MIDI

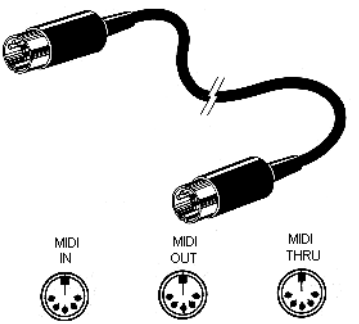
a. Do we really have to learn about this?

Well, the truth is that we do not have to LEARN all of this. What is absolutely necessary for you to UNDERSTAND is that which follows: Usually, the configuration of your equipment (at least initially) will only need to be done once (and we allow short cuts). But good planning on how to set up your studio will be important.

The word MIDI is an acronym for Musical Instrument Digital Interface. It is a norm accepted in 1983 by most manufacturers of electronic musical instruments. The system was created using a series of connections and messages of binary computer language in order to be able to establish communication between musical instruments, computers, software etc., regardless of the manufacturer. This in reality was an attempt to achieve a universal language for machines in the same way as Esperanto was an attempt to achieve verbal communication between human beings.

Author's note: A curious detail is that the version of MIDI that is used today, and which has been used since 1983, is the 1.0. This goes to show that the people who began it created a good system way back then. Congratulations to them.

Basically this means:



-PHYSICALLY, there are connections of five pins that are common to all the appliances that use the MIDI norm. There can be three types: OUT, which is the standard connector through which the information goes to other devices. IN,

which is where information enters our apparatus, and THROUGH, which is another conducting bridge through which the information which has come into the IN connector exits again, without being processed or manipulated. Although these days you can also have USB connections, which can also deal with the MIDI information, and thereby save on some appliances (such as MIDI signal processors, which serve for connecting MIDI devices to the computers that do not have it by using some connection through communications ports, parallel, PCI, etc.).

-LOGICALLY (software), they are a series of messages that serve to exchange data between different instruments and computers. Easy, right? ...

Now we shall try to explain using a simple example of what MIDI really is. Imagine that we play an instrument (a guitar, a piano, a mandolin, whatever) and that we could record the notes we are playing, but not the sound. This means that when you play your instrument, using for example a C quaver, only this would be recorded: a C note and its length.

Then, on reproducing it, we could make that DO quaver sound the way we want, in the same way that we can read a musical score and then play it with the instrument we prefer. How can we do this? ... Well, with a MIDI controller. Let's go for it.

b. MIDI Drivers

A MIDI driver is nothing more than an instrument (or something with the

form of an instrument) that helps us to send these MIDI messages we have just mentioned, to a sound generator. Therefore, it does not matter what form this device has as long as it sends our messages successfully. Of course there are some forms which are more useful than others, depending on what messages or sounds we want to use.

For example, from a MIDI driver with a battery shape we can play piano

sounds, but it is not very useful because, among other things, we could only play eight or ten notes, and those without much feeling. Equally, if we feel more comfortable with drumsticks

but we have a driver in the shape of a piano... well, let's say that to replace the broken keys with new ones could be quite expensive...

A special case is when we mastered a specific instrument (for example, the piano or guitar), and we have no idea of other instruments (such as the flute), or simply do not want to buy them or have them ... In this case, and with a driver in the shape of our favourite instrument (and some practice), we will be able to simulate that we play any other instrument that we can recreate via MIDI.

The MIDI drivers may take various forms.

Keyboards, instruments with piano keys, synthesizers, were the first to bear the MIDI standard implemented.

In **wind instruments** that are controlled by keys, buttons and by blowing. A good example of these is the wind drivers of Yamaha or AKAI.

In **percussion**, with pads such as those used in electronic drums.

MIDI guitars, normal guitars (classical, acoustic or electric) that carry a data transformer which converts the pressing of strings into MIDI messages.

In any case, the basic rule is that the string instruments will play better from a string driver, that pianos play better from a keyboard, wind instruments ditto, percussion... etc. But if the musician is good, with his driver he will be able to play any sound in a realistic way.

Yes, I know that this is going to upset many vocations! ... In my case, I always wanted to learn how to play the flute. I gave up my dream the day I realized how well my flute sounded from a piano driver... And I challenge any purist to differentiate between the sounds I recorded and the real ones... Well, maybe I have exaggerated a little, but what I

want to make clear is that this sound will fool (and convince) 99 out of every 100 people that hear it. Therefore, with a good performer, we can recreate almost any sound in entirely convincing way, allowing one person to become a real orchestra or band.

c. Sound Sources

Now we should understand that MIDI are messages (zeros and ones) that we play on a driver and which then sound like musical instruments (real or not). How do we hear the sound? The answer is: through any sound source...

A sound source is a piece of equipment (a machine or similar) that is capable of receiving MIDI messages (zeros and ones), to interpret them as notes with all their expressions (volume, vibrato, attack, etc...), and to produce a sound from the messages.

These machines tend to have a pre-prepared sound library that usually comes from the equipment's own synthesis (i.e., they produce the sound from scratch, modifying the waves), or the sounds may come from samples taken from reality. More than not, the equipment might have both these possibilities.

The samples taken from reality are worth a paragraph.

A Sampler can be an external device or a computer program exactly the same as a sound module, and it also works as a sound source. The difference is that sound synthesizers create a sound to imitate real sounds, or create sounds that are nonexistent in nature, while samplers use pieces of recorded sound that we can hear every time we play a note with our driver. For example, in order to create a piano sound we should use a good piano (if possible, tuned) and play a note while we record the sound. Then, after recor-

ding all the notes on the piano (and usually by playing each note two or three times: soft, medium and strong, and by adding the sound of the hammer, etc., etc. and etc.) we create a sound that tells the software of the sampler that when we play, for example, a MIDI note D in the fourth octave, that it should sound like the same note we recorded on the real piano. The result is often spectacular.

Returning to the sound sources in general, they can be pieces of equipment or, as lately is trendy for its ease, software on a computer. But it still is only a machine to which you send MIDI signals (zeros and ones)

and which gives back sounds.

There are sounds sources of all sorts, of pianos, strings, metals, percussion, synthetic sounds, etc. And usually, these sound modules contain programs with all kinds of sounds.

The author of these lines particularly likes and uses the Kurzweil brand for sounds of strings and pianos; the Yamaha brand for metals; Roland equipment for percussion, strings and guitars, and Korg for synthetic sounds. This is a personal opinion. AKAI has always had great sam-

plers, but I also use Kurzweil for this task. Clearly these are generalities, and I leave many brands aside, but keep it in mind when you go shopping. Always TRY THEM OUT, and those that inspire you are the good ones...

I do not want to finish this part of the book without commenting on what is now

becoming the trend to follow in sound sources: sounds via software. These are modules with virtual sounds, or computer programs that mimic the operation of those hardware modules mentioned earlier. Although they were very basic at first, nowadays they are as powerful as or even more so than the others.

Some of these sounds via software are usually incorporated into good quality sequencers (for example the VST in Cubase or in Logic virtual instruments) or can even be the program basis (Apple GarageBand). This means that with a master controller, a MIDI adapter or a sound card with MIDI and audio, a computer and a sequence programmer (with these virtual synthesizers) you can set up a real composition station or a recording studio with great ease. We will cover this in depth later on.

d. An extra bit of data. The MIDI messages

MIDI messages can take many shapes and forms, and to list and explain them will only give you a tremendous headache. It unnecessarily complicates what you actually need, which is how to use the technology and not the explanation of its internal operation (the same way in which in order to show how a television works we would have to understand all the theory concerning Hertzian waves and the function of cathode ray tubes. What a hassle!).

MIDI messages go through different channels (the MIDI standard uses 16 channels), numbered from one to sixteen, (although later on we will see that there are ways to get more than16 channels using multiple MIDI ports). The analogy that is easiest to understand is to imagine

that there are data issuers that can broadcast through any of these channels in the same way as if they were broadcasters of television channels, and data receivers. This is the same as if they were television sets that choose the channel one wants to see, or also like some modern televisions where you can see several channels at once.

MIDI messages can be of two types: Channel, which shows us the way to bring information to different destinations, and which can be mode or voice; and System, which can be common or exclusive.

Mode messages are information that affects the whole apparatus that receives them. For example:

-Messages to shut down or turn off the notes. Useful if at some point the instrument becomes stuck and continues to sound although you haven't touched any keys or strings.

Local Control, which can be ON or OFF, and which is a control to separate, on a electronic keyboard, the driver (for example, a series of keys) from the rest of the apparatus which is the sound source or producer, being that part of the equipment which produces the sounds (piano, strings, winds, percussion, etc...).

-Omni Off, which is a message that lets us know that the receiver has taken into account the MIDI channel through which it receives the information.

-Omni On, which is a message to indicate that the recipient responds to the messages

received regardless of the channel through which they arrive.

-Poly On, which signifies that the apparatus is using its polyphonic capacity and

responds with all the polyphony at its disposal.

-Poly Off, which means that the receiver will act as if it were a Mono appliance, which means that it only responds to one note at a time.

The voice messages can be:

-Note On, which means that a note is pressed.

-Note Off, signifying that the note is no longer pressed.

-Aftertouch, which are messages that affect the note after it has been pressed, allowing added effects such as vibrato.

-Program Change, or change of programme, which indicates the type of sound we want, either a piano, violins, etc.

-Pitch Bend, or alteration of the tone height, which produces a glisan kind of effect.

-Control change messages, which are different types of messages that indicate the many and varied ways to control the sound, such as the panoramic sound of stereo, the control of the modulation wheel, volume, etc.

Key velocity or speed with which the button is pressed. This was so named because the first MIDI controllers were keyboards, but it can be applied to any type of controller, and it controls the volume that can be reached depending on how quickly the note is pressed. It would appear that change of volume depends on the force with which the key is pressed, but this is a sensation that does not correspond to reality.

We control the immediate volume of a note by how quickly we press it. System messages do not go through a specific MIDI channel but rather affect all of the MIDI system used.

The most common system messages are:

- Song select, which selects the song we want to reproduce or to edit in a sequencer or program sequencer from the internal memory.

-The position marker of the song, which indicates the position within the song. This means that at all times we will know the distance between the place in the song where we are at any given moment, and the beginning of the same.

Within the system messages there is a group called Real time, which

is used to realize synchronisation in time between different MIDI devices.

-MIDI clock is a reference time which serves to put all the equipment used in synchronicity.

-Start is an order for starting the sequencers.

-Stop is to conclude the sequence.

-Continue is used to resume the reproduction from a point where it had previously been stopped.

-Follow-up connection (Active Sensing) is a security mechanism which controls the functioning of the connections. This permits, that if for some reason a cable disconnects while we press a key (note on), the sound will cease even though it does not receive the message to do so (note Off).

Reset System, which serves to adjust the equipment that we are using

in the predetermined values with which it left the factory.

Although the MIDI standard is a common language for all equipment,

it was also considered necessary to leave a space for each manufacturer's individuality. Therefore a series of messages for the specific use of each brand was incorporated. This is called Exclusive System Messages and they are messages that usually can only be understood between apparatus of the same brand, such as, for example, data dumping, sound editing, configurations, settings, etc.

However, in order to connect our MIDI apparatus to a computer we need some sort of equipment that carries these connections and that connects to the computer to perform the entry and exit of information, and these are the MIDI interfaces. These can have one or more ports: for example Unitor 8 (from Emagic) or MIDI EXPRESS (of MOTU) with 8 MIDI ports of entry and exit, each of these ports having 16 channels and being connected to the computer by a USB port. This means we

can have 128 MIDI channels. Imagine that we could have an orchestra of 128 instruments at our service. The possibilities are endless!

E. GM (General MIDI)

As each module has its own instrumental sounds in the order the manufacturer originally chose. In due course, it was agreed to have a pre-established order of sounds of all sorts (including sound effects) to create a standard that could play correctly any MIDI files that a third party developed.

This means that if we take a sequence or a song in MIDI file format where on track one (e.g.) it ought to sound like a grand piano, the creator of the track would had have to establish that track No 1 uses sound No 1. Likewise, if you want a church organ you would have to use sound No 20.

Thanks to this agreement we can encounter millions of Midifiles that we can reproduce on our equipment without the need to configurate anything.

The listing of General MIDI sounds is as follows:

PIANO

1. Acoustic Grand
2. Bright Acoustic
3. Electric Grand
4. Honky-Tonk
5. Electric Piano 1
6. Electric Piano 2
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. Nylon String Guitar
26. Steel String Guitar
27. Electric Jazz Guitar
28. Electric Clean Guitar
29. Electric Muted Guitar
30. Overdriven Guitar
31. Distortion Guitar
32. Guitar Harmonics

BASS

33. Acoustic Bass
34. Electric Bass (finger)
35. Electric Bass (pick)
36. Fretless Bass
37. Slap Bass 1
38. Slap Bass 2
39. Synth Bass 1
40. Synth Bass 2

SOLOIST STRINGS

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

ORCHESTRAL SETS

49. String Ensemble 1
50. String Ensemble 2
51. SynthStrings 1
52. SynthStrings 2
53. Choir Aahs
54. Voice Oohs
55. Synth Voice
56. Orchestra Hit

METALS

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

WIND

65. Soprano Sax
66. Alto Sax
67. Tenor Sax
68. Baritone Sax
69. Oboe
70. English Horn
71. Bassoon
72. Clarinet

FLUTE

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

SOLOIST SYNTHESIZERS

81. Lead 1 (square)
82. Lead 2 (sawtooth)
83. Lead 3 (calliope)
84. Lead 4 (chiff)
85. Lead 5 (charang)
86. Lead 6 (voice)
87. Lead 7 (fifths)
88. Lead 8 (bass+lead)

SYNTHESIZER PADS

89. Pad 1 (new age)
90. Pad 2 (warm)
91. Pad 3 (polysynth)
92. Pad 4 (choir)
93. Pad 5 (bowed)
94. Pad 6 (metallic)
95. Pad 7 (halo)
96. Pad 8 (sweep)

SYNTHESIZER EFFECTS

97. FX 1 (rain)
98. FX 2 (soundtrack)
99. FX 3 (crystal)
100. FX 4 (atmosphere)
101. FX 5 (brightness)
102. FX 6 (goblins)
103. FX 7 (echoes)
104. FX 8 (sci-fi)

ETHNIC

105. Sitar
106. Banjo
107. Shamisen
108. Koto
109. Kalimba
110. Bagpipe
111. Fiddle
112. Shanai

PERCUSIVE SOUNDS

113. Tinkle Bell
114. Agogo
115. Steel Drums
116. Woodblock
117. Taiko Drum
118. Melodic Tom
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

This is the listing of General MIDI sounds, but we also have to bear in mind that synthesizers and samplers have thousands of sounds that are not on this list and that we can also use in our compositions.

F. Program sequencers

A sequencer is computer software (but also they exist integrated into synthesizers or as external machines. We shall focus on programmes that are the most widespread in addition to being the simplest) that allows us to record multiple tracks of MIDI at different times (without having to burn them all at once), and that usually allows us to do the same with audio tracks.

There are different manufacturers who put sequencing programmes at our disposal. We believe that the best are Logic (Emagic, a subsidiary of Apple), Cuba (Steinberg) and Cakewalk (Twelve Tone Systems), without disregarding any of the others that exist on the market. Again the choice will depend on the taste of each user. The choice of computer can also be decisive because if you are using a Mac, the choice would be Logic, as their last versions are available only for this operating system and not for PC. If you use PC, Cubase is the leading brand for Microsoft's operating systems, as it is intuitive and easy to use from the beginning. Cakewalk is slightly less complete than the previous ones, but nowadays all the tools used in computer music are of a very high quality.

The program sequencers are essentially multi-track recorders. This means that they can record one or more tracks at the same time and then add on more tracks according to our needs. For example, we can record a percussional drum base first and afterwards add a

bass, a piano, etc. until we have orchestrated the theme that we are composing.

What we see when we open one of these programs is a screen on which we have the information about each track on the left, and on the right, a work area in which a series of boxes representing data are positioned. This data can take various forms:
-AUDIO tracks, which are "pieces" of music that we are recording in the sequencer, or that we import from a previous recording.

-MIDI data tracks, which record the MIDI data that we generate with our master controller.

-And then, depending on each sequencer, there are a whole lot of different types of tracks that can be used for effects, for virtual instruments, etc.

The sequencers also carry the typical VCR controls: PLAY, STOP, FAST FORWARD and FAST REVERSE, and the RECORDING button. Generally, in order to go to the beginning of the theme, you have to push the STOP button twice. Although we authors tend to be lax in doing this, it is incredible how reading the instruction manual actually helps one to understand how to work the sequencer. This is one of those times when it is really worth the time spent (to read this book is another of those rare occasions).

G. Notation software

Another one of the great advantages of using MIDI is when you transcribe the music on to paper, or create a music score (whether it is for registration or for distribution within your group, band or orchestra).

If you have had to write it by hand on occasions, you will certainly jump with joy with this revelation. There is no longer any need! Now you can play whatever you want to transcribe on your favourite instrument (OK, on your favourite MIDI driver) and notation software will take care of it.

The majority of sequencer programs tend to have a part that undertakes writing the scores, and some are really very professional. Although specialized programs in musical notation also exist, such as Sibelius (Sibelius Software) or Finale (Make Music), which can carry out this matter independently. Of course, all of these allow us to connect with our master controller in order to write while, at the same time, we are playing the piece that we want to transcribe to a score. One point concerning this subject is that we should not believe that the system is perfect, because when we play we send much more information than the programs can use, and we should always filter the data and correct the score. Even so, with patience and experience,

we will learn to prepare authentically professional scores.