LESSON
6

Introduction to Sequencing

After completing this lesson, you should be familiar with the following concepts:

- Sequencing is the art of building up a music performance part by part by recording MIDI performance data into a sequencer.
- Sequencers have many parts which are similar to DAWs, and many sequencer programs are actually integrated into DAW programs. Similar parts include tracks, arm/safe controls, and output assignments.
- MIDI signals come in and out of a computer via a MIDI interface which may have several sets of inputs and outputs called ports. Ports are typically named for the MIDI devices connected to them so that one can choose a particular device to send messages to easily from the sequencer software.
- Most sequencer programs allow the user to choose patches on the connected synthesizers right from the sequencing software.
- Users can record MIDI data as they perform it (real time entry) or enter the note data separately from the rhythmic data (step-time entry).
- DAWs mixer windows treat MIDI tracks just like audio tracks, the only difference being that the controls send out MIDI messages to the different devices.
- Channels can be shown or hidden in the mixer window of most DAW programs to keep visual confusion to a minimum.

Glossary for this Lesson:

Default Patch- The Column used to send program change messages to synthesizers and other MIDI devices connected to the computer. In More sophisticated programs, you can choose patches by name.

Hide- You can choose not to see (hide) channels in the mixer window so that you can just see the tracks you are currently working with. This speeds up your work terrifically.

MIDI Activity Light- A MIDI activity light blinks whenever a MIDI message comes in or goes out.

MIDI IN Light-A MIDI IN activity light blinks on once each time a MIDI message comes in the IN jack it is associated with.

MIDI Interface- A MIDI interface is a box which allows MIDI devices to connect to your computer. More sophisticated MIDI interfaces have many ports, while simpler ones have only one or two.

MIDI Out Light- The MIDI OUT activity light blinks on once each time a MIDI message goes out a particular OUT jack on a MIDI interface.

Port- A port is a set of MIDI IN and OUT jacks on a MIDI interface.

Real-time Entry- A method of entering performance data in which the sequencer acts like a tape recorder, recording MIDI messages in time as they come in.

Sequencer- A hardware device or software program which is capable of recording and editing MIDI data.

Sequencing- The art of recording different MIDI performances into a sequencer and causing them to play back together to create a complete musical performance.

Show - The opposite of hide (see above).

Step-time Entry- A method of entering MIDI data into a sequencer in which note data is entered separately from rhythmic data.

LESSON 6

Introduction to Sequencing

Sequencing is the art of building a musical arrangement part by part, usually from a keyboard controller. Learning to sequence well is like learning to play an entirely new musical instrument. It is an art which takes a lot of experience, practice, and a discerning ear. Before you can begin to practice sequencing to sharpen your skills, you need a basic understanding of the parts of a sequencer and what each part does.

Like a DAW, a sequencer can be a single, dedicated piece of hardware, or a program running on a computer which turns that computer into a sequencer. Many DAW programs have sequencer functions built into them. Some DAWs actually started as sequencing programs and the ability to record audio was added later.

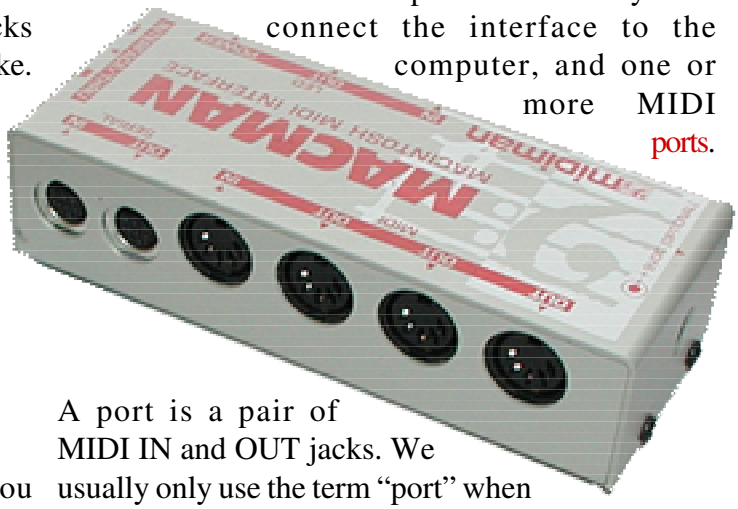
Anatomy Of A Sequencer

Sequencers have many of the same parts that DAW programs have. Sequencers use tracks just like DAW programs do. Unlike DAWs, MIDI tracks cannot hold the actual sounds that synthesizers make. Instead, a MIDI track in a sequencer holds different MIDI messages, including note on and off messages, controllers, and other messages. When you record on a particular track, the sequencer actually just makes a record of which notes you played and when you released them, how hard each note was played, etc. When you use the transport controls to stop the sequencer and start it playing back again, the sequencer will send out the same MIDI messages that it recorded.

When DAWs record audio at CD quality, a mono signal uses up 5MB of hard drive space per minute. Because there is much less data being recorded when MIDI signals are being stored, several hours of MIDI messages might only take up a few hundred kilobytes of hard drive space (less than 6 seconds worth of audio). Like DAWs, most sequencers allow you to have multiple takes on each track. You can freely copy, paste, cut, and duplicate these takes as you see fit.

In And Out

You may recall that when recording to an audio track on a DAW, you had to assign an audio input and output on the audio interface to each track so that sounds could be recorded from the interface, and could go back out through the right jack on the interface. MIDI tracks also require you to assign an input and an output on an interface, but MIDI uses its own special interface called a MIDI interface. MIDI interfaces have one port that allows you to connect the interface to the computer, and one or more MIDI ports.



A port is a pair of MIDI IN and OUT jacks. We usually only use the term "port" when talking about MIDI interfaces, however. Small MIDI interfaces like the ones shown on this page have only one input and one output while large MIDI interfaces might have up to 16 INs and 16 OUTs. Really fancy interfaces allow you to chain multiple interfaces together for a total of 128 INs and 128 OUTs!

Most MIDI interfaces, including the ones pictured above, have activity lights which help you

to make sure the interface is functioning properly. The power light just insures that the interface is getting power from the computer, or for a larger interface, that the power is switched on. The MIDI IN light flashes whenever a MIDI message comes into the IN port, and the MIDI OUT light flashes whenever a MIDI message is sent out by the computer. These lights are very helpful when it comes to troubleshooting problems in a studio. Larger MIDI interfaces with many ports usually offer a separate in and out light for every single port.

Most sequencer software packages allow you to name the different ports on a MIDI interface so that you can choose ports by the name of the device connected to them rather than by number. This is a very intuitive way to work, because when you want to connect to a device in your studio, you just choose that device from the output list, and the sequencer will send the output of that MIDI track to the device you selected. Below, you can see several MIDI tracks in a sequencer program. Each track's output is set to a particular MIDI device. At the same time we choose the device (thus choosing a port on the MIDI interface) we also get to choose which MIDI channel the track will transmit on. Some MIDI devices can only receive on one channel at a time, so the channel information is hidden on these devices, and you just have to choose their name. In the picture, the instrument "JP-8000" can only receive on one channel at a time, so its name is not followed with a channel number.

It is possible to change the output port of a track at any time, even after you have recorded MIDI data. This means that it is possible to change which instrument plays a particular part, and the part can be played with an entirely different sound.

Pick Your Poison

Almost every software sequencer on the market today allows the user to select patches on a synthesizer by using a menu in each track. The sequencer program sends out program change messages to the synthesizer or other MIDI device to tell it which patch to call up. More sophisticated programs keep track of the names of the patches which are currently loaded into the synthesizer and allow you to choose patches by name!

Remember that you can switch sounds at any time, because when you record on a MIDI track, you are not recording sounds, but merely data which represents your performance. This means that you can play in a part with one sound, and then switch to an entirely different sound later on.

Starting To Record

Here it is, the moment you've been waiting for: It is time to record your first MIDI track. There are several things you need to do to prepare the sequencer program to record your performance. First, you have to create a MIDI track using the mini-menu which is at the top of the tracks overview window. Then, you have to arm the track. Arming is done with the arm/safe controls, which function exactly like those used on audio tracks. When you arm a MIDI track, you connect your MIDI controller to whatever MIDI instrument is selected as the track's output. (This is a very useful thing, because you can instantly connect your main keyboard controller to any device in the studio by simply arming a track and selecting the right output.) So the next step is to select the device you wish to play from the output column. You also have to select a MIDI channel to transmit on if the device you choose is multitimbral.

One you have created the track, armed it, and set the output, you can use the default patch column. Depending upon the device you choose and the sequencer you are using, you will see either a list of numbers from 0 to 127 representing the different sounds in the synthesizer's memory, or you will see the names of all of the sounds currently loaded into the synthesizer. Choose a sound which is close to what you are looking for, and click on record (or use a keyboard shortcut). The metronome will start click-

ing, and after a measure, you can begin playing along with it.

As you play, tiny lines will appear in the tracks overview window, representing the notes you played. The sequencer will continue to record until you have finished your performance. At this point, you can click on the stop button in the transport window, or you can press the space bar.

Rewind And Playback

Since sequencers don't use tape, there is no time wasted rewinding. However, you may need to press a button that takes you back to the beginning of the sequence. Other sequencers automatically return to the beginning of the sequence or a predetermined point whenever you press stop. To find out how the sequencer works, you just have to look at the counter. If it returned to measure 1 when you pressed stop, chances are it has auto-rewind. If the counter reads the same measure where you stopped, your sequencer doesn't have auto-rewind, or it has been disabled.

To play back your track, you just have to click on the play button or press the space bar. While the sequencer is playing back, it is actually just sending out MIDI messages which represent your performance.

Time To Step Out

The method of entering MIDI data we used above is called real-time entry, because performance information is entered in real time as it happens. Another method of entering MIDI information is step-time entry. In step time entry, note messages are entered separately from rhythmic information. In step time, you select the rhythmic value you want to enter, and its duration, and then you play the notes on the keyboard.

To enter performance data in step time, you must use the sequencer's step entry mode. Every sequencer functions slightly differently, but every program has a few things in common.

You select the rhythmic value of the current note from the possible values shown in the step entry window. (You can see this window below.) When you play notes on the keyboard, note data will be created in the track with whatever value is selected. For instance, if you selected the eighth note from the step entry window, regardless of how fast or slow you play in notes, they will all be perfectly even eighth notes when you play the track.

To record in step time, you must first select a track to record on by arming it, and then you must call up the step entry window (command-8 in Digital Performer). After selecting the first rhythmic value you wish to record, you simply play notes on your keyboard, changing rhythmic value wherever necessary, until you have entered the part in it's entirety.

Step entry mode is a very useful tool for entering parts which are too fast or too difficult to play in real time, or for rhythms that are very tricky to execute in real time.

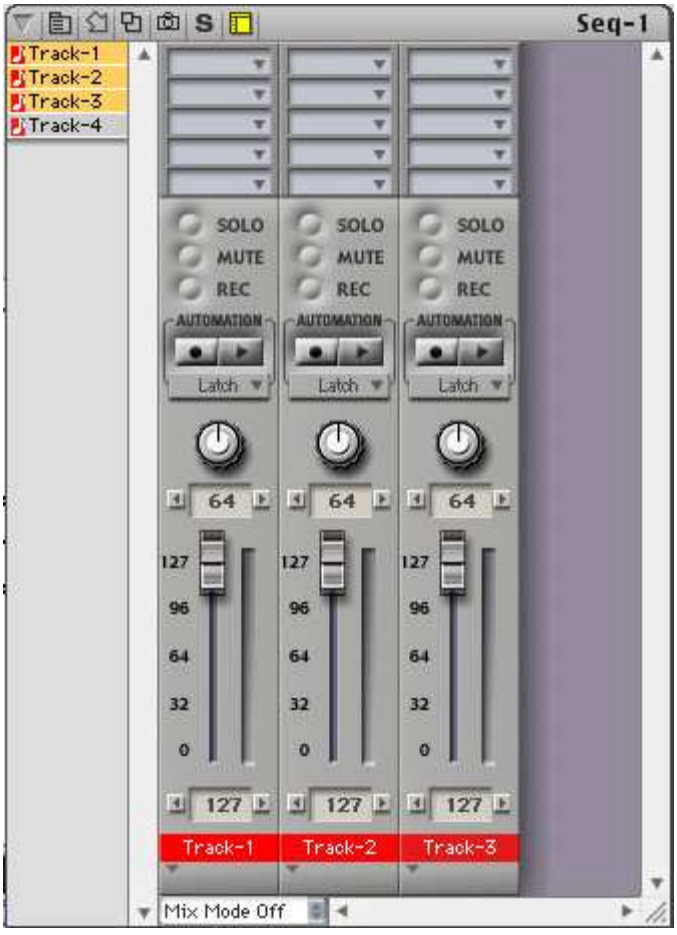
Other MIDI Messages

So far we have only recorded note messages, but it is possible to record many other kinds of MIDI messages as well. For instance, you can record continuous controller messages into a track so that you can record your pedaling, movements of the modulation wheel, etc. It is also possible to record volume and panning messages so that you can actually automate your mix.

Using The DAW's Mixer

As we learned in lesson four, a DAW's mixer is really a lot like a hardware mixer. DAWs typically show one channel in the mixer for each audio track. DAWs also show one channel in the mixer for every MIDI track. Instead of the level meter showing the actual volume of the sound a synthesizer is producing, the level meters jump up momentarily each time a note is played. The higher the note's velocity, the higher the meters go.

DAWs send out continuous controller message #7 when you move the faders up and down. This is important to remember, because a few older synthesizers don't respond to incoming volume messages. You could move the slider up and down until you are blue in the face, and there will be no change in the volume. You can also use the pan knobs to send pan messages. However, many synthesizers (including several currently in production) have only a single output, so they can't respond to incoming pan messages. For the most part, most synthesizers you deal with will respond to both volume and pan messages, so there should be no problem.



The beautiful thing about using a DAW's mixer is that you can control the volume levels of many different synthesizers without ever having to get up from your chair. It is also possible to move the DAW mixer's faders and pan knobs while you are recording, and you can create volume and pan messages in the tracks this way. When you go to play the track back, the faders and pan knobs will even appear to move on the screen.

As you begin to add more and more MIDI tracks, you may find that all of the channels in the mixer window don't fit on the screen anymore. Of course, you could scroll from side to side, but with many tracks, it can be difficult to locate the one you are looking for. A better option is to show and hide tracks. Many DAWs provide a list of all tracks at the left side of the mixer window. When a track's name is highlighted, its channel is shown in the mixer window. When its name isn't highlighted, the channel temporarily disappears from the mixer window. This is a helpful feature, because you can hide the tracks you aren't using currently, while seeing only the tracks you need. You can see a track list on the left side of this page. You can see that one track, "track-4" is currently hidden.

Practice Makes Perfect

As we learned at the beginning of this lesson, sequencing is an art which takes many many years of practice to master. In the coming weeks, it is very important for you to practice sequencing as much as you can so that you can gain as much skill and experience as possible before working on your final project for *Basic Music Technology II*. Sequencing will be a very important part of your final project because you can sequence any parts you want. This frees you from depending on finding musicians who are both willing and capable of performing the necessary parts for your project and opens the door to many new and wonderful musical possibilities.

Let's Review

1. What is sequencing, and why is it important? How will it help us later on, and what do you have to do to get good at it?

2. What is similar between sequencer and DAW programs, and what is different?

3. What is real-time recording, and what are the steps you need to follow to make a real-time MIDI recording?

4. What is step-time recording, and what are the steps you need to follow to make a step-time MIDI recording? What are the advantages and disadvantages of making a step-time recording?

5. What is auto-rewind, and do all sequencers offer this feature?

6. Besides note messages, what other kinds of MIDI messages can you record in a MIDI track?

7. How can the DAW's mixer help us when we are working with MIDI tracks? How do you show and hide channels in the mixer window, and when would you want to do this?

Words To know:

Default Patch
Hide
MIDI Activity Light
MIDI IN Light
MIDI Interface
MIDI Out Light
Port
Real-time Entry
Sequencer
Sequencing
Show
Step-time Entry

QUICK HISTORY

MIDI sequencers started as hardware devices. The earliest sequencers from companies like Roland and Sequential Circuits only allowed you to input notes in step time. You couldn't play the notes on a keyboard, however. You had to actually type in the note's name and octave, as well as other performance information about the note such as whether the note was to be played legato or staccato, accented or not. Some sequencers lost their memory every time they were turned off, so it was important to get your sequences recorded to tape by the end of your session. Other sequencers allowed you to save your sequences, but they didn't have disk drives, so you would have to connect a tape recorder to special outputs which stored the data on tape using special tones.

Experiments:

1. Look at several different MIDI interfaces and identify their ports. How many ports does each one have? Can you find the activity lights on each interface?

2. Create a MIDI track in your DAW/sequencer software, and arm it. Try switching the device in the output column to connect your controller keyboard to those different devices. How could this save you a lot of time in a studio with many different MIDI instruments?

3. Try making a brief real-time recording. Is it difficult to stay in time with the sequencer's metronome? Why do you think the sequencer always provides a metronome click?

4. Determine whether the sequencer you are using has auto rewind, and if it does, how you can deactivate it. What do you have to do to rewind to the beginning in sequencers which do not have auto rewind?

5. Using your sequencer's step-time entry mode, enter a drum part which would be difficult for you to play in real time.

6. After recording a few different tracks, use the DAW's mixer to control the volume level of these different tracks. Try out the pan knobs as well.

7. Try showing and hiding different tracks in the mixer window.

More History...

Most sequencers are software programs today, but sequencers started out as hardware devices. The first sequencers were primitive devices which put out a series of voltages (usually 8-16 different voltages) which represented pitches. These voltages represented different notes, and by moving sliders or by turning knobs, the user could set the 8-16 notes which would play back over and over again.

As sequencers evolved, they could actually remember notes (sometimes as many as 100!) and users entered data in step time, but it still took many hours to enter what would take only minutes today using real time entry.

On the Web:

Here are some sites of different sequencer manufacturers. Every sequencing program is a little different, so it's important to learn about as many as you can!

http://www.motu.com/
http://www.emagic.de/
http://www.steinberg.net/
http://www.propellerheads.se/
http://www.cakewalk.com/
http://www.sonicfoundry.com/
http://www.digidesign.com/
http://www.rolandus.com/