General MIDI System Level 1

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PLEASE SEE MMA PUBLICATION "General MIDI System Level 1 Developer Guidelines" (1996) FOR ADDITIONAL RECOMMENDATIONS AND CLARIFICATIONS RELATED TO THIS SPECIFICATION.

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GM System - Overview

This Specification outlines a minimum MIDI configuration of a "General MIDI System" which defines a certain class of MIDI controlled sound generators. The General MIDI (or GM) System provides a high degree of compatibility between MIDI synthesizers, and adds the ability to play songs (in the form of MIDI data) created for any given MIDI synthesizer module that follows this Specification.

This class of products are intended for broad applications in the music, consumer, and entertainment markets, due to increased compatibility and unprecedented ease-of-use.

Background

Without this specification, when an end user tries to play back MIDI data on a given set of MIDI synthesizers the results can vary widely depending on what MIDI synthesizers are involved and what their capabilities are. The MIDI data has to be specially prepared for those particular synthesizers and drum machines in order to sound exactly as originally intended.

For example, the sound that plays on MIDI note messages sent over channel one/program number one is determined by the individual synthesizer manufacturer. However, there usually is little similarity between program numbers and expected timbres on today's popular synthesizers. Other examples are the variability of pitch bend range, octave registration, or the drum note mapping.

This variety is wonderful for professional users, but can be troublesome for consumers and music authors. Therefore, it has in the past been virtually impossible to produce MIDI data that will play on all of the popular MIDI synthesizers. The data had to be made manufacturer and device specific. This has limited the availability of MIDI data titles to individual instruments or at best to those of a particular manufacturer.

The main barrier to resolving this problem is that the original MIDI specification does not specify a "minimum MIDI configuration" or set of capabilities that one could rely on being in a given synthesizer. A particular MIDI device has no idea what MIDI device is connected to the other end of its MIDI cable, and until now there was no industry-standard minimum configuration that manufacturers or authors could use as a reference.

The Solution

This General MIDI System is the solution to that problem. It describes a minimum number of voices, sound locations, drum note mapping, octave registration, pitch bend range, and controller usage, thereby defining a given set of capabilities to expect in a given synthesizer module. This mode will be identified by a logo on the instrument such as the "Compact Disc" logo shown on all devices supporting the CD standard.

General MIDI is a mode that synthesizers can be switched in and out of to provide a common "base case." Higher end products will likely support additional modes of operation and should not be limited by General MIDI. The General MIDI Specification is also left open to further extensions (or "levels") for advanced applications and continued improvements.

GM System - Level 1 Performance Requirements

General MIDI Sound Generator Requirements

Synthesis/Playback Technology (Sound Source Type):

- Up to the manufacturer.

Number of Voices:

- A minimum of:
  1) 24 fully dynamically allocated voices available simultaneously for both melodic and percussive sounds; or:
  2) 16 dynamically allocated voices for melody plus 8 for percussion.

MIDI Channels Supported:

- All 16 MIDI channels.
- Each channel can play a variable number of voices (polyphony).
- Each channel can play a different instrument (timbre).
- Key-based Percussion is always on channel 10.

Instruments:

- A minimum of 128 presets for Instruments (MIDI program numbers), conforming to the "GM Sound Set" (see Table 2)
- A minimum of 47 preset percussion sounds conforming to the "GM Percussion Map" (see Table 3)

General MIDI Sound Generator Recommended Hardware

- Master Volume control.
- MIDI In connector (Out and Thru connectors are optional).
- Audio Out (2 – left & right) plus Headphones connectors.

General MIDI Protocol Implementation Requirements

Note on/Note off:

- Octave Registration: Middle C = MIDI Key 60 (3CH)
- All voices, including percussion, respond to velocity
- Voices dynamically allocated (notes/drums can re-attack using free voices)

Controller Changes:

Controller #	Description
1	Modulation
7	Volume
10	Pan
11	Expression
64	Sustain
121	Reset All Controllers
123	All Notes Off

Registered Parameter #	Description
0	Pitch Bend Sensitivity
1	Fine Tuning
2	Coarse Tuning

Channel Messages:

- Channel Pressure (Aftertouch)
- Pitch Bend (default range = ±2 semitones)

Default Settings:

- Bend="0", Volume="100" (0-127), Controllers "normal"

GM System - Additional Messages

General MIDI System Messages

In addition to the above already-defined MIDI messages, there is a defined set of Universal Non-Real Time SysEx messages for turning General MIDI on and off at a sound module (should it have more than one mode of operation):

- Turn General MIDI System On: F0 7E <device ID> 09 01 F7

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

- Turn General MIDI System Off: F0 7E <device ID> 09 02 F7

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

General MIDI Sound Set Groupings:

(all channels except 10)

Prog #	Instrument Group	Prog #	Instrument Group
1-8	Piano	65-72	Reed
9-16	Chromatic Percussion	73-80	Pipe
17-24	Organ	81-88	Synth Lead
25-32	Guitar	89-96	Synth Pad
33-40	Bass	97-104	Synth Effects
41-48	Strings	105-112	Ethnic
49-56	Ensemble	113-120	Percussive
57-64	Brass	121-128	Sound Effects

Table 1

General MIDI Sound Set:

(MIDI Program Numbers 1 – 128; all channels except 10)

Prog #	Instrument	Prog #	Instrument	Prog #	Instrument	Prog #	Instrument
1.	Acoustic Grand Piano	33.	Acoustic Bass	65.	Soprano Sax	97.	FX 1 (rain)
2.	Bright Acoustic Piano	34.	Electric Bass (finger)	66.	Alto Sax	98.	FX 2 (soundtrack)
3.	Electric Grand Piano	35.	Electric Bass (pick)	67.	Tenor Sax	99.	FX 3 (crystal)
4.	Honky-tonk Piano	36.	Fretless Bass	68.	Baritone Sax	100.	FX 4 (atmosphere)
5.	Electric Piano 1	37.	Slap Bass 1	69.	Oboe	101.	FX 5 (brightness)
6.	Electric Piano 2	38.	Slap Bass 2	70.	English Horn	102.	FX 6 (goblins)
7.	Harpsichord	39.	Synth Bass 1	71.	Bassoon	103.	FX 7 (echoes)
8.	Clavi	40.	Synth Bass 2	72.	Clarinet	104.	FX 8 (sci-fi)
9.	Celesta	41.	Violin	73.	Piccolo	105.	Sitar
10.	Glockenspiel	42.	Viola	74.	Flute	106.	Banjo
11.	Music Box	43.	Cello	75.	Recorder	107.	Shamisen
12.	Vibraphone	44.	Contrabass	76.	Pan Flute	108.	Koto
13.	Marimba	45.	Tremolo Strings	77.	Blown Bottle	109.	Kalimba
14.	Xylophone	46.	Pizzicato Strings	78.	Shakuhachi	110.	Bag pipe
15.	Tubular Bells	47.	Orchestral Harp	79.	Whistle	111.	Fiddle
16.	Dulcimer	48.	Timpani	80.	Ocarina	112.	Shanai
17.	Drawbar Organ	49.	String Ensemble 1	81.	Lead 1 (square)	113.	Tinkle Bell
18.	Percussive Organ	50.	String Ensemble 2	82.	Lead 2 (sawtooth)	114.	Agogo
19.	Rock Organ	51.	SynthStrings 1	83.	Lead 3 (calliope)	115.	Steel Drums
20.	Church Organ	52.	SynthStrings 2	84.	Lead 4 (chiff)	116.	Woodblock
21.	Reed Organ	53.	Choir Aahs	85.	Lead 5 (charang)	117.	Taiko Drum
22.	Accordion	54.	Voice Oohs	86.	Lead 6 (voice)	118.	Melodic Tom
23.	Harmonica	55.	Synth Voice	87.	Lead 7 (fifths)	119.	Synth Drum
24.	Tango Accordion	56.	Orchestra Hit	88.	Lead 8 (bass + lead)	120.	Reverse Cymbal
25.	Acoustic Guitar (nylon	57.	Trumpet	89.	Pad 1 (new age)	121.	Guitar Fret Noise
26.	Acoustic Guitar (steel)	58.	Trombone	90.	Pad 2 (warm)	122.	Breath Noise
27.	Electric Guitar (jazz)	59.	Tuba	91.	Pad 3 (polysynth)	123.	Seashore
28.	Electric Guitar (clean)	60.	Muted Trumpet	92.	Pad 4 (choir)	124.	Bird Tweet
29.	Electric Guitar (muted	61.	French Horn	93.	Pad 5 (bowed)	125.	Telephone Ring
30.	Overdriven Guitar	62.	Brass Section	94.	Pad 6 (metallic)	126.	Helicopter
31.	Distortion Guitar	63.	SynthBrass 1	95.	Pad 7 (halo)	127.	Applause
32.	Guitar harmonics	64.	SynthBrass 2	96.	Pad 8 (sweep)	128.	Gunshot

Table 2

Level 1 Sound Set

General MIDI Percussion Map:

(Channel 10)

MIDI Key	Drum Sound	MIDI Key	Drum Sound	MIDI Key	Drum Sound
35	Acoustic Bass Drum	51	Ride Cymbal 1	67	High Agogo
36	Bass Drum 1	52	Chinese Cymbal	68	Low Agogo
37	Side Stick	53	Ride Bell	69	Cabasa
38	Acoustic Snare	54	Tambourine	70	Maracas
39	Hand Clap	55	Splash Cymbal	71	Short Whistle
40	Electric Snare	56	Cowbell	72	Long Whistle
41	Low Floor Tom	57	Crash Cymbal 2	73	Short Guiro
42	Closed Hi Hat	58	Vibraslap	74	Long Guiro
43	High Floor Tom	59	Ride Cymbal 2	75	Claves
44	Pedal Hi-Hat	60	Hi Bongo	76	Hi Wood Block
45	Low Tom	61	Low Bongo	77	Low Wood Block
46	Open Hi-Hat	62	Mute Hi Conga	78	Mute Cuica
47	Low-Mid Tom	63	Open Hi Conga	79	Open Cuica
48	Hi Mid Tom	64	Low Conga	80	Mute Triangle
49	Crash Cymbal 1	65	High Timbale	81	Open Triangle
50	High Tom	66	Low Timbale		

Table 3

GM Sound Set

For music authors, one of the most frustrating parts of the original MIDI specification was the lack of sound definitions. For example, where is the piano sound on this instrument (i.e. what is the program number)? The solution lies in a "sound-set-to-Program-Change-number" mapping that is specific to the General MIDI System.

This mapping only needs to take effect while operating inside a General MIDI System, and would otherwise let manufacturers organize sounds in any way they wish. In short, while operating inside a General MIDI System, this map takes effect – in any other mode, the manufacturer could present the sounds in any manner desired.

The General MIDI Sound Set (instrument and percussion maps) is shown in Tables 2 and 3. This mapping describes the MIDI Program Change numbers used to select sounds under the General MIDI System. The instrument would map these General MIDI program numbers to its own internal organization. MIDI Program numbers can be changed in real time during play.

GM Sound Definitions

General MIDI does not recommend any particular method of synthesis or playback. Each manufacturer should be free to express their own ideas and personal aesthetics when it comes to picking the exact timbres for each preset. In particular, the names in parentheses after each of the synth leads, pads, and sound effects are intended as guides.

Therefore, to promote consistency in song playback across a range of sound modules, a set of guidelines for General MIDI Score authors and Instrument manufacturers will be produced.

GM Performance Notes

For all instruments, the Modulation Wheel (Controller #1) will change the nature of the sound in the most natural (expected) way. i.e. depth of LFO; change of timbre; add more tine sound; etc.)

There are other MIDI messages currently pending in the MMA and JMSC that will become part of a General MIDI Level 2 Specification.

GM System - Logos

Rules for Application

The MMA and JMSC have approved the following design for a logo which will indicate a product that conforms to this specification.

For sound generators, GM is intended to allow the user to play back any score developed for GM without user intervention. This means a GM sound source must support all of the features described in that section without requiring any modification by the user. Only products which meet these requirements should have the GM logo.

Software, such as sequencer and notation programs, games, or other applications which create or play MIDI music, may also display a GM logo, as long as the product does not interfere with the performance of required GM data when used with a compatible sound source. For example, software which allows the user to select different sounds on playback should include a resident list of the GM sounds. In addition, any software which is GM compatible must properly play back — without modification — all controller settings and other required messages which may be found in a MIDI file or otherwise performed via MIDI.

GM Logo Variations

The logo is available from the MMA upon application and signing of a license agreement. The agreement specifies the terms, conditions and restrictions for application of a GM logo to products, packaging, and marketing materials. For details please refer to the current license agreement.

GM System Logo - This version of the logo can be applied to sound generators, applications software (games, sequencers, etc.), and scores (MIDI data) which conform to the GM System Level 1 Specification.

GM Sound Set - This version of the logo is intended for display with sound-sets (samples or patches) designed to modify a specific sound source to be GM System Level 1 compatible.