

YAMAHA

Realtime Parameter Change

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

Welcome

This Supplemental Booklet describes the musical potential of the Realtime Parameter Change functions of the DX7 II, and explains how to understand and program the parameters that unlock these musical possibilities.

Section 1 outlines the changing landscape of Realtime-Parameter-Change situations in the history of electronic musical instruments.

Section 2 describes the basic operations of the Realtime Parameter Change functions on the DX7 II.

Section 3 explains how to understand Realtime Parameter Change by exploring the factory-preset Performance memories of the DX7 II.

Section 4 provides a listing of Internal Performance Realtime Parameter Change data.

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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Introduction

Introduction

In the beginning was the knob—or the slider, or the ribbon controller, or the switch.

The earliest generations of synthesizers didn't have computer memories inside, so it was impossible to create a sound and store the settings that created it. On the other hand, earlier synthesizers did have front panels that were festooned with controls: knobs, sliders, switches, and the like. These controls were used to create the sounds—there was usually one control for each one of the variables in the unit. It was necessary to adjust each control until you created the sound you wanted; then, in order to retain the sound for later use, you had to make a drawing of the front panel that showed the settings of each one of the controls.

Obviously, it was hard to “save” a favorite patch in those earlier days. However, it was easy to play with a patch: All of the variables were represented by front-panel controls. In order to hear the sonic result of a new setting, all you had to do was move the knob (or slider) and listen.

The first generation of so-called “programmable” synthesizers—instruments such as the Prophet 5, the Jupiter 8, and the OB-X—also had front panels filled with knobs. It was still necessary to adjust each control to create the sound you wanted; however, to retain the sound, all you had to do was store it in the internal memory of the unit. The age of computers (actually, the age of microchips) had arrived in the world of synthesizers.

Gradually, the number of controls dropped, and the kinds of functions assigned to the remaining controls changed. Some of this was the result of market research: Many manufacturers noticed that their customers *did not* use the knobs and sliders very often: They created sounds with them, stored those sounds, and that was it. Also, controls were hardware items, and were therefore expensive. Given this situation, the synthesizer manufacturers can not be blamed for looking for ways to reduce the number of knobs on the front panel of a synthesizer.

These days, the variables are called “parameters,” and most synthesizers are designed to call up one parameter at a time. The idea seems to be that most musicians want to create sounds during “research” periods, and just want to be able to call up these sounds during performance.

With the DX7 II, both the “programming” and the “playing” approach are possible. In Performance mode, it is possible to program CS1 and CS2 to act as realtime controllers for specified FM Voice parameters. To understand how this works, read on.

2

Basics of Realtime Parameter Change

Definitions

Realtime Parameter Change is a feature that is programmed in the Performance mode of the DX7 II. It allows you to assign FM parameters to CS1 and CS2. CS1 and CS2 are the two continuous sliders located just to the right of the volume slider on the front panel of the DX7 II.

Using CS1 and CS2, it is possible to change the values of the selected parameters in real time as you play the DX7 II. In other words, you can make changes in the timbre of the sound as part of your performance.

How It Works

To hear how this works, enter the Performance Play mode and call up Internal Performance #2 (“Mallet Brass”) from the factory-supplied set. Play the DX7 II for a while, until you get familiar with the “Mallet Brass” sound. Now, as you continue to play, move CS1 up and down; notice how the timbre changes. Do the same with CS2, and notice how the attack of the sound changes. Both sets of changes are available to you in real time as you play.

Procedure

Now that you have an idea of what Realtime Parameter Change means, let's take a closer look at how it all works. Follow these steps:

1. Enter the Performance Play mode by pressing the **PERFORMANCE** button.
2. Select a Performance memory by pressing one of the number buttons (1~32).
3. Enter the Edit mode by pressing the **EDIT** button.
4. Press the **FS/CS** button (button #27) until you reach the “CS1” display:
5. Use the **CURSOR** buttons to position the cursor next to the “Select” parameter.
6. Use the **+1/-1** buttons or the data entry slider to scroll through some of the FM Voice parameters that can be assigned to CS1.

It may take you quite a while to scroll through all of the possibilities, since there are a total of 105 different FM Voice parameters available:

DATA ENTRY slider

highest position



- OP 6 Total level
- } OP 1
- OP 6 AMP. MOD. SENS
- } OP 1
- OP 6 Key velocity
- } OP 1
- OP 6 EG Level 4 (L4)
- } OP 1
- OP 6 EG Level 3 (L3)
- } OP 1
- OP 6 EG Level 2 (L2)
- } OP 1
- OP 6 EG Level 1 (L1)
- } OP 1
- OP 6 EG Rate 4 (R4)
- } OP 1
- OP 6 EG Rate 3 (R3)
- } OP 1
- OP 6 EG Rate 2 (R2)
- } OP 1



lowest position

- OP 6 EG Rate 1 (R1)
- } OP 1
- OP 6 OSC. detune
- } OP 1
- OP 6 Frequency fine
- } OP 1
- OP 6 Frequency coarse
- } OP 1
- Portamento time
- Pitch EG Level 4
- } Level 1
- Pitch EG Rate 4
- } Rate 1
- LFO AMD
- PMD
- PMS
- Delay
- Speed
- Wave
- Feedback level
- Algorithm
- Dual detune
- PAN select
- Output balance (A/B)
- Total volume
- No effect

Looking again at the “CS1” display, notice that there are two other parameters (labelled “A” and “B”), and that the value underneath each of these is either “on” or “off.” These allow you to turn the effect of CS1 (with its selected FM parameter) ON or OFF for Voice A or Voice B in the Performance. The same holds true for CS2.

Even though CS1 and CS2 are programmed in Performance mode, they are both assigned to control FM Voice parameters, so they are actually controlling some aspect of the Voice or Voices that make up the Performance. With both CS1 and CS2, you can decide whether the selected parameter will be controlled for Voice A only, Voice B only, or for both Voice A and Voice B.

By the way, CS1 and CS2 control Realtime Parameter Change ONLY in the Performance Play mode. In the Voice Play modes (Single, Dual, and Split), the two sliders have no effect. In the Edit modes (Performance Edit and Voice edit), CS2 becomes the Data Entry Slider, and CS1 becomes an A/B balance control (for the Dual and Split modes).

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Exploring Realtime Parameter Change

Exploration

One of the best ways to understand the possibilities of Realtime Parameter Change is to explore the uses of CS1 and CS2 in the factory preset Internal Performance memories. Let's start by taking a closer look at the Performance you played in Section 2, Internal Performance #2 ("Mallet Brass"). Follow these steps.

1. Enter the Performance Play mode by pressing the PERFORMANCE button.
2. Select Performance #2 ("Mallet Brass") by pressing number button 2.
3. Enter the Edit mode by pressing the EDIT button.
4. Press the FS/CS button (button #27) until you reach the "CS1" display:

CS 1	>Select	>A	>B
[30]	OP1 Frequency coarse	on	off

Notice that CS1 is set to control "OP1 Frequency coarse" for Voice A only.

5. Now press the FS/CS button once again to reach the "CS2" display:

CS 2	>Select	>A	>B
[31]	OP4 EG Rate 1 (R1)	off	on

Notice that CS2 is set to control "OP4 EG Rate 1" for Voice B only.

6. Now press the VOICE MODE button (button #28) until you access the "Voice Mode" display:

>Voice mode	Voice A	Voice B
dual	INT63	INT25

Notice that Voice A is "INT63," and that Voice B is "INT25."

In order to understand the effect that CS1 and CS2 will have in each Performance, it is necessary to know what Voices are involved. It is also important to know how each Voice is structured, in order to know how a change in a parameter value will affect the overall sound. The most important aspect of any Voice's structure—the foundation of that structure, in fact—is the algorithm used.

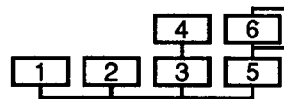
Therefore, to understand how Realtime Parameter Change works with Performance #2 (“Mallet Brass”), we need to look up the Voices involved, and make a note of the algorithms that form the foundation of each. Follow these steps:

1. Return to Performance Play mode by pressing the PERFORMANCE button.
2. Move into Single Voice mode by pressing the SINGLE button.
3. Use the number 1–32/33–64 button and the number buttons to call up Internal Voice #63 (“Xylo-Brass”).
4. Enter the Edit mode by pressing the EDIT button.
5. Press the Algorithm button (button #7). Looking beneath the “Alg” (algorithm) parameter, you see that “Xylo-Brass” uses algorithm #29. Make a note of this.
6. Return to Single Voice mode by pressing the SINGLE button.
7. Use the number 1–32/33–64 button and the number buttons to call up Internal Voice #25 (“MalletHorn”).
8. Enter the Edit mode by pressing the EDIT button.
9. Press the ALGORITHM button (button #7). Looking beneath the “Alg” (algorithm) parameter, you see that “MalletHorn” uses algorithm #18. Make a note of this also.

Analysis

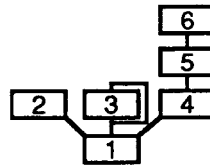
We now have the basic information we need to understand the effect that CS1 and CS2 will have in Internal Performance #2 (“Mallet Brass”):

CS1 is set to control the “OP1 Frequency coarse” of Voice A. Voice A, Internal Voice #63 (“Xylo-Brass”) is constructed using algorithm #29:



As you can see, OP1 is one of the carriers in algorithm #29; therefore, any change in the frequency of Operator #1 will have a direct effect on the basic frequency content of the sound. On the other hand, algorithm #29 has four carriers, so a change in Operator #1 will have a less striking effect than it would have if Operator #1 was one of two carriers (as in algorithm #1), or if Operator #1 was the only carrier (as in algorithm #16).

CS2 is set to control the “OP4 EG Rate 1” of Voice B. Voice B, Internal Voice #25 (“MalletHorn”) is constructed using algorithm #18:



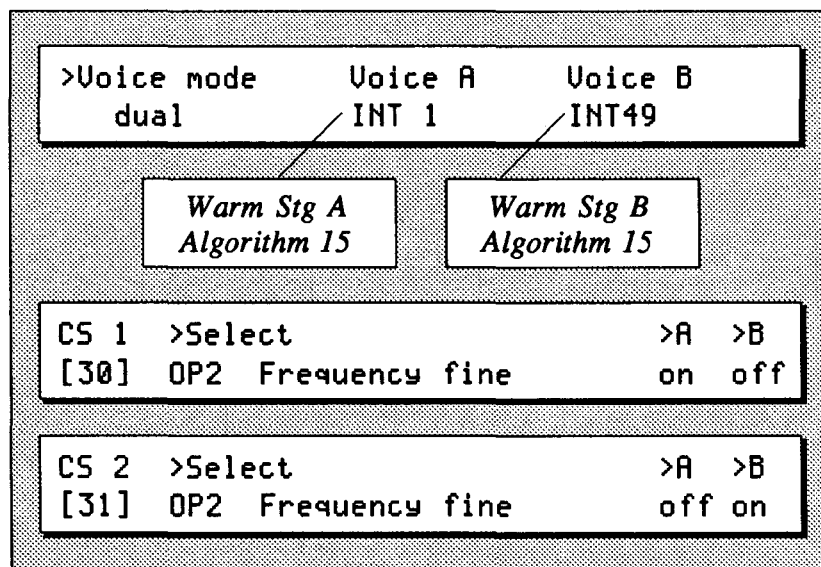
As you can see, OP4 is a modulator in algorithm #18. In fact, it is at the base of a stack of three modulators (Operators #4, #5, and #6). Any change in the EG Rate 1 of Operator #4 will change the time frame within which the timbral effect of the entire stack of modulators (Operators #4~6) can operate. And, since Operator #4 is at the base of a stack of three modulators, any change in its envelope will have a major effect on the timbral expression of the sound over time.

To have a full understanding of the sonic possibilities of Realtime Parameter Change, it is necessary to understand many of the subtleties of FM Voicing. For more information on this subject, consult the following DX7 II Supplemental Booklets: “Voicing Parameter Reference Guide,” “Modifying Preset Voices,” and “Creating New FM Voices.”

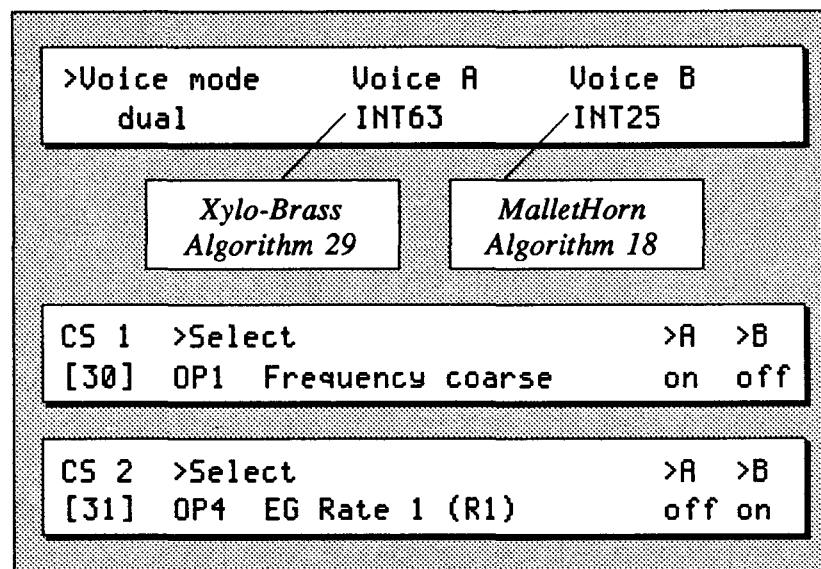
4

Realtime Parameter Change Data

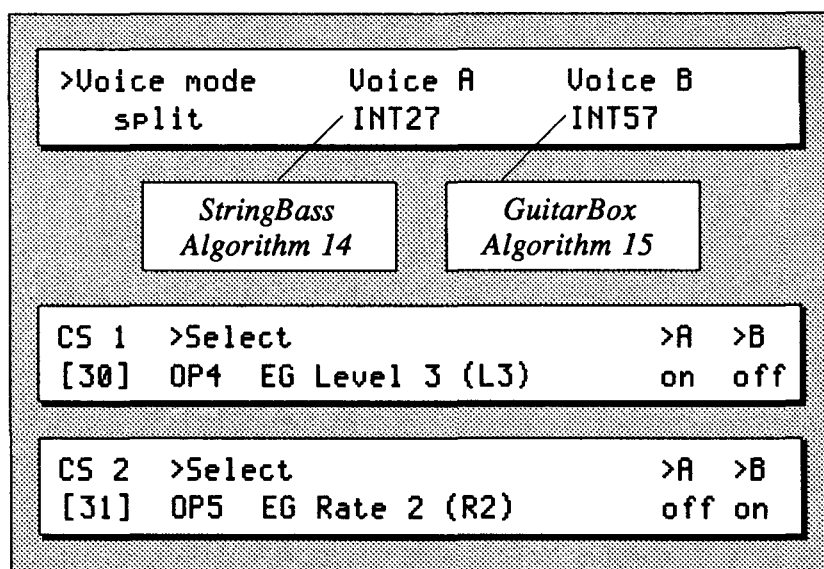
Performance 1
Warm String Section



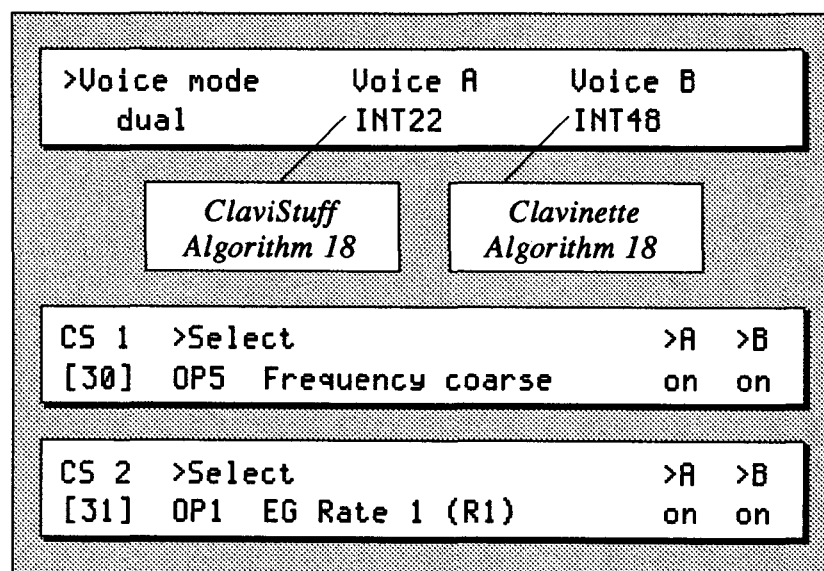
Performance 2
Mallet Brass



Performance 3
String Bass-Guitar



Performance 4
Dual Clavinette



Performance 5
Rich Grand Piano

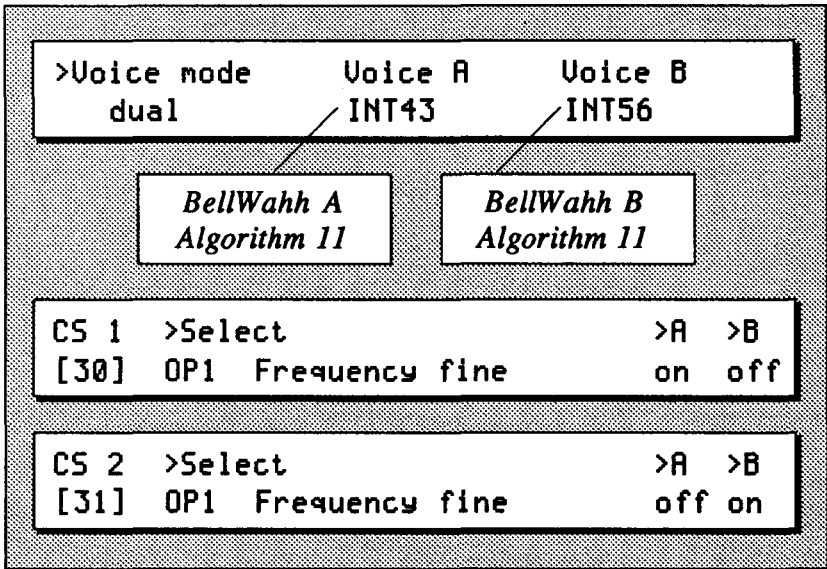
>Voice mode		Voice A	Voice B
single		INT 9	-----
<i>EbonyIvory</i> <i>Algorithm 7</i>		----- -----	
CS 1	>Select	>A	>B
[30]	OP6 Frequency coarse	on	on
CS 2	>Select	>A	>B
[31]	OP3 EG Rate 1 (R1)	on	on

Performance 6
Stereo ElectricPiano

>Voice mode		Voice A	Voice B
dual		INT50	INT62
<i>KnockRoad</i> <i>Algorithm 13</i>		<i>HardRoads</i> <i>Algorithm 12</i>	
CS 1	>Select	>A	>B
[30]	LFO Speed	on	on
CS 2	>Select	>A	>B
[31]	OP1 EG Rate 1 (R1)	on	on

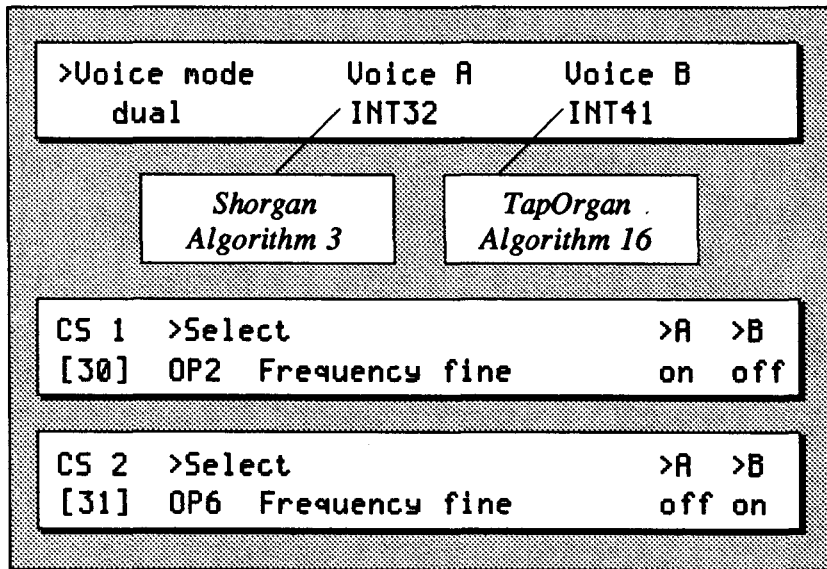
Performance 7

Tubular Bell Wah

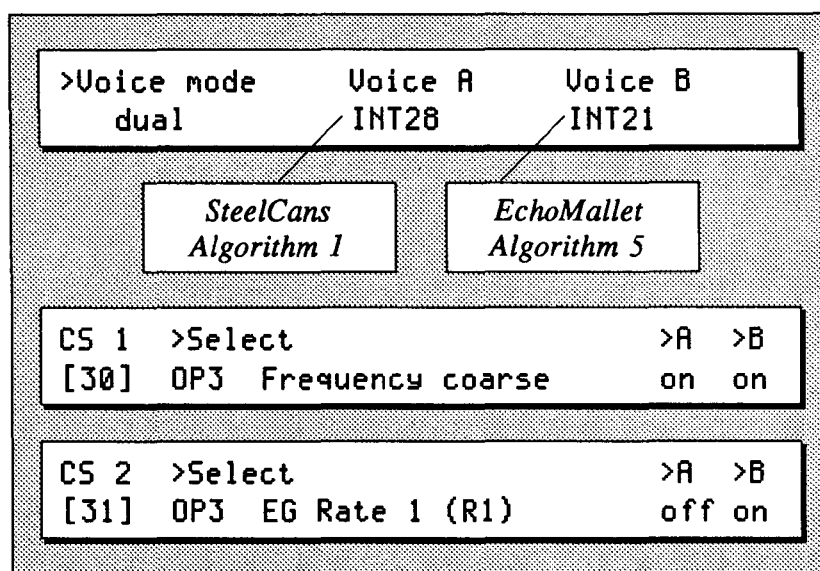


Performance 8

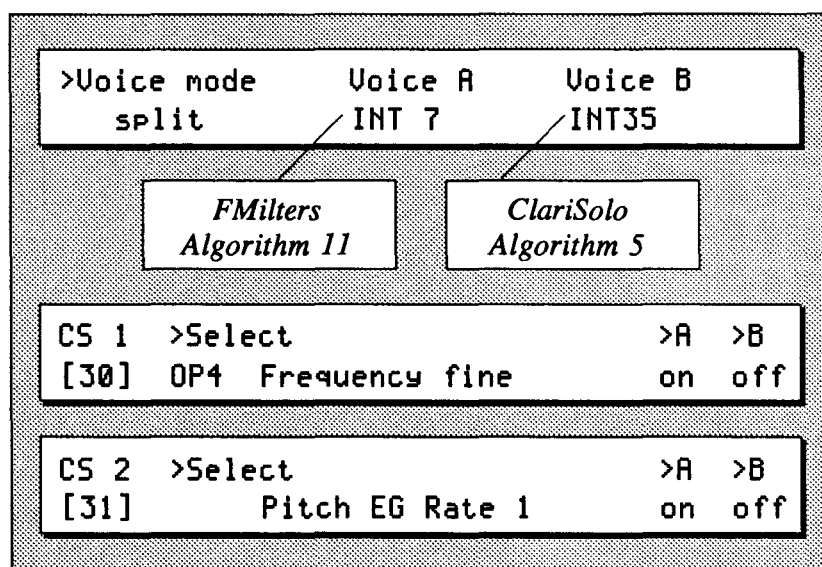
Electric Rock Organ



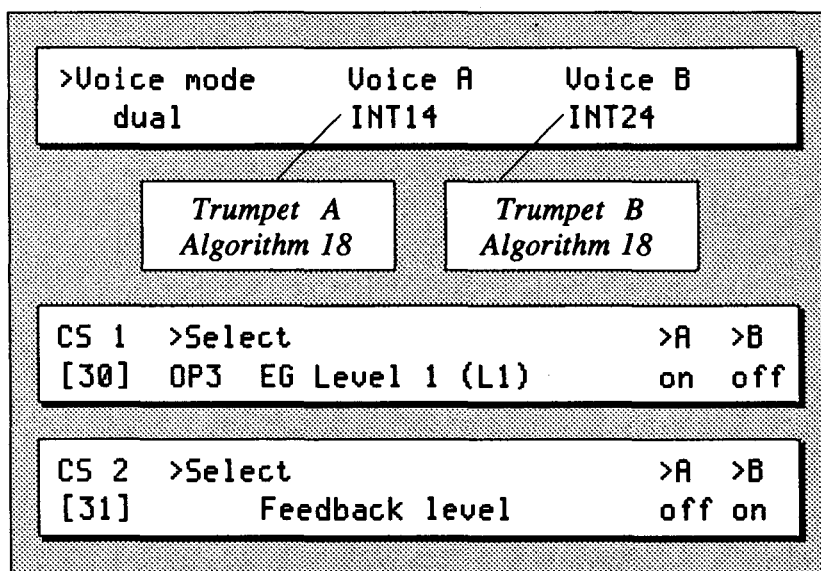
Performance 9
Jamaica Mallet Band



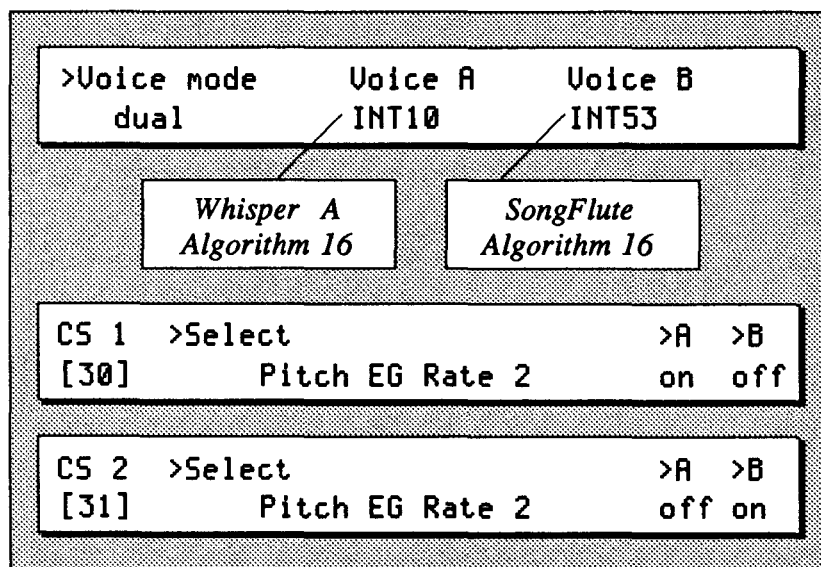
Performance 10
Mono Poly Synth



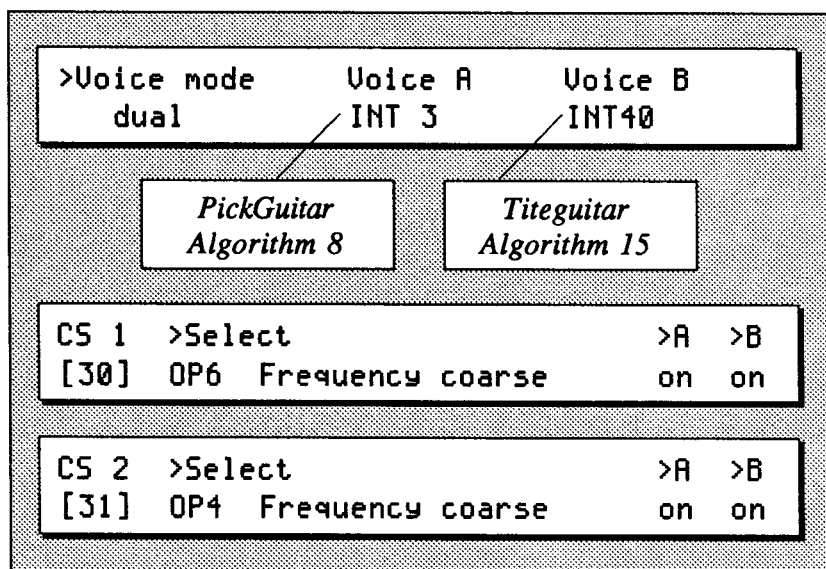
Performance 11
Dual Octave Trumpets



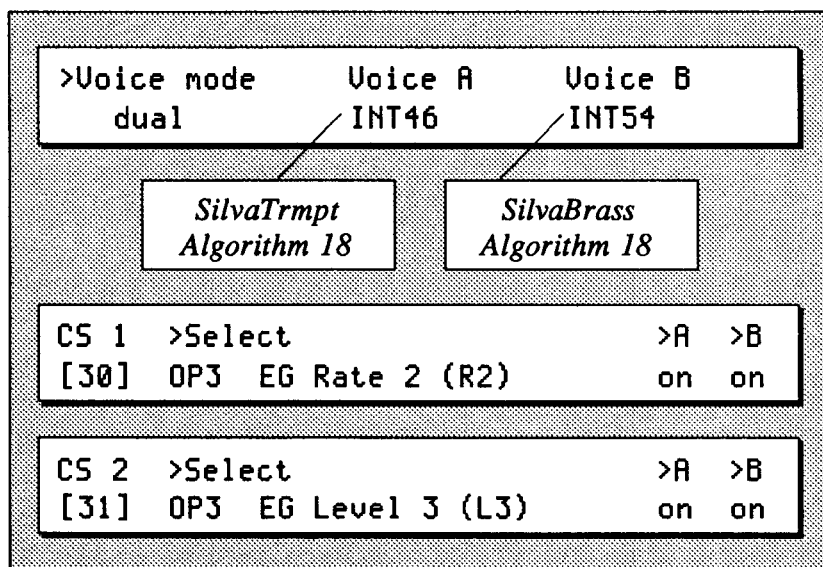
Performance 12
Angels



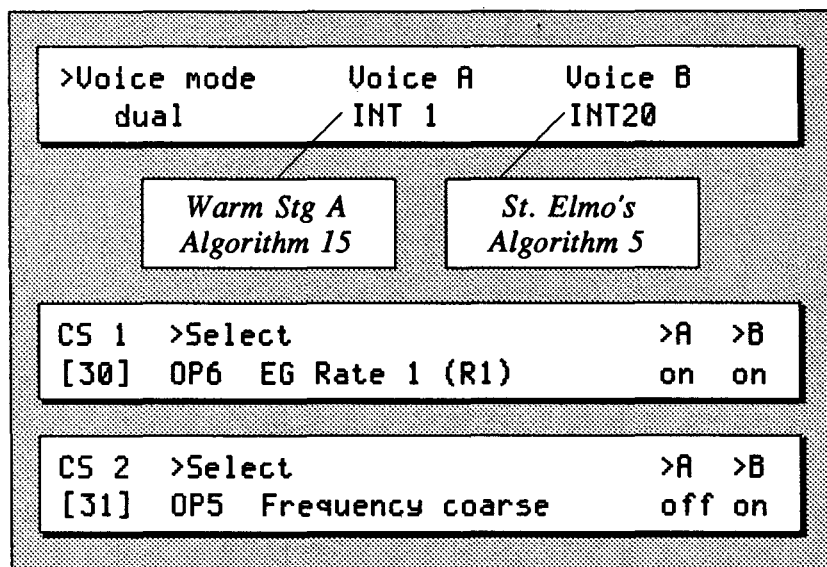
Performance 13
Acoustic PickGuitar



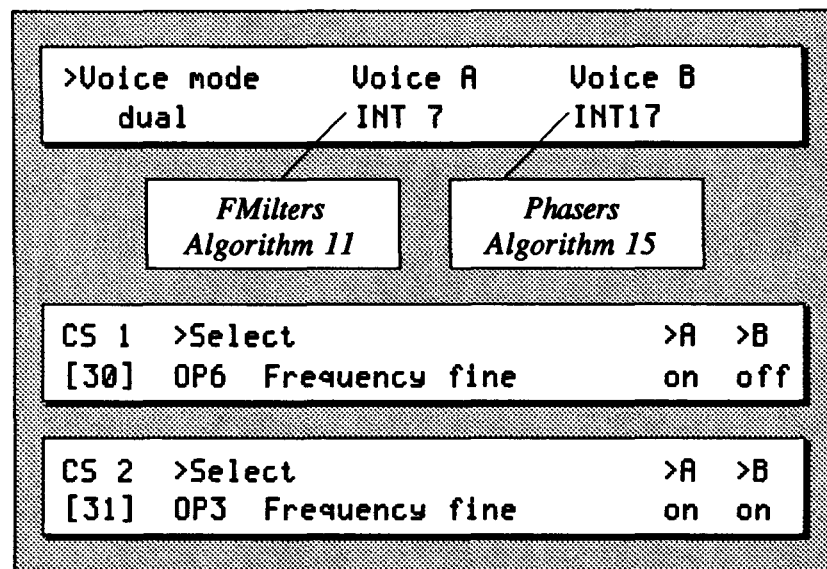
Performance 14
Multi Brass Ensemble



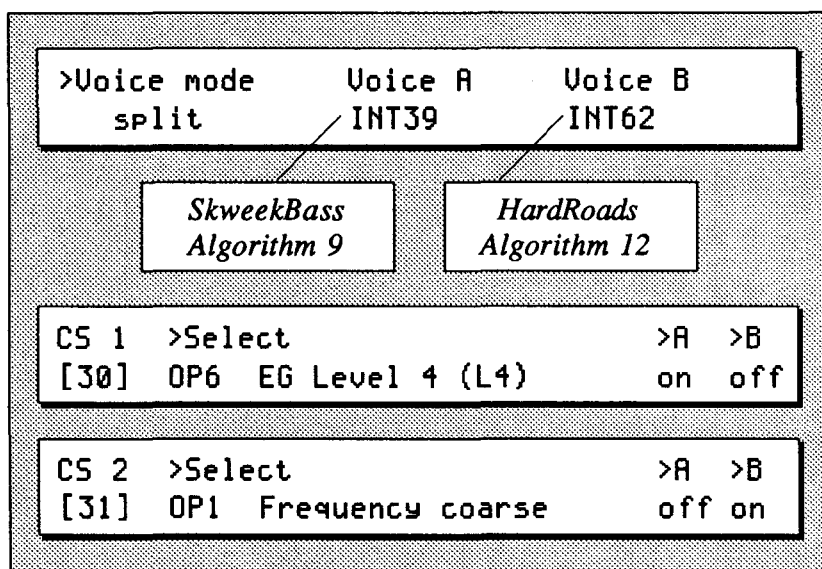
Performance 15
St. Elmos StringBell



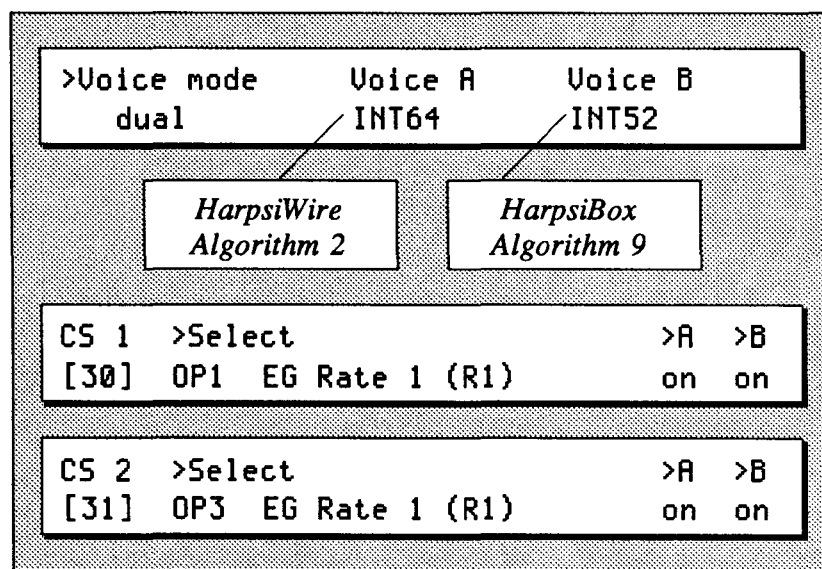
Performance 16
Phasars Whasars



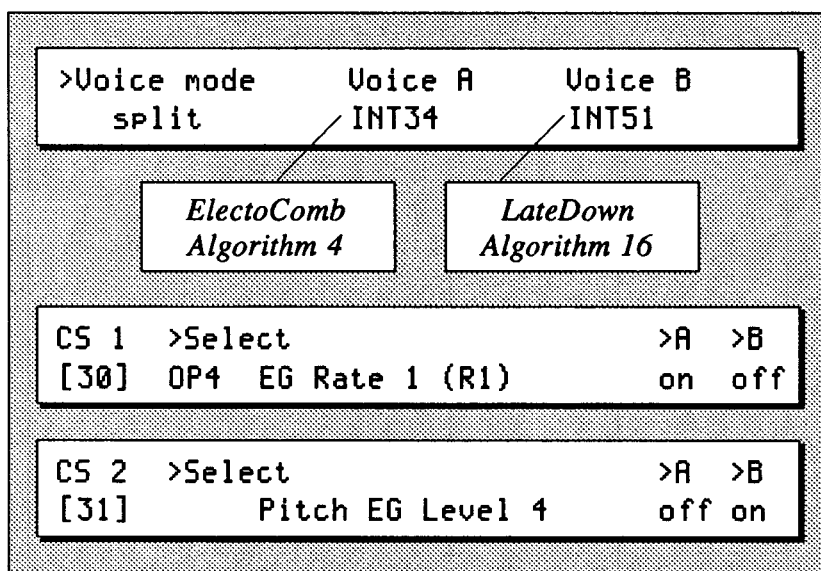
Performance 17
Bass Piano Split



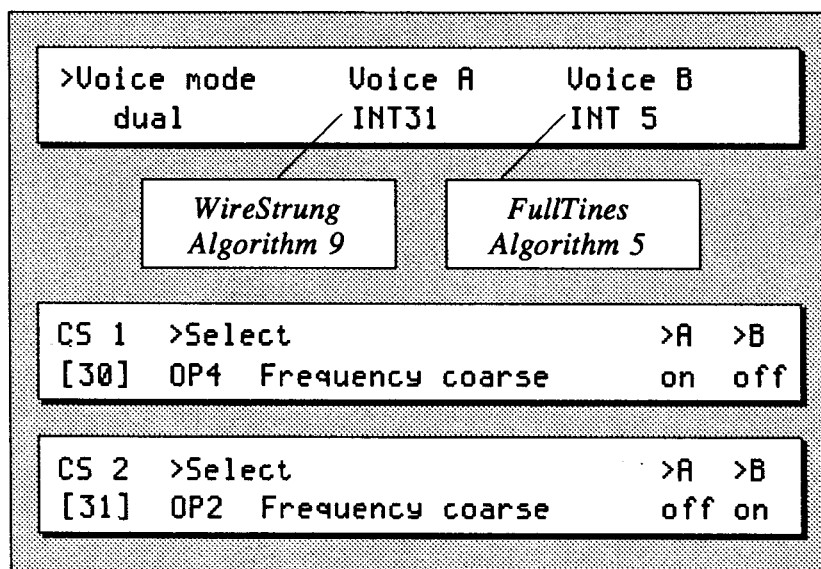
Performance 18
Grand Harpsichord



Performance 19
Sea Songs



Performance 20
FM WireStrung Piano



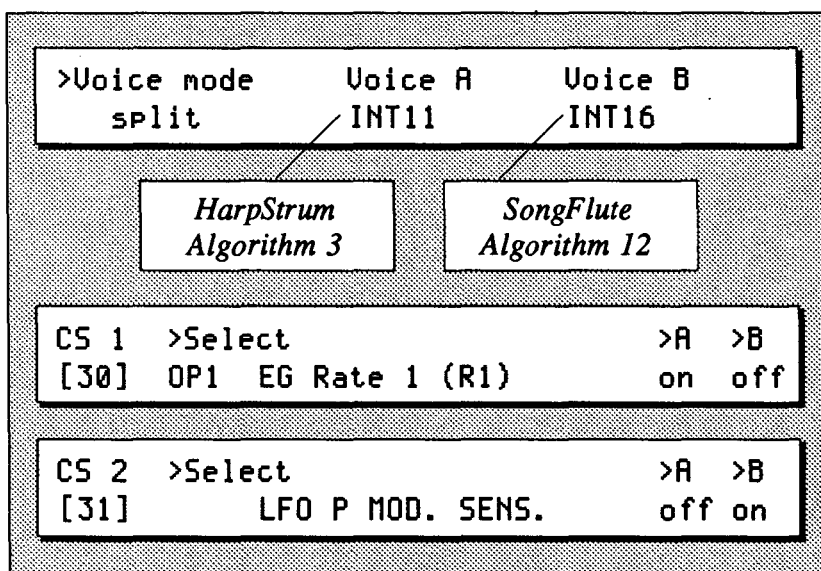
Performance 21
Cello Quartet

>Voice mode dual	Voice A INT44	Voice B INT60
<div style="border: 1px solid black; padding: 5px; display: inline-block; width: 45%;"> <i>EleCello A</i> <i>Algorithm 11</i> </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; width: 45%; margin-left: 10px;"> <i>EleCello B</i> <i>Algorithm 11</i> </div>		
CS 1 >Select [30] No effect		
CS 2 >Select [31] No effect		

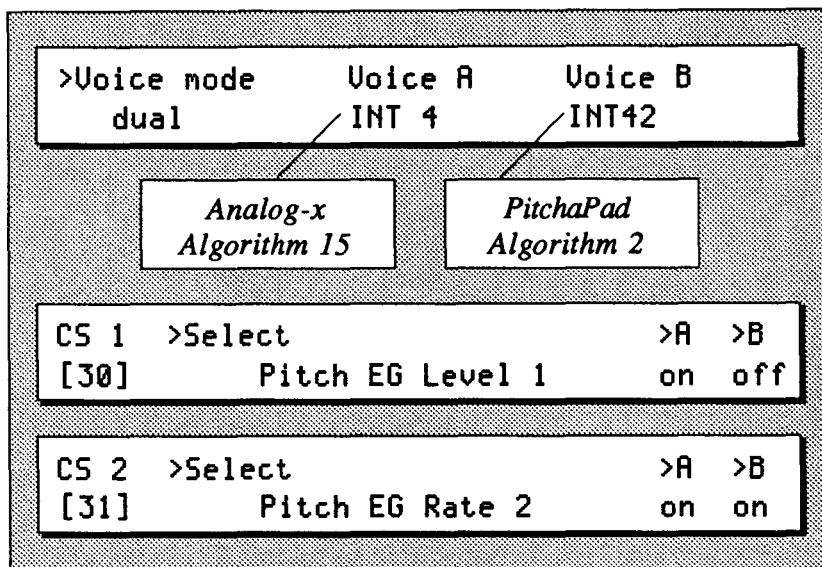
Performance 22
Touch Jazz Organ

>Voice mode single	Voice A INT12	Voice B -----
<div style="border: 1px solid black; padding: 5px; display: inline-block; width: 45%;"> <i>TouchOrgan</i> <i>Algorithm 6</i> </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; width: 45%; margin-left: 10px;"> ----- ----- ----- </div>		
CS 1 >Select [30] LFO Speed		
	>A	>B
	on	off
CS 2 >Select [31] OP5 EG Rate 3 (R3)		
	>A	>B
	on	on

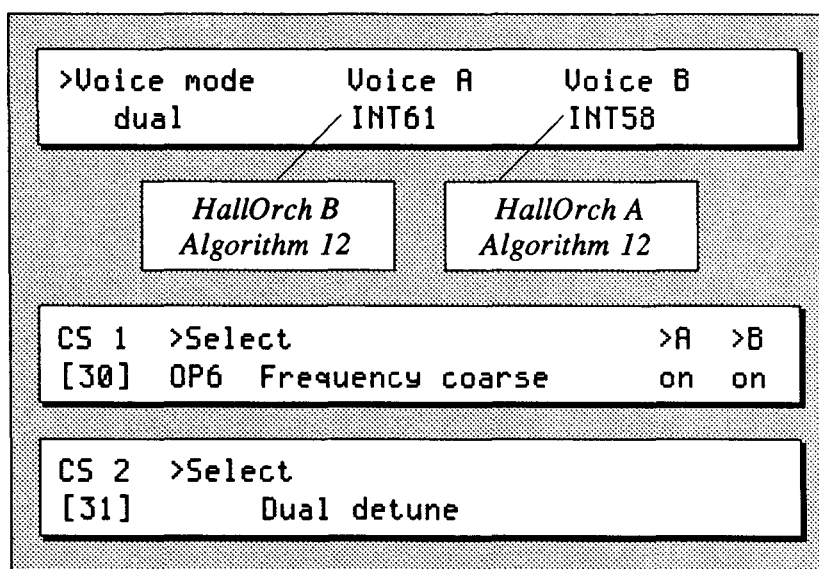
Performance 23
DoubleHarp-SongFlute



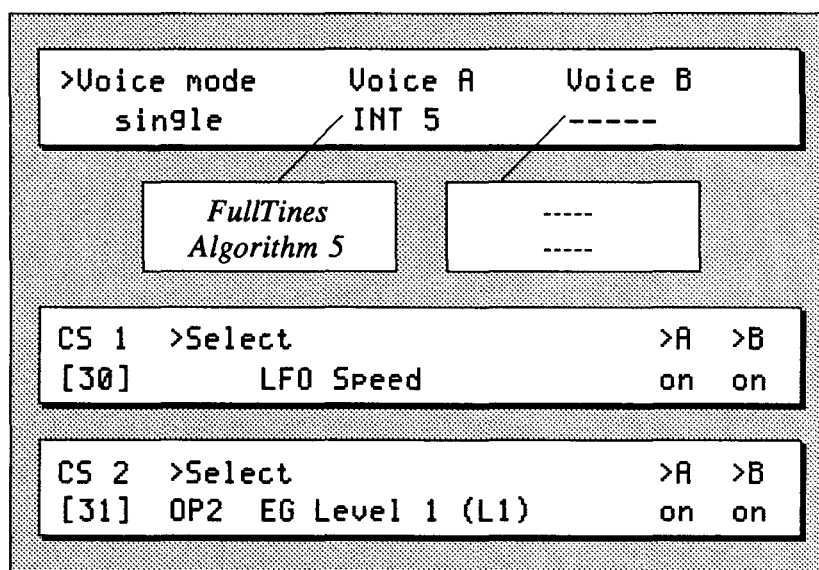
Performance 24
SynthBrass Ensemble



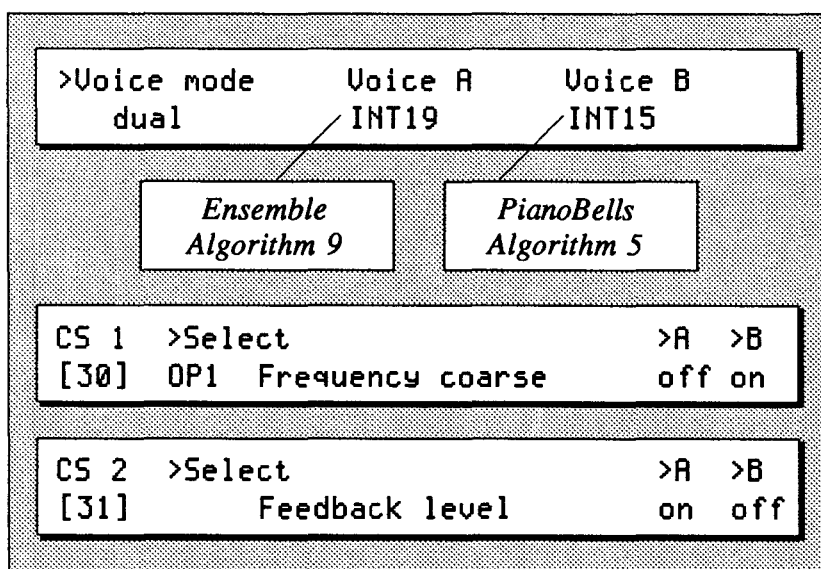
Performance 25
Orchestral Violins



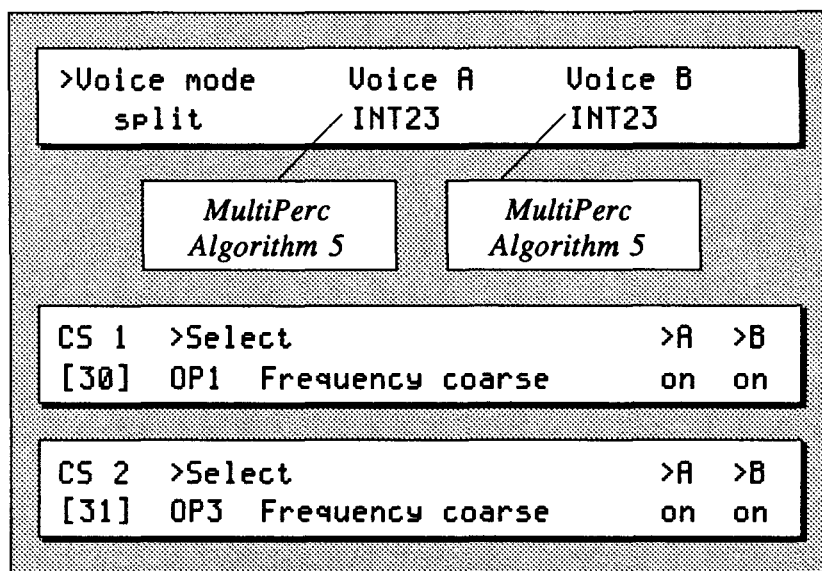
Performance 26
Stereo TinePiano



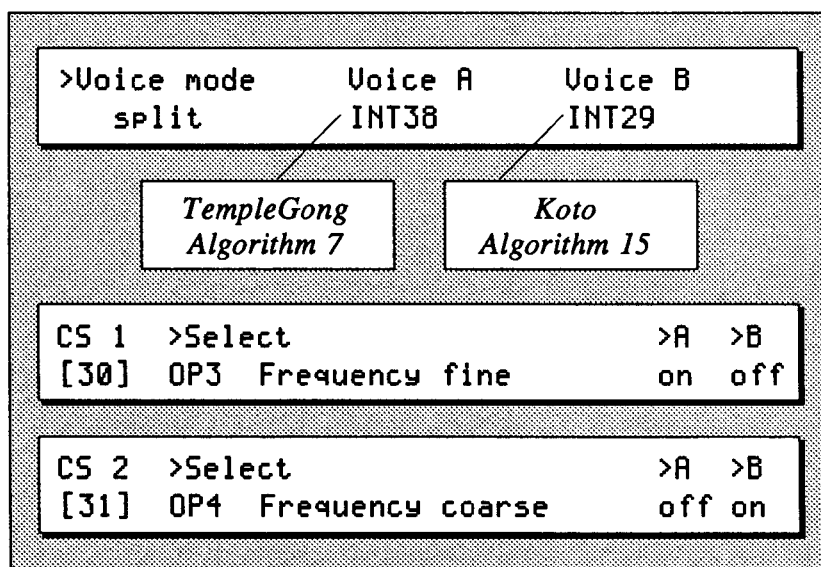
Performance 27
PianoBell Ensemble



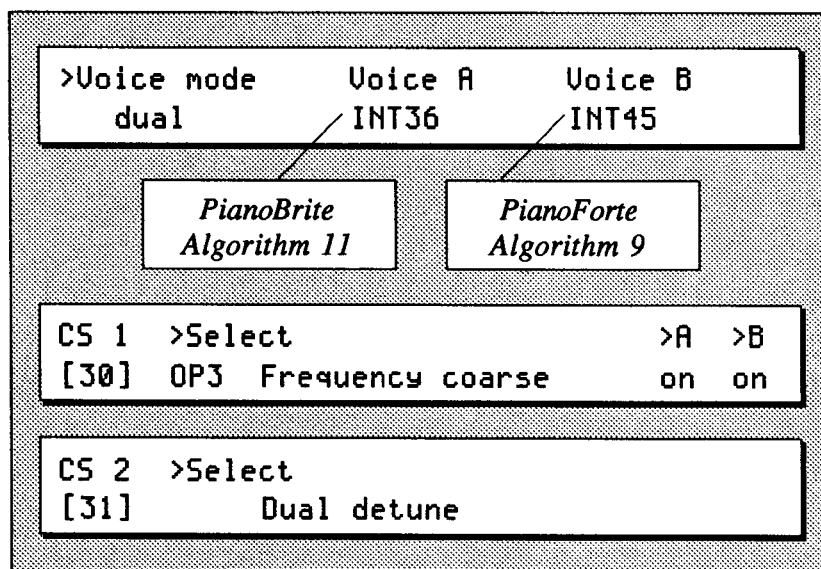
Performance 28
MultiPercussionSplit



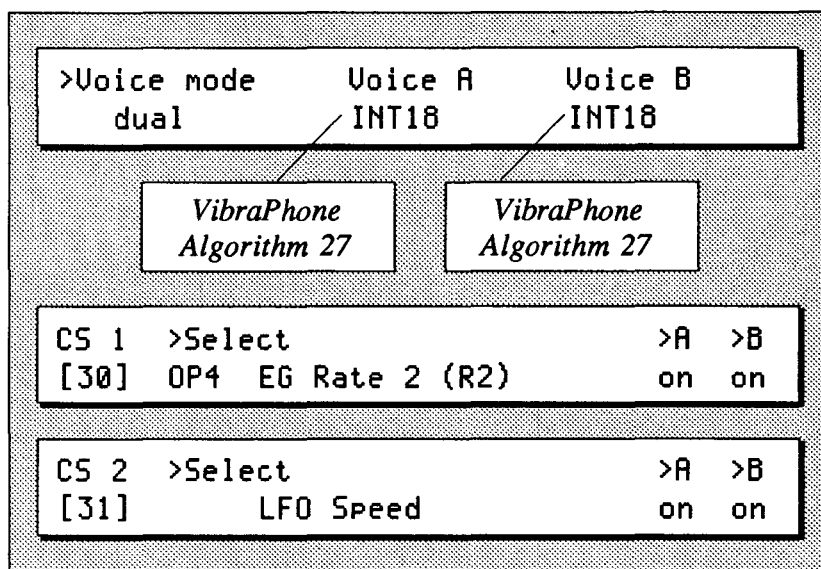
Performance 29
Temple Gong - Shami



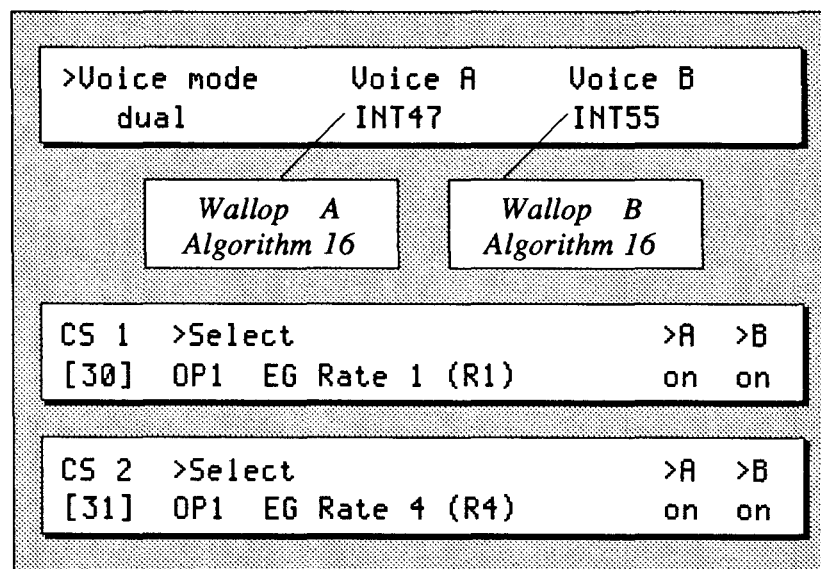
Performance 30
Dual Piano



Performance 31
Stereo Vibraphone



Performance 32
Orchestral Wallop



Notes
