

## All you wanted to know about MIDI

MIDI stands for Musical Instrument Digital Interface. It is a system designed for connecting musical instruments, sequencers, drum machines, computers and so on.

It is a digital system which means that it is based on a series of numbers, codes that tell the instrument or machine what notes to play etc. For more information on the codes see MIDI messages.

MIDI does not provide any sound capability in itself. All sound is produced by the receiving instrument and the MIDI messages simply tell the instrument which notes to play. A MIDI adapter therefore cannot produce any sound itself, only transmit the MIDI messages from the PC to your MIDI instrument.

MIDI is essentially a type of serial interface. For more information on this topic see MIDI hardware.

### Connections

To connect two MIDI instruments you must use two MIDI cables to be able to send and receive. Connect OUT on one to IN on the other and IN on the first to OUT on the other.

If you have more than one piece of MIDI equipment it will not be long before you are wrestling with the best way to connect them all. When connecting various MIDI devices you will probably have several options in the configuration you use. Which you choose will depend on the type of equipment and combination of MIDI sockets available.

If you want to drive several devices from one sequencer, for example, a MIDI thru box may be the easiest solution. Alternatively, if the device can echo to the MIDI out socket the data being received at the MIDI in socket, the devices could be daisy-chained. MIDI merge units are available that will combine two MIDI data streams, as are full blown software-based MIDI patch bays, although these are a much more expensive option.

### MIDI THRU BOX

A MIDI Thru box has one MIDI in socket and several MIDI out sockets. This enables a sequencer to send MIDI information to a number of different MIDI devices at the same time. The same effect can be achieved by using thru sockets on the receiving devices, if available, but the MIDI data stream can suffer delays as it is processed by each MIDI thru socket. The use of a thru box removes this problem.

### MIDI SWITCH BOX

A MIDI Switch box switches one MIDI connector to any one of a number of connectors on the other side. The connections are reversible and can be either "in to out" or "out to in". This enables MIDI devices to remain connected to a system and be switched in and out without continually plugging and unplugging cables.

## MIDI MERGE BOX

A MIDI merge unit has the ability to merge more than one MIDI data stream in real time. In order to do so this type of unit usually employs a microprocessor solution. This requires software in ROM and memory chips for buffering data which means that merge units are usually more expensive than thru and switch boxes.

### **MIDI software**

There is a very wide range of software available to process MIDI and music. What you choose should be determined by what you want to do. Most software will be installed from a CD or downloaded (legally) from the web. The web is a rich resource for freeware/shareware MIDI applications

When the software is installed the first task is to select MIDI drivers. There is usually a menu option for MIDI setup or MIDI drivers. On selecting this you are usually presented with a dialog box where you can select a driver for input and output. If no drivers are displayed on screen then the drivers for your MIDI devices are not installed properly.

### MIDI Drivers

Most MIDI devices that connect to a PC will come with an install CD with drivers to be installed. This is usually a simple process but essential if your device is to work.

### **MIDI hardware**

The MIDI standard employs a serial stream for transmission of data.

The protocol for this data stream is:

Baud rate    31.25k Baud

Data bits    8 bits

Stop bits    1 bit

Parity none

MIDI employs a 5ma current loop system for transmission of data and MIDI inputs are always (or should be) optoisolated. This is to avoid unwanted noise being introduced into the system.

### Cables

The cables are wired straight through (not mirrored). This means that any standard straight through audio type cable could be used although it is preferable to use proper MIDI cables. As with most serial type data transmission, long runs of cable should be avoided wherever possible. With screened twisted pair cable, MIDI data can be transmitted up to distances of 50 ft.

Standard connectors are used for MIDI and these are audio-type 5 pin DIN connectors. MIDI devices usually have one in socket and one out socket. There may also be a thru socket where the incoming data is transmitted on to other devices. The MIDI sockets normally use only pins 2, 4 and 5.

## **MIDI Messages**

MIDI messages are a series of codes sent to different instruments or computers that give instructions on what notes to play etc.

All MIDI data is in a digital form and is sent serially byte by byte. A MIDI message is made up of one, two or three bytes and the format of these bytes is discussed in more detail below.

The main types of message are :

- Channel messages

- System Exclusive messages

- System Real Time messages

- System Common messages

Channel messages actually comprise the note on/note off information sent on one or all MIDI channels. There are 16 MIDI channels available (0 - 15). These messages are the means of actually getting sound out of a synthesiser via MIDI and comprise a note on/note off status byte, the note number and velocity.

System Exclusive messages enable transfer of information stored in memory from one MIDI device to another. Such information may be sequence data, voice parameters or other synthesiser settings.

System Real Time messages, as the name implies, control the synchronisation of MIDI devices "making music" together.

System Common messages apply to all connected MIDI devices.

MIDI messages are made up of one, two or three 8 bit bytes per message. The first byte is a status byte and is usually followed by one or two data bytes. The status byte defines the type of message. A status byte always has the high bit set (in the range 128-255), whereas data bytes always have a high bit of 0 (in the range 0-127). Some devices employ running status for channel messages, where a status byte is not sent if the type of command or message is the same as the previous message. In this case the receiver needs to keep track of the last status byte received.

Refer to the MIDI specification for specific details of the various MIDI messages

## **MIDI and the PC**

To use MIDI on the PC you need to have installed a MIDI adapter. These used to mostly be expansion card that fitted inside the PC system unit but are commonly now USB adapters. The MIDI signals on a SoundBlaster type sound card are found on two pins on the 15-way D MIDI/joystick connector. These signals need converting to the MIDI spec. so an adapter that plugs in to the 15 way connector is required.

## MIDI files

A standard MIDI file is a file that contains sequencer information. Most programs now read and write standard MIDI files which means you can easily transfer sequencer data from one program to another.

The MIDI file standard does not at present cope with information specific to music notation programs but basic note information can be transferred between notation programs using MIDI files.

MIDI files contain one or more tracks of information with timing data for each event in the track. Tempo and time signature plus track names and other descriptive information can be included.

A MIDI file contains a file header plus one or more data tracks. There are 3 types of MIDI file: type 0, 1 and 2.

### Type 0

Most MIDI files you buy are type 0 and contain 1 multi-channel track.

### Type 1

Most software writes a type 1 file as standard containing one or more simultaneous sequencer tracks.

### Type 2

This appears to be little used and contains one or more sequentially independent single-track patterns.

## Conclusion

MIDI is great. It is just about the only real standard I know and provides endless hours on fun.

It is also a great means for getting your songs computerised and also as part of the recording process if you have the right software on your PC.

***Coming soon – setting up a home recording studio.***