

Analog

By Gino Robair

Renaissance

Although analog modular synthesizers are considered boutique items, often with prices to prove it, their influence on popular music belies their niche status. Check out the gear lists of many of the top creators of synth-based music—Trent Reznor of Nine Inch Nails, Johnny Greenwood of Radiohead, and John McEntire of Tortoise and the Sea and Cake, to name three of my favorites—and you’ll see patchable instruments by Analogue Systems, Blacet, Doepfer, Metasonix, Synthesis Technology MOTM, and Wiard, among others.

In this article, I will survey 11 product lines of analog modules that have appeared since 2001. The first section (“The New Players”) focuses on the products of new companies, while the second (“New Formats”) looks at new lines of products created by older companies. (The article “Something Old, Something New” in the April 2001 issue, available at www.emusician.com, covered 20 companies making analog synths.) Although a module or two covered here may contain digital circuitry, the majority of the modules are completely analog based.

Back to the Future

Unlike the first generation of companies in the '60s and '70s, many of today's modular designers create products that support other product lines. For example, Plan B and Livewire modules fit the Doepfer Euro-rack, and both companies have designs that complement rather than duplicate the functionality of the Doepfer product

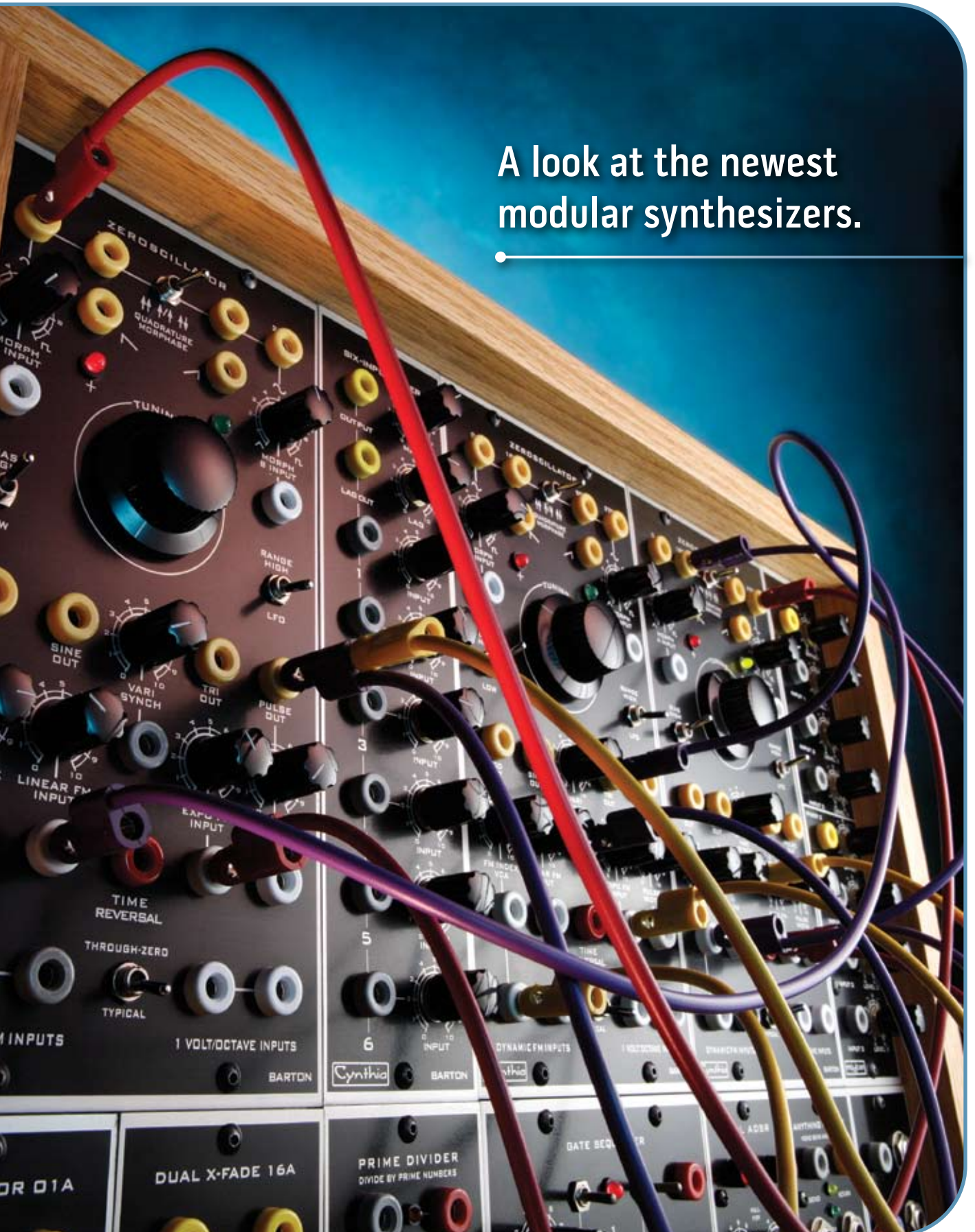
line. Sure, nearly every company has a filter or two in its catalog, but a synthesizer can never have too many filters. However, it's more exciting when a designer comes up with an entirely new concept for a module, and there are plenty of those in this roundup.

Throughout the article, I will refer to products that support the Synthesis Technology form factor—5U panel height, power supply, and use of ¼-inch jacks—as *MOTM-style* modules. Similarly, I will use the term *FracRak* for modules that fit into the racks and use the power supplies sold by Blacet and PAiA, and the term *Euro-rack* to signify modules that fit into Doepfer cases and use the same power connector.

It's likely that the Euro-rack modules in the roundup will also fit into racks from Analogue Solutions and Analogue Systems. However, the power connector that attaches the module to the power bus, as well as the positions of the screw holes, may differ slightly between



A look at the newest modular synthesizers.



BILL SCHWOB



systems, so be sure to ask the manufacturer or distributor about these compatibility issues before you buy.

The New Players

All of the companies in this section have modules that fit into previously available form factors. This is a boon for musicians who have already invested in one type of system and want to expand beyond the main product line. And the manufacturers benefit by being able to tap into an established user base and concentrate on new designs, rather than investing their energy and funds in basic modules and support products, such as racks and power supplies.

Bananalogue. A recent entry into the modular scene is Bananalogue, which is run by Seth Nemeč in collaboration with Ken Stone of CGS and Serge Tcherepnin, the designer of the original Serge modular system. Bananalogue modules use 3.5 mm plugs, not banana cables as the company's name suggests. (The name is a tip of the hat to Stanislaw Lem's *Futurological Congress* as well as a nod to the stackable jacks in the Serge system.) Bananalogue modules can be ordered in either the FracRak or Euro-rack format.

The company's first release is the Serge VCS (\$195), which is based on the classic Serge Universal Slope Generator. VCS stands for Voltage Controlled Slopes, which in its most basic form is an envelope generator (EG) with voltage controllable attack and decay times. Although that function is useful enough on its own, it is only part of what the Serge VCS can do.

The Serge VCS has an audio input, a trigger input, two outputs (one of which is AC coupled for use with audio signals), and an exponential CV input (see Fig. 1). The knobs are bipolar—a typical Serge feature—and the VC rise and fall pots introduce feedback into the circuit when pulled out, resulting in nonlinear behavior. The Serge VCS has a very sensitive response, and I recommend adjusting the knobs slowly if you want to hear the module's full potential.

Stone's design adds a few new features to the original Serge module, such as voltage controllable attack and decay times. The End Out jack sends a trigger signal after the envelope cycle is complete, letting you use the Serge VCS as a voltage controllable pulse delay. You can also use the module for portamento effects.

The Serge VCS can be used as an envelope follower with a positive or

negative peak, depending on the rise and fall settings. Another new feature is the Cycle switch, which connects End Out to the Trigger input so you can use the module as an LFO.

And as if that wasn't enough, the module can be used as an oscillator with a softened sawtooth waveform. The pitch can be controlled manually with the Rise and Fall knobs or by using the Exp CV input at the bottom of the module. The user manual admits that the oscillator has a reduced range and is less accurate than a dedicated voltage-controlled oscillator (VCO), but I found it to be very useful.

Additionally, by feeding the trigger input with an audio rate signal, you can use the VCS as a subharmonic generator.

Bananalogue's next release will be the WVX wave multiplier (\$255). Designed by Ken Stone, the WVX is an update of the lower sections of the Serge module of the same name; it offers voltage controllable wave-shaping and distortion effects with a number of output options. (For more on Stone, see the sidebar "The Man Behind the Curtain.")

Cyndustries. Starting with a few designs by Ken Stone, and complementing the original Modcan line (now called the A-series), Cynthia Webster has created an impressive line of modules that, with one notable exception, are based on the Modcan 5V standard and use banana cables (see the sidebar "Going Bananas"). However, all Cyndustries products can handle 10V signals, and with the Anything Module (\$260), your modular synth can accommodate the audio levels of nearly every device in your studio.

Cyndustries modules range from the utilitarian—Quad Bandpass Filter (\$250), Triple Resonant Filter (\$300), Sawtooth Animator (\$375), and Gate Sequencer (\$425)—to the esoteric—RanDivide (\$300) and Logipac (\$251)—to the downright bizarre—VC Tabla and Tanpura (\$750) and Cynthia Macintosh, a special-order item that puts an Apple Mac mini, as well as MIDI I/O, into a module.

One of my favorite modules in this roundup is the Zeroscillator (\$750). Created in collaboration with designer Mark Barton, it is the first Cyndustries product that is available in more than one format (Modcan



FIG. 2: Cyndustries' Zeroscillator excels at FM synthesis. It is one of the most expensive modules in this roundup, but its sound and feature set make it well worth the money.

FIG. 1: The Bananalogue Serge VCS can be used as an EG, an envelope follower, and an oscillator.





A-series, FracRak, MOTM, Synthesizers.com, and Euro-rack). I will describe the Modcan A-series version, which has the same features as the other form factors. (The one exception is the Euro-rack version, which loses two inputs but maintains virtually all of the module's functionality.)

The Zeroscillator (ZO) has a wide panel in every format, in order to accommodate all the features (see Fig. 2). Behind the faceplate are three large circuit boards attached to the panel-mounted boards. The ZO is well built and feels solid.

The module offers ten bipolar audio outputs (10V peak-to-peak), and the waveform options include Mod (which has an accompanying CV input), sine, triangle, pulse, ramp up, ramp down, and four morphable quadrature outputs. The waveforms of the quadrature outputs can be adjusted—either manually or with a CV—to morph from a triangle wave, through a sine wave, to a square wave. In addition, the four outputs are out of phase with each other in 90-degree steps.

The ZO was designed for FM synthesis, so besides a pair of 1V/octave inputs, it includes exponential and linear “through zero” FM inputs and an FM depth modulation input, as well as pulse-width modulation, a Variable Synch input with attenuator, and a Time Reversal jack. This last input adds a secondary sync option that introduces formantlike timbres: it sounds so good that nearly every patch I created with the ZO used this input.

The ZO's through-zero ability gives the module its name. When you attempt to modulate the signal below zero and into negative frequencies, phase artifacts are introduced. The result is an exciting timbral effect that is substantially different compared with typical analog FM capabilities. In fact, the ZO has a switch that selects between Typical and Thru Zero behavior, so you can tone down the effect if you want.

Other switches include Bias, which sets the module's overall response to frequency modulation, and Range, which has High and LFO settings. The large ten-turn master tuning knob has a satisfyingly smooth action.

But what really matters with an oscillator is the sound, and that's where the ZO shines. Forget using a filter: its rich timbre is capable of



FIG. 3: In the Livewire Dual Cyclotron, three oscillators interact with each other, sometimes in seemingly mysterious ways.

exceptionally tasty sounds on its own. Add frequency modulation, and you can get an FM sound that is reminiscent of classic digital FM instruments. Because of its myriad modulation opportunities, the ZO works equally well in a self-generating patch or in more traditional keyboard-based situations.

However, swirly effects and complex bell sounds are only part of the picture. The quadrature outputs can also be used for spatialization when the module is set to LFO. For example, you can use the quadrature outputs to control the levels of four voltage-controlled amplifiers (VCAs) in a 4-channel environment. I experimented with this using an oscilloscope to view the movement of sound in a virtual space, and the results were very exciting.

Cyndustries has also released the Sub Mux Deluxe (\$330), a suboctave multiplexer that offers four simultaneous suboctave outputs—from one to four octaves below the input signal. Based on a similar MOTM module by Synthesis Technology's Paul Schreiber, the module includes a stepped voltage output.

A number of exciting new products are also in the works at Cyndustries, including the ScanOpan, an 8-channel high-speed interpolator that can be used for panning, scanning, scrambling, and analog granular effects, and the Sawtooth Animator in the other module form factors.

Livewire. One of three companies under the Electro-Acoustic Research (EAR) banner, Livewire's products are well built and lots of fun to use. Designer Mike Brown's electronic-music aesthetic is definitely old-school, harking back to the days when composers used lab equipment to make music.

Livewire's first two modules—the Dual Cyclotron (\$275) and the FrequenSteiner (\$225)—share a vintage look but couldn't be more different from each other in operation. The simpler of the two in terms of feature set is the FrequenSteiner filter, a reproduction of Nyle Steiner's filter in the Steiner-Parker Synthasystem modular. Like the original, the FrequenSteiner lets you switch between lowpass, bandpass, and highpass modes and gives you knobs for cutoff frequency and resonance.

MANUFACTURERS

Bananalogue

www.bananalogue.com

Cwejman/Analogue Haven (distributor)

www.analoguehaven.com

Cyndustries

www.cyndustries.com

Livewire/Analogue Haven (distributor)

www.ear-group.com

Magic Smoke Electronics

www.magsmoke.com

Metalbox

www.metalbox.com

Modcan

www.modcan.com

Oakley Sound Systems/Analogue Haven (distributor)

www.ear-group.com

Plan B/Analogue Haven (distributor)

www.ear-group.com

Synthesis Technology MOTM/Analogue Haven (distributor)

www.analoguehaven.com

Wiard Synthesizer Company

www.wiard.com



Although the original module had three unattenuated audio inputs, the FrequenSteiner has one attenuated input. In addition, it has two VC inputs with trim pots, whereas the original had a trim pot on only one of the two VC inputs.

The FrequenSteiner is a colorful filter that has a buzzy, growling pungency reminiscent of its namesake. It's the perfect antidote to vanilla filter sounds, and it nicely complements the Buchla-like woodiness of its EAR-related cousin, the Plan B Model 13 Dual Timbral Gate.

The Dual Cyclotron, on the other hand, is a complex voltage generator with three oscillators that interact with each other in unconventional—and occasionally counterintuitive—ways (see Fig. 3). The obscure parameter names certainly don't help much: their functionality is intentionally oblique, forcing you to think about what you are hearing rather than relying on old patching habits. That's a good thing.

The upper section has two identical oscillators—the “cyclotrons”—with Cycle Frequency and Symmetry (wave-shape) controls, and switches for speed (Stretched, Normal, Compressed) and waveform (linear or “discrete”—triangle and square). In the center are knobs for Axis Tilt, which controls the balance between the two oscillators, and Intensity, which acts as a modulation depth control.

The master oscillator, which morphs between triangle and square waves using the Shape Shifter knob, includes a rate control and a high/low frequency switch. The bipolar Symmetry pot changes the horizontal symmetry of the waveform from the 12 o'clock position: turning the knob clockwise gives you a square wave with a positive shape and a sawtooth wave with an ascending ramp; turn the knob counterclockwise, and you get a negative pulse wave and a descending ramp for the sawtooth wave.

The Control switch allows the master oscillator to be controlled manually, externally, or by the cyclotron oscillators. When the Control switch is set to External, a signal going into the External CV jack affects the master oscillator's behav-

FIG. 4: The Plan B Model 15 Complex VCO is a beefy-sounding oscillator that gives you voltage control over the waveshape at the Morph output.



MODULAR SYSTEM OVERVIEW

COMPANY	FORM FACTOR	CABLE TYPE
Bananalogue	Euro-rack, FracRak	3.5 mm
Cwejman	Euro-rack	3.5 mm
Cyndustries	Modcan A-series	banana
Livewire	Euro-rack	3.5 mm
Magic Smoke Electronics	Euro-rack, FracRak	3.5 mm
Metalbox	FracRak	3.5 mm
Modcan	MOTM	¼"
Oakley Sound Systems	MOTM, Euro-rack	¼", 3.5 mm
Plan B	Euro-rack	3.5 mm
Synthesis Technology MOTM	FracRak	3.5 mm
Wiard	FracRak	3.5 mm

ior, and it can be difficult to predict the results as you change the Initial Rate and Symmetry settings. As these knobs approach their extreme ranges, things change in a surprising way.

The Dual Cyclotron has two outputs, which provide a mixture of all three circuits. The main output favors the master oscillator, with the cyclotrons acting as modulators. The auxiliary out seems to reverse that algorithm. The Shape Shifter knob controls the waveform shape for the main oscillator output, and the Focus control is a slew limiter that smooths the waveform.

The Dual Cyclotron is another one of my favorite modules. Although its seemingly bizarre behavior may not be for everyone, its modulation potential is nearly unmatched by the other modules in this roundup, and I highly recommend it to Euro-rack owners.

Upcoming Livewire modules include the Sub Divider, which is based on a Nyle Steiner frequency divider, and the Chaos Computer series modules. The main section of these latter modules, the Core Chaos Engine (CCE), has dual 32-bit shift registers with programmable feedback paths and cross-modulation capabilities that are set using 16 3-position probability switches. Eight random stepped-voltage outputs are available, each with a different probability weighting. The result is like a set of complex, yet mathematically related, sample-and-hold sequences. An eight-by-eight LED matrix displays the module's behavior and is fun to watch.

Three expansion modules support the CCE. The Random Gates module gives you 16 additional quasi-randomized gate signals based on the CCE's settings. The Exponential Curve Calculator provides individual



slew rate control of the CCE's eight outputs, as well as three random fluctuating voltages. The Analogue Computation module offers a set of related CV outputs based on various mathematical functions. The combination should offer new levels of complexity for synthesists interested in creating evolving, organic patches.

Magic Smoke Electronics. Manufacturing designs by the influential DIY-synth advocate Thomas Henry, Magic Smoke Electronics has entered the modular market with the TH-201 Mankato lowpass filter. The module features inputs that can be configured as AC coupled for audio use or DC coupled so you can use the module to add slew to CVs for portamento effects.

The TH-201 is available as a 2-in/4-out model—the TH-201/4 (\$250)—and a 4-in/8-out model—the TH-201/8 (\$330). Initially the TH-201 voltage-controlled filter (VCF) will be available as a kit, in both Euro-rack and FracRak versions. PCBs of each module (\$22 or \$35) are also available for the more adventurous builder.

With a resonant frequency range of roughly 0.1 Hz to 23 kHz, the TH-201 can be used as an LFO and oscillator. According to the company, lowering the frequency range further is simply a matter of replacing the timing capacitors, and details will be included with the kit.

The TH-201/4 has pairs of 12 and 24 dB outputs, two of which are inverted. The phase difference between each output is 90 degrees, allowing you to use the module as a quadrature sine wave VCO when set into resonance.

The TH-201/8 has 6, 12, 18, and 24 dB outputs, with inverted versions of each. When in resonance, the phase difference between the eight outputs is 45 degrees, giving you an “octature” oscillator when the module is in full resonance.

As a lowpass filter, the TH-201 has a deep and beefy sound that is very musical. When resonating, the module makes an exceptional LFO because of how slow it can go. It's also refreshing to have the entire frequency range available from a single control (most modules have a high/low frequency switch). Overall, the TH-201 is handy and would be a nice addition to nearly any system.

Metalbox. Although Michael Ford has been building Stone-designed modules to order for years, he only recently decided to make them more readily available. Supporting the FracRak format, Metalbox offers 15 modules that complement the functionality of modules from Blacet and Wiard very well.

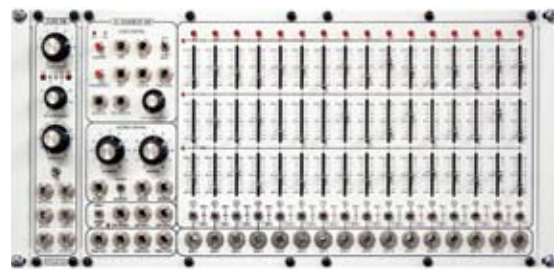


FIG. 6: The Modcan VC Sequencer 54B (shown here with the Clock 53B module) gives you three rows of 16 steps that can be summed to create a 48-note sequence.

His voltage sources and processors offer a wide range of features. The Sequential Switch (\$400) is an 8-step sequencer switch with eight Gate outputs, eight Stage inputs with attenuators, and Clock, Inhibit, Reset, and Direction inputs. The module can be clocked with audio rate signals as well. Other modules in this category include the 3-stage Analog Shift Register (\$125), the Gated Comparator (\$225), and the Pulse Divider/Logic module (\$250).

A standout in the line is the versatile Wave Multiplier (\$300), a voltage controllable 2-in/2-out waveshaper that includes the independent Grind circuit and Lockhart Folder circuit. However, one of my favorite Metalbox modules is the Psycho LFO, which gives you a pseudorandomized voltage that you can rein in with the Rate, Range, and Glide controls. Its unpredictability is perfect for subtle timbre animation, and it is available in three speeds.

The Burst Generator (\$225) can be used as an audio or triggering source. You can select the number of pulses (one to nine), the length of the pulses, and the internal clock speed. The module also accepts an external clocking signal.

Other Metalbox audio generators include the Dual Chime (\$145), the Dual Drum (\$125), the 8008 Bass Drum (\$150), and the Cynare (\$400), a full percussion synthesizer named after the famous '70s-era analog drum synth.

Plan B. After years of being one of the go-to guys for synth module customization and repair, Peter Grenader went public by launching Plan B and cofounding the EAR Group. Inspired by Buchla and Serge modulars, Grenader's modules have multifunctional, feature-rich designs. Although they can easily be incorporated into a more traditional melodic synth, Plan B modules are perfect for experimental work, and their features nicely complement the modules by other companies in the Euro-rack form factor.

The first module released, the Model 15 Complex VCO (\$289), is a triangle-core oscillator with outputs for five different waveforms: sine, triangle, ramp-up sawtooth, square, and Morph (see Fig. 4). The Morph output lets you pan from a sine wave to either a triangle or square wave—the secondary waveform is selected with a switch. The morph circuit involves a Vactrol,

FIG. 5: The Cwejman MMF-1 multimode filter offers three dual bandpass modes, each of which gives you two sine tones when the filter goes into resonance.





so it can be modulated only into lower audio rates.

The Model 15 has a 1V/octave input with master tuning and fine-pitch controls, two linear VC inputs with bipolar controls, an exponential FM voltage input with level control, a sync input, and a pulse-width modulation input with bipolar control. The oscillator has a range of roughly 1 Hz to 20 kHz, so it can be put to use as a pseudo-LFO or a heterodyning modulator.

Overall, the Model 15 has a rich timbre thanks to its discrete core circuit (no ICs are used). Like the Buchla 258 that inspired it, the Plan B VCO sounds great unfiltered, and its wealth of modulation inputs makes it a very colorful module.

Plan B's Model 12 State Variable Vactrol Filter (\$225) is a multimode filter that offers simultaneous highpass, bandpass, lowpass, and allpass output. The module has an unusual bandwidth control that allows you to select a mix between a pleasing 1-pole (6 dB/octave) response and a more strident 2-pole (12 dB/octave) response. Besides frequency, resonance, and input level controls, it offers two VC frequency inputs with level controls (one of which is bipolar). Although the filter does not go into self-oscillation when you crank up the resonance, the sound sharpens nicely. In addition, as the input gain approaches its maximum setting, a pleasing and subtle overdrive is introduced into the signal.

Based on the Buchla 292 Quad Lopass Gate, the Model 13 Dual Timbral Gate (\$225) has two independent circuits that offer voltage controlled gating, lowpass filtering, and a combination of the two effects. The circuit uses a Vactrol, which helps give it its unique, plucked-

string quality. The Offset control for each gate allows signal to pass through as it is turned clockwise. Getting the classic, woody Buchla-style sound requires you to set the Offset control so a tiny bit of sound is heard even when the gate and filter are completely shut down. As the filter and gate are quickly opened by an incoming voltage, you get a resonance that is reminiscent of an acoustic instrument. And with the right source material, it can produce a nice growl.

A welcome feature of the Model 13 is the Sum output. It includes a mix control for setting the balance between the two filtered channels.

Inspired by a module in Native Instruments Reaktor, the Model 17 Triple Event Timer (\$200) has three amplitude-dependent comparators that can be

controlled independently or, more interestingly, serially cascaded. The module has three inputs that can handle audio and CVs, each with a level control and two delayed outputs, one of which is 180 degrees out of phase. Flip the upper Slave switch, and comparator 2 relies on the level of comparator 1, as well as its own level, to trigger. Comparator 3 can be slaved to 2 in the same way. You can use the individual jacks for separately timed pulses, or use the A+B+C outputs, one of which is inverted, to get all three pulses from one jack.

What makes this effect useful is that the relationship between the comparators remains the same no matter what speed the incoming signal is. Altering the threshold setting of each comparator will change the rhythmic characteristic of the output, letting you create swinging or loping patterns that shift in response to the input signals. Cross-patching within the module itself yields the most satisfying results.

Plan B has a number of new modules in the fire, none of which were available for demonstration as of this writing. Among them are the Spectral Multiplexer, which is similar to a fixed filter bank with VC capabilities; the Model 14 Dual Voltage Processor; the Model 19 Gate Delay; the Model 23 Dual Analog Shift Register, which has two 3-output registers that can also be configured into a single 6-output register; and the Model 21 Milton Sequential Controller, which is a highly programmable voltage controllable sequencer that comes in two sizes: the Grande, with four banks of 8 steps, and the Vente, with four banks of 16 steps.

New Formats

Of the companies I covered in the last roundup, several have crossed into other form factors by introducing new lines of modules. Although in some cases the switch to a new format was mostly cosmetic, other companies have come up with new ideas to fill the format.

Cwejman. Swedish manufacturer Cwejman made a big splash a few years ago with its S1 and S2 rackmountable semimodular synths. The instruments are solidly built and have a tight, clear sound with plenty of punch.

This year Wowa Cwejman has released a line of modules in the Euro-rack format that let you create a more personalized system using his exceptional designs. The modules are as ruggedly built as the semimodulars, with thick panels, heavy-duty 3.5 mm jacks, and the use of surface mount technology (SMT) on the boards. The SMT design keeps the circuit boards small enough to be enclosed and positioned flat behind the panel. And Cwejman's attention to detail is evident elsewhere, as with the tuning controls, which have frequency indications—a very nice touch.

Based on the core of the oscillator in the S1, the VCO-2RM (\$515) contains two independent oscillators and a built-in ring modulator. The VCOs have seven

FIG. 7: The 1000-series MOTM modules are FracRak-size and accept 3.5 mm plugs.





waveforms and a range of 0.01 Hz to 22 kHz, so you can use them as LFOs, too. Each oscillator includes three FM inputs as well as sync and pulse-width modulation inputs. The oscillators are normalized to the ring modulator circuit, but external inputs are also included.

The MMF-1 (\$399) is a multimode filter that lets you select a 12 dB/octave or 24 dB/octave response (see Fig. 5). Besides lowpass, highpass, bandpass, and notch modes, the module offers three dual bandpass modes with voltage controllable resonance and spacing. The module has two audio inputs, one audio output, two CV inputs for controlling the cutoff frequency, and CV inputs for resonance and spacing. When the MMF-1 is in resonance in the dual bandpass modes, you get two sine tones, with the interval determined by the spacing control.

The VCEQ-3 (\$515) is a 3-band parametric equalizer with voltage controllable frequency (5 Hz to 22 kHz), bandwidth (0.02 to 1 octave), and level (0 to 16 db). Bandwidth and level use 0 to 5V control signals, and the module can handle 20V peak-to-peak signals. Each band can be independently switched to boost or cut.

A number of other modules have been announced by Cwejman. The D-LFO (\$499), which has the same oscillator core as the VCO-2RM, offers two independent, 7-waveform oscillators as well as a built-in ring modulator. The module has several sync capabilities, including the ability to sync the second LFO to any voltage point of the first LFO.

The VM-1 (\$599) is a complete synthesizer voice in one module. It offers a VCO, a 4-pole multimode filter, and an EG, as well as a VCA and external audio input. Other modules that have been announced include the VCA-2P stereo panning VCA, the ADSR-VC2 dual envelope generator with voltage controllable segments, the RM-2S stereo ring modulator, and the M-CV master voltage control module.

Modcan. In the 2001 roundup I was very impressed with the Modcan system: it has a functionally diverse selection of well-built modules with an appealing sound quality. Modcan was one of two systems in that roundup that used banana jacks (the other was Serge/STS). However, until Cyndustries stepped in, the module size was unique and unsupported by other manufacturers. The format has since been dubbed the A-series.

Since then, Modcan's Bruce Duncan has created the B-series, which uses a panel format based around ¼-inch jacks, as well as the same 5U height and similar power supply requirements as the Synthesis Technology

GOING BANANAS



FIG. A: Banana plugs have holes that allow you to stack them.

The use of banana cables in modular synthesizers dates back to the Buchla 100- and 200-series (where they were used for control and timing voltages only) and, later, the Serge and Fenix systems. Banana cables are particularly useful because each plug has a hole in the top, allowing you to send an output to more than one input simply by stacking the plugs rather than using a mult module (see Fig. A).

Some synthesists don't like the single-conductor banana cable because of potential noise issues. In contrast, ¼-inch and 3.5 mm plugs have two conductors, one of which connects to ground. Personally, I don't think unwanted noise has ever been an issue with modern instruments, such as those from Cyndustries and Modcan, and the convenience and utility of stackable plugs far outweigh any potential noise risks.

MOTM system. However, you will need a conversion cable, which Modcan sells, to go from each module to the power supply if you're using Modcan modules in an MOTM system or vice versa.

One difference between the Modcan system and most of the others in this roundup is that its modules operate at 5V peak-to-peak. However, Duncan's designs easily support 10V systems: many of the modules have attenuators for scaling down the amplitude of higher signals, and the audio inputs are designed to handle 10V. Duncan also notes that his VCAs, for example, have a gain factor of 2, so you can scale them up to work with 10V modules.

The B-series includes the same selection of A-series modules, which I covered last time, as well as a number of new releases. The most significant is the VC Sequencer 54B (\$1,450), which can be driven from the Clock 53B module (\$300; see Fig. 6). The sequencer offers three rows of 16 steps, with sliders to set voltage levels; an output for each row and gate inputs for each step; a summed output for creating a 48-note sequence; two gate buses; manual and pulse reset; voltage controlled step selection; and a skip-step function, among other features.

Besides giving you a tempo control, the Clock module lets you divide and filter the clock pulse in a number of ways, including by musical values. The module offers a chip with eight Division Tables and a Divide by N control. Jacks for external clock input, as well as Rate and Table CV inputs, are also available.

The Dual Quantizer 55B (\$375) puts two identical but independent quantizers into one module. The quantizers take a continuous CV signal and convert it into a stepped voltage that conforms to musically useful pitches. Each quantizer offers three banks of 16 scales or arpeggiated chords, ranging from the common (major, minor,



Phrygian, and so on) to the exotic (Balinese, Octatonic, Sixtone Symmetric). A knob is included for transposing the pitch set up an octave in half steps.



FIG. 8: Wiard's Joystick Axis Generator lets you control ten voltage inputs using a single joystick controller.

The Dual Quantizer can be used in two ways. When used with a sequencer, a pulse or rising ramp waveform is applied to the Clock input to step through the pitches. When used in Free mode, the stepped voltage output changes when the input voltage crosses the conversion threshold set by the selected scale. A 5 ms pulse is sent from the Pulse output jack during each transition when in Free mode, which you can use to trigger other events, such as envelopes. Each of the

quantizers includes input and output jacks, Scale and Transpose CV inputs, a Clock input, a Pulse output, and an Invert input for changing pitch direction.

Also appearing in the B-series is the Dual VCA 13B (\$265), which gives you two independent channels that can be switched to have a linear or exponential response and to accept AC or DC inputs; and the Switch 56B (\$290), a voltage-controlled switch that lets you route one of four inputs to the output jack. The Switch cycles sequentially through the four inputs when a Gate signal is sent to the Clk input. The module's Pulse out jack sends a 5 ms pulse when the switch changes, which can be used to initiate events. The module responds to both audio and CV signals.

Oakley Sound Systems. For many years, Tony Allgood's U.K.-based Oakley Sound Systems was the source for high-quality MOTM-style modules in kit form. When Allgood closed shop a few years ago, his great-sounding designs were sorely missed by the DIY crowd.

It was a welcome surprise to the synth community when the Oakley name reappeared in 2005, this time as part of the EAR Group. Four modules supporting the MOTM and Euro-rack formats were announced. However, this time the modules are not available in kit form.

The modules were not shipping as of this writing, but they should be available by the time that you read this. Two of them, the Wavefolder and ADSR/VCA, were covered in "Something Old, Something New."

According to the manufacturer, the Octal Resonator offers eight resonant fixed-frequency bandpass filters tuned to 250, 350, 500, 700, 1,000, 1,400, 2,000, and 2,800 Hz. Three outputs are provided: a mix output, the output of the four left filters, and the output of the four right filters.

The State Variable Filter is a voltage controllable, resonant 2-pole filter offering simultaneous highpass, lowpass, bandpass, and notch outputs. Included are three audio inputs and three CV inputs, one of which is for 1V/octave control.

Synthesis Technology MOTM. Paul Schreiber of Synthesis Technology has expanded his MOTM system into the FracRak format with the introduction of the 1000-series modules (see Fig. 7). Although the smaller modules occasionally borrow designs from the larger series, new designs are also being introduced.

To reduce the module size by 50 percent, as well as to keep costs down, the new system is built using SMT. Although Synthesis Technology is well known to DIYers for offering its modules in kit form directly, the new modules are only available fully assembled through Analogue Haven.

Two of the first four modules are borrowed from the older series: the 1490 Lowpass Ladder VCF (\$199) and the 1485 GX-1 Diode Filter (\$229). These filters cover two timbral extremes. The 1490 has a 24 dB/octave Moog-style response and offers two audio inputs with attenuators, an FM input, a resonance control, and two outputs.

The 1485 is based on the filter in that vintage monster of a polyphonic synth, the Yamaha GX-1. It has a colorful, snarly character and can be used as a highpass or lowpass filter. The 1485 offers two audio inputs with attenuators, an FM input, and CV controllable resonance.

First in the category of new designs is the 1800 Looping ADSR EG (\$139), which has three modes of operation and a very wide timing range: less than 1 ms to more than 15 seconds. Besides being a traditional 4-stage envelope generator, when the 1800 is set in Loop mode, the end of the release cycle triggers the attack cycle, giving you a complex LFO. In Burst mode, the module loops when the gate signal is high. The module includes positive and negative outputs, gate and trigger inputs, and a manual gate button.

The 1190 Dual VCA module (\$249) holds two independent voltage-controlled amplifiers with a discrete transistor path rather than ICs. The module has a soft clipping feature, and it can accept linear and exponential CVs simultaneously.

Wiard. Largely inspired by the open-ended and experimental aesthetics of the Buchla modular system, Wiard's original line of modules was well crafted and wonderfully expressive. (A full review of the system is in the February 2002 issue, available at www.emusician.com.) However, since the last roundup, the 300-series modules have gone out of regular production and are now available by special order only.

For his 1200-series modular, designer Grant Richter has settled on the FracRak format. But instead of simply repackaging his designs behind the smaller faceplates, Richter has implemented new and often innovative

ideas into multifunctional modules that are as musically useful as they are deep. The new modules are available with black faceplates that match the Blacet look, as well as metallic blue with the Celtic designs of the 300-series. (When two prices are listed for a module, they represent the black version and blue version, respectively.)

The Noise Ring (\$249/\$299) is a pseudorandom voltage source that takes into consideration the musical usefulness of long-form repetition. Consequently, the module not only lets you determine the level of randomness, but also lets you control how often and how quickly new information appears. Richter refers to the Noise Ring as a “data resonator modulated entropy voltage source.”

The module is built around an analog white-noise generator and a digital shift register. You can manually set the percentage of new information entering the shift register with the Change control, and the probability weighting of the bits in the shift register with the Chance control. Both functions are voltage controllable.

The Noise Ring is internally clocked by a VCO with a range of 1 Hz to 10 kHz, but you can use an external clock signal. An attenuator is provided. There are two audio outputs: one changes between 9 voltage levels, and the other between 256 levels.

In its simplest form, the Noise Ring can be used for sample-and-hold-like sequencing effects. Clocking the device into the audio spectrum produces a variety of colorful noise timbres. The Noise Ring is great for creating irrational rhythmic patterns that slowly evolve.

Another innovative module is the Joystick Axis Generator (JAG; \$206/\$299), which gives you control over as many as ten VC inputs simultaneously using a single *x-y* joystick controller (\$90/\$150). The JAG has two sets of *x* and *y* input jacks, and eight output jacks that are mapped to the joystick’s *x-y* coordinates. The Edge and Dome outputs are for taking a summed voltage from the outer and center joystick positions, respectively (see **Fig. 8**). The Dome Height knob sets the peak voltage value for the Dome output jack, and the Polarity switch sets the input response to $\pm 5V$ or 0 to 10V.

Suggested uses for the JAG include vector synthesis and quad panning. However, it’s a fun module to experiment with by connecting the various outputs to any number of parameters of a patch.

The Wiard 1200-series also includes a pair of interesting filters. The Boogie Filter (\$312) is a Vactrol-based, 4-pole lowpass filter with a ballsy, Moog-like vibe. The module has two audio inputs, Control and Key CV inputs, and separate outputs for each pole—6, 12, 18,

THE MAN BEHIND THE CURTAIN

If you spend enough time haunting the analog-modular users groups, you’re bound to see the name Ken Stone. The Australian synth enthusiast is responsible for scores of module designs under the name of CGS, which stands for Cat Girl Synth and is based on the artwork from a couple of his own modules (see **Fig. B**).

Stone has designed a wide variety of modules, including a tribute to the Steiner-Parker Synthacon VCF, an analog shift register, the Infinite Melody semirandom CV generator, and the Burst Generator. He was inspired to create the Psycho LFO, which also offers pseudorandomized voltages, when he decided to use up printed circuit boards (PCBs) left over from a model-railroad project that produced a flickering fluorescent-light effect. He also has a module that simulates the sound of a V-8 engine.

But he has created plenty of utilitarian modules, too, including a VCO, an LFO, a bandpass filter, and a DC mixer. He plans to add a VCA and EG to the list in the future. His creations have been put into production by several manufacturers, including Bananalogue, Cyndustries, and Metalbox, and more are on the way.

“In my younger days I simply could not achieve much in synth DIY because the resources were few, and available components fewer,” Stone explains. “I sought to

change that, and to give people who are in the same position a chance to make their dream synthesizer.

“I do all the synth design work for fun and to achieve things I want my own synthesizer to be capable of doing,” he continues. “I may as well share the results so my efforts are put to good use and others can have some fun, too.”

If you are interested in the DIY approach, you can purchase Stone’s PCBs directly at www.cgs.synth.net. The Web page for each module includes a detailed description of the circuit as well as a parts list.

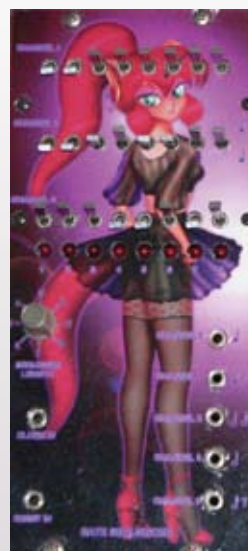


FIG. B: Ken Stone’s creative panel designs earned his home-brew modular the name Cat Girl Synth.



and 24 dB. Knobs are provided for setting the cutoff frequency, attenuating the Control input, and setting the amount of resonance. This punchy filter is perfect for shaping melodic lines in any register.

Like its big brother the Borg filter in the 300-series, the Borg 2 (\$312) combines features from the legendary Korg MS-20 filter and the Vactrol-based Buchla 292 Quad Lopass Gate. However, the Borg 2 has a Vactrol with a quicker response than the Borg, which gives it a faster decay time than the original and allows it to be used with faster bpm's.

The auto-squelch feature from the MS-20 filter, which automatically rides the gain of the resonance control as the input amplitude increases, is a jumper selectable option.

Plug and Play

Historically, the biggest drawback of an analog modular synthesizer has been the incompatibility between products from different companies in terms of module and

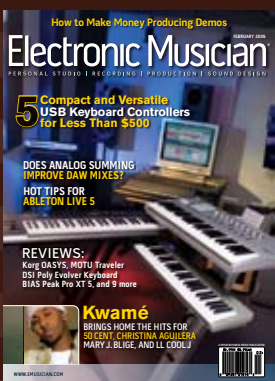
rack size, the type of patch cords used, and the voltage requirements. However, all the modules in this roundup play well together, and the variety of rack sizes has been standardized to a greater degree than ever before. This means you can create a system that fits your musical tastes fairly easily, although you may end up with different rack types in your system. Fortunately, all the racks themselves are a standard 19 inches wide.

Serious modular enthusiasts who have a variety of manufacturers represented in their system but want a uniform look will take a DIY approach and design their own faceplate to standardize the overall appearance of their synthesizer. With a little time and ingenuity, there is no limit to what you can do to create your own highly personalized electronic instrument. **EM**

Gino Robair is a senior editor at EM. Special thanks to Tim and Tom Duff, Analogue Haven, and Big City Music for their help with this article.

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