

# Vertigo Sound VSE-2

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In the 10 years since Munich-based Vertigo Sound launched their dual-channel VSC-2 Quad Compressor, the company have forged an enviable reputation for delivering beautifully built, high-end hardware devices which combine modern circuit design and technology with the highly desirable sonic characteristics of vintage classics. The VSC-2 (reviewed in *SOS* November 2012: <http://sosm.ag/vertigo-vsc2>) took its inspiration from the best VCA compressors of the 1970s and '80s; the VSP-2 dual-channel mic preamp (*SOS* June 2014: <http://sosm.ag/vertigo-vsp2>) harked back to one the most highly regarded mic preamps of the same era; and now, with the dual-mono VSE-2 Gyrator Equaliser, they've turned their attention to an EQ circuit topology first developed in the 1970s.

## Why Gyrate?

First proposed in 1948 by Bernard Tellegen (as a hypothetical fifth linear element after the resistor, capacitor, inductor and ideal transformer), a gyrator is essentially an active two-terminal device that inverts the current-voltage characteristic of an electrical component. Thus a gyrator can transform a capacitor into an inductor, so it can be used to replace the inductor in an LRC (inductor,

## Dual-channel Gyrator EQ

Vertigo's classy new equaliser draws on some intriguing design ideas from the 1970s.

capacitor and resistor) filter circuit. In fact, gyrators are sometimes referred to as 'simulated inductors', but that can be undeservedly faint praise because a gyrator is actually capable of producing more desirable results than the coil of wire wound around a metal core that makes up an inductor.

One of the attractions of an LRC filter is that its Q increases as the level of cut or boost are increased. Since Q and bandwidth have an inverse relationship, the bandwidth narrows as the amount of cut or boost is increased — the cut or boost becomes more focussed on the centre frequency, reducing the effect on the frequencies on either side. By the same token, decreasing the amount of cut or boost widens the bandwidth, reducing the focus on the centre frequency and increasing the effect on adjacent frequencies. This characteristic, often referred to as 'proportional Q', applies to LRC filters whether they employ a real inductor or a gyrator.

The solid-state gyrator, then, has the potential to solve the inductor's major drawbacks, namely its size and weight, its susceptibility to stray electromagnetic fields, and its cost. However, as with

transformers, the non-linearities inherent in the materials and construction of a physical inductor can play a major role in the sonic character of an EQ, and removing those via the use of a gyrator can, in some cases, mean throwing the proverbial baby out with the bath water...

## Outside In

As with all the Vertigo Sound products I've encountered, the VSE-2 is superbly built. Its hefty 3U 19-inch rackmount steel chassis extends rearwards quite significantly, and it's fronted by a thick, beautifully finished red panel with silvered detailing and legends. The VSE-2's dual-mono operation is reflected in the two identical functional areas that together occupy almost the entirety of the fascia, leaving just enough room for the orange and silver Vertigo logo on the left and for the unit's main power switch and indicator light on the right.

The control layouts for each channel are identical. An upper row of three large rotary switches set the levels of cut or boost in the low-frequency, mid-frequency and high-frequency bands. Other than the maximum  $\pm 8$ dB positions, no level information is given — although the



manual tells us that the intermediate steps are  $\pm 1$ ,  $\pm 2$ ,  $\pm 3.5$  and  $\pm 5.5$  dB. A corresponding lower row of rotary switches selects the centre frequency in each band. In a playful visual touch, the 18 possible frequencies (see the 'Freq Scene' box) are laid out in the form of a sinusoidal wave that seemed to me to make it easier to recognise what frequencies were in use in each band. The initials AIR stand for 'All Impedance Resonance', and this final position,

**"Maintaining a proportional-Q peaking response at 40Hz and 16kHz gives, in practice, virtually the same audible result as a shelving EQ at those frequencies."**

centred on 16kHz, allows you to add a sense of 'air' to proceedings.

The upper-right corner of each area is occupied by a switchable high-pass filter that's continuously variable between 10 and 400 Hz, and beneath this sits its indicator LED and in/out toggle switch. In the bottom right-hand corner a red clip LED lies to the left of a similar switch-and-indicator combination that toggles the EQ in and out of hard bypass.

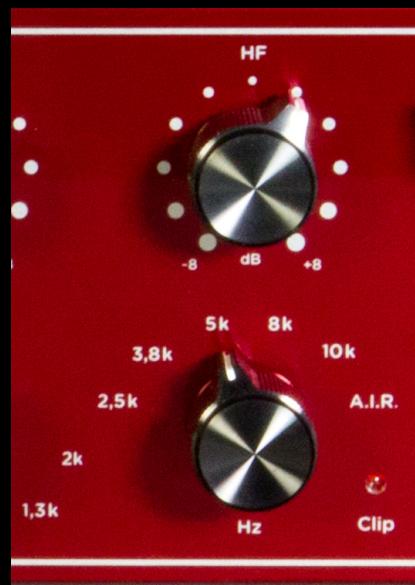
The XLR connectors of the transformer-balanced inputs and electronically balanced outputs lie on the rear panel, along with the fused IEC mains socket. The review unit's 230V AC operating voltage was printed on the rear panel, and I've found no indication of any other available alternative, even though removing the top cover reveals that selecting 110V operation is simply a matter of flipping an internal switch

(I imagine that will be the default setting for units sold in the USA and Canada, but it would be worth checking!).

Removing the top cover reveals a similarly high build quality inside, with top-flight, full-size components and evidence of exceptional attention to detail. Each channel's audio circuitry is carried on separate PCBs: a single I/O board, a stacked twin-board assembly that contains the gyrator itself, and a much smaller board, on which sit the

high-pass filter frequency control and its connector header. A second small header board sits on the back of the channel's XLR connectors. Finally, a seventh board, separated from the audio boards by as large a distance as possible inside the case, is where you'll find the VSE-2's toroidal transformer-based power supply. Multi-way cables, crossing at precise right-angles, form the board-to-board interconnects.

The major physical features of the two channel I/O boards are their Jensen JT-11P-1TB line-level input balancing transformers, Vertigo's proprietary 1976 package of twin, discrete, bipolar op-amps, and the 1646 ICs that drive and electronically balance the channel outputs. The two-storey gyrator boards carry the resistor ladders of the three gain controls on their upper floors, whilst the lower floors are home not only to



The HF band includes an AIR setting at 16kHz, which appears to function a little more like a harmonic enhancer than an EQ.

the bands' frequency selectors, but also to Vertigo's 1972 proprietary discrete triple-gyrator package. The 1972 triple gyrator utilises the discrete twin op-amp from the 1976, one side of which handles cut duties, whilst the other takes care of boosts. The 1972's three gyrator circuits each handle one frequency band and are connected in parallel to each other, in order to minimise phase differences.

In the VSE-2, the maximum gain range for each frequency band is restricted to  $\pm 8$ dB, in order to reduce the overlap between adjacent frequencies that occurs as the filter's bandwidth widens at low levels of cut or boost. Had the gain range been extended to, say,

»



## Vertigo Sound VSE-2 £4620

### PROS

- Superb audio performance.
- It's not only a great EQ, but it can also add weight, warmth and sheen.
- Good value for the capabilities that it possesses.

### CONS

- If you can afford it, then there are none!

### SUMMARY

The Vertigo Sound VSE-2 is a superb equaliser that is capable of enhancing any signal running through it and that delivers a stunning level of performance at a price point commensurate with its capabilities.

The review model came configured for UK/EU mains voltage, but an internal jumper allows this to be switched to 110V.



» ±15dB, the change in filter bandwidth and the area of overlap with adjacent bands at lower boosts would have been correspondingly greater.

The VSE-2's features and quoted specifications add up to a very impressive package overall: a frequency response of 10Hz-80kHz (±3dB); 122dB of dynamic range; a signal-to-noise ratio of 105dB (20Hz-20kHz unweighted RMS @ +6dBu); a noise figure of -99dBu (20Hz-22kHz unweighted RMS @ unity gain); and a crosstalk value between channels of under -100dB.

### In Use

With no physical metering other than the clip LED that indicates +22dBu at the output, the VSE-2 is one of those units where your best meters are your ears. In addition to the expected sense of warm richness you'd expect of transformer-balanced inputs — especially when you start to push the levels — the VSE-2's gyrator circuits have been designed to produce what Vertigo describe as "tube-like" distortion when being driven hard with high levels of EQ boost. The unit's specifications give a figure of one percent distortion at +24dBu that, presumably, is going to be mostly centred on the boosted frequencies, making the VSE-2 more a source of colour, rather than a distortion device.

Running a wide range of material through the VSE-2 revealed a clear and

extremely articulate overall sound that, by simply increasing input levels, can be persuaded to reveal more and more of its potential tube-like character. Spending time experimenting with input levels, EQ boost/cut and the cut-off frequency of the high-pass filter to find the EQ profile and the level of coloration that suited the track best was more than worthwhile. Making a note of these settings gave me a reference point I could return to if I later became a little heavy-handed with EQ.

The VSE-2's EQ is more gentle and smooth than in-your-face. In fact it just doesn't do hard and aggressive, no matter what level is being forced into it. There's an extremely 'organic' feel to the sound, and a seeming ability to enhance the area of the audio spectrum you're boosting, while somehow bringing increased clarity to the area that's being cut. It's an EQ that starts by applying quite a broad brush to the sound, and although its response sharpens up and focuses on the chosen frequencies as boost and cut levels increase, it's never going to reach the precision of a multi-band parametric EQ or a 31-band, constant-Q graphic equaliser.

All this makes using the VSE-2 extremely intuitive. Once you've identified the areas that need to be worked on, it's just a matter of dialling in the levels of cut and boost that feel right. Simply because it sounds so good, I did catch myself applying more boost than was actually required over the 5-10 kHz range. To be fair, the VSE-2's manual warned that I might do this, so I followed

its suggestion of increasing the level of the AIR mode rather than boosting 10kHz — and in most cases this produced subjectively better results. From the manual's description of the AIR mode as "pushing artifacts and higher distortion products rather than primarily processing the original signal", it seems to me that what's going on here is more akin to harmonic enhancement than a simple 16kHz EQ band.

Speaking of frequencies, unlike other two-thirds-octave (16-band) equalisers of my acquaintance, the VSE-2 deviates in places from the geometric ISO 266 series of preferred frequencies (see box). Taking out the highest (20kHz) and the two lowest (20Hz and 40Hz) ISO frequencies results in six (rather than five) frequencies per band, all of which correspond exactly, or at least reasonably well, with their equivalents on the ISO third-octave preferred list. I was very happy with the frequencies chosen by Vertigo Sound, and I especially appreciated the increased frequency choices in the 40Hz to 2kHz range compared with

### Freq Scene

Here's how the ISO 266 third- and two-third-octave frequencies compare with those of the VSE-2. (All figures are in Hertz, with 'k' denoting kilohertz).

#### ISO 266: 2/3 Octave

**Low:** 20, 31.5, 50, 80, 125, 200,  
**Mid:** 315, 500, 800, 1.25k, 2k,  
**High:** 3.15k, 5, 8k, 12.5k, 20k

#### VSE-2

**Low:** 40, 60, 80, 120, 160, 240  
**Mid:** 315, 480, 640, 1.0k, 1.3k, 2k  
**High:** 2.5k, 3.8k, 5.0k, 8.0k, 10.0k plus A.I.R (16k)

#### ISO 266: 1/3 Octave

**Low:** 12.5, 16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250  
**Mid:** 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k  
**High:** 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k, 20k

### Alternatives

At this price and performance level, you're probably also going to be looking at alternatives such as **Chandler's TG12345 Curve Bender**, **Great River's MAQ-2NV**, **GML's 8200** five-band stereo parametric EQ, **Manley's Massive Passive** and the **Pultec EQM-153** mastering EQ.

the ISO-based lineup available on my elderly, and recently retired, 16-band stereo graphic EQ.

Another interesting aspect of the VSE-2 is the absence of a shelving EQ at either end of the frequency spectrum. Vertigo Sound consider that shelving EQ can add too much energy to the signal thus reducing system headroom, and that maintaining a proportional-Q peaking response at 40Hz and 16kHz gives, in practice, virtually the same audible result as a shelving EQ at those frequencies, since the 'furthest away' side of their respective bell curves sit in the less-audible areas of the audio spectrum.

### Conclusion

Without doubt, the Vertigo Sound VSE-2 is a superb equaliser. It looks beautiful and, used judiciously, it's capable of delivering results of the highest quality, and of adding shape, warmth, depth and a quite seductive sheen to a track, bus or mix. Although Vertigo Sound state that the standard VSE-2 is suited to mastering duties (they're perfectly correct to say

## Graphic Detail

There's a footnote to be added to the history of the proportional-Q LRC filter. Although, at least in my personal opinion, an LRC filter really benefits the sound of a three- or four-band EQ, it became a real liability in multiband units, such as graphic equalisers designed for room equalisation and sound system tuning. What's needed for those applications are tight bands, with no interaction between them. The first true graphic EQs arrived circa 1963 in the shape of Cinema Engineering's six-band Type 7080, and Langevin's seven-band Model EQ-252-A, both of which were proportional-Q units.

Although API had designed a proportional-Q 10-band graphic EQ in 1967, it wasn't until 1976 that an IC-based circuit, which virtually eliminated interference between adjacent bands, appeared in *National Semiconductor's Audio Handbook*. This new development offered a real alternative to the inductor- and gyrator-based circuits of the day, but its bandwidth performance was not sufficient for third-octave equalisers. It took until the early '80s for 31-band graphics with 'constant-Q' characteristics to appear, and more or less relegate inductors and gyrators to the EQ history books.

so), they also produce a variant designed specifically for that purpose; available to order at no extra cost, which gives  $\pm 5$ dB of boost/cut in 1dB steps.

The VSE-2 costs an eye-watering amount for those of us with modest fiscal horizons, but that's hardly a surprise given what it's capable of sonically. Yet, when compared with what's out there in its own price/performance bracket, the price of the VSE-2 isn't actually uncompetitive.

If you're fortunate enough to be able to afford and justify the purchase of a VSE-2, I'd urge you to audition it without delay. The rest of us must content ourselves with dreaming... **///**

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