

# Fury-800

## Polyphonic Synthesizer

Version 1.0

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<http://www.fullbucket.de/music>

Presets and Beta Testing by kraftraum

<https://soundcloud.com/kraftraum>



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## Table of Contents

Introduction.....	3
From The <i>Poly-800</i> .....	3
... To The <i>Fury-800</i> .....	4
Acknowledgments.....	4
General Operation.....	5
The Play Modes.....	5
Selecting a Program.....	5
Editing Parameters.....	6
Memorizing and Playing Chords.....	6
MIDI Learn And The Config File "fury800.ini".....	6
Options Menu.....	7
Sequencer.....	8
Recording a Sequence.....	8
Playing a Sequence.....	8
Sound Creation.....	9
DCOs (Digital Controlled Oscillators).....	9
DOUBLE Mode.....	10
DEG (Digital Envelope Generator).....	10
VCF (Voltage Controlled Filter).....	10
Noise.....	11
MG (Modulation Generator).....	11
Chorus.....	11
Modulation Wheel.....	11
Velocity.....	11
Parameters.....	12
DCO1.....	12
DCO Mode.....	12
DCO2.....	12
Noise.....	12
VCF.....	12
Chorus.....	13
DEG1 (for DCO1).....	13
DEG2 (for DCO2).....	13
DEG3 (for VCF and Noise).....	13
MG.....	14
Sequencer.....	14
Other Parameters.....	14
Frequently Asked Questions.....	15

## Introduction

The *Fury-800* is a software synthesizer plug-in for Microsoft Windows (VST) and Apple macOS (VST/AU) simulating the KORG® *Poly-800 Polyphonic Synthesizer* from 1983. It is written in native C++ code for high performance and low CPU consumption. The main features are:

- Two band-limited DCOs with individual envelope generators (DEG)
- Two waveforms with additive harmonics (16', 8', 4', 2') per DCO
- Single (paraphonic) lowpass VCF and Noise
- On-board sequencer and Chord Memory
- Pseudo-stereo Chorus effect
- Tweaks:
  - Up to 64 voices polyphony with Velocity
  - "God Mode" for real polyphony
  - Continuous parameter values and direct access
- Double precision audio processing
- Resizable user interface
- All parameters can be controlled by MIDI controllers
- Plug-in supports Windows (32 bit and 64 bit) and macOS (64 bit)

The *Fury-800* is based on the new **iPlug2** framework maintained by **Oli Larkin and the iPlug2 team**. Big thanks, guys!!! Without your work it would not have been possible to create a resizable *Fury-800* user interface.

To resize the plug-in you just grab the yellow triangle at the bottom right of the *Fury-800* window and drag it. You can save the current window size using the menu entry "Save Window Size" in the *Options Menu*.

## From The *Poly-800*...

Once upon a time I promised myself not to create a simulation of an existing piece of hardware that I do not own by myself. Anyway, after receiving so many mails about "Why not recreating the *Poly-800*?" I thought "Why not?". After all, this could have been the first polyphonic synthesizer I'd ever had bought – if it were not for the mighty *Bit One* \*cough, cough\*...

In the mid 80's, it was time for weird and futuristic designs. It was also time for transition (from analog to digital...) and for relentless cost reduction – how else could one explain the advent of music machines with zillions of parameters but only two buttons to edit them? The Yamaha *DX7* became an icon of its time (plus beyond), and other manufacturers gave their new machines a similar look: Parameter numbers and ranges were printed on the face plate, knobs/sliders disappeared, pseudo-technical diagrams and LED displays were ubiquitous.

Enter, stage right: The KORG *Poly-800* from 1983. It had the look! It was polyphonic! It was programmable! It was cheap (and inexpensive)! It was sexy! Put on a strap and you could pose like a guitar player! It had only one filter for all voices? Ouch...

But it also had some outstanding features that are worth mentioning: Two DCOs, each with their own ADBSSR envelope generators (EG) and a funky way of additive waveform generation, a VCF with its own ADBSSR EG, a Chord Memory and on-board sequencer.

## ... To The *Fury-800*

Well, I added some enhancements to my *Fury-800* simulation:

- The *Fury-800* can be 64 voice polyphonic – the *Poly-800* only offered 8 voices (just 4 in *DOUBLE* mode).
- *Velocity* is – optionally – available.
- Due to technical reasons the *Poly-800* was paraphonic with respect to the VCF (the special chip used for the eight DCOs did not output the individual DCO signals but a mixture of their *octave signals*; thus the signal of the DCOs could only be filtered in their sum). But the God Mode will turn the *Fury-800* into a “true” polyphonic synthesizer.
- Where ever useful I turned step-like parameters into their continuous equivalents. For example you can adjust the *level* of the 8’ DCO wave instead of just turning it on or off.
- The sequencer in the *Poly-800* offered 256 “steps” – but the correct description would have been that it offered 256 *events* (for example a chord of three notes eats three “steps” and not just one). The sequencer of the *Fury-800* is different and features 256 “real” steps. In theory you can have sequences of 256 steps where each step stores a chord of 64 notes. ☺
- Editing the *Poly-800* is no fun because you have to dial each parameter using the numeric keyboard, and there is no slider to change the parameter’s value (just two buttons). The *Fury-800* has the option to show and edit all parameters at the same time.
- The Chorus effect of the *Poly-800* was said to be a *stereo* chorus. Well, I don’t want to split hairs here, but in fact it was a *mono* chorus where the *inverted* signal was mixed to the right channel of the *Poly-800*’s output (quite a common pattern in these days). The chorus in the *Fury-800* also is a mono effect, but here you can select if the chorus signal shall be inverted when mixed to the right channel or not.

Just for all the nitpickers out there: I do **not** claim that the *Fury-800* sounds exactly like the *Poly-800*. I explicitly do state this although I doubt that all those who claim they can really can tell the difference. I don’t think I could (tell, I mean).

## Acknowledgments

**kraftraum** (<https://soundcloud.com/kraftraum>) has designed some of the default patches (starting with 57), but even more I was able to win him for Beta Testing – thank you!!!

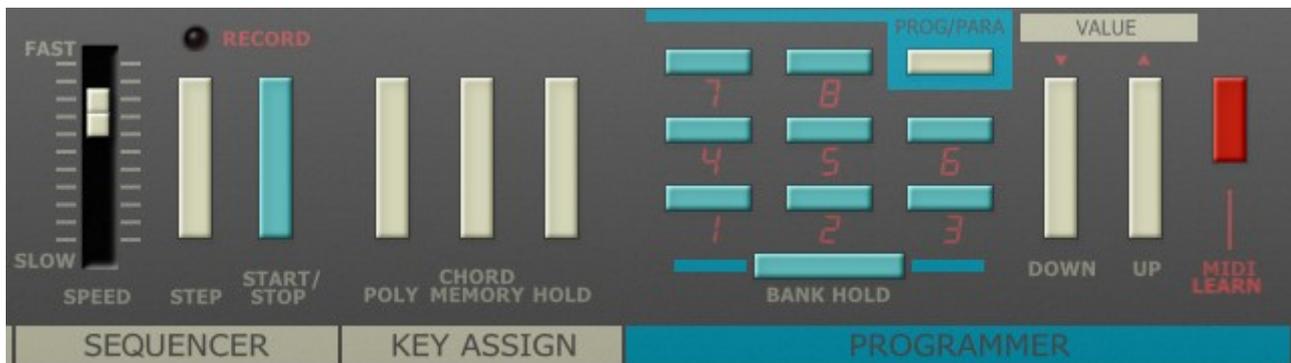
And at this point I would also like to say **Thank you!** to all the people who share their information about the *Poly-800* via the Internet. Last not least another THANK YOU! to the KVR Audio community and to the KORG engineers.

No, I am not affiliated with KORG in what relation ever except that I always find myself entangled with their instruments. ☺

## General Operation

### The Play Modes

The *Fury-800* has three play modes: *POLY*, *CHORD*, and *SEQUENCER*. To select *POLY* or *CHORD* mode you have to press the respective button. To enter *SEQUENCER* mode (and therefore to start the sequencer), press the *START/STOP* button. The *HOLD* button does the obvious thing and played makes notes sound indefinitely.



### Selecting a Program

The *Fury-800* has 64 programs numbered in a weird fashion from 1-1 to 8-8. The first digit is called the *bank*; there are 8 banks (1 to 8) having 8 programs (1 to 8). To select a program from the *Fury-800* front plate you have to be in *POLY* or *CHORD* mode (the LED display of the *Fury-800* will show **P** or **C** at *PARAMETER NO.*).



Now you can dial in a new program number using the number pad. When you have pressed the first button (the bank number) the display will show something like **4-** at *PROGRAM NO.* with a dash indicating that you have to press another number button for the program. Using the *BANK HOLD* function you can "fix" the bank: Pressing a number button will then immediately select the respective program of that bank. Note that in *BANK HOLD* mode the dot at *PROGRAM NO.* will be lit, for example like **4.3** instead of **43**.

You can also change the program by using the *DOWN* and *UP* buttons. The *Fury-800* will then step downwards or upwards through the programs.

## Editing Parameters

Clicking the *PROG/PARAM* button switches into *PARAMETER* mode where you can edit the individual parameters of a program. Each parameter has a number similar to the program numbers which can be determined by looking at the lower part of the front plate (for example *VCF Cutoff Resonance* has the number 42). The display will show the number at *PARAM NO.* and its value at *VALUE*.



To change the value of a parameter you have to use the *DOWN* and *UP* buttons. If the value of the parameter has changed, the display will show a dot at *VALUE*. Note that this only applies as long as you do not select a different parameter or program (this is a funny feature of the original *Poly-800* transported into the 21<sup>st</sup> century).

This is a rather tedious procedure when creating new sounds (note that the Apollo astronauts used a similar procedure to program their computer for landing on the moon!). Now, with the *Fury-800* you can directly select and edit a parameter by clicking into the parameter list at the front plate. This will show up a value slider that can be moved up and down using the mouse. There is also an option to show and edit the value sliders for all parameters at once (see section *Options Menu*).



## Memorizing and Playing Chords

Enter *POLY* mode, press the *HOLD* button, play some notes and press *CHORD*. Now the display shows  $\text{C}$  at *PARAMETER NO.* and you can play the memorized chord over the keyboard. Of course the number of notes of the chord is limited by the current number of voices available (4 in *DOUBLE* mode, 8 in *WHOLE* mode, 64 in tweaked polyphony mode). Note that if you memorize only *one* note, the *CHORD* mode turns the *Fury-800* into a monophonic instrument.

## MIDI Learn And The Config File "fury800.ini"

Every parameter of the *Fury-800* can be controlled by one MIDI controller. If you want to change the assignment of MIDI controller (CC; *MIDI Control Change*) to *Fury-800* parameter the *MIDI Learn* function comes in quite handy: Just click the *MIDI Learn* button on the Sound Manager panel (caption turns red) and wiggle both the MIDI controller and the parameter you want to assign (you can abort *MIDI Learn* by clicking the button again). If you want to unlearn the assignment, right-click the *MIDI Learn* button (the label now reads "UNLEARN") and activate it. Now wiggle the MIDI controller or the parameter that you want to unlearn. To save the controller assignments use "Save Configuration" in the *Options Menu* (see next section); they are stored in the `fury800.ini` configuration file. The exact location of this file depends on your operating system and will be displayed when you click on "Reload" or "Save Configuration".

## Options Menu

When clicking on the *MENU* button, a context menu opens with the following options:

<b>Copy Program</b>	Copy current program to internal clipboard
<b>Paste Program...</b>	Paste internal clipboard to current program (either the full program, only the sound, or only the sequencer data)
<b>Init Program</b>	Initialize the current program
<b>Load Program...</b>	Load a program file containing a patch to the <i>Fury-800's</i> current program (either the full program, only the sound, or only the sequencer data)
<b>Save Program</b>	Save the <i>Fury-800's</i> current program to a program file
<b>Load Bank</b>	Load a bank file containing 64 patches into the <i>Fury-800</i>
<b>Save Bank</b>	Save the <i>Fury-800's</i> 64 patches to a bank file
<b>Select Startup Bank</b>	Select the bank file that should always be loaded when the <i>Fury-800</i> is started
<b>Load Startup Bank</b>	Load the Startup bank file; can also be used to check what the current Startup bank is
<b>Unselect Startup Bank</b>	Unselect the current Startup bank
<b>MIDI Thru</b>	Set globally if MIDI data sent to <i>Fury-800</i> should be sent through to its MIDI output (stored in configuration file)
<b>Ignore Program Change</b>	Set globally if MIDI Program Change data sent to the <i>Fury-800</i> should be ignored (stored in configuration file)
<b>Reload Configuration</b>	Reload the <i>Fury-800's</i> configuration file
<b>Save Configuration</b>	Save the <i>Fury-800's</i> configuration file
<b>Show All Parameters</b>	Show or hide all parameter sliders of the <i>Fury-800</i>
<b>Window Size...</b>	Change the window size of the <i>Fury-800</i>
<b>Save Window Size</b>	Stores the current window size to the configuration file so that it will be restored on the next loading of <i>Fury-800</i>
<b>Check Online for Update</b>	When connected to the Internet, this function will check if a newer version of the <i>Fury-800</i> is available at <a href="http://fullbucket.de">fullbucket.de</a>
<b>Visit fullbucket.de</b>	Open <a href="http://fullbucket.de">fullbucket.de</a> in your standard browser

## Sequencer

The *Poly-800* had a polyphonic step sequencer which was a very impressive feature by that time, especially considering the price tag of this machine. However, one could store only *one* sequence at a time. In contrast, each program of the *Fury-800* has its own sequence.

### Recording a Sequence

The sequencer of the *Fury-800* allows to record 256 steps – in step mode only, there is no real-time recording option. In the sequencer section, click on the *RECORD* light to activate recording (the original *Poly-800* used a switch at the back of the casing instead). Press *START/STOP* to start recording (this will erase any existing sequence of the current program!). The display will display the program number followed by an "S" and the number of the current step (001) i.e. **5001**.



Now press one or more keys – once you release the last key, the respective note(s) will be recorded for the current step, and the display shows the incremented step number (**5002** and so forth). Here are some more commands:

- To enter a rest for the current step press the *STEP* button.
- To tie the notes of the current step to the next step, do not release the pressed keys but press the *STEP* button instead.
- To delete the last step press *START/STOP*.
- To finish recording click on the *RECORD* light again.
- After you have recorded the 256<sup>th</sup> step, recording will stop automatically.

### Playing a Sequence

Given that a sequence was recorded for the current program, pressing the *START/STOP* button will start the sequencer (or stop it if it is already playing) – the *SPEED* slider controls the speed. Parameters **85** to **88** offer the following options:

- Synchronizing start/stop and speed with the host DAW
- Start/stop on pressing a key
- Transposing the sequence with respect to the currently played note

Note that the latter two features were not available with the *Poly-800*.

## Sound Creation

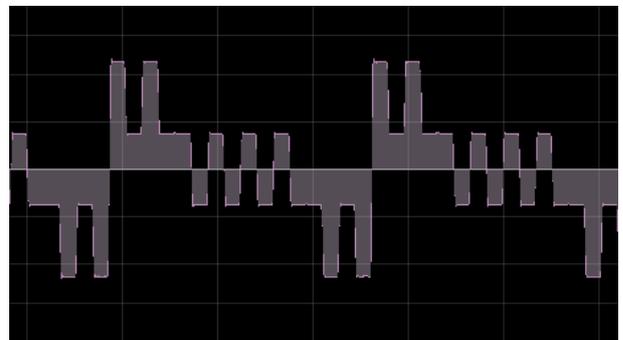
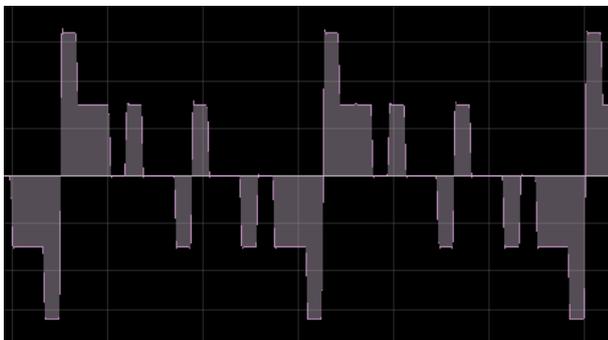
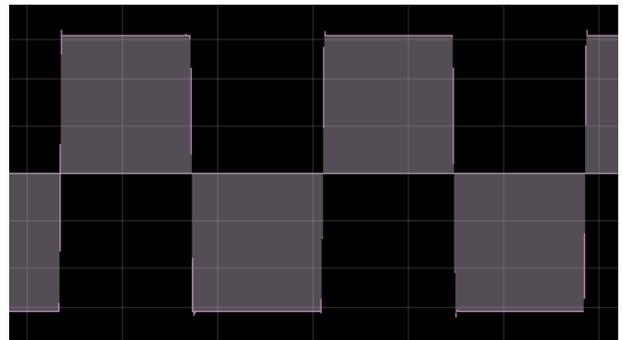
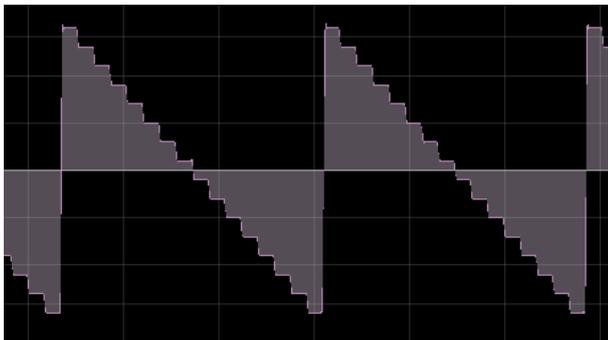
### DCOs (Digital Controlled Oscillators)

The *Fury-800* has two DCOs per voice, and each DCO offers two wave forms, *Sawtooth* and *Square*. Furthermore, in addition to the *Octave* switch, there are four more parameters called *Harmonics* (16', 8', 4', and 2') that control the wave shape. In fact, a DCO produces four square wave signals at 16', 8', 4' and 2'. These can be mixed by activating the *Harmonic* switches (sliders in case of the *Fury-800*).

OCTAVE	WAVE	16'	8'	4'	2'	LEVEL
11	12	13	14	15	16	17
3 HIGH	2 	1 ON	1 ON	1 ON	1 ON	31
2 MID						▲
1 LOW	1 	0 OFF	0 OFF	0 OFF	0 OFF	0

DCO1

The *Wave* parameter determines the *weighting* of the respective harmonics in the mix – this way it is possible to create a staircase-shaped “Sawtooth” wave. Below are some examples of possible wave forms.



This kind of additive synthesis is known from the KORG *Delta* (and my *Nabla* simulation) and gave the *Poly-800* its “rough” sound character (at least that’s what folks say). Note again that the *Harmonics* and the *Wave* parameters of the *Fury-800* are continuous and can have any value between 0 and 1.

## DOUBLE Mode

In *WHOLE* mode, the *Poly-800* was 8-voice polyphonic and DCO2 was deactivated. Switching to *DOUBLE* mode activated DCO2, but reduced polyphony to 4 voices. However, this allows for much richer and more interesting sounds, last not least because DCO2 features two additional parameters, namely *Interval* (0 to 12 notes) and *Detune*.

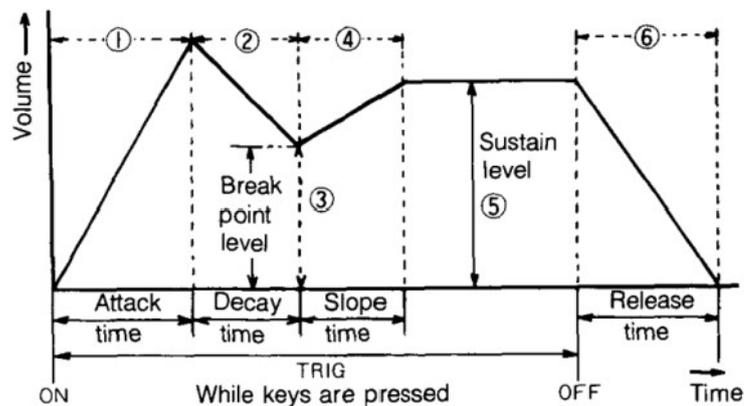
If *DOUBLE* mode is set for the current program, the display will show a dot at *PARAMETER NO.*

## DEG (Digital Envelope Generator)

A very cool feature is that each DCO has its own envelope generator (DEG). Even more, these DEGs are of an advanced ADSR type with two extra parameters called *Break Point* and *Slope*.

ATTACK	DECAY	BRK P.	SLOPE	SUST.	REL.
51	52	53	54	55	56
31	31	31	31	31	31
0	0	0	0	0	0

DEG1 (FOR DCO1)



ADBSSR envelope – the diagram right is ripped from the original *Poly-800* Owner’s Manual.

*Break Point* is the level to which the envelope output will drop in *Decay* time after the *Attack* phase has completed. *Slope* is the time until the envelope rises or falls from *Break Point* to *Sustain* level.

## VCF (Voltage Controlled Filter)

As stated earlier, the *Poly-800* had only one filter, a 24 dB lowpass VCF, for all voices. Technically this means that the *Poly-800* is a paraphonic instrument with respect to the filter (the *Fury-800* can be set into God Mode to make it a “true” polyphonic machine).

CUTOFF	RESO.	KBD	POLAR.	EG INT	TRIG.
41	42	43	44	45	46
99	15	2 FULL	2	15	2 MULTI
0	0	1 HALF	1	0	1 SINGLE

VCF

The VCF has its own DEG and offers positive or negative envelope modulation. Triggering modes of the envelope are *SINGLE* (the DEG is only triggered if a key is pressed and no other key was pressed) or *MULTI* (the envelope is triggered for each key pressed). Note that in God Mode this setting has no effect. Also note that the filter will not self-oscillate even if resonance is set to maximum.

## Noise

The white noise generator is controlled by its own *LEVEL* parameter and the VCF envelope. No surprises here.

## MG (Modulation Generator)

Traditionally, the LFOs of KORG instruments were called "Modulation Generators", and there is one in the *Poly/Fury-800*. It creates a sine wave, can be delayed and has parameters for DCO and VCF modulation intensity.

## Chorus

Although claimed to be stereo, the chorus was a mono effect where the inverted effect signal has been mixed with the right output of the synthesizer. Besides a somehow uncomfortable listening experience (especially under headphones) this becomes audible when the left and right output are mixed to a mono sum – then the chorus signal will be canceled out completely. Thus, the *Fury-800* features an additional switch to (de)activate this "stereo" option.

Note that the speed of the chorus effect was fixed on the *Poly-800*. The *Fury-800* adds a hidden parameter (#61) to change the speed.

## Modulation Wheel

For real-time modulation purposes, the *Poly-800* like many of its relatives featured the cool KORG joystick. As with all my other KORG simulations I added some controls that "emulate" the joystick using the ubiquitous modulation wheel. Therefore the *Fury-800* has sliders for controlling each the MG-to-DCO and MG-to-VCF intensities controlled by the modulation wheel.

## Velocity

The *Poly-800* did not react to velocity information but the *Fury-800* does. The intensity can be controlled by the *VELOCITY* slider.

## Parameters

### DCO1

parameter	ID	number	description
<i>OCTAVE</i>	5	11	Octave
<i>WAVE</i>	6	12	Wave form ( <i>Sawtooth</i> or <i>Square</i> )
<i>16'</i>	7	13	16' harmonic level
<i>8'</i>	8	14	8' harmonic level
<i>4'</i>	9	15	4' harmonic level
<i>2'</i>	10	16	2' harmonic level
<i>LEVEL</i>	11	17	Total level

### DCO Mode

parameter	ID	number	description
<i>MODE</i>	12	18	DCO mode ( <i>WHOLE</i> or <i>DOUBLE</i> )

### DCO2

parameter	ID	number	description
<i>OCTAVE</i>	13	21	Octave
<i>WAVE</i>	14	22	Wave form ( <i>Sawtooth</i> or <i>Square</i> )
<i>16'</i>	15	23	16' harmonic level
<i>8'</i>	16	24	8' harmonic level
<i>4'</i>	17	25	4' harmonic level
<i>2'</i>	18	26	2' harmonic level
<i>LEVEL</i>	19	27	Total level
<i>INTERVAL</i>	20	31	Interval in notes
<i>DETUNE</i>	21	32	Detuning

### Noise

parameter	ID	number	description
<i>LEVEL</i>	22	33	Noise level

### VCF

parameter	ID	number	description
<i>CUTOFF</i>	23	41	Cutoff frequency
<i>RESONANCE</i>	24	42	Resonance

parameter	ID	number	description
<i>KBD TRACK</i>	25	43	Keyboard tracking
<i>POLARITY</i>	26	44	Polarity of DEG modulation
<i>EG INTENSITY</i>	27	45	Intensity of DEG modulation
<i>TRIGGER</i>	28	46	Trigger mode ( <i>SINGLE</i> or <i>MULTI</i> )

## Chorus

parameter	ID	number	description
<i>CHORUS</i>	29	48	Chorus on or off

## DEG1 (for DCO1)

parameter	ID	number	description
<i>ATTACK</i>	30	51	Attack time
<i>DECAY</i>	31	52	Decay time
<i>BREAK POINT</i>	32	53	Break Point level
<i>SLOPE</i>	33	54	Slope time
<i>SUSTAIN</i>	34	55	Sustain level
<i>RELEASE</i>	35	56	Release time

## DEG2 (for DCO2)

parameter	ID	number	description
<i>ATTACK</i>	36	61	Attack time
<i>DECAY</i>	37	62	Decay time
<i>BREAK POINT</i>	38	63	Break Point level
<i>SLOPE</i>	39	64	Slope time
<i>SUSTAIN</i>	40	65	Sustain level
<i>RELEASE</i>	41	66	Release time

## DEG3 (for VCF and Noise)

parameter	ID	number	description
<i>ATTACK</i>	42	71	Attack time
<i>DECAY</i>	43	72	Decay time
<i>BREAK POINT</i>	44	73	Break Point level
<i>SLOPE</i>	45	74	Slope time
<i>SUSTAIN</i>	46	75	Sustain level
<i>RELEASE</i>	47	76	Release time

**MG**

<b>parameter</b>	<b>ID</b>	<b>number</b>	<b>description</b>
<i>FREQUENCY</i>	48	<b>81</b>	MG speed
<i>DELAY</i>	49	<b>82</b>	Delay time
<i>DCO</i>	50	<b>83</b>	DCO modulation level
<i>VCF</i>	51	<b>84</b>	VCF modulation level

**Sequencer**

<b>parameter</b>	<b>ID</b>	<b>number</b>	<b>description</b>
<i>SEQ. CLOCK</i>	52	<b>86</b>	Sync to host DAW
<i>PLAY ON NOTE</i>	53	<b>87</b>	Start/Stop on key pressed
<i>TRANSPOSE</i>	54	<b>88</b>	Transpose sequence on played note

**Other Parameters**

<b>parameter</b>	<b>ID</b>	<b>description</b>
<i>VOLUME</i>	0	Total volume
<i>TUNE</i>	1	Master tune
<i>BEND</i>	2	Amount of pitch bending
<i>SEQ. SPEED</i>	3	Sequencer speed
<i>KEY ASSIGN</i>	4	Keyboard mode ( <i>POLY</i> or <i>CHORD</i> )
<i>VOICES</i>	55	Number of voices (8/4 or 64)
<i>GOD MODE</i>	56	God Mode on or off
<i>"STEREO" CHORUS</i>	57	"Stereo" chorus effect on or off
<i>WHEEL TO DCO</i>	58	Intensity of Mod Wheel to DCO modulation
<i>WHEEL TO VCF</i>	59	Intensity of Mod Wheel to VCF modulation
<i>VELOCITY</i>	60	Intensity of velocity
<i>CHORUS RATE</i>	61	Chorus speed (hidden parameter)

## Frequently Asked Questions

### **How do I install the Fury-800 (Windows 32 bit version)?**

Just copy the files `fury800.dll` from the ZIP archive you have downloaded to your system's or favorite DAW's VST plug-in folder. Your DAW should automatically register the *Fury-800* VST plug-in the next time you start it.

### **How do I install the Fury-800 (Windows 64 bit version)?**

Just copy the file `fury80064.dll` from the ZIP archive you have downloaded to your system's or favorite DAW's VST plug-in folder. Your DAW should automatically register the *Fury-800* VST plug-in the next time you start it.

Note: You may have to remove any existing (32 bit) `fury800.dll` from your VST plug-in folder or else your DAW may screw the versions up...

### **How do I install the Fury-800 (Mac VST/AU 64 bit)?**

Locate the downloaded PKG package file `fury800_1_0_0_mac.pkg` in Finder (!) and do a right- or control-click on it. In the context menu, click on "Open". You will be asked if you really want to install the package because it comes from an "unidentified developer" (me ☺). Click "OK" and follow the installation instructions.

### **What is the plug-in ID of the Fury-800?**

The ID is `£ 8 0 0 .`

### **How can I decrease the Fury-800's CPU load?**

Whenever it does not degrade the *sound* you need, switch off God Mode and reduce the number of voices to 8/4 (instead of 64).

### **How do I know if a new version of the Fury-800 is available?**

When connected to the Internet, open the File menu (see section *Options Menu*) by clicking the disk icon and select the entry "Check Online for Updates". If a new version of the *Fury-800* is available on [fullbucket.de](http://fullbucket.de) the respective information will be shown in a message box.

### **How do I resize the Fury-800 window?**

Just grab the yellow triangle at the bottom right of the *Fury-800* window and drag it. You can save the current window size using the menu entry "Save Window Size" in the *Options Menu*.

### **Can I load/paste only the sound or sequencer data of a program?**

Yes you can! Please see section *Options Menu*.