erica synths x richie hawtin

learn. produce. perform

Bullfrog XL user manual

thank you for purchasing erica synths x richie hawtin bullfrog XL synthesizer!

Created by Erica Synths & Richie Hawtin, Bullfrog is an educational electronic music instrument designed to captivate and inspire both youth and professionals alike.

Bullfrog invites you to unlock your musicality while combining the thrill of electronic music production with a comprehensive learning experience. Bullfrog XL is designed specifically for teachers to use in front of the classroom and it expands the concept of the regular Bullfrog by inflating its size by factor of 3 (literally!).

It features several additions, like a built-in oscilloscope, that helps to explain the basics of music technology and subtractive synthesis. In order to improve the visibility of patches, on the Bullfrog XL, we use 6.3 mm patch sockets.

We believe that Bullfrog XL will find its place not only in science and music classes, but also in studios, because not only does it sounds great, but also looks damn good.

For the most part, the Bullfrog XL is identical to the regular Bullfrog and all patch examples of the Bullfrog are applicable to the Bullfrog XL – please refer to the Bullfrog manual (enclosed). There are, however, some additional features that help to explain music technology even deeper.

features

- Fully analog design
- Highly accurate voltage controlled oscillator (VCO) that tracks great over 8 octaves
- Manually adjustable and voltage controlled waveshapes – sine-shark fin and pulse wave with pulse width modulation (PWM)
- Zener diode-based noise generator
- Resonant lowpass voltage controlled filter (VCF)
- Voltage controlled amplifier (VCA) with adjustable offset
- Delay effect with adjustable delay time and feedback amount
- Two looping attack-sustain-release envelope generators (EG)
- Sample & Hold circuit with an individual clock
- Attenuverter
- Slew processor with adjustable slew time
- Two buffered splitter circuits
- Two channel oscilloscope
- 6.3 mm jack sockets
- Manual gate button
- Gate and Trigger out
- Voice card slot
- Built in speakers
- DIN5 MIDI input
- USB connector
- Keyhole slots on the rear panel
- Dimensions (mm): 820x505x65 (250 with the side panels)
- Mass: 5.3 kg

what's included

- BULLFROG XL synthesizer with sidepanels
- Universal 12VDC wall wart adapter with the power cable
- User manual
- 12 1/4" patch cables
- Sequencer, Sampler/Looper, Acid Bassline, Hipass filter, LFO and Electric Organ Voice cards
- 3 DIY voice cards

The ATTENUVERTER is often found on synthesizers for processing control voltages and audio signals. At the 12:00 setting, no signal is passed through the module. When the attenuverter knob is turned clockwise, the incoming signal gradually increases in amplitude until the output signal is equal to the input signal at the fully-clockwise setting. When the attenuverter knob is turned counterclockwise, the signal on the output is inverted and its amplitude gradually increases until it reaches an inverted signal of the same amplitude.

USB-C connector for firmware updates and extended functionality. The Bullfrog XL does not have BOOT and CONFIG pushbuttons like the regular Bullfrog, because these functions are performed on the oscilloscope screen.

The voice card slot. All voice cards are compatible with Bullfrog XL.

DIN5 MIDI connector.

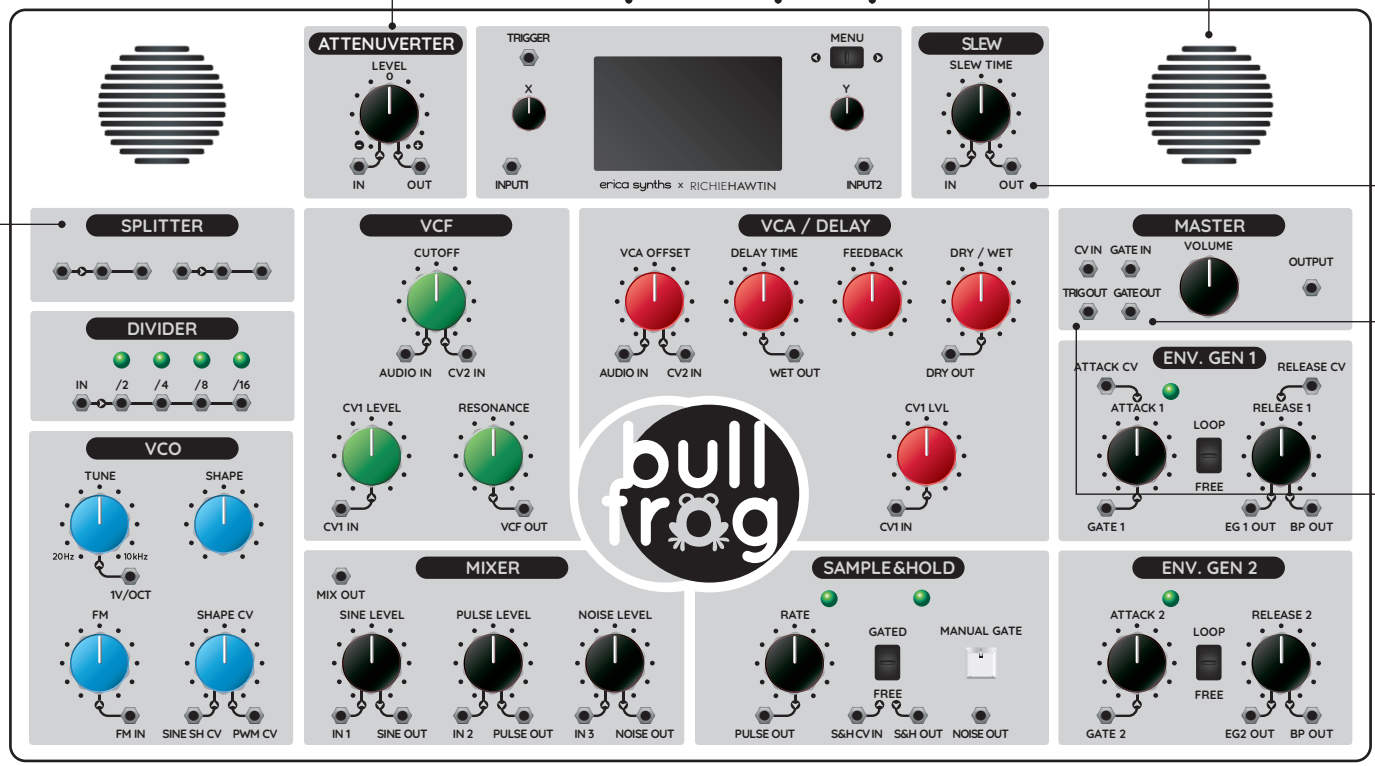
The Bullfrog XL features a pair of high quality speakers so a teacher can demonstrate patches even without external monitor speakers.

The SLEW processor adds an adjustable glide to the discrete voltages incoming. You can use the unit for achieving portamento effects (if note CV is processed) or for waveshaping – turning a low frequency oscillator square wave into a triangle wave, for example. The slew action very much depends on the frequency of the incoming signal.

Two buffered SPLITTERS allow for splitting the audio or CV signal in two identical copies of the incoming signal. It is particularly useful if you want to visualize the signal using the oscilloscope. For example, split the MIX OUT signal into two copies where one goes to the oscilloscope, while the other one goes to the AUDIO IN of the VCF module.

This is the gate output – it duplicates the incoming gate and also outputs the gate signal when the MANUAL GATE button is pressed.

This is the trigger output – it converts all incoming gates into short 5 ms triggers. These are useful for percussive sound generation.



the oscilloscope

The “brain” of the Bullfrog XL is the oscilloscope module. Besides waveform visualization, it is also used for firmware updates, MIDI and voice card configuration.

This it the trigger input of the oscilloscope. Use it to monitor single shot signals, for example, to see a manually triggered envelope, patch the GATE OUT into the TRIGGER input and EG OUT into INPUT 1.

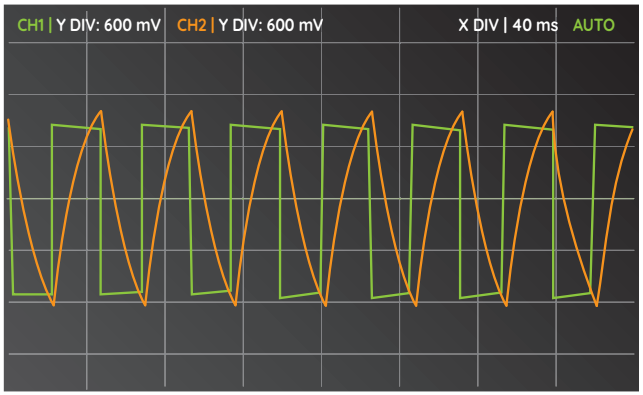
Flip the MENU switch to access various sections of the menu. Rotate the Y encoder to navigate through the menu sections. Push the X encoder to exit the menu.

This it the input of the first (green) channel of the oscilloscope .

This it the input of the second (orange) channel of the oscilloscope.

The X encoder adjusts the timescale of the oscilloscope signal. By pushing it, you can freeze and unfreeze the waveforms on the oscilloscope, as well as exit the configuration menu.

The Y encoder adjusts the amplitude of the oscilloscope signal or the trigger level (this will be explained later in the user manual). Push the encoder to jump between amplitude adjustment and trigger level adjustment. The trigger level is indicated by the thin, light blue vertical line and it moves up and down, if the trigger adjustment is activated. The Y encoder is also used for navigation in the configuration menu.



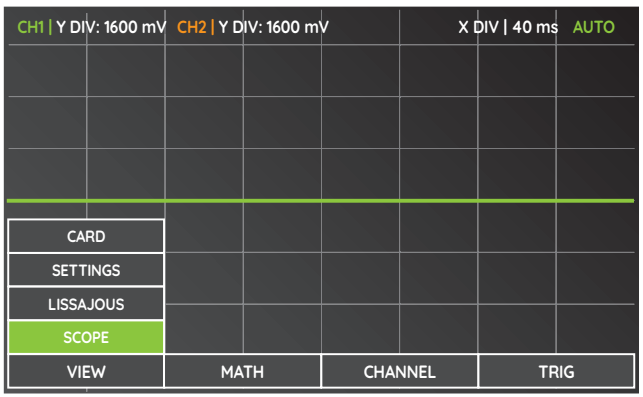
As you power on the Bullfrog XL, the oscilloscope advances to a default setting – a two channel scope, where the first channel (INPUT 1) is represented by the green colour and the second channel (INPUT 2) - by the orange colour. In the example on the left, the relation between the input (green) and the output (orange) of the SLEW limiter module is shown.
It essentially lugs sharp rising and falling edges of the pulse wave and turns it into a triangle wave, where the slope of the triangle is defined by position of the slew potentiometer.

On the top part of the screen, the oscilloscope resolution settings are displayed. In the example on the left, a single amplitude unit (vertical side of the unit rectangle) is 600 millivolts (mV) for both channels and a time unit (horizontal side of the unit rectangle) is 40 milliseconds (ms).

Laboratory oscilloscopes typically display the period of oscillations as T – the time it takes to complete one oscillation. Knowing the period, it's easy to calculate the frequency, a value more often used in music. As we found out in the Bullfrog manual, the frequency represents the number of full oscillations (or periods) per second, so if one oscillation takes 40 ms or 0.04 seconds, the frequency is 1/T, or 1/0.04 = 25 Hz.

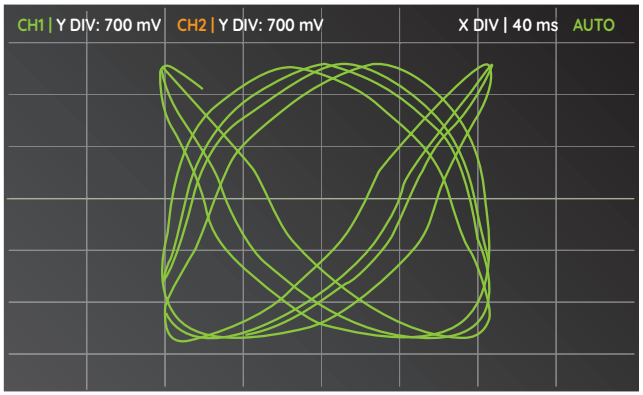
Because the amplitude of the pulse wave in the example on the left is roughly 3 units, it's easy to calculate the peak-to-peak amplitude of the pulse wave. 600 mV x 3 = 1800 mV or 1.8 V. Similar calculations can be performed to identify the frequency.

You can alter the X and Y resolution by adjusting the X and Y encoders. By default, Y encoder affect both channels simultaneously, but you can configure its behaviour in the menu. The timescale, controlled by encoder X, always adjusts both channels.



As you flip the MENU switch, the configuration menu appears. In the first submenu, you can set the basic functions of the unit. The options (from bottom to top) are: OSCILLOSCOPE, LISSAJOUS FIGURES, MASTER SETTINGS AND CONFIGURATION, VOICE CARD CONFIGURATION. Rotate the Y encoder to select the relevant feature and push the Y encoder to confirm.

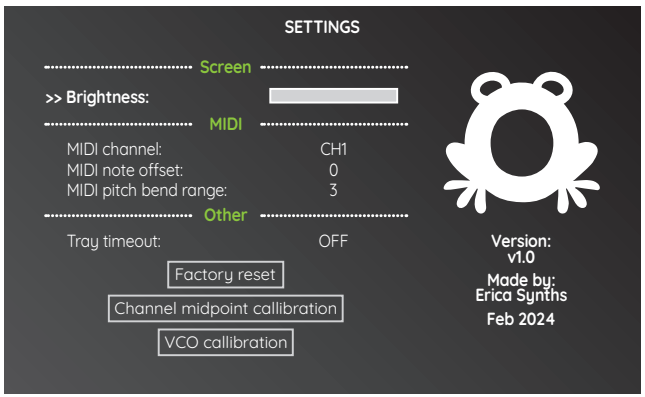
SCOPE, known as the two-channel oscilloscope, is the default setting.



In the LISSAJOUS FIGURES screen, the oscilloscope turns into a Lissajous figure generator – a visualizer of the superposition of two perpendicular oscillations in X and Y directions of different angular frequency. The resulting family of curves was first investigated by Nathaniel Bowditch in 1815 and later in more detail in 1857 by Jules Antoine Lissajous. Lissajous curves have been used in the past to graphically represent musical intervals via the use of a Harmonograph - a device that consists of pendulums oscillating at different frequency ratios. Because different tuning systems employ different frequency ratios to define intervals, these can be compared using Lissajous curves to observe their differences. Therefore, Lissajous curves have applications in music education by graphically representing differences between intervals and among tuning systems. Also, Lissajous curves are often used in art and as visual accompaniment in audiovisual performances.

In LISSAJOUS, two signals are fed into INPUT 1 (representing X) and INPUT 2 (representing Y), and both signals trace out voltages - one on the X-axis and, as if the waveform was turned sideways, the other on the Y-axis. The resultant image is known as a Lissajous pattern. By examining the Lissajous pattern, certain information about the relationship between the two signals becomes clear. The metrics of interest are frequency, ratio, relative amplitude and phase shift.

Since the Bullfrog XL only has one VCO that can be used as an input signal for channel X, for the signal source of channel Y, we recommend using a regular Bullfrog or the VCF set in self-oscillation and patched into INPUT2 through the ATTENUVERTER module.



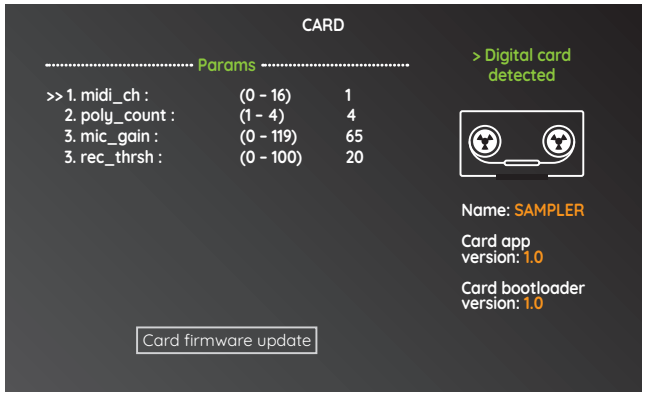
In the SETTINGS screen, the Bullfrog XL calibration and configuration options are available.

Use the X encoder to navigate through the options and the Y encoder to adjust the setting.

Available settings are:

- Screen brightness
- MIDI channel
- MIDI note offset (up to 60 semitones)
- MIDI pitch bend range (up to extreme 36 semitones)
- Tray timeout ON/OFF. If the tray timeout is ON, the top tray of the oscilloscope, indicating X and Y units, will fade out in approximately 10 seconds.
- Factory Reset
- Oscilloscope channel midpoint calibration
- VCO tuning calibration when controlled by MIDI

In order to perform the last three features, follow the instructions on the screen.



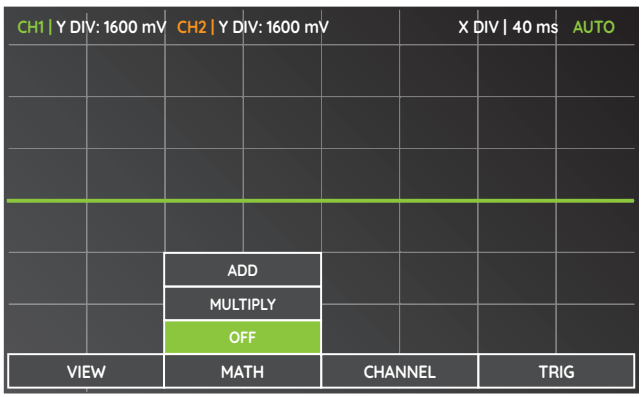
The CARD screen is available only if a digital voice card (Sampler/Looper, Gesture controller) is inserted in the voice card slot.

The example to the left shows the Sampler/Looper voice card configuration menu. Here you can set:

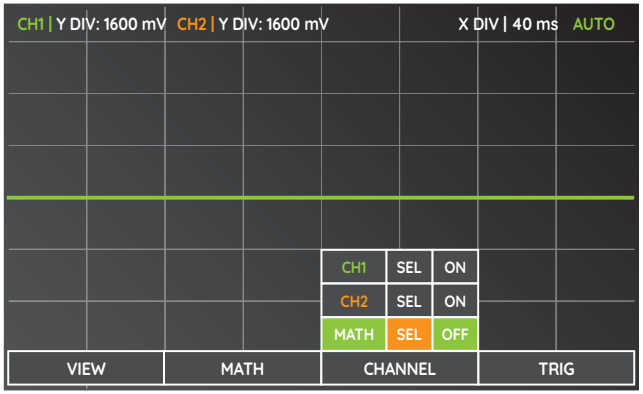
- The MIDI channel to play samples from the MIDI controller
- Voice count in sample playback via MIDI controller (poly_count)
- Microphone gain
- Recording threshold

You can also perform voice card firmware updates. In order to do so, follow the instructions on the screen.

Every digital voice card has different features, therefore the configurable parameters will vary card by card.



In the MATH menu you can ADD or MULTIPLY signals applied to channels 1 and 2 of the oscilloscope. The resulting waveform is represented by a yellow color. This feature is very useful to illustrate and visualize different new waveform synthesis techniques.

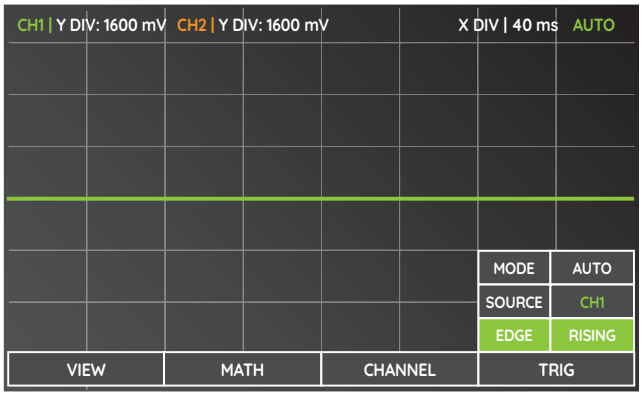


In the CHANNEL menu, you can activate and deactivate the oscilloscope channels. There are two channels available, represented by INPUT 1 and INPUT 2 and one virtual channel – MATH, that visualizes the sum or multiplication of the incoming signals. Each channel has two settings – SEL (select) and ON/OFF.

Rotate the Y encoder to select the channel you want to configure and the X encoder to navigate between the SEL and ON/OFF options. Push the Y encoder to select or deselect the feature.

If SELECT on the relevant channel is active (in bold), you can use the Y encoder to alter the amplitude unit of the channel. If it's not active, the amplitude unit of the relevant channel remains fixed and rotation of the encoders has effect on the selected channels only. This is a handy feature if input signals are of radically different amplitudes and frequencies, but you wish to fit them on the same screen. Likewise, when performing MATH – adding or multiplying incoming signals, the amplitude of the yellow signal can be much greater than one of the signals connected to INPUT 1 and INPUT 2 and it may need to be adjusted individually. By default, all three channels are SELECTED.

If the channel is OFF, it is not represented on the oscilloscope screen. By default, both CH1 (green) and CH2 (orange) are ON.



In the TRIG menu you can configure the oscilloscope trigger settings – a moment of time (or you can imagine it as a point on the X axis on the oscilloscope screen) at which the waveform drawing is refreshed. This allows for a nice, static representation of the waveforms on the oscilloscope screen.

There are several configuration options: MODE, SOURCE and EDGE in the TRIG menu. Rotate the Y encoder to navigate between the modes and push it to change the setting.

The MODE allows to select the trigger mode:

AUTO (default) mode - the oscilloscope automatically scans for a trigger instance based on the level set by the Y encoder and draws the waveform in a nice and static fashion. If no trigger instance is found, the incoming waveform is drawn out regardless.

NORMAL mode – functions the same as auto mode, however, if a trigger instance is not found, the incoming data is not drawn on the screen.

SINGLE mode - the oscilloscope scans all incoming data until a trigger instance is found and only then draws the data on the screen. Then the wave is frozen for the user to observe. Basically, it's like making a photo of the oscilloscope screen.

This is handy for signals that do not periodically oscillate, like an envelope or a specific single oscillation. In the SINGLE mode you can arm the oscilloscope again (make it ready to take another photo) by pushing the X encoder.

EXT mode - similar to SINGLE mode, but instead of one of the channels triggering the oscilloscope, it requires an external trigger signal patched into the TRIGGER input.

FREE mode - triggers are ignored and the oscilloscope is refreshed continuously, therefore the picture on the screen will, most probably, not be static at any time. It differs from AUTO mode by having a smoother and higher-refresh look.

The SOURCE allows for selecting the trigger reference source – it can be CHANNEL 1 or CHANNEL 2, represented by signals applied to INPUT 1 or INPUT 2 correspondingly. In EXT mode, this setting is disregarded.

The EDGE determines, if the trigger starts on the RISING (default), the FALLING edge or on BOTH edges of the incoming signal. For audio applications, RISING edge triggers are most useful.

safety instructions

Please follow the instructions for the use of the Erica Synths Bullfrog XL below, because only this will guarantee the proper operation of the module and ensure the warranty from Erica Synths.

Use the the Bullfrog XL exclusively with the power supply unit (PSU) supplied with the system. Powering it with other PSU units may cause permanent damage to the device.

Water is lethal for most electric devices unless they have been rendered waterproof. The the Bullfrog XL is NOT intended for use in a humid or wet environment. No liquids or other conducting substances should be allowed into the module. Should this happen, the module should be disconnected from mains power immediately, dried, examined and cleaned by a qualified technician.

Do not expose the instrument to temperatures above +50° C or below -20° C. If you have transported the instrument in extremely low temperatures, leave it at room temperature for an hour before plugging it in.

Transport the instrument carefully. Never let it drop or fall over. The Warranty does not apply to instruments with visual damage.

The Bullfrog XL must be shipped in the original packaging only. Any instrument shipped to us for return, exchange and/or warranty repair must be in its original packaging. All other deliveries will be rejected and returned to you. Ensure that you keep the original packaging and technical documentation.

disposal

This device complies with EU guidelines and is manufactured and confront RoHS without the use of lead, mercury, cadmium or chrome. Nevertheless, this device is special waste and disposal in household waste is not recommended.

User manual by Girts Ozolins@Erica Synths.
Design by Ineta Briede@Black8 & Maija Vitola@Black8.

The specifications are subject to change without notice.

If you have any questions, feel free to contact us on SUPPORT section on www.ericasynths.lv

warranty

You will find the Erica Synths terms of warranty at www.ericasynths.lv

Items for return, exchange and/or warranty repair should be sent us according to the guidelines on SUPPORT section on www.ericasynths.lv