

Dynamo

B A S T L

Dynamo is a combination of 3 utility modules: an envelope follower, a comparator and a voltage controlled switch. It uses the envelope follower and comparator to extract gates from the envelope. On top of that, there is a full-wave rectifier output $|EF\ IN|$ and a Compressor CV curve generator.

When the Compressor CV is plugged into the CV input of a VCA with offset and attenuator knobs, you get a Compressor! The Threshold knob on Dynamo sets the compressor threshold, Offset on the VCA sets the gain and the attenuator on the CV input sets the ratio of compression (which can also go negative). This allows you to create compressor type of effect from anything: VCA, tube module, VCF or anything that comes to your rack!

The other trick of the Dynamo is the voltage controlled switch section in combination with the full-wave rectifier and comparator. They are all normalised ... and for what reason? To create "fake thru-zero modulation" with anything you like! Define what happens with the negative modulation and adjust the zero crossing point with CV. The whole world of very deep modulation is waiting for you now...

... and it is totally bonkers!

instruction

1 Envelope follower ("EF") is a circuit that analyses the loudness of the incoming signal and outputs respective voltages that represent the envelope contour of the signal. Because most of the patches with EF are analysing a signal and then processing it further, a multiple to split the signal is needed. Therefore Dynamo has a 2-way passive multiple on the EF IN.

2 The EF OUT gives only positive voltages which represent the loudness of the signal. The louder the signal on the EF IN the higher voltage at the EF OUT.

3 $-EF\ OUT$ is an inverted version of the EF OUT which means it outputs only negative voltages. The louder the signal on the EF IN the lower voltage at the EF OUT.

4 Because part of the EF circuit is a slew limiter (a very low low pass filter) there is a setting available to change the Release time of the slew. This comes handy to set the speed of the response, when using the Compressor CV output. General recommendation could be that if a lot of bass frequencies are processed, mid or long EF Release times is required. It might also come handy when the trigger at the EF IN causes an exponential decay envelope to come out of the EF OUT and the switch then adjusts the decay time.

5 $|EF\ IN|$ is an output which outputs the absolute value of the EF IN signal. In terms of modular synthesis this is often called a full wave rectifier. This circuit takes the negative part of the EF IN signal and inverts it so that the signal is always a positive voltage. This output can be used to obtain octaver effects, but also comes very handy in other applications of the Dynamo module.

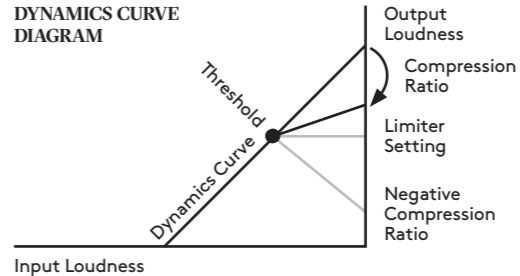
6 The comparator section has 3 connectors and the Threshold knob. A Comparator is a device which takes two voltages, compares them and outputs a HIGH gate, if one of the voltages is greater than the other. In the case of Dynamo, if the voltage at the comparator IN is greater than the comparator THRESHOLD, the voltage output is HIGH. The THRESHOLD voltage is the sum of the position of the Threshold Knob and the voltage on the comparator

THR input. The EF OUT is normalised to the comparator IN so this section allows you to extract gate signals from the EF circuit.

7 The Compressor CV curve generator is the most unique feature on the Dynamo. It generates the right CV signal to be used with any VCA to create a compressor. So what is a compressor? When the signal loudness on the input of the compressor reaches a threshold it starts to attenuate the output in a specific ratio to the rising loudness of the input signal.

The Compressor CV curve generator on Dynamo is using the same threshold as the Comparator and starts to output negative voltage as soon as the EF OUT signal reaches the threshold voltage. This negative voltage is a curve derived from the EF OUT so it is proportional to the loudness of the signal. The indication LED shows when there is a negative CV output. The more negative the CV is, the brighter the LED. If this CV is routed to a CV input of a VCA, then the attenuation on the CV input sets the RATIO of the compression. The VCA should preferably be linear, have both offset and attenuator knobs and preferably should be able to amplify the signal - not only attenuate. The interesting part of this compressor architecture is that the attenuation on the VCA CV input allows you to create negative compression ratios. Most compressors stop at the limiter setting. Of course the signal processed in the VCA doesn't have to be the same signal that is being analysed by the Dynamo. This open architecture allows you to define any kind of side-chain compression scenario. If you would like to precisely define the attack and release of the compressor just run the Compressor CV thru any slew limiter. Because this is just a common CV source it allows you to create a "compressor" from any type of sound processing module. Any type of VCA (tube, vactrol, OTA, SSM, discrete etc.), filter, distortion, BBD delay, downsampler - anything! Redefine what "compressor" means!

DYNAMICS CURVE DIAGRAM



8 THR-EF outputs a signal which is the Threshold voltage of the comparator (threshold knob position + the CV on the THR input) minus the EF OUT. This output can have several uses! It is a similar signal to the Compressor CV but not limited to only negative voltages. That means you can tilt the whole Dynamics curve around the Threshold point (not only the part above the threshold point) when used instead of the Compressor CV. This allows you to define expander effects which let only the silent parts come thru your mix, as well as many other interesting effects.

9 The Voltage controlled switch section on the Dynamo is a bi-directional analog switch with GATE input to switch which connectors are connected. On a HIGH Gate, the B connector is connected with the A or B and on a LOW gate A is connected with A or B. All connectors A, B and A or B are unbuffered so the signal can flow both ways. The signal on connector A is inverted and normalised into connector B, so if using only connector A as an input and A or B as an output, you get a gate controllable inverter. The Gate input has an indication LED. By default the OUT of the comparator is normalised to the GATE input of the switch, so when nothing is plugged into the GATE input the LED shows the output of the comparator.

B A S T L



About fake thru zero modulation

We have already talked about the dynamo as a dynamics analyser, but there is a whole other layer of how it can be used and it is what we call "fake thru zero modulation". One of the main tricks about the thru zero modulation in general is that the negative part of the modulating signal is NOT ignored, which allows a deeper amount of modulation. Now we are talking about thru zero oscillators (which don't stop oscillating at the negative modulation range), but also about thru zero VCAs (or bi-polar VCAs, balanced modulators or just ring modulators). So the fake thru zero modulation trick is about taking an oscillator or VCA (or even a filter or anything else) which is NOT thru zero and enabling it to BE thru zero! So how is that done?

What you want to do at this point, is that the modulating signal you are using never goes negative. That is obtained by plugging it into the EF IN and taking the full wave rectified signal |EF IN| and plugging that into the modulation input of the modulated module (VCO, VCA etc.). Now if we take the copy of the original signal from the multiple at EF IN and plug it into the comparator IN, we can analyse when this signal actually goes negative by setting the Threshold knob to its center position. Now the comparator output tells us when the signal is negative by outputting a HIGH gate which is normalised into the GATE input of the voltage controlled switch.

And now at the switch section you can DEFINE what is happening with the negative part of the modulation! By default, the signal at connector A is inverted and normalised to B. This means if we want to create a thru zero VCA from a non-thru zero VCA, we just take the output of that VCA and plug it into the A connector and listen what comes out at the A or B jack. When the

modulating signal goes negative the signal is inverted. And that is exactly how bi-polar VCAs work!

Another example could be if you are modulating a VCO you can invert its waveform in the negative part of the modulation. Or more interestingly, you can take another waveform of the VCO and override the normalisation on the B connector. So for example the VCO in the positive part of the modulation is Sine wave and in the negative part it is Sawtooth. Or ANYTHING! You can build a thru zero filter by defining that in the positive part of the modulation it is lowpass and the the negative part it is highpass! ...ANYTHING!

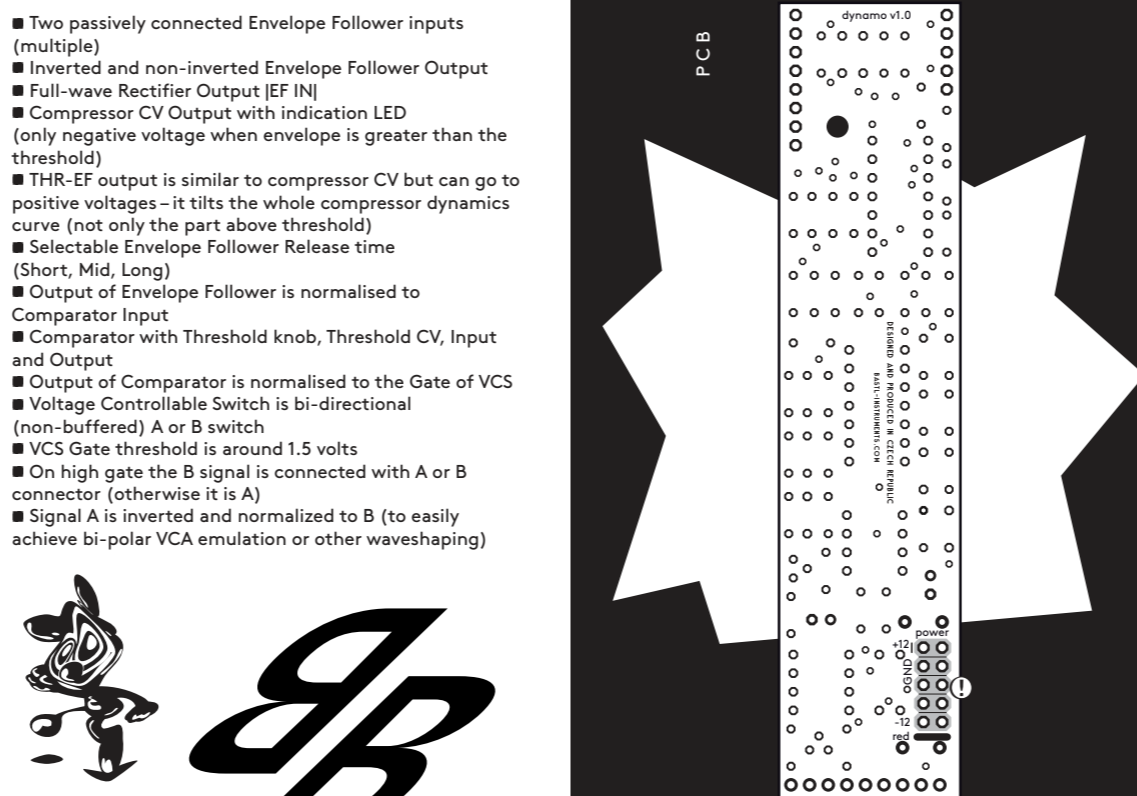
So again the fake thru zero patch is:

1. Modulating signal into the EF IN
2. |EF IN| output goes to the modulation input of modulated module
3. Multiplied EF IN goes to the Comparator IN
4. Set Threshold knob to centred position
5. Output of the modulated module goes to the A connector of the switch
6. Optionally any other signal goes to the B connector of the switch
7. The final output is at the A or B switch connector

Ok! We are not done here! Remember the centered position of the Threshold knob? The one which says whether the modulating signal is positive or negative? Now, forget positive or negative. You can place the "zero-crossing" point anywhere you like and you can move that threshold with CV! ...at audio rate!

features

- Two passively connected Envelope Follower inputs (multiple)
- Inverted and non-inverted Envelope Follower Output
- Full-wave Rectifier Output |EF IN|
- Compressor CV Output with indication LED (only negative voltage when envelope is greater than the threshold)
- THR-EF output is similar to compressor CV but can go to positive voltages – it tilts the whole compressor dynamics curve (not only the part above threshold)
- Selectable Envelope Follower Release time (Short, Mid, Long)
- Output of Envelope Follower is normalised to Comparator Input
- Comparator with Threshold knob, Threshold CV, Input and Output
- Output of Comparator is normalised to the Gate of VCS
- Voltage Controllable Switch is bi-directional (non-buffered) A or B switch
- VCS Gate threshold is around 1.5 volts
- On high gate the B signal is connected with A or B connector (otherwise it is A)
- Signal A is inverted and normalized to B (to easily achieve bi-polar VCA emulation or other waveshaping)



Take it Carefully

technical details

- 5HP width
- PTC fuse and diode protected 10pin power connector
- 35mm deep
- current consumption: +12V: <30mA, -12V: <35 mA

Connecting module to your system

Before connecting the ribbon cable to this module disconnect your system from power !

- ⚠ Double check the polarity of the ribbon cable and that it is not shifted in any direction. The red cable should be attached to the -12V rail, both on the module and on the bus board side!

please make sure of the following

- you have a standard pinout eurorack bus board
- you have +12 and -12 power rails on that bus board
- the power rails are not overloaded

Although we put protection circuits in the device, we do not take any responsibility for damages caused by wrong power supply connection. After you connected everything, double checked it and closed your system so no power lines can be touched by your hand, turn on your system and test the module.

WE ARE PLANETARY
BASTARD

