

Focusrite VRM Box

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Many people who record in home project studios or work in the field monitor and mix using headphones rather than speakers. Often it's because of cost, both to purchase accurate monitor speakers and in treating the room acoustically so that the monitors will give you the accuracy you paid for. Other times it's a matter of practicality – you're working at night and can't make a lot of noise, or you're recording a live show and have no space to set up even a temporary monitoring environment. Or maybe you're monitoring on speakers and you just want to know how your mix will sound when played over different speakers in a different environment. The traditional way to check how well a mix will “translate” is simply to switch to alternate speakers. Auratones (the 6 inch cube box with a car radio speaker inside) was the alternate monitor of choice throughout the 1970s. Throughout the 1980s and still remarkably popular today, the Yamaha NS-10 became the way to check a mix for good balance in the home listening environment.



What's VRM?

Focusrite's VRM (Virtual Reference Monitoring) technology, first introduced in a DSP-based line computer audio interfaces, is a new approach to evaluating a mix. VRM provides a headphone simulation of a loudspeaker sound, by modeling both the loudspeaker's frequency response and the room's acoustical characteristics. This offers the headphone listener a sense of what the mix will lose or

gain when played through speakers in different listening environments. The process that Focusrite used when developing the VRM models began with a data set from an MIT (Massachusetts Institute of Technology) research project. Using a dummy head equipped with omnidirectional microphone “ears,” the impulse response of a loudspeaker in an anechoic chamber was recorded and analyzed. Focusrite extended this anechoic data to incorporate room reflections, distance cues, and frequency response and radiation patterns of various loudspeakers. Using this expanded data set, they developed the VRM modeling process, providing a believable representation on headphones of the sound of mix played through a loudspeaker in a room.

Rather than expounding further here on the details of the modeling process, check out this informative but not highly technical on-line audio lecture (about 11 minutes long) at:

<http://soundcloud.com/focusrite/vrm-podcast>

Listen to it with good headphones to get the full benefit of the aural examples. For a more in-depth study, download the AES convention paper by Ben Supper, the principal designer of the VRM process, on creating a credible loudspeaker sound through headphones:

http://www.focusrite.com/support/download/characterising_studio_monitor_loudspeaker_for_auralization/982

The Box

The VRM Box is simplicity in itself, a box about 2-1/2 inches square by an inch high. It's light enough to carry easily, but beefy enough not to slide around on the table in use. A large volume control knob dominates the top surface, with a single green LED that blinks a few times when first connected to the computer by a USB cable, then indicates when VRM processing is engaged. One edge of the box has a 1/4" stereo headphone jack, the opposite edge has the full sized USB connector and an RCA phono jack for S/PDIF digital input. More about that later. For the terminally paranoid, there's a slot for chaining it to your desk with a Kensington laptop locking cable. A USB cable is supplied, though given that it's intended to be used with headphones, including an adapter for a 1/8" phone plug would have been nice. You probably have one lying around somewhere, so start looking for it.

There's software, of course, and as usual there was a newer version on the Focusrite web site than what was on the CD in the box. The CD also includes the 6 page user guide in English, French, and German. Without the software installed, the VRM Box is a class-compliant USB-input, bus-powered headphone amplifier, clean and with adequate but not ear-splitting volume. The software incorporates an ASIO driver as well as the DSP model. It requires Windows XP Service Pack 3, Vista, or Windows 7 or Mac, OS-X 10.5 (Leopard, Intel only, not PPC) or OS-X 10.6 (Snow Leopard). I did all my testing using Windows XP. Using the downloaded installer file, software installation went smoothly. Once the software is installed, clicking on a desktop icon brings up the VRM Box control panel where you select among the various speaker and room combinations and switch the speaker simulation on and off.

VRM was first incorporated in the Focusrite Pro24 DSP audio interface where it runs on an internal DSP chip, whereas with the VRM Box, the processing model

runs on the host computer. Like all USB devices, the box puts a load on the CPU, which increases a bit when the VRM processor is engaged. The Windows load meter bounced up about 10% when connecting the VRM Box and about another 10% with the modeling engaged. It didn't cause any problems when playing a 14 track mix, which was about as hard as I worked it during this tryout.

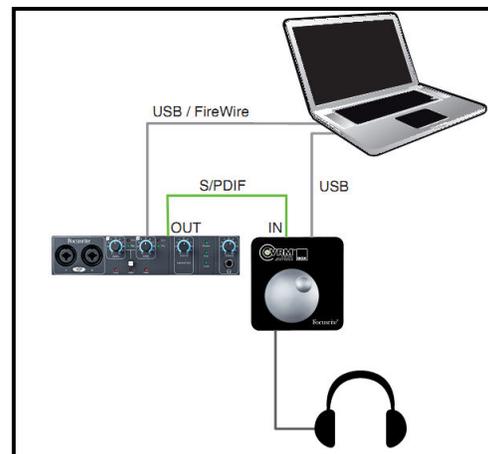
The VRM Box driver takes the output of the DAW, sends it back to the CPU where it's processed by the modeling program, and then it comes back to the Box's headphone jack. All of that takes some time. It's of no consequence when simply playing back a mix, there's maybe a tenth of a second additional delay between when you press the Play button to when you hear the playback, but when integrated into the tracking environment, you'll find that monitor latency is excessive. Your mileage, as always, will vary.

As a class-compliant device, the VRM Box is limited to 44.1 and 48 kHz sample rates. No mention is made of bit depth in the specs, though it has no problem playing 24-bit files.

Connections

Just plug it into a USB port, plug in a set of headphones, make sure that your computer's audio playback system knows to send its output to the VRM box, and that's it. This is its normal playback-only mode, but if you want to listen through the VRM Box when tracking or when recording a live show, connections can get more complicated. Since this is a playback-only device, your recording (input) hardware must also be available to the computer. On a Mac, you can (at least in theory – I didn't verify this) use the Leopard or Snow Leopard Core Audio setup to create an aggregate audio device consisting of the VRM box and your standard I/O device, assigning playback chores to the VRM box. On a PC, it's a little trickier since Windows allows only one ASIO driver to be running at a time, and no recording device exists (yet, anyway) that shares the VRM Box's ASIO driver. While most audio I/O devices (including the VRM Box) offer a WDM driver, this may not be the best route to glitch-free and low-latency multitrack recording. I was able to set up Reaper using my Lynx L22 for recording (input) and the VRM Box for playback (output) by selecting the WDM drivers for each, but Sound Forge 9 wouldn't let me do the same thing.

The S/PDIF port may help when using the VRM Box in conjunction with a conventional audio I/O device or sound card, and I believe this is why it was



provided. If your recording interface is equipped with a an S/PDIF output, this can be connected to the VRM Box's S/PDIF input. With this setup, your primary audio interface remains the DAW's input and output device, but with its S/PDIF routed through the VRM Box, the VRM-processed mix appears at the Box's headphone output. The S/PDIF input can accept sample rates from 32 to 192 kHz, which is automatically down-sampled in the VRM box to match up with the processing software. Since the VRM box gets its power through the USB port, it's still necessary to connect it to the computer even to use only as a headphone amplifier. When the VRM Box detects an incoming S/PDIF data stream, the S/PDIF input takes over and the VRM Box no longer appears to the computer as a USB audio device.

Controls

Other than the volume knob on the top of the box, all control is via a software control panel. This gets installed along with the driver and pops up when you click its desktop icon. Clicking the bulls eye in the center of the VRM logo at the bottom left toggles the processing on or off (green is on).



(green is on). The listening environment is selected by one of the three radio buttons in the center. The picture changes to go along with the selected room. To the right is a pull-down window for selecting the speaker. Not every speaker model is available in every environment, but most are. Some of the speakers have their actual names (Focusrite must have obtained permission to use trademarks since the Pro24 DSP version, where all of the names are generic),



however they keep no secrets. The manual or a table on the web site gives you a detailed description, including the make and model, of the speakers used in developing the processing model.

You actually don't have to look that far, however. Clicking on the Info [i] button below the speaker selection window pops up full details of the currently selected model (for example "Japanese White Classic" is the Yamaha NS-10) including room dimensions and speaker location relative to the listener. One difference between the Pro24 DSP and VRM Box models is that the Pro24 room models offer a choice of listener positions, both front to back and off center, while in the VRM Box version, the position of the listener is fixed on center. The speaker spacing and listener distance is such that the listener and speakers are at the usually recommended vertices of an equilateral triangle.

The modeling process, because it adds room reverberation and nodal effects (reinforcement or cancellation due to reflections from the walls and ceiling), requires a little headroom in order to operate. This is the reason for the 0 dB and -6 dB buttons in the lower right section of the control panel. If you're playing a mix that peaks at or very near 0 dBFS, you'll probably hear clipping with the processing engaged. Clicking the -6 dB button adds 6 dB of digital attenuation, giving the modeling software some breathing room.

The tiny lock icon  in the lower right corner indicates, when the lock is closed, that the S/PDIF input is active. This is pretty difficult to see at a glance, but if you've plugged a cable into the S/PDIF jack, you'll know it, though a virtual LED would have been clearer.

The driver remembers the VRM Box's last setting. If it was set for the Genelec 1031A in the living room and modeling was turned on when you last used it, the next time you plug it into that computer, it will come up in the same state whether or not the control panel is open. If you use the VRM Box on more than one computer, keep this in mind. It may start up differently on the studio computer than on the laptop you used on the remote gig.

It's necessary to pop up the control panel to switch the modeling on and off since there's no bypass button on the box itself. Given that the modeling software runs on the computer rather than on dedicated DSP hardware, it seems like a logical extension to offer it in a DAW plug-in format so that it could be operated from within the DAW program.

In Use

Here's the part you're all waiting for (I know some of you probably jumped ahead to this section). I'll admit to viewing the VRM technology with some skepticism after a quick listen at a NAMM show when it was first introduced. It didn't impress me as sounding like loudspeakers in a room, but I understood its intent. I tend to avoid reviewing products that require being objective about things as subjective as sound quality since one man's "blows everything else away" is another man's

“sucks.” But the VRM Box, although it’s all about subjective sound, is different from reporting on a loudspeaker, microphone, or preamp. It’s a signal processor, and I thought it would be interesting to see what I could learn from listening to what it does.

I’ll tell you right up front that the VRM won’t turn your \$3 ear buds or even \$300 headphones into \$3,000 monitors set up properly in well designed control room. What you hear when the VRM models are applied to a mix depends, as might be expected, on the quality of your headphones. I used Sony 7506 and Fostex T-20 headphones for this review, and I always preferred the Fostex to the Sony when listening to the VRM models. I didn’t bother with my \$3 earbuds and neither should you. You need good quality headphones, the flatter the better. Headphones with intentional (or not) coloration like bass boost or mid-range presence peak will substantially reduce the reality of the models. You’re probably looking at \$100 - \$150 headphones at minimum, and good headphones will always be useful.

But what you hear also depends greatly on the source material and how the mix is constructed. Your degree of success also depends on your expectations and how you use the VRM Box. Well recorded and well mastered commercial studio recordings provide a good example of what the VRM Box does best. With a good mix, it gives a good representation of what that mix will sound like over different speakers. MP3 files downloaded from the Internet universally sound dreadful, as do streaming netcasts, perhaps a result of having two perceptual-based processes working in series.

While Focusrite, in their marketing material, suggests that the VRM Box is a mixing tool, they don’t come right out and say that you should mix with the processor engaged full time. Remember that the “R” in VRM stands for “Reference.” So how and when should you use it? I found it most informative when listening to a completed mix with various simulated environments and perhaps make small changes to fix a standout problem in a particular simulation. It’s a substitute for not having a bunch of different speakers on which to check your mix. I found it distracting to try to construct a mix with the VRM engaged.

The VRM Box did what I expected when listening to finished or nearly finished mixes. It’s a little easier to verbalize what it does by looking at it in reverse. When listening to a stereo mix with headphones, you don’t hear any of the right channel in your left ear and vice versa, so until you learn how to adjust to this ear-to-ear isolation, there’s a tendency to pan things closer to the center than you would if you were listening on speakers. When you put that headphone mix through speakers, what you thought was a nice wide spread becomes more like centered mono. Also, we tend to be more perceptive of artificial reverberation when we don’t have room cues. What sounds like just the right amount of reverb in the headphones is nearly lost when played through the speakers. While the restricted frequency response of some of the modeled speakers is clearly

evident, narrowing of the stereo image and exaggerated reverberation are the most noticeable effects when switching VRM on and off.

Most of the recording that I do these days is live; real musicians playing real instruments together in the same room, mostly acoustic. I don't do many projects in which a song is built up track by track through overdubbing. With a live recording, there's often a substantial amount of ambient sound as well as leakage between mics, and the VRM's model tends to exaggerate the ambience. This causes the processed headphone mix to sound muddier than it does when played through speakers. It sounds a lot like listening to a stereo mic placed too far away from the speakers, in a too-live room. Live recordings that sound fine in multiple listening environments sounded very unreal through the VRM box. I observed this with a mix (made on speakers) of a multitrack PA capture of a Celtic folk band with drums and electric bass, as well as with a contemporary classical string ensemble recorded in a decent sounding auditorium using a single X-Y stereo mic setup.

Since I had the Celtic band tracks handy, I tried mixing them using headphones, with the VRM Box simulating Genelec 1031A speakers in a professional studio. It was a miserable failure. Nothing I did sounded good in the phones with the VRM processing engaged, and the best I could do sounded even worse when played through speakers. Based on this failed experiment, I wouldn't find the VRM Box useful on a live gig, with the expectation of getting a better recording mix than with unprocessed headphones.

But there are some pretty smart folks at Focusrite, and they must have some better reasons for developing this modeling technology than to get an AES paper out of it, so I continued to experiment. I recorded a few fairly dry, close-miked tracks of me playing guitar, mandolin, and singing a couple of parts. When I tried mixing those tracks while listening through the VRM Box (again using the studio/Genelec setup) I got pretty good results and it came close to giving the sense of mixing on speakers. If I was recording a demo in a hotel room and had to mix it on the spot, I might get some benefit of using the VRM Box in the headphone path when mixing, though not when tracking.

This semi-success suggests that if the VRM Box would probably work well for mixing a project consisting of tracks that never saw a microphone or a room. Since there's a whole genre of pop music today that's based largely or entirely on pre-recorded loops, samples, and virtual instruments, this sort of project might be the best application for the VRM box. And there are a whole lot of people creating music like this today, most of them working in small personal studios.

It's worth noting that the human brain is a very powerful acoustic processor. While we need cues from reflections in order to locate a sound in space, after a short while in an excessively reverberant environment, the brain tends to suppress some of the reverberation and we can hear fairly normally. Once you

got accustomed to listening to the VRM sound, (it takes about five minutes before your brain accepts the processed information), it could at least make mixing on headphones a little more fun by adding some realism.

A couple of more passing thoughts here. Listening with the VRM box is a good test of how well mastered a project is. If it sounds reasonable using the living room with Hi Fi speakers, the TV set, and the computer speaker simulations, it's a good mastering job. If there's insufficient stereo separation or you hear too much room sound, you have some more work to do. However, these days it's also important to have a mix that sounds good on earphones (dare I say \$3 earbuds?) since that's such a common listening environment.

One modeled listening environment conspicuous by its absence (and it's missing on the DSP version of VRM as well) is the automobile. Back when every studio had Auratone™ speakers on top of the console, some also had a low power FM transmitter connected to the console's monitor bus so clients could go out to the parking lot and listen to a mix on their car radio. Some even had an Optimod™ (broadcast loudness enhancer) between the console and the transmitter to simulate what happens to the mix when it goes through a radio station's processing. I think that this is still an important place to check a mix. Perhaps since automotive sound systems vary so widely, it wasn't possible to come up with one or two models that cover that territory, so don't forget to check your mix at least in your own car when preparing it for distribution.

I was curious enough about what the modeling process was doing that I attempted to generate some plots to include with this review. I tried FFT (Fast Fourier Transform), RTA (real time analysis) and even a couple of programs that produce "waterfall" plots. Whatever I tried, I couldn't get graphic results from the VRM Box output that were consistent with what I heard, so I don't have any cool plots to relate to the operation.

Conclusions

Though I was skeptical at first, the VRM Box isn't about snake oil or gimmickry. Given the right input (a good mix), the VRM Box does indeed give the sense of listening to actual speakers. But with certain material that sounds fine through speakers, that simulation isn't very realistic, and sometimes gets downright ugly. Be sure to park your ego at the door when you first listen to your mixes through the VRM box. It can be elating or deflating. I think its greatest value is in assessing the translatability of a mix to other speakers and listening environments, though if you must mix through headphones and have a set of really cans, it might be worth a try.

Quick Facts and Observations



- Good quality headphone amplifier, particularly compared to the output of most laptop computers
- Simple, straightforward operation
- Small, lightweight, easy to pack along for field work
- Provides a somewhat useful speaker listening experience



- Really intended for playback only, not easily integrated into a record/playback workflow.
- Eats up some computer power
- No bypass switch on the box
- Provides a somewhat useful speaker listening experience

Street price: \$100

Further Information at: <http://www.focusrite.com/vrm/>

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