

General MIDI

General MIDI (also known as **GM** or **GM 1**) is a standardized specification for electronic musical instruments that respond to MIDI messages. GM was developed by the American MIDI Manufacturers Association (MMA) and the Japan MIDI Standards Committee (JMSC) and first published in 1991. The official specification is available in English from the MMA, bound together with the MIDI 1.0 specification, and in Japanese from the Association of Musical Electronic Industry (AMEI).

GM imposes several requirements beyond the more abstract MIDI 1.0 specification. While MIDI 1.0 by itself provides a communications protocol which ensures that different instruments can interoperate at a fundamental level — for example, that pressing keys on a MIDI keyboard will cause an attached MIDI sound module to play musical notes — GM goes further in two ways. First, GM requires that all compliant MIDI instruments meet a certain minimal set of features, such as being able to play at least 24 notes simultaneously (polyphony). Second, GM attaches specific interpretations to many parameters and control messages which were left unspecified in the MIDI 1.0 specification. For example, assigning one of the 128 possible MIDI *Program Numbers* selects an instrument. With MIDI 1.0, the assignment could be to an arbitrary instrument; but with GM, a program number assigns a specific *instrument name*. This helps ensure that playback of MIDI files sounds more consistently between different devices compliant with the GM specification. However, it still leaves the actual *sounds* of each instrument up to the supplier to implement; one manufacturer's French horn, say, could be brighter, or more mellow, than another's.

The GM 1 specification was superseded by General MIDI 2 in 1999; however, GM 1 is still commonly used.^[1] General MIDI was widely supported by computer game developers in the 1990s.^[2]

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General MIDI 1 Requirements

To be GM 1 compatible, sound generating devices (keyboards, hardware or software synthesizers, sound cards) are required to meet the General MIDI System Level 1 performance specification:

Criterion	Requirement
Voices	Allow 24 voices to be available simultaneously for both melodic and percussive sounds (alternatively, allow 16 melodic and 8 percussive voices). All voices respond to note velocity.
Channels	Support all 16 channels simultaneously, each assignable to different instruments. Channel 10 is reserved for percussion. Support polyphony (multiple simultaneous notes) on each channel.
Instruments	Support a minimum of 128 MIDI Program Numbers (conforming to the GM 1 Instrument Patch Map) and 47 percussion sounds (conforming to the GM 1 Percussion Key Map).
Channel messages	Support for controller number 1, 7, 10, 11, 64, 100, 101, 121 and 123; support for channel pressure and pitch bend controllers.
Other messages	Respond to the data entry controller and the RPNs for fine and coarse tuning and pitch bend range, as well as all General MIDI Level 1 System Messages.

Parameter interpretations

GM Instruments must also obey the following conventions for program and controller events:

Program change events

In MIDI, the instrument sound or "program" for each of the 16 possible MIDI channels is selected with the Program Change message, which has a Program Number parameter. The following table shows which instrument sound corresponds to each of the 128 possible GM Program Numbers.^[3] There are 128 program numbers. The numbers can be displayed as values 1 to 128, or, alternatively, as 0 to 127. The 0 to 127 numbering is usually only used internally by the synthesizer; the vast majority of MIDI devices, digital audio workstations and professional MIDI sequencers display these Program Numbers as shown in the table (1–128).

Piano

- 1 Acoustic Grand Piano
- 2 Bright Acoustic Piano
- 3 Electric Grand Piano
- 4 Honky-tonk Piano
- 5 Electric Piano 1 (usually a Rhodes Piano)
- 6 Electric Piano 2 (usually an FM piano patch)
- 7 Harpsichord
- 8 Clavinet

Chromatic Percussion

- 9 Celesta
- 10 Glockenspiel
- 11 Music Box
- 12 Vibraphone
- 13 Marimba
- 14 Xylophone
- 15 Tubular Bells
- 16 Dulcimer

Organ

- 17 Drawbar Organ
- 18 Percussive Organ
- 19 Rock Organ
- 20 Church Organ
- 21 Reed Organ
- 22 Accordion
- 23 Harmonica
- 24 Tango Accordion

Guitar

- 25 Acoustic Guitar (*nylon*)
- 26 Acoustic Guitar (*steel*)
- 27 Electric Guitar (*jazz*)
- 28 Electric Guitar (*clean*)
- 29 Electric Guitar (*muted*)
- 30 Electric Guitar (*overdriven*)
- 31 Electric Guitar (*distortion*)
- 32 Electric Guitar (*harmonics*)

Bass

- 33 Acoustic Bass
- 34 Electric Bass (*finger*)

- 35 Electric Bass (*picked*)
- 36 Fretless Bass
- 37 Slap Bass 1
- 38 Slap Bass 2
- 39 Synth Bass 1
- 40 Synth Bass 2

Strings

- 41 Violin
- 42 Viola
- 43 Cello
- 44 Contrabass
- 45 Tremolo Strings
- 46 Pizzicato Strings
- 47 Orchestral Harp
- 48 Timpani

Ensemble

- 49 String Ensemble 1
- 50 String Ensemble 2
- 51 Synth Strings 1
- 52 Synth Strings 2
- 53 Choir Aahs
- 54 Voice Oohs (or *Doos*)
- 55 Synth Voice or Solo Vox
- 56 Orchestra Hit

Brass

- 57 Trumpet
- 58 Trombone
- 59 Tuba
- 60 Muted Trumpet
- 61 French Horn
- 62 Brass Section
- 63 Synth Brass 1
- 64 Synth Brass 2

Reed

- 65 Soprano Sax
- 66 Alto Sax
- 67 Tenor Sax
- 68 Baritone Sax
- 69 Oboe

- 70 English Horn
- 71 Bassoon
- 72 Clarinet

Pipe

- 73 Piccolo
- 74 Flute
- 75 Recorder
- 76 Pan Flute
- 77 Blown bottle
- 78 Shakuhachi
- 79 Whistle
- 80 Ocarina

Synth Lead

- 81 Lead 1 (square)
- 82 Lead 2 (*sawtooth*)
- 83 Lead 3 (*calliope*)
- 84 Lead 4 (*chiff*)
- 85 Lead 5 (*charang*, a guitar-like lead)
- 86 Lead 6 (*space voice*)
- 87 Lead 7 (*fifths*)
- 88 Lead 8 (*bass and lead*)

Synth Pad

- 89 Pad 1 (*new age* or *fantasia*, a warm pad stacked with a bell)
- 90 Pad 2 (*warm*)
- 91 Pad 3 (*polysynth* or *poly*)
- 92 Pad 4 (*choir*)
- 93 Pad 5 (*bowed glass* or *bowed*)
- 94 Pad 6 (*metallic*)
- 95 Pad 7 (*halo*)
- 96 Pad 8 (*sweep*)

Synth Effects

- 97 FX 1 (*rain*)

Percussion

- 98 FX 2 (*soundtrack*, a bright perfect fifth pad)
- 99 FX 3 (*crystal*)
- 100 FX 4 (*atmosphere*, usually a nylon-like sound)
- 101 FX 5 (*brightness*)
- 102 FX 6 (*goblins*)
- 103 FX 7 (*echoes* or *echo drops*)
- 104 FX 8 (*sci-fi* or *star theme*)

Ethnic

- 105 Sitar
- 106 Banjo
- 107 Shamisen
- 108 Koto
- 109 Kalimba
- 110 Bag pipe
- 111 Fiddle
- 112 Shanai

Percussive

- 113 Tinkle Bell
- 114 Agogô
- 115 Steel Drums
- 116 Woodblock
- 117 Taiko Drum
- 118 Melodic Tom or 808 Toms
- 119 Synth Drum
- 120 Reverse Cymbal

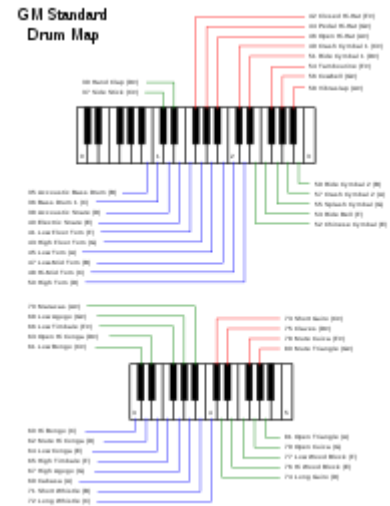
Sound Effects

- 121 Guitar Fret Noise
- 122 Breath Noise
- 123 Seashore
- 124 Bird Tweet
- 125 Telephone Ring
- 126 Helicopter
- 127 Applause
- 128 Gunshot

In GM standard MIDI files, channel 10 is reserved for percussion instruments only.^[3] Notes recorded on channel 10 always produce percussion sounds when transmitted to a keyboard or synth module which uses the GM standard. Each distinct note number specifies a unique percussive instrument, rather than the sound's pitch.

If a MIDI file is programmed to the General MIDI protocol, then the results are predictable, but timbre and sound fidelity may vary depending on the quality of the GM synthesizer. The General MIDI standard includes 47 percussive sounds, using note numbers 35-81 (of the possible 128 numbers from 0-127), as follows:^[3]

- 35 Acoustic Bass Drum
- 36 Electric Bass Drum
- 37 Side Stick
- 38 Acoustic Snare
- 39 Hand Clap
- 40 Electric Snare
- 41 Low Floor Tom
- 42 Closed Hi-hat
- 43 High Floor Tom
- 44 Pedal Hi-hat
- 45 Low Tom
- 46 Open Hi-hat
- 47 Low-Mid Tom
- 48 Hi-Mid Tom
- 49 Crash Cymbal 1
- 50 High Tom
- 51 Ride Cymbal 1
- 52 Chinese Cymbal
- 53 Ride Bell
- 54 Tambourine
- 55 Splash Cymbal
- 56 Cowbell
- 57 Crash Cymbal 2
- 58 Vibraslap
- 59 Ride Cymbal 2
- 60 High Bongo
- 61 Low Bongo
- 62 Mute High Conga
- 63 Open High Conga
- 64 Low Conga
- 65 High Timbale
- 66 Low Timbale
- 67 High Agogô
- 68 Low Agogô



GM Standard Drum Map

- 69 Cabasa
- 70 Maracas
- 71 Short Whistle
- 72 Long Whistle
- 73 Short Guiro
- 74 Long Guiro
- 75 Claves
- 76 High Woodblock
- 77 Low Woodblock
- 78 Mute Cuica
- 79 Open Cuica
- 80 Mute Triangle
- 81 Open Triangle

Controller events

In MIDI, adjustable parameters for each of the 16 possible MIDI channels may be set with the Control Change (CC) message, which has a Control Number parameter and a Control Value parameter (expressed in a range from 0 to 127). GM also specifies which operations should be performed by multiple Control Numbers.^{[1][4]}

CC	Function	CC	Function
1	Modulation wheel	100	Registered Parameter Number <u>LSB</u>
7	Channel <u>volume</u>	101	Registered Parameter Number <u>MSB</u>
10	Channel <u>pan</u>	121	All controllers off
11	Expression controller	123	All notes off
64	<u>Sustain pedal</u>		

RPN

GM defines several Registered Parameters, which act like Controllers but are addressed in a different way. In MIDI, every Registered Parameter is assigned a Registered Parameter Number or RPN. Registered Parameters are usually called RPNs for short.^[5]

Setting Registered Parameters requires sending (numbers are decimal):

1. two Control Change messages using Control Numbers 101 and 100 to select the parameter, followed by
2. any number of Data Entry messages of one or two bytes (MSB = Controller #6, LSB = Controller #38), and finally
3. an "End of RPN" message

The following global Registered Parameter Numbers (RPNs) are standardised^[6] (the parameter is specified by RPN LSB/MSB pair and the value is set by Data Entry LSB/MSB pair):

- 0,0 Pitch bend range
- 1,0 Channel Fine tuning
- 2,0 Channel Coarse tuning

An example of an RPN control sequence to set coarse tuning to A440 (parm 2, value 64) is 101:0, 100:2, 6:64, 101:127, 100:127.

System Exclusive messages

Two GM System Exclusive ("SysEx") messages are defined: one to enable and disable General MIDI compatibility mode (for synthesizers that also have non-GM modes); and the other to set the synthesizer's master volume.

GS extensions

Roland GS is a superset of the General MIDI standard that added several proprietary extensions. The most notable addition was the ability to address multiple banks of programs (instrument sounds) by using an additional pair of Bank Select controllers to specify up to 16384 "variation" sounds (cc#0 is Bank Select MSB, and cc#32 is Bank Select LSB). Other most notable features were 9 Drum kits with 14 additional drum sounds each, simultaneous Percussion Kits - up to 2 (Channels 10/11), Control Change messages for controlling the send level of sound effect blocks (cc#91-94), entering additional parameters (cc#98-101), portamento, sostenuto, soft pedal (cc#65-67), and model-specific SysEx messages for setting various parameters of the synth engine. The 14 additional drum sounds are numbered 27-34 and 82-87, bracketing the 47 General MIDI standard sounds numbered 35-81, and are as follows:

- | | |
|-----------------------------------|----------------------------|
| ▪ 27 <u>High Q or Filter Snap</u> | ▪ 34 <u>Metronome Bell</u> |
| ▪ 28 <u>Slap Noise</u> | ▪ 82 <u>Shaker</u> |
| ▪ 29 <u>Scratch Push</u> | ▪ 83 <u>Jingle Bell</u> |
| ▪ 30 <u>Scratch Pull</u> | ▪ 84 <u>Belltree</u> |
| ▪ 31 <u>Drum sticks</u> | ▪ 85 <u>Castanets</u> |
| ▪ 32 <u>Square Click</u> | ▪ 86 <u>Mute Surdo</u> |
| ▪ 33 <u>Metronome Click</u> | ▪ 87 <u>Open Surdo</u> |

GS was introduced in 1991 with the Roland Sound Canvas line, which was also Roland's first General MIDI synth module.^[7]

XG extensions

Yamaha XG is a superset of the General MIDI standard that added several proprietary extensions. The most notable additions were the 600 instruments and 32 notes polyphony.

XG was introduced in 1994 with the Yamaha MU-series line of sound modules and PSR line of digital keyboards.

General MIDI Level 2

In 1999, the official GM standard was updated to include more controllers, patches, RPNs and SysEx messages, in an attempt to reconcile the conflicting and proprietary Roland GS and Yamaha XG additions. Here's a quick overview of the GM2 changes in comparison to GM/GS:

- Number of Notes – minimum 32 simultaneous notes
- Simultaneous Percussion Kits – up to 2 (Channels 10/11)
- Up to 16384 variation banks are allowed, each containing a version of the 128 Melodic Sounds (the exact use of these banks is up to the individual manufacturer.)
- 9 GS Drum kits are included
- Additional Control Change introduced, called "Sound Controllers 1–10":^[4]

CC	Default function	CC	Default function
70	Sound Variation	75	<u>Decay</u> Time
71	Timbre/Harmonic Intensity (<u>filter</u> resonance)	76	<u>Vibrato</u> Rate
72	<u>Release</u> Time	77	Vibrato Depth
73	<u>Attack</u> Time	78	Vibrato Delay
74	Brightness (cutoff frequency)	79	(undefined)

- Registered Parameter Numbers (RPNs)
 - Modulation Depth Range (Vibrato Depth Range)
- Universal SysEx messages
 - Master Volume, Fine Tuning, Coarse Tuning
 - Reverb Type, Time
 - Chorus Type, Mod Rate, Mod Depth, Feedback, Send to Reverb
 - Controller Destination Setting
 - Scale/Octave Tuning Adjust
 - Key-Based Instrument Controllers
 - GM2 System On SysEx message

Additional melodic instruments can be accessed by setting CC#0 to 121 and then using CC#32 to select the bank before a Program Change.

See also

- Comparison of MIDI standards

References

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7. Microsoft (22 October 1996). "Microsoft Licenses Sound Canvas Sounds From Industry Leader Roland Corp" (<https://news.microsoft.com/1996/10/22/microsoft-licenses-sound-canvas-sounds-from-industry-leader-roland-corp/>). *Stories*. Retrieved 14 June 2018.

Official MIDI Standards Organizations

- MIDI Manufacturers Association (<https://web.archive.org/web/20150520120852/http://www.midi.org/>) (MMA) - Source for English-language MIDI specs
- Association of Musical Electronics Industry (http://www.amei.or.jp/index_e.html) (AMEI) -Source for Japanese-language MIDI specs

External links

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