Workaround for the Two Layer/ Split Limitation

a mini-tutorial for Yamaha EX series synthesizers

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1. Introduction

1.1 This document summarises a workaround to counter the keyboard layer limitations of the Yamaha EX5.

1.2 The Yamaha EX5 only allows two voices to be split or layered from the keyboard within a performance. If you attempt to set up more than two voices, you are presented with an error message stating **"Error – Too Many Layers"**.

1.3 Refer to Page 165 of the EX5 manual for details of performance layers.

1.4 This is a rather surprising limitation considering that the EX5 is capable of sixteen part multi-timbral operation over MIDI.

1.5 I find this a limitation because, although I only have two hands, I would sometimes like to have more than two sounds split on a keyboard for live work to avoid having to select voices during a song. This is important to me given that there is a noticeable delay on the EX5 between selecting a new sound and it being available for playing, which makes quick, "on the fly" voice selection impractical during a song.

1.6 In an addendum to the main EX5 manual, Yamaha describes a workaround which involves combining voices together, but this assumes that the total number of elements within the voices being combined is no more than four elements. For example:

- Four single element voices can be combined into a new split/layered voice.
- Two dual element voices can be combined into a new split/layered voice.
- A single element and a triple element voice can be combined into a new split/layered voice.

1.7 If you do not already have this addendum, it can be obtained from the Yamaha Manual library at www2.yamaha.co.jp/manual/emi/index_e.html (you will need to register to gain a user ID and password – but it's well worth it). Do a search for EX5 and download the "Additional Performance Setup Tips" PDF file (EX7E3.PDF).

1.8 This technique works, providing you are willing to combine voices in this manner, and providing that they are simple enough with respect to the total number of elements.

1.9 The rest of this document describes an alternative technique for countering the layer limitation.

1.10 The technique in outline is to treat the EX5 as two separate units – a master keyboard and a tone generator.

1.11 Before describing this technique, it's worth noting that you cannot use it counter the inherent limitations that exist in performance mode, such as the number of effects or that certain voice combinations are not allowed (e.g. AN and VL together); these limitations are due to the available DSP power of the EX5.

2. MIDI Connection

2.1 First, you need to disable local keyboard control of the EX5 tone generator. You do this by selecting the **UTILITY** button, and selecting the MIDI Setup menu. Within this menu find the Local setting and set it to OFF. The relevant screen is shown on Page 274 of the EX5 manual.

2.2 With no external MIDI connection you'll now find that the EX5 will not be making a sound when you play the keyboard. To get the sound back you need a MIDI connection and a properly configured performance.

2.3 The MIDI connection can be made in one of two ways. You can either take a single MIDI cable and use it to loop the EX5's "MIDI OUT A" port back into the "MIDI IN A" port, or you can make the same connection via a computer or hardware sequencer, providing that your system can automatically echo received MIDI data. You'll have to check your sequencer documents to see if it can do this.

2.4 I have used the former option of just using a single MIDI lead to prove the concept, because I predominantly use the EX5 for live work when I don't have it connected to a computer, and I needed to ensure that this at least worked.

2.5 For testing this was also the best option, as I didn't have to worry about where latency was being introduced; if a PC was used to echo data, I wouldn't have known how much latency was induced within the PC. With the single lead, I know that any latency was attributable to the EX5 and the external MIDI flow.

3. Performance Setup

3.1 Select Performance Mode, and the performance you wish to edit.

3.2 Pages 165-167 of the EX5 manual describe the editing selections that you'll be using to set the parts up.

3.3 Now consider your performance setup and select the voices for the parts that you wish to split/layer.

3.4 Normally in a performance, the parts you play from the keyboard must have the keyboard layer switch selected. With this technique all parts are played via MIDI, so ensure that for all parts the **"Layer SW"** switch is disabled.

3.5 Of relevance to this technique, all parts can be independently assigned:

- A note range – the default range is the whole keyboard
- A velocity range – the default range is the whole velocity range
- A MIDI channel number – the default channel number is the same number as the part number
- Whether or not MIDI data is transmitted for that part on either MIDI Channel A or B.

3.6 Thus to spread your selected parts over the keyboard, adjust the note range for each part to restrict it to the area you wish to play it from. You are free to create separate zones, layered zones or a combination of both; this includes layering parts either partially or fully, depending upon your requirements. You may also assign velocity limits if you wish to make things a little more complex (e.g. two layered piano sounds but only one is played if within the selected range).

3.7 For each part you are using, you'll also need to select the **"Trns MIDI A"** switch within the **LYR** page and set it to on (this is described on Page 165 of the manual).

3.8 You should now hopefully be able to hear your parts in response to playing the keyboard.

3.9 However, if you have layered parts, you may be using more MIDI channels than is necessary and consequently transmitting more data than is necessary, which may lead to latency problems.

3.10 To reduce delays induced by the amount of MIDI traffic you can minimise the number of channels used.

3.11 By default each part within a performance gets its own MIDI channel (e.g. part two gets assigned MIDI channel 2); this channel number is used for both MIDI transmission and reception. You can adjust the channel number for all parts, and several parts can be assigned the same channel number.

3.12 If you consider four parts split across the keyboard with no layering of parts. All parts can have different MIDI channel numbers, but they can actually share the same MIDI channel with no adverse effects. As the parts are split, no savings on MIDI bandwidth are made, but the unused MIDI channels are made available for other instruments.

3.13 If you now consider those four parts all layered over the same keyboard range, they are all transmitting and receiving the same note data over four MIDI channels. In other words more data than is necessary is being sent over MIDI.

3.14 If you set all layered parts to the same MIDI channel number, select one part and enable the **"Trns MIDI A"** switch, and disable the **"Trns MIDI A"** switch for the remaining parts, you can reduce the number of channels needed and also reduce the amount of MIDI data being sent.

4. MIDI Latency

4.1 I found in my tests that, dependent upon the playing style and tempo, between four to eight voices could be stacked before latency was noticeable. Fast glissandos on the keyboard really expose the technique when stacking more than four voices. Having said that a four voice stack becomes pretty mushy anyway, and my interest is more in splitting the keyboard, for which the technique works pretty well with no noticeable latency.

4.2 With sixteen voices stacked together it is quite easy to overflow the MIDI buffer on fast glissandos.

4.3 As described above, latency can be minimised when stacking by ensuring that the stacked parts are all using the same MIDI channel and that only one of the stacked parts is transmitting the data.

5. Conclusion

5.1 This document shows how to counter a limitation of the EX5 that I still find hard to believe is there.

5.2 This technique can be mixed for any combination of split and/layered voices over the keyboard range, and, within the limitations of the tone generator, can be very effective (I just wish Yamaha had allowed me to do this within the machine in the first place!).

5.3 The workaround is not a cure-all; certain issues such as DSP power and MIDI latency need to be considered when using this technique, but this is true of the EX5 or any workstation in general.

5.4 The workaround certainly works for me, and I hope that this description will help other EX5 users out there.

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A Note from Derek and Ski

This mini-tutorial is brought to you in the hope that it will benefit your EX experience. We hope that it will turn into a series of useful documents. If you have a short topic of your own that you think could help others, we strongly encourage you to write it up, even if it's only a page or so. It doesn't have to be a huge tutorial to be useful. We can help a bit with the writing, if necessary, and we'll format it, publish it in .PDF format, and post it for you. Visit us at the EX5Tech discussion boards at http://www.wbmedia.com/ex5, or send email to:

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