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The XG Disklavier!

Also: XG Xtra Talks With The Fat Man..... page 4

Using XG Variation Voices page 6

XG Software Listing page 10

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EXPLORING THE YAMAHA DISKLAVIER

The XG revolution is beginning to spread far and wide, with the XG logo making its appearance on more and more products. Perhaps the most unique of all is the brand-new Yamaha DGH1BXG Disklavier™ grand piano, unveiled at the 1996 Winter NAMM show.

Many people consider the Yamaha Disklavier to be the player piano of the twentieth century. This incredible technology enables standard acoustic pianos to be constructed with a patented mechanical system that drives both the keys and pedals in response to MIDI sequence data being played back from an onboard floppy drive or coming from an external source

via a MIDI input jack. As the MIDI data is received, the Disklavier keys and pedals magically move up and down, as if it were actually being played! This has applications in both home entertainment (where you can, for example, sit in the comfort of your living room and hear the music of George Gershwin actually being played on your acoustic piano by Gershwin) and in education, where music students can learn playing techniques and arrangements by literally watching and/or playing along. There are currently more than 300 disks (called PianoSoft™ and PianoSoft•Plus™) available for the Disklavier which contain the left-hand, right-hand, and pedal parts recorded on separate

MIDI channels—and, of course, since these are MIDI sequences, they can be played back at any tempo that is comfortable and transposed into any key you like.

Disklaviers are also equipped with an onboard MIDI tone generator, enabling complete ensemble backing for acoustic piano parts. Up until now, the tone generators used by Disklaviers have been simply GM-compatible, but the DGH1BXG is the first to contain a fully XG-compatible tone generator—the Yamaha WaveForce DB50XG daughterboard—within the piano's compact computer control unit. The end result is a beautiful 5' 3" grand piano, combined with 676

high-quality wavetable voices, 21 drum kits, and extensive DSP functions, including 11 reverb settings, 11 chorus settings, and numerous Variation settings such as distortion, rotary speaker, flanger, and delay.

Another unique feature offered by Disklaviers is *half-pedaling*, whereby 16 incremented steps of variable pedal values are accepted for Sustain and Soft pedal (cc #64 and #67) in addition to the simple On-Off (00h or 7Fh) switching normally used for these controllers. This enables the accurate replication of the subtle pedalling of a trained pianist.

In addition, the DGH1BXG can play back any type 0 GM or XG SMF stored on a DOS-formatted 3-1/2" floppy disk. There are three standard Disklavier song types. The standard mapping for so-called "Normal" songs is:

- *Track 1 (MIDI channel 1):* Piano part (left and right hand) plus pedal on-off data
- *Track 3 (MIDI channel 3):* Continuous pedal data (half-pedaling)

For educational purposes, it is often desirable to separate out the left- and right-hand piano parts. This is the purpose of Disklavier "L/R" songs, mapped as follows:

- *Track 1 (MIDI channel 1):* Left-hand piano part plus pedal on-off data
- *Track 2 (MIDI channel 2):* Right-hand piano part plus duplicate of pedal on-off data
- *Track 3 (MIDI channel 3):* Continuous pedal data (half-pedaling)

The third type of standard Disklavier song is called "Ensemble." This uses

exactly the same mapping as the "L/R" song for MIDI channels 1-3; however, additional accompanying instrument sounds (played by the onboard tone generator) can be added to channels 4-16 (as with GM, channel 10 is used as a rhythm part).

The Disklavier is not limited to playing just these song types, however, since there is also provision for remapping individual tracks to specific MIDI channels. Any two MIDI channels (one for the right-hand part and one for the left-hand part) can be assigned to drive the Disklavier playback mechanism (though Yamaha recommends using channels 1 or 2 for this purpose). This means that the DGH1BXG can play back any XG music file—and if the file contains one or two tracks meant to play a wavetable piano program, the sound of a real piano can be substituted!

One last interesting note: Because the Disklavier uses a mechanical solenoid system to drive the piano keys and pedals, received MIDI data is not played instantly, as it is on a synthesizer. There is a slight delay, which will vary according to note number and key velocity. But the DGH1BXG is smart enough to factor this in, automatically applying the required delay time to incoming MIDI data so as to ensure perfect synchronization between the piano part(s) and the accompanying parts being played by the internal DB50XG tone generator.

Keep an eye out for the new DGH1BXG at your local piano dealer—it represents the marriage of the Disklavier and XG: two truly amazing technologies in one amazing instrument!

XG Xtra Talks With The Fat Man

Mention the words “The Fat Man” to your average Joe on the street and he’ll think you’re conjuring up images of Sydney Greenstreet or Victor Buono in some grainy old black-and-white movie. But mention the name to anyone in gaming, and they’ll know exactly who you mean — George Alistair Sanger, renowned composer of numerous best-selling titles, including 7th Guest (Trilobyte), which was not only the first game to include a General MIDI score, but

was also the first to sell over a million copies. While continuing to crank out some of the best MIDI music in the gaming industry, The Fat Man has branched into new endeavors in recent months. Most notably, he has established Fat Labs, a testing service which checks sound card products for compatibility and balance—the important issues for determining a GM sound card’s usefulness. Says Sanger, “If the mix is well-balanced when the target card

plays back, the card is useful. If not, it doesn't matter how pretty the string sounds are, or what the signal-to-noise ratio is—the card just isn't compatible with other cards or the GM music that's out there." He continues, "Incompatibility is the greatest danger to General MIDI's survival. General MIDI's next greatest danger comes from the possibility that we might lose this golden moment in which there is only one de facto standard for balance. If a more popular, less expensive sound card, with very different balance specifications, were to reach the market and become another de facto standard, we may never find an elegant way to allow all General MIDI files to work with all General MIDI instruments."

Recently, Fat Labs awarded Yamaha's new DB50XG daughterboard with their Match Seal, giving it their



recommendation for the playback of General MIDI music when used in conjunction with an MPU-401 compliant sound card. Sanger states, "This is a product that is beyond reproach as far as its compatibility with GM," adding, "until I had tested the DB50XG, every sound card I listened to lost some significant musical passages due to incompatibilities with GM. This product is the only one I have encountered that, off the shelf, works perfectly. I love the sounds that are in it and the balance of the

instruments is wonderful—in fact, there are some things that I'd rather listen to on the DB50XG than on other sound cards or tone modules." His conclusion? "I feel perfectly comfortable in recommending that developers go ahead and write their GM music files on the DB50XG."

Of course, while XG is designed to be totally GM-compatible (as certified by Fat Labs), that isn't the whole story by any means. Sanger observes, "In some ways, the XG format is almost proof of the validity of the GM concept," in that it adds a whole new set of features and tools while still maintaining universal compatibility. "Many of the XG demos have totally knocked me out," says Sanger, "and I expect that much beautiful music will be composed with XG."

You can contact Fat Labs at (<http://www.outer.net/fatman/>).

Using XG Variation Voices

One of the most significant improvements XG makes to General MIDI is the addition of hundreds of new sounds above and beyond the basic 128-voice GM Sound Set. XG instruments always provide at least 520 melody voices stored in ROM, and many offer even more (for example, the MU50 has a total of 737). These additional presets are called “Variation” voices, accessed by transmitting a Bank Select MSB (cc #0) value of 00H, followed by the appropriate Bank Select LSB (cc #32) value and Program Change message. If no Bank Select LSB is transmitted, a value of 00H is assumed, and the XG instrument defaults to Bank 0, which contains the basic 128-voice GM

Sound Set, as defined in the GM Specification. Good as those GM voices are (and we think that XG does the best job of GM emulation around, as recently evidenced by Fat Labs’ certification of our DB50XG sound card—see page 4 in this issue of XG Xtra for more information), a lot of the magic in XG is contained in those other banks of Variation voices. In this article, we’ll take a closer look at how Variation voices are organized and talk about how you can best use them to add a new dimension to your XG music files.

The XG Specification includes an important table called “Bank Definition” (also presented at the conclusion of this article, on

pages 13 - 20 — but, thanks to the magic of Adobe Acrobat™, you can simply click [HERE](#) to jump directly to it). This table describes the basic types of sounds that can be stored in the 128 different banks that XG instruments can potentially utilize, making it easy to pick a specific kind of Variation voice when the basic GM voice just doesn’t “cut it” in a particular musical situation. Here are some helpful hints pertaining to Variation voice organization:

- The voices in banks 1 - 8 are essentially similar to their GM equivalent in bank 0, with only minor (though often highly effective) modifications.

- The voices in banks 9 - 15 differ from their GM counterparts mainly by having different AEG (Amplifier Envelope Generator) settings.
- The voices in banks 16 - 23 differ from their GM counterparts mainly by having different filter settings.
- The voices in banks 24 - 31 differ from their GM counterparts mainly by having different FEG (Filter Envelope Generator) settings.
- The voices in banks 32 - 39 differ from their GM counterparts mainly by layering two elements and then detuning the elements or changing their pitch relative to one another in various ways.

- The voices in banks 40 - 47 differ from their GM counterparts mainly by layering two elements, with the new wave different from the basic one.
- Banks 48 - 63 are reserved for future use.
- The voices in banks 64 - 95 differ from their GM counterparts in that they use a different wavetable (though they are designed to create a similar kind of sound).
- The voices in banks 96 - 111 often have little or no resemblance to their GM counterpart.
- Banks 112 - 127 may be used by future XG instruments for the storage of user-created voices.

Of course, compatibility is always an important issue—you'll certainly want your XG music to be played back accurately on all XG instruments. For this reason, you'll probably want to use only the 128 basic GM voices (stored in bank 0) plus the 392 Variation sounds offered by all XG instruments (as described in the XG Voice List, included in the XG Specification and also available online as an independent document). You'll find these voices stored in a number of specific banks, which, as is shown in the table on the next page, are organized according to the types of sounds they contain:

Bank #	Description
1	Key Scaled Panning (KSP)
3	Stereo
6	Single Element
8	Slow Attack
12	Fast Decay
14	Double Attack
16 - 17	Bright
18 - 19	Dark
20	Resonant
24	Attack Transient
25	Release Transient
27	Rezo Sweep
28	Muted
32 - 34	Detune
35 - 36	Octave Layered
37 - 38	Fifth Layered
39	Bend Up/Down
40 - 42	Tutti
43	Velocity Switch
45	Velocity Crossfade
64 - 72	Other Wave (similar to GM equivalent)
96 - 101	Other Wave (dissimilar from GM equivalent)

There are many advantages to using Variation voices beyond the obvious one of expanding your sonic palette. For example, voices stored in banks 1 and 3 provide strong panning effects, particularly effective in gaming applications or when the sound is likely to be played back through a system that utilizes “surround sound” techniques. The usage of Variation voices can also help minimize the MIDI data stream, reducing your programming time and lessening the chances of glitches due to MIDI traffic overload. For example, if you know that a musical passage will be playing a French Horn fanfare in parallel fifths, you can save some time and MIDI overhead by selecting the “HornOrch” voice from bank 37 and playing single notes instead of the standard GM “French Horn” voice (PC #61) in bank 0 and playing chords. If you know that you want a

violin sound with a soft attack, well, sure, you can choose the “Violin” GM voice (PC #41) in bank 0 and then use a stream of control change or NRPN messages to slow its attack time—or you can simply select the “SlowVln” Variation voice in bank 8.

The Velocity Switch and Velocity Crossfade banks (banks 43 and 45) contain matching pairs of sounds, effectively allowing you to assign two matched voices to a single channel, and then either switch or crossfade between them as velocity values change. For example, the “VelGtHrm” voice stored in bank 43 (PC #25) plays a standard GM nylon string guitar when played at velocities of 120 or less, but switches to guitar harmonics when played with velocities higher than 120. The “HardVibe” voice stored in bank 45 (PC #12) adds an extra dimension to the basic GM “Vibes” voice stored

in bank 0 by increasingly mixing in the sound of a hard mallet attack as notes are played with higher velocity values; this yields quite a different sound than if velocity is simply used to increase brightness and volume. The “Other Wave” sounds in banks 64 - 72 and 96 - 101 enable you to step outside of the limitations of the GM sound set in varying degrees. Variation voices stored in banks 64 - 72 have a strong similarity to their GM counterparts in bank 0, but the substitution of alternate wavetables give them a distinctive flavor. However, the Variation voices stored in banks 96 - 101 often bear little resemblance to anything in the GM world. In particular, you’ll find loads of alternate Synth Effects, Sound Effects, Ethnic and Percussive sounds stored in these banks.

The maximum number of notes that can be played at once is a function of

the architecture of the receiving instrument and of the number of elements (oscillators) used by a specific sound; where two oscillators are used, polyphony is halved. Because XG instruments are always capable of playing at least 32 elements simultaneously (as opposed to the 24 required by GM and GS), this will rarely be an issue. However, there are times when Variation voices use two elements, as opposed to the single element used by the base GM voice. Voices stored in banks 3 (Stereo), 32 - 34 (Detune), 35 - 36 (Octave Layered), 37 - 38 (Fifth Layered), 39 (Bend Up/Down), 40 - 42 (Tutti), 43 (Velocity Switch), and 45 (Velocity Crossfade) will always use two elements, for obvious reasons. Variation voices stored in other banks may use either one or two elements—this information can be found in the XG Voice List.

XG publications available from Yamaha

- XG Interactive Online Help
- An Introduction to XG
- XG Guidebook
- XG Music Production Recommendations
- XG Specifications
- XG Voice List
- XG Xtra issues #1 - #5

All available online (www.ysba.com) or in hard copy direct from Yamaha:

Send requests via e-mail to:

news@ysba.com

or, via “snail-mail,” to:

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XG-Compatible Software Products

as of 5/96
page 1 of 3

Developer	Title	Release Date
Atlantean Interactive	Cat Fight	1st qtr 96
Atlantean Interactive	Fighting Spirit	tba
Atlantean Interactive	Human Dart	tba
Atlantean Interactive	Medieval Madness	2nd qtr 96
Calliope Media		In development
Compton's New Media		In development
Dark Planet Interactive	Lord of Tantrazz	1st qtr 96
Double Trouble		In development
Electric Fantasies Production	Bamboozle	2nd qtr 96
Electric Fantasies Production	Island Peril	1st qtr 96
E-Magic	Logic Audio	Current
Fat Labs	Fat Man Seal	Current
Hal Leonard Publishing	Various Titles	1st qtr 96
Howling Dog Systems	Power Chord Pro V2.x	2nd qtr 96
I-Motion	Knight Chase	Current
Looking Glass Technologies	Star Trek Voyager	In development
Looking Glass Technologies	Terra Nova	Current
Media Terra	Explorer the Grand Canyon v.2	Current
MIDItainment Inc.	One Hand Band	1st qtr 96
Miles Design	Audio Interface Library	Current
Opcode Systems	Galaxy (MU50, MU80 librarians)	Current

XG-Compatible Software Products

*as of 5/96
page 2 of 3*

Developer	Title	Release Date
Sonic Foundry	GeneSynth (Development Tool)	Current
Tran Tracks	All future releases	
Twelve Tone Systems	Cakewalk Express 4.0	1st qtr 96
Twelve Tone Systems	Cakewalk Home Studio 4.0	1st qtr 96
Twelve Tone Systems	Cakewalk Pro Audio 4.0	Current
Twelve Tone Systems	Cakewalk Pro Audio 5.0	3d qtr 96
Twelve Tone Systems	Cakewalk Pro Audio Deluxe CD 4.0	Current
Twelve Tone Systems	Cakewalk Pro Audio Deluxe CD 5.0	3d qtr 96
Twelve Tone Systems	Cakewalk Song Station	1st qtr 96
Voyetra	Digital Orchestrator Plus 2.0	1st qtr 96
Voyetra	Midi Orchestrator 2.0	1st qtr 96
Voyetra	Orchestrator 2.0	1st qtr 96
Worship Solutions	Breaking Down the Walls	1st qtr 96
Worship Solutions	Contemporary Hymns Vol 1	1st qtr 96
Worship Solutions	Contemporary Hymns Vol 2	1st qtr 96
Worship Solutions	Contemporary Hymns Vol 3	1st qtr 96
Worship Solutions	Kids Praise Vol 1	1st qtr 96
Worship Solutions	Kids Praise Vol 2	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 1	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 2	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 3	1st qtr 96

XG-Compatible Software Products

as of 5/96
page 3 of 3

Developer	Title	Release Date
Worship Solutions	Maranatha Music Praise Series Vol 4	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 5	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 6	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 7	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 8	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 9	1st qtr 96
Worship Solutions	Maranatha Music Praise Series Vol 10	1st qtr 96
Worship Solutions	Raise the Standard Vol 1	1st qtr 96
Worship Solutions	Raise the Standard Vol2	1st qtr 96
Worship Solutions	Seize the Moment	1st qtr 96

This list is constantly expanding, so we'll be updating it periodically in future issues of XG Xtra—stay tuned!

***Coming in the next issue of XG Xtra!
A Glimpse Into the Digital Future — IEEE 1394 (FireWire)***

XG Bank Definition

Bank No. 1-63: Voices that can be created by modifying voice parameters

Bank No.	Description	Note (example)
0	Capital Tone Voice	GM basic tone
1	Voices that can be added without changing the sound	Key Scaled Panning (L to R)
2		Key Scaled Panning (R to L)
3		Stereo
4		With LFO
5		Without LFO
6		Single Element
7		
8	Voices that can be added mainly by AEG changes (or by equivalent operations).	Slow Attack
9		Fast Attack
10		Long Release
11		Short Release
12		Fast Decay
13		Slow Decay
14		Double Attack
15		

XG Bank Definition

Bank No.	Description	Note (example)
16	Voices which can be added mainly by Cutoff changes (or equivalent operations) or changes in Q (or equivalent operations).	Bright
17		Bright
18		Dark
19		Dark
20		Resonant
21		
22		
23		
24	Voices which can be added mainly by FEG changes (or equivalent operations).	Attack Transient
25		Release Transient
26		Sweep
27		Rezo Sweep
28		Muted
29		
30		
31		

XG Bank Definition

Bank No.	Description	Note (example)
32	Voices which can be added by modifying the pitch (or equivalent operations), including 1-element <> 2-element extensions of the same type of voice.	Detune with same wave
33		Detune with same wave
34		Detune with same wave
35		Octave Layered
36		Octave Layered
37		5th Layered
38		5th Layered
39	Voices which can be added by layering with an entirely different type of wave.	Bend Up/Down
40		Tutti
41		Tutti
42		Tutti
43		Velocity Switch
44		Velocity Switch
45		Velocity X-Fade
46		Velocity X-Fade
47		Breathy WW

XG Bank Definition

Bank No.	Description	Note (example)
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		

XG Bank Definition

Bank No. 64-127: Voices that can be created by changing the wave

Bank No.	Description	Note (example)
64	Identical instrument sounds which can be created using an entirely different type of wave.	
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		

XG Bank Definition

Bank No.	Description	Note (example)
80	Identical instrument sounds which can be created using an entirely different type of wave.	
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		
91		
92		
93		
94		
95		

XG Bank Definition

Bank No.	Description	Note (example)
96	Voices which are not unacceptably incompatible with capital tones, even though from a perspective of category and instrumental family they are entirely different instruments	Dulcimer -> Cimbalon
97		Nylon Gt. -> Ukelele
98		
99		
100		
101		
102		
103		
104		
105		
106		
107		
108		
109		
110		
111		

XG Bank Definition

Bank No.	Description	Note (example)
112	User voices which are not unacceptably incompatible with capital tones.	
113		
114		
115		
116		
117		
118		
119		
120		
121		
122		
123		
124		
125		
126		
127		