MIDI Madness
or
The Music Goes Round and Round...
and it comes out here

MIDI is an acronym for Musical Instrument Digital Interface. It's easier to say MIDI than that other mouthful, even if it sounds like you are talking about women's dress styles.

MIDI is a cabling and communication system that lets electronic instruments work together. It was first used with synthesizer keyboards, but later expanded to drum machines and unlikely instruments like electronic saxophones. MIDI is a sort of "partyline" where instruments can listen and talk. Unlike a party line, however, MIDI has an electronic musical conductor orchestrating it all.

This "music conductor" is called a SEQUENCER. Sequencers are usually computer systems of some sort. MPC MIDI capability, which we'll get to later, functions as a sequencer.

Sequencers talk to instruments on the MIDI partyline using a serial transmission protocol, not that different from data transfer over phone lines by modem. Modem communications have a top speed of about 14,400 bits per second. MIDI information goes about 50,000 bits per second!

Sequencers don't really know who (or what) is listening on the partyline. Some instruments are "output only" devices that seldom (if ever) talk back. Therefore, some MIDI arrangements are hit-and-miss propositions.

Sequencers send commands over the partyline. The following is typical of MIDI commands: "Instrument 4, play C sharp using your voice 22, 4th octave, 80% loud NOW and sustain." There are other sound effects and commands, but it basically is instrument-specific channels, note values, voice settings, and loudness control. Most MIDI instruments respond to a range of channels; each channel can be programmed to one of many voice values--each with a separately controlled pitch and loudness. Furthermore, a chord of notes can play on the same channel, voice and instrument. It all depends on the sophistication of the MIDI device.

MIDI sophistication is measured in terms like: number of simultaneous channels, number of simultaneous notes possible in each channel, number of instrument voices supported each channel, total number of simultaneous voices and/or notes possible.

MPC MIDI Capability

One popular MPC sound card is the Creative Labs' SOUND BLASTER PRO. It can synthesize music using simple FM (Frequency Modulated) sound chips. Similar chips can be found in the PRO AUDIO SPECTRUM by Media Vision. FM synthesis creates tones by specifying pitch and envelope. Crude waveforms like triangle, square or sine waves can play at a wide range of note (pitch) values, then shaped in amplitude (envelope) to approximate more complex sounds. You may notice that your sound card FM-synthesized MIDI music does not sound much like a piano, for instance--or a guitar, trumpet, etc. To me, it sounds like a cross between a rubber band and a leaky flute. By combining multiple FM tones, one approximates a single piano note (for instance).

The Sound Blaster Pro has two chips, each capable of 11 FM synthesized tones. This

gives a total of 22 tones in stereo--of which at least 4 *must* be percussion sounds (drums, explosions, snaps, clanks, hissing). Of course you need not use all 22 tones all the time. Percussion tones can be quiet at any programmed time, just as the others can.

When you play a "basic" MIDI file, you are activating MIDI Channels 13-16. Channel 16 is the "percussion" channel, and should be able to play up to 2 "notes" simultaneously. Channels 13-15 must support at least 6 simultaneous notes across their range. For example, Channel 13 plays two simultaneous piano notes; Channel 14, three harpsichord notes; Channel 15, one flute note; Channel 16, two bass drum notes. This is a maximized example, with every channel group (percussion and non) fully utilized. Another maximum example: Channel 13 playing six violin notes while Channel 16 plays two on snare drums. Channels 13-15 should play no more than six simultaneous notes, and Channel 16 no more than two. To exceed limits is to assume ability above and beyond the MPC spec--which many add-on components have.

A channel is like an instrument. Only one "voice" can appear on a channel at any given time, even though that voice can play more than one simultaneous note (e.g., chords). Once a channel finishes playing music in one voice (after the piano solo, for instance), it can then switch voices and play new notes until that segment ends. Changes can occur frequently (every note), or infrequently (several bars worth of music, or never changing during the whole composition).

When you play a basic .MID file using FM synthesis, music should have a maximum of 6 "melodic" and 2 "percussive" sounds at the same time. Because cards usually have 22 FM tone generators to work with, it's safe to assume that most instrument sounds are formed from two or more FM tones. Not all instruments require "composite" or "complex" tones, so some extensions are possible.

Extended MIDI

Extended MIDI uses Channels 1-10. Channel 10 is a percussion channel, and should handle 16 simultaneous notes. Channels 1-9 should also support 16 simultaneous notes across their range. This extended specification is intended for professional synthesizers or groups of instruments strung together on the MIDI partyline.

Stressed-out MIDI

In a basic MIDI setup, it isn't hard to imagine playing too many notes at once. Even extended MIDI would have a hard time playing all parts of a symphony piece. Whenever too many notes come down the partyline (or are attempted by the sound card), the oldest note still playing gets "stolen" (cancelled) by the newest note. This makes for strange sounding music; the back beat, bass line, or harmony gets interrupted, making you wonder if your computer is broken.

If a MIDI instrument (or sound card) is told to use too many channels at the same time, it will ignore all notes on the higher-numbered channels. Therefore, Channels 1-4 should contain the most important (melody) part of music in an extended composition, and Channels 13-14 in a basic composition.

Voices from Hell

MPC MIDI calls for no fewer than 128 instrument voices! These are arranged into logical groups of 16 instrument types (piano, organ, guitar, etc.) with 8 variations in each type (acoustic grand piano, bright acoustic piano, electric grand piano, etc.). Most piano variations sound the same by FM synthesis.

MIDI Mapping, or how to get REALLY lost

MIDI instruments have been around much longer than MPC computers. As a result of not having accurate standards forecasting, older MIDI instruments do not have an Accordion sound as Voice 21. Nor is Voice 65 an Alto Sax. Enter the MIDI Mapper, one of the gadgets in your Multimedia Control Panel. The MIDI Mapper has several functions; one of them is a "patch list," or translator that changes MPC voice numbers into a MIDI instrument-specific voice numbers. Since you can map any number of MPC voices to the same MIDI instrument-specific voice, you can have all piano variations sound the same over MIDI. This could be a piano or steel drum sound--you can toy with it as you please. With the MIDI Mapper, you may also direct where a particular channel goes. For instance, you can set Channels 1-10 for the MIDI partyline, and Channels 13-16 for FM synthesis on your sound card. Mix and match as you please. There's no strict definition of Channels 11-12. These are useful for sound effects and percussion on extended MIDI, but the Mapper lets anything go on these channels as well.

Channel "patches" are not fun. They are probably the most boring and confusing part of the MPC environment. They require intimate knowledge of channel numbers supported by MIDI instruments, what voices play what sounds, and so on. Fortunately, once programmed, their settings are retained by the MIDI Mapper until edited or changed again. You may create new ones or edit existing ones.

MIDI Drivers

MPC usually comes with FM synthesis drivers, usually in two or more flavors--basic and extended. Extended FM synthesis can support better MIDI files, but seldom play them as was intended to be heard. Want something better? There are drivers and support for other MIDI connections. If you use the DRIVERS icon in the Control Panel, you should find a MICROSOFT MPU-401 MIDI driver. The MPU-401 is a special MIDI interface that plugs into your computer and controls MIDI instruments using the most solidly supported MIDI standard in use today. MPU-401 was made for DOS use and many programs (notably, games with "Roland sound") can play MIDI music on instruments connected this way.

MIDI "Instruments" (!?)

For klutzes like me, there are MIDI "sound modules." These are quaint little boxes that connect to MIDI ports and perform synthesizer functions, but have no keyboards. Notable sound modules (supported by DOS and MPC programs) include these Roland products: MT-32, CM-32L, CM-64, LAPC-1, and SOUND CANVAS. The Sound Canvas is available as a plug-in card that supplies MPU-401 interface compatibility plus synthesizer circuitry on the same board. The LAPC-1 is its predecessor; it too is a plug-in interface/synthesizer board. The other units are still well supported, and sell cheaply (as they have been obsoleted by the Sound Canvas). $300 is an average price for a MIDI sound module; the Sound Canvas (as an external "stand alone" unit) lists for well over $700. As a plug-in, I've seen prices around $450.

Turtle Beach has a MULTISOUND card that is like the internal Sound Canvas, except for it has the most advanced music generation ability, plus an audio mixer, digitizer, etc. It comes with MPC drivers, but I doubt DOS games supporting Roland sound know how to use a Multisound. With a suggested retail price just under $1000, I doubt anybody but studio professionals will consider it anyway. You don't want *Leisure Suit Larry* to start playing music during a recording session, anyway!

Synthesizers by Casio, Yamaha, Ensonic, Roland, and many more have MIDI connectors. To be compatible with MPU-401 or sound card MIDI, a candidate

instrument should have MIDI IN and MIDI OUT. MIDI THRU is not needed in simple setups. Confusingly, you wire the OUT from one component to the IN of another. It makes a grand loop starting from the OUT of your computer to the IN of the instrument (and then from its OUT to another's IN, etc.) of each component in the chain until the last instrument's OUT connects to the computer's IN. MIDI THRU is sometimes used in substitution for the OUT connection, depending on what the instrument does with MIDI data.

.MID Files

Multimedia Windows (and Windows 3.1) support MIDI music recorded in files ending with a .MID extension. These files are standardized for PC and Macintosh computers, and are supported by a library of programs on both these machines. You can receive a .MID file and play it under Multimedia Windows, providing it uses Channels compatible with your MIDI instruments (or sound cards) and MIDI Mapper. Compositions played on some Roland equipment (like the MT-32) will not sound right unless your MIDI Mapper is set to MT-32 or a compatible patch map. Because .MID files contain no instrument patch definitions, it is important to know what instrument(s) a particular piece is composed for. Fortunately, default MIDI mapping and channel assignments are compatible with GMM, or General MIDI Mode--a standard created by the MIDI Manufacturer's Association. New MIDI products (like the Roland Sound Canvas) conform to GMM mapping, and therefore work without special MIDI Mapping. For game use, the Sound Canvas has a MT-32 emulation mode, so its instruments would also sound correct when played by DOS.

Conclusion

Because of its versatility and age, MIDI is extremely flexible and extremely confusing. The MPC environment helps orchestrate and interface MIDI instruments, but does not give you any kind of "word processor" for .MID files. Several manufacturers have or will release MIDI editing and composing programs, but those are left for review elsewhere. You can delve quite deeply into MIDI, and have stunning music capability by adding just one component and wiring its sound output into the LINE IN jack on your sound card. (I bet you were wondering what that was for!) Remember the General MIDI Mode (GMM) when shopping for add-ons. If a component doesn't support GMM, make sure you have sufficient documentation and/or MPC support for it--be it in the form of a MIDI Map or a Windows Multimedia Device Driver.

You'll be amazed at the improvement in sound quality MIDI instruments give you over the FM synthesis you probably are now using.

-Richard Alan Kaapke