

## Notes on MIDI

Musical Instrument Digital Interface, or MIDI, was created in the early 1980's as a way for musical instruments to communicate with each other. Since it is a digital form of communication, computers soon were in the MIDI loop. In a little over ten years MIDI has become common on desktop PC's. Musicians and nonmusicians alike are discovering how MIDI can transform a PC into a home studio or add music to an application or presentation in a way that is both easily customized and resource efficient.

To communicate with each other, MIDI devices use a serial protocol at a baud rate of 31.25kbs on 16 discreet channels. The MIDI specification designates 128 patch numbers, 128 controller numbers, and has a provision for controlling other aspects of musical performance via pitch wheel and breath controller data. The complete MIDI specification is a copyrighted document and may be obtained from:

International MIDI Association  
23634 Emelita St.  
Woodland Hills, CA 91367

(818) 598-0088 voice  
(818) 346-8578 fax

The cost as of the time of this writing is \$11.50 (U.S.).

MIDI data is stored in a file format known as Standard MIDI File or MIDI File Format. Music data in MIDI form are instructions that a MIDI device, such as a synthesizer, will respond to. Since MIDI data is not a recording of actual sound, most of its parameters can be altered, making MIDI a truly interactive form of recorded music. Some examples of how an edited MIDI file can be used are:

1. The key of all or part of a piece can be changed without changing the tempo.
2. The tempo of all or part of a piece can be changed without changing the key.
3. Verses, choruses, or even the entire piece can be repeated by using cut and paste functions found in most MIDI editing software.
4. Individual tracks (instruments) can be muted, allowing for practice or performance by a solo musician.

MIDI data is usually stored in one of two types of MIDI files. The Type 1 MIDI file, which is most common, has individual instrument and channel assignments on separate tracks. This makes editing the file much easier. Type 0 files store all data on one track, with individual channel data intact. Please see the Glossary for a better understanding of tracks and channels. Since most MIDI sequencers have more than 16 tracks, it is common for MIDI files to have several tracks assigned to the same MIDI channel. This allows an orchestral score with many

instrumental parts to stay within the confines of MIDI's 16 channels.

The MIDI specification provides for system exclusive (also known as SYS-EX) data exchanges. These messages contain a manufacturer's ID number at their beginning. This ID number tells the devices in the MIDI signal path which device the message is intended for, so other devices ignore it. Sys-ex messages are used for setting parameters on synth modules and transmitting voicebanks or individual patches. For many synth modules, sys-ex messages are the only way to access certain controls. MIDI also supports a similar feature called MIDI Sample Dump. This provision allows transmission of digital samples between samplers and computers via the MIDI port.

## Glossary

Channel data path for transmitting data in both directions. Think of it in terms of a television channel. Data can be present on any or all channels at once, but only the data on channels that a device is set for will be recognized.

Controller  
output is  
generating

1. In software, a message that causes certain functions of a MIDI device to respond. For instance, MIDI controller number 7 controls volume. When controller 7 is set for 127, volume at its maximum.
2. In hardware, a MIDI controller is a keyboard that send MIDI data out to -other devices. It usually has no sound capabilities of its own.

FM  
waveforms  
are  
generator and an  
generator causes the  
over time. Algorithms determine  
other operators. An operator  
operator is called a modulator.  
goes out of the synthesizer is called a  
operators as building blocks. The more  
have stacked on each other, the more complex the  
become. The Yamaha DX7 is the best known example  
synthesis. In the multimedia world, the Adlib and Sound  
cards are known for their FM synthesis.

Frequency Modulation synthesis. A type of sound generation that uses simple waveforms modulating other simple to create complex waveforms. Within an FM device Operators. An operator consists of a waveform envelope generator. The envelope loudness of the waveform to vary what operators' outputs feed into whose output feeds into another An operator whose output carrier. Think of blocks you sound can of FM Blaster

General MIDI  
"1"  
table

A standard for MIDI devices and software which uses certain sounds in certain patch locations. For instance, patch 41 (based numbering) would be assigned to a violin sound. A of General MIDI patches are included in this document.

The must be instruments on Channel largely the Roland	General MIDI standard also states the minimum number of simultaneous voices available, the MIDI messages that recognized, and assignments for rhythm 10. The General MIDI standard is based Sound Canvas.
Hertz being	The measurement of sound frequency. It is also known as cycles per second. Human hearing is generally regarded as between 20 HZ and 20,000 HZ.
Key piece of	In music, the tonal base around which the music is based. A system of sharps (#) and flats (b) designate the key of a music.
Meter (called four (or bar) and the	In music, the designation of how time is divided, also known as time signature. Music has an underlying beat. In 4/4 (four) time, there are four beats to every measure quarter note receives one beat.
MPU 401 standard written. Even current models of MPU 401 design.	Some of the first MIDI interfaces for IBM compatible computers were built by Roland Corp. They became the de facto for which most MIDI software for the PC was though the MPU 401 is out of production, the most PC MIDI interfaces still conform to the
MT32 (at that instrument Many products, standard for music MT32 are not the same MIDI file on an MT32 or vice instrument assignments.	Roland device produced in the 1980's which helped pioneer the way for multimedia sound devices. It used an advanced (time) form of synthesis to achieve more realistic sounds than had been available in synthesizers. especially computer games, used it as a authoring. Most patch numbers on the as General MIDI, so playing a GM versa, will result in incorrect
Octave and C 5 frequency of Middle	The distance between two pitches whose frequencies are based on a ratio of 2:1 or 1:2. On a piano keyboard, Middle C are one octave apart with C5 being twice the C.
Patch separate modules had to has survived	A term coined in the early days of synthesizers. Early synthesizers had individual modules that performed functions. For a modular synth to make a sound, be connected together with patch cords. The term to this day.
Pitch	The frequency of a sound. The first A above Middle C on a piano is 440 Hertz.
Sample	A sample is a digital representation of sound. In sampling, the

into a stream of numbers. Each number represents the loudness of the sound at each sampling interval. Eight bit sampling allows for 256 different levels of loudness. Sixteen bit sampling allows for 65,536 different levels of loudness. Audio CD's are recorded at a sampling rate of 44.1KHZ, at a 16 bit resolution, which means the analog signal is sampled 44100 times per second. Some sound cards are available with sample based MIDI playback sections in place of synthesizers. Many will even allow the user to load in custom samples for use as instrument sounds.

**Sequence** Music stored in a file format. Most sequencers have the ability to store MIDI information in MIDI format as well as it's own proprietary file format. A sequencer is a software program that reads, edits, and writes sequences.

**Tempo** The speed at which a musical performance is played.

**Track** In a sequencer, a track is similar to a track on a multi-track tape deck. It is an area where individual instruments can be recorded. Using separate tracks for each instrument allows more flexibility in recording and editing.

**Voice** In FM synths, this term is sometimes used in place of PATCH. In other usage it refers to the number of notes played at any given time. A 24 voice synth would be capable of playing a maximum of 24 simultaneously. Due to the nature of some synthesis technology, some devices capable of playing a certain number of voices when using simple patches or sounds can play fewer than their maximum when playing complex or layered sounds.

**Wavetable** A form of synthesis that uses waveforms, stored in digital form and usually stored in ROM. Most wavetable devices mix different waveforms at different levels of volume and at different pitches to achieve somewhat realistic instrument sounds.

**Wheel** MIDI control element that will shift the pitch of a played note up or down. Like PATCH, this term was used in the early days of synthesis. The MiniMoog, a very popular instrument with rock groups of the 1970's and early 1980's, had two wheels at the left end of the keyboard. One controlled modulation and one controlled pitch.

## General MIDI Instrument Assignment

These instruments are valid on MIDI channels 1-9 and 11-16, except when used in some Windows setups. Microsoft has designated a Basic MIDI setup using

channels 13-15 as melodic instrument channels and channel 16 as the Basic Setup percussion channel. In an Extended MIDI setup, channels 2-9 are used for melodic instruments and channel 10 is used for percussion. This most often applies to Windows sound drivers using the MIDI Mapper. If you are using an external device driven by an MPU 401 compatible interface, use the Windows MPU 401 driver and all 16 MIDI channels will be available.

- 1- Bright Acoustic Piano
- 2- Electric Grand Piano
- 3- Honky Tonk Piano
- 4- Rhodes Piano
- 5- Chorused Piano
- 6- Harpsichord
- 7- Clavinet
- 8- Celesta
- 9- Glockenspiel
- 10-Music Box
- 11-Vibraphone
- 12-Marimba
- 13-Xylophone
- 14-Tubular Bells
- 15-Dulcimer
- 16-Hammond Organ
- 17-Percussive Organ
- 18-Rock Organ
- 19-Church Organ
- 20-Reed Organ
- 21-Accordion
- 22-Harmonica
- 23-Tango Accordion
- 24-Acoustic GTR(nylon)
- 25-Acoustic GTR(steel)
- 26-Electric GTR(jazz)
- 27-Electric GTR(clean)
- 28-Electric GTR(muted)
- 29-Overdriven GTR
- 30-Distortion GTR
- 31-Guitar Harmonics
- 32-Acoustic Bass
- 33-Electric Bass(fingered)
- 34-Electric Bass(picked)
- 35-Fretless Bass
- 36-Slap Bass 1
- 37-Slap Bass 2
- 38-Synth Bass 1
- 39-Synth Bass 2

40-Violin  
41-Viola  
42-Cello  
43-Contrabass  
44-Tremelo Strings  
45-Pizzicato Strings  
46-Orchestral Harp  
47-Timpani  
48-String Ensemble 1  
49-String Ensemble 2  
50-Synth Strings 1  
51-Synth Strings 2  
52-Choir Aahs  
53-Voice Oohs  
54-Synth Voice  
55-Orchestra Hit  
56-Trumpet  
57-Trombone  
58-Tuba  
59-Muted Trumpet  
60-French Horn  
61-Brass Section  
62-Synth Brass 1  
63-Synth Brass 2  
64-Soprano Sax  
65-Alto Sax  
66-Tenor Sax  
67-Baritone Sax  
68-Oboe  
69-English Horn  
70-Bassoon  
71-Clarinet  
72-Piccolo  
73-Flute  
74-Recorder  
75-Pan Flute  
76-Blown Bottle  
77-Shakuhachi  
78-Whistle  
79-Ocarina  
80-Lead 1(square)  
81-Lead 2(sawtooth)  
82-Lead 3(calliope)  
83-Lead 4(chiff)  
84-Lead 5(charang)  
85-Lead 6(voice)

86-Lead 7(fifths)  
87-Lead 8(bass+lead)  
88-Pad 1(new age)  
89-Pad 2(warm)  
90-Pad 3(polysynth)  
91-Pad 4(choir)  
92-Pad 5(bowed)  
93-Pad 6(metallic)  
94-Pad 7(halo)  
95-Pad 8(sweep)  
96-FX 1(rain)  
97-FX 2(soundtrack)  
98-FX 3(crystal)  
99-FX 4(atmosphere)  
100-FX 5(brightness)  
101-FX 6(goblins)  
102-FX 7(echoes)  
103-FX 8(sci-fi)  
104-Sitar  
105-Banjo  
106-Shamisen  
107-Koto  
108-Kalimba  
109-Bagpipe  
110-Fiddle  
111-Shanai  
112-Tinkle Bell  
113-Agogo  
114-Steel Drums  
115-Woodblock  
116-Taiko Drum  
117-Melodic Drum  
118-Synth Drum  
119-Reverse Cymbal  
120-Guitar Fret Noise  
121-Breath Noise  
122-Seashore  
123-Bird Tweet  
124-Telephone Ring  
125-Helicopter  
126-Applause  
127-Gunshot

Percussion Note Assignments

Middle C (C4) is MIDI note #60. This should be your reference point since most MIDI keyboards do not go as low as MIDI note #27

Midi Note Number	Instrument
27	High Q
28	Slap
29	Scratch Push
30	Scratch Pull
31	Sticks
32	Square Click
33	Metronome click
34	Metronome Bell
35	Kick Drum 2
36 (C2)	Kick Drum 1
37	Side Stick
38	Snare 1
39	Hand Clap
40	Snare 2
41	Low Tom 2
42	Closed Hi Hat
43	Low Tom 1
44	Pedal Hi Hat
45	Mid Tom 2
46	Open Hi Hat
47	Mid Tom 1
48 (C3)	High Tom 2
49	Crash Cymbal 1
50	High Tom 1
51	Ride Cymbal 1
52	Chinese Cymbal
53	Ride Bell
54	Tambourine
55	Splash Cymbal
56	Cowbell
57	Crash Cymbal 2
58	Vibra Slap
59	Ride Cymbal 2
60 (Middle C)	Hi Bongo
61	Lo Bongo
62	Mute Hi Conga
63	Hi Conga
64	Lo Conga
65	Hi Timbale
66	Lo Timbale
67	Hi Agogo
68	Lo Agogo



69	Cabasa
70	Maracas
71	Short Whistle
72 (C5)	Long Whistle
73	Short Guiro
74	Long Guiro
75	Claves
76	Hi Woodblock
77	Lo Woodblock
78	Mute Cuica
79	Open Cuica
80	Mute Triangle
81	Open Triangle
82	Shaker
83	Jingle Bells
84	-----
85	Castanets
86	Mute Surdo
87	Open Surdo