THE OFFICIAL MAGAZINE OF

THE YAMAHA X SERIES OWNERS CLUB

Feed Back

"GET PROGRAMMING!" SPECIAL

JUNE/JULY ISSUE 1987

Feedback

OFFICIAL MAGAZINE OF THE YAMAHA X SERIES OWNERS CLUB

JUNE/JULY, 1987 ISSUE

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Foreword

This issue is dedicated to FM Voice creation and editing. Many of the articles are taken from the American Owners' Club magazine 'Aftertouch', reprinted with their permission and we are very grateful for their cooperation.

Many of the articles refer to the DX7 — if you don't own a DX7 don't be put off — remember the principles are the same with all DX synths, and using the comparisons printed here it will be possible to get close to many of the sounds and effects suggested here for the DX7.

Editing and creating sounds on DX synthesizers seems to be a favourite preoccupation among many of our members but it is important not to lose sight of the reason for making these new sounds, i.e. making music. The close imitation of another instrumental sound or the creation of weird and wonderful noises may be very absorbing but, in my opinion, if this gets in the way of musical expression, the joy of playing well-known melodies or creating our own, then the exercise becomes pointless. Try to remember the first time you heard your synthesizer, I expect you were enthralled by the startlingly realistic acoustic quality that the sounds of the machine had. I wouldn't mind betting that you immediately imagined playing your favourite style of music and possibly singing along while accompanying yourself, maybe you even fantasised about being a pop musician or starting a professional career in music — all this would be possible after you have purchased your first synth! Well don't lose sight of your dreams — play along to your favourite records, accompany yourself singing your favourite songs, encourage your family and friends to join in — even let them have a go on your instrument. In other words use the fantastic palette of sounds possible from your DX/CX to enhance your music making — and most of all enjoy yourself — that's what X-series instruments were made for!

On a more serious note may I remind readers that, although Yamaha-Kemble are possibly the largest Musical Instrument wholesaler in the U.K., the Owners' Club only consists of two full-time employees. This causes us some problems occasionally — especially when it comes to producing your magazine and unfortunately it has meant that 'Feedback' has been behind schedule, despite our best efforts. We apologise for the lateness of the April/May issue, and we hope this issue catches up on our quarterly schedule. Perhaps we should point out that 'Feedback' costs approximately £1.50 to £2 per copy to produce, so you can see that the membership fee of £5 per annum (4 copies) doesn't cover the cost of the magazine, let alone the free cassettes that we send out to new members, the personal answering of every letter the club receives from members, the collation of voices, and general club administration!

If you are ordering goods from the Club or from advertisers in Offers and Services please allow **28 days for delivery.** Remember — it takes 10 working days for your cheque to clear and several days at least for the post — so please don't chase up orders too early.

The Club usually responds very quickly to orders for cassettes, etc., often not waiting the full 10 working days for cheques to clear, but we have been let down on several occasions (yes, even with cheques worth £5 or £10, believe it or not!) so don't be too harsh on us and remember that the advertisers in the Offers and Services supplement **will** wait for cheques to clear.

That's it from me this time — so now 'get programming';

Martin J. Tennant
Manager
X-Series Owners Club

CONTENTS

Conversion Factors And Hints For Converting DX7 Voices For Use On The CX5 And DX100/27/21

(Partially reprinted from Aftertouch Vol. 1, No. 3)

THERE ARE NOW A number of different FM digital operator/algorithm configurations available, from the 6-operator system of the DX7 and related instruments to the various 4-operator systems such as those found in the DX9, the DX21, and the CX5M's internal FM digital tone generator unit.

Although many voices are available for all of these systems, the large majority of the available voices have been designed for the DX7-based six-operator systems. To take advantage of this large library of voices, I have developed a way to convert DX7 voices for use with the CX5M's internal synthesizer. Obviously, there are some compromises involved, since the CX5M system has only four operators. Beyond that, the number values for almost all of the other parameters are different. To overcome that problem, you will find a number of conversion tables below. These will help you to "translate" parameter values from one system to the other.

The conversion values were derived largely by ear; a number of types of graph paper were also used to plot the various ranges and values. Although one might be able to be a little more exact using electronic measuring equipment, the conversion values in the charts below have proven to be quite accurate. Using the techniques and charts below, CX5M owners can now have access to the large library of voices developed originally for the DX7.

Algorithm—Since the DX7 has 6 operators and the CX5M only 4, choose the 4 DX7 operators that provide the major part of the DX7 sound that you want to program on the CX5M. Then pick the CX5M algorithm to use in your programming that has the same configuration as (or is most similar to) the DX7 algorithm minus the DX7's two extra operators. Since the DX7 and the CX5M operators are numbered differently in their algorithms, make sure that you program each operator according to its corresponding position in the algorithm rather than to its operator number.

Feedback—Values for feedback are the same for both the DX7 and the CX5M.

LFO. Speed—for sawtooth, sine, square and triangular waves:

DX7		CX5M
1	=	115
2	=	140
3	=	145
4	=	151
5	=	156
6	=	161
7	=	166
8	=	168
9	=	171
10	=	173
12	=	177
14	=	181
15	=	182
17	=	185
20	=	189
23	=	193
25	=	195
30	=	198
35	=	203
40	=	205
50	=	211
60	=	216
70	=	227
80	=	235
90	=	243
99	=	255

AMD (amplitude modulation depth)

DX7		CX5M
10	=	2
20	=	4
30	=	6
40	=	8
50	=	10
60	=	12
70	=	14
80	=	16
90	=	18
99	=	20

PMD (pitch modulation depth)

DX7		CX5M
1	=	1
2	=	5
3	=	10
4	=	15
5	=	20
7	=	30
10	=	40
15	=	50
20	=	60
25	=	70
30	=	80
35	=	90
40	=	100
45	=	110
50	=	120
55	=	127

Using these conversion tables, many DX7 voices can be simplified and 'translated' for use with the CX5M's internal FM tone generator.

AMS
(amplitude modulation sensitivity)

DX7		CX5M
1	=	1
2	=	2
3	=	3

PMS
(pitch modulation sensitivity)

DX7		CX5M
1	=	3
2 & 3	=	4
4	=	5
5 & 6	=	6
7	=	7

Wf (waveform)

DX7	CX5M
Saw up (or Saw down)	= 0
Square	= 1
Sine or Triangle	= 2
Sample & Hold	= 3

Note: The LFO speeds for Sample and Hold waveform on the CX5M are about half as fast as those of the other waveforms on the CX5M. To figure the correct LFO speed on the CX5M for the Sample and Hold, subtract an additional 120 from the CX5M LFO speed given above. *Example:* If DX7 LFO speed = 10 and thus the CX5M LFO speed = 173, then for Sample and Hold (only) on the CX5M, the correct value would be 53 (or, 173 – 120 = 53).

F (frequency of operator)—Values for frequency are the same for both the DX7 and the CX5M. If an inharmonic frequency (fine tune) is used in a DX7 operator, find its exact match in the table in the CX5M's FM Voicing Program manual or else use just the fundamental frequency value. *Example:* If a DX7 operator has a frequency value of 5.12, then use just the value of 5 in the corresponding CX5M operator.

Envelope generator—Depending on the DX7's EG rate and level values for each operator, use the relevant formula given below in determining the correct EG to use for each CX5M operator. (Conversion tables follow)

On the DX7, if Rate 2 = 99, Level 1 = Level 2, and Level 3 = 0, then:

DX7	CX5M
Rate 1 =	Attack

Rate 3 = 1st-Decay
Sustain = 0 (always)
2nd-Decay = 0 (always)
Rate 4 = Release

On the DX7, if Level 1 = Level 2 and Level 3 does not equal zero, then:

DX7	CX5M
Rate 1 =	Attack
Rate 3 =	1st-Decay
Level 3 =	Sustain
	2nd-Decay = 0 (always)
Rate 4 =	Release

On the DX7, if Level 1 is greater than Level 2 and Level 3 does not equal zero, then:

DX7	CX5M
Rate 1 =	Attack
Rate 2 +	Rate 3 ÷ 2 = 1st Decay
Level 3 =	Sustain
	2nd-Decay = 0 (always)
Rate 4 =	Release

On the DX7, if Rate 2 is less than 99, Level 1 = Level 2, and Level 3 = 0, then:

DX7	CX5M
Rate 1 =	Attack
Rate 2 =	1st-Decay
	Sustain = 15 (always)
Rate 3 =	2nd-Decay
Rate 4 =	Release

On the DX7, if Level 1 is greater than Level 2 and Level 3 = 0, then:

DX7	CX5M
Rate 1	= Attack
Rate 2	= 1st-Decay
Level 2	= Sustain
Rate 3	= 2nd-Decay
Rate 4	= Release

On the DX7, if Level 1 is less than Level 2, then:

DX7	CX5M
Rate 1 +	Rate 2 ÷ 2 = Attack
Rate 3	= 1st-Decay
Level 3 =	Sustain
	2nd-Decay = 0 (always)
Rate 4	= Release

EG conversion tables—For use with EG formulas given earlier:

Attack rate

DX7		CX5M
15	=	1
18	=	2
21	=	3
24	=	4
27	=	5
32	=	6
34	=	7
38	=	8
40	=	9
44	=	10
47	=	11
50	=	12
54	=	13
57	=	14
60	=	15
64	=	16
67	=	17
70	=	18
74	=	19
77	=	20
80	=	21
83	=	22
85	=	23
87	=	24
89	=	25
91	=	26
93	=	27
95	=	28
96	=	29
98	=	30
99	=	31

1st-Decay & 2nd-Decay Rate

DX7		CX5M
10	=	1
13	=	2
16	=	3
19	=	4
21	=	5
24	=	6
27	=	7
30	=	8
33	=	9
36	=	10
39	=	11
42	=	12
45	=	13
48	=	14
51	=	15
54	=	16
57	=	17
60	=	18
63	=	19
66	=	20
69	=	21
72	=	22
75	=	23
78	=	24
81	=	25
84	=	26
87	=	27
90	=	28
93	=	29
96	=	30
99	=	31

Sustain Level

DX7		CX5M
35	=	1
39	=	2
44	=	3
48	=	4
53	=	5
57	=	6
62	=	7
66	=	8
71	=	9
75	=	10
80	=	11
84	=	12
89	=	13
93	=	14
99	=	15

Release Rate

DX7		CX5M
21	=	1
27	=	2
32	=	3
38	=	4
43	=	5
49	=	6
54	=	7
60	=	8
65	=	9
71	=	10
76	=	11
82	=	12
87	=	13
94	=	14
99	=	15

Output level of operator—Add 28 to the output level of each DX7 operator to get the output level for each CX5M operator. *Example:* If the DX7 operator #1 has an output (volume) level of 50, then the correct value for the operator with the same position (but not necessarily the same number) in the CX5M algorithm is 78.

Detune

DX7		CX5M
+1	=	+1
+2	=	+2
+3 to +7	=	+3
-1	=	-1
-2	=	-2
-3 to -7	=	-3

Ks
(key scaling)

DX7		CX5M
Right & -LIN	=	0
Left & -LIN	=	1

Kd
(key scaling down)

DX7		CX5M
1 & 2	=	1
3, 4, & 5	=	2
6 & 7	=	3

Rk (rate key scaling depth)—CX5M keyboard scaling depths left and right are figured for a DX7 breakpoint of C3 (Middle C). For DX7 break points higher or lower than C 3, adjust CX5M keyboard scaling depth by ear.

LEFT
(key scaling)

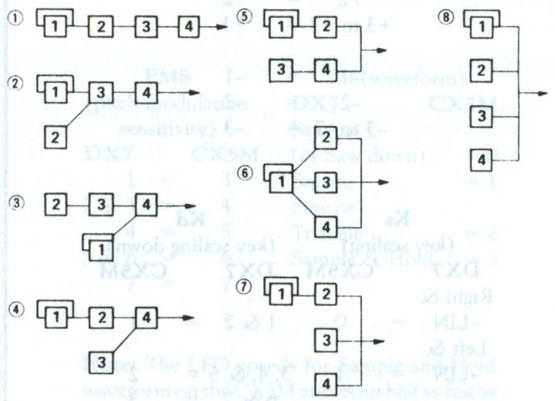
DX7		CX5M
20	=	1
30	=	2
38	=	3
44	=	4
48	=	5
52	=	6
55	=	7
58	=	8
60	=	9
62	=	10
64	=	11
66	=	12
67	=	13
68	=	14
70	=	15

RIGHT
(key scaling down)

DX7		CX5M
10	=	1
12	=	2
14	=	3
16	=	4
18	=	5
21	=	6
23	=	7
25	=	8
27	=	9
30	=	10
32	=	11
34	=	12
36	=	13
39	=	14
41	=	15

COMPARATIVE LEVELS

CHART C: CX5M/CX5M II–128 and FB01



	DX7	DX100/21/27	CX5
Output level	0–99	0–99	0–127
Freq. Course	(see	0.50–25.95	0–15 (50–25.95)
— fine	notes)	(same as CX5)	0–3 (50–25.95)
Detune	−7 to +7	−3 to +3	−3 to +3
ENV	R1 0–99	AR 0–31	A 0–31
	R2	DIR 0–31	D 0–31
	R3	DIL 0–15	S 0–15
	R4	D2R 0–31	D 0–31
	L1 0–99	RR 0–15	R 0–15
	L2		
	L3		
	L4		
Key Scaling (level)	See notes		0=
		0.99	1=
Key Scaling depth	See notes		0–15
Rate Scaling	0–7	0–3	0–3
LFO W/F	TRI	SAW	0 SAW
	SAW Rm	SQ	1 Sq
	SAW up	TRI	2TRI
	SQ	S/H	3 S/H
	SINE		
	S2H		
		0–99	0–255
Speed	0–99	0–0008–55Hz	0.008Hz–53Hz
AMD	0–99	0–99	0–127
PMD	0–99	0–99	0–127
AMS	0–3	0–3	0–3
PMS	0–7	0–7	0–7
Velocitys	0–7	0–7	0–7
TRANS			−128+127 (12=octave)
ALG	1=2 see chart	1–8 see chart	1–8 see chart
Feedback	0–7 (6)	0–7 (4)	0–7 (1)

CHART A: DX7/DX5/DX1 and DX7 II

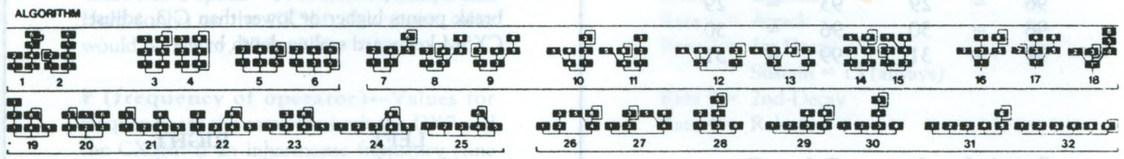
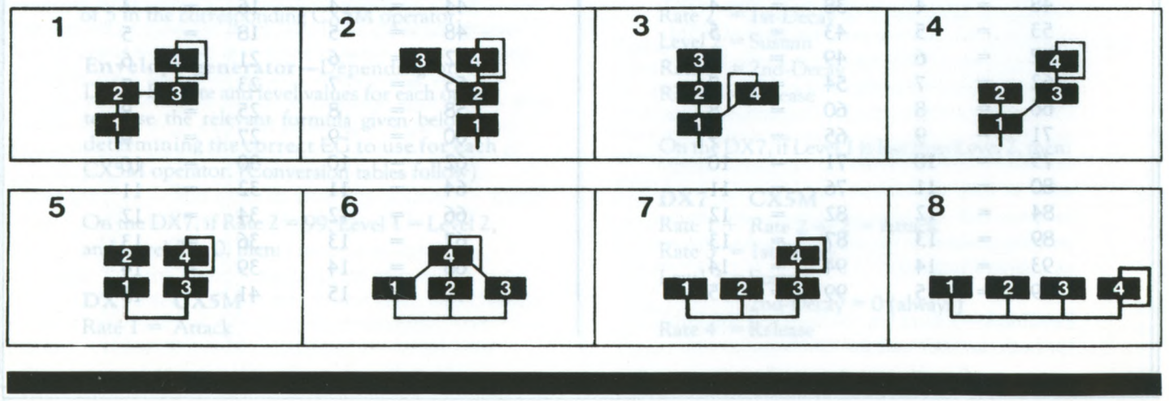


Chart B: DX9/100/DX27/DX21 and TX81Z



MODULATION INDEX vs OUTPUT LEVEL GRAPHS

Reprinted from 'FM Theory and Applications for Musicians by Musicians'

The information contained here allows an estimation of modulator output values on other "X"-Series instruments, given values for a DX7. (DX9 values are the same as DX7.)

In order to have the possibilities of using and comparing different "X"-synths for exercises and sound making, the following tables and graphs have been prepared, based upon the internal workings of the "X"'s. These graphs should give you adequate information to make practical comparisons between DX7, DX21 and CX5.

A selection of output levels have been converted to index by the formulas shown. TL is simply a value that the "X" reads for any given output level shown on the LCD. If you want to calculate an index accurately for output levels not shown here, then convert the output level to a TL value by the table given below (TL v output level), then apply the appropriate formula for index according to the model of your synth. DX5, 1, TX7 are the same as DX7; DX27, 100 are the same as DX21; and CX11, 7m are the same as CX5.

TL vs. OUTPUT LEVEL (For DX7 and DX21)

Level table

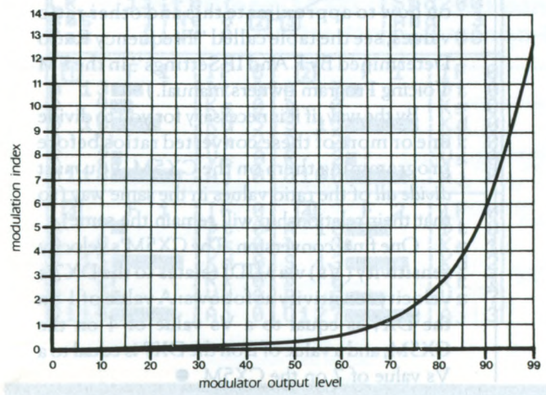
TL values	0	1	2	3	4	5	6	7	8	9
0	127	122	118	114	110	107	104	102	100	98
10	96	94	92	90	88	86	85	84	82	81
20	79	78	77	76	75	74	73	72	71	70
30	69	68	67	66	65	64	63	62	61	60
40	59	58	57	56	55	54	53	52	51	50
50	49	48	47	46	45	44	43	42	41	40
60	39	38	37	36	35	34	33	32	31	30
70	29	28	27	26	25	24	23	22	21	20
80	19	18	17	16	15	14	13	12	11	10
90	9	8	7	6	5	4	3	2	1	0

(For example, for an output level of 67 on the synth, look up 60 in left hand column, then across to 7, to make 67, and take the "TL" value from the box, in this case 32.)

DX7 modulation index table for values: $I = \Pi \times 2^x$ $\quad x = (33/16) - TL/8$

Output	TL	TL/8	X	2^x	Index
10	96	12	−9.9375	0.00102	0.003
20	79	9.875	−7.8125	0.00445	0.013
30	69	8.625	−6.5625	0.01058	0.031
40	59	7.375	−5.3125	0.02516	0.079
50	49	6.125	−4.0625	0.05985	0.188
60	39	4.875	−2.8125	0.14235	0.446
65	34	4.25	−2.1875	0.21953	0.690
70	29	3.625	−1.5625	0.33856	1.068
75	24	3.0	−0.9375	0.52214	1.639
80	19	2.375	−0.3125	0.80525	2.512
85	14	1.75	+0.3125	1.24186	3.894
90	9	1.125	+0.9375	1.91521	6.029
95	4	0.5	+1.5625	2.95365	9.263
99	0	0	+2.0625	4.17710	13.119

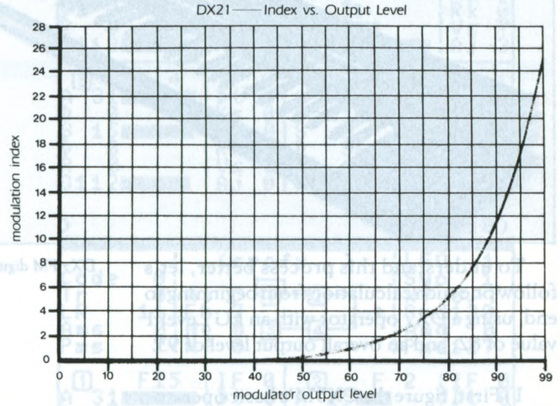
DX7——Index vs. Output Level



DX21 modulation index table for values: $I = 8\Pi \times 2^y$ $\quad y = -TL/8$

Output	TL	TL/8 (= −y)	2^y	Index
10	96	12	0.00024	0.004
20	79	9.875	0.00107	0.025
30	69	8.625	0.00253	0.063
40	59	7.375	0.00602	0.151
50	49	6.125	0.01433	0.360
60	39	4.875	0.03408	0.855
65	34	4.25	0.05256	1.320
70	29	3.625	0.08105	2.037
75	24	3.0	0.12500	3.143
80	19	2.375	0.19278	4.850
85	14	1.75	0.29730	7.466
90	9	1.125	0.45850	11.527
95	4	0.5	0.70711	17.773
99	0	0	1.00000	25.136

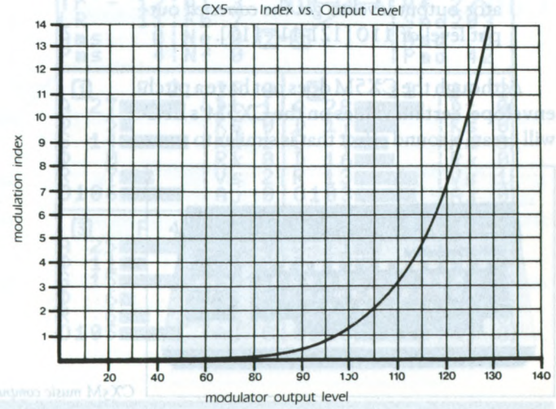
DX21——Index vs. Output Level



CX5 modulation index table for values: $I = 8\Pi \times 2^z$ $\quad z = -(135\text{-}output)/8$

Output	z	2^z	Index
20	−14.375	0.00005	0.003
40	−11.875	0.00027	0.005
60	−9.375	0.00151	0.025
80	−6.875	0.00852	0.037
90	−5.625	0.02026	0.218
95	−5.000	0.03125	0.508
100	−4.375	0.04819	1.207
105	−3.75	0.07433	1.869
110	−3.125	0.11463	2.891
115	−2.5	0.17678	4.425
120	−1.875	0.27263	6.853
127	−1.0	0.50000	12.570

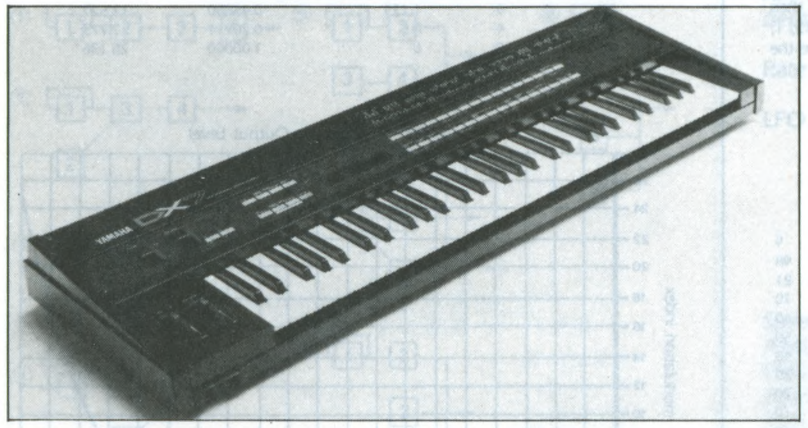
CX5——Index vs. Output Level



To determine the correct output level for a CX5M operator if the relevant DX7 operator has an envelope generator Level 1 of less than 99, use the following procedures:

1) If the DX7's EG value for Level 1 is *higher* than its overall output level for that operator, then *add* the difference between the two values to the converted CX5M output for the relevant operator.

2) If the DX7's EG value for Level 1 is *lower* than its overall output level for that operator, then *subtract* the difference between the two values from the converted CX5M output for the relevant operator.



DX7 FM digital synthesizer.

To understand this process better, let's follow one such calculation from beginning to end, using a DX7 operator with an EG Level 1 value of 82, and an overall output level of 93.

1) First, figure the CX5M's basic operator output level (using the conversion factors from the Dec. '85 article), which would be **121** [93+28=121].

2) Next, determine the difference between the EG Level 1 [82] and the overall output level [93], which would be **11** [93–82=11].

3) Finally, since the EG level is lower than the overall output level, *subtract* the difference from the CX5M's original operator output level to get the *corrected* output level of **110** [121-11=110].

Although the CX5M does not have a pitch envelope, certain values on the CX5M's LFO will create a sound effect that is similar to some of the pitch-envelope effects available on the DX7. For example, set the CX5M's LFO to the following values:

LFO = 1
SYN = 0
Wf = 0
Spd = 90-120
PMD = 127
PMS = 7

When these values are added to a voice, they will create a slow pitch rise on each note.

When you are dealing with a DX7 voice that uses fixed frequency values for one or more operators, you need to translate those values into a frequency ratio before they can be programmed into a CX5M voice. The easiest way to translate is to use a DX7:

1) In EDIT mode, find the operator (or operators) that has fixed frequencies settings by cycling through the coarse frequency values (using the COARSE FREQUENCY and OPERATOR SELECT buttons).

2) Once you have found an operator with a fixed frequency value, press the MODE/SYNC button. The display will read "FIXED FREQ. (Hz)."

3) Now press the NO/-1 data entry button. The display will now read "FREQUENCY (RATIO)."

4) Finally, press the FREQUENCY COARSE button. You will now see a frequency ratio value. In many cases, this value will have to be divided in half to get a value low enough for use in the CX5M.

Here is an example of how this process works. If you start with a fixed frequency value of 3236 Hz on a DX7 operator and follow the steps outlined above, the DX7 will give you a frequency ratio value of 46.81. If you halve this value, you get 23.40, a value that can be closely approximated on the CX5M. (For information on how to approximate this and other ratio values, see the table called "Frequency Ratio Determined By F And IF Settings" in the FM Voicing Program owners manual.)

By the way, if it is necessary for you to divide one or more of these converted ratios before programming them on the CX5M, you *must divide all* of the ratio values in the same way (so that their relationship will remain the same).

One final conversion. The CX5M's velocity sensitivity (Vs) via MIDI relates to the DX7's velocity sensitivity as follows: A value of 1 on the DX7 is equal to a Vs value of 4 on the CX5M, and a value of 2 on the DX7 is equal to a Vs value of 7 on the CX5M. ●

CX5M music computer.

Four interesting voices for the CX5:

● atsynbr:

Listen to the 'filter sweep' effect that Operator 2 & 3 create. Try turning off Operator 1 to hear the effect more clearly.

● triperc:-

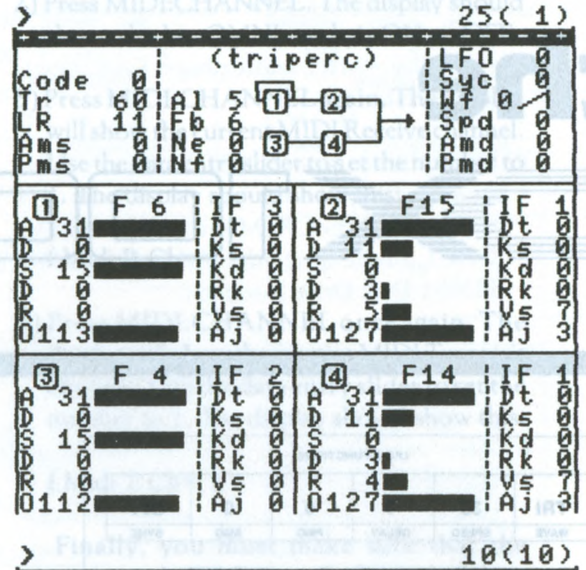
Notice the strange effect to pitch that the Frequency Ratios cause. Try turning off Operators 3 & 4, and then 1 & 2.

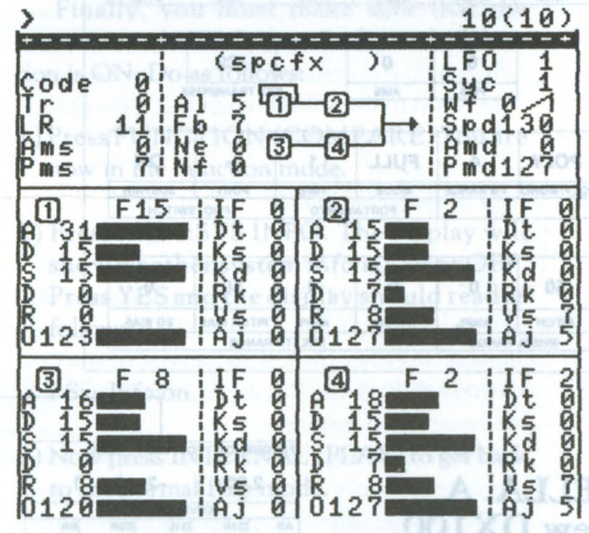
● spcfx:-

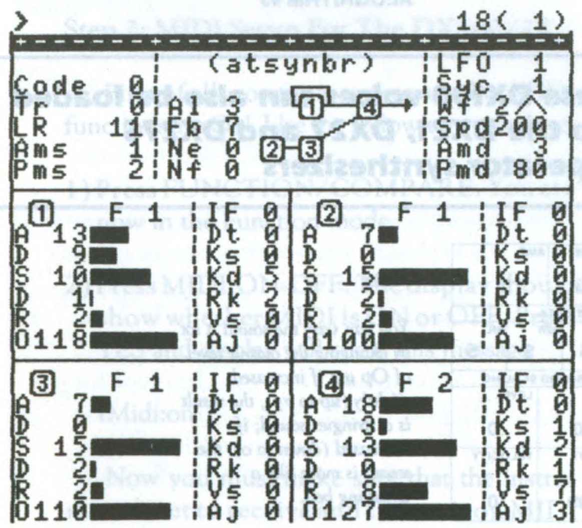
The LFO is used as a pitch envelope generator, notice the White Noise caused by Feedback on Operator 1.

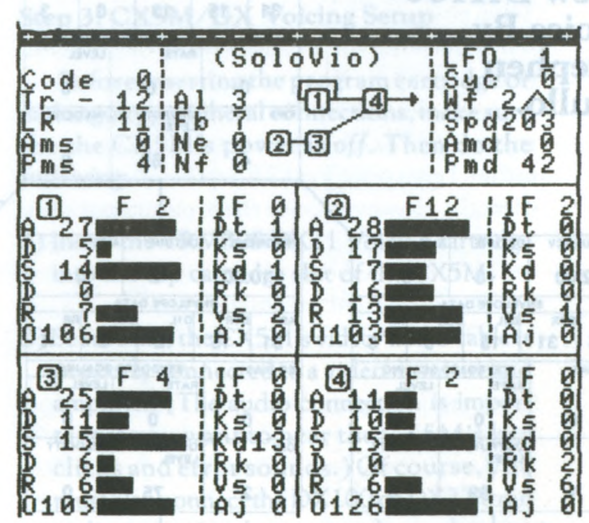
● SoloVio:-

This is an FB01 Voice — notice the effect of turning off Operator 1 — a dramatic transformation from Violin to Pan Flute!









Two new voices for the DX100

BRIT RODES. A New DX100 Voice By Ken Como.

LFO & FUNCTIONS

TRI	0	0	3	0	ON
WAVE	SPEED	DELAY	PMD	AMD	SYNC

6	1	C3
PMS	AMS	KEY TRANSPOSE

POLY	0	FULL	0	--	ON
POLY/MONO	PB RANGE	MODE	TIME	PORT	SUSTAIN
		PORTAMENTO		FOOTSWITCH	

50	0	0	0	50	0
PITCH	AMPL	PITCH	AMPL	PITCH BIAS	EG BIAS
WHEEL RANGE		BREATH RANGE			

FREQUENCY	DETUNE	AME
1.00	-3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	10	10	8	2

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	37

OP#	OUTPUT LEVEL	VELOCITY
2	67	0

FREQUENCY	DETUNE	AME
15.00	+2	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	13	0	0	10

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
4	55	0

FREQUENCY	DETUNE	AME
1.00	-1	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	10	10	8	8

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	21

OP#	OUTPUT LEVEL	VELOCITY
1	99	0

FREQUENCY	DETUNE	AME
3.00	+3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	13	0	0	10

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	26

OP#	OUTPUT LEVEL	VELOCITY
3	72	0

ALOGRITHM #5

BELLA. A New DX100 Voice By Stephen Cullo.

FREQUENCY	DETUNE	AME
2.00	-2	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	15	13	0	3

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
4	65	0

FREQUENCY	DETUNE	AME
2.00	+3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
15	31	15	9	5

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
1	99	0

FREQUENCY	DETUNE	AME
10.00	+2	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	15	12	0	4

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
2	75	0

FREQUENCY	DETUNE	AME
2.00	-3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
15	31	15	9	5

EG BIAS	KEYBOARD SCALING	
	RATE	LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
3	99	0

ALOGRITHM #6

These DX100 voices can also be loaded into the DX21, DX27 and DX27S 4-operator synthesizers

Notes:

You can vary the sound a lot by changing the output level of Op #4: if increased slightly (up to 75), the result is a stringier sound; if decreased (down to 0), the sound is more like a whistling bell.

Also, try algorithms #5, #7, and #8 for a more bellish sound.

How to use the CX5M DX21 Voicing Programme with the DX27 or DX100. By Kevin Laubach

CX5M

YAMAHA HAS INTRODUCED a new line of FM digital synthesizers that are based on a 4-operator, 8-algorithm system of voicing. Shortly after the introduction of the first instrument in this line, the DX21, Yamaha also introduced a CX5M program (YRM305) designed to help musicians program voices on the DX21. Since then, two other synthesizers have been introduced that use the same 4-operator system as the DX21—the DX27 and the DX100. Since all three of these instruments use the same basic FM configuration, it is possible to use the CX5M's DX21 Voicing program (YRM305) as a voicing aid for any of the three instruments.

What follows is a step-by-step guide for setting up the CX5M and the YRM305 DX21 Voicing program for use with the DX27 and DX100 digital synthesizers. For more information on the operation of the program itself, please consult the YRM305 Owner's Manual.

CX5M music computer.

Step 1: MIDI Connections

Connect the MIDI OUT of the CX5M to the MIDI IN of the DX27 or DX100, and connect the MIDI IN of the CX5M to the MIDI OUT of the DX100 or DX27.

Step 2: MIDI Setup For The DX100/27

First of all, you must make sure that MIDI functions are ON. Use the following procedure:

1) Press FUNCTION/COMPARE. You are now in the Function mode.

2) Press MIDI:ON-OFF. The display should show whether MIDI is ON or OFF. Press YES and display will show this message:

fMidi:on

Now you must make sure that the instrument is set to receive and transmit on MIDI channel 1. Use this routine:

1) Press FUNCTION/COMPARE. You are now in the Function mode.

2) Press MIDI:CHANNEL. The display should show whether OMNI mode is ON or OFF.

3) Press MIDI:CHANNEL again. The display will show the current MIDI Receive channel. Use the data entry slider to s et the number to 1. The display should show this:

f Midi R Ch= 1

4) Press MIDI:CHANNEL once again. The display will show the current MIDI Transmit channel. Use the data entry slider to set the number to 1. The display should show this:

f Midi T Ch= 1

Finally, you must make sure that the instrument's MIDI System Exclusive Information is ON. Do as follows:

1) Press FUNCTION/COMPARE. You are now in the Function mode.

2) Press MIDI:SYS INFO. The display will show whether system info is ON or OFF. Press YES and the display should read as follows:

f Sys.Info:on

3) Now press INTERNAL (PLAY) to get back to the normal Play mode.

Step 3: CX5M/DX Voicing Setup

Before inserting the program cartridge or making any peripheral connections, make sure the the CX5M's power is *off*. Then do the following:

1) Insert the YRM305 DX21 Voicing cartridge into the top cartridge slot of the CX5M.

2) Be sure that the CX5M's video/audio cable is properly connected to a video monitor and amplifier. (The audio connection is important if you want to hear the CX5M's key clicks and error sounds.) Of course, you must also connect the DX100 or DX27 to an audio system so that you can hear what you ▶

CX5M
Voice Programming — continued

are doing!

3) If you plan on using cassette tape to load or save data, connect the CX5M to a cassette recorder using the standard cassette cable (red plug = MIC, white plug = EAR, black plug = REM).

4) If you plan to use an FD05 Disk Drive to load or save data, be sure that the disk drive is connected to the CX5M's rear slot (using the CA01 Single Cartridge Adaptor and the FD051 Disk Drive Interface.

5) Now power up the CX5M and video monitor (and disk drive if installed in the system).

6) After a few seconds you will see the Directory of all voices in memory. If everything is properly connected, the program will automatically get the voices from the RAM (random-access memory) of the DX synthesizer to which it is connected. There are 24 voices in RAM in the DX100 and DX27; the DX21 has 32 voices in RAM.

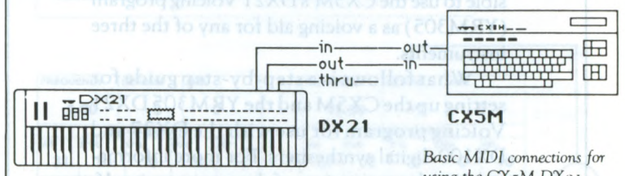
Step 4: Begin Voicing

Now it's time to begin working on a voice. Press F1 on the CX5M's keyboard to enter the Edit mode. You can now make parameter changes on either the CX5M screen or the DX synthesizer. Both the DX and the CX5M screen will be updated instantly.

If you are using the MU01 Mouse with the computer, simply point to the parameter you wish to change and click the left Mouse button. Then press and hold the right Mouse button while moving the Mouse left to decrement (decrease the value) or right to increment (increase the value). This makes editing much easier. (By the way, the Mouse cannot select either Transposition (TR) or Feedback (FB) directly. However, once these parameters are accessed using the CX5M's cursor keys, they can be altered in the usual way with the Mouse.)

There are eight parameters that the DX21 has which the DX100 and DX27 do not have. These parameters are Foot Volume Range, Chorus switch, and the six Pitch Envelope Generator parameters (Pitch EG Rate 1, Pitch EG Rate 2, Pitch Rate 3, Pitch EG Level 1, Pitch EG Level 2, and Pitch EG Level 3). If you change these parameters on the CX5M, nothing will happen to the DX100 or DX27.

If you would like to create or edit a patch that uses velocity, you should connect a velocity keyboard (such as the DX7 or KX88) to the MIDI IN of the CX5M. Now, in order to play the DX100, DX27, or DX21 from that velocity keyboard, you must turn on the CX5M's MIDI merge function, so that Key On information from the velocity keyboard will pass through the CX5M and reach the synthesizer you are programming. Use the following procedure:



Basic MIDI connections for using the CX5M DX21 Voicing Program (YRM305) with the DX21, DX27, or DX100.

1) Press the F7 button. The top left display will read as follows:

Midi Ch=

2) Press the SELECT button. Now the top left display will show this message:

Midi Merge?

3) Press the YES button. The top right display will respond with this confirmation message:

Me=on

At this point, incoming MIDI data from the velocity keyboard will be mixed with MIDI data from the CX5M program, and both will be sent to the DX keyboard you are programming.

One final technical note: Unlike previous FM digital tone generators such as the TX7 and TX816, the performance function data and voice data are combined into one data type for the DX100, DX27, and DX21. Also, since these 4-operator systems are configured differently, their voice data is not compatible with that of the 6-operator systems such as the DX7 or TX816. ●

TIN SYNTH. A New DX21 Voice By John Cocchiarella.

LFO & FUNCTIONS

WAVE	SPEED	DELAY	PMD	AMD	SYNC
TRI	35	8	10	0	OFF

PMS	AMS	KEY TRANSPOSE
6	0	C3

POLY/MONO	PB RANGE	MODE	TIME	PORT	SUSTAIN
POLY	12	FULL	0	ON	ON
		PORTAMENTO		FOOTSWITCH	

PITCH	AMPL	PITCH	AMPL	PITCH BIAS	EG BIAS
50	0	0	0	50	0
WHEEL RANGE		BREATH RANGE			

DX21 ONLY

PITCH ENVELOPE

PR1	PR2	PR3
99	99	99
PL1	**PL2**	**PL3**
50	50	50

CHORUS	FOOT VOL
ON	40

FREQUENCY	DETUNE	AME
0.50	+1	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	31	15	0	6

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
3	83	0

FREQUENCY	DETUNE	AME
6.00	-2	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	10	15	0	7

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
4	75	0

7

Two DX21 voices for you to try

LFO & FUNCTIONS

WAVE	SPEED	DELAY	PMD	AMD	SYNC
TRI	53	33	0	43	ON

PMS	AMS	KEY TRANSPOSE
6	0	C3

POLY/MONO	PB RANGE	MODE	TIME	PORT	SUSTAIN
POLY	2	FULL	0	ON	ON
		PORTAMENTO		FOOTSWITCH	

PITCH	AMPL	PITCH	AMPL	PITCH BIAS	EG BIAS
50	1	50	0	50	0
WHEEL RANGE		BREATH RANGE			

DX21 ONLY

PITCH ENVELOPE

PR1	PR2	PR3
56	99	99
PL1	**PL2**	**PL3**
99	50	99

CHORUS	FOOT VOL
OFF	99

HOOT-GLOCK. A New DX21 Voice By J.H. Kane.

FREQUENCY	DETUNE	AME
5.00	+3	1

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	14	14	14	6

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	2	17

OP#	OUTPUT LEVEL	VELOCITY
4	74	0

6

FREQUENCY	DETUNE	AME
1.00	-3	1

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	17	15	0	5

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	2	0

OP#	OUTPUT LEVEL	VELOCITY
1	90	0

FREQUENCY	DETUNE	AME
1.00	0	1

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	18	15	9	4

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
2	70	0

FREQUENCY	DETUNE	AME
2.00	+3	1

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
25	14	11	5	8

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	2	32

OP#	OUTPUT LEVEL	VELOCITY
3	48	0

ALOGRITHM #6

Notes:

This patch sounds great with digital reverb, and does interesting things with the sustain pedal depressed.

FREQUENCY	DETUNE	AME
0.50	-3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
31	31	15	0	7

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
2	67	0

FREQUENCY	DETUNE	AME
1.00	+3	0

ENVELOPE DATA

AR	D1R	D1L	D2R	RR
27	31	14	6	6

EG BIAS	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL
0	0	0

OP#	OUTPUT LEVEL	VELOCITY
1	99	0

ALOGRITHM #2

These DX21 voices can also be loaded into the DX27, DX27S, and DX100 4-operator synthesizers; all voice parameters, with the exception of those listed in the "DX21 ONLY" box, can be loaded into these units.

What the EG's going on here?

The other day, the phone rang.

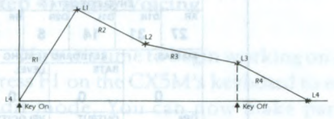
Would this be a call for — (fanfare) — DX-Man? (What?)

More importantly, would the call mean DX-Man missing his favourite TV programme — 'Eastcross Street Farm'?

Seriously though, someone rang me, the other day, to say that they had an edit that wouldn't stop playing/sounding, after they had taken their fingers off the keyboard. What had they done wrong? By going through the precise detail of the person's edit, it became obvious that the 'problem' was in the EG. In particular Rate and Level 4 for Operator 1; Level 4 had been set to a value of 30. Thereby causing the drone after releasing the keyboard.

This tends to be a regular 'error', but it can be made useful for effects, especially if applied to operators which are Modulators.

Before looking any further, let's take a look at the 'EG' diagram (on the DX7<DX9/DX5/DX1>).



Rates 1, 2, 3, 4 have a range of 0-99.
Levels 1, 2, 3, 4 also have a range of 0-99.

The first time you press a key on the DX (after switching on) the EG will race to Level 1 at a rate of (R1 setting), from a level of 0. It then proceeds to Level 2 at a rate of (R2 Setting), then onward to Level 3 at a rate of (R3 Setting). When you release the key, it moves from Level 3 to Level 4 at a rate of (R4 Setting).

The next key you press starts from the previous Level 4 to the (new) Level 1 at a rate of (R1 setting). The cycle goes onto the end of the piece that you're playing.

Therefore, if you set Level 4 to zero you will avoid a drone.

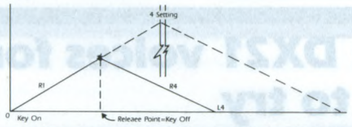
Remember that the rates are relative and that they are not fixed rates. Also remember that your 'key-off' could come anywhere between R1/L1 and R3/L3, but it will always 'release' to Level 4 at Rate 4.

Try this exercise

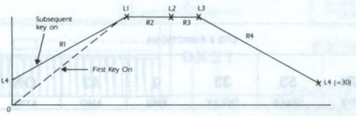
1. Enter 'Edit' Mode.
2. Switch off all operators, except operator 1.
3. Set Frequency Ratio at 1.00, detune to 0 and output to 99.
4. Then enter the following for EG Rates and Levels.

R1 = 35	L1 = 99
R2 = 35	L2 = 99
R3 = 35	L3 = 99
R4 = 35,	(check L4 = 0)

5. If you now hold any key down, you should hear the opertor 'attack' at a Rate of 35 down to Level 1=99, from a starting Level of 0.
6. Now release the key, the operator will now 'release' at a Rate of 35 to Level 4=0, from a level of 99.
7. If you now hold down any key, and release it before a level of 99 is reached, you will still get a 'release' at a Rate of 35 back to zero, from wherever.



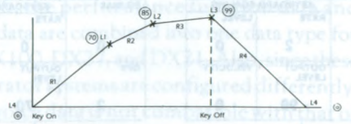
8. If we set L4 to 30, and keep the other Rates and levels as they are. Let's see what happens.



9. Hold down any key, you will hear the operator 'attack' from ZERO to L1 at a Rate of 35. (Hold the key for a few seconds.)
10. Now release the key, what you should now hear, is the operator 'release' to L4 (=30) at a Rate of 35. Note that you will have a 'drone-tone' remaining.
11. Press and hold down any key again, now you should hear the operator 'attack' from a Level of 30, instead of zero.
12. If you've read what's in your owner's manuals, you should know that your DX (DX7/9/5/1) is 16-note polyphonic. So, to clear the 'drone-tone' you should set Level 4 to Zero, and then create a 16-note chord! What if you're not fortunate to possess 4 arms or 8 fingers to each of your 2 hands? Then use a sustain pedal! What if you've not got a sustain pedal? Panic!!!... No! Simply press the 'Play' button, and then any memory select button. Should you still get the 'droning', try another memory button.

To hear the EG moving through each stage, try setting Level 1 to 70 and Level 2 to 85, leave Level 3 at 99 and Level 4 at zero.

When you hold down any key, you will hear the operator developing its EG through each stage until Level 3 is reached. Releasing the key returns the EG Level to zero at Rate 4.



Through this piece we have only used a 'carrier-operator'. Have a try at using the same data with a 'Modulator-operator', select an algorythm (e.g. 5) which gives you a stack with one carrier and one modulator.●

Get Programming!

Four new DX9/100 Voices — by Bill Coopland

DATA NAME : CLIMINUCCI

ALGORITHM	FEEDBACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	MODULATION SENSITIVITY PITCH	MODULATION SENSITIVITY AMPLITUDE	MODULATION SENSITIVITY EG BIAS	KEY VELOCITY
2	7	TRI	28	47	31	8	OFF	5	3		

OP	AME			
4	1	0	/	4
3	1	0	/	3
2	0	0	/	2
1	0	0	/	1

Analogue Type Voice
Crossbreed "Reedy Organ" /"Fuzzy Strings"
★ Pitch Bend and Portamento — set to own needs.

OP	FREQ RATIO	DETUNE	AR	D1R	D1L	D2R	RR	OUT LEVEL	RATE	LEVEL	TRANSPOSE
4	1-00	+3	18	11	14	0	3	78	0	0	C2
3	1-00	+2	23	20	15	0	8	64	2	0	
2	1-00	-1	17	14	15	0	8	63	0	0	
1	1-00	0	19	31	15	0	8	99	0	0	
	OSCILLATOR		ENVELOPE GENERATOR					OPERATOR	KEYBOARD SCALING		
	13	14	15	16	17	18	19	20	21	22	23 24

POLY/MONO	PITCH BEND RANGE	PORTAMENTO MODE	PORTAMENTO TIME	FOOT SW ASSIGN	WHEEL RANGE PITCH	WHEEL RANGE AMPLITUDE	BREATH RANGE PITCH	BREATH RANGE AMPLITUDE	BREATH RANGE PITCH BIAS	BREATH RANGE EG BIAS
POLY	*	-	*	POR	74	32	-	-	50	-

DATA NAME : RIO SLAP

ALGORITHM	FEEDBACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	MODULATION SENSITIVITY PITCH	MODULATION SENSITIVITY AMPLITUDE	MODULATION SENSITIVITY EG BIAS	KEY VELOCITY
3	7	TRI	29	46	28	68	OFF	5	1		

OP	AME			
4	1	4	—	4
3	0	2	—	3
2	0	2	—	2
1	1	7	—	1

C1–C3 — Softish Slap — Electro Bass
C3–C5 — Guitar-Clav. — Lead Voice
Also try in "Mono" Mode with Portamento set up to 5

OP	FREQ RATIO	DETUNE	AR	D1R	D1L	D2R	RR	OUT LEVEL	RATE	LEVEL	TRANSPOSE
4	1-00	+3	21	16	15	12	2	72	0	0	C2
3	1-00	-3	26	22	15	9	1	81	0	0	
2	1-00	-1	20	8	11	10	3	76	0	0	
1	1-00	-2	23	11	15	0	8	99	0	0	
	OSCILLATOR		ENVELOPE GENERATOR					OPERATOR	KEYBOARD SCALING		
	13	14	15	16	17	18	19	20	21	22	23 24

POLY/MONO	PITCH BEND RANGE	PORTAMENTO MODE	PORTAMENTO TIME	FOOT SW ASSIGN	WHEEL RANGE PITCH	WHEEL RANGE AMPLITUDE	BREATH RANGE PITCH	BREATH RANGE AMPLITUDE	BREATH RANGE PITCH BIAS	BREATH RANGE EG BIAS
POLY	2	-	-	—	50	15	0	0	50	0

DATA NAME : BRAZILIA

AME	OP
1 4 —	4
1 2 —	3
0 2 —	2
0 7 —	1

ALGORITHM	FEEDBACK	WAVE	SPEED	DELAY	PMD	AMD	SYNC	PITCH	AMPLITUDE	EG BIAS	KEY VELOCITY
		LFO						MODULATION SENSITIVITY			
3	7	△	29	71 (33E6)	28	68	ON	5	1		
1	2	3	4	5	6	7	8	9	10	11	12

With LFO/delay @ 71 modulation brought in by wheel.

With LFO/delay @ 33 modulation brought in by key sustain.

Either modulation can be used to good effect dependant on piece being played.

NB: if transposed too high i.e. to C5 **watch** out when pitch bending Top B of C if pitch bending up you'll arrive at C of D_4!
10 semitones down if PBR set to 2.

OP	FREQ RATIO	DETUNE	AR	D1R	D1L	D2R	RR	OUT LEVEL	RATE	LEVEL	TRANSPOSE
	OSCILLATOR		ENVELOPE GENERATOR					OPERATOR	KEYBOARD SCALING		
4	2-00	−1	16	8	15	0	2	72	0	12	C3
3	2-00	+2	21	8	15	0	1	81	0	11	
2	3-00	−1	16	8	15	16	3	68	0	0	
1	1-00	0	18	22	15	0	8	99	0	0	

13	14	15	16	17	18	19	20	21	22	23	24
POLY/MONO	PITCH BEND RANGE	PORTAMENTO MODE	PORTAMENTO TIME	FOOT SW ASSIGN	WHEEL RANGE PITCH	WHEEL RANGE AMPLITUDE	BREATH RANGE PITCH	BREATH RANGE AMPLITUDE	BREATH RANGE PITCH BIAS	BREATH RANGE EG BIAS	
POLY	2-4	FT	15 MAX	POR	75	29	0	0	50	0	

DATA NAME : ELEKTRON

AME	OP
1 4 —	4
1 7 —	3
1 2 —	2
0 7 —	1

ALGORITHM	FEEDBACK	WAVE	SPEED	DELAY	PMD	AMD	SYNC	PITCH	AMPLITUDE	EG BIAS	KEY VELOCITY
		LFO						MODULATION SENSITIVITY			
3	7	Δ	29	68	62	11	OFF	5	2		
1	2	3	4	5	6	7	8	9	10	11	12

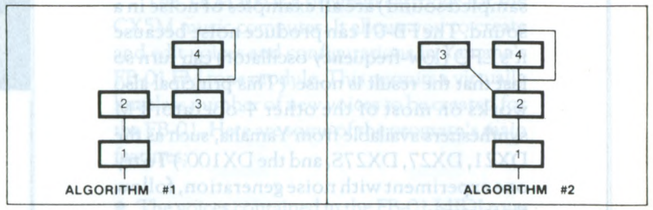
NB: **Operator 1 AR — can be dropped to 16 for "Sax" Type Voice**
C1–C3 — Bass Synth — Poly Mode Only
C3–C5 — Lead Synth — becomes more effective adding in portamento and also switch across from "poly" to "mono" mode. Reminds me of Rick Wakeman's Moog Lead Setting (slightly)

OP	FREQ RATIO	DETUNE	AR	D1R	D1L	D2R	RR	OUT LEVEL	RATE	LEVEL	TRANSPOSE
	OSCILLATOR		ENVELOPE GENERATOR					OPERATOR	KEYBOARD SCALING		
4	0-50	+3	17	8	11	2	3	64	0	0	C3
3	0-50	−2	23	2	4	9	8	71	0	0	
2	0-50	−1	31	2	8	5	8	73	0	0	
1	2-00	+1	24	3	15	0	7	99	1	0	

13	14	15	16	17	18	19	20	21	22	23	24
POLY/MONO	PITCH BEND RANGE	PORTAMENTO MODE	PORTAMENTO TIME	FOOT SW ASSIGN	WHEEL RANGE PITCH	WHEEL RANGE AMPLITUDE	BREATH RANGE PITCH	BREATH RANGE AMPLITUDE	BREATH RANGE PITCH BIAS	BREATH RANGE EG BIAS	
POLY	2	FT	1	POR	55	15	0	0	50	0	

Editing FB01 voices via the CX5M with the YRM506

Here are the eight algorithm forms used in the FB-01 FM tone module. These same algorithms are used in the DX21, DX27, DX27S, DX100, and DX9 synthesizers.



"I Was A 6-Op Snob . . . ."—Are *You* Still?

What is a six-op snob? In a musical world dominated by the sounds of the DX7, TX816, TX7, DX5, and DX1, it is easy to ignore the capabilities of the 4-operator instruments. This is an oversight that many of us have been guilty of for quite some time. For example, there are a number of L.A.-area electronic musicians who have been raving about a particular DX7 brass patch. It turns out that this brass patch (yes, it is pretty good) uses only 2 out of the 6 operators available on the DX7! The moral of the story is that FM synthesis packs quite a lot of power and that whether we are talking about 6-operator or 4-operator FM, it is worth our time to make the most of what's available.

CAV: Computer-Aided Voicing

The FB-01 has the ability to voice new patches using its extensive MIDI capabilities—but not by editing from the front panel. For musicians interested in creating their own voices, the FB-01 can be voiced by using an external computer and FB-01 voicing software. This concept is not new: Many of us have used the CX5M program, the DX-PRO for the Apple II, or other similar FM computer-aided voicing programs, and most musicians prefer this method of creating and editing voices.

One such FB-01 voicing program is available for the CX5M computer. Yamaha's FB-01 Voicing Program cartridge (YRM506) allows you to create voices or edit configurations that are displayed on the screen.

Another FB-01 voicing program, FB-PRO, written by Digital Music Services (the same company who wrote and now distributes DX-PRO), is designed for the Apple Macintosh computer. It was used to voice the two FB-01 voices that appear in this issue of AfterTouch. There will undoubtedly be similar FB-01 voicing programs for other computers as well. See your authorized Yamaha dealer, and watch the pages of AfterTouch regarding the availability of CAV programs for your particular computer.

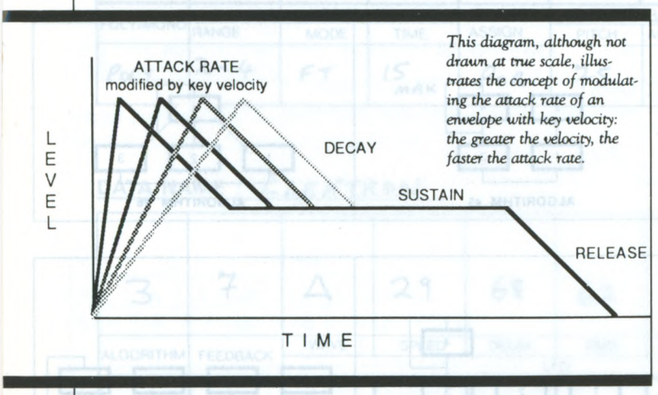
Why Should You Be Interested In Voicing The FB-01?

As mentioned before, the 4-operator instruments have quite a bit of untapped potential. The FB-01 has at least *two* capabilities (we're still finding more) that the 6-operator units do not include. [*Note: To try these two examples, you will need to have a CAV program to use with your FB-01 tone module.*] Here are two ▶

quick voicing experiments you can try to explore these new capabilities:

Experiment 1: Noise Generation. Noise is a principal part of many musical sounds. The initial sound of a pick on a guitar string, the hit of a stick on a drum head, the breath of a flute, and the breath of a voice (a very popular sampled sound) are all examples of noise in a sound. The FB-01 can produce noise because it's LFO (low-frequency oscillator) can turn so fast that the result is noise. (This principal also works on most of the other 4-operator FM synthesizers available from Yamaha, such as the DX21, DX27, DX27S, and the DX100.) To try one experiment with noise generation, follow these steps:

1. Set the LFO waveform to S/HOLD.
2. Set the LFO speed to its fastest setting (255 on the FB-01).
3. Set the PMD pitch modulation depth all the way up (127 on the FB-01).
4. Adjust the PMD sensitivity to taste (try 6 or 7 on the FB-01).



This diagram, although not drawn at true scale, illustrates the concept of modulating the attack rate of an envelope with key velocity: the greater the velocity, the faster the attack rate.

Experiment 2: Modulating The Attack Rate With Velocity. Sounds intimidating? It isn't. This is the ability to speed up the attack rate (time) of an envelope by how hard you play the note. This effect is common on many instruments. For example, a brass section can swell notes up to their full intensity (a slow attack rate), or bite into notes from the very beginning (a fast attack rate). With many synthesizers, FM or analog, to play both types of attacks would require two different sounds; one with the fast attack rate, and one with the slower rate. This is not necessary with the FB-01. You can voice the FB-01 so that a note played with light velocity will swell, yet a note that is played with a heavy velocity will sound immediately. (To get an idea of how this concept works, see the accompanying diagram).

Yamaha's FB01 FM Sound Generator.

How Can You Use The FB-01 In Your MIDI System?

While the number of ways that an FB-01 can be used in your system is limited only by your needs and imagination, let's see how the FB-01 can be used in a simple system with a DX7. For this basic example, we will add a string sound from the FB-01 to an electric piano part played from the DX7.

Start by connecting the audio outputs of the DX7 and the FB-01 to a suitable mixer/amplifier/speaker system. Then connect the MIDI OUT of the DX7 to the MIDI IN of the FB-01. Now turn both instruments ON, and follow these steps:

1. On the FB-01, use the DATA ENTRY/+1 and DATA ENTRY/-1 keys until the display reads as follows:

   #1 [17] single

2. On the FB-01, press VOICE SELECT once, and then press DATA ENTRY/+1 4 times. This will select bank 3, voice 5, which is named "Strings."
3. Call up an electric piano voice on your DX7 and begin playing. Adjust volumes to taste.

This is a basic example of how to create layered sounds via MIDI using just two sound-generating units and one MIDI cable.

A Final Note: FB-01 Expansion

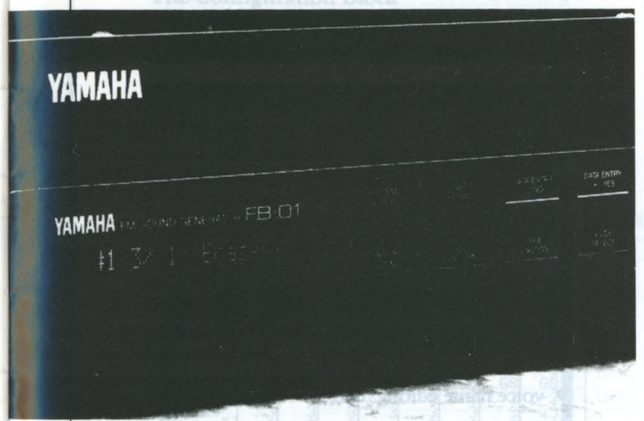
With the optional RFB-01 rack mount adaptor (featured on the cover of this issue of AfterTouch), two FB-01s can easily be mounted side-by-side in a standard equipment rack. Two FB-01s, with one set to receive only even MIDI note numbers and the other set to receive only odd MIDI note numbers, can be made to function as a 16-voice tone generator.

As you can see, the FB-01 FM tone module can be a powerful addition to your MIDI music system! ●

Introducing the new YRM506 FB-01 Editor Program Cartridge BY MICHAEL A. HUISMAN

Computer-aided voicing is not a new idea. Many of us have used the CX5M programs (or those for other computers such as the Apple II series, the Apple Macintosh, the IBM PC, and so on) for creating or editing DX7 voices. In the case of the FB-01, computer-aided voicing is especially important, because the FB-01 *cannot be voiced from its front panel.*

In general, though, CAV programs offer at least three important advantages for voice programmers:



1. Ease of voicing: CAV programs allow you to see more about what is "going on" in a voice because of the computer monitor's size. A computer monitor is larger in size than the display on the front panel of a synthesizer. Further, related data can be viewed together on one screen. An example is being able to view a complete operator envelope rather than just one segment of the envelope.
2. Additional storage: CAV programs usually allow you to store your voices (and all of your precious voicing work) to the computer's storage device, such as a diskette or a data cassette. The number of voices that can be saved on a single diskette far exceeds the internal voice storage of almost any synthesizer currently on the market.
3. Additional voicing control: CAV programs sometimes allow you to access parameters not accessible from the front panel. As mentioned above, the FB-01 has the ability to voice new patches using its extensive MIDI capabilities—but NOT from its front panel. In order to edit voices or create new voices on the FB-01, one *must* use a CAV program.

What is the YRM506?

The YRM506 is a program cartridge for the CX5M music computer. It allows you to create and edit voices and configurations in Yamaha's FB-01 FM tone module. This permits a virtually limitless number of new voices to be created for the FB-01. Here are some of the program's main features:

- The voices contained in the FB-01 MIDI tone generator can be edited, and new voices can be created from scratch.
- Data can be displayed on the screen as it is entered from the CX5M's computer keyboard. (Sound can also be output for monitoring the voices as the data is entered.)
- Voices can be saved onto a floppy disk (when using the SFG05 MIDI/tone generator unit with the CX5M).
- Voices can also be saved on cassette tape or a Data Memory Cartridge (UDC01) and later utilized with the FM Music Macro II Program cartridge (YRM504) and/or the FM Music Composer II Program cartridge (YRM501).
- Both the voice data and the table of voices can be printed out using an optional printer (PN101).

A Quick Overview Of The Program

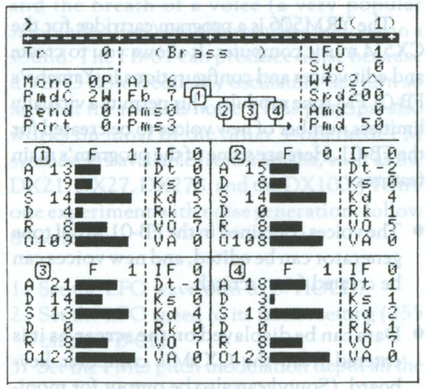
The YRM506 program utilizes the concept of blocks. There is a Voicing Block, a Configuration Block, and a File/Transfer Block. When editing or creating voices, you use the Voicing Block. When editing or creating a configuration, you use the Configuration Block. Similarly, when transferring data between the program and the FB-01 or when saving or loading files from disk or cassette, you use the File/Transfer Block.

The Voicing Block

The Voicing Block allows you to edit all of the FB-01's voice paramenters. Figure 1 shows the voice editing screen as it appears on the monitor. From this screen you can edit these parameters: ▶

- algorithm number
- feedback level
- operator on/off for each of the four operators

Figure 1: The edit screen for the Voicing Block in the YRM506.



- output level for each operator
- velocity sensitivity for each operator's output level
- operator frequency (which consists of the frequency, the inharmonic frequency and detune amount—Figure 2 shows the possible operator frequencies)
- five-stage envelope for each of the four operators (the five individual segments of the envelope are: attack rate, 1st decay rate, sustain level—breakpoint when 2nd decay rate is not equal to 0, 2nd decay rate, and release rate)
- velocity sensitivity for each operator's attack rate [*Note: Please see last issue's article on the FB-01 for more about this new voice parameter.*]
- LFO settings (the LFO values in the FB-01 are: waveform select (sawtooth, square, triangle and sample/hold), amplitude modulation depth and sensitivity, pitch modulation depth and sensitivity, LFO sync on/off, and LFO enable on/off)
- key scaling type for each operator (negative-linear curve or positive-exponential curve)
- key scaling depth for each operator
- rate scaling depth for each operator
- poly or mono mode

	0	1	2	3
0	0.50	0.71	0.79	0.87
1	1.00	1.41	1.57	1.73
2	2.00	2.82	3.14	3.46
3	3.00	4.23	4.71	5.19
4	4.00	5.64	6.28	6.92
5	5.00	7.05	7.85	8.65
6	6.00	8.46	9.42	10.38
7	7.00	9.87	10.99	12.11
8	8.00	11.28	12.56	13.84
9	9.00	12.69	14.13	15.57
10	10.00	14.10	15.70	17.30
11	11.00	15.51	17.27	19.03
12	12.00	16.92	18.84	20.76
13	13.00	18.33	20.41	22.49
14	14.00	19.74	21.98	24.22
15	15.00	21.15	23.55	25.95

Figure 2: The operator frequencies available in the FB-01 FM tone module.

- pitch bender range (up to one full octave in half-step increments)
- portamento time
- pitch modulation depth controlling device (you can choose between aftertouch, modulation wheel, breath controller, foot controller, or none—if no LFO is desired)
- voice transposition
- voice name editing/entry

You can also view all the voices in a bank (see Figure 3), copy the values for one operator

Figure 3: The Bank voice display screen of the YRM506.

to another, recall a voice you edited by a simple keyboard command (CTRL R), copy one voice from one location to another, or swap two voices' locations within a bank (see Figure 4).

Figure 4: The voice transfer screen of the YRM506.

The Configuration Block

The Configuration Block allows you to edit all of the parameters that make up a configuration. In the Configuration Block's configuration editing screen you can also set values for the FB-01's LFO that are independent of the values in a configuration. Figure 5 shows the configuration edit screen as it appears on the monitor. From this screen you can edit parameters for:

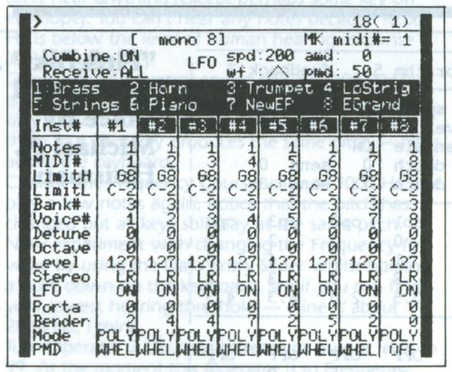


Figure 5: The edit screen for the Configuration Block in the YRM506.

- MIDI channel assignment
- number of notes assigned to the instrument
- low key limit for the instrument
- high key limit for the instrument
- the bank number of the voice assigned to the instrument
- the number of the voice assigned to the instrument
- the output level (volume) for the instrument
- octave transposition (two octaves down, one octave down, none, one octave up, or two octaves up)
- detune amount
- stereo panning position (either L—left, R—right, or LR—center) [*Note: Yes, the FB-01 has stereo outputs!*]
- LFO on or off
- pitch bender range
- portamento time
- poly/mono mode
- pitch modulation depth controlling device (you can choose between aftertouch, modulation wheel, breath controller, foot controller, or none—if no LFO is desired)

The last 4 parameters above (beginning with "pitch bender range") can override the value stored with the voice by assigning a different value in a configuration—without affecting the voice data.

There are also a number of parameters that affect *all* the voices in a configuration. These include:

- voice combine mode on/off
- keycode receive mode (odd, even or all MIDI note numbers)
- LFO waveform
- LFO speed
- Amplitude Modulation Sensitivity (AMS)
- Pitch Modulation Sensitivity (PMS)

The File/Transfer Block

The File/Transfer Block is used to manage the voice and configuration data that are stored on data cassette, disk, or Data Memory Cartridge (UDC01). It is also used to send and receive voices and configurations to and from the FB-01. Figure 6 shows the File/Transfer screen as it appears on the monitor. From this screen you can perform the following operations: ▶

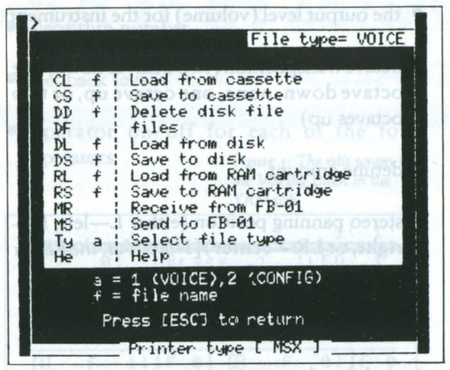


Figure 6: The File/Transfer screen of the YRM506.

- load a file from cassette
- save a file to cassette
- delete a file on a disk
- list all the files on a disk
- load a file from disk
- save a file to disk
- load a file from a Data Memory Cartridge
- save a file to a Data Memory Cartridge
- receive a voice bank from the FB-01
- send a voice bank to the FB-01
- receive configurations from the FB-01
- send configurations to the FB-01
- select voice or configuration file type

As you can see, the new YRM506 FB-01 Editor Program cartridge is an excellent example of CAV (computer-aided voicing). It opens the door to all of the voicing capabilities of the new FB-01 FM tone module, and gives you complete control over those powerful parameters. With the CX5M and the YRM506 cartridge, you will be able to create your own library of sounds for the FB-01. ●

"Flt&Blk." A New FB-01 Voice By Michael A. Huisman.

Voice Name: Flt&Blk					algorithm 5 feedback 7				
FUNCTION	transpose	C3			LFO	speed	197	sync	OFF
	mode	POLY				waveform	TRIANGLE		
	porta speed	0				load enable	ON		
	input control pmd	WHEEL				amp mod depth	0	sens	0
	pitch bender range	4				pitch mod depth	71	sens	3
LEVELS	op1	op2	op3	op4	PITCH	op1	op2	op3	op4
on/off	ON	ON	ON	ON	inharmonic	0	0	2	1
output level	108	93	121	96	freq ratio	1	2	4	3
vel sens	7	4	3	5	detune	3	7	3	7
					frequency	0.5	2.0	6.3	4.3
ENVELOPES					SCALING				
attack rate	14	30	31	27	type	OFF	OFF	OFF	OFF
decay 1 rate	0	0	0	0	level depth	0	5	0	5
sustain level	0	0	6	0	adj for t1	0	0	0	0
decay 2 rate	31	20	20	18	rate depth	1	0	0	1
release rate	15	14	7	13					
velocity mod	8	5	6	9					

TWO NEW FB-01 VOICES

"digilog." A New FB-01 Voice By Michael A. Huisman.

Voice Name: digilog					algorithm 2 feedback 7				
FUNCTION	transpose	C2			LFO	speed	205	sync	OFF
	mode	POLY				waveform	TRIANGLE		
	porta speed	0				load enable	ON		
	input control pmd	WHEEL				amp mod depth	0	sens	0
	pitch bender range	4				pitch mod depth	0	sens	5
LEVELS	op1	op2	op3	op4	PITCH	op1	op2	op3	op4
on/off	ON	ON	ON	ON	inharmonic	0	0	0	0
output level	127	98	123	127	freq ratio	1	1	10	3
vel sens	2	2	1	2	detune	7	0	7	0
					frequency	1.0	1.0	10.0	3.0
ENVELOPES					SCALING				
attack rate	31	31	31	31	type	OFF	OFF	OFF	OFF
decay 1 rate	0	0	0	0	level depth	0	3	4	4
sustain level	14	13	13	12	adj for t1	0	0	0	0
decay 2 rate	11	15	18	12	rate depth	2	0	0	1
release rate	8	2	14	5					
velocity mod	6	5	6	6					

DX7 Fixed Frequency Mode

The use of fixed frequencies in the programming of DX7 FM voices is perhaps one of the most interesting components that the DX7 has to offer, yet there is very little mention of what the fixed frequency mode is, and how it may be used, in any of the manuals!

Here then is a brief "Getting Started" approach to the fixed frequency mode. You will need to be seated at your DX7.

What is Fixed Frequency?

Fixed frequency mode changes the output mode of an Operator from its normal 'Frequency Ratio' mode where it will play a different frequency (note) for each note of the scale, (based on a ratio to A440 Hz) to one where every note played on the keyboard will play at the same frequency. Let's hear this on the DX7.

1. Initialise a voice on the DX7 — remember how to do this?
2. Turn off Operators 2, 3, 4, 5, and 6 and select Algorythm 32.
3. Enter the Edit Mode and Find the Oscillator Mode/Sync switch and change the Operator Mode for Operator 1 to "FIXED FREQUENCY", the LCD will read "fixed freq. (Hz)".
4. Select Frequency Course and observe that the current fixed frequency is 10.00 Hz exactly.
5. Play some notes on the keyboard — notice that you can't hear anything (except perhaps some key off envelope). You can't hear any notes because 10.00 Hz is below the level of human hearing response (called 'subsonic').
6. Change the Frequency course value to 100.00 Hz, this is now in the audible range. Now when you play a few notes on the keyboard you can hear them, but each key produces the same pitch — right across the keyboard.
7. Change the Frequency Course value to 1000 Hz and play a few notes again, notice that the pitch has changed but all keys still play at the same pitch.
8. Now experiment with changing the Frequency fine value by using the Data Entry Slider whilst holding a note down on the keyboard. See if you can find your lowest hearing threshold — mine is about 28.18 Hz, I think.
9. Turn Operator 2 On, and increase its output level to 99. At the moment this Operator is in Frequency Ratio mode so when we play keys on the keyboard we will hear different frequencies (notes) for each key.
10. Set Operator 1 Fixed Frequency to 436.5 Hz and adjust its Detune to +7. Operator 1 should be outputting approximately 440 Hz.
11. Now, while holding down Middle A ("A" below Middle C), put your DX7 into Function Mode and select Master Tune Adjustment, now using the Data Entry slider adjust the tuning of the keyboard. Notice that as the two "A's" get closer you can hear a 'beating' which will slow down the nearer the two notes get to each other. Now when you play the keyboard you will be able to play a scale, but with a 'pedal tone' of an 'A' producing a drone.
12. Experiment with changing the pitch of the drone (by altering the Frequency of Oparator 1) and adding other Operators which have fixed frequencies of different values — thus creating a chordal drone. You could also try fixing two Operators at the same frequency and detuning one of them slightly.

Now you know what Fixed Frequency means and what effects it can have on CARRIERS we will now see what type of effects Fixed frequency can have on MODULATORS.

1. Initialize a voice and turn off Operators 3, 4, 5, and 6. Select Operator 2 and increase its Output level to 99.
2. Change the Oscillator Mode of Operator 2 to Fixed Frequency, select Frequency Course and change it to 1.00 Hz.
3. Play a note on the keyboard, you will hear a sine wave changing pitch once every second.
4. Slowly increase the Frequency Fine value for Operator 2, holding down the note so that you hear the speed of the pitch change increasing. Notice that as the Frequency of Operator 2 increases it affects the scale as you play it. At about 2089 Hz you can just about hear the scale for most of its range. (At about 20 Hz the pitch modulation ceases to be heard as such and instead you can hear dissonent overtones.)

Playing a series of different notes on the keyboard will produce different timbres per note. The reason for this is because each note within the scale generates a different frequency ratio.
Try experimenting with a stack of 3 Operators:- 3
2
1

Set Operator 1 and 2 to Freq. Ratio of 1.00–1.00 and an Output level of 99. Set Operator 3 output level to 80 and set its mode to Fixed Frequency and experiment by playing the keyboard and changing the Frequency value.

With Operator 3 at a frequency of 2884 Hz and Output level of 46 you might get near to the sound of some ancient wind instrument(s).

'Flanging' or 'Chorusing' by applying a Subsonic Fixed Frequency to a carrier.

This is perhaps the most pleasing effect which can be created by using the Fixed Frequency mode. It can be used to make your sounds very much more 'analogue' in quality. Back to your DX7:-

1. Initialise a voice and turn off Operators 3, 4, 5, and 6 again.
2. Select Operator 2 and increase its output level to 85.
3. Select Operator 1 and change the oscillator Mode to fixed Frequency. Change the Frequency Course Value to 1.00 Hz and play a few notes.
4. Notice how the timbre of the note changes once every second, try changing the brightness of the tone by altering the output level of Operator 2. Notice that the tone gets brighter, (or harsher) as You INCREASE the output level, and less bright as you REDUCE the Output level.
5. Try altering the Frequency Fine value of Operator 1 by using the Data Entry slider. Notice that as the Frequency increases so does the speed of the effect.
6. Select Algorythm 5 and repeat the above procedure. Try having a slightly different Frequency Fine Value for Operator 3 to the one Operator 1 has.
7. Experiment with changing the Frequency Ratio value of other Modulating Operators (2 and 4).

Try changing the Oscillator Mode of the carriers for some of the DX7 preset voices to hear the subtle difference this effect can make to your old favourites — it works particularly well on the "STRINGS" presets. You may wish to return the same sound and 'Filter' it through one or more fixed Frequency carriers. To do this you may need to 'move' all the Operators 'up one', i.e. copy their parameters to the Operator **above.** It's up to you to experiment! ●

Get Programming!

TWO NEW DX7 VOICES

BY BILL MARTIN

YAMAHA DX7 VOICE DATA LIST

DATE/PRESET No. : 16/3/87

VOICE NAME : NORTHUMBRIAN SMALL PIPES

PROGRAMMER : BILL MARTIN

OP	ALGO RITHM	FEED BACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	LFO PITCH MOD. SENSITIVITY	LFO AMPLITUDE MOD. SENSITIVITY
	17	0	□	45	65	0	40	OFF	0	2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	POLY/MONO	PITCH BEND RANGE	PITCH BEND STEP	PORTAMENTO MODE	PORTAMENTO GLISSANDO	PORTAMENTO TIME									

NOT USED { 〈OC〉

OP	OSC MODE/SYNC	OSC FREQ COARSE	OSC FREQ FINE	OSC DETUNE	EG RATE 1	EG RATE 2	EG RATE 3	EG RATE 4	EG LEVEL 1	EG LEVEL 2	EG LEVEL 3	EG LEVEL 4	KEYBOARD LEVEL SCALING BREAK POINT	KEYBOARD LEVEL SCALING L CURVE	KEYBOARD LEVEL SCALING R CURVE	KEYBOARD LEVEL SCALING L DEPTH	KEYBOARD LEVEL SCALING R DEPTH	KEYBOARD RATE SCALING	OPERATOR OUTPUT LEVEL	OPERATOR VELOCITY SENS.	PITCH EG RATE 1	PITCH EG RATE 2	PITCH EG RATE 3	PITCH EG RATE 4	PITCH EG LEVEL 1	PITCH EG LEVEL 2	PITCH EG LEVEL 3	PITCH EG LEVEL 4	KEY TRANSPOSE	VOICE NAME
6		1	00																0											
5		1	00																0											
4	R	15	00		99	99	70	00	99	98	00	00	F4		-L		27		81										C4	
3	R	0	50		99	99	67	00	99	99	00	00							50											
2	R	2	00		99	99	99	00	99	99	00	00							67											
1	R	0	50		66	99	99	00	99	99	00	00	82		-L		74	7	82											
	ON																													

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
MODULATION WHEEL RANGE	MODULATION WHEEL PITCH	MODULATION WHEEL AMPLITUDE	MODULATION WHEEL EG BIAS	FOOT CONTROL RANGE	FOOT CONTROL PITCH	FOOT CONTROL AMPLITUDE	FOOT CONTROL EG BIAS	BREATH CONTROL RANGE	BREATH CONTROL PITCH	BREATH CONTROL AMPLITUDE	BREATH CONTROL EG BIAS	AFTER TOUCH RANGE	AFTER TOUCH PITCH	AFTER TOUCH AMPLITUDE	AFTER TOUCH EG BIAS

YAMAHA DX7 VOICE DATA LIST

DATE/PRESET No. :

VOICE NAME : OSCAR BASS

PROGRAMMER : BILL MARTIN

OP	ALGO-RITHM	FEED BACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	LFO PITCH MOD. SENSITIVITY	LFO AMPLI-TUDE MOD. SENSITIVITY
	9	6	SIN	60	Ø	Ø	Ø	ON	2	0
										0
										0
										0
										0
										0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	POLY/MONO	PITCH BEND RANGE	PITCH BEND STEP	PORTAMENTO MODE	PORTAMENTO GLISSANDO	PORTAMENTO TIME									

OP	OSC MODE/SYNC	OSC FREQ COARSE	OSC FREQ FINE	OSC DETUNE	EG RATE 1	EG RATE 2	EG RATE 3	EG RATE 4	EG LEVEL 1	EG LEVEL 2	EG LEVEL 3	EG LEVEL 4	KEYBOARD LEVEL SCALING BREAK POINT	KEYBOARD LEVEL SCALING L CURVE	KEYBOARD LEVEL SCALING R CURVE	KEYBOARD LEVEL SCALING L DEPTH	KEYBOARD LEVEL SCALING R DEPTH	KEYBOARD RATE SCALING	OPERATOR OUTPUT LEVEL	OPERATOR VELOCITY SENS.	PITCH EG RATE 1	PITCH EG RATE 2	PITCH EG RATE 3	PITCH EG RATE 4	PITCH EG LEVEL 1	PITCH EG LEVEL 2	PITCH EG LEVEL 3	PITCH EG LEVEL 4	KEY TRANSPOSE	VOICE NAME
6		4	04	-2	46	10	46	71	99	15	00							2	82	2										
5		1	01	0	31	24	33	46	99	93	00							7	83	2										
4	RATIO	1	01	-2	36	35	23	69	99	93	00		N/A					0	81	0									C2	
3		1	01	0	75	32	25	59	99	93	00							0	99	7										
2		1	00	0	99	30	29	50	99	92	00							0	83	2										
1		2	00	0	31	32	23	67	99	95	00							0	99	1										
	ON																													

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
MODULATION WHEEL RANGE	MODULATION WHEEL PITCH	MODULATION WHEEL AMPLITUDE	MODULATION WHEEL EG BIAS	FOOT CONTROL RANGE	FOOT CONTROL PITCH	FOOT CONTROL AMPLITUDE	FOOT CONTROL EG BIAS	BREATH CONTROL RANGE	BREATH CONTROL PITCH	BREATH CONTROL AMPLITUDE	BREATH CONTROL EG BIAS	AFTER TOUCH RANGE	AFTER TOUCH PITCH	AFTER TOUCH AMPLITUDE	AFTER TOUCH EG BIAS

TX816

— A NEW 8 VOICE COMBINATION PATCH

BY SCOTT PLUNKETT & MICHAEL A. HUISMAN

THIS TX816 VOICE PATCH USES ALL eight of the slots in a TX816 FM digital rack-mount tone generator system. The sounds are created in groups of two. What this means is that you can still take advantage of these sounds, even if you don't own a complete TX816 system. If you have a TX216, two DX7s, or a DX7/TX7 combination, you can reproduce each individual sound in this TX816 setup.

If you *do* have a full TX816 rack, the sounds are set up to be playable as follows:

Electric Piano—playable in all ranges
Strings—assigned to foot controller, playable in all ranges
Brass—assigned to breath controller, playable in middle/upper ranges
Bass—playable in low ranges (level scaling prohibits upper ranges)

Because the voice charts contains so much data, we did not have enough space to reproduce a graphic representation of each algorithm. However, we did provide you with information concerning the structure of each algorithm, under the column labelled "ALS." In that column, each Carrier operator is indicated with a "C." Modulator operators are indicated by numbers that represent the Carrier operators that they are modulating. Operators involved in the feedback loop are indicated by a dot in front of their number in the "# OP" column.

Here are notes on the various sound pairs that make up this combination sound for the TX816:

SLOTS 1 & 2

Electric Piano sound:
Rhodes1/Rhodes2

This electric piano sound differs somewhat from the normal DX/TX electric piano sound. It was created using a component voicing approach: Slot 1 creates the body of the sound, while slot 2 creates the tine sound and the "knock" of a traditional electric piano. Changing the frequencies of operators #3, 4, and 5 in slot 2 will produce different types of tine sounds.

SLOTS 3 & 4

String sound:
Live Str1/Live Str2

Scott did all the hard work on this sound, which has reverb built in! This FM voicing technique that has been around for about a year, but has just recently caught on with sound programmers. The key to the reverb in this sound is the fixed frequency modulator in the number two position in a stack.

SLOTS 5 & 6

Horn sound:
BloHorns1/BloHorns2

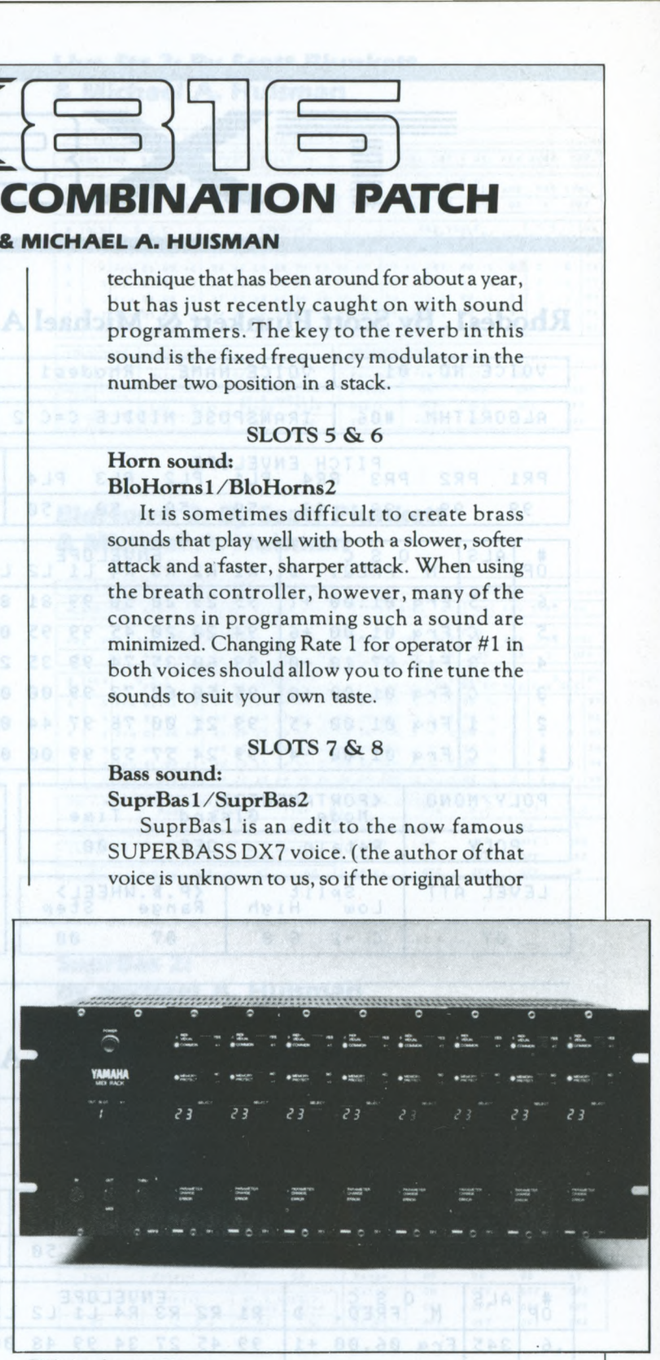
It is sometimes difficult to create brass sounds that play well with both a slower, softer attack and a faster, sharper attack. When using the breath controller, however, many of the concerns in programming such a sound are minimized. Changing Rate 1 for operator #1 in both voices should allow you to fine tune the sounds to suit your own taste.

SLOTS 7 & 8

Bass sound:
SuprBas1/SuprBas2

SuprBas1 is an edit to the now famous SUPERBASS DX7 voice. (the author of that voice is unknown to us, so if the original author happens to be reading—*nice, very nice* . . .). The edits smooth out the voice so that it can be combined with another sound—the SUPERBASS voice is great by itself but sometimes is too strong to combine with other voices. SuprBas2 is more of a Moog-type bass sound. Combining these two voices together seemed to work well. If you play in mono mode, you can get a Chicago/David Foster type of bass sound.

* Data charts for these 8 voices illustrated on following pages.



TX816 rack-mount FM digital tone generator system.

TX816 *Continued*

Rhodes1. By Scott Plunkett & Michael A. Huisman.

VOICE NO.: 01	VOICE NAME : Rhodes1

ALGORITHM: #06	TRANSPOSE: MIDDLE C=C 2	F.B.LEVEL: 04	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
99	99	99	99	50	50	50	50	TRIANGL	14	00	01	00	1	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
.6	5	Frq	01.00	+7	95	29	20	50	99	81	82	00	04	+L	D 3	34	-L	3	4	3	77
.5	C	Frq	01.00	+6	94	20	20	45	99	95	00	00	00	-L	G#2	00	-L	4	4	3	99
4	3	Fix	87.18	+0	99	60	35	74	99	35	27	00	10	+L	F 2	54	+L	3	3	3	85
3	C	Frq	01.00	+0	95	50	62	73	99	00	00	00	00	-L	G 3	99	+L	2	3	3	93
2	1	Frq	01.00	+5	99	21	00	76	97	44	00	00	10	+L	D 3	12	-L	3	5	3	89
1	C	Frq	01.00	-4	99	24	57	53	99	00	00	00	00	-L	A -1	00	-L	3	5	3	98

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	08	15	08
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	OFF

Rhodes2. By Scott Plunkett & Michael A. Huisman.

VOICE NO.: 02	VOICE NAME : Rhodes2

ALGORITHM: #22	TRANSPOSE: MIDDLE C=C 4	F.B.LEVEL: 07	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
82	99	99	99	50	50	50	50	SAW DWN	15	00	02	00	4	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
.6	345	Frq	06.00	+1	99	45	27	34	99	48	00	00	20	-L	C 4	00	-L	3	4	0	80
5	C	Frq	17.00	+3	99	58	23	45	99	00	00	00	99	-L	E 4	24	+E	3	5	0	73
4	C	Frq	06.08	+2	99	92	22	61	99	00	00	00	99	-L	E 3	16	-L	2	6	0	73
3	C	Frq	00.50	+0	99	71	23	58	99	59	00	00	99	-L	E 3	08	-L	2	5	0	80
2	1	Fix	75.86	+0	99	62	69	40	99	00	00	00	00	-L	G#3	99	+L	2	1	0	94
1	C	Frq	00.50	+7	99	62	69	40	99	22	00	00	00	-L	A#2	00	-E	2	5	0	99

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	08	15	08
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	OFF

Live Str 1: By Scott Plunkett & Michael A. Huisman

VOICE NO.: 03	VOICE NAME : Live Str1

ALGORITHM: #15	TRANSPOSE: MIDDLE C=C 3	F.B.LEVEL: 07	OSC KEY SYNC: OFF

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
84	95	95	60	50	50	50	50	SINE	30	00	18	00	1	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
6	4	Frq	03.00	-7	84	36	10	16	99	99	95	00	00	+L	C#4	00	-L	0	0	0	68
5	4	Frq	01.00	-6	84	36	10	12	99	99	95	00	18	+L	C#4	00	-L	0	1	0	75
4	3	Fix	2.455	-3	84	36	10	00	99	99	99	00	06	-L	B 2	00	-L	0	1	0	80
3	C	Frq	01.00	+6	38	07	07	41	93	92	92	00	31	-L	A 2	00	-L	0	1	3	99
.2	1	Frq	01.00	+7	44	36	10	22	99	99	99	00	00	-L	G 2	00	-L	0	1	0	78
1	C	Fix	1.820	+0	45	35	18	48	99	99	99	00	31	-L	A 2	00	-L	0	1	3	99

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	15	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	ON	OFF	OFF

Live Str 2: By Scott Plunkett & Michael A. Huisman

VOICE NO.: 04	VOICE NAME : Live Str2

ALGORITHM: #15	TRANSPOSE: MIDDLE C=C 3	F.B.LEVEL: 07	OSC KEY SYNC: OFF

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
84	95	95	60	50	50	50	50	SINE	31	00	33	00	1	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
6	4	Frq	03.00	+6	84	36	10	00	99	99	95	00	00	+L	C#4	00	-L	0	0	0	68
5	4	Frq	01.00	+6	84	36	10	00	99	99	95	07	18	+L	C#4	00	-L	0	1	0	74
4	3	Fix	2.951	-3	84	36	10	00	99	99	99	00	06	-L	B 2	00	-L	0	1	0	77
3	C	Frq	01.00	-5	37	12	10	42	96	94	94	00	31	-L	A 2	00	-L	0	2	3	99
.2	1	Frq	01.00	-6	44	36	10	34	99	99	99	00	00	-L	B 2	00	-L	0	1	0	76
1	C	Fix	1.985	+0	56	35	10	43	99	99	99	00	31	-L	A 2	00	-L	0	1	3	92

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	15	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	ON	OFF	OFF

BloHorns 1: By Scott Plunkett & Michael A. Huisman

VOICE NO. 05	VOICE NAME : BloHorns1

ALGORITHM: #18	TRANSPOSE: MIDDLE C=C 3	F.B.LEVEL: 07	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
92	93	88	60	47	49	50	50	SINE	29	00	00	00	3	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
6	5	Frq	01.00	-1	42	39	28	03	99	94	88	07	04	+L	F 2	00	-E	0	1	0	70
5	4	Frq	01.00	-5	60	39	31	40	99	98	81	01	24	-L	C 3	00	+L	0	3	0	82
4	1	Fix	2.512	+1	49	39	32	46	99	98	81	00	24	-L	D 4	16	-L	0	3	0	82
.3	1	Frq	01.00	-5	60	39	32	67	99	81	81	00	35	-L	C 3	02	-L	0	3	0	78
2	1	Frq	01.00	-5	61	46	42	71	99	98	86	00	49	-L	F#3	00	+L	0	2	0	80
1	C	Frq	01.00	-5	59	30	32	56	99	77	81	00	00	+L	C 4	00	+L	3	7	3	95

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	08	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	ON

BloHorns 2: By Scott Plunkett & Michael A. Huisman

VOICE NO. 06	VOICE NAME : BloHorns2

ALGORITHM: #18	TRANSPOSE: MIDDLE C=C 2	F.B.LEVEL: 07	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
81	63	95	60	52	50	50	50	TRIANGL	30	44	05	00	3	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
6	5	Frq	01.01	+0	99	80	20	70	99	75	00	00	00	-L	A -1	00	-L	7	1	0	97
5	4	Frq	01.00	-1	83	22	16	50	97	61	00	00	00	-L	A -1	00	-L	0	1	0	81
4	1	Frq	01.00	+0	66	28	15	50	75	75	50	00	00	-L	A -1	00	-L	0	1	0	99
.3	1	Frq	01.00	-6	44	15	17	56	99	86	86	00	00	-L	G 3	00	-L	2	0	0	74
2	1	Frq	01.00	+1	48	19	15	64	88	77	00	00	00	-L	A -1	00	-L	2	2	0	94
1	C	Fix	1.000	+0	49	24	19	60	99	86	86	00	00	-L	A -1	00	-L	2	2	3	99

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	03	08	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	ON

SuprBas 1: By Michael A. Huisman

VOICE NO. 07	VOICE NAME : SuprBas1

ALGORITHM: #17	TRANSPOSE: MIDDLE C=C 3	F.B.LEVEL: 07	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
99	99	99	99	54	50	50	50	TRIANGL	31	00	00	00	3	ON

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
6	5	Fix	416.9	+0	99	99	65	99	99	99	00	00	00	-L	A -1	00	-L	4	3	0	99
5	1	Frq	07.00	-2	99	99	38	99	99	99	00	00	00	-L	E 3	99	-L	7	7	0	78
4	3	Frq	03.00	-2	81	53	41	78	99	97	00	00	00	-L	G 3	99	-L	7	7	0	78
3	1	Frq	00.50	+6	61	99	99	14	99	99	99	00	00	-L	A -1	00	-L	7	1	0	75
.2	1	Frq	02.02	-5	95	99	19	59	84	86	00	00	00	-L	A -1	00	-L	5	5	0	83
1	C	Frq	01.00	+2	99	64	33	67	99	86	00	00	00	-L	D 3	99	-L	2	2	0	99

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	08	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	OFF

SuprBas 2: By Michael A. Huisman

VOICE NO. 08	VOICE NAME : SuprBas2

ALGORITHM: #22	TRANSPOSE: MIDDLE C=C 3	F.B.LEVEL: 04	OSC KEY SYNC: ON

PITCH ENVELOPE PR1	PR2	PR3	PR4	PL1	PL2	PL3	PL4	LFO WAVE	SPD	DLY	PMD	AMD	PMS	SYNC
99	95	95	60	50	50	50	50	SINE	29	63	35	08	1	OFF

# OP	ALS	OSC M	OSC FREQ.	OSC D	ENV R1	R2	R3	R4	L1	L2	L3	L4	KBD SCALE LD	LC	BP	RD	RC	Krs	S Kvs	S Ams	OL
.6	345	Frq	01.00	+0	81	88	38	48	93	99	00	00	00	-L	F 2	99	-L	3	7	0	94
5	C	Frq	00.50	+0	99	05	00	99	99	92	00	00	00	-L	F 2	99	-L	3	0	0	99
4	C	Frq	01.00	+0	99	05	00	99	99	92	00	00	00	-L	F 2	99	-L	3	0	0	96
3	C	Frq	01.00	+0	99	05	00	99	99	92	00	00	00	-L	F 2	99	-L	3	0	3	95
.2	1	Frq	00.50	-5	99	73	46	53	99	99	00	00	00	-L	A -1	00	-L	3	3	1	92
1	C	Frq	01.00	-5	99	29	35	99	99	99	07	00	00	-L	F 2	99	-L	3	1	3	99

POLY/MONO	<PORTAMENTO> Mode	Glssnd	Time
POLY	Retain	OFF	00

LEVEL ATT	Split Low	High	<P.B.WHEEL> Range	Step
07	C -2	G 8	07	00

<MODULATION>	M.W	F.C	A.T	B.C
Range	08	08	08	15
Pitch	ON	OFF	OFF	OFF
Amplt	OFF	OFF	OFF	OFF
EG.bi	OFF	OFF	OFF	OFF

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