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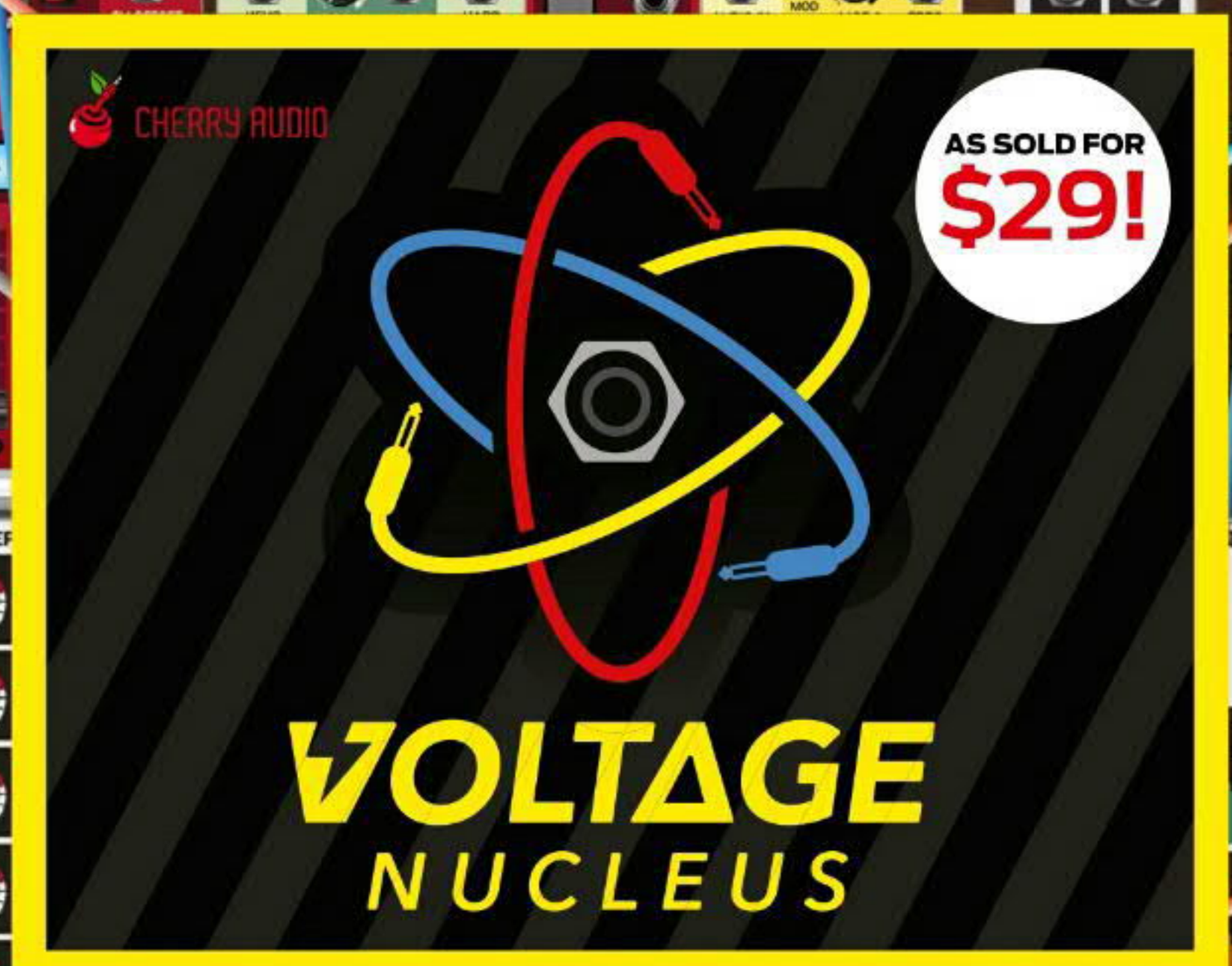
In-studio session with the Warp Records duo

PATCH LIKE A PRO

Learn modular synthesis and build killer sounds with your new virtual instrument



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TRENTEMØLLER

The eclectic Danish producer talks tech

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DOWNLOAD

See page 5 to find out how to download this issue's exclusive content

welcome

A software modular synthesiser represents the ultimate in raw sound design power. Starting from an empty rack, you combine any number of oscillators, filters, envelopes, LFOs and effects, then grab a fistful of virtual patch cables and plug them all together in any configuration you like. It's Lego for synth geeks, essentially.

As you can imagine, this power is both a blessing and a curse. Accomplished sound designers can let their imaginations run wild and dive headfirst down the rabbit hole of patching and tweaking, but a synth newbie can quickly get stuck without making a single noise.

"The ultimate in raw sound design power"

But overcome this learning curve and not only will you end up with tons of unique sounds that other synths couldn't possibly make, but you'll unlock the underlying principles of synthesis – knowledge that will transfer across all of your music-making endeavours.

So to set you off on this epic journey of sound design discovery, we've teamed up with expert developers Cherry Audio to bring you Voltage Modular Nucleus, a virtual Eurorack-style environment for PC and Mac, worth $29. This powerful package comes complete with 22 modules, plus a wealth of presets to get you started – including over 50 *Computer Music*-exclusive sounds.

And once you've installed your new modular monster, turn to p22 and follow our get-started tutorials and videos to find out how to *Patch Like A Pro*!

ENJOY THE ISSUE

Joe Rossitter **Editor**

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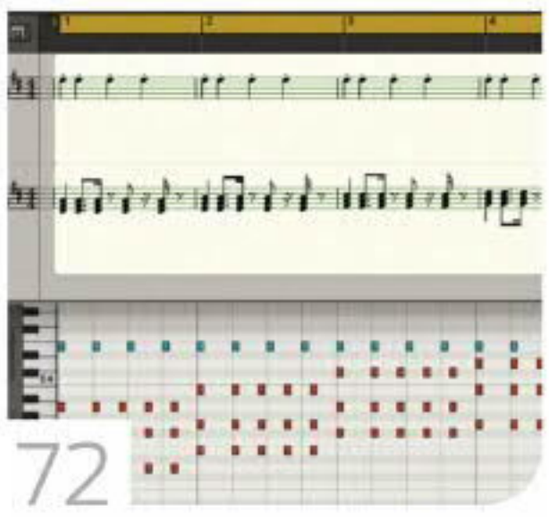
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PATCH LIKE A PRO

Begin your journey into virtual Eurorack synthesis with this issue's free giveaway – a breathtaking software modular system!

> We don't have to tell you that modular synthesisers are back with a vengeance. Infinitely expandable and utterly customisable, the modern Eurorack format has become the de-facto standard thanks to its relatively compact size and the wide variety of modules on offer.

Virtual modular synthesisers have been around for decades, but only recently have developers begun to emulate the now-familiar Eurorack format.

Case in point: Cherry Audio, who released their own virtual modular system, Voltage Modular (8/10, **cm**264), in 2018. A note-on recreation of the Eurorack format, it offers a myriad of modules ranging from the obvious to the esoteric. Considerably cheaper (and lighter!) than even the tiniest hardware equivalent, it has quickly become a favourite among aficionados of analogue and digital synthesis.

Cherry Audio celebrated the first anniversary of their system with a cut-price variant called Voltage Modular Nucleus. With a list price of $50 ($29 street), this involves far less risk for the newcomer. Better still, the developers have generously allowed *Computer Music* to bring you the full package for no cost at all. Yes, you read that right – you pay nothing! Voltage Modular Nucleus is already yours, by dint of the fact that you are reading this.

And if that isn't reason enough to step into the world of modular synthesis, we here at **cm** have taken the extra step of easing your learning curve by providing a killer collection of step-by-step tutorials to arm you with everything you need to know to begin your mastery of modular patching. We'll give you the run-down of all the most important concepts in play, show you the most crucial modules in detail, and demonstrate how you can combine them to produce virtually any sound you can imagine, from the simplest tones to wildly complex textures that play themselves.

To authorise and install your copy of Voltage Modular Nucleus, simply head to this issue's FileSilo page (**filesilo.co.uk/computermusic**), download the **Voltage Modular Nucleus** text file and follow the simple instructions.

So, what are you waiting for? Fire up your computer, load up this fabulous virtual instrument and dive into the magnificent marvels of modular synthesis!

Introducing Voltage Modular Nucleus

Your virtual modular environment looks and operates exactly like a hardware Eurorack system. Let's get to grips with the interface...

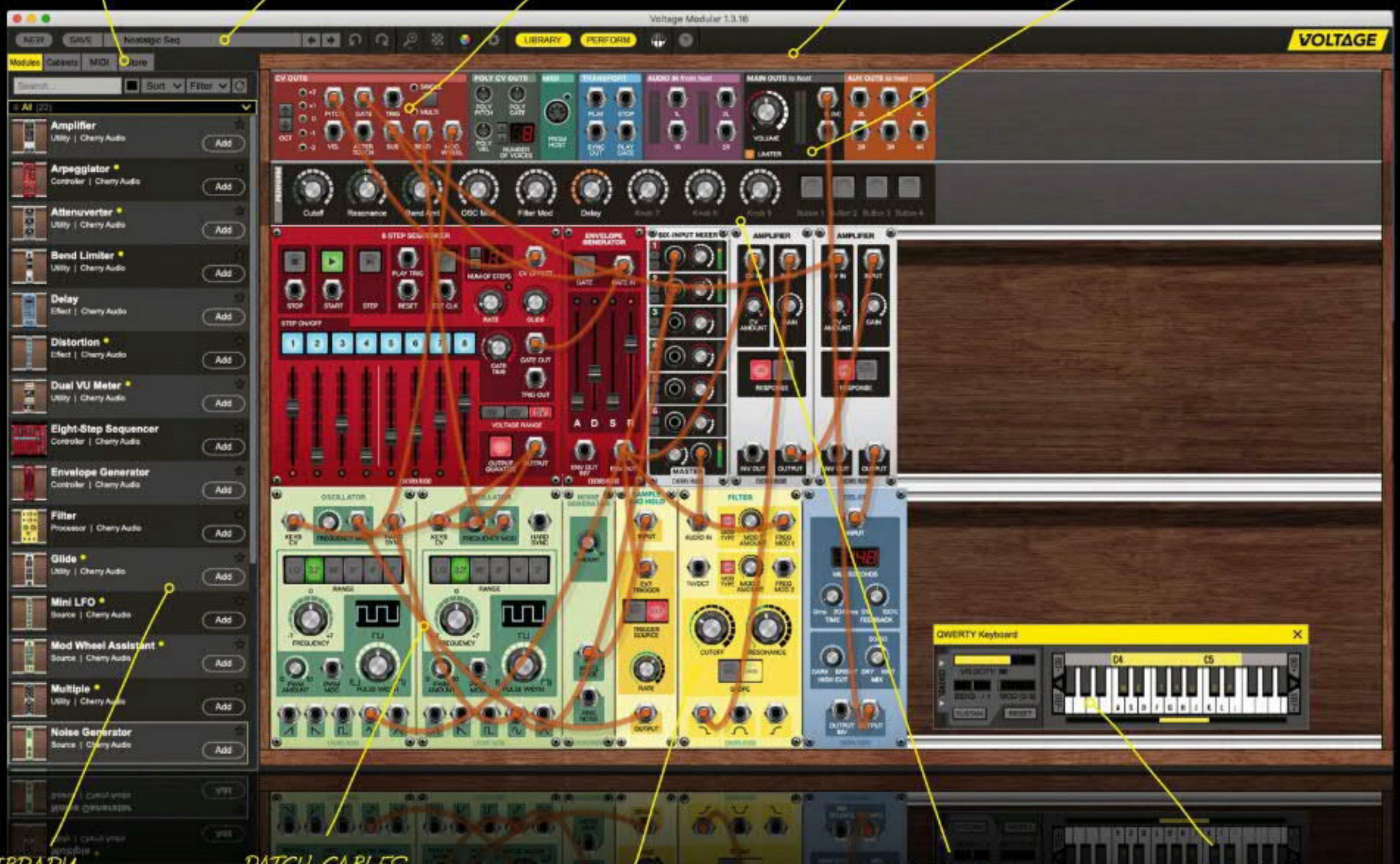
STORE
Click the Store button to access a vast number of optional add-on modules and patches.

PRESETS
Voltage Modular Nucleus is packed with heaps of original and inspiring presets to get you started

CV OUTS
Use CV – short for 'control voltage' – to route voltage signals from your external controllers and beyond

TOOLBAR
Perform functions like accessing the Library, saving patches, zooming in and out and more

MAIN OUTS
The Main Outs section of the I/O Panel offers a master volume control, built-in limiter and VU meters for monitoring your levels



LIBRARY
This scrollable, searchable browser allows access to all of the modules you own. Voltage Modular Nucleus contains a whopping 22 of them!

PATCH CABLES
A modular patch can easily become a jungle of cables. Voltage Modular Nucleus allows you to change their colour and transparency for easier viewing

MODULES
It wouldn't be a modular synthesiser without modules! Here's where you rearrange and tweak them

PERFORM
This collection of eight knobs and four buttons is freely assignable to multiple module functions for macro-style tweaking

KEYBOARD
This keyboard can be played with your mouse or triggered from your computer's QWERTY keyboard

A new look at old tech

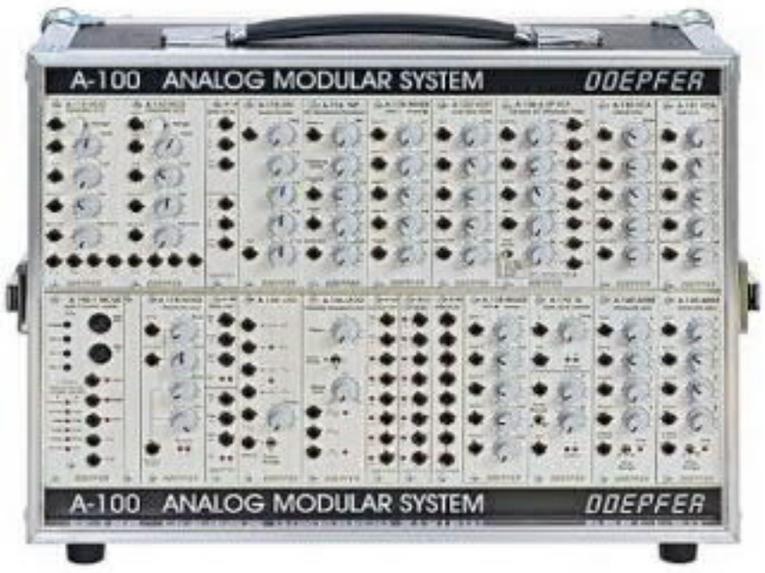
With their monolithic facades of cables and controls, modular synthesisers – both hard and soft – can look intimidating to the uninitiated. Even a modest system might contain a dozen or more modules, each one a unique device in its own right and sporting a very particular arrangement of jacks, knobs, and switches. What does one do with them all? And how on Earth do you decide how to connect all those many cables? Surely only the most educated and experienced can achieve anything recognisably musical on the things!

In actuality, it's not hard to get going, but it helps to understand the origins of modular synthesisers, simultaneously but independently developed by American inventors Dr Robert Moog and Donald Buchla.

Before Moog and Buchla, most electronic music was made with primitive electronic test equipment built for the laboratory. Electronic signal generators spat out test tones – simple sine, square, and triangle waves. In order to make anything musical with such a device, the composer would dial in the desired pitch and record the signal onto a bit of tape. The next desired note would then be dialled in and recorded onto another bit of tape, which would be cut and spliced to the first. This tedious process was repeated to create complete musical passages. Along the way, you might tweak the amplitude, use a tone control to alter the spectrum, or use multiple signal generators to add a bit of modulation or alter the timbre.

East vs West

Bob Moog – a builder of amplifiers and Theremins – came up with the idea of using a standardised voltage range to control the pitch of a signal generator, allowing it to be controlled by an organ-style keyboard. Moog also incorporated transistors (a new technology at the time) as the basis for a 4-pole resonant filter.



Dieter Doepfer's synthesiser helped revive interest in modular synthesis and birthed the Eurorack format

Alongside musician Herbert Deutsch, Moog began working on his voltage-controlled subtractive synthesiser designs, which would be presented to the public at the AES convention in New York, in 1964.

On the other side of North America, Donald Buchla had been commissioned to build an electronic music instrument for the San Francisco Tape Music Center. Unlike Moog, Buchla was not at all interested in building an instrument to produce traditional music such as could be played from a keyboard. Instead, he wanted to reduce the tedium of splicing tape, a feat he managed by means of a voltage sequencer, a prominent feature in the instrument he delivered to the Tape Center.

> "Buchla's system appealed more to experimental, avant-garde composers"

While Moog's system was designed to appeal to traditional players, Buchla's system – with exotically-named functions and an esoteric approach – appealed more to experimental, avant-garde composers.

As different as they were, they had much in common. For example, both were comprised of diverse, discreet 'modules', each fulfilling one or more functions, and both relied upon patch cables to interconnect said modules and functions to form the signal path.

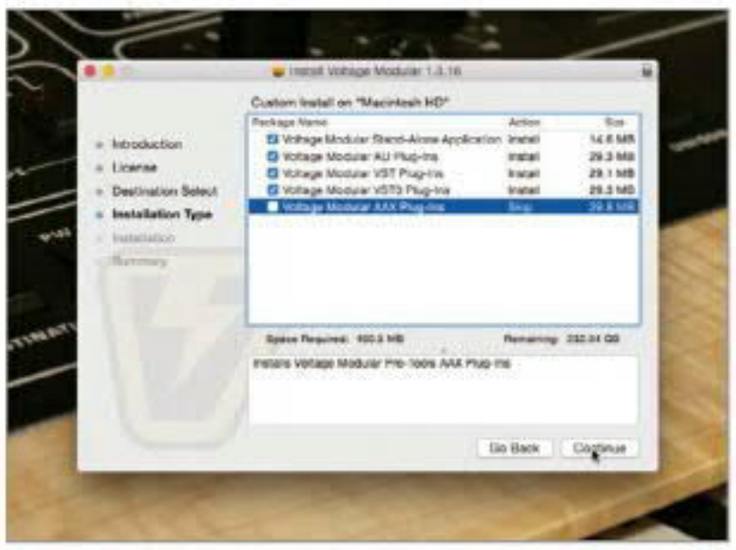
Eurorack attack

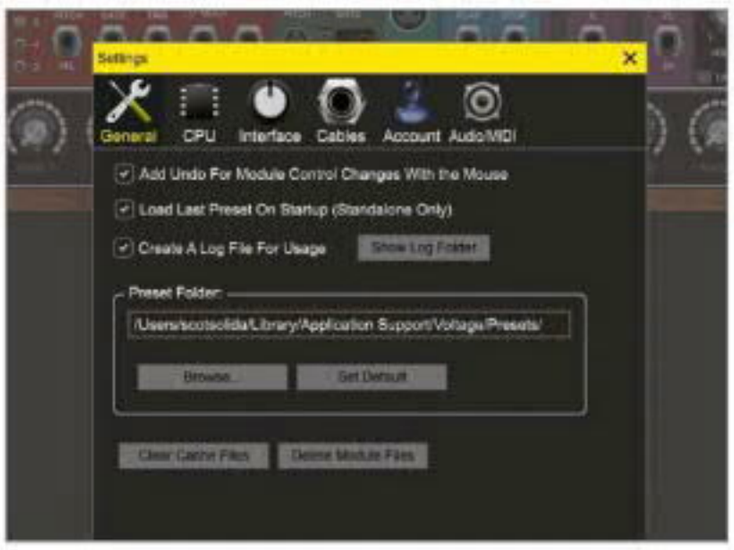
As more manufacturers joined in, other methods of interconnection were employed. ARP's 2500 used a slider-based matrix, while EMS employed a 16x16 grid into which pins were inserted to connect one bit to another. However, the patch cord prevailed, and when modular systems began to reappear in the 1990s, patch cables were the de rigueur method of shuttling signals to and fro, not least because they were the approach chosen by Dieter Doepfer when he unleashed his tiny A-100 system in 1995.

Doepfer's combination of Eurorack modules and 3.5mm jacks and connectors have become the most widely adopted modular format, with thousands of modules on offer from multiple manufacturers worldwide. Not too shabby, given that there were a mere ten modules available when the system was first issued!

Voltage Modular Nucleus follows the Eurorack aesthetic and, as such, it uses patch cables to connect between its available modules. Like Dr. Moog's system, it's easy to 'play' the instrument in a traditional manner, but Buchla fans will find that it's more than capable of producing unusual, experimental music as well. Though most analogue synthesisers are subtractive in nature, there's no rule stating that you must build your modular system to reflect this common ideal.

> Step by step 1. Getting started with Voltage Modular Nucleus





1 > Installing Voltage Modular Nucleus is done in the usual way: run the installer and follow the directions provided. You'll be asked where you want to install Voltage Modular and which variants should be installed. Choose your preferred plugin formats and follow the install procedure through to completion.

2 > One thing to understand about Voltage Modular is that the actual product installed does not include the modules in the bundle (or bundles) that you own. These are tied to your user account at Cherry Audio's website. If you've not yet activated said account, you'll need to before using the software. Upon first running it, you'll need to log in.

3 > Once you've logged into your account, Voltage Modular determines what modules you own and populates the browser on the left of the interface with all of those available to you. Before you start playing, click the gear icon at the top of the GUI to access the preferences, where you can connect to your preferred audio and MIDI interface.

Meet the modules *(part 1)*

Oscillator

The heart and soul of any analogue synthesiser, the voltage-controlled oscillator (sometimes called 'VCO') is the module that produces the various audio (and often sub-audio) waveforms – usually sine, pulse, sawtooth and/or ramp, and triangle waves. **Frequency** can be controlled via external modules. The **Pulse Width** of the pulse wave can also be modulated.

Noise Generator

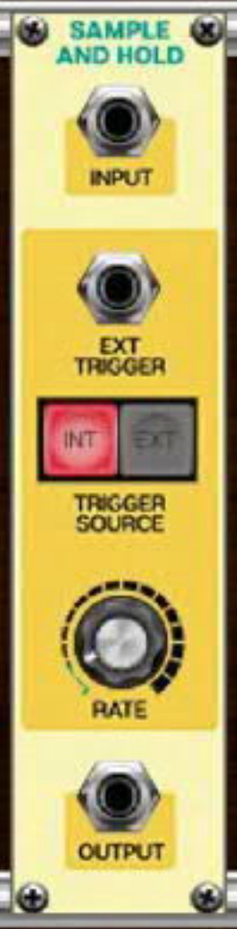
A noise generator does exactly what its name implies: it produces a noise signal. Noise, by definition, is comprised of random signals, each with equal power. The result is something like a steady 'hiss' or 'wind' sound. This Noise Generator produces two types of noise: **White** and **Pink**. Pink noise has a more muted frequency spectrum than the white variety.

Filter

A filter puts the 'subtractive' in subtractive synthesis. Its role is to filter out select frequencies from the incoming audio signal. This module offers three modes: **Low-Pass** filters out high frequencies; **High-Pass** filters out low frequencies; **Band-Pass** filters out a specified band between the two. Two 'slopes' are offered: **12dB** and **24dB**. **Resonance** emphasises the area around the cutoff frequency.

Mini LFO

Low-frequency oscillators generate sub-sonic signals that act as modulation sources. Like audio oscillators, an LFO produces different waveforms at the output – in this case, **Square** and **Triangle** waves. They can be used to produce tremolo, vibrato, and other periodic effects. The standard Oscillator module can also be used as an LFO and, in fact, offers more features than this quick 'n' easy compact option.



Sample and Hold

Like an LFO, the Sample and Hold module produces a periodic modulation source. Unlike an LFO, S&H produces a random modulation signal based on an incoming signal, most commonly a noise generator or oscillator. The period of modulation is determined by an **Int**ernal or **Ext**ernal clock signal. Sounds complex, but the effect is instantly recognisable.

Ring Modulator

One of the oldest and most identifiable electronic effects, a ring modulator multiplies a pair of incoming signals and produces the sum and difference at the output. It's an atonal effect, ideal for clangorous, metallic effects. This version offers the ability to modulate one or both of the incoming sources. If you're looking for that classic clang, this is the module for you.

Amplifier

The Amplifier (ie, VCA) is used to control the level of an incoming signal. It can be used as a passive volume control, but it can also be used to shape the level of an incoming signal over time with a modulation source such as an LFO or envelope. Two response curves are provided: **Lin**ear, for getting longer, more gradual responses; and **Expo**nential if you're wanting punchier, snappier sounds.

Envelope Generator

Used to shape a signal over time, triggered by an incoming gate signal. It'll transition through different stages: **A**ttack is how long it takes to achieve its maximum level; **D**ecay is how long it takes to fade from maximum to that set by the **S**ustain (the held or steady state); and **R**elease is how long it takes to fade from the Sustain level to silence once the gate is released.

Six Input Mixer

A six-channel mixer used to combine incoming audio or control signals. **M**ute and **S**olo buttons are available for each channel, as is a **Level** control. **Level** and **M**ute controls are also available to the Master output section at the bottom. Use this module to mix oscillators before plumbing them through a filter, or at the end of the signal chain to blend complex layers.

Arpeggiator

Yes, it's that ubiquitous source of predictable, repetitive mono patterns based on the notes of an incoming chord. The usual playback patterns of **Up**, **Down**, **Up & Down** and **Random** are provided, as is a **Hold** button to latch playback. Internal clocking is here, and external clocking is provided as well. **Oct**ave **Range** and **Gate Time** are also on offer.

Sync Divider

A modern variation on the clock divider modules found in hardware modular systems, the Sync Divider provides a means by which incoming sync signals can be divided into different beat or bar divisions, from **1/32** notes all the way up to **4 bars** in length. Triplets and dotted notes are also supported.

Eight-Step Sequencer

Initially designed to replace the tedious process of slicing and splicing snippets of tape, a sequencer provides a means by which specified voltages may be programmed to play back in sequence. Typically applied to note pitch, a gate output is provided. Sequencers may be used to control any target parameter, such as filter cutoff or amplitude level - anything, really!

Attenuverter

It might have a mouthful of a moniker, but the Attenuverter is actually a simple module. You can think of it as something of a passive level control for audio and control voltage signals. Offering three independent channels, each with a level attenuation knob and an **Inv**ersion switch, it does exactly what its portmanteau of a name suggests. Attenuverters are primarily used to dial down the levels of voltage or audio signals.

Bend Limiter

The useful Bend Limiter is used to control how a target parameter responds to signals from an incoming pitchbend wheel or joystick. Typically, a pitch wheel or joystick provides a symmetrical bi-polar signal - the maximum upward throw is the inverse of the max downward throw. The Bend Limiter module provides user-defined ranges for up and down, specified in semitones.

Glide

Once an obligatory component of the prog rock Minimoog solo, glide (aka portamento) would be revived by its inclusion on Roland's TB-303. This module gives you total control of how glide is applied, with both **Con**stant and **Lin**ear modes available, as well as a voltage input that allows external sources to switch glide in and out. This one is your sequencer's best friend.

Mod Wheel Assistant

This is similar in remit to the Bend Limiter, but intended as an intermediary stage for the signals from an incoming modulation wheel. Usually used with an LFO module, you can use it to route and control mod wheel control amount of any modulation target. You can also use its onboard LFO with some of its many waveforms.

Subverting the sequencer

There's far more to a sequencer than chugging 1/8-note passages. Consider, for example, its potential as a user-customisable step LFO. You can add a bit of glide for smoothing the values between steps.

Consider, as well, how a sequencer's voltage output might be applied to the timing of, for example, an oscillator acting as an LFO, or even that of another sequencer.

A third and very interesting application of the sequencer is as a multi-stage envelope generator. This is achieved by clever usage of the start and stop functions found on the Eight-Step Sequencer module.

A sequencer module may also be triggered to advance to the next step by a trigger or gate, meaning you can use a single series of key presses to advance through a sequence each time you press a key.

Finally, a sequencer can also be called into play as an actual oscillator by simply cranking its rate up into the audio range. In order to do this with Voltage Modular Nucleus' Eight-Step Sequencer module, just use the output of a pitched oscillator as an external clock source for the module.

Meet the modules *(part 2)*

Delay

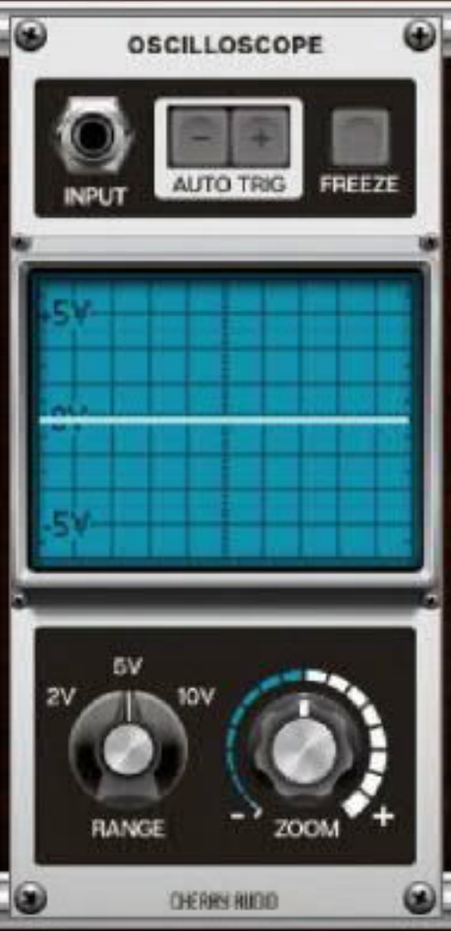
The Delay module offers a quick and easy way to add a bit of echo to your signals – especially useful for those classic Tangerine Dream-styled sequences. Delay **Time** of up to 2s is available, as is control over the **Feedback** amount. A **Dry/Wet Mix** knob controls the blend, and a **High Cut** filter allows you to roll off high frequencies for a more muted tail-out.

Distortion

It's crunch time! Voltage Modular Nucleus offers a handful of familiar effects modules, and we're pleased to see that distortion hasn't been left out. Unlike a typical fuzz pedal, this one allows you to select **Dist**ortion **Amount** as a modulation target. An **Output Level** knob provides a bit of compensation for any drastic gain changes imparted by the effect.

Spring Reverb

Reverberation is an easy way to impart a signal with atmosphere, and mechanical reverbs such as the spring-based units this module mimics were an intrinsic part of early electronic music. This one's a stereo job, with control over the reverb effect's **Decay** time, **Input** level and **Mix** of wet and dry signals. There's not a lot to play with here, but it can add a splash of vintage vibe to any patch.

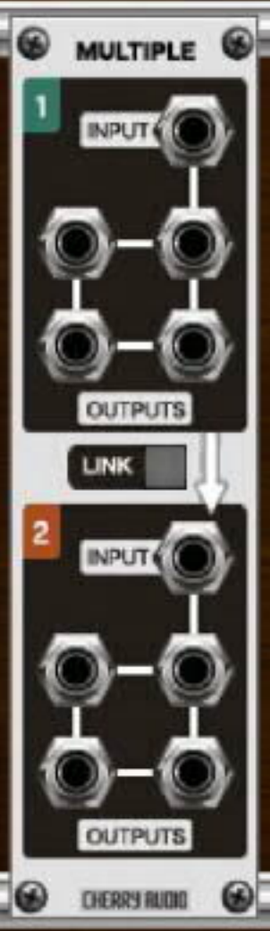


Oscilloscope

Oscilloscopes have been a favourite tool of modular synthesists ever since Keith Emerson first hauled his massive Moog system onstage with its kludged 'scope glowing eerily from the top row. This one gives you control over **Range** and **Zoom**, and there's a **Freeze** function for taking a longer look at the signals in play.

Dual VU Meter

It may not be as comprehensive a reference as the oscilloscope, but you can learn a lot at a glance with a VU Meter, especially one with the ability to track control voltage signals as well as audio signals. With two independent VU meters, this one gives users the ability to add text labels to each channel. You can also switch the **Meter Colour** between **Amb**er and **Black**.



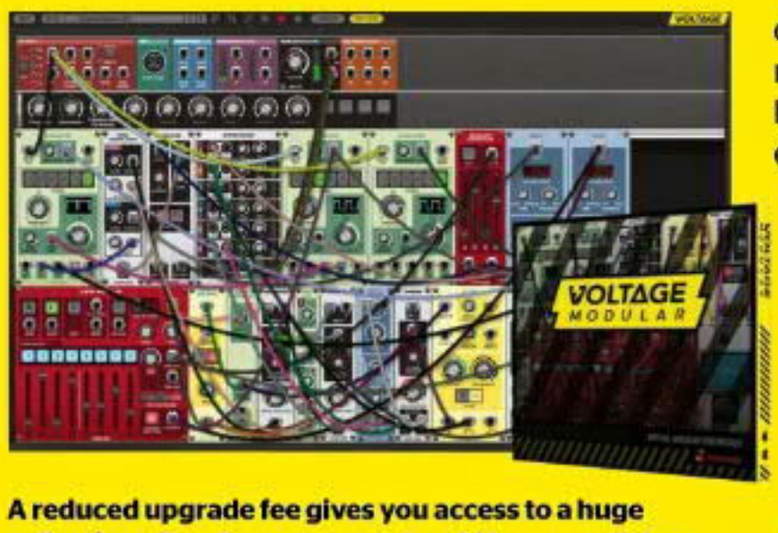
Multiple

One of the most unassuming yet crucial modules in any modular system – so much so that many hardware semimodular synths, such as ARP's 2600 and Moog's Grandmother, have them built in. The Multiple is merely a bunch of jacks wired to one another so that any signal present at one jack will be available to the rest. It's the easiest way to send one signal to a bunch of destinations and vice-versa.

Upping the ante

If you haven't already clicked that Store button and checked out the numerous items that can be added to your Library, you really should. There, you'll find a wide variety of presets, modules and bundles ranging in price from free (Dust, a SuperCollider-based noise generator from Hetrick) to $149 (legendary software developers PSP Audioware's Ultimate Modular Collection consisting of 33 custom components). Cherry Audio's own Year One Collection of 19 modules tops the list at $199 but, at the time of writing, is reduced to $99.

Also from Cherry Audio comes Core+Electro Drums, their premium bundle. Normally priced at $99, Nucleus owners (ie, you!) can take advantage of an upgrade price of $79. This killer bargain includes no less than 90 modules in addition to those found in the Nucleus package.



A reduced upgrade fee gives you access to a huge collection of cool components to add to your patches

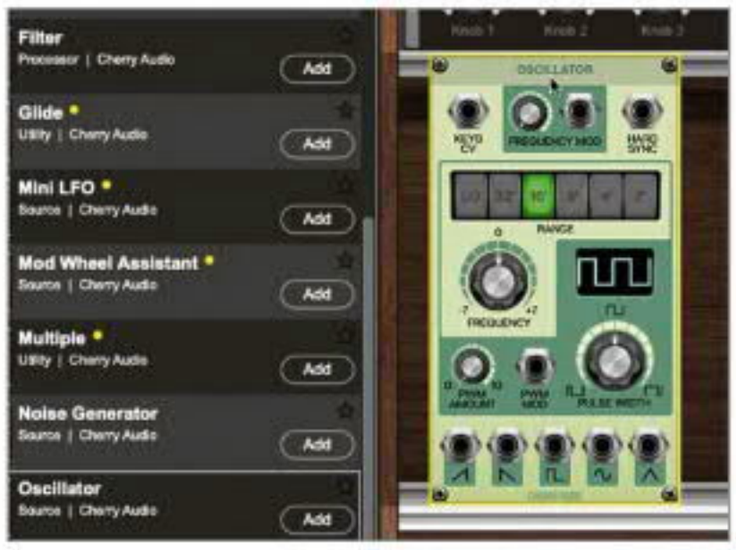
What exactly do you get with the upgrade? Well, for starters, you get Misfit Audio's Electro Drums, a bundle of 15 high-impact analogue drum modules modelled after classic analogue machines. From booming kicks and skittering hats to snappy snares and more, there's everything you'd expect and more. And to help program them, there's even a dedicated Drum Trigger Sequencer module.

To claim your exclusive discount, all you need to do is log into your Cherry Audio account and head to the Store – the upgrade price will be applied automatically when you view or purchase Core+Electro Drums.

The real meat, though, is in the Core bundle. Modules include the massive Super Envelope Generator, Super Oscillator, Super LFO and a superb Sampler module. Then there are plenty more filters, effects and utilities, alongside exotic fare like the Analogue Shift Register and Boolean Logic modules.

> Step by step 2. Crafting a virtual analogue patch from scratch

1 > In this tutorial, we'll take you through the basics of Voltage Modular Nucleus by showing you how to build a simple patch. Fire up the program and start with a blank slate. You can always start fresh by clicking the **New** button in the upper left.



2 > Look at all that empty space. You'll need something to generate a sound, so head to the **Library** on the left and scroll down until you see the **Oscillator** module. Click its **Add** button to add it to your rack. Once loaded in, you can click and drag its top header to move it around the rack.

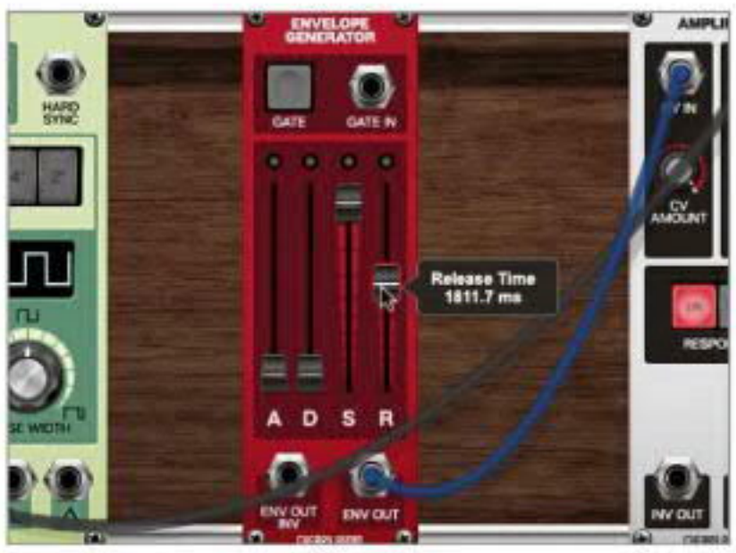
3 > Note the little star button in the upper-right of the Oscillator's entry in the Library. Clicking this adds it to your **Favourites** list. At the moment, you can't hear the oscillator. Click, hold and drag on one of its waveform outputs (we choose **Triangle**) to stretch a virtual cable up to the Main Outs module's **1L (M)** jack.

4 > You can now hear the waveform. Click and hold on either end of one of the jacks and drag the cable away to disconnect and remove it. An analogue oscillator module is always emitting a signal, and that signal is shaped by other modules. Go back to the Library, locate the **Amplifier** module and add it to your rack.

5 > Move the Amplifier rack to any position you like. Stretch a cable from the Oscillator's **Saw**tooth output to the Amplifier's **Input** jack. Next, run a cable from the Amplifier's **Output** jack up to the Main Outs' **1L(M)** port. You can now use the Amplifier's **Gain** knob to adjust the volume of the Oscillator's signal.

6 > This isn't terribly exciting. Turn the **Gain** back down to minimum. What's needed is control over that Gain knob, which is where modulation comes into play. Go back to the Library and find the **Envelope Generator**. Add it to the rack. An envelope generator outputs a control voltage signal that is used to shape a signal over time.

7 > Connect a patch cable from the Envelope Generator's **Env Out** jack to the Amplifier's **CV In** jack. Just below the CV In jack is a knob labelled **CV Amount** – make sure it's fully raised. An envelope generator needs something to kick it into action. You can click the Envelope Generator's **Gate** button to do so.

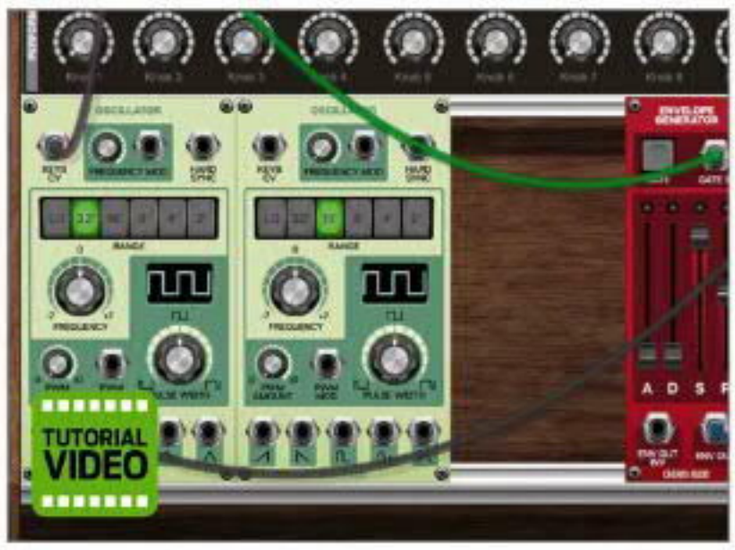


8 > At the moment, the envelope is just acting as an on/off switch – it's not being used to shape the volume in any way. Try pushing the Envelope Generator's **R** slider up halfway. Now, when you press the **Gate** button, hold it for a second before releasing it – the sawtooth tone fades out more gradually.

9 > To trigger the envelope from your MIDI keyboard, go to the **CV Outs** panel in the upper-left, then run a cable from its **Gate** jack down to the Envelope Generator's **Gate In**. Currently, pitch is constant, no matter what key you play, so plug the CV Outs panel's **Pitch** jack down to the Oscillator's **Keyb CV** jack. Now play some notes with your first modular patch!

> Step by step

3. Developing our bass patch



1 > Right now, this patch sounds a bit like a toy electronic piano, so let's beef it up. Look at the Oscillator module in your rack. See the **Range** buttons? Click the one labelled **32'**. This will reduce the pitch by a full octave – ideal for a bass sound. For an even fatter sound, add a second **Oscillator** module from the Library.

2 > Once again, route a cable from the CV Outs' **Pitch** jack to the new Oscillator's **Keyb CV** port. Note that clicking and holding on the **Pitch** jack will expand it into a multi-jack so that you can connect multiple cables to it. This applies across the system, reducing the need for an excessive number of **Multiple** modules.

3 > The first Oscillator is the only one audible at the moment. To add the second into the patch, you could use the feature described in the previous step, but that would offer no control over the relative levels of the oscillators – a mixer is needed for this. Find the **Six-Input Mixer** in the Library and add it to your rack.

4 > Disconnect the patch cable running from the first Oscillator module's **Saw**tooth output to the Amplifier's **Input**. Route that same Sawtooth output to the first (**1**) channel of the Mixer. After that, plug the second Oscillator module's **Square** waveform output into channel **2** of the Mixer.

5 > As you've probably guessed, you now need to patch the Mixer's **Master** output into the Amplifier's **Input**. Play a note or two from your keyboard controller: you should hear both oscillators. It's all a bit loud, so adjust the levels of Mixer channels 1 and 2, so the first sawtooth tone is a little bit more prominent than the second square.

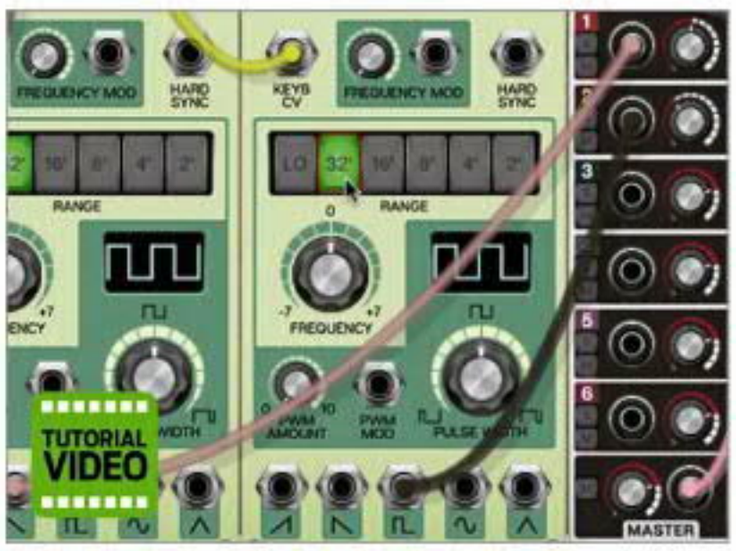
6 > The sound is nice and thick. Time to add a filter – hunt down the **Filter** module in your Library and add it to the rack. Disconnect the Mixer's **Master** output from the Amplifier and connect it to the Filter's **Audio In** jack instead.

7 > You'll need the Filter's **Low-Pass** mode, so run a cable from its bottom-left output into the Amplifier's **Input** jack. You won't hear any change to the sound, because the Filter's **Cutoff** knob is fully open. Twist this knob while holding a MIDI note to hear it doing its thing. Once done, set it to around **1000Hz**.

8 > The sound needs some motion, and that means adding another **Envelope Generator** module. Again, patch a cable from the CV Outs' **Gate** jack into the new Envelope Generator's **Gate In**, then run another cable from the new Envelope Generator's **Env Out** to the Filter's top **Freq Mod** jack.

9 > Turn the Filter's **Mod 1 Amount** knob up nearly halfway. Cutoff is now being modulated by the new Envelope Generator. Set the envelope's **R**elease to about halfway, the **S**ustain slider to about **30%**, and **D**ecay to around **115ms**. This will quickly reduce the Cutoff frequency to the steady state, or sustained level.

> Step by step 4. Fattening up our bass sound



1 > The synth-savvy among you will notice that this patch bears a strong resemblance to the sort created by famous bass synths. Let's emphasise the bass by flipping the second Oscillator's **Range** to **32'**.

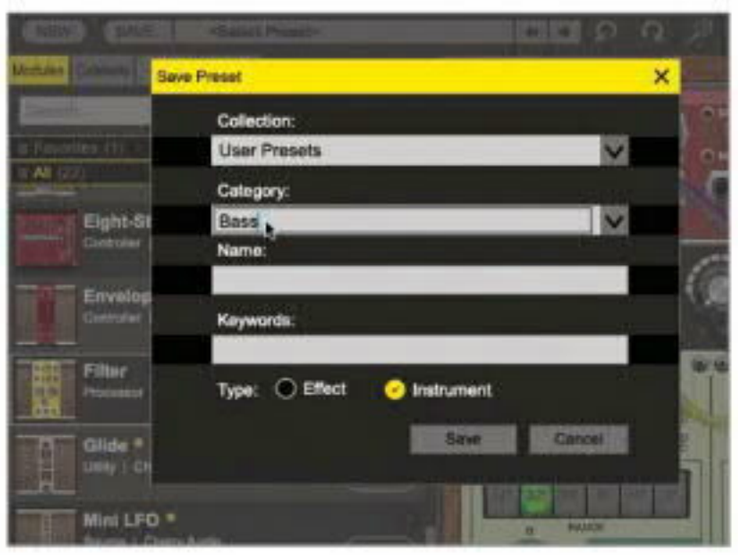
2 > For a fat, Minimoog-style bass, let's add a third Oscillator module. Go ahead and route its **Saw**tooth output into the Mixer module's Input **3**, then set **Level** to about **12 o'clock**. Flip this Oscillator's **Range** to **32'**, and route the CV Outs' **Pitch** into its **Keyb CV** jack, as you did with the other oscillators.

3 > Reduce the first Oscillator's **Frequency** to **-0.10**, and increase the third Oscillator's **Frequency** to **+0.10**. This detuning causes them to gently 'beat' against each other. This is a common way to achieve a thicker, fatter tone. Have a play from your MIDI keyboard controller to hear it in action.

4 > It's time to add a dollop of squelch. Head to that that lovely 24dB Filter, find the **Resonance** knob and push it up to **34%** or so. You'll lose a bit of gain, but you can compensate for that by increasing the Main Outs' **Volume** knob. Finally, go to the Envelope Generator controlling the Filter's Cutoff and reduce its **S**ustain level.

> Step by step 5. Saving a Voltage Modular preset

1 > If you've been following along thus far, you'll likely want to keep your new bass patch. Do this by going up to the top-left corner of the GUI and clicking the **Save** button.



2 > Alternatively, use the **Ctrl/Cmd-S** keyboard shortcut to open the **Save Preset** window, offering a number of options. Choose which Collection you'd like your preset to be stored in. In this case, you might choose **User Presets**. You can also choose or create a category, such as **Bass**, shown here.

3 > Give your new patch a suitable name. Keywords may also be entered, to help you search for the sound later. Finally, select whether the sound is an Effect patch (more on these later) or an Instrument patch. Once done, click **Save** to commit the preset to memory.

Patches versus presets

A slightly different mindset is required when working with a modular synthesiser, especially when it comes to the concept of patches. You've doubtlessly seen the term 'patch' applied to the various preset sounds that come with a fixed-signal-path instrument. This term was carried over from modular synthesisers when manufacturers began making hardwired instruments. The diagrams used to document a sound were often called 'patch sheets'. This usage of the term was reinforced when micro-processor-based instruments that allowed users to save sounds came along (starting with Sequential Circuits' Prophet-5).

In a virtual modular synthesiser such as Voltage Modular Nucleus, when you save a patch, along with all of its parameter settings, you're also saving a preset made with that specific patch. It's in your best interest to differentiate the two. Consider each patch as a complete synthesiser in its own right, capable of producing a wide variety of timbres without ever changing the cable routing. We urge you to give each patch the attention it deserves by exploring all of the different sounds it can generate.

> Step by step 6. Modular sequencing

1 > Sequencing has been an intrinsic element of modular synthesis from the very beginning. Voltage Modular Nucleus has everything you need to create classic sequencer patches, and we'll show you how to do it. Our previous tutorials used the standalone version of Nucleus, but this time, open the plugin instance in your DAW.

2 > Expand the plugin's interface by dragging its lower-right corner. The Library isn't the only way to add a module. Right-click an empty section of the rack, choose **Add Module** from the pop-up menu, then find the **Eight-Step Sequencer** in the **Controller** sub-menu.

3 > You need a signal to sequence, so add an **Oscillator**. One will do for now. While you're at it, add a **Filter**, a pair of **Envelope Generators**, and an **Amplifier** – in other words, a basic synth voice. You can copy the layout shown here. Patch the Oscillator's **Square** out into the FIlter, and route the Filter's **Low Pass** output to the Amplifier's **Input**.

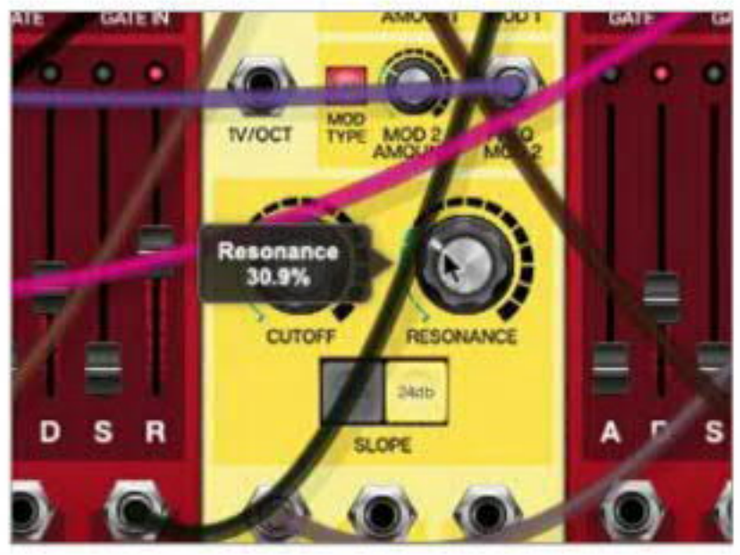
4 > Add a **Delay** module, route the Amplifier's **Output** into the Delay's **Input** and then pipe the Delay's **Output** to the Main Outs' **1L(M)**. As in our previous tutorial, route one of the Envelope Generators' **Env Out** to the Amplifier's **CV In**, and the other Envelope's **Env Out** to the Filter's **Freq Mod 1** input.

5 > We've intentionally left out keyboard control, as we'll be using the Sequencer to control our pitch and gates. Go to the Sequencer, find its **Gate Out** jack and run cables from that to the Envelope Generators' **Gate In** ports. Click the Sequencer's **Start** button: playback now triggers the Envelopes.

6 > Click the Sequencer's **Stop** button. Next, find the Sequencer's Output (lower-right corner) and pipe that signal into the Oscillator's **Keyb CV** input. Note that the Sequencer's **Output Quantize** button is engaged. This forces each step of the sequence to the nearest note value. When programming musical passages, leave this on to lock steps to semitones.

7 > The Sequencer has a row of eight sliders, each with an illuminated button above it. The buttons are used to determine if a step sends a gate to the Gate Out, while the sliders are used to adjust the 'voltages' sent to the Sequencer's main Output. Go ahead and alter the sliders' values to create a riff.

8 > The sound obviously needs some work. Reduce the Amp Envelope's **D**ecay and **R**elease to around **330ms**. Turn **S**ustain all the way down. Reduce the Filter's **Cutoff** to around **37Hz**. Set its **Mod 1 Amount** to **130%** or so. Over to the Envelope controlling the filter: kill **S**ustain, set **D**ecay to around **500ms** or so, and **R**elease to roughly **1000ms**.



9 > For more motion, you can call up the **Mini LFO** module. Find it and add it to the rack. Route its topmost **Triangle** wave output to the Filter's **Freq Mod 2** jack, and set **Mod 2 Amount** to about **60%**. We want the LFO to modulate very slowly, so reduce the Mini LFO's **Rate 1** knob to around **0.34Hz**. Finally, nudge the Filter's **Resonance** up to **30%** or so.

> Step by step

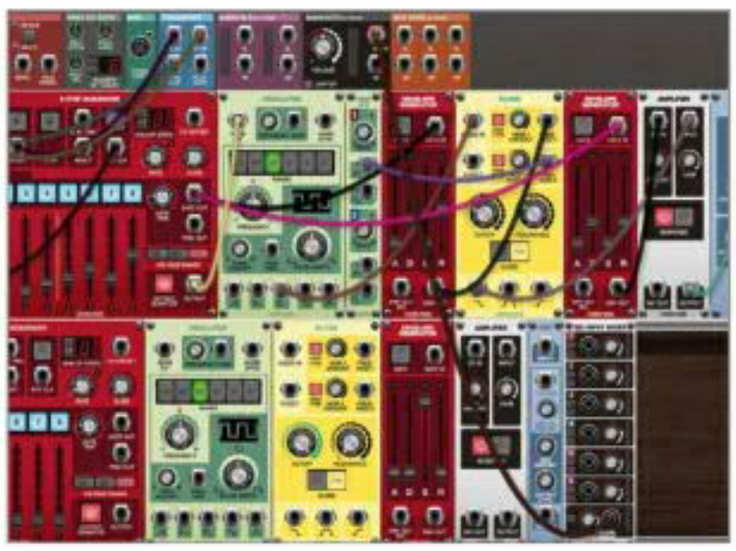
7. Modular sequencing, part 2 – drums and sync

1 > Let's pick up where we left off by diving deeper into Voltage Modular Nucleus' Sequencer module. Though we're using Voltage Modular in a DAW here, the instrument is running to its own internal clock. Make sure the Sequencer module's **Rate** knob is set to **60bpm**.

2 > You can also sync the Sequencer to your host. Go to your Library and add the **Sync Divider** module to the rack. Next, go to the top Transport panel and run a cable from the **Sync Out** jack to the Sync Divider's **Sync In** jack. Now run a cable from the Sync Divider's **Clock Out** to the Sequencer's **Ext Clk** input.

3 > This connects your DAW's transport to the Sequencer by way of the Sync Divider, which is used to determine the beat divisions used by the Sequencer module. Click the Sequencer's **Ext Clk** button to engage external sync. Run a patch cable from the Transport panel's **Play** jack down to the Sequencer module's **Start** input.

4 > As you've probably guessed, we'll need to control the Sequencer module's **Stop** function, too. We'll do that by going to the Transport panel and patch its **Stop** output jack to the Sequencer module's **Stop** input. Give it a try. Your DAW is likely playing at a much higher BPM – set it to **120**. Now use the Sync Divider's **Note Value** switch to select **1/8**.

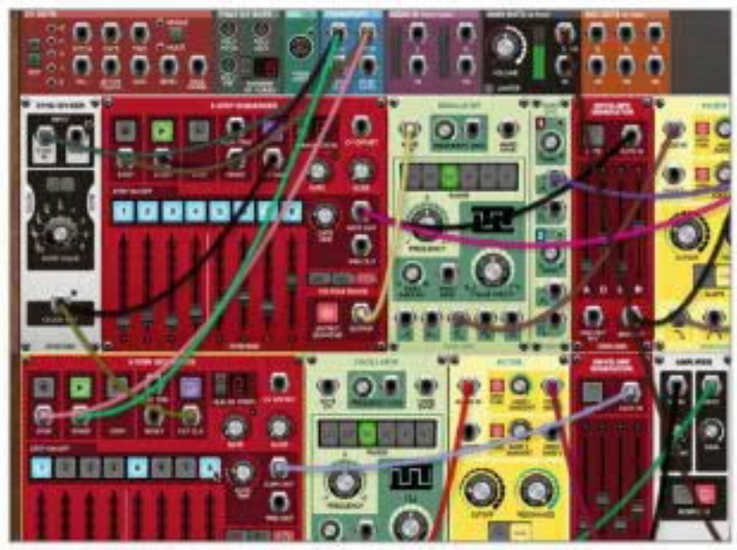


5 > Let's elaborate a little. Add another **Eight-Step Sequencer** module, an **Oscillator**, **Filter**, **Envelope Generator**, **Amplifier**, **Distortion**, and a **Six-Input Mixer**. Disconnect the Delay's **Output** from **Main Outs 1L(M)** and send the Mixer's **Master** output to the **Main Outs 1L(M)** jack instead.

6 > Route the Delay's **Output** to the Mixer's first channel, and the Distortion's **Output** to its second channel. Pipe the second Amplifier's **Output** into the Distortion's **Input**. Funnel the Oscillator's **Sine** output to the second Filter's **Audio In** and send that Filter's **Low Pass** output to the new Amplifier's **Input**.

7 > Send the new Envelope's **Env Out** to the second Filter's **Freq Mod 1** input, as well as the second Amplifier's **CV In**. If you haven't guessed, this is a completely separate new patch. Now route the new Sequencer's **Gate Out** to the new Envelope's **Gate** input. Start the second Sequencer. Use its **Step On/Off** buttons to activate only steps **1** and **5**.

8 > Reduce the second Filter's **Cutoff** to around **35Hz**, and crank its **Resonance** to full. Set the **Mod 1 Amount** to **175%** or so. Now, go to Envelope 3 and kill the **S**ustain. Set its **D**ecay to around **366ms**, and **R**elease to about **100ms**. Set Amplifier 2's **Response** to **Expo** for more snap, and you have a synthetic kick drum.



9 > Finally, connect the second Sequencer to the **Transport** and **Sync Divider** in the same way that you did with the first Sequencer, so they're both synchronised to each other and your DAW. Fine-tune the patches, tweak the Delay's time and add and remove steps to your patterns.

> Step by step 8. Synthesising a classic lead patch

1 > So far, we've looked at creating basses, sequences, and even a kick drum – ie, everything you need to construct a modular backing track. The next step, then, should be obvious: a classic expressive lead sound, because sometimes you just want to play. You'll need a keyboard controller to get the most out of this one. Start a new patch.

2 > Only the Favorites Library is visible at this point. To access the rest, go down to the lower-left and click **All**. Obviously, some **Oscillators** will be needed, so go ahead and add three of them to your rack. Route your CV Out's **Pitch** output to all three Oscillators' **Keyb CV** inputs.

3 > Next, you'll need a Six-Input **Mixer**. Route the Square wave outputs of all three Oscillators into the first three Mixer channels. You'll need a **Filter** module, of course, but while you're at it, add a **Distortion** module between the Mixer and the Filter. Route the Mixer's **Master Out** into the Distortion's **In** and the Distortion's **Out** to the Filter's **Audio In**.

4 > Add two **Envelope Generators** and an **Amplifier**. Patch the first Envelope's **Env Out** to the Filter's **Freq Mod 1** jack, and the second's **Env Out** to the Amp's **CV In**. Route the Filter's **Low-Pass Out** to the Amplifier's **In**. Add a Delay and send the Amplifier's **Out** to its **In**. Send the Delay's Out to the **Mains Out**.

5 > Send a **Gate** signal from the **CV Out** panel to the Envelopes. Before playing, set each Mixer channel's level to **-10dB** and the Distortion's **Dist Amount** to **10%** or less. Just a little grit! Nudge the Amp Envelope's **Release**. Set Envelope 1's **Decay** and **Sustain** to just under half, and push its **Release** way up.

6 > Reduce the Filter's **Cutoff** to around **300Hz**. Push its **Mod 1 Amount** to **130%** or so. Set Oscillator 3's **Range** to **8'**. Set Oscillator 1's **Frequency** to **-0.10** and Oscillator 2's to **0.10**. Have a play. That's a nice, brassy lead sound! Give the Filter **Resonance** a little nudge. Nice!

> Step by step 9. Adding expression to our lead

1 > We've got a nice lead sound going, but it's missing a crucial (and often overused) element: portamento. Grab a **Glide** module from the Library and stick it into the rack to the left of the Oscillators. Now, disconnect each Oscillator's **Keyb In** from the CV Outs' **Pitch** and route the CV Outs' **Pitch** into the Glide's **Input**.

2 > Now, route the Glide's **Output** into each Oscillator's **Keyb In**. Push the Glide's **Amount** up to around **130ms**. Play some notes an octave apart and hear how the pitch gradually glides from one note to the next. That's a classic, and no mistake. Let's go further by adding a **Mod Wheel Assistant** module.

3 > Find the **Mod Wheel** output in the **CV Outs** module and patch it to the Mod Wheel Assistant's **Mod Wheel In** jack. Send the Mod Wheel Assistant's **Output** to the Filter's **Freq Mod 2** jack, and crank its **Mod 2 Amount**. Back in the Mod Wheel Assistant, set the **Frequency** to **9.0** or so. Hold a note and push up your mod wheel.

> Step by step 10. Designing a modular drone

1 > As you've learned, an oscillator module is always 'on', endlessly emitting its waveforms and awaiting your intervention. This makes modular synths ideal for creating drone music. Start with a new patch, and add a **Six-Input Mixer** module to the rack. Drag it to the right and add a pair of **Oscillators**.

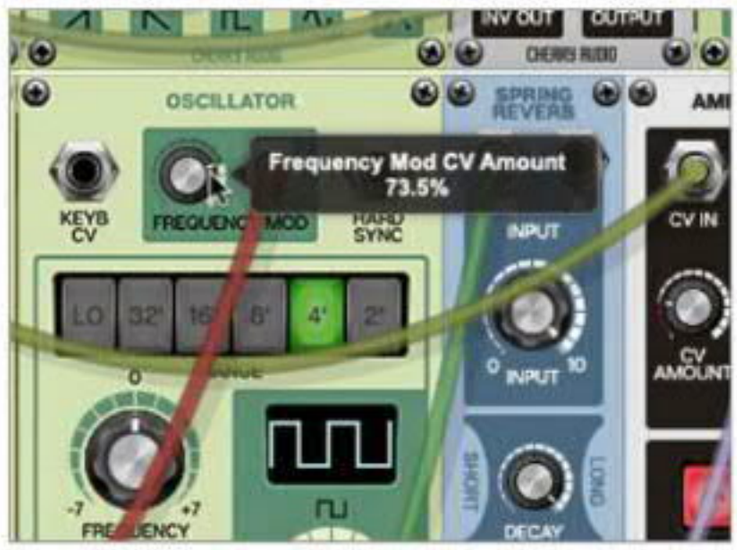
2 > Connect the **Triangle** outputs from each Oscillator to Mixer channels **1** and **2**, respectively. Now, add a **Delay** module and patch the Mixer's **Master Out** into the Delay's **Input**. Patch the Delay's **Output** into the **Main Outs' 1L(M)** jack. You should hear a slightly phased sound. You might need to adjust the Mixer levels.

3 > Set the **Range** of one of the Oscillator modules to **32'**. It's time to start adding some motion. Go to your Library and find the **Mini LFO** module. Add it to the rack and place it to the left of the first Oscillator. Next, add a pair of **Amplifier** modules. Drag each one to the right of an Oscillator module, as shown here.

4 > Run a cable from the top LFO's **Triangle** out to the left-most Amplifier's **Input**. Run a cable from that Amplifier's Input to the left-most Oscillator's **Frequency Mod** jack. Repeat with the Mini LFO's lower **Triangle** output, this time routing it to the right-most Amp's **Input**, and send that Amp's **Output** to the second Oscillator's **Frequency Mod**.

5 > Crank both Oscillators' **Frequency Mod** knobs fully clockwise. Add another **Mini LFO** module. Run a cable from its topmost **Triangle** out to the **CV In** of the left Amplifier. Set the Amplifier's **CV Amount** to around **50%**. Now, go to the top section of the first Mini LFO and set its **Rate** to under **0.20Hz**. Set the second Mini LFO's topmost **Rate** to **0.02Hz**.

6 > Now, add a third Oscillator and set its **Range** to **Lo**. Route its **Sine** out to the second Amplifier's **CV In**. It should behave similarly to the Mini LFO. Adjust the third Oscillator's **Frequency** to taste. Finally, route the second Mini LFO's **Triangle** out to the third Oscillator's **Frequency Mod**.



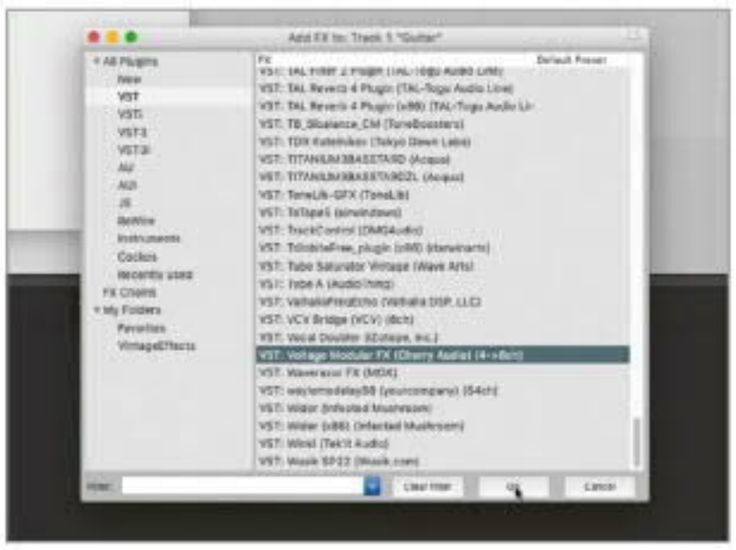
7 > Adjust the various parameters to your liking. The trick is to generate slow and subtle movements. It might be a good idea to tidy up your rack, making room in the bottom row, as you're about to add an entirely new signal path. Go ahead and drop another Oscillator into the bottom row. Leave its **Range** set to **4'**.

8 > Add a **Spring Reverb** module, and send the new Oscillator's **Square** wave into its **L(M)** input. Next push the Reverb's **Decay** and **Mix** nearly to full. Add an **Amplifier** and route the Spring Reverb through it, then route the Amplifier into Mixer channel 3. Use yet another **Mini LFO** to modulate the new Amplifier as you did the others, but keep the Amplifier's **CV Amount** low.

9 > You can leave your most recent Mini LFO's **Rate 1** (the top one) set as is. However, crank its bottom most Rate way, way down, and route the lower Triangle wave to the latest Oscillator's **Frequency Mod** input, adjusting the **Frequency Mod** knob to about **75%** or so. This is just a start - keep adding to and experimenting with your drone patch!

> Step by step 11. Using Voltage Modular as an effects processor

1 > If you've made it this far, you can consider yourself a bona fide modular synthesist! As a reward, we'll let you in on one of the less obvious features of modular synthesisers: they make great effects processors! Start by opening your DAW and importing the **Guitar.wav** file into an audio track.



2 > Set your project tempo to **120bpm**, and your DAW's transport to play the clip back in a three-bar loop. Now, open Voltage Modular Nucleus as an effects plugin on an insert on the audio track onto which you've put the clip.

3 > If you engage your DAW's transport, you should see the audio signal's levels reflected on Nucleus' **Audio In** meters in the top panel. If you don't, retrace your steps to see what went wrong. Once you're confident that all is as it should be, we can begin building an effects processing patch. We'll start with an **Amplifier** module.

4 > Route a patch cable from the **Audio In**'s **1L** jack to your Filter's **Audio In** jack, then run a cable from the Filter's **Band-Pass Out** up to the Main Outs' **1L(M) Input**. If your DAW is still playing, you might not actually hear much of anything until you set the Filter's **Cutoff** knob to around the halfway mark.

5 > Push the Filter's **Resonance** up to around **26%** or so. Not bad, but it could use a little motion. Add a **Mini LFO** module to your rack. Run a patch cable from the top **Triangle** wave output to the Filter's **Freq Mod 1 Input**. Give the Filter's **Mod 1 Amount** a push – a value of around **25%** should do. Set the Mini LFO's **Rate 1** to **6.00Hz**. Nice.

6 > That's a neat effect, but it only hints at Voltage Modular Nucleus' capabilities. Let's ditch the LFO by selecting it and deleting it (use the **Delete** key on your QWERTY keyboard, or right-click on the module and choose **Remove** from the menu of available options). Let's go for the **Eight-Step Sequencer**.

7 > As we did in our previous tutorial on sequencing, we'll also use a **Sync Divider** module. Set up your Sequencer and Sync Divider so that they sync to the DAW's transport as we showed you before. If you've not followed along with that tutorial, go back and give it a go now. This time, however, leave the Sync Divider's **Note Value** set to **1/16**.

8 > Grab an **Amplifier** module and route it between the Filter's **Band-Pass Output** and the Main Outs' **1L(M)**, replacing the current connection. Insert an **Envelope Generator** before the Amplifier, route the Sequencer's **Gate Out** to the Envelope's **Gate In** jack, and send the Envelope's **Env Out** to – you guessed it – the Amplifier's **CV In**. You're getting good at this!

9 > Engage your DAW's transport to hear a sort of tremolo effect as the Envelope Generator is triggered by the Sequencer. That's not the end, though! The next step is to route the Sequencer's **Ouput** to the FIlter's **Freq Mod 1** input. Set the Filter's **Mod 1 Amount** to about halfway, and the **Cutoff** to **380Hz**, then have a play with the Sequencer's sliders and buttons!

Patching pointers

PRESET PARADE

As we pointed out many (many!) pages back, Cherry Audio have provided a massive collection of custom presets suitable for all styles of music. There are even more available for purchase (and for free) in the Cherry Audio store. You can buy them right from within the program itself. Some of the patches are basic, while others are exercises in complexity. They also serve as terrific examples of what can be done even with a modest collection of modules. Don't just play the presets, study the patches! Take a hard look at what modules have been put into play and how they are patched together.

Presets aren't just for playing – they can also serve as a resource of knowledge for the intrepid sonic explorer!

THE SINCEREST FORM OF FLATTERY

As we've discussed, the first fixed-signal path synths resemble a single modular patch. If you want, say, a Minimoog, all you need do is call up a trio of oscillators, noise generator, 24dB filter, mixer, envelopes and an amplifier, and patch them together in the order described by the original. As a matter of fact, recreating the functionality and signal routings of classic instruments is one of the best ways to learn how to use your modular system, so go on, build your own collection of classic synths!

THE SINCEREST FORM OF FLATTERY, REDUX

Of course, mastery over a craft isn't just about collecting (or creating) the right tools for the job – one must then master their use. Every

Use a modular instrument to recreate fixed-signal path synths

painter learns to imitate the masters by mixing the right pigments and mediums, but the real adventure begins when you start laying paint to canvas. This is the same for synthesis. Once you've created your palette and collected your brushes, you'll need to start working on your tone colours. You too can imitate the masters by trying to recreate the sounds used by your favourite artists. Whether you're into Emerson or Autechre, it's one of the best ways to learn!

TAKE A DIFFERENT ROUTE

We've already suggested looking to that unobtainable dream synth for inspiration, but you shouldn't overlook the many, many modular synths on the market. Many manufacturers of such synths (Synthesizers.com comes to mind) provide patch examples on their websites to help you use the instruments they sell – but there's no reason you can't cobble together those patches using the Voltage Modular Nucleus. If you don't have access to the exact same modules, all the better – it just means that you'll put your own special spin on the patch in question. Don't beat yourself up if it doesn't sound the same – it might still be useful with a tweak or two.

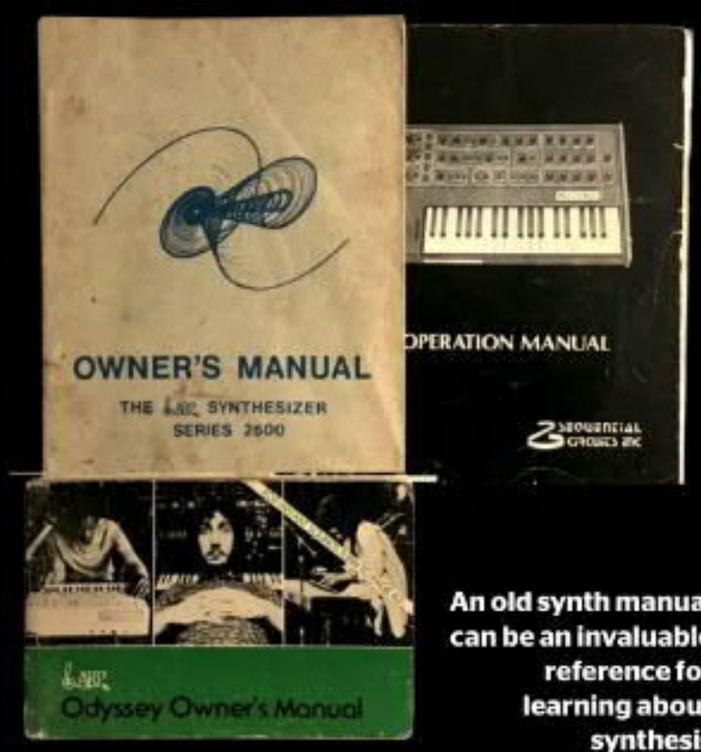
THE CALL OF NATURE

Once you've thoroughly dissected your favourite synthesiser, electronic artist or preset patch, it can behoove you to look beyond the obvious sources of inspiration. The sounds of the natural world provided some of the first sources of inspiration for pioneering electronic artists. It's easy enough to make a synth bass, but how close can you come to a human voice? What modules would you use to imitate water dripping into a pool in a darkened cave? How about the call of a crow and the rustle of leaves in the trees? If you can evoke these sounds with an analogue synth, you will have achieved true modular mastery.

BOOK SMART

In the past, would-be synth wizards had few options when it came to gathering information about their chosen instruments. If you were lucky, the manual for the instrument might contain a few example patches. The Minimoog's manual had quite a few, as did those for both ARP's 2600 and Odyssey. In fact ARP's manuals became something of a how-to guide for synthesists just starting out. One of the best sets of patch examples could be found in the manual for Sequential Circuits Prophet-5, though, as it charted all of the necessary parameter settings used to create the many factory presets.

Today, manuals such as these can be found online at sites such as archive.org/details/synthmanuals. We encourage you to seek them out and apply their contents to your own modular ministrations.



An old synth manual can be an invaluable reference for learning about synthesis

Three modular masterpieces to check out

Morton Subotnick, *Silver Apples of the Moon* (1967)

The first piece of electronic music to be commissioned by a record label (Nonesuch Records). Subotnick and Ramon Sender had started the legendary San Francisco Tape Music Center in 1961, and secured a $500 grant from the Rockefeller Foundation to enlist Donald Buchla to create a modular electronic instrument. The keyboardless Buchla 100 was used to create the unusual tones of Subotnick's most famous recording. A sometimes difficult, but ultimately rewarding record.

Wendy Carlos, *Switched-On Bach* (1968)

This chart-topping album introduced the world at large to the synthesiser and genuinely popularised electronic music. A far cry from the atonal bleeps and bloops of academic electronic music, Carlos' masterful patching and painstakingly multi-tracked renditions of well-known classical pieces demonstrated to the general public that electronic music could be, well, musical. After *Switched-On Bach*, the name Moog became synonymous with the word 'synthesiser'.

Isao Tomita, *Snowflakes Are Dancing* (1974)

The success of *Switched-On Bach* ensured a slew of exploitative 'switched-on' releases, most of which are forgettable at best. Isao Tomita's Moog-based collection of Claude Debussy's tone poems are a notable exception. Where Carlos had created accessible patches to indoctrinate listeners unfamiliar with electronic tones, Tomita took a joyously creative approach with sounds that were utterly unlike those of classical instrumentation. The result is a tour-de-force of modular synthesis.

> Step by step 12. Patching together an ambient pad

1 > In this tutorial, we'll take you deep into analogue ambience by creating a motion-filled atmospheric pad. We're going to assume you've followed our other Voltage Modular Nucleus tutorials, and have a basic understanding of how the instrument works. If not, go back and give them a look, then come back and fire up a new patch.

2 > To begin, add a pair of **Oscillator** modules. These will provide the main body of a layered sound. Patch the **CV Outs' Pitch** into each Oscillator's **Keyb CV Inputs** for keyboard control. Next, add a pair of **Envelope Generators** and patch the CV Outs' **Gate** jack to each Envelope Generator's **Gate In**.

3 > You will, of course, need an **Amplifier**, so put one in and route one of the Envelope Generators' **Env Out**s to its **CV In**. Next, add a **Mixer** and a **Filter**. Patch one of the Oscillators' **Sawtooth** outputs into one Mixer channel, and the other Oscillator's **Square** wave into another channel. Send the Mixer's **Master output** into the Filter.

4 > Send the Filter's **Low Pass** output to the Amplifier's **Input**. Add another **Mixer**. Send the Amp's **Output** to a Mixer channel. Now, add a **Delay** and route the Mixer into it, then send the Delay's **Output** to the Mains Out **1L(M)** jack. Set the **Range** of the Oscillator producing the sawtooth wave to **32'** and adjust the Mixer input levels to a comfortable level.

5 > Attach the **Env Out** of the unused Envelope Generator to the Filter's **Freq Mod 1** jack. Set the Filter's **Cutoff** to around **280Hz** and **Resonance** to about **70%**. Increase the Filter's **Mod 1 Amount** to **85%**. Set the Filter Envelope's **Attack** to about **800ms**, **Decay** and **Release** all the way up, and **Sustain** all the way down. Increase the Amp Envelope **Release**.

6 > Now, add an **Oscillator**, **Filter**, **Amplifier**, and **Envelope Generator**. Send the Oscillator's **Square** out to the Filter's **Input**. Send the Filter's **High-Pass** to the Amp's **Input**. CV Outs' **Gate** goes to the Envelope's **Gate**, and the Envelope's **Env Out** goes to the Amplifier's **CV In**. The Amplifier's **Output** goes to channel 2 on your second Mixer.

7 > Attach the newest Oscillator's **Keyb CV** to the CV Outs' **Pitch**. Set the Oscillator's **Range** to **8'**. The Filter **Cutoff** should be about **15,000Hz**, and **Resonance** about **70%**. Now, set the Envelope's **Attack** to **4000ms**, **Decay** and **Release** all the way up, and **Sustain** fully down. Add a **Noise Generator** and a **Sample And Hold** module.

8 > Run patch cables from the Noise Generator's **White Noise** output to the Sample And Hold's **Input**, and the Sample And Hold's **Ouput** to the Filter's **Freq Mod 1** input. Set the Filter's **Mod 1 Amount** to about **100%**. The Sample And Hold now modulates the filcutoff. You'll probably want to decrease this layer's level in your second Mixer.

9 > Add another Oscillator with its **Range** set to **32'**. Route its **Pulse** wave output to the Sample And Hold's **Ext Trigger** input, and set the **Trigger Source** to **Ext**. This will allow the new Oscillator to control its rate. To modulate that rate, route the Envelope Generator's **Env Out Inv** to the Oscillator's **Frequency Mod** input and crank up the amount.

More tips, tricks and suggestions

RATCHET UP YOUR DRUMS

You'll find a nifty sequencer-based sound called 'CM Ratchet' among the many exclusive preset patches we've created for you. This patch makes use of multiple sequencers that – for the most part – play a typical Berlin School pattern. However, every few bars, there's a skittering burst of rapid-fire notes – an old-school method to add interest to long-winded cosmic jams. You can use the same technique to add occasional drum fills to your sequencer-driven modular beats.

DUDE, WHERE'S MY SAMPLER?

The Nucleus incarnation of Voltage Modular is a decidedly analogue affair. It's chock full of everything you need to create virtually any classic analogue sound. However, today's modular synthesist isn't restricted by such retro restrictions, drawing upon a wide variety of digital modules, including samplers. While you can indeed add an optional sampler module to your rack, you'll have to divest yourself of a bit of cash to do so. However, if you have a sampler plugin, you can incorporate it into any Nucleus patch using the same methods discussed in our tutorial on modular effects processing. All you have to do is to set your sampler to trigger at the same time as VM Nucleus, and you'll be able to route it through whatever modules you like.

Depending on your DAW, it might take a bit of head-scratching, but it's well worth the effort.

SONIC REDUCER

Voltage Modular Nucleus offers a crunchy Distortion module for dirtying up your patches and incoming audio signals. However, you may not realise that there is another, less obvious sonic mangler onboard, too. We're speaking of the Sample And Hold module. When triggered, sample and hold circuits sample the voltage of incoming signals, and play back that voltage, generally all in lock step to a clock, either internal or from an external source. As it happens, you can use a sample and hold module as a sort of analogue sample-rate processor. Try running audio through the Sample And Hold module and clocking its Trigger input from an Oscillator with a high Range setting. Experiment with different incoming Oscillator frequencies. The results will be gritty, metallic, and most unusual!

Need hands-on control? Use VM Nucleus' MIDI Learn function to assign parameters to incoming MIDI CC messages

PULLING YOUR STRINGS

Voltage Modular Nucleus is strictly monophonic. As with sample playback, you can get polyphonic modules, but they're going to cost you extra. However, you can fake some old-time divide-down polyphony for a string-machine or organ style sound. All it takes is an external poly plugin that can pump out a simple sawtooth waveform. Route its output into Nucleus as described in the previous entry and trigger it simultaneously with Voltage Modular. This incoming polyphonic sawtooth wave can then be treated as an oscillator in your Nucleus patch. Add a low-pass filter and a couple of envelopes, and you'll have the beginnings of a pretty convincing string machine. Obviously, you can do a lot more with it besides strings, so don't be afraid to give it the full modular treatment!

A LEARNING PROCESS

There can be few among us who aren't impressed by a towering modular system bedecked with cables and knobs – oh so many knobs! It's the potential for real-time control that draws many musicians into the world of modular synthesis and, admittedly, it's not easy to replicate that experience with software. Seasoned desktop producers have become accustomed to using generic real-time MIDI controllers to simulate at least some of the workflow, and – assuming you have such a controller – so can you, thanks to Voltage Modular's MIDI Learn features. Simply right-click a parameter and choose MIDI Learn from the menu to assign it to an incoming MIDI message. Alternatively, you can click the MIDI tab in your Library to access any and all assignments together.

CONFUSE YOUR CABLES

As you've learned, there are some distinctions between the various signals that travel down a modular synth's patch cords. Some carry audio signals, while others carry control signals. Even the types of control signals differ, with gates, triggers and other control voltages available at any given time. Some manufacturers choose to separate them using specific jacks and plugs – for example, Moog used Cinch-Jones connectors for gates and 1/4" cables for audio and modulation signals.

Like many modern modular systems, Voltage Modular Nucleus adheres to no such distinction, and audio signals might be patched into, say, the Filter module's Frequency Modulation input and used to force the filter to respond to the audio's dynamics.

Conversely, a modulation signal could be cranked up high enough to be used as an audio signal. Experiment with unexpected routings – you might be surprised at some of the cool effects you can create.

SEQUENCE YOUR SEQUENCES

If you've trawled through our exclusive CM Nucleus presets, you might have noticed that the sequencer patches often make use of multiple Sequencer modules. As described above, they might be used to facilitate occasional flourishes or fills. You will also have noticed that many of them are patched so that the patterns can be transposed by incoming MIDI. With some clever patching, you can use another Sequencer module to transpose instead. You can work out how to divide down the clock so that transposition occurs every 'x' number of bars, or use Sync Divider modules driven from a common master clock, such as an Oscillator.

PICTURE THIS

You've likely realised that modular synthesisers can be very educational. There are few better ways to learn about synthesis and sound, which is why so many universities plumped for systems back in the 1960s.

Voltage Modular Nucleus offers one essential – yet often overlooked – module that can be most enlightening. We're speaking of the Oscilloscope. It doesn't make a sound, send a trigger, or modulate anything. No, it simply shows you what your signal looks like. This is an invaluable tool, allowing you to see, for example, exactly what happens to one waveform when it's modulated by another, or visualise the shape of an envelope. We urge you to stick one of these modules into your patches when you're starting out.

The Sample And Hold module makes for some weird and wonderful sonic destruction

Take a look inside your sounds with Voltage Modular's awesomely educational Oscilloscope module

Preset breakdown

Your new modular synth comes loaded with 50 exclusive patches handcrafted by our in-house sound designers. Let's take a tour...

BASS

CM 3 OSC Bass

A rich, detuned bass patch with loads of presence, this sound is built from a relatively basic signal path. The mod wheel adds vibrato, and incoming velocity is applied to the filter cutoff. Play with lots of dynamics.

CM Acid Base

A simple, sliding, single-oscillator sound, this one has a decidedly acidic timbre with a hint of velocity-aided distortion. Glide can be added by pushing up your mod wheel. A single envelope generator is shared by filter cutoff and amplitude – just like the old Roland monosynths.

CM FM Bass

This makes use of analogue frequency modulation to add bite. Ostensibly a dual-oscillator bass, a third oscillator is used as a source of audio-range frequency modulation over the main pair. Mod wheel controls filter cutoff.

CM Manic Modwheel Bass

At first glance, this is a straightforward variation on a typical three-oscillator bass patch, but give the modulation wheel a nudge and it gets very interesting indeed, with chaotic filter modulation and a fourth oscillator modulating pitch.

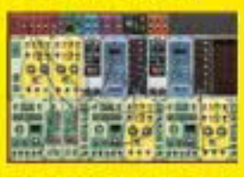
CM MW Bass

A squelchy, snappy bass with body, comprising a pair of oscillators through a 24dB filter with a healthy dose of resonance. Muted in its default state, the filter's cutoff frequency is modulated by the modulation wheel.

DRONE

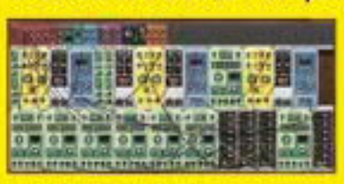
CM Busy Drone

A 'playable' ambient drone, this one provides a couple of slowly filtered oscillators, the pitches of which can be triggered from incoming MIDI notes. There's also a Noise Generator that feeds both the filter and a Sample And Hold module.



CM Cosmic Signals

A slightly busy self-playing drone patch combining a pair of filtered pulse wave oscillators (with pulse width modulation) with a Noise Generator. Multiple LFOs are used to slowly modulate the various parameters.



CM Sextet

Six distinct sound sources and a whopping eight Oscillator modules make this a many-tentacled behemoth of a patch. A self-player by nature, you can control the basic pitch from incoming MIDI notes.

CM Slow Drone

This is a self-playing drone with plenty of slow motion, courtesy of multiple modulation sources, including a trio of Mini LFO modules and an Oscillator in the 'Lo' range. You can control the base pitch from incoming MIDI notes.

EFFECTS PROCESSING

CM Dual Filter Mods

Wrap this chaotic, unquantised effect around a vintage beatbox loop for a truly Chrome-plated experience. Hard-panned stereo filtering and distortion with oodles of modulation make this patch a squelchy delight.

CM Flowmotion

This percolating patch modulates the incoming left and right signals with a pair of filters controlled by two host-synced Sequencer modules. Wet and dry mix is controlled by the mixers at the end of each channel's chain.

CM Panned Band Echoes

A hard-panning effect that splits the incoming left and right audio signals to a bank of three filters each, set to differing cutoff frequencies. The outputs of each filter are then sent to one of six Delay modules.

CM Panned Mod Ring Mod

A stereo effect with hard-panned outputs, this patch passes the incoming left and right signals through dual Ring Modulator modules, each fed with an Oscillator. Host-synchronised Oscillators act as LFOs, modulating a pair of filters.

CM Stereo Auto Pan

A standard stereo audio-panning effect created by modulating two Amplifier modules with an LFO provided by an Oscillator module. An Attenuverter module is used to flip the phase of the LFO waveform.

LEADS

CM GloxLead

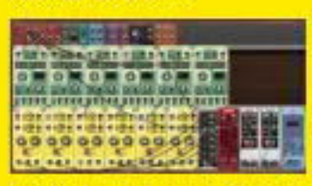
A simple, yet versatile lead using but a single oscillator. A bit of spring reverb adds some atmosphere. Play short, staccato notes for a tinkling glockenspiel sound. Hold the notes and push the mod wheel up for a modulated filter sound.

CM ProgLead

A typical glide lead – two oscillators and a Moog-style filter spat through some ambience courtesy of the Delay and Spring Reverb modules. Mod wheel adds LFO to filter and pitch wheel bends to fifths.

CM Sync Lead

This nasal, ripping patch feeds the output of one Oscillator module into the other's Sync input and modulates the latter with an Envelope. Mod wheel adds motion.



CM Unison Saws

Six sawtooth waves detuned for a thick burst of power. An additional six filters can be individually tweaked to add even more depth and dimension. A bit of delay makes it perfect for 1990s-style stabs. Incoming velocity controls the amplitude.

PADS

CM Chord Pad

Back in ye olden days, when synths were only monophonic, owners of three-oscillator instruments such as Moog's Minimoog would fudge polyphony by tuning each oscillator to a different note in a chord, such as we've done in this pad.

CM Low Pulse

Inspired by the rumbling string pads made famous by Sequential Circuits' Prophet-5, this patch makes use of

pulse width modulation to add some motion to a deep, groaning pad. Push up the mod wheel to make it a little bit brighter.

CM MW PWM Pad

Modulating the pulse width of a pulse waveform can make for some super-thick sounds. Here, we've got a massive three-oscillator buzzy pad with some envelope-based filter modulation. Pulse width modulation is introduced by the mod wheel.

CM Prophetic Brass

A once and future classic, this honking sound is inspired by the brass patches found on Sequential Circuits' Prophet-5. Two Oscillators (one tuned five steps above the other) pump out sawtooth waves. Mod wheel adds just a touch of vibrato.

CM S+H Pad

This one has two distinct signal paths. The first consists of a thick PWM pad, while the second is a single oscillator affair modulated by a gurgling Sample And Hold modulator. Both have a generous slathering of echo.

CM S+H Swell

An atmospheric pad that gradually swells and fades thanks to the Envelope Generators' long attack and release times. Pulse width modulation adds motion, and the Sample And Hold module provides a distant layer of random chime-like motion. Hold notes for full effect.

PERCUSSION

CM Beatbox HiHat

White noise, a resonant band-pass filter and a couple of envelopes are all that's needed to get a skittering retro rhythm going. This one responds very well to dynamic playing.

CM Beatbox RezKick

Traditionally, analogue kick drum sounds are created by exciting a self-oscillating resonant filter. Alas, the included filter doesn't self-oscillate, so we're stuck pumping a sine wave through it. A bit of distortion and a little layered white noise beefs it up.

CM Beatbox Snare

It's a snappy snare from days gone by. This is a good backbeat builder right out of the box, but it can also be used as a starting point for your own sizzling snare sounds. Have a play (gently!) with the filter cutoff and various envelopes to shape your own timbral take.

CM Comb Drum

Inspired by early 1980s New Wave productions, this unusual percussive effect makes use of a delay with super-short delay times and high feedback settings to create something like a comb-filtered effect. It's yet another one that responds well to dynamic playing styles.

CM CR Tamb

Taking its inspiration from the chirping, cricket-like Roland CR-78 tambourine, this one combines noise and band-pass filtering to produce a metallic tone. An Oscillator module acts as an LFO to modulate the filter.

CM NoiseDrum

This loud, resonant, noisy drum patch is aggressive. Try tweaking the top-right Filter module's Cutoff for a bit of quick fine-tuning. Tweaking the envelopes can lead to an unlimited number of variations.

CM Tuned Noise

Applying a tuned resonant filter to a burst of white noise is an age-old approach to creating interesting synthetic percussion that can be played from the keyboard. At lower octaves, it resembles wood blocks; at higher octaves, it sounds more like a partially-open hi-hat.

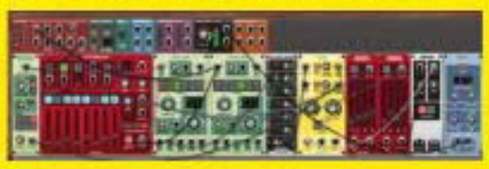
SEQUENCES

CM 2-Part Sequence

The top sequencer controls the transport and fast passage. It also acts as a master clock. The bottom-left sequencer acts as a clock divider, while the bottom right controls the slower part. You can transpose the sequence using incoming MIDI notes.

CM ARP Trio

This arpeggiated patch offers three oscillators for a full sound. The Glide module is deployed for ripping portamento, and a synchronised Sequencer simulates velcoity.



CM Dotted Eight Sequence

A stripped-down sequencer patch with a major-key pattern driving a pair of oscillators and a dotted 1/8 delay. Pitch can be transposed with incoming MIDI, and LFO-to-filter modulation is introduced with the mod wheel.

CM DRM MCHN

A skittering three-part rhythm machine. The top-left Sequencer module acts as both the timing master and the gate for the hi-hat. The faders control the filter cutoff for the hi-hats. The top-right sequencer handles kicks, while the remaining sequencer deals out the backbeat.

CM Ratchet

An effect made famous by Tangerine Dream back in the 1970s, ratcheting adds occasional bursts of rapid-fire notes to sequences. The top-left Sequencer controls the rate of the main sequence (as well as the notes' pitches), the top-right the rate of the ratchet effect.

CM Sheffield

A dark, gothic, industrial drum beat. Once again, multiple synchronised sequencers create a multi-part beat with a thudding, reverberant bass drum, echoing backbeat and nervous hi-hats. The top-left Sequencer module controls rate and transport.

SPECIAL FX

CM Metal Trash

A metallic industrial percussion patch, this atonal creation makes use of the Ring Modulator module to deliver the perfect preset for scoring the soundtrack to the next robot apocalypse. Three oscillators, plenty of dynamics, and some wicked distortion do the dirty work.

CM Ring Mod Sweep

You didn't think we could pass up the chance to have some fun with the Ring Modulator, did you? A classic sweeping effects patch of the sort made famous by Yamaha's CS80, We've added in some delay to get a bit of ambience.

CM SynthiNoiseFX

A sweeping, sizzling, bubbling whirlwind of white noise gone mad, this is an ideal sound effect for the mad scientist or alien explorer. Inspired by the sorts of sounds made by countless electronic instrumentalists of the 1970s, this one uses the mod wheel to add even more modulation.

CM VelBell

A clangorous, percussive tone, this patch makes use of the Ring Modulator module to combine the signals of a pair of oscillators, producing a metallic tone. Velocity controls the pitch of Oscillator 2.

TEMPLATES

CM 3 OSC

A good starting point for all manner of classic synth patches, built on the architecture made famous by the Minimoog, but with the addition of a Sample And Hold module and a Delay processor. By default, Aftertouch controls the amount of sample and hold applied to the filter cutoff.

CM Drum Template

Another template with everything you need to start crafting your own custom percussion sounds, you can think of this as a one-stop shop for building your beatbox basics. Dual layers – one for the 'body', the other for the noise of the drum. Tweak those envelopes and filters until you have percussion perfection. **cm**

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