during a break in the sound playback, since effects changes may not occur quickly.

4.4.1 Reverb Type

pp = 0

Default Value: 4 (Large Hall)

The names for each reverb type are provided as examples of reverb designs, and they are not intended to define the effect algorithms. Each reverb type may have certain distinctive acoustical characteristics associated with that size of a space, such as early reflections or a unique frequency response. Care shall be exercised to avoid compatibility problems. While the same general algorithm may be used for several or all of the different reverb types, it must be possible to set the Reverb Time. When a Reverb Type is selected, the default Reverb Time from the table below for that Reverb Type shall be set.

0: Small Room	A small size room with a length of approximately 5m.
1: Medium Room	A medium size room with a length of approximately 10m.
2: Large Room	A large size room suitable for live performances.
3: Medium Hall	A medium size concert hall.
4: Large Hall	A large size concert hall suitable for a full orchestra.
8: Plate	A plate reverb simulation.

4.4.2 Reverb Time

pp = 1

$$val = \ln(rt) / 0.025 + 40$$

rt is the time in seconds (0.36 - 9.0) for which the low frequency portion of the original sound declines by -60 dB. The default values for each reverb type are listed below.

Type	Value (Time)
0	44 (1.1s)
1	50 (1.3s)
2	56 (1.5s)
3	64 (1.8s)
4	64 (1.8s)
8	50 (1.3s)

4.5 Chorus Parameters

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Global Parameter Control"]

 [required]

The Global Parameter Control Universal Real-Time SysEx Message can be used to control the system-wide parameters of the Chorus unit.

```
F0 7F <device ID> 04 05 01 01 01 01 02 [pp vv] ... F7

    F0 7F           Universal Real-Time SysEx header
    <device ID>     ID of target device (7F = all devices)
    04              sub-ID#1 = DEVICE CONTROL
    05              sub-ID#2 = GLOBAL PARAMETER CONTROL
    01              Slot Path Length = 1
    01              Parameter ID Width = 1
    01              Value Width = 1
    01              Slot Path MSB = 1
    02              Slot Path LSB = 2 (Effect 0102: Chorus)
    pp              Parameter to be controlled.
    vv              Value for the parameter.
    F7              EOX
```

Although this is a real-time message, it shall only be used at the start of playback for a song or during a break in the sound playback, since effects changes may not occur quickly.

4.5.1 Chorus Type

$pp = 0$

Default Value: 2 (Chorus 3)

Sets Chorus parameters as listed below.

Type	Feedback	Mod Rate	Mod Depth	Rev Send
0: Chorus 1	0 (0%)	3 (0.4Hz)	5 (1.9ms)	0 (0%)
1: Chorus 2	5 (4%)	9 (1.1Hz)	19 (6.3ms)	0 (0%)
2: Chorus 3	8 (6%)	3 (0.4Hz)	19 (6.3ms)	0 (0%)
3: Chorus 4	16 (12%)	9 (1.1Hz)	16 (5.3ms)	0 (0%)
4: FB Chorus	64 (49%)	2 (0.2Hz)	24 (7.8ms)	0 (0%)
5: Flanger	112 (86%)	1 (0.1Hz)	5 (1.9ms)	0 (0%)

Each parameter's definition assumes an algorithm that modulates the delay time of the effect-send line. The modulation waveform and stereo output are implementation-dependent.

4.5.2 Mod Rate

$pp = 1$

$mr = val * 0.122$ mr is the modulation frequency in Hz.

4.5.3 Mod Depth

$pp = 2$

$md = (val + 1) / 3.2$ md is the peak-to-peak swing of the modulation in ms.

4.5.4 Feedback

$pp = 3$

$fb = val * 0.763$ fb is the amount of feedback from Chorus output in percent.

4.5.5 Send to Reverb

pp = 4

ctr = val * 0.787 ctr is the send level from Chorus to Reverb in percent.

4.6 Controller Destination Setting

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Controller Destination Setting"]

4.6.1 Channel Pressure (Aftertouch)

[required]

```
F0 7F <device ID> 09 01 0n [pp rr] … F7
        F0 7F                   Universal Real Time SysEx header
        <device ID>             ID of target device (7F = all devices)
        09                      sub-ID#1 = Controller Destination Setting
        01                      sub-ID#2 = Controller Type: 01 (Channel Pressure)
        0n                      MIDI Channel (00 - 0F)
        [pp rr]                 Controlled parameter and range
         :
        F7                      EOX
```

For each Channel, this message assigns Channel Pressure. "Controller Destination Setting" also provides a way to map Polyphonic Key Pressure; however, only Channel Pressure is required for GM2.

Only the last complete Controller Destination Setting message received for a Channel is active for that Channel, meaning that if Channel Pressure was previously controlling something else, it will now only control what the most recent Controller Destination Setting message specifies.

The following controlled parameters and ranges are supported in GM2:

Controlled Parameter (pp)	Range (rr)	Description	Default
00 Pitch Control	28H - 58H	-24 - +24 semitones	40H
01 Filter Cutoff Control	00H - 7FH	-9600 - +9450 cents	40H
02 Amplitude Control	00H - 7FH	0 - (127/64) * 100 percent	40H
03 LFO Pitch Depth	00H - 7FH	0 - 600 cents	0
04 LFO Filter Depth	00H - 7FH	0 - 2400 cents	0
05 LFO Amplitude Depth	00H - 7FH	0 - 100 percent	0

The example below sets Channel Pressure to control pitch, filter cutoff, and LFO Amplitude Depth (tremolo):

```
        F0 7F                   Universal Real Time SysEx header
        <device ID>             ID of target device (7F = all devices)
        09                      sub-ID#1 = Controller Destination Setting
        01                      sub-ID#2 = Controller:  01 (Channel Pressure)
        06                      Channel:      06 (= 7 one-based)
        00                      Destination:  00 (Pitch Control)
        42                      Range:        42 (+2 semitones)
        01                      Destination:  01 (Filter Cutoff Control)
        60                      Range:        60 (+4800 cents)
        05                      Destination:  05 (LFO Amplitude Depth)
        20                      Range:        20 (25%)
        F7                      EOX
```

[recommended]

Rhythm Channels shall not respond to this message.

4.6.2 Controller (Control Change)

[required]

```
F0 7F <device ID> 09 03 0n cc [pp rr] … F7
        F0 7F                   Universal Real Time SysEx header
        <device ID>             ID of target device (7F = all devices)
        09                      sub-ID#1 = Controller Destination Setting
        03                      sub-ID#2 = Controller Type: 03 (Control Change)
        0n                      MIDI Channel (00 - 0F)
        cc                      Controller number (01 - 1F, 40 - 5F)
        [pp rr]                 Controlled parameter and range
         :
        F7                      EOX
```

For each Channel, this message assigns any one MIDI controller to any selection on the list of controlled parameters.

Only the last complete Controller Destination Setting message received for a Channel is active for that Channel, meaning that if a Control Change was previously controlling something else, it will now only control what the most recent Controller Destination Setting message specifies.

The Controller Destination Setting is only active for one controller at a time on each Channel, meaning that, if a Controller Destination Setting for some other controller was already set, that controller will be reset to its default, with the exception of the Channel Pressure Controller Destination Setting.

The following controlled parameters and ranges are supported in GM2:

Controlled Parameter (pp)	Range (rr)	Description	Default
00 Pitch Control	28H - 58H	-24 - +24 semitones	40H
01 Filter Cutoff Control	00H - 7FH	-9600 - +9450 cents	40H
02 Amplitude Control	00H - 7FH	0 - (127/64) * 100 percent	40H
03 LFO Pitch Depth	00H - 7FH	0 - 600 cents	0
04 LFO Filter Depth	00H - 7FH	0 - 2400 cents	0
05 LFO Amplitude Depth	00H - 7FH	0 - 100 percent	0

The example below sets General Purpose Controller #1 to control pitch, filter cutoff, and LFO Amplitude Depth (tremolo):

```
        F0 7F                   Universal Real Time SysEx header
        <device ID>             ID of target device (7F = all devices)
        09                      sub-ID#1 = Controller Destination Setting
        03                      sub-ID#2 = Controller:  03 (Control Change)
        06                      Channel:      06 (= 7 one-based)
        10                      Controller Number: 10 (General Purpose Controller #1)
        00                      Destination:   00 (Pitch Control)
        42                      Range:        42 (+2 semitones)
        01                      Destination:   01 (Filter Cutoff Control)
        60                      Range:        60 (+4800 cents)
        05                      Destination:   05 (LFO Amplitude Depth)
        20                      Range:        20 (25%)
        F7                      EOX
```

[recommended]

Rhythm Channels shall not respond to this message.

4.7 Scale/Octave Tuning Adjust

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Scale/Octave Tuning"]

[required]

Default Value: 40H

Sets the micro tuning. GM2 supports the Non-Real-time, one-byte form of the Scale Octave Tuning Adjust SysEx message.

This message shall only be used at the start of playback for a song or during a break in the sound playback, since changes may not occur quickly.

[recommended]

It is recommended that devices also support the Real-Time one byte form of the Scale/Octave Tuning Message.

Rhythm Channels shall not respond to these message.

4.8 Key-Based Instrument Controllers

[Refer to Complete MIDI 1.0 Detailed Specification 1999 or later - "Key-Based Instrument Controllers"]

[required]

Allows the control of Volume, Pan, Reverb Send Level, Chorus Send Level, etc., for individual Note numbers in the GM2 Percussion Sound Set programs.

When a new percussion sound set is selected by a Program Change message, the receiving device should adopt the preset setting for each key-based instrument.

The following items can be adjusted per Note number in GM2. Units are provided where appropriate.

CC#	nn	Name	vv	Description	Default
07	07H	Volume	00H-40H-7FH	0 -100 - (127/64) * 100 (%) (Relative)	40H
10	0AH	Pan	00H-40H-7FH	Left-Center-Right (Absolute)	(Preset value)
91	5BH	Reverb Send Level	00H-7FH	0 - Max. (Absolute)	(Preset value)
93	5DH	Chorus Send Level	00H-7FH	0 - Max. (Absolute)	(Preset value)

[recommended]

Melody Channels shall not respond to this message.

4.9 GM System Messages

4.9.1 GM2 System On

[required]

```
F0 7E            Universal Non-Real Time SysEx header
<device ID>      ID of target device (7F = all devices)
09               sub-ID#1        = General MIDI message
03               sub-ID#2        = General MIDI 2 On
F7               EOX
```

When this message is received, all currently sounding Notes immediately mute without producing a click, and the device is reset to the initial GM System 2 status.

The reset operation shall be completed within 100ms after receiving GM2 System On.

4.9.2 GM1 System On (currently called GM System On)

[required]

```
F0 7E            Universal Non-Real Time SysEx header
<device ID>      ID of target device (7F = all devices)
09               sub-ID#1        = General MIDI message
01               sub-ID#2        = General MIDI 1 On
F7               EOX
```

When this message is received, all currently sounding Notes immediately mute without producing a click, and the device is reset to the initial GM System Level 1 status.

4.9.3 GM System Off

[required]

```
F0 7E            Universal Non-Real Time SysEx header
<device ID>      ID of target device (7F = all devices)
09               sub-ID#1        = General MIDI message
02               sub-ID#2        = General MIDI Off
F7               EOX
```

When a device that has an initialized mode that is not GM1 or GM2 receives this message, it returns to its initialized mode. A device that is exclusively GM will ignore this message.

5. Other MIDI Messages

5.1 Active Sensing

[required]

GM2 devices shall respond to Active Sensing.

6. GM2™ Logo

Devices that meet these specifications may display the GM2™ logo when properly applied for and used in accordance with guidelines supplied by AMEI (Japan) and MMA (all other countries). The logo is the property of the MMA & AMEI and cannot be used without permission. Please contact AMEI or MMA for details.

7. Appendix A: GM 2 Sound Set

General MIDI 2 Sound Set — 1 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Piano			
1(00H)	79H 00H	Acoustic Grand Piano	21-108
	79H 01H	Acoustic Grand Piano (wide)	21-108
	79H 02H	Acoustic Grand Piano (dark)	21-108
2(01H)	79H 00H	Bright Acoustic Piano	21-108
	79H 01H	Bright Acoustic Piano (wide)	21-108
3(02H)	79H 00H	Electric Grand Piano	21-108
	79H 01H	Electric Grand Piano (wide)	21-108
4(03H)	79H 00H	Honky-tonk Piano	21-108
	79H 01H	Honky-tonk Piano (wide)	21-108
5(04H)	79H 00H	Electric Piano 1	28-103
	79H 01H	Detuned Electric Piano 1	28-103
	79H 02H	Electric Piano 1 (velocity mix)	28-103
	79H 03H	60's Electric Piano	28-103
6(05H)	79H 00H	Electric Piano 2	28-103
	79H 01H	Detuned Electric Piano 2	28-103
	79H 02H	Electric Piano 2 (velocity mix)	28-103
	79H 03H	EP Legend	28-103
	79H 04H	EP Phase	28-103
7(06H)	79H 00H	Harpsichord	41-89
	79H 01H	Harpsichord (octave mix)	41-89
	79H 02H	Harpsichord (wide)	41-89
	79H 03H	Harpsichord (with key off)	41-89
8(07H)	79H 00H	Clavi	36-96
	79H 01H	Pulse Clavi	36-96
### Chromatic Percussion			
9(08H)	79H 00H	Celesta	60-108
10(09H)	79H 00H	Glockenspiel	72-108
11(0AH)	79H 00H	Music Box	60-84
12(0BH)	79H 00H	Vibraphone	53-89
	79H 01H	Vibraphone (wide)	53-89
13(0CH)	79H 00H	Marimba	48-84
	79H 01H	Marimba (wide)	48-84
14(0DH)	79H 00H	Xylophone	65-96
15(0EH)	79H 00H	Tubular Bells	60-77
	79H 01H	Church Bell	60-77
	79H 02H	Carillon	60-77
16(0FH)	79H 00H	Dulcimer	60-84

General MIDI 2 Sound Set — 2 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Organ			
17(10H)	79H 00H	Drawbar Organ	36-96
	79H 01H	Detuned Drawbar Organ	36-96
	79H 02H	Italian 60's Organ	36-96
	79H 03H	Drawbar Organ 2	36-96
18(11H)	79H 00H	Percussive Organ	36-96
	79H 01H	Detuned Percussive Organ	36-96
	79H 02H	Percussive Organ 2	36-96
19(12H)	79H 00H	Rock Organ	36-96
20(13H)	79H 00H	Church Organ	21-108
	79H 01H	Church Organ (octave mix)	21-108
	79H 02H	Detuned Church Organ	21-108
21(14H)	79H 00H	Reed Organ	36-96
	79H 01H	Puff Organ	36-96
22(15H)	79H 00H	Accordion	53-89
	79H 01H	Accordion 2	53-89
23(16H)	79H 00H	Harmonica	60-84
24(17H)	79H 00H	Tango Accordion	53-89
### Guitar			
25(18H)	79H 00H	Acoustic Guitar (nylon)	40-84
	79H 01H	Ukulele	40-84
	79H 02H	Acoustic Guitar (nylon + key off)	40-84
	79H 03H	Acoustic Guitar (nylon 2)	40-84
26(19H)	79H 00H	Acoustic Guitar (steel)	40-84
	79H 01H	12-Strings Guitar	40-84
	79H 02H	Mandolin	40-84
	79H 03H	Steel Guitar with Body Sound	40-84
27(1AH)	79H 00H	Electric Guitar (jazz)	40-86
	79H 01H	Electric Guitar (pedal steel)	40-86
28(1BH)	79H 00H	Electric Guitar (clean)	40-86
	79H 01H	Electric Guitar (detuned clean)	40-86
	79H 02H	Mid Tone Guitar	40-86
29(1CH)	79H 00H	Electric Guitar (muted)	40-86
	79H 01H	Electric Guitar (funky cutting)	40-86
	79H 02H	Electric Guitar (muted velo-sw)	40-86
	79H 03H	Jazz Man	40-86
30(1DH)	79H 00H	Overdriven Guitar	40-86
	79H 01H	Guitar Pinch	40-86
31(1EH)	79H 00H	Distortion Guitar	40-86
	79H 01H	Distortion Guitar (with feedback)	40-86
	79H 02H	Distorted Rhythm Guitar	40-86
32(1FH)	79H 00H	Guitar Harmonics	40-86
	79H 01H	Guitar Feedback	40-86

General MIDI 2 Sound Set — 3 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Bass			
33(20H)	79H 00H	Acoustic Bass	28-55
34(21H)	79H 00H	Electric Bass (finger)	28-55
	79H 01H	Finger Slap Bass	28-55
35(22H)	79H 00H	Electric Bass (pick)	28-55
36(23H)	79H 00H	Fretless Bass	28-55
37(24H)	79H 00H	Slap Bass 1	28-55
38(25H)	79H 00H	Slap Bass 2	28-55
39(26H)	79H 00H	Synth Bass 1	28-55
	79H 01H	Synth Bass (warm)	28-55
	79H 02H	Synth Bass 3 (resonance)	28-55
	79H 03H	Clavi Bass	28-55
	79H 04H	Hammer	28-55
40(27H)	79H 00H	Synth Bass 2	28-55
	79H 01H	Synth Bass 4 (attack)	28-55
	79H 02H	Synth Bass (rubber)	28-55
	79H 03H	Attack Pulse	28-55
### Strings & Orchestral instruments			
41(28H)	79H 00H	Violin	55-96
	79H 01H	Violin (slow attack)	55-96
42(29H)	79H 00H	Viola	48-84
43(2AH)	79H 00H	Cello	36-72
44(2BH)	79H 00H	Contrabass	28-55
45(2CH)	79H 00H	Tremolo Strings	28-96
46(2DH)	79H 00H	Pizzicato Strings	28-96
47(2EH)	79H 00H	Orchestral Harp	23-103
	79H 01H	Yang Chin	23-103
48(2FH)	79H 00H	Timpani	36-57
### Ensemble			
49(30H)	79H 00H	String Ensembles 1	28-96
	79H 01H	Strings and Brass	28-96
	79H 02H	60s Strings	28-96
50(31H)	79H 00H	String Ensembles 2	28-96
51(32H)	79H 00H	SynthStrings 1	36-96
	79H 01H	SynthStrings 3	36-96
52(33H)	79H 00H	SynthStrings 2	36-96
53(34H)	79H 00H	Choir Aahs	48-79
	79H 01H	Choir Aahs 2	48-79
54(35H)	79H 00H	Voice Oohs	48-79
	79H 01H	Humming	48-79
55(36H)	79H 00H	Synth Voice	48-84
	79H 01H	Analog Voice	48-84
56(37H)	79H 00H	Orchestra Hit	48-72
	79H 01H	Bass Hit Plus	48-72
	79H 02H	6th Hit	48-72
	79H 03H	Euro Hit	48-72

General MIDI 2 Sound Set — 4 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Brass			
57(38H)	79H 00H	Trumpet	58-94
	79H 01H	Dark Trumpet Soft	58-94
58(39H)	79H 00H	Trombone	34-75
	79H 01H	Trombone 2	34-75
	79H 02H	Bright Trombone	34-75
59(3AH)	79H 00H	Tuba	29-55
60(3BH)	79H 00H	Muted Trumpet	58-82
	79H 01H	Muted Trumpet 2	58-82
61(3CH)	79H 00H	French Horn	41-77
	79H 01H	French Horn 2 (warm)	41-77
62(3DH)	79H 00H	Brass Section	36-96
	79H 01H	Brass Section 2 (octave mix)	36-96
63(3EH)	79H 00H	Synth Brass 1	36-96
	79H 01H	Synth Brass 3	36-96
	79H 02H	Analog Synth Brass 1	36-96
	79H 03H	Jump Brass	36-96
64(3FH)	79H 00H	Synth Brass 2	36-96
	79H 01H	Synth Brass 4	36-96
	79H 02H	Analog Synth Brass 2	36-96
### Reed			
65(40H)	79H 00H	Soprano Sax	54-87
66(41H)	79H 00H	Alto Sax	49-80
67(42H)	79H 00H	Tenor Sax	42-75
68(43H)	79H 00H	Baritone Sax	37-68
69(44H)	79H 00H	Oboe	58-91
70(45H)	79H 00H	English Horn	52-81
71(46H)	79H 00H	Bassoon	34-72
72(47H)	79H 00H	Clarinet	50-91
### Pipe			
73(48H)	79H 00H	Piccolo	74-108
74(49H)	79H 00H	Flute	60-96
75(4AH)	79H 00H	Recorder	60-96
76(4BH)	79H 00H	Pan Flute	60-96
77(4CH)	79H 00H	Blown Bottle	60-96
78(4DH)	79H 00H	Shakuhachi	55-84
79(4EH)	79H 00H	Whistle	60-96
80(4FH)	79H 00H	Ocarina	60-84

General MIDI 2 Sound Set — 5 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Synth Lead			
81(50H)	79H 00H	Lead 1 (square)	21-108
	79H 01H	Lead 1a (square 2)	21-108
	79H 02H	Lead 1b (sine)	21-108
82(51H)	79H 00H	Lead 2 (sawtooth)	21-108
	79H 01H	Lead 2a (sawtooth 2)	21-108
	79H 02H	Lead 2b (saw + pulse)	21-108
	79H 03H	Lead 2c (double sawtooth)	21-108
	79H 04H	Lead 2d (sequenced analog)	21-108
83(52H)	79H 00H	Lead 3 (calliope)	36-96
84(53H)	79H 00H	Lead 4 (chiff)	36-96
85(54H)	79H 00H	Lead 5 (charang)	36-96
	79H 01H	Lead 5a (wire lead)	36-96
86(55H)	79H 00H	Lead 6 (voice)	36-96
87(56H)	79H 00H	Lead 7 (fifths)	36-96
88(57H)	79H 00H	Lead 8 (bass + lead)	21-108
	79H 01H	Lead 8a (soft wrl)	21-108
### Synth Pad			
89(58H)	79H 00H	Pad 1 (new age)	36-96
90(59H)	79H 00H	Pad 2 (warm)	36-96
	79H 01H	Pad 2a (sine pad)	36-96
91(5AH)	79H 00H	Pad 3 (polysynth)	36-96
92(5BH)	79H 00H	Pad 4 (choir)	36-96
	79H 01H	Pad 4a (itopia)	36-96
93(5CH)	79H 00H	Pad 5 (bowed)	36-96
94(5DH)	79H 00H	Pad 6 (metallic)	36-96
95(5EH)	79H 00H	Pad 7 (halo)	36-96
96(5FH)	79H 00H	Pad 8 (sweep)	36-96
### Synth SFX			
97(60H)	79H 00H	FX 1 (rain)	36-96
98(61H)	79H 00H	FX 2 (soundtrack)	36-96
99(62H)	79H 00H	FX 3 (crystal)	36-96
	79H 01H	FX 3a (synth mallet)	36-96
100(63H)	79H 00H	FX 4 (atmosphere)	36-96
101(64H)	79H 00H	FX 5 (brightness)	36-96
102(65H)	79H 00H	FX 6 (goblins)	36-96
103(66H)	79H 00H	FX 7 (echoes)	36-96
	79H 01H	FX 7a (echo bell)	36-96
	79H 02H	FX 7b (echo pan)	36-96
104(67H)	79H 00H	FX 8 (sci-fi)	36-96

General MIDI 2 Sound Set — 6 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### Ethnic Misc.			
105(68H)	79H 00H	Sitar	48-77
	79H 01H	Sitar 2 (bend)	48-77
106(69H)	79H 00H	Banjo	48-84
107(6AH)	79H 00H	Shamisen	50-79
108(6BH)	79H 00H	Koto	55-84
	79H 01H	Taisho Koto	55-84
109(6CH)	79H 00H	Kalimba	48-79
110(6DH)	79H 00H	Bag pipe	36-77
111(6EH)	79H 00H	Fiddle	55-96
112(6FH)	79H 00H	Shanai	48-72
### Percussive			
113(70H)	79H 00H	Tinkle Bell	72-84
114(71H)	79H 00H	Agogo	60-72
115(72H)	79H 00H	Steel Drums	52-76
116(73H)	79H 00H	Woodblock	*
	79H 01H	Castanets	*
117(74H)	79H 00H	Taiko Drum	*
	79H 01H	Concert Bass Drum	*
118(75H)	79H 00H	Melodic Tom	*
	79H 01H	Melodic Tom 2 (power)	*
119(76H)	79H 00H	Synth Drum	*
	79H 01H	Rhythm Box Tom	*
	79H 02H	Electric Drum	*
120(77H)	79H 00H	Reverse Cymbal	*

General MIDI 2 Sound Set — 7 of 7

PROG#	BANK#(MSB LSB)	GM2 TIMBRE NAME	Recommended Key Range
### SFX			
121(78H)	79H 00H	Guitar Fret Noise	*
	79H 01H	Guitar Cutting Noise	*
	79H 02H	Acoustic Bass String Slap	*
122(79H)	79H 00H	Breath Noise	*
	79H 01H	Flute Key Click	*
123(7AH)	79H 00H	Seashore	*
	79H 01H	Rain	*
	79H 02H	Thunder	*
	79H 03H	Wind	*
	79H 04H	Stream	*
	79H 05H	Bubble	*
124(7BH)	79H 00H	Bird Tweet	*
	79H 01H	Dog	*
	79H 02H	Horse Gallop	*
	79H 03H	Bird Tweet 2	*
125(7CH)	79H 00H	Telephone Ring	*
	79H 01H	Telephone Ring 2	*
	79H 02H	Door Creaking	*
	79H 03H	Door	*
	79H 04H	Scratch	*
	79H 05H	Wind Chime	*
126(7DH)	79H 00H	Helicopter	*
	79H 01H	Car Engine	*
	79H 02H	Car Stop	*
	79H 03H	Car Pass	*
	79H 04H	Car Crash	*
	79H 05H	Siren	*
	79H 06H	Train	*
	79H 07H	Jetplane	*
	79H 08H	Starship	*
	79H 09H	Burst Noise	*
127(7EH)	79H 00H	Applause	*
	79H 01H	Laughing	*
	79H 02H	Screaming	*
	79H 03H	Punch	*
	79H 04H	Heart Beat	*
	79H 05H	Footsteps	*
128(7FH)	79H 00H	Gunshot	*
	79H 01H	Machine Gun	*
	79H 02H	Lasergun	*
	79H 03H	Explosion	*

8. Appendix B: GM 2 Percussion Sound Set

NOTE#	PC#1 STANDARD Set Inst.Name		PAN	PC#9 ROOM Set Inst.Name	PAN	PC#17 POWER Set Inst.Name	PAN
27 (D#)	High Q		49	@		@	
28 (E)	Slap		49	@		@	
29 (F)	Scratch Push	[EXC7]	54	@		@	
30 (F#)	Scratch Pull	[EXC7]	54	@		@	
31 (G)	Sticks		64	@		@	
32 (G#)	Square Click		54	@		@	
33 (A)	Metronome Click		64	@		@	
34 (A#)	Metronome Bell		64	@		@	
35 (B)	Acoustic Bass Drum		64	@		@	
36 (C)	Bass Drum 1		64	@		Power Kick Drum	64
37 (C#)	Side Stick		64	@		@	
38 (D)	Acoustic Snare		64	@		Power Snare Drum	64
39 (D#)	Hand Clap		54	@		@	
40 (E)	Electric Snare		64	@		@	
41 (F)	Low Floor Tom		34	Room Low Tom 2	34	Power Low Tom 2	34
42 (F#)	Closed Hi-hat	[EXC1]	84	@		@	
43 (G)	High Floor Tom		46	Room Low Tom 1	46	Power Low Tom 1	46
44 (G#)	Pedal Hi-hat	[EXC1]	84	@		@	
45 (A)	Low Tom		58	Room Mid Tom 2	58	Power Mid Tom 2	58
46 (A#)	Open Hi-hat	[EXC1]	84	@		@	
47 (B)	Low-Mid Tom		70	Room Mid Tom 1	70	Power Mid Tom 1	70
48 (C)	High Mid Tom		82	Room Hi Tom 2	82	Power Hi Tom 2	82
49 (C#)	Crash Cymbal 1		84	@		@	
50 (D)	High Tom		94	Room Hi Tom 1	94	Power Hi Tom 1	94
51 (D#)	Ride Cymbal 1		44	@		@	
52 (E)	Chinese Cymbal		44	@		@	
53 (F)	Ride Bell		44	@		@	
54 (F#)	Tambourine		74	@		@	
55 (G)	Splash Cymbal		54	@		@	
56 (G#)	Cowbell		84	@		@	
57 (A)	Crash Cymbal 2		44	@		@	
58 (A#)	Vibra-slap		29	@		@	
59 (B)	Ride Cymbal 2		44	@		@	
60 (MID C)	High Bongo		99	@		@	
61 (C#)	Low Bongo		99	@		@	
62 (D)	Mute Hi Conga		39	@		@	
63 (D#)	Open Hi Conga		39	@		@	
64 (E)	Low Conga		44	@		@	
65 (F)	High Timbale		84	@		@	
66 (F#)	Low Timbale		84	@		@	
67 (G)	High Agogo		29	@		@	
68 (G#)	Low Agogo		29	@		@	
69 (A)	Cabasa		29	@		@	
70 (A#)	Maracas		24	@		@	
71 (B)	Short Whistle	[EXC2]	99	@		@	
72 (C)	Long Whistle	[EXC2]	99	@		@	
73 (C#)	Short Guiro	[EXC3]	94	@		@	
74 (D)	Long Guiro	[EXC3]	94	@		@	
75 (D#)	Claves		84	@		@	
76 (E)	Hi Wood Block		99	@		@	
77 (F)	Low Wood Block		99	@		@	
78 (F#)	Mute Cuica	[EXC4]	44	@		@	
79 (G)	Open Cuica	[EXC4]	44	@		@	
80 (G#)	Mute Triangle	[EXC5]	24	@		@	
81 (A)	Open Triangle	[EXC5]	24	@		@	
82 (A#)	Shaker		94	@		@	
83 (B)	Jingle Bell		99	@		@	
84 (C)	Bell Tree		104	@		@	
85 (C#)	Castanets		34	@		@	
86 (D)	Mute Surdo	[EXC6]	44	@		@	
87 (D#)	Open Surdo	[EXC6]	44	@		@	
88 (E)	---			---		---	

General MIDI 2 Percussion Sound Set — 2 of 3

NOTE#	PC#25 ELECTRONIC Set Inst.Name	PAN	PC#26 ANALOG Set Inst.Name		PAN	PC#33 JAZZ Set Inst.Name	PAN
27 (D#)	@		@			@	
28 (E)	@		@			@	
29 (F)	@		@			@	
30 (F#)	@		@			@	
31 (G)	@		@			@	
32 (G#)	@		@			@	
33 (A)	@		@			@	
34 (A#)	@		@			@	
35 (B)	@		@			Jazz Kick 2	64
36 (C)	Electric Bass Drum	64	Analog Bass Drum		64	Jazz Kick 1	64
37 (C#)	@		Analog Rim Shot		64	@	
38 (D)	Electric Snare 1	64	Analog Snare 1		64	@	
39 (D#)	@		@			@	
40 (E)	Electric Snare 2	64	@			@	
41 (F)	Electric Low Tom 2	34	Analog Low Tom 2		34	@	
42 (F#)	@		Analog CHH 1	[EXC1]	84	@	
43 (G)	Electric Low Tom 1	46	Analog Low Tom 1		46	@	
44 (G#)	@		Analog CHH 2	[EXC1]	84	@	
45 (A)	Electric Mid Tom 2	58	Analog Mid Tom 2		58	@	
46 (A#)	@		Analog OHH	[EXC1]	84	@	
47 (B)	Electric Mid Tom 1	70	Analog Mid Tom 1		70	@	
48 (C)	Electric Hi Tom 2	82	Analog Hi Tom 2		82	@	
49 (C#)	@		Analog Cymbal		84	@	
50 (D)	Electric Hi Tom 1	94	Analog Hi Tom 1		94	@	
51 (D#)	@		@			@	
52 (E)	Reverse Cymbal	44	@			@	
53 (F)	@		@			@	
54 (F#)	@		@			@	
55 (G)	@		@			@	
56 (G#)	@		Analog Cowbell		84	@	
57 (A)	@		@			@	
58 (A#)	@		@			@	
59 (B)	@		@			@	
60 (MID C)	@		@			@	
61 (C#)	@		@			@	
62 (D)	@		Analog High Conga		39	@	
63 (D#)	@		Analog Mid Conga		44	@	
64 (E)	@		Analog Low Conga		49	@	
65 (F)	@		@			@	
66 (F#)	@		@			@	
67 (G)	@		@			@	
68 (G#)	@		@			@	
69 (A)	@		@			@	
70 (A#)	@		Analog Maracas		24	@	
71 (B)	@		@			@	
72 (C)	@		@			@	
73 (C#)	@		@			@	
74 (D)	@		@			@	
75 (D#)	@		Analog Claves		84	@	
76 (E)	@		@			@	
77 (F)	@		@			@	
78 (F#)	@		@			@	
79 (G)	@		@			@	
80 (G#)	@		@			@	
81 (A)	@		@			@	
82 (A#)	@		@			@	
83 (B)	@		@			@	
84 (C)	@		@			@	
85 (C#)	@		@			@	
86 (D)	@		@			@	
87 (D#)	@		@			@	
88 (E)	---		---			---	

General MIDI 2 Percussion Sound Set — 3 of 3

NOTE#	PC#41 BRUSH Set Inst.Name	PAN	PC#49 ORCHESTRA Set Inst.Name		PAN	PC#57 SFX Set Inst.Name		PAN
27 (D#)	@		Closed Hi-hat 2	[EXC1]	84	---		
28 (E)	@		Pedal Hi-hat	[EXC1]	84	---		
29 (F)	@		Open Hi-hat 2	[EXC1]	84	---		
30 (F#)	@		Ride Cymbal 1		44	---		
31 (G)	@		@			---		
32 (G#)	@		@			---		
33 (A)	@		@			---		
34 (A#)	@		@			---		
35 (B)	Jazz Kick 2	64	Concert BD 2		24	---		
36 (C)	Jazz Kick 1	64	Concert BD 1		24	---		
37 (C#)	@		@			---		
38 (D)	Brush Tap	64	Concert SD		44	---		
39 (D#)	Brush Slap	64	Castanets		34	High Q		49
40 (E)	Brush Swirl	64	Concert SD		44	Slap		49
41 (F)	@		Timpani F		34	Scratch Push	[EXC7]	54
42 (F#)	@		Timpani F#		34	Scratch Pull	[EXC7]	54
43 (G)	@		Timpani G		34	Sticks		64
44 (G#)	@		Timpani G#		34	Square Click		54
45 (A)	@		Timpani A		34	Metronome Click		64
46 (A#)	@		Timpani A#		34	Metronome Bell		64
47 (B)	@		Timpani B		34	Guitar Fret Noise		64
48 (C)	@		Timpani c		34	Guitar Cutting Noise Up		64
49 (C#)	@		Timpani c#		34	Guitar Cutting Noise Down		64
50 (D)	@		Timpani d		34	String Slap of Double Bass		64
51 (D#)	@		Timpani d#		34	Fl.Key Click		64
52 (E)	@		Timpani e		34	Laughing		64
53 (F)	@		Timpani f		34	Scream		64
54 (F#)	@		@			Punch		64
55 (G)	@		@			Heart Beat		64
56 (G#)	@		@			Footsteps 1		64
57 (A)	@		Concert Cymbal 2		34	Footsteps 2		64
58 (A#)	@		@			Applause		64
59 (B)	@		Concert Cymbal 1		34	Door Creaking		64
60 (MID C)	@		@			Door		64
61 (C#)	@		@			Scratch		64
62 (D)	@		@			Wind Chimes		64
63 (D#)	@		@			Car-Engine		64
64 (E)	@		@			Car-Stop		64
65 (F)	@		@			Car-Pass		64
66 (F#)	@		@			Car-Crash		64
67 (G)	@		@			Siren		64
68 (G#)	@		@			Train		64
69 (A)	@		@			Jetplane		64
70 (A#)	@		@			Helicopter		64
71 (B)	@		@			Starship		64
72 (C)	@		@			Gun Shot		64
73 (C#)	@		@			Machine Gun		64
74 (D)	@		@			Lasergun		64
75 (D#)	@		@			Explosion		64
76 (E)	@		@			Dog		64
77 (F)	@		@			Horse-Gallop		64
78 (F#)	@		@			Birds		64
79 (G)	@		@			Rain		64
80 (G#)	@		@			Thunder		64
81 (A)	@		@			Wind		64
82 (A#)	@		@			Seashore		64
83 (B)	@		@			Stream		64
84 (C)	@		@			Bubble		64
85 (C#)	@		@			---		
86 (D)	@		@			---		
87 (D#)	@		@			---		
88 (E)	---		Applause		64	---		

Notes: ---:Does not sound
@ :Use Standard Set Instrument
[EXC]:Instruments that have same EXC numbers do not sound simultaneously.
Program Change messages in consumer documentation are normally one-based; therefore, the decimal value of PC #1 presented here (Standard Set) is equivalent to 00H.