GENERATE 3

EXTENSIVE USER GUIDE

by BRiES / Simon De Rycke

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About GENERATE 3 Extensive User Guide (G3 E.U.G. v1.1)

I wrote this guide because I think the amount of controls on Generate 3 can be quite confusing and unless you take the time to really understand what's happening it's not possible to get the best experience out of this amazing module.

While the manual that comes with Generate 3 is neat and informative, it still took me some time and some extra digging on the web to figure out what it all meant. I feel by reading through this guide you'll find yourself having more fun with Generate 3.

If there's any questions or remarks about this guide, please contact me at derycke7 at gmail dot com.

There's several hours of video about Generate 3 on my Youtube channel. Go have a look if you're curious: https://www.youtube.com/c/BRiESY

I hope you have fun wiggling those knobs.

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Belgium

CHAPTER 0: FRONT PANEL CONTROLS

Generate 3 has a lot of inputs, outputs, knobs and switches. Some are familiar, other seem to come straight from an electronic circuit diagram. I'll do a brief fly-by of what every knob, jack and switch does before diving into the nitty-gritty of Generate 3.

The **FINE** and **COARSE** knobs work toghether with the **LOW/AUDIO** switch to tune the core oscillator. **LOW** is for LFO rates, and **AUDIO** for VCO duties.

øFM stands for (through zero) linear frequency modulation. The **øFM knob** is the polariser (attenuvertor or bipolar attenuator) for the according **øFM** input and is chaperoned by both the **AC** and **BIAS** switches to control the behaviour of this function. Turn the **øFM** knob to the right and toggle the switches in the up position (off) for a clean start of your patch. The knob is normalised to 5V (i.e. the module acts like there's 5V coming in when nothing is connected to the input). Switching the **BIAS** to on adds 5V of positive offset to the signal (generally this means that bipolar modulation becomes unipolar). Switching on the **AC** switch (down position) filters DC offset (<16Hz) from the incoming signal.

The **EXP. FM** knob attenuates whatever you send into the **EFM** input. This **EFM** behaviour is exponential (1V/Oct), not through zero and the knob does nothing when no signal is patched into the **EFM** input.

The **PHASE** polariser affects the phase of the harmonic generators (except for the CORE) and attenuverts the signal being received at the **PHASE** input. The knob works when nothing is being sent into the input too.

V/OCT. likes to receive pitch CV, but it will take just about antyhing.

The **RESET** and **FLIP** input jacks are connectors for syncing Generate 3 to an external source.

FUND., **EVEN** and **ODD** are the input connectors for the amplitude of the harmonic generators. You can send in bipolar signals. The according knobs attenuvert the incoming signal, but also work as bipolar amplitude knobs when nothing is patched in.

CORE, FUND., EVEN and ODD are the outputs of the seperate harmonic signals. The FULL output is a mix of the **FUND.**, **EVEN** and **ODD** harmonics depending on how you set-up the knobs and modulation for the **FUND.**, **EVEN** and **ODD** harmonics.

CHAPTER 1: HARMONIC GENERATORS

When you look at Generate 3, there's a plethora of knobs and switches, but the feature that first caught my eye were the 3 bottom knobs for FUND, EVEN and ODD harmonics. These are the main foundation for every sound coming out of Generate 3 and together with the according modulation inputs these are one of most basic yet most powerful features on this module.

Having worked with countless virtual and analog subtractive synths words like 'saw' and 'triangle' make total sense to me, but I had no idea what to expect of the selection of waves in Generate 3. Let's take a closer look at what the harmonic generators are and what the knobs, inputs and outputs do.

1.1 CORE

Generate 3 is a VCO built around a triangle core which can be tapped off at the CORE output. It is not influenced by the phase modulation therefore it can be really useful to use it to modulate other parameters (*read chapter 6.1 FOLD 3*). As its frequency is one octave below the other harmonic outputs it is also a good source for syncing Generate 3 to itself (*read chapter 6.3 Pulse Width Modulation*) or for subs. It has no polariser, it has no modulation input nor is it present at the FULL output jack.

1.2 FUND.

The FUND. output produces a clean sine wave. FUND. is short for 'fundamental' as a sine wave only has one fundamental (it's a pure oscillation without any overtones). The polariser for this output changes the amplitude (volume) with no volume at the center position. Turning it to the left of the center position inverts the wave. I'll refer to these inversions as respectively the 'positive' and the 'negative' sine.

The jack at the bottom left labeled FUND. controls the amplitude and inversion of the wave, just like the polariser would. When a signal is connected to this jack, the knob acts as a bipolar attenuverter. What this means is that when you send in a positive voltage (for example an envelope) and you turn the polariser to the right of the center position, a positive sine will be present at the output, with the maximum amplitude (when the modulating signal reaches it's maximum) being restricted by the position of the FUND. knob. When you send in a positive voltage and you turn the FUND. polariser to the left of the center position the sine coming out of the ouput will be inverted. This also works the other way around: when you send in a negative voltage it will always invert the wave. So if you send in a negative voltage and you set the FUND knob to the left of the center position the sine coming out will be positive. It's by using this trait of Generate 3 that we can achieve amplitude and ringmodulation (read chapter 5: AM and ringmodulation)

1.3 EVEN

The EVEN output generates even multiplications of the fundamental harmonic, lowering in volume as the multiplication factor increases. In other words: only the harmonics with frequencies 2x, 4x, 6x ... times the fundamental are present at the EVEN output.

In practice this can be called a SAW (polariser to the left) or RAMP (polariser to the right) output, with a frequency one octave up from the fundamental (p*icture 1*).

The input and polariser for the EVEN harmonics feature the same behaviour as the input and knob for the FUND harmonic.

When I'm using a scope to examine what's happening inside Generate 3, I tend to use this wave because it's very easy to see when this wave inverts.

1.4 ODD

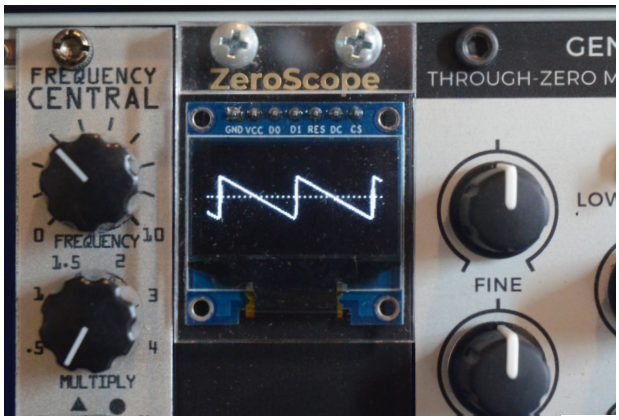
The ODD output generates odd multiplications of the fundamental harmonic, lowering in volume as the multiplication factor increases. So only harmonics 3x, 5x, 7x, ... are present at this output. The resulting wave is not a shape that can be easily described. It's not a pulse or a square, it is something else completely (*picture 2*).

The input and polariser for the ODD harmonic output feature the same behaviour as the inputs and knobs for the other harmonic channels.

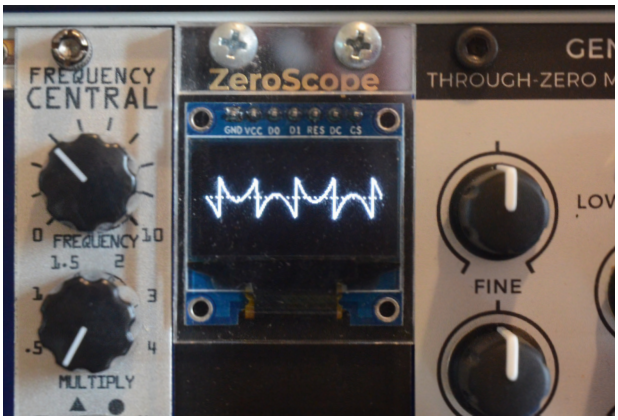
1.5 FULL

While the signals of the 3 harmonic generators have seperate outputs, they are also present at the FULL output (according to the position of the respective polarisers and considering whatever modulation you're sending into the inputs).

Using one (or all) of the separate outs does not remove the signal from the full output, so you can use all the outputs at the same time to send them around your rack or to modulate other parameters on Generate 3 itself.



Picture 1: even harmonics



Picture 2: odd harmonics

CHAPTER 2: PHASE MODULATION

The first thing I did when I got a Generate 3 in my rack, back when I was still sporting a home-made cardboard skiff with a Happy Ending kit, was to patch my only other VCO into the PHASE input and turn the knob all the way to the right.

I had seen and heard all the amazingly sculpted sounds that DivKid created in his overview and I thought just getting the module was the way to achieve sonic heaven.

To my dismay, whatever was coming out of my speakers, sounded absolutely nothing like what I was expecting and it took quite a lot of experimentation to discover how to sculpt a sound instead of just shredding it to pieces.

2.1 What is phase modulation?

The phase of a wave has, very simply put, something to do with the question: 'Where does the wave start?'. When you modulate the phase you change where and when the wave goes high and low.

Changing the starting point of a soundwave doesn't make much difference to how it sounds though, so at first glance phase adjustment might be only useful when you're dealing with low frequency oscillations (for example modulating a filter) and it actually matters if the wave is at a 'high' point or a 'low' point.

Phase is a parameter that only makes sense when you compare it to something else, and one wave can be out of phase with another wave (*picture 3*). If you change the phase of a wave you can compare its phase to its own phase a few moments ago. But how could this be useful at audio rates?

Imagine a kid with a siren on a tricyle driving past your house. You hear the siren just as if it were stationary. Now imagine a police car driving very fast, and while the pitch of the siren itself isn't changing, you actually hear a pitch change. This is called the Doppler effect and it happens because the soundwaves get compressed together while the car moves closer and they get streched apart when it's getting farther away - relative to you, of course, there's nothing really getting compressed or stretched from the car's perspective, i.e. the officers in the car don't hear the pitch change.

It's kind of the same thing with phase modulation: by changing the phase while the wave is doing it's oscillations the peaks of the waves get compressed or stretched and that's what, at slow modulation speeds, makes it sound as if the pitch is changing, while actually the frequency of the core of the sound (and in Generate 3 quite literally the core oscillator) isn't.

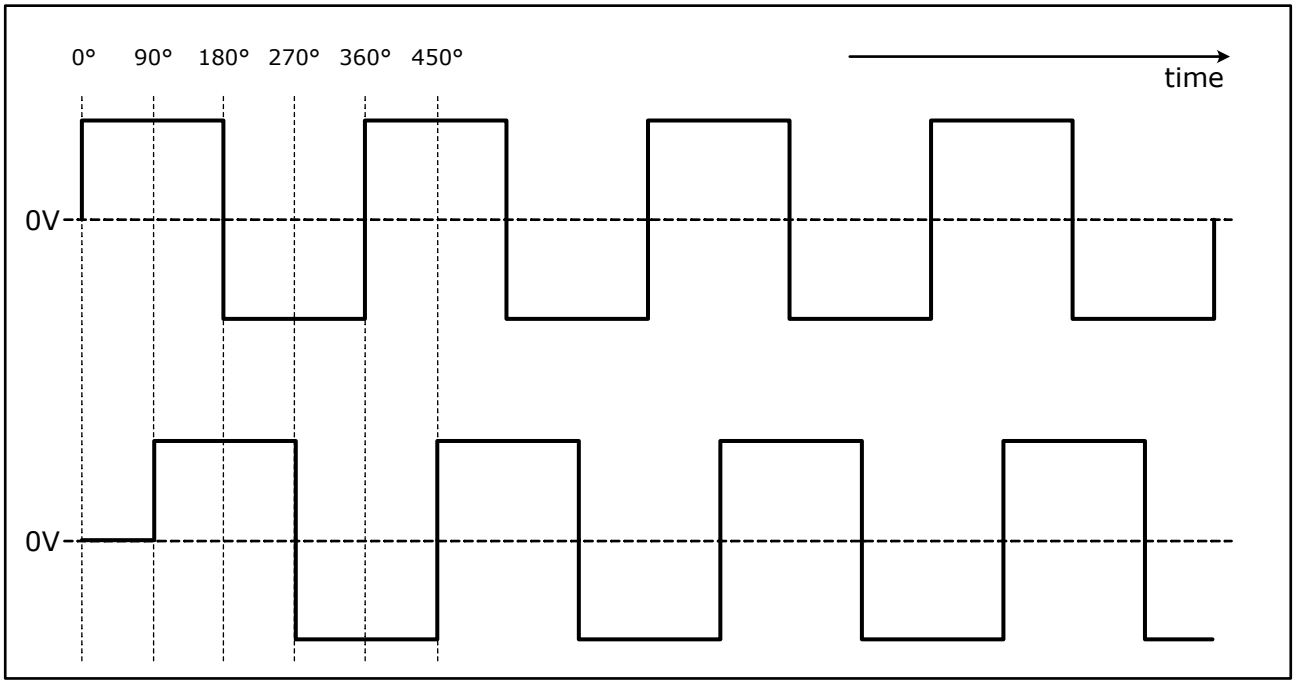
2.2 Phase Modulation in Generate 3

Turning the PHASE knob on Generate 3 without patching anything into the PHASE input might be a little disappointing. Maybe if you turn it quickly enough you might hear a momentary pitch change, but at whatever position you leave the knob, the sound remains unchanged.

It should be clear by now that the PHASE input really needs to be fed with a continuously changing signal (for example an LFO or preferably something faster) for any change to be apparent. You can send positive or negative voltages into it and the modulation of the phase of the wave will act accordingly. The phase of the waves can be shifted from -450° to +450° but I've found that a little bit of (fast) modulation goes a long way most of the times.

The PHASE knob is a polariser so just as it was the case for the harmonic inputs and polarisers, a negative value for the knob will invert whatever signal coming in, turning a negative input value into a positive phase change and vice versa but restricting the modulation to the absolute value of the knob with no phase changes at the central position. In other words: the knob attenuverts the signal.

In practice it makes little to no difference whether you turn the PHASE polariser to the left or to the right, especially because 90% of the times the signal you'll send in will be a symmetrical bipolar signal to begin with... but interesting resulsts can be achieved by self-patching (*read chapter 6.1: FOLD 3*) or sending in a unipolar or offsetted signal (*read chapter 6.3 Pulse Width Modulation*).



Picture 3: the bottom oscillation is 90° out of phase relative to the top one

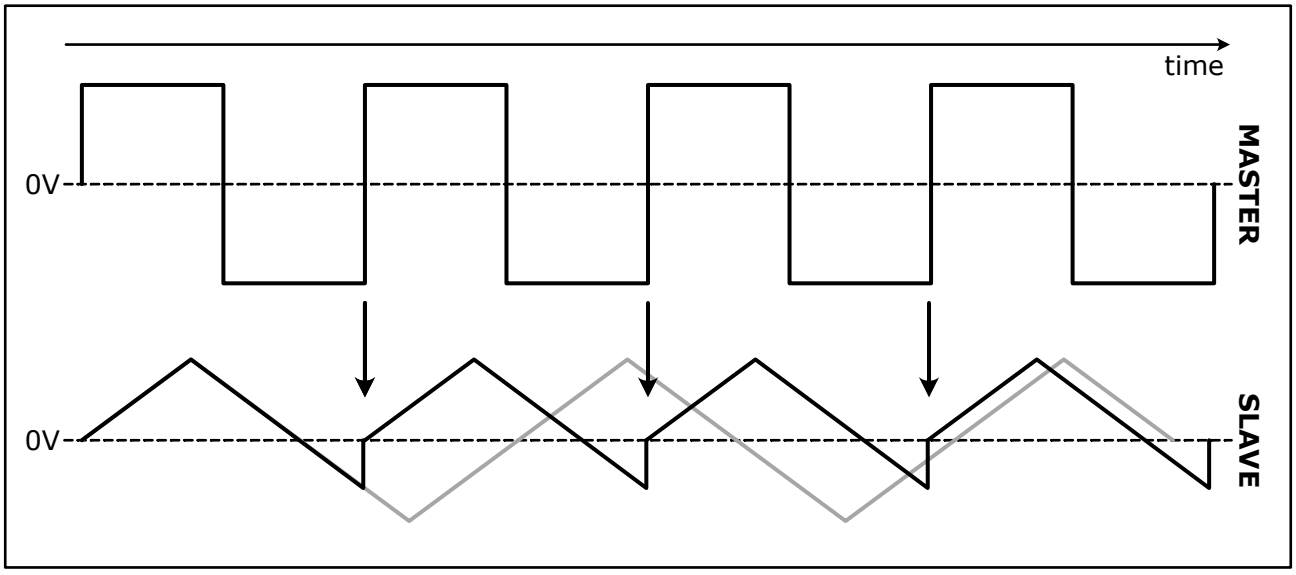
CHAPTER 3: RESET AND FLIP (SYNC)

I always had a hard time understanding how sync works on (virtual) analog synthesizers like the Korg Microkorg or the Roland JX-3P. It's only when I started working with modular VCO's that it made sense. On Generate 3 I tend to go for the reset (hard sync) input, but that's a matter of taste....interesting resulsts can be achieved with the flip (soft sync) input too and you can even use them both at the same time.

3.1 SYNC basics

Oscillator sync is a way to 'lock' the frequencies of two oscillators together, but by doing so you can drastically change the sound of the synced oscillator. When you connect a VCO to the sync input of another one the first one is called the master and the synced VCO is called the slave. Sync works for LFO's too and a lot of LFO modules have this feature as a way to achieve sync(opat)ed modulation.

The slave oscillator will be forced to reset its cycle every time the master oscillator has completed a cycle and the pitch of both oscillators will sound the same (*picture 4*). It's because the slave VCO hasn't got the time to complete its cycles and has to reset abruptly to its starting point that the timbre coming out of this slaved VCO changes. Accordingly you can shape the sound by changing the core pitch of the slaved VCO, and when you keep tuning it down, even though the frequency won't change because it is slaved to the master, the sound will become less and less harsh until its core oscillations are so slow (in reference to the master VCO) that it hasn't got time to oscillate at all before it's forced to restart its cycle. If you keep tuning the synced VCO up though, there's a point where so many oscillations can happen before it's forced by the master VCO to restart its cycle, that it won't make much of a difference in neither pitch nor



Picture 4: hard sync / oscillator reset

timbre of the slaved VCO.

3.2 RESET or HARD SYNC

This is the type of sync I was talking about in the previous explanation. Connecting an oscillator to the RESET input on Generate 3 will force Generate 3s cycle to start from scratch. Even though pulse or square waves are normally used to sync to (because they have a straight and clean rising edge at the start of their cycle) Generate 3 doesn't really care what kind of wave you send into it. The phase parameter influences at which point (phase) the wave starts over and this proves to be especially useful in LOW mode.

3.3 FLIP or SOFT SYNC

When you slave Generate 3 to another VCO connected to the FLIP input it might not be clear at first glance what's happening. Soft sync sounds are generally less harsh than the hard sync timbres because the slaved VCO isn't forced to restart its cycle. Instead it just skips to the next part of its oscillation that has the same voltage.

When you have for example a rising edge of a triangle wave (the CORE output on Generate 3) and you sync it to another VCO, whenever the triangle receives a rising edge crossing zero at the FLIP input, the triangle is nudged to the falling edge of its oscillation and vice versa.

It depends greatly on what kind of wave is being synced how the timbre will change. I suggest soft syncing a saw wave (EVEN output) and putting it through a scope while changing the relative frequencies of the oscillators to see what happens... This provides some interesting and sometimes confusing results.

3.4 Use SYNC more

If you've watched the video DivKid did on Generate 3, you should already know that syncing Generate 3 to another VCO that's also modulating the other parameters (PHASE, FM, ...) on Generate 3 tends to lead to really rich sounds that are still focussed and clear in terms of pitch. You can even sync Generate 3 to itself.

CHAPTER 4: FREQUENCY MODULATION

When it comes to frequency modulation options, Generate 3 really has a lot to offer... and I mean a lot.

Linear frequency modulation generally produces more predictable results than exponential frequency modulation, but the timbres you get when using the through zero frequency modulation on Generate 3 are hardly predictable.

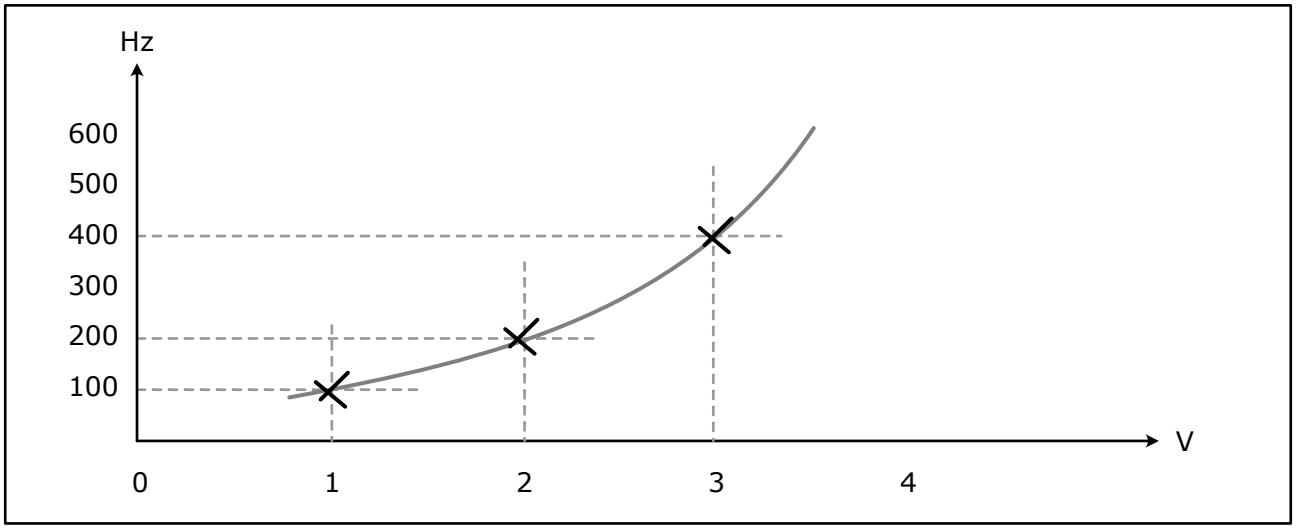
Implementing the through zero aspect of the FM on this module is in my opinion best done through trial and error, trying different modulation sources, offsetting them, inverting them, modulating them through a VCA, flipping the BIAS and AC switches ... There's a lot of sound design possibilities to be discovered.

4.1 Linear vs. Exponential

V/Oct inputs on most VCO's react exponential to whatever you send into it. The rise in frequency gets higher the more volts you send in and V/Oct inputs are usually callibrated to a doubling of the frequency for every added volt.

If you start off with a frequency of 100Hz and you add 1V the frequency will go up to 200Hz (if your VCO is properly callibrated). If you add an extra 1V the frequency of the oscillation will be at 400Hz (*picture 5*). Another extra volt would yield a frequency of 800Hz. In other words: for every volt you send into the V/Oct input the pitch goes up one octave.

You can see that the first extra volt only adds 100Hz but the second volt adds 200Hz and the third adds 400hz. This exponential behaviour is used for the callibration and pitch tracking of most analog synths and eurorack modules, although there are brands that use linear tracking (Hz/V) for pitch (Yamaha and Korg, I'm looking at you).



Picture 5: example of exponential tracking in an extremely simplified graph

In Hz/V tracking there's a set number of cycles that correspons to 1V, for example 1V can be callibrated to a change in frequency of 100 cycles. If you start off with a oscillator cycling at 100Hz and you add 1V to the Hz/V input you'll end up with a frequency of 200Hz. If you add another 1V the frequency will rise to 300Hz. So unlike in V/Oct tracking there is a linear relationship between the control voltage (whatever that is: CV from a sequencer, an LFO, envelope, ...) and the change in frequency.

Most of the internal functions of a synth work with linear voltages, as apparently it's easier to manufacture and callibrate linear behaviour. It's also easier to get predictable (i.e. less extreme) results with linear modulation, that's why most eurorack modules that support any kind of (frequency or other) modulation work with linear relationships between the amount of volts you send in and the amount of change the modulation creates. On modulation inputs with an attenuator or attenuverter (polariser) you actually callibrate this linear relationship manually by chosing the position of the knob: you decide how much every volt of the incoming signal will affect the respective parameter.

4.2 Through-Zero Linear Frequency Modulation & BIAS/AC switch

If you've ever created a vibrato by sending an LFO into an FM input of a VCO you were modulating the frequency of one oscillator with the signal coming from another (in this case slow) oscillator.

This is how FM works at audio rates in most modules too. Luckily for us folks Generate 3 doesn't care what all the other modules do unless you really want it to, so sending in an LFO to the øFM input might sound a little different than expected: as long as the BIAS switch is up (the default/off position) every time a modulating signal crosses through zero the core of Generate 3 stops and inverts (*picture 6*).

In the case of an LFO modulating Generate 3s FM input the pitch will not simply rise and fall according to the incoming LFO (as in vibrato) but it follows the rise and fall, keeps falling until it stops when the LFO goes through zero, the wave inverts and then rises and falls according to the absolute value of the negative portion of the LFO. The amount of pitch change is set by the FM knob but as long as you send in a bipolar signal the oscillations on Generate 3 will move through zero and the wave will invert. As with all the polarisers on Generate 3 the incoming voltage is inverted when you turn the knob to the left of the center position.

While it's very easy to hear what's happening when an LFO modulates the through zero FM input it's a lot harder to discern when audio rate modulation is used and I really suggest you experiment (a lot) with different signals and settings.

You might still wonder how to achieve a simple vibrato on Generate 3, and all you really need to do is make sure the modulating signal (for vibrato that would be an LFO) doesn't go through zero so the pitch of Generate 3 won't go through zero (stopping and inverting) as well. Considering a bipolar LFO is usually oscillating between -5V and 5V

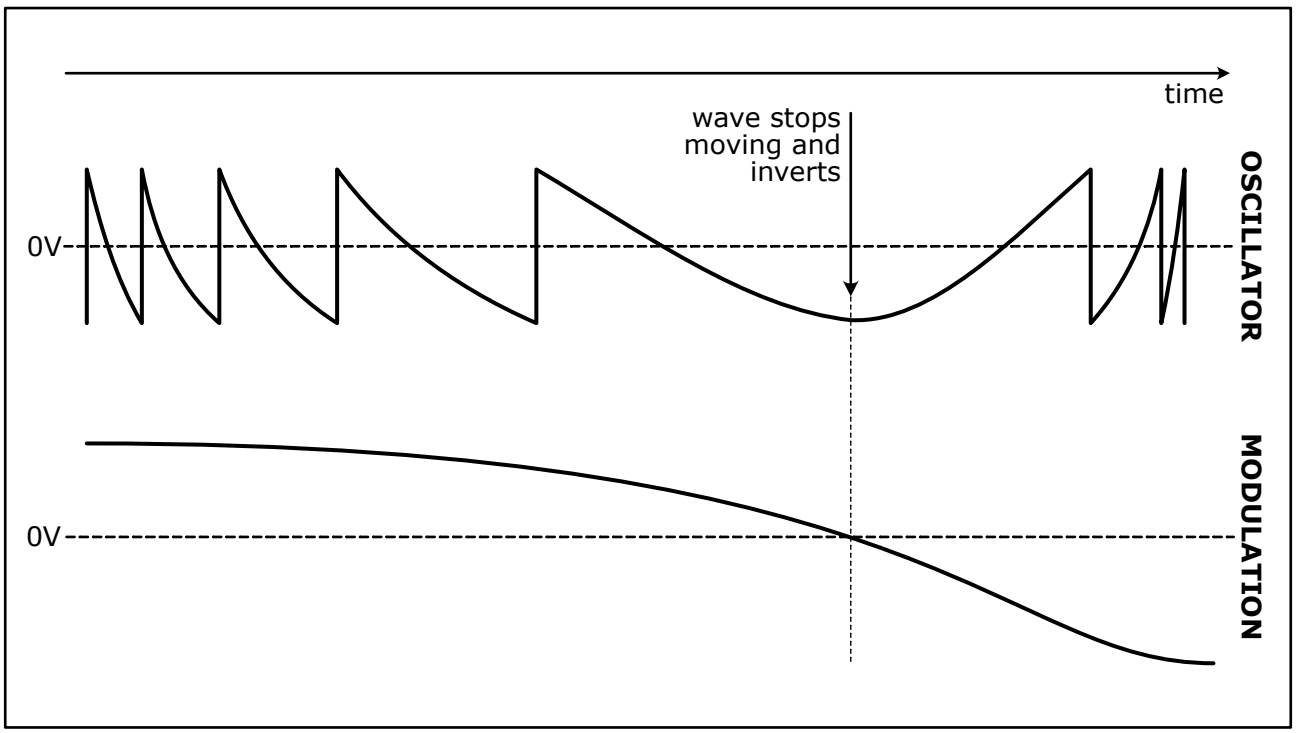
you would have to add a 5V offset to the signal before it enters the FM input. In this case you might also want to back down the FM knob a little bit just so the offsetted LFO is attenuated and won't ever reach zero volts.

This might sound like a hassle as it requires extra modules and more cables so the good people at Joranalogue Audio Design gave us the BIAS switch to add a 5V offset (BIAS switch down/on position) to any incoming signal patched into the øFM input thus resulting - in most of the cases - in 'normal linear FM' where the carrier just 'wiggles' a little bit under the influence of the modulator instead of periodically stopping and inverting.

As I mentioned earlier, it's easier to understand what's happening when you use an LFO patched into the FM input, but the fun (or mayhem) really starts when you use audio rate modulation.

Please note that it's still possible to get Generate 3 to come to a halt and invert through zero with the BIAS switch on by adding negative offset to the incoming modulation before it hits Generate 3. You could let an envelope or another modulation source control this offset creating unique timbres that are impossible to achieve without through zero frequency modulation.

When nothing is patched into the through zero FM input and without any internal offset - so BIAS switch in the default/up position - the signal coming in is equal to zero all the time. Attenuating the signal with the according FM polariser should make no sense because there is no signal to begin with. We learned that the core of Generate 3 stops whenever the modulating signal goes through zero so you might come to the conclusion that with no signal coming into the FM input the core of Generate 3 is in a perpetual



Picture 6: through zero frequency modulation

state of not moving. This is exactly why the FM polariser is normalised to 5V whenever nothing is connected to the according input. Attenuating the signal will affect the pitch of the VCO and setting the knob to the center position will stop the core completely.

Whenever you send an oscillator into the through zero FM input the modulator itself might carry some slight DC fluctuations with it. This might be just as you intended it but sometimes the DC part of the signal will change the percieved pitch of the carrier and you might just not like how that sounds. To filter out all the DC offset or slow modulation you need to flip the AC switch in the down/on position (*picture 7*).

It's a lot to take in but this might help...

Another way of looking at the through zero frequency modulation and especially the behaviour around the zero point is this: while the external voltage drops and gets close to zero the frequency of Generate 3 goes down and oscillations become so slow that they eventually stop. When the modulating voltage drops below zero the core of Generate 3 starts oscillating in the opposite direction, slow at first but then faster and faster.

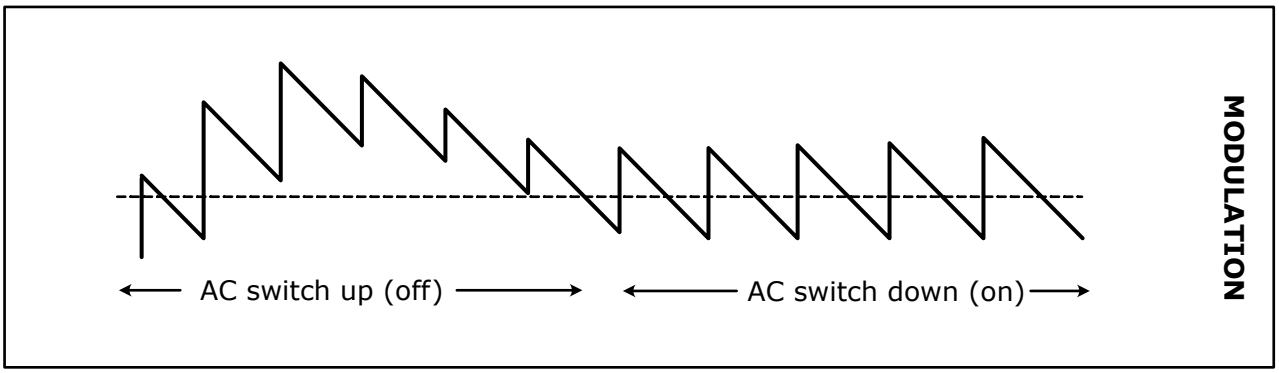
It makes no difference to the absolute pitch of Generate 3 whether the modulating voltage is 2V or -2V, the only difference +2V or -2V makes is the inversion of the wave.

By doing so you also remove the 5V normalisation so with nothing patched into the FM input turning the according polariser will not change the pitch and unless you add 5V offset with the BIAS switch the core of Generate 3 won't oscillate.

4.3 Exponential Frequency Modulation

Remember the vibrato? If you don't want to deal with offsetting voltages (externally or internally with the BIAS switch) or through-zero physics you might just as well patch an LFO into the EXP. FM input of Generate 3.

As I explained earlier the relationship between the modulating voltages and the amount of change (or modulation) happening to the frequency of the oscillations in Generate 3 is exponential, and the Exp. FM polariser regulates that relationship. At full (completely to the right of the center position) incoming voltages will induce a 1V/Oct change (in AUDIO mode) and with the knob completely to the left 1V added will drop the pitch by one octave. Keep in mind that the Exp. FM input is not as precisely callibrated as the V/Oct input. Everything in between those extreme settings will attenuate the influence



Picture 7: the AC switch removes any signal below 16Hz sent into the linear FM input

of the incoming signal. The EXP. FM input gives us a quick way to transpose sequences sent into the V/Oct input on Generate 3 (*read chapter 6.5 FM transposing Generate 3*).

When switched to LOW (LFO) mode 0.66V will make the frequency go up (or down) one octave (with no attenuation i.e. the polariser set fully left or right).

CHAPTER 5: AM & RINGMODULATION

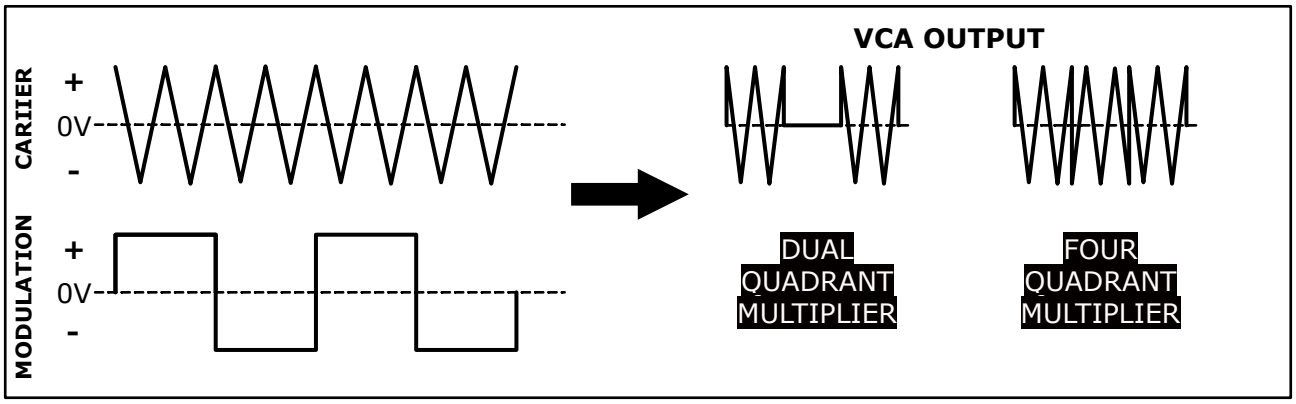
Both amplitude modulation and ringmodulation have something to do with the amplitude of a sound and they are definitely related to each other. It takes a little bit of explanation (and maths) to understand how they work, what the differences are and how to use their behaviour to your sonic advantage.

It's worth the effort as there's more to AM and RM than clangerous 70s mancave sounds.

5.1 Let's talk about VCA's...

There's no way I can explain what AM and RM are without taking a look at Voltage Controlled Amplifiers first. Most modules have some sort of a VCA-circuit built in (or several), even if it's just an attenuator for an incoming modulation signal. Whenever there's need for either a manually or automatically controlled attenuation (or amplification) of a signal there's a VCA in there, somewhere.

Most of you will own a dedicated VCA module to control the amplitude of the sounds you're creating, perhaps it's built-in to a filter module like on my trusty Manhattan Analog MA-35. A 'regular' VCA will have an input (for the signal you want to attenuate), a CV input and/or knob for controlling the attenuation and an output that sends out the attenuated signal. While the signal at the input might be bipolar (an oscillator oscillating between -5V and 5V) and the signal at the output might be bipolar too, the CV input doesn't always handle negative signals. Most regular VCA's just ignore whatever negative CV you send in. You might try to connect an LFO to the CV input to control the amplitude of a sound but you'll notice that parts of the sound go missing when the LFO drops below zero. Normally you'd use an envelope (which is unipolar) to control the amplitude of a sound so this behaviour isn't a problem most of the times. VCA's that act this way are called dual quadrant multipliers. There are also VCA's that are called four quadrant multipliers which don't ignore the negative portion of the CV and you need one of those to do ringmodulation (*picture 8*).



Picture 8: 'normal' VCA (dual quadrant x) vs. bipolar VCA (four quadrant x)

5.2 Amplitude Modulation

Any VCA can handle amplitude modulation, it's their sole purpose. When you send an LFO into a dual quadrant multiplier aka a 'normal' or unipolar VCA certain parts of the sound will be chopped away but that doesn't mean it won't sound good. If you turn up the LFO into audio rate (or instead use a VCO) you'll get some nice AM sounds. I'm 95% sure it will sound like a dissonant mess unless you carefully tune the frequency of both oscillators.

To understand what's happening to the frequencies we need an example and some maths. Let's say you start off with a nice clean sine wave at 100Hz (carrier) and you try to modulate it with another sine wave at 500Hz (modulator). The sound coming out of the unipolar VCA will be a combination (dual quadrant multiplication) of those frequencies (the sidebands) plus the frequency of the carrier (100Hz).

To multiply frequencies you oddly need to add and subtract them and keep the absolute value of whatever the outcomes are. In our example the sum of the frequencies is 100hz + 500Hz = 600Hz. The difference of the frequencies is 100Hz - 500Hz = -400Hz but you drop the '-' to get the absolute value.

So the sound coming out of the VCA will be a combination of 3 fundamental frequencies: 100Hz, 400Hz and 600Hz.

I used nice round numbers in my example but I bet you'll understand that it will get really messy really quickly in real life. On top of that: whenever you use anything else than a sine wave, you'll be multiplying a lot more frequencies together because of all the added harmonics and the results will be a lot less predictable still.

5.3 Ringmodulation

With a four quadrant multiplier or ringmodulator you won't lose the bits that were chopped out by a normal VCA, instead the amplitude is just modulated and the wave of the carrier inverts when the modulator goes into the negative portion of its cycle. Weirdly enough the biggest sonic difference between ringmodulation and amplitude modulation is the fact that the 'base' frequency will be lost at the output. Therefore it's actually no longer of any use to distinguish a carrier or a modulator... however you connect them to your VCA, the resulting sound will be the same.

If we use the same values as the example for amplitude modulation, combining a 100Hz and a 500Hz sine through a ring-modulator (four quandrant multiplier) you'll end up with a sound that's a combination of the sum and the difference between the two: 400Hz and 600Hz. This might sound even more dissonant because there is no longer a solid base frequency that corresponds to any of the ones you started with (except for ringmodulated signals that are 1 octave apart - why is that? Do the maths!).

5.4 AM and RM in Generate 3

Because of the 'through-zero everything' nature of Generate 3 you'll get instant ringmodulated sounds when you patch another VCO into one of the harmonic inputs. You can even use the CORE output to ringmodulate the other harmonics. Sadly there is no built-in way to offset the incoming signal to make it unipolar so the only way to achieve amplitude modulation is by sending in a unipolar signal like a cycling envelope or by adding offset to your bipolar modulator beforehand. There's tons of fun to be had with this though because, depending on what modules you own, you can modulate the offset in several ways to get a combination of AM and RM sounds. There's loads of fun to be had by simply spending some time exploring how all of these things interact.

CHAPTER 6: FUN THINGS TO EXPLORE

In this chapter I'll guide you through some of my favourite ways to set up Generate 3, some will be rather basic, others will be a little more convoluted.

If you have a Generate 3 nearby, I suggest you grab a cup of coffee or tea, get your cables ready and patch along.

6.1 FOLD 3

As I was doing some experimental patching in preparation of a video I stumbled on a simple way to wavefold the harmonics of Generate 3.

Most wavefolders have an intensity knob that regulates the amount of folding and some also feature a symmetry knob to affect the symmetry of the folded wave in some way. I was able to achieve both controls from the frontpanel of Generate 3, without the need for any other modules. The only thing you'll need to be able to patch both controls is a stackable patchcable (or a mult).

First patch the CORE output to the PHASE input.

If you can, use a scope to check the output of Generate 3. Stick to the sine wave (FUND.) first and turn up the amplitude. Then turn the PHASE knob and watch how the sine is being folded.

Then patch another cable (stackable cable or through a multiple) from the CORE output to the FM input. Flip the BIAS and the AC switch into the ON position (down) and while you turn the FM knob watch how the symmetry of the folded sine is broken horizontally.

Now listen how the other harmonics sound when they are being folded, use the full output, add VCAs in between the CORE output and the 2 inputs, ...

6.2 Generate 3 Electronic Drumkit

Thanks to the inputs for the seperate harmonic generators it's possible to turn Generate 3 into a simple drum or percussion module.

All you need are 3 triggered envelopes and a few cables.

First patch an envelope into the FUND. input. Turn the polariser up and tune Generate 3 so you hear a nice low bass, adjust the envelope to your liking. If you can mult this envelope, send it to the EXP. FM input too and adjust the according knob until you're satisfied.

Connect another envelope to the EVEN harmonic input and adjust the corresponding polariser. Do the same thing for the ODD fundamental.

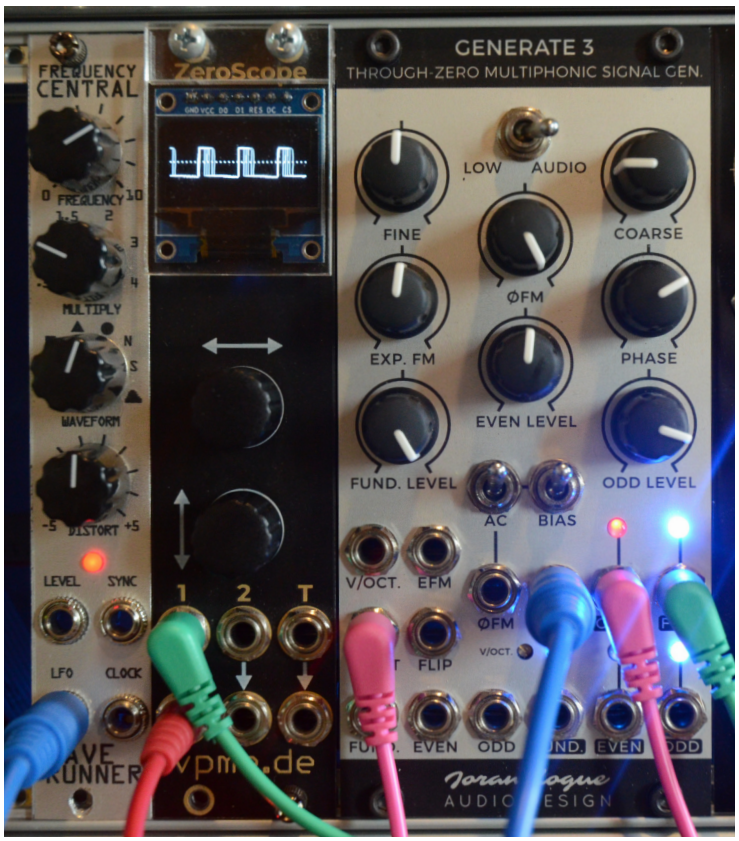
Depending on what rhythms you send in you might end up with a nice beat where the FUND acts as a kickdrum, the EVEN acts as a snare and the ODD acts as a hihat. Of course this all depends on the envelopes, the tuning, etc. too and this patch is merely a starting point for further explorations.

Try patching a VCO into the PHASE input or RESET. Add a sequence to the V/Oct input. Use one of the harmonic outputs to patch back into the FM, add inverted envelopes, ...

6.3 Pulse Width Modulation

If there's one thing I hardly ever use it's PWM sounds, but that's no reason not to try and squeeze them out of Generate 3. This patch started off as a thought-experiment, one that actually seems to work in real life too, albeit with really touchy controls.

Here's my 'sneaky' way to get PWM sounds from Generate 3. All you need is an LFO and something to offset it with, or perhaps a cycling envelope would work too if you haven't got a way of offsetting signals.



Start of by patching an LFO into something to offset it (Make Noise Maths would work, Intellijel Duat, Triplatt, Quadratt, Mutable Instruments Shades, Befaco A*B+C, ...). Patch it through to the PHASE input on Generate 3. Adjust the PHASE polariser so you get a sound with a slow vibrato.

Connect the CORE output to the RESET input.

Be sure to set the FUND. and ODD levels so that you actually have a pulse coming out of the FULL output.

Adjust everything until it works. Sometimes attenuating the LFO before offsetting it helps.

6.4 Custom VCO/LFO shapes

Perhaps you need an LFO that has some offset and you don't have any modules (left) in your system for that job, or maybe you just need a custom VCO. Generate 3 can achieve all of this with one connection. All you need is a cable.

Connect the CORE output to the RESET for offsetted (or pseudo-rectified) waveshapes. Use the PHASE polariser to sculpt your wave.

Alternatively, connect the CORE output to the FLIP input to reshape the wave with the PHASE polariser. The most interesting results can be achieved by using the FUND output although there is some effect when you use the ODD output too.

If you have more time to spend, listen to the full output instead of one separate output and try modulating the signal from the CORE output through a VCA before sending it back into the RESET or FLIP input.

6.5 FM Transposing Generate 3

As most sequencers in the eurorack format are restricted to 8 or 16 steps things can get quite repetitive. Of course some clever modulation and sound design help to keep the listener (and yourself) entertained, but sometimes you really need a little bit more pitch variation.

This is where the Exp. FM input on Generate 3 can be quite useful: it's callibrated to 1V/Oct when you turn the corresponding polariser to the right (although not as precise as the dedicated V/Oct input). You can use this input to send in pitch CV to transpose any sequence received at the regular V/Oct input. When you turn the EFM knob completely to the left Generate 3 will be transposed one octave down for every 1V you send in. I've found this works well on most other VCO's too, if the callibration of the Exp. FM input is somewhat precise.

It's also possible to transpose notes with the øFM input and - to me - this yields far more interesting and fun results: from 8 bit chaos to psuedo-glide!

Try patching a gate or trigger into the øFM input while a sequence is playing. Toggle the BIAS switch into the down position (on), turn the øFM knob completely to the right and you'll notice that whenever Generate 3 receives a gate or trigger it will momentarily double it's frequency. Depending on what you use this might sound as a nice arpeggio effect, 8 bit wiggles or glitch madness.

This of course is a byproduct of how the linear FM is callibrated and it is also stated in the manual that you can use the BIAS switch as an octave up toggle (when you turn the øFM knob completely to the right). We're doing the same thing here, but automated by CV. Keep in mind that this will only work as described if the gates or triggers you're sending in are exactly 5V.

Alternatively try patching a gate through a slew limiter (if you have one) or an envelope and patch that into the øFM input with the BIAS switch in the up position. This can result in glide-like behaviour or could even be used as a way to achieve pumping side-chained sounds.

CLOSING THOUGHTS

This is the end, my friend.

Congratulations, you've reached the end of my GENERATE 3 EXTENSIVE USER GUIDE. I hope by reading through this document you've gotten a better understanding of Generate 3 - and synthesis in general.

I want to thank Joran from Joranalogue Audio Design for supporting my work on this guide. Keep making awesome stuff!

I learned a lot about Generate 3 (and other synth-related subjects) by watching other people's videos on youtube and by reading through articles on the subject. If you need more in-depth information about eurorack modules, synthesis techniques or gear in general, I suggest you take a look at the pages listed below.

YOUTUBE:

DivKid https://www.youtube.com/c/DivKidVideo

Synth DIY Guy https://www.youtube.com/c/SynthDiyGuy

Molten Music Technology https://www.youtube.com/c/Moltenmusictechnology

Color My Sound https://www.youtube.com/channel/UC3IgU2sj_fxXYhKH8ou7YTQ

Ricky Tinez https://www.youtube.com/c/RickyTinez

Loopop https://www.youtube.com/c/loopop

Mylar Melodies https://www.youtube.com/c/mylarmelodies

Running On Air https://www.youtube.com/user/Runningonaircom

OTHER:

Synthesizer Academy https://synthesizeracademy.com

Sound on Sound https://www.soundonsound.com/techniques