

Sys-Ex on the Bitstream 3X

Since the manual of the Bitstream 3X comes a little short in explaining how to use/download Sys-Ex strings in/to the Bitstream 3X using the configuration software, here is a little explanation and example to get you started. We certainly don't pretend to be complete. It's just a little entrance into the wonderful world of Sys-Ex.

First of all, entering Sys-Ex commands on the Bitstream 3X can only be done using the configuration software that comes with it (for the latest version: check the website).

It is not possible to enter Sys-Ex messages with the Bitstream 3X itself in this current firmware version (V1.7)! This may change in future updates.

In short, what is Sys-Ex?

System Exclusive messages, or in short Sys-Ex, are manufacturer dependent messages, used in synthesizers, midicontrollers, FX-gear etc. It is a way of describing and altering functions and parameters of such a machine that goes far beyond the possibilities of the standard midi controller commands, the so called CCs. It was invented to be able to control more parameters than the standard midi protocol allowed, so to speak.

For instance, using midi CCs (Midi Controller Commands) only allows the altering of a maximum of 128 parameters. Of those 128 CCs a lot are already defined in the standard protocol (CC7, volume, CC64 sustain pedal, but also some exclusive ones like breath controller, soft pedal etc.), so in practice you have even less user-definable ones.

But modern gear most of the time has much more parameters than 128. Therefore THE solution: Sys-Ex.

Sys-ex messages contain a number of bytes written in hexadecimal values.

To find out what hexadecimal is, I suggest you do a search on the internet. Dozens of sites explain this and it is quite easy to understand.

In short you use besides the numbers 0 to 9 also the letters A to F which give you a maximum of 16 possibilities. With two digits you get a maximum of 256 possibilities (0-255).

See some examples beneath:

<i>Decimal</i>		<i>Hexadecimal</i>	<i>Decimal</i>		<i>Hexadecimal</i>	<i>Decimal</i>		<i>Hexadecimal</i>
0	=	0	8	=	8	16	=	10 (16 + 0)
1	=	1	9	=	9	17	=	11 (16 + 1)
2	=	2	10	=	A	26	=	1A (16 + 10)
3	=	3	11	=	B	57	=	39 (3 x 16 + 9)
4	=	4	12	=	C	124	=	7C (7 x 16 + 12)
5	=	5	13	=	D	255	=	FF (15 x 16 + 15)
6	=	6	14	=	E			
7	=	7	15	=	F			

The Sys-Ex message

A Sys-Ex message always start with F0 and always ends with F7 to mark the beginning and end of a Sys-Ex command.

In between there are a number of bytes of which some bytes follow a certain protocol and where others are completely manufacturer independent.

Let's take a look at an example message that I use to control the filter 1 envelope of a Waldorf synthesizer:

F0 3E 13 00 20 00 00 4E DV F7

This looks quite impressive huh? But it is not. You just have to know what the bytes stand for. And to know that you need to know the Sys-Ex implementation of the machine you want to control. Most manufacturers have a Sys-Ex description file at the end of the specific machine manual, or otherwise you should be able to find it on the internet. In those documents the meaning of all these bytes is explained.

Now let us first take a closer look to the meaning of each byte in the example string:

1. **F0** Start of Sys-Ex message
2. **3E** Manufacturer ID, in this case Waldorf
3. **13** The device model of the manufacturer, in this case the Blofeld synthesizer
4. **00** The Device ID. See beneath
5. **20** Sound Parameter Change
6. **00** Sound/Multi edit buffer ID
7. **00**
8. **4E** In this case bytes 7. and 8 are combined bytes, to describe a parameter, explained below.
9. **DV** Data value control. This is the place where your midi controller will change the value.
Important: various midicontrollers use various data for that! See beneath.
10. **F7** End of Sys-Ex Message

1. Start of system exclusive message. This is *a/ways* F0.

2. Every manufacturer has its own ID. Waldorf has 3E, Roland has for instance 41, Korg 42, etc.

3. After the manufacturer ID you get the model ID. Works the same as 2. In this case "13" means the Blofeld synthesizer of Waldorf.

4. Device ID. Devices that work with Sys-Ex will have in 99% a parameter where you can set a Device ID. This is implemented to be able to chain two or more of the same devices (for instance two midi interfaces, or two racksynths to double your voices) and control only one of those devices. Or, if you give them the same ID, control both devices at the same time. Normally, a Device ID is set to 00.

5. From here it is definitely necessary to have the Sys-Ex documentation of the specific machine at hand, because every manufacturer does things it's own way. Therefore I won't go into the details of the rest of the message. In short, the "20" message tells the Blofeld synthesizer that a sound parameter change will be made after it with the Sys-Ex message.

The "00" from 6. gives an edit location (because this synth has sound- and multi edit buffers) Then the two bytes 7. "00" and 8. "4E" together describe which parameter will be changed (in this case the filter cutoff of filter 1 of this synthesizer).

Since this synthesizer has hundreds of parameters that can be changed, there is a pair of bytes necessary to describe them all.

9. This is an important one to talk a little bit more about in relation to the Bitstream 3X. The position 9 is in this case used to describe at what position the changes you cause while turning a knob or pressing a button on your Bitstream 3X should be entered.

On the Bitstream 3X this value (we called it DV: Data Value) in the Sys-Ex string must ALWAYS be set to "00" and actually you can insert two of those positions within one Sys-Ex string on the Bitstream 3X. In the software you have to give up the positions as well. Read on!

Once you get the hang of Sys-Ex you will discover that it is a *very* powerful tool to steer your gear in conjunction with a midi controller (like the Bitstream 3X). With Sys-Ex you can normally dive much deeper into the machine then with CCs.

The configuration software for the Bitstream 3X

Now, let us take a closer look at the software that came with your Bitstream 3X. If you start it up and have a proper midi-cable or USB connection with your Bitstream 3X, you can communicate with it using the software. Again, we will not explain the whole software package here, just the parameters that are important for entering Sys-Ex messages. There is a help file in the top menu available to learn more about the other settings.

After starting up the software you will see this screen:



It is a visual representation of the Bitstream 3X in the upper part, where you can choose the controller you want to send out your Sys-Ex string, and you see some parameter boxes in the lower part with five tabs in between (Preferences, Global parameters, Realtime parameters, Assign Common & Standard mode, Assign User & Mackie/Logic modes).

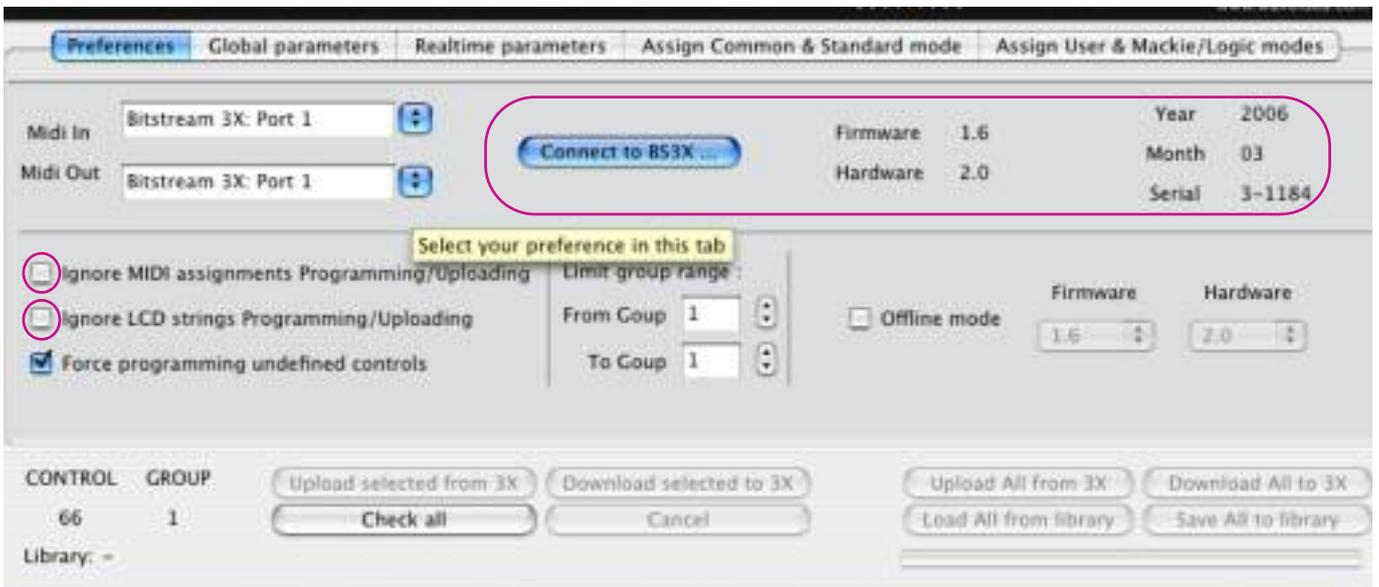
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First you have to decide which controller you want to use to send out your Sys-Ex command. Just click a knob, or button or slider to activate it. You will see a green line on or around that controller. I have clicked on the upper left knob:



You can see the green line inside the knob, saying that that one is activated now for programming.

Then, we take a look in the Preferences tab:



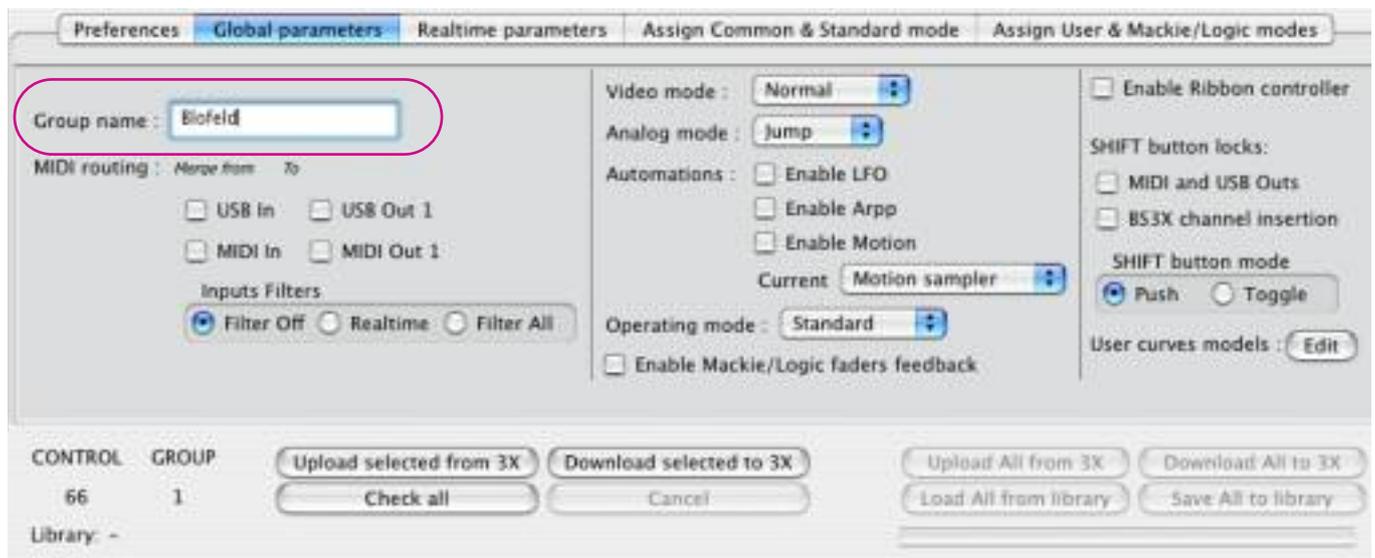
Here, you can make your connection to the Bitstream 3X and when that has happened see the Firmware and Hardware revision, the Serial etc.

IMPORTANT: UN-check the two boxes called “Ignore MIDI assignments Programming/Uploading” and “Ignore LCD strings Programming/Uploading”, otherwise the Bitstream 3X will ignore your nice Sys-Ex string and the name you will give to the parameter which will become visible in the LCD screen. after this download the settings to your Bitstream 3X by clicking the button “Download selected to 3X”.

Also, be sure the group range is not limited (from 0-20) unless you want to program/upload a limited number of groups.

Then, you can eventually name the Group you are working in (so to speak the layer or template you are altering. See the manual for this.)

You do that in the Global Parameters tab:

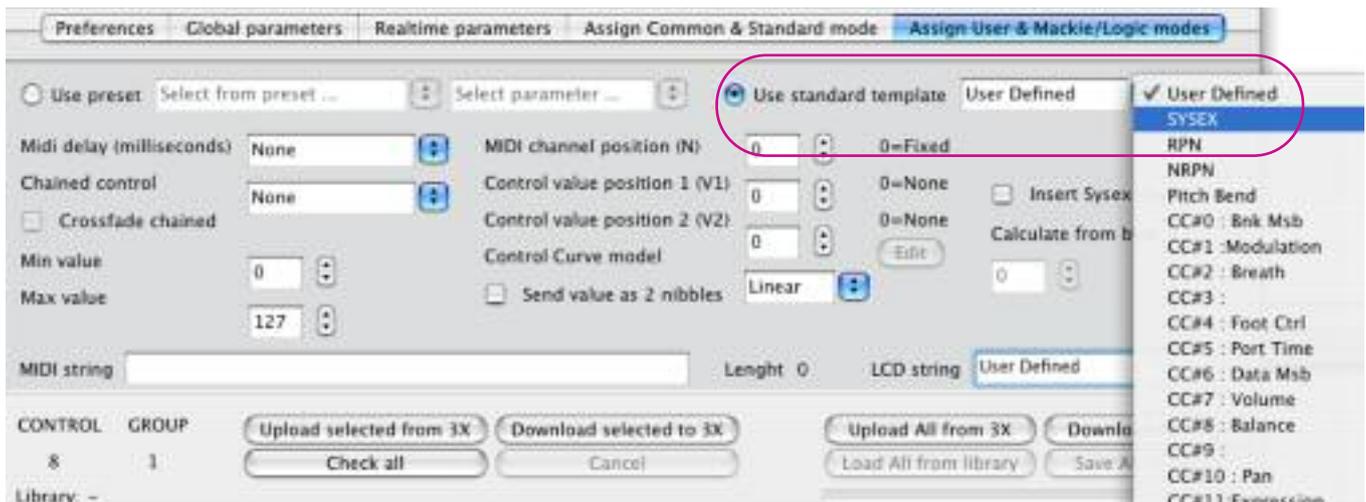


I've named mine “Blofeld” (Group name). There is much more to fine tune on this page, but read about that in the help file. After naming you may download the group name to your Bitstream 3X by clicking the “Download selected to 3X” button again. Please note here we have downloaded only global parameters to the Bitstream 3X, while assignments to the knobs, buttons, sliders etc. are downloaded separately (read on!).

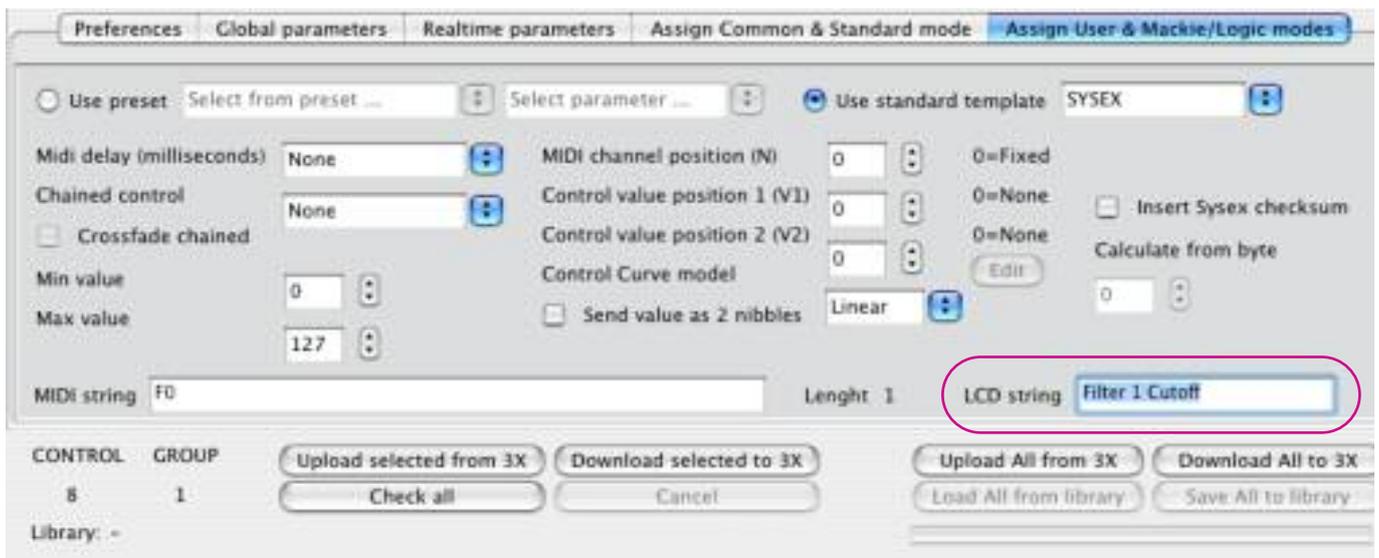
Now we are going to the final tab “Assign User & Mackie\Logic modes” to enter our Sys-Ex message.

First you need to tell the software that you want to enter a *Sys-Ex* string. You do this by clicking on the pop up menu in the upper right section (“use standard template”) and choose “SYSEX”.

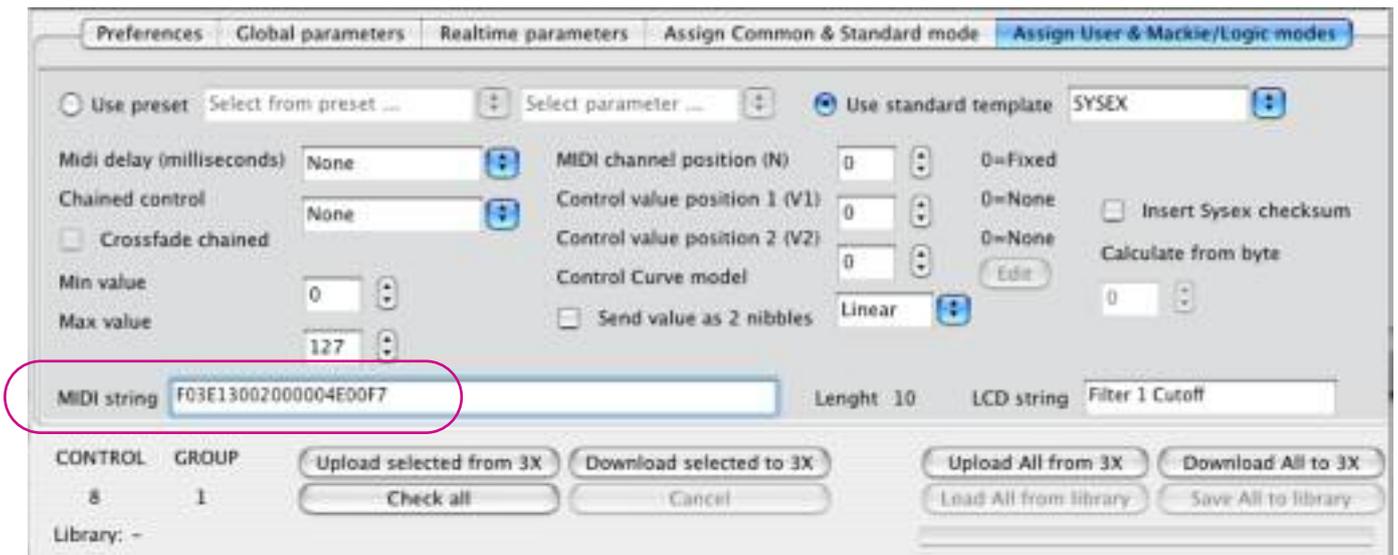
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After this you may give your knob a name in the lower right corner (LCD string). In our case, we named it "Filter 1 Cutoff". After downloading later on the settings to the Bitstream 3X, as soon as I touch the upper left knob I will see "Filter 1 Cutoff" in the LCD screen.



Now finally we will enter the Sys-Ex string:



Notice that you enter the string (“MIDI string”) without spaces!

As discussed earlier, you have to enter a position where you want your controller value changes to take place, in this case, we have entered a double “00” just between the last two bytes of the sound change parameter “4E” and the end of Sys-Ex message “F7”, being position 9 of the 10 positions in this particular Sys-Ex message.

YOU ARE NOT FINISHED YET!

You have to tell the Bitstream that it must enter the receiving parameter change values **there**. You do that by entering a “9” in the box behind “Control value position 1 (V1)”.

So to recap: you *define* the position with a “00” in the Sys-Ex string and you *enter* that position in the “Control value position 1 (V1)” box!

Notice that “F0” in the Sys-Ex string is position “1” in the “Control value position (V1)” checkbox. A value of “0” there indicates that there is no control value at all in the Sys-Ex message.

Once you have done this, you can click the “download selected to 3X” button and from now on, the upper left knob on the Bitstream 3X controls the Filter 1 Cutoff of my Blofeld, with a value between 0 and 127 which you can *also* define in the above screen (Min value/Max value).

Some parameters on the “Assign User & Mackie/Logic modes” we did not use in this example “insert Sys-Ex checksum” and “send value as two nibbles”. The first is a non-standard byte that is used by certain manufacturers to calculate if a message arrived in good order. The way of calculating this varies from one to the other manufacturer. Waldorf for instance doesn’t use checksums on sound parameters. Check the Sys-Ex documentation of your machine to see if a checksum is wanted or not.

“Send value as 2 nibbles” is an uncommon way of sending Sys-Ex messages. For instance the Korg Wavestation uses this way. Normally this should be unchecked.

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Again, a good reading of the Sys-Ex documentation that comes with your gear is really necessary!

Well: it's short, it's not complete, but we hope it will give you a start!

Be sure to check our website regularly to see if you have the latest firmware into your Bitstream 3X and if you are using the latest configuration software.

Feel free to ask your question/give your comment on the WaveIdea forum so we can improve this document!

Boele Gerkes

October 31st, 2007

Something Completely Different
<http://www.synthmusic.info>