

**YAMAHA**

**Modifying  
Preset Voices**

**DX7** II·FD/D  
**DIGITAL PROGRAMMABLE ALGORITHM SYNTHESIZER**  
**SUPPLEMENTAL BOOKLET**

# Welcome

This is the first in a series of Supplemental Booklets designed to provide a practical guide to creating your own sounds on the DX7 II. It describes the processes by which you can modify any of the presets to improve or change them. Several specific examples are used to illustrate these procedures.

Section 1 presents a brief introduction to some of the major concepts of FM synthesis.

Section 2 describes the basic modification of different aspects of sound using selected presets.

For continuing information concerning the DX7 II FD/D, consult AfterTouch, the official publication of the Yamaha Users Group. Many advanced functions will be discussed in its pages in the coming months. There will also be information regarding the availability of other materials concerning more advanced applications. To receive a free copy of AfterTouch every month, send your request to AfterTouch, P.O. Box 7938, Northridge, CA 91327-7938. On your letter or postcard, be sure to indicate that you are the owner of a DX7 II FD/D.

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# 1

## Introduction

*One of the easiest ways to begin an exploration of FM voice programming is to modify existing voices. The preset voices found on the supplied ROM cartridge include a wide variety of sounds that illustrate programming techniques and provide a starting point from which you can create new sounds.*

*In this booklet, several of the voices on the ROM cartridge are modified in order to demonstrate FM programming. In most cases, a voice is enhanced by altering only one or two parameters. The step-by-step procedures for modifying these voices are included.*

## Preliminary Information

Before presenting these examples, a brief summary of the basic tonal characteristics affected by some of the major FM parameters is in order. This treatment is quite broad and without the depth required by a comprehensive study of FM programming. However, it does provide a general understanding of the effect various FM parameters have on the final sound.

All references to the buttons with which these parameters are accessed assume the DX7 II to be in Single Voice Edit Mode. This mode is entered from Performance mode by pressing the SINGLE VOICE MODE button followed by the EDIT button. If you are unfamiliar with any of the parameters or modes, please refer to the Supplemental Booklet "Voicing Parameter Reference Guide" for detailed explanations of these terms.

After modifying a preset, you may wish to save it in the internal memory or in a RAM cartridge. These procedures are presented in the Supplemental Booklet "Utility Parameter Reference Guide." Please refer to this booklet for the voice saving procedures.

## Vibrato/Tremolo

Vibrato is normally a slow, regular modulation of a note's pitch. Tremolo is a similar effect applied to the volume of a note. These expressive effects are reproduced using an LFO (Low Frequency Oscillator) to modulate a carrier's frequency or output level. These parameters are accessed by pressing the LFO button (#12).

## Envelopes

The way in which a sound begins, evolves, and ends is shaped by what is known as an envelope. For example, think of the difference between the sound of a note played by striking a piano key and the sound of a bowed violin string. The volume of the piano note peaks almost immediately and decays very slowly until the key is released. The violin sound reaches its peak more slowly and retains a high level as the bow moves across the string.

All acoustic instruments have characteristic envelopes which shape the volume, timbre, and even the pitch of each note. The envelope generator (EG) associated with each operator provides a means of closely simulating these envelopes in any DX7 II voice. By controlling an operator's output level over time, the EG of a carrier affects the shape of the volume envelope of a voice. The EG of a modulator affects the shape of the timbre envelope of a voice.

Each operator's EG is accessed by pressing the EG button (#9). The envelope is specified by four rates and four levels.

## Noise

DX7 II voices often use a bit of noise at the beginning of a sound to simulate the "breathy" quality of some instruments, such as flutes. This noise is usually generated by feeding the signal from a modulator back into itself. Each algorithm (except #32)

## Harmonic Content

includes one modulator or stack of modulators with a feedback path. If the level of this feedback signal is high, unpitched noise generally results. The absolute level of the feedback signal is determined by the output level of the modulator and the feedback level parameter. The feedback level parameter is accessed by pressing the ALGORITHM button (#7).

The timbre, or tone color, of a sound is determined by its harmonic spectrum. You may recall that any complex waveform can be distilled into a series of sine waves. This series is known as the harmonic spectrum. The component sine waves, known as partials, are identified by their frequencies and amplitudes. For a more detailed discussion of harmonic spectra, please refer to the Supplemental Booklet "The Acoustics of Microtuning."

By modulating the frequency of one operator with an audio range signal from another, a practically infinite variety of timbres can be reproduced by a single voice of the DX7 II. This is the heart of FM synthesis. The operator being modulated is called a carrier, and the modulating operator is called a modulator. The 32 available algorithms determine the precise configuration of carriers and modulators.

There are five basic concepts that affect timbre.

1. The ratio of the frequencies in a single carrier/modulator pair determines the frequencies of the partials in the resulting harmonic spectrum. It also influences the amplitude of each partial.
2. Only ratios of integers (or whole numbers) produce harmonic spectra in which the frequencies of the partials are integer multiples of the fundamental frequency. This type of spectrum is often called the harmonic series. Sounds consisting of the harmonic series have a clearly identifiable pitch.
3. The output level of the modulator in a single carrier/modulator pair determines which partials are audible. In essence, it provides a variable bandpass filter for the resulting sound.
4. The waveform of the signal modulating a carrier strongly affects the number of partials in the spectrum. This waveform is determined by the frequency and level relationships (as described above) between the modulators appearing in a stack above a carrier.
5. The overall timbre of a voice is determined by the simple combination of sounds produced by the operator stacks in the selected algorithm.

The operator parameters which determine the values described above are available by pressing the OSCILLATOR button (#8). The algorithm is selected in the display of the ALGORITHM button (#7).



# 2

## **Basic Modifications**

*This section presents the procedures used to make small modifications to various preset voices. The aspects of sound described in the previous section are modified individually so that you can become familiar with each one.*

# Modifying Vibrato

*LadyVox (ROM Bank 2 #10)*

## *Procedure*

Vibrato is one of the easiest musical aspects to alter in an FM voice. This is achieved by modifying the LFO parameters accessed by pressing the LFO button (#12).

The LadyVox preset (ROM Bank 2 #10) has a nice tonal quality, but the vibrato may sound too fast to suit you. The procedure that follows provides a step-by-step guide to reducing the vibrato rate and decreasing the delay time.

1. Call up the LadyVox preset (ROM Bank 2 #10) in Single Voice Mode.
2. Press the EDIT button.
3. Press the LFO button (#12).
4. Position the cursor at the Speed parameter. This parameter determines the vibrato rate.
5. Use the -1 button or the data entry slider to reduce the parameter value from 41 to 30.
6. Position the cursor at the Delay parameter. This parameter determines the time between the moment a key is pressed and the moment the vibrato begins. It is very useful in simulating the natural delay often used by musicians.
7. Use the -1 button or the data entry slider to reduce the parameter value from 76 to 56.
8. Position the cursor at the Pmd parameter. This parameter determines the potential strength or depth of the vibrato effect. This depth is also influenced by the Pms parameter displayed by the SENSITIVITY button (#11).
9. Use the -1 button or the data entry slider to reduce the parameter value from 39 to 30.

With even such a simple modification, the LadyVox voice may now sound more natural and subtle to you.

# Modifying Envelopes

*HarpStrum (ROM Bank 1 #11)*

As you may recall, envelopes are used to determine the “shape” of the volume and timbre of a sound over time. The DX7 II uses envelope generators (EGs) applied to the output levels of each operator to specify these shapes. The EG parameters for each operator are accessed by pressing the EG button (#9).

The HarpStrum preset (ROM Bank 1 #11) is an excellent harp sound. It uses two operator stacks of one carrier and two modulators each. The first stack, consisting of operators 1, 2, and 3, is delayed slightly in its attack with respect to the second stack. This is accomplished by specifying a rather slow Rate 1 (R1) in the EG of operator 1. The result is

a “double plucked” effect. This example removes the delay by increasing R1 in the EG of operator 1.

*Procedure*

1. Call up the HarpStrum preset (ROM Bank 1 #11) in Single Voice Mode.
2. Press the EDIT button.
3. Press the EG button (#9).
4. Press the OPERATOR SELECT button #1 (#1).
5. Position the cursor at the R1 parameter. This parameter determines the attack rate of the envelope for operator 1.
6. Use the +1 button or the data entry slider to increase the parameter value from 34 to 74.

The delayed attack of the first operator stack should now be gone.

## Modifying Noise

Noise is often used in DX7 II voices to simulate the sound of breath or an imperfect attack in a wind instrument. This is usually accomplished by setting the feedback level to its maximum value. You may recall that each algorithm includes a feedback path by which the signal from an operator (usually a modulator) is directed back to modulate itself or another modulator above it in a stack. The feedback level is controlled by the Fbl parameter accessed by the ALGORITHM button (#7).

*SongFlute (ROM Bank 1 #16)*

This voice produces a very pretty flute sound. If you play the keys with high velocity, you will notice that there is a moment of unpitched noise at the very beginning of each note. This noise is intended to simulate the sound of a flute player’s breath as loud notes are played. It is produced by setting the feedback level to its highest possible value. This is very easily modified to eliminate the noise if you wish to. The procedure below describes the process by which this is accomplished. It also provides some additional modifications to the SongFlute voice.

*Procedure*

1. Call up the SongFlute preset (ROM Bank 1 #16) in Single Voice Mode.
2. Press the EDIT button.
3. Press the ALGORITHM button (#7).
4. Position the cursor at the Fbl parameter. In this algorithm, the Fbl parameter determines the feedback level for operator 2.
5. Use the data entry slider to decrease the parameter value from 7 to 0.

The noise at the beginning of any note played with high velocity should now be gone.

## Modifying Harmonic Content

*MellowHorn (ROM Bank 1 #2)*

*Procedure*

While playing notes with high velocity on the keyboard, you may have noticed that applying aftertouch causes the pitch to bend down slightly and adds a rough quality to the sound. This can be eliminated by following the procedure below, which assumes that you are still in Edit mode.

1. Press the BC/MW/AT button (#25) until the After touch display appears.
2. Position the cursor at the Pbias parameter. This parameter determines the depth of the effect aftertouch will have on the pitch of notes played on the keyboard.
3. Use the +1 button or the data entry slider to increase the parameter value from -10 to +0.
4. Position the cursor at the Pmod parameter. This parameter determines the depth of the effect aftertouch will have on the vibrato of notes played on the keyboard as applied by the LFO.
5. Use the data entry slider to decrease the parameter value from 40 to 0.

Aftertouch should now have no effect on the sound.

Harmonic content refers to the specific sine waves that make up the harmonic spectrum of any sound. As you may recall, the timbre of any sound is determined by the frequencies and amplitudes of these component sine waves. By modifying these values for the sine waves in a harmonic spectrum, you can change the character of a sound in many ways.

Determining the harmonic content of a sound is one of the most fundamental aspects of FM synthesis. This example uses the MellowHorn preset (ROM Bank 1 #2) to illustrate the process by which the operator frequencies and output levels are modified to change the sound of the preset.

This preset uses Algorithm 2 to produce a mellow brass horn sound. In the following procedure, the frequency ratios of the operators are altered to produce a clarinet-like sound.

1. Call up the MellowHorn preset (ROM Bank 1 #2) in Single Voice Mode.
2. Press the EDIT button.
3. Press the PITCH BEND/PORTAMENTO button (#24) several times until the Random Pitch Depth display appears.
4. Use the -1 button or the data entry slider to decrease this parameter from 2 to 0. This will prevent slight random pitch shifts from occurring.

5. Press the ALGORITHM button (#7).
6. Position the cursor at the Fbl parameter. In this algorithm, the Fbl parameter determines the feedback level for operator 2.
7. Use the data entry slider to decrease the parameter value from 7 to 0. This will prevent a buzzy quality at high key velocities which is more characteristic of brass instruments.
8. Position the cursor at the Osc.sync parameter.
9. Press the -1 button to turn oscillator synchronization off. This will cause each note to sound a bit different from the others as they are played, simulating a human player's inevitable changes in embouchure and articulation.
10. Press the OSCILLATOR button (#8).
11. Press the OPERATOR SELECT button #2 (#2).
12. Position the cursor at the Coarse parameter.
13. Press the +1 button to increase the tuning value from 1.00 to 2.00.
14. Press the OPERATOR SELECT button #4 (#4).
15. Use the +1 button to increase the tuning value from 1.00 to 2.00.
16. Press the OPERATOR SELECT button #5 (#5).
17. Position the cursor at the Fine parameter.
18. Use the -1 button or the data entry slider to decrease the tuning value from 1.10 to 1.00.
19. Press the OPERATOR SELECT button #6 (#6).
20. Use the -1 button or the data entry slider to decrease the tuning value from 1.06 to 1.00.

The voice should now sound quite like a clarinet. Compare it with the original sound by pressing the EDIT/COMPARE button while still in Edit mode. Play some keys to hear the MellowHorn preset. Press the EDIT/COMPARE button again to hear the new clarinet voice.

## Notes

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