LESSON
12 A Taste of Programming

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

- Programming is the art of creating a new patch or modifying an existing one. More often than not, programming is accomplished by selecting a patch which is already close to the sound you want and then modifying that patch.
- Synthesizers with many front panel controls are easier to program than synths with fewer front panel controls.
- Cutoff frequency is one of the most common front panel controls, and is a very important tool in shaping synthesizer sounds. It determines the brightness of the sound. It is commonly changed throughout a song.
- Resonance adds a whistling effect to a filter's sound, and is a common synthesizer sound. Its setting generally doesn't change throughout a song like cutoff frequency does.

Glossary for this Lesson:

Attack - The amount of time it takes the cutoff frequency to reach its highest point or the amount of time it takes the patch to reach its loudest volume.

Cutoff - Another name for the filter cutoff frequency control.

Decay - The amount of time it takes the cutoff frequency to descend from its highest point to the sustain level or the amount of time it takes the patch to descend from its loudest volume to the sustain level.

Emphasis - Another name for resonance. The emphasis label is found on Moog synthesizers.

Fc - The abbreviation used in scientific equations to represent the filter's cutoff frequency.

Filter Cutoff Frequency- The frequency at which the filter begins to attenuate frequencies. The specific frequencies which are attenuated are determined by the type of filter in question.

Filter Sweep - The act of taking the filter's cutoff frequency through its full range of values. This is typically performed with resonant lowpass filters of the 2- or 4- pole variety.

Frequency - Yet another common label for the filter's cutoff frequency control.

Programming - The art of creating and modifying synthesizer patches.

Q - The abbreviation used in scientific equations to represent the filter's resonance setting.

Regeneration- Yet another label for a filter's resonance control.

Release- The amount of time it takes the cutoff frequency to return to its initial setting after a key is released or the amount of time it takes the patch to descend from its sustain volume to silence after a key is released.

Resonance- A peak in a filter's response, centered at the Fc which causes the filter to accentuate frequencies which are near the cutoff frequency. The result is a whistling, familiar sound.

Save- A common alternate label for the write button on synthesizers.

Sustain- The level at which the filter's cutoff frequency remains while a key is being held down, or the volume level at which the patch remains while a key is being held down.

Write- A synthesizer button which allows users to permanently store their changes to patches in designated locations in memory. Writing a patch to memory will permanently erase the patch previously stored in this location. If changes are made to a patch, but the patch is not stored again before the patch is changed or the synthesizer is turned off, changes will be lost forever.

The End Is In Sight

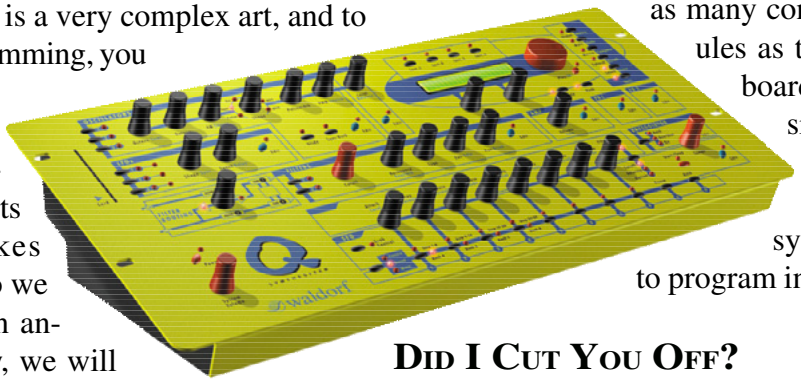
Although this is the final lesson in this book, there is still much to be learned about music technology. For more information, check out "Things to Come" page 68. While this book doesn't prepare students for advanced studies into the world of music technology, it has provided students with a great base of knowledge from which they can expand. Be sure to check out *Basic Music Technology II*, which introduces students to the art of recording sound. After completing this second course in music technology, there are a variety of different courses available to them.

LESSON 12

A Taste of Programming

What Is Programming?

Although the word programming is used different ways when talking about synthesizers, programming is usually creating a new sound on a synthesizer. Programming is a very complex art, and to fully understand programming, you have to understand what all the parts of the synthesizer do. Learning about all of the parts of a synthesizer takes months and months, so we will talk about them in another book. Right now, we will look at some of the most basic synthesizer programming controls that are the easiest to get at.



Almost every time you create a sound, you don't start from scratch. Most of the time, you find a sound that is very similar to what you are trying to create, and then change that sound slightly. For the purposes of this lesson, we won't try to create any particular sound. Instead we'll find out how to identify the controls that allow you to make new sounds and what some of the more common controls do.

Friendly And Unfriendly Synths

Some synthesizers are just begging to be programmed. They are easy to use and provide instant gratification. Some synthesizers are extremely difficult to program. It is important to be able to tell which instruments are easy to program, and which are trickier. One big clue is the number of controls the instrument has. If a synth is covered with buttons, knobs, and sliders, chances are that it will be easy to program. (See the yellow Waldorf Q synthesizer above) On the other hand, a unit with few controls will be significantly tougher to deal with. (Look at the Roland Phantom below.)

To save space, many manufacturers don't put as many controls on tone modules as they do on the keyboard version of synthesizers. Although this has gotten better in recent times, many synths are still harder to program in tone module form.

Did I Cut You Off?

The single most common control on any synthesizer is filter cutoff frequency. Filter cutoff controls are sometimes labeled cutoff, frequency, or by their scientific abbreviation, Fc. The cutoff control gives a very distinct synthesizer sound when changed. Filter cutoff controls are usually either knobs or faders. As the cutoff is turned up, the sound will become brighter, and perhaps more buzzy. As the cutoff is decreased, the sound will become more mellow. By constantly changing the cutoff setting, it is possible to create one of the most popular synthesizer effects of all time: the filter sweep. You can create a filter sweep by changing the cutoff frequency from its lowest setting to its highest setting, or from its highest setting to its lowest setting.

Another common control on synthesizers is resonance. Resonance controls are sometimes also labeled regeneration, emphasis, or by their scientific abbreviation, Q. When resonance is turned all the way down, it has no effect on the sound. Turn it up, and the synthesizer will make sparkling, whistling sounds as you change the cutoff control. The cutoff control is frequently moved up and down the whole time you are playing a part, but the resonance control is usually left in one place. This is because moving the resonance control doesn't have the effect that changing the cutoff does.

Attack!

Another set of controls which are commonly found on synthesizers is a set of four knobs or sliders labeled Attack, Decay, Sustain, Release. There are often two sets of these controls. One set is commonly found near the cutoff control. The attack, decay, sustain, release controls (or ADSR for short) allow you to automatically move the cutoff control every time you play a key. The other set of ADSR controls is found near the synthesizer's amplifier controls. (Synthesizers don't have the kind of amplifier that can power speakers. This kind of amplifier just allows the synthesizer to change volume automatically every time you play a key.)

The attack, decay, sustain, and release controls near the cutoff knob allow you to automatically turn the cutoff knob up every time you play a key. The attack time determines how fast the cutoff knob gets turned up after you play a key (just like the attack control on a compressor or limiter). The decay control lets you set how long it takes to turn the cutoff down after it gets turned up all the way. The sustain control sets how high the cutoff will stay as long as you hold down a key, and the release control sets how long it takes for the cutoff knob to be turned all the way down after you let the key up. (This is just like the release control on a compressor.)

Seeing Double?

The second set of attack, decay, sustain, and release controls don't control the cutoff knob. Instead, they allow you to control the volume of the sound. The attack control determines how fast the patch's volume gets turned up when you play a key. The decay control determines how long it takes the volume to get turned down to the level it holds at. The sustain control sets how loud the patch will be while you are holding a key down. The release control sets how long it takes to turn down the volume of a sound after you let the key up.

Experimentation

For now, don't try to make new sounds on synthesizers which don't have a lot of controls on them. Digging through the menus on a synthesizer's tiny screen can be really confusing and frustrating (even for people who know what every part of a synthesizer does). Look for synths with a lot of knobs on them when you go to begin your experiments.

As you try out the synth, try the different knobs and faders. Try to locate the controls we learned about in this lesson, and try moving them while you are playing a note. You may need to play the note again after you adjust one of the controls, because some controls only work on the start of a note, and some controls only change the end of a note. You might also try switching to different patches on the synthesizer and trying the same controls. They may do slightly different things for different sounds.

Don't worry that you are making permanent changes to the synthesizer's sounds. In most cases, instruments have a special button labeled write or save. You have to actually push this button and then push several other buttons to save your work. (You shouldn't usually save a sound unless you own the synthesizer, because saving a sound erases another sound in memory.) To undo the changes you have made to a sound (assuming that you didn't save) all you usually have to do is switch to another sound. All of your changes instantly vanish, never to be heard again. This is also a good technique to remember if you accidentally make a change to a sound that you don't want and can't figure out how to undo it. Switch to the next highest or lowest sound, and then switch back to the sound you were working on.

Although we have only scratched the surface of the world of synthesizer programming, you now have the basic knowledge needed to customize sounds on a user-friendly instrument. Keep experimenting with controls, and find sounds that appeal to you. The more you experiment, the more fun you'll have!

Let's Review

1. What kinds of synthesziers are easiest to program and why?

2. What does the cutoff control do? What does the resonance control do? What are some other names for these controls?

3. What do the attack, decay, sustain, and release controls do?

4. Are your changes to sounds permanent? How can they be made permanent? How can you undo changes?

Words To know:

Attack
Cutoff
Decay
Emphasis
Fc
Filter Cutoff Frequency
Filter Sweep
Frequency
Programming
Q
Regeneration
Release
Resonance
Save
Sustain
Write

Experiments:

1. Try to find the cutoff control on several different instruments. Is it always in the same place? Is it always the same type of control (a knob, slider, etc.)? Is it always labeled the same way?

2. Move the cutoff control while playing a note. What happens? Have you heard this sound before?

3. Try to find the resonance control on several different instruments. Is it always in the same place? Is it always the same type of control (a knob, slider, etc.)? Is it always labeled the same way?

4. Set the resonance control about halfway up, and then change the cutoff frequency again. What has changed? Have you heard this sound before? See if you can create a filter sweep. What happens if you set the resonance too high?

5. Move the cutoff control while playing a note. What happens? Have you heard this sound before?

6. Try to locate the attack, decay, sustain, and release controls on several different instruments. Are they always in the same place? Are they always the same type of control?

7. Try changing the settings of the ADSR controls. Experiment with one control at a time so that you can hear what each control does. You may need to keep playing a key so that you can hear the patch change.