



REVEL CONCERTA2 M16

LOUDSPEAKERS

One of the trickiest ongoing problems for any speaker designer is not so much getting the speakers they design to sound good—though that can be pretty tricky!—as making sure that they don't sound so good that they cannibalise the sales of higher-priced models in the company's own speaker range.

That's certainly a problem that Revel Concerta2 M16's designer Mark Glazer would have faced when he was updating the original Concerta Series to Concerta2 status, because he wouldn't have wanted to take sales away from the similar—but higher-priced—Revel Performa3 M105s. Yet at the same time it was also his job to make the Concerta2 M16s better-sounding, better-performing speakers than similarly-priced models from Revel's competitors of which, at this popular and affordable price point, it must be said that there are a good many... and then some!

I was intrigued to see how he'd managed, as I am sure you will be too, so read on, and you'll find out how well he fared!

THE EQUIPMENT

The 25mm aluminium dome tweeter in the Concerta2 M16 has a wave guide that has a large gently bending radius at its exit and an acoustic lens in front of its dome. The waveguide is to help with directivity, so the tweeter's dispersion pattern is more closely matched to that of the bass/midrange driver, but in the Concerta2 M16 design it also gives an increase in output at the crossover frequency. The acoustic lens gives the tweeter's high-frequency response a little more level and extension. Tweeters with hard domes sometimes have resonances in their pass-band, but Revel has avoided this by designing the tweeter so there's a large cavity, vented around its perimeter, behind the magnetic assembly, and a highly compliant diaphragm surround. These two design tricks drop the resonance frequency down an octave, so it's lower than the crossover frequency and thus

out of the pass-band. To be precise with the frequencies, that of the resonance is 800Hz and that of the crossover is 2,100Hz.

The 165mm bass/midrange driver in the Concerta2 M16 has an MMC (Micro-Ceramic Composite) cone in which a layer of aluminium has been coated on both sides with a ceramic material with a very high Young's Modulus. This 'sandwich' construction results in a very stiff cone but one that's internally damped due to the differences in the speed of sound through the different materials. Revel claims that in a cone of this size, the MCC material delivers superior performance to ordinary metal, paper and aramid fibre (Kevlar) cones. Although Revel rates the Concerta2 M16's cone with a diameter of 165mm, the moving diameter is only 142mm and the diameter of the cone is just 122mm. The Thiele/Small diameter, which is the important one, is 133mm, giving an effective cone area (Sd) of 140cm². Because the Revel Concerta2 M16 is a bass-reflex design, it has a port (not obvious in the photograph because it's on the rear panel).

Look carefully at this port and you'll see that it's not a 'standard' port, because it's made using what Revel calls a 'Constant Pressure Gradient Design' where the inner wall of the port is contoured so that the pressure gradient, or the change in pressure along the longitudinal axis of the port, remains constant along its length. This design reduces the chance of any unwanted noise from air movement through the port, improves airflow through the port (effectively increasing

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its output) and reduces distortion. Essentially, instead of the port being a tube with a constant diameter and a small rounding at either end, like most bass reflex ports, the port is only tubular at its centre, with the diameter of the port increasing quite dramatically as it approaches either end before finishing with a small rounding at either end. Revel's parent company, Harman International Industries (though Harman is itself now owned by Samsung) was granted a US patent on this design.

What *should* be obvious from our photograph is that the side walls of the Revel Concerta2 M16 are curved. This is a well-known technique for reducing the viability of standing waves and resonances inside the cabinet. It also enables the front baffle to be narrower than it would otherwise be, which improves dispersion and reduces unwanted baffle reflections. Revel achieves these curves by using the even better-known woodworking technique called 'kerf cutting', kerf bending or just plain old 'kerfing', where dozens of channels are cut into the MDF that's used to form the cabinet walls, which allows an otherwise flat piece of wood to be bent. (Look inside an acoustic guitar through the sound hole and you're very likely to see an example of kerf bending.) Whereas many manufacturers don't bother dressing the side of the MDF that's been kerfed, Revel does: It adds another piece of wood that's thin enough to follow the curve, because it says that doing this adds strength to the finished cabinet. Further strength is provided by internal bracing.

The speaker terminals on the rear of the cabinet (two gold-plated multi-way types) are contained on a small plastic fitting that's just small enough to make it fiddly to try to

tighten the posts using your fingers. Whereas many manufacturers of two-way designs mount the crossover network on the rear of the speaker terminal plate, the Concerta2 M16's crossover network is 'way too big to do that, so Revel has fixed it to the inside of the base of the speaker. The nine-element, high-order network is comprised of four inductors, one of which is air-cored, and three of which are cross-mounted so there can be no interaction between them, while

the two that are parallel are at opposite ends of the PCB (far apart enough for there to be no magnetic interaction between them). The circuit is completed by three capacitors (two bipolar electrolytic and one metallised polyester) and two cermet resistors (one five-watt,

one ten-watt), all of which are mounted on a single PCB. This network includes compensation for the free-space to half-space 'bump' that can occur in bookshelf speakers at low frequencies. The exterior of the cabinet of our Revel Concerta2 M16 was finished in high-gloss piano black paint, but you can also have a high-gloss white painted finish. Each cabinet measures 375×219×274mm (HWD) and weighs 7.3kg.

IN USE AND LISTENING SESSIONS

Although, due to their size, they're usually classified as 'bookshelf' loudspeakers, all so-called 'bookshelf' speakers will deliver better performance when placed on stands, so 'stand-mount' is probably the better term to describe them. The problem is that the money you spend on stands would probably produce better returns if invested in the speakers themselves, so that assuming you have exactly the same amount to spend, you'd be better advised to purchase a more expensive pair of floor-standing loudspeakers than a pair of lower-cost speakers plus a pair of stands. That said, if you only have a finite amount to spend, but you need some sound straight away, you could buy a pair of stand-mount speakers with the money from one year's tax return and use them on bookshelves for a year then use the money from the following year's tax return to buy a pair of stands. Of course I haven't factored in the partner acceptance factor here at all, and there's no doubt that a small pair of stand-mount speakers on nice slim stands looks far more 'presentable' in a nicely-furnished room than a pair of floor-standers.

For this review I did use the Revel Concerta2 M16s on stands, where they performed the best, but for the record they also spent a brief time on bookshelves in my home office, either side of my computer, and my experience was such that if you'd prefer to use the Concerta2 M16s on bookshelves (or any other surface), they'll return absolutely outstanding sound... perhaps not quite as good as if you'd mounted them on stands, but close... very close.

One big advantage of small speakers on stands is that they're really easy to move back and forwards, so if you want the midrange to be as accurate as possible and the stereo imaging to be at its best, and you don't mind missing out on a bit of deep bass, you can move the speakers out into the room a little, further away from rear and side walls. And when you'd prefer to maximise your bass response, you can move the speakers closer to a rear wall. Of course possibly a better way to maximise your bass response would be to add a subwoofer, in which case the best match for the Concerta2 M16s would be a Revel B10.

Often when I first connect a pair of speakers for review one particular aspect of their performance will become immediately obvious right from the very first track I play, but in the case of the Revel Concerta2 M16s, two aspects of their performance immediately grabbed my attention. The first was the incredible plausibility of the sound-stage they presented: The performers just 'appeared' in a three-dimensional space before me, and one



that was not constrained to the boundaries of the speakers' physical locations in the room—I could hear instruments further to the left and right of those positions, and the stage had depth as well, with sounds appearing to come from the speakers' plane and some appearing to come from behind it. Within the stage, the imaging was pin-point, with performers firmly anchored in position, whether it was stage centre, or offset to stage left or stage right. Yes, I have previously heard loudspeakers that have delivered this high level of imaging, but none that have been selling at the price Revel is asking for its Concerta2 M16s.

The second focus of my attention was the clarity and reality of the midrange sound. As the late, great, Gordon Holt once noted, if you can't get the midrange right, you needn't bother getting anything else right. (OK, he actually said *'if the midrange is not right then nothing else matters'*, but I like my misquote rather better.) Holt was definitely a subjectivist, but even the objectivists take the same line, with no less an authority than loudspeaker researcher Floyd E. Toole saying: *'frequency response is the single most important aspect of the performance of any audio device. If it is wrong, nothing else matters.'* Toole went on to say that getting the frequency response right was only the first step in any speaker design project, and that it was also necessary to get other factors correct, notably directivity, but that's a story that's 'way too long for this review. Significantly Floyd E. Toole, Mark Glazer and Kevin Voecks all worked for Harman at the same time, so you'd assume they were all singing from the same songbook...)

But back to the midrange, and more on the clarity and reality of it. Playing my favourite Lorde album, *'Melodrama'*, always starting at the very first track (*Green Light*) and working through to the closing *Perfect Places* (and then, usually, starting play all over again) and the Revel Concerta2s just renewed my enthusiasm for her work. First, there's the unmistakable sound of her voice itself.

An excellent choice if you want a small pair of high-performance loudspeakers that punch well above their weight



Then there's that underlying piano, chordal at first, with the sound of each sustained chord dying away with a beautifully authentic 'stringiness' before being replaced by another, then when her voice gets layered, with the repeated dying fall of 'liar, liar, liar', then as the kick drum sets the rhythm for the track to develop to the full chorus... the Revel Concerta2s just encouraged me to listen fully into the mix, gaining in appreciation for the musicianship with every passing second. This is the type of performance that defines the word 'musicality'.

The syncopation that typifies the following track, *Sober*, (my other half needles me that this should be my theme song... and not just because I play it so much) is again perfectly reproduced by the Concerta2s: the percussion sounds are crisp, sharp and immediate, the brass sound properly piercing, and the chorus vocals truly eerie. Wait a few tracks and then turn up the volume on *Writer in the Dark* as Lorde reveals the palette of her voice, from pure, to croak, to falsetto to a threatening baritone. Listening to the Concerta2s, absolutely all these different sounds were perfectly pitched, perfectly placed... and perfectly paced. You can also hear the *electronica* perfectly... and maybe wish it could all have been recorded using real instruments. Keeping with the 'L's', I followed on with London Grammar, not least because for mine, Hannah Reid has one of the most gloriously beautiful voices in popular music today. It's truly rare to hear a contralto these days, and even rarer to hear one in pop with Reid's range and training.

Listen carefully to *Rooting For You* (from *Truth is a Beautiful Thing*) and you'll immediately hear what I'm raving about, and you'll be particularly impressed if you're using the Concerta2s to do so. Continue through to *Big Picture* and you'll get a taste of what the Revels can offer in the bass department—bass that's depth and deep, yet bass without overhang and bass that doesn't get in the way of similarly-pitched percussion. Listen to the way the Concerta2s deliver the gradual 'build' of the track without being obvious, and without any 'step-like' action... just a smooth, almost imperceptibly inclined increase in level until the sparkly fade to black.

The 'live' feel the Revel Concerta2s can deliver was for me typified by the authentic sound of the Afro-Cuban All Stars in full swing. Again there's the perfectly paced percussion but this time you get the searing blast of live brass, and if you don't swear it's a real cowbell that's snuck itself into your listening room, I'll be surprised. After you've been listening awhile, be then amazed that despite dozens of different instruments and musical lines, you're hearing every single sound... and I mean *every single sound*... with crystalline clarity, as if each one is etched into the air in front of the speakers. I was listening to a live performance, and in addition to the clarity of the sound, I was amazed by the accuracy of the sound-staging, so that the musicians perfectly positioned in their places on the stage, and the imaging so precise that I could hear the slight differences in the tonal quality of the trumpet sound as the players swept their instruments from side to side.

As you'd expect, you get the full benefit of the imaging—and the maximum stage depth—when you're listening in the 'sweet spot' (which for the Concerta2 M16s is rather larger than usual) but even off-axis the imaging holds up very well.

Although the stereo imaging and the clarity and reality of the midrange sound were the stand-outs for me, the Revel Concerta2s' delivery of the low and high frequencies came in a very close second. I was not expecting truly deep bass from such a small loudspeaker, yet the Concerta2s confounded my expectations by delivering satisfyingly deep bass that was delivered with speed and precision and there was no 'doubling' when I turned up the volume. Bass was certainly sufficiently extended that I still felt the punch from kick drums and the full energy from the lowest strings on both bass guitars and double-bass.

The treble was extended, so I could clearly hear the shimmering sound of a delicately brushed cymbal above the sound of the rest of the kit and the band. I could also hear the 'air' of the venue when playing live recordings.

CONCLUSION

If you're after a small pair of high-performance loudspeakers that punch well above their weight, the Revel Concerta2 M16s would be an excellent choice. \curvearrowright

Hugh Douglas

Readers interested in a full technical appraisal of the performance of the Revel Concerta2 M16 loudspeakers should continue on and read the LABORATORY REPORT published on the following pages. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

CONTACT DETAILS

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- Sonic accuracy
- Spectacular imaging
- Superb midrange



- Wood veneer finishes
- Fiddly rear terminals

LABORATORY TEST REPORT

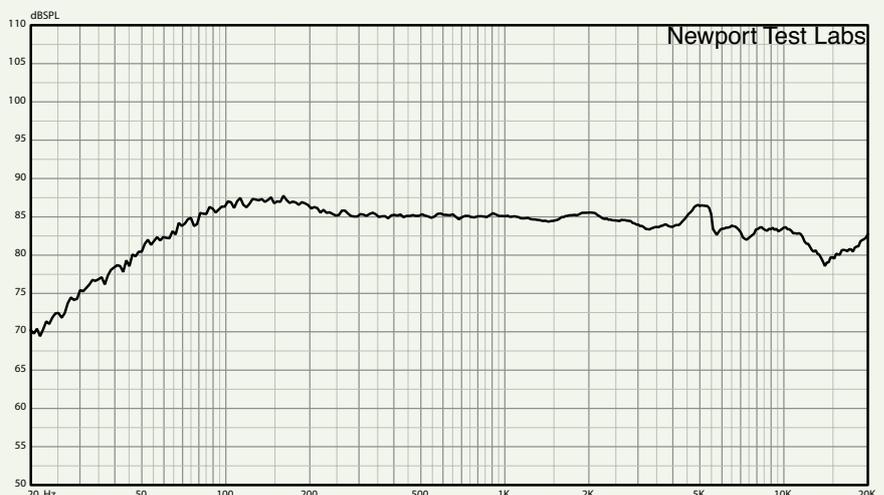
Newport Test Labs measured the frequency response of the Revel Concerta2 M16 speaker as 45Hz to 22kHz ± 4 dB, which is an excellent result and shown in Graph 1. You can see from this graph that the response is particularly flat between 250Hz and 12kHz where, except for one small discrepancy centred at 5kHz, it's essentially within ± 1 dB. Also note that this is a very high-resolution graph without any smoothing—the human ear would actually hear the in-room response that's shown in Graph 5.

In Graph 2, Newport Test Labs has again used a high-resolution measurement technique and also extended the high-frequency limit of the measurement up to 40kHz. The peak at 23kHz is a resonance caused by the use of aluminium as a dome material. Luckily, being at 23kHz it's well above the limit of perception for almost all humans, but even the few that could hear this high a frequency would be unlikely to be able to detect the peak, due to its very high Q. The same could be said for the extremely sharp dip in response that follows immediately after. The tweeter is certainly a hi-res type, as demonstrated by its response extending easily out to 40kHz, and by the look of it, likely far above this frequency.

This graph shows the difference in response between using the Revels with their grilles fitted (red trace) and without. Although there are some minor differences, I doubt they'd be audible, so I'd plump for listening with the grilles on to ensure added physical protection for the drivers.

Low-frequency response is measured by Newport Test Labs using a near-field technique that simulates the response that would be measured if the speaker were in an anechoic chamber, and is shown in Graph 3. You can see the bass/midrange driver starts rolling off at 100Hz to a minimum at 45Hz which is the expected behaviour for a small bass/mid driver in a small-volume bass reflex enclosure. What I didn't quite expect was the performance of the port, which rather than being peaky is instead quite flat, delivering a sustained equal-volume output from around 30Hz up to 70Hz. This would not only contribute to improved bass output, it would also mean the bass from the Concerta2 M16 would sound different to bass from a speaker with a conventional bass reflex alignment.

The impedance of the Revel Concerta2 M16, as measured by Newport Test Labs (Graph 4), shows that the speaker will require your amplifier to deliver adequate current between 120Hz and 270Hz, where the impedance is around 5 Ω or lower, but this won't be a particularly difficult task because the phase (blue trace) is reasonably benign ($\pm 30^\circ$) across this frequency range. Don't skimp on amplifier power and make sure the amplifier you use will comfortably drive 4 Ω loads. The impedance plot is otherwise unremarkable, other than to say there are no cabinet resonances, which is good, and the modulus is constrained between 4.2 Ω and 28 Ω , which is also good.



Graph 1. Frequency response. Trace below 1kHz is the averaged result of nine individual frequency sweeps measured at three metres, with the central grid point on-axis with the tweeter using pink noise test stimulus with capture unsmoothed. This has been manually spliced (at 1kHz) to the gated high-frequency response, an expanded view of which is shown in Graph 2.

The Revel Concerta2 M16 is an excellent design that has been brilliantly executed and, as a result, delivered outstanding performance



The pair matching is outstanding, with the left and right traces so well overlaid that one channel obscures the other across the entire spectrum. This means excellent quality control and suggests that imaging will be outstandingly good with correct speaker placement. It also suggests there will be very little variation between different manufactured samples, which can otherwise be a problem with loudspeaker production processes.

Graph 5 shows the in-room response measured by *Newport Test Labs*, reflecting what you can expect to hear in your own room when listening to the Revel Concerta2 M16s when they are positioned well clear of any rear or side walls. This means that if you do move the speakers closer to one or more boundaries you could reasonably expect increases in both bass extension and level over what's shown here. You can see there's a slight boost in the low-frequency response between 80 and 250Hz, but it's only 2.5dB so more likely to be heard as a warmth rather than a forwardness. As noted previously, the response is then spectacularly flat from 250Hz up to 5.5kHz, after which there's a very shallow roll-off to be around 2.5dB down at 12kHz. The response then continues to roll off to be 3dB down at 16kHz after which it rises again, eventually to that tweeter resonance at 24kHz which is shown on Graph 2. Overall, this is truly excellent performance.

Newport Test Labs measured the efficiency of the Revel Concerta2 M16 as 84.7dB SPL at one metre, (with an input of 2.83V_{eq}) using its standard test procedure, which is more stringent than that used by most manufacturers and a bit 'biased' against small speakers. So it wasn't much of a surprise to find the lab's measurement was somewhat lower than Revel's specification of 86dB SPL, not that

Graph 2. High-frequency response, expanded view, with grille removed (black trace) and with grille in situ (red trace). Test stimulus gated sine. Microphone placed at three metres on-axis with dome tweeter.



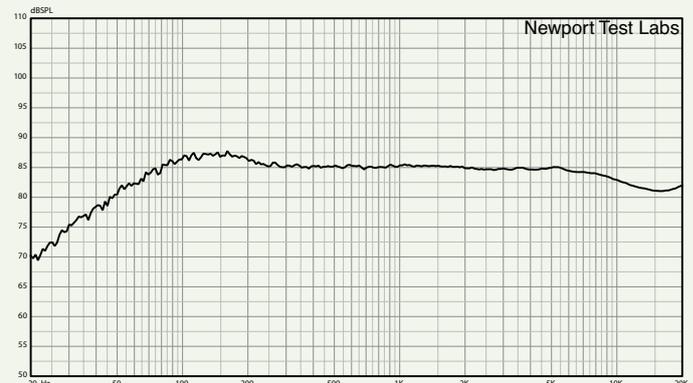
Graph 3. Low frequency response of rear-firing bass reflex port (red trace) and woofer. Nearfield acquisition. Port/woofer levels not compensated for differences in radiating areas.



Graph 4. Impedance modulus of left (black trace) and right (yellow trace) speakers plus phase (blue trace).



Graph 5. In-room averaged frequency response using pink noise test stimulus. Trace is the averaged result of nine individual frequency sweeps measured at three metres, with the central grid point on-axis with the tweeter.



1.3dB is a huge difference! It does mean that in addition to the driving amplifier being able to provide current, it should also be able to deliver voltage, so a high-powered amplifier will definitely deliver better results with the Concerta2 M16 than a low-powered one. The actual power you need will depend on your room's volume and absorbency as well as

your preferred listening levels, but I'd suggest 50-watts as an absolute minimum, even if you only listen at low-to-average levels in a fairly small room. Overall, the Revel Concerta2 M16 is an excellent design that has been brilliantly executed and, as a result, delivered outstanding performance on *Newport Test Labs'* test bench. *— Steve Holding*