

An Introduction to MIDI and Desktop Music

You need not have an orchestra around just to play one. The latest generation of personal computer music hardware and software will let you handle all the instruments.

by Steve Rimmer

One of the splendid things about having a multitrack tape recorder is that you can overdub. There was a period some years ago when it was all the rage to release single person albums in which one musician did all the work, overdubbing multiple tracks.

One of the less than splendid things about a multitrack tape recorder is the tape. Despite the impressive sophistication of even the really low end four track cassette systems at the moment, tape has finite limits and there isn't much you can do to transcend them. Inherently analog, it's restricted to recording only that which you can actually play.

If your piece needs a horn part and you don't have the lip for it, all the tracks in the world will be of little use.

There are several ways around this situation. One of them is to get to know a lot of other musicians. A second is to let a computer and some synthesizers stand in for them. Great philosophical debates might well be wrought over this issue... we'll be considering the second alternative here. A good horn player can outplay even the best horn syn-

thesizer, but not if he or she isn't available.

The MIDI system... the musical instrument digital interface... is a somewhat common standard which allows users of all sorts of computer based music hardware and numerous synthesizers and tone generators to communicate. It means that you can play horn on a keyboard, violin on a guitar, sax on a flute or the whole works on a computer. It allows you to edit music like a word processing document... and it allows you to cheat, for example, by editing in arpeggios and sixteenth notes which you might not have been able to play in real time.

More than being just an interesting bit of technology, MIDI allows you to take control of an entire piece. You can arrange and play all the parts exactly as you envision them. In this respect it's a powerful tool, giving you the opportunity to create music which might not have been possible any other way, and all without having to hire an orchestra to perform it.

There's a lot going on around MIDI, and a lot which is beyond the scope of this article. Over the next few pages, however, we'll get into the basics of MIDI.

Downbeat

The basis of the MIDI interface is a high speed serial link which uses common hardware connectors and a common data format. The MIDI standard has

It allows you to cheat, for example, by editing in arpeggios and sixteenth notes which you might not have been able to play in real time

been adopted by a variety of music and computer hardware manufacturers. This means, for example, that you can connect a Roland keyboard to a Yamaha tone generator and have them function perfectly.

continued...

Music can be thought of in digital terms as being the fusion of two types of data. Tone data is the information which makes a brass voice sound different than a string voice. Note data is the information which results from pressing the keys on a keyboard to play music. In isolation, the second sort of data is independent of the first. You can... at least in theory... play the same notes through different voices to have a piece play as if by different instruments. One of the things which most MIDI users discover early on is that you can play something in its usual voice... Pachelbel's Canon played in a string or organ voice is a popular victim of this experiment... and then have your computer play it back through a wholly different voice. The Canon played on saxophones, for example, is unusual. Classical performers might find other words to describe it played this way.

If you play a piece on a MIDI instrument, the note data which results from your playing can be sent through the MIDI interface and recorded as digital information on, for example, a computer. It can thereafter be stored on disk and replayed precisely as you played it a week later... through a different instrument if you like.

It can also be edited. Score and sequence editing software such as Cakewalk or Ballade allows you to change a few notes, add in whole passages and fix your mistakes. It can perform such things as transposition and quantization, the latter being a sort of "snap" function which will adjust notes slightly off beat.

A MIDI synthesizer which receives MIDI note information need not know where the information is coming from. As such, you can play music into a MIDI system through whatever instrument suits your fingers. Among the possibilities are a traditional synthesizer keyboard, a MIDI guitar or a flute or other wind instrument fitted with a pitch to MIDI converter such as the Roland CP-40... you can also sing into one of these. Finally, you can create music from scratch in a computer based score editing program and never actually play anything.

It's probably worth mentioning that unlike MIDI note data, voice informa-

tion tends to be manufacturer specific. It can be sent over a MIDI interface, but will only be of use to synthesizers similar to the one which sent it. Each of the major MIDI synthesizer manufacturers has a proprietary synthesis system, and these are disparate enough to make their voice definition data incompatible.

On Track

It's probably easiest to think of a complex MIDI system as being composed of two sorts of devices, that is, ones which send MIDI note data and ones which receive it. MIDI senders include keyboards, MIDI guitars and computers. MIDI receivers include tone generators and computers. In many cases the same box may encompass both a sender and a receiver. For example, a traditional keyboard



synthesizer with a MIDI interface can both generate note information and play notes independently of its keyboard if note information is sent to it from another source. To keep things clearer, you might want to think of such an instrument as being two distinct boxes in one.

A computer typically doesn't play the notes sent to it, but rather records them. It serves as a MIDI receiver none the less. There are, in fact, quite a few MIDI cards for personal computers which serve as both MIDI interfaces and tone generators. As such, the role of a personal computer in a MIDI system is growing.

In most cases, you'll only need one or perhaps two keyboards, even though your pieces will typically have many more voices. The sequencing software available for computers allows you to overdub MIDI tracks just as you would tracks on a tape recorder. As such, there is a wide variety of "keyboard-less" synthesizers available especially for MIDI applications. These "tone generators" are boxes which will accept

MIDI note information and play the notes in high quality voices.

We've discussed MIDI note data informally until this point. It's really the heart of what MIDI can do, and it should serve to give you a clear understanding of what you can do with this technology. A lot more than just notes can move over the cables of a MIDI system.

A typical MIDI instrument has three MIDI connectors labelled In, Out and Through. MIDI instruments can be chained together, such that all the instruments in a system appear to be on a common bus. In fact, in large MIDI systems the propagation delays through many chained instruments may present the more remote instruments with timing delay problems. In these cases,

MIDI splitters or "through" boxes can serve to drive multiple instruments in parallel.

Every packet of information which is placed on the MIDI bus includes the nature of the information in the packet and a MIDI channel number. There are sixteen available channels in a MIDI system. This means that you can have sixteen voices playing different parts running through the system at one time.

Consider a simple piece... we'll further abuse Pachelbel's Canon in this instance. As it's usually played, the Canon has three violins and viola. Each of these instruments plays different notes. Allowing that the note data for the Canon is stored in a sequencing program and will be played back, you could assign each of the four tracks to a different MIDI channel number and then connect four MIDI tone generators to the bus, each set to listen to a different channel. The tone generator which was set up to listen to channel one would play the first violin part, the tone generator which was set up to listen to channel two would play the second violin part and so on.

In a real world tone generator, you might only need one actual box. The Roland MT32 tone generator, for example, has thirty-two actual voices which can be assigned any way you like over the sixteen MIDI channels. You can program the box to have two voices

available for each of the sixteen MIDI channels, or four voices for your choice of eight channels or all thirty-two voices on a single channel. There are still other permutations, of course.

Having more than one voice on a channel doesn't mean much to a piece like the Canon, in which no one instrument is called upon to play more than one note at a time. If your music involves playing chords, you'll need at least as many voices as there are notes in your most complex chord available. In practice, a thirty-two voice tone source like the MT32 is capable of generating a lot of music.

Every voice in a MIDI tone source is assigned a number. Aside from note data, the MIDI bus can carry a number of other standard information packets. One of these is a program change message. This allows a piece of music being played back by a sequencing program to not only play the voices in the tone generators which are reproducing it, but also to change voices.

For example, in the Canon there's a bit in the middle which has a lot of thirty-second notes and rips along at quite a pace. Played on a fairly long-winded voice with a lot of sustain, this turns into mud. You could have the voice change at this point to be something a little more staccato... log drums or perhaps banjo if you want to be really offensive.

Program change numbers are another thing which isn't consistent between different manufacturers of synthesizers. As such, voice twelve may be a harpsichord on one tone generator, a violin on a second and Martian wind chimes on a third. In addition, most contemporary tone generators and synthesizers allow you to download new voices to them over the MIDI bus, or otherwise select different sets of voices internally, so they may not even be consistent from one day to the next in the same instruments. It's up to you to make sure that you're playing through the right voices.

The issue of voices is one which delights many MIDI performers. Most higher end MIDI synthesizers and tone generators allow you to run dedicated voice editing and library software which makes it possible to modify their voices to suit your music. Because these instruments have fairly subtle tone synthesis systems, you can usually generate some pretty sophisticated sounds. I have a bank of harpsichord

voices for one of my MIDI tone generators which spans the range of the instrument... it includes voices for old French and German harpsichords, harpsichords with pig bristles and nylon picks for jacks and so on.

It's also worth noting that there is another class of tone generators for MIDI, this being samplers. A sampler will digitize real acoustic sounds and allow you to play them back as MIDI controlled voices. You can use both original voices which you sample yourself and "canned" voices provided by the sampler manufacturer. As such, you can sample a real violin and then play that from any MIDI note source. You can also "play" musical car horns, trash cans, ringing phones, barking dogs, screeching cats, breaking glass... the possibilities are staggering.

MIDI to the Max

There is a great deal more about MIDI which hasn't been discussed here. A MIDI system can control things like program mix down and stage lighting, for example. The latest generation of PC sound cards allows you to have all the flexibility of MIDI without very much external hardware. The range of specialized MIDI gadgets could be an article of itself.

The best way to learn about MIDI is to plug it in and try it. Inexpensive MIDI hardware exists which will let you get into MIDI performance for a few hundred dollars. If you have a personal computer you're already half way there... MIDI interfaces exist for IBM PC compatibles, the Apple Macintosh and the Atari ST, among others.

It's also worth noting that a growing number of systems include MIDI interfaces. The IBM PS/1 comes complete with a MIDI port built in. All you need add is the music. □

Wright, Cont'd from page 15

about how to transmit electricity 11 miles from a hydro-electric plant at Montmorency Falls to Quebec City, Wright suggested that Thomson pile up 11 miles of wire in a warehouse at the falls and hook it up. "Thomson made the test—and it worked!," his son did, "So did the long-distance lighting system for Quebec city."

J.J. Wright died in 1922, the same year the Toronto Electric Light Com-

pany, a company Wright had created and managed for most of his professional life, was absorbed into Toronto Hydro. But his system wasn't completely abandoned or forgotten. Wright's ideas and belief in electricity lit up the city in the dark years at the turn of the century. And in many ways, those lights haven't dimmed ever since.

For more Canadian electrical history see the exhibit: "Bright Lights, Big City: the History of Electricity in Toronto," at The Market Gallery of the City of Toronto Archives running until June 23, 1991.

The author would like to thank the many groups who helped in research for this story including Toronto Hydro, Ontario Hydro, Toronto City Archives, and the CBC Broadcast Museum. □

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Making MIDI Music

by Chuck Ander

MIDI (Musical Instrument Digital Interface) is a language standard for the communication of musical information. It can also be used to record and play back musical information using a sequencer (MIDI recorder) and a MIDI keyboard. A sequencer can record, edit and play back musical information in the form of MIDI data.

Sequencer Plus Gold

The sequencer I used is from Voyetra, a company that has developed a full line of MIDI products. It is called **Sequencer Plus Gold** and it runs on an IBM compatible PC. To turn your personal computer into a fully equipped MIDI studio, you will also need a MIDI interface board. Again Voyetra provided the necessary hardware in the form of the **V-22 Professional Dual-Port MIDI Interface**. The V-22 is an inexpensive interface board which uses a software driver (instead of hardware on the board) to communicate with the programs running. Some advantages of this are MTC sync, multiple MIDI ports and mute/solo while

playing. However, if you have software that requires 100% MPU-401 compatibility, you can obtain a module which will make the V-22 into a V-22m, a fully MPU-401 compatible unit.

The board installed flawlessly and passed its self-test with flying colours. Next, **Sequencer Plus Gold** was installed and fired up. Lastly, I connected a multi-timbral MIDI keyboard to the MIDI in and out jacks and we were ready to roll. Now I needed something to record. Instead of trying to play chopsticks or some equally inane (and badly played) piece, one of the people in the office who is a real keyboard guru played an excellent version of the organ part to "Light My Fire" by the Doors. With this as a basic track, I was able to add bass, drums and some other instruments. It was like doing multi-track recording — except that what was recorded was not sound (or an electronic representation of sound) but digital information which, in order to be played back, needed a multi-timbral MIDI keyboard or sound modules

to reproduce the original sounds. When played back, the piece sounded exactly like the original — except that you could finely edit the information, once it was on the disk. You can, of course, change the tempo or the key, or mute

any track while the piece is being played back.

Sequencer Plus Gold has all the features you could want in a professional MIDI sequencer including: a graphical "piano-roll" form, making it easy to view and edit with great detail, memory buffers which allow you to cut and paste sections of a song or move them into a different song, and features to organize and modify tracks using name, mute solo, quantize, lop, offset and transpose commands. In addition, **Sequencer Plus Gold** includes a **Universal Librarian** program and a **MIDI Data Analyzer**.

With the **Universal Librarian** program you can arrange, name and archive MIDI instrument programs onto PC disk and audition sounds in most MIDI instruments from your PC's keyboard. It also includes a complete voice editor and librarian for the **Sound Blaster™ FM synthesizer**.

MusiClips

MusiClips is "clip art for music." It is actually quite a large collection of multi-track MIDI song files which cover a wide variety of musical styles. These files are perfect for adding music to multimedia presentations, film and video productions, commercials, or practically anything. When used with a sequencer program, you have a ready supply of songs to use and/or edit. You can audition variations of the same song played by a piano, string section or any other instrument supported by your MIDI synthesizer or PC sound card.



Song MINUETC		View		STOP		Men 144448				
Tk	1 Melody	BPM	140	CK: INTERNAL	1:0					
Trk	Name	Pt	Ch	Gp	Prg	Bars→	18	116	124	132
1	Melody	1	1	.	.	1	█	█	█	█
2	Chords	1	1	.	.	2	█	█	█	█
3	Bass	1	1	.	.	3	█	█	█	█
4		1	1	.	.	4	█	█	█	█
5		1	1	.	.	5	█	█	█	█
6		1	1	.	.	6	█	█	█	█
7		1	1	.	.	7	█	█	█	█
8		1	1	.	.	8	█	█	█	█
9		1	1	.	.	9	█	█	█	█
10		1	1	.	.	10	█	█	█	█
11		1	1	.	.	11	█	█	█	█
12		1	1	.	.	12	█	█	█	█
13		1	1	.	.	13	█	█	█	█
14		1	1	.	.	14	█	█	█	█
15		1	1	.	.	15	█	█	█	█
16		1	1	.	.	16	█	█	█	█

View Menu

Add	Copy	Delete	Goto-bar	Insert	Loop	Mute	Name	Replace	Solo	Width	
Zap	BLOCK	EDIT	FILES	H_MULTI	OPTIONS	PUNCH-IN	TEMPO	XFORMS			

Sequencer Plus Gold "View" Screen

L.M.P

L.M.P (Laser Music Processor) from Teach Services is one great music notation program. Many years ago I used to write songs and I'd try to transcribe them into music notation. This was a messy and laborious task, at best. How I wish I had L.M.P, a computer and a printer back then!

With L.M.P, you can write music notation using a mouse (or the cursor keys) and the program will automatically draw any kind of staff. It also features automatic key signatures and can produce symbols for fermata, segno, repeats, arpeggio, and coda. In addition, it can create adjustable ties, slurs, and beams. Songs can be up to 100 pages long.

Printing might be the best part of the program (except for the automatic transcription from a MIDI keyboard) L.M.P prints like a dream. I used a LaserJet II compatible printer and the print quality was excellent — just like sheet music you'd buy.

My favourite feature (as you may have already guessed) is automatic transcription. To test it, I got our resident keyboard genius to play a piece and a short while later presented him with a laser-printed copy of what

he had just played. The program will quantize to 4th, 8th, 16th or 32nd notes and adjust inter-staff spacing. What can I say, it's nice and solves a very real need — that of producing high-quality and correct music notation.

Band-in-a-Box

It's hard to have a favourite program among all these great ones, but Band-in-a-Box just might be it. Maybe it has something to do with my experience many years ago of sitting laboriously over my tape recorder, trying to synchronize my rhythm box and pathetic bass playing in order to create

an accompaniment tape. I should explain — I used to perform music, playing the guitar and singing. To enhance my performances I recorded drums, bass, and sometimes lead guitar on a tape and played along with it. It actually didn't sound too bad. But sometimes I wanted to change keys, or speed it up a little. Then, I had to do my recording all over again. This was a heck of a lot of work. Now, along comes Band-in-a-Box from PG Music Inc., a program that does all this (and more) automatically. And the painful part is that its bass lines are better than mine!

To use Band-in-a-Box, all you have to do is load a song (from any of over 500 in the MIDI-Fakebook collection) or type in the chords to any song you please. Once you type in the chords, you next choose one of 24 musical styles such as country, light, medium or heavy rock, reggae or whatever. Then just press <F4> to start the program and it will create a drum, bass and piano part for your song and play it through your MIDI synthesizer. You can vary the part anywhere in the song. For example, you can slow it down or speed it up, change styles or change the time signature for varied effect. If you realize that the song is not in the right key for you, you can transpose to any key — and all the chords are likewise automatically transposed. You can vary the tempo and even play the same song in a different

String Quartet in C# Minor, Opus 131

excerpts

Ludwig van Beethoven
(1826)

Printout from L.M.P done on Laser Printer

Bye, bye, Miss Amer. Pie, drove my Chevy to the levi but the levi was dry
 & gd ole boys were drnking whisk and rye, singin this'll be the d that I

1bC	F	2 C	G	3 E	F	4 C	G
5 C	F	6 C	G	7 Am	Am	8 D	D
9 Am	Am	10 G	C	11 G	C	12aC	C
13 Dm	G	14 F	F	15 Dm	Am	16 Am	Am
17 G	G	18 G	G	19aC	C	20 Am	Am
21 Dm	G	22 F	G	23 Am	Am	24 D	D
25 G	G	26 G	G	27aAm	Am	28 G	G
28bAm	Am	30 G	G	31 F	C	32 Dm	Dm
33 F	F	34 G	G	35bC	C	36 Am	Am
37 Dm	G	38 F	F	39 C	G	40 Am	Am
41bF	F	42 G	G	43 C	F	44 C	C
45aC	F	46 C	G	47 C	F	48 C	C
49 C	F	50 C	G	51 Am	Am	52 D	D
53 Am	Am	54 G	G	55 G	C	56bC	F
57 C	G	58 C	F	59 C	C	60 C	C
61 C	G	62 F	G	63 C	F	64 C	C



Band-in-a-Box Playing a Song

musical style. By assigning different MIDI channels, you can change the sound of the instruments the program plays.

Now if I had this when I was performing — maybe I'd be rich and famous today. Even if you're totally musically illiterate, if you know the chords to a song (or can find them in a book), you can generate great drums, bass and piano accompaniment — and sing right along.

I should point out that both L.M.P and Band-in-a-Box need an IBM compatible PC with an MPU-401 compatible MIDI interface. I used the V-22m from Voyetra to run these last two programs.

Read All About It

It always helps to have a good understanding of the basics of any discipline. A really excellent book that helped me learn about MIDI is, *MIDI The Ins, Outs & Thrus* by Jeff Rona, published by Hal Leonard Books. This book is written in an easy-to-understand, simple and often humorous style. It takes a difficult subject and explains it in a clear-cut manner. It starts with a brief history of the events and needs that led up to the creation of MIDI. It explains the basics, gradually progress-

ing to more complex portions of the subject. Finally, it explains how to set up a MIDI system, and provides the solution to common problems.

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