

Velodyne CHT-12Q

Subwoofer (DEQ-12R*)



Velodyne obviously intends its CHT-Q Series subwoofers to be used in home theatre applications. This is not mere supposition on my part: it's printed right there on the front of the Owners' Manual: 'Remote Controlled Home Theatre Subwoofers.' However, proving that you can have your cake and eat it too, I found that I would be more than happy to use Velodyne's CHT-12Q in an audiophile-quality home hi-fi system.

The Equipment

Upon opening the packaging, and placing this relatively small subwoofer (and I mean small—it's only 457mm high, 381mm wide and 495mm deep) on the floor, the very first thing I did was remove the front grille, beneath which I found something surprising. No, it wasn't the input for a microphone—I quite expected that. What was unexpected was the slot at the bottom of the front panel. I had been labouring under the impression that all Velodyne's subwoofers used infinite baffle enclosures, yet here was the CHT-12Q with a bass reflex enclosure... though I noted when reading the specifications that Velodyne obviously prefers to call it 'slot-loaded bass reflex.'

I was actually quite pleased about the bass reflex port, because although infinite baffle (sealed) subwoofers have extraordinarily smooth and extended bass, bass reflex subwoofers are far more efficient (because they harness the energy from the rear of the cone that is completely lost in an infinite baffle design) and because I personally think the bass from a reflex enclosure has a little more bottom-end 'punch'—especially on transients—which I particularly like, and therefore I am prepared to trade this against a slight loss of deep bass extension. However, when I did a quick check-up via the miracle of the Internet, it transpired that I was labouring under a mis-impression regarding Velodyne using only infinite baffle, because Velodyne actually has a very large number of subwoofers with bass reflex enclosures...

though it also has an equally large number with infinite baffle enclosures! Indeed this time around it was my turn to be surprised by the sheer number of models Velodyne has in its range—it's quite incredible!

What is also incredible is that the CHT-12Q has Velodyne's auto-equalisation circuitry, which automatically adapts the frequency response of the subwoofer for best results in your room. To use it, all you have to do is position Velodyne's tiny microphone at your usual listening position, using the miniature microphone stand that's also supplied, and plug the other end of the microphone lead into the mini socket on the front panel of the subwoofer that I mentioned earlier (which is so much more sensible than putting the socket on the rear, as was the case with earlier Velodyne subwoofers!). Then—after making sure the CHT-12Q is switched on, all you have to do is press the 'EQ' button on the remote. That's it. In a few moments you'll hear the first of a series of frequency sweeps and, after 40 seconds or so, the job is done and you simply disconnect the microphone, lead and microphone stand and pack them all away for if you ever need to use them again. I should note that you don't have to use the auto-tuning if you don't want to. If you just plug the CHT-12Q into mains power and connect the LFE output of your AV receiver to the LFE input on the rear panel of the CHT-12Q, you can be up-and-running with just a flick of the on/off switch and a push of the volume control. However, the simplicity of the calibration procedure is such that it will only take a few extra minutes, so why wouldn't you?

Unfortunately, although the inbuilt calibration can match the CHT-12Q to your room, it can't match its output to that of your main speakers or to your AV receiver. So you will still have to set the CHT-12Q's high-pass control and volume control by ear—as you would with all other subwoofers. If your AV receiver is a recent model and has its own inbuilt calibration, you can use this

to aid set-up. However, note that you must always run the CHT-12Q calibration BEFORE you run your AV receiver's calibration. (Also, since most AV receivers have only a limited calibration range, it's still better to set up by ear first, and then run the two automated calibration routines.

When the Velodyne equalises itself, it does so for the flattest response, which it then makes available '*au naturel*' in the Jazz/Classical preset position. This ensures tight, clean, extended—and perhaps most importantly—accurate bass response, but when you're playing video games, or watching an action movie, you don't necessarily want accurate bass, you want 'oomph' and excitement! This is where the other three presets come in: 'Movies', 'R&B/Rock' and 'Games'. The titles are self-explanatory, but of course you can use any setting you like, no matter what you're doing. If you're playing a video game and you think the game sounds the best when you're using the 'Movies' preset, then use the 'Movies' preset! There are no rules.

The CHT-12Q's driver has a cone of reinforced fibre that's driven by a two-layer copper voice coil. I measured the cone as being 330mm in diameter overall, a little larger than claimed by Velodyne, but the Theile/Small diameter is 258mm, which gives a cone area (S_d) of 523cm². The bass reflex slot beneath measures 345×31mm. The amplifier plate on the rear has the usual rotary low-pass crossover filter, but it works 'backwards' to usual, so that the subwoofer operates at its maximum bandwidth (120Hz) when the control is fully counter-clockwise, and at its minimum (40Hz) when it's fully clockwise. The crossover slope is 12dB/octave (24dB/octave ultimate). The volume control is far from conventional, being push-button(s) rather than rotary. (However the only time I can imagine you would use the push-buttons is if you have mislaid the remote or let the batteries run flat.) Below the volume control is a two-position slider switch marked 'Standby' and 'Always On' that self-evidently

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Velodyne CHT-12Q Subwoofer 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.

switches between signal-sensing activation and 'On.' (There's also a 240V on/off switch, located adjacent to the fused three-pin IEC socket.)

Velodyne provides a full set of inputs and outputs on the CHT-12Q, with low-level L/R inputs and L/R outputs via RCA sockets, with the left-channel RCA input doubling as an LFE input. High-level (speaker-level) inputs are via banana/screw terminals. These terminals have a fixed high-pass filter that turns over at 120Hz for the pass-through signal.

Last, but not least, there's an IR input. This enables you to run a wire to a remote infrared relay sensor, enabling you to locate the subwoofer in a cupboard, or somewhere else that would normally be out of range of the IR signal from the remote.

Listening Sessions

I have always viewed remote controls for subwoofers as superfluous to requirements, simply because setting subwoofer volume is usually a 'set and forget' operation, because once you have correctly matched the volume against that of your main and surround speakers, the subwoofer automatically 'tracks' whatever volume you set using your AV receiver, so there's no real need to control volume remotely.

However, seeing that the CHT-12Q offers so much more than an ordinary subwoofer, I found the remote almost indispensable. And, once I became accustomed to using it, I have to admit that I found it very handy indeed, to the point where I found myself fiddling around with the volume far more than I ever have with any subwoofer I have ever owned or reviewed that didn't have a remote control, and finding that there were benefits in doing so. I confess that whenever I watched a movie, I also switched across all the presets, to make sure I was getting the best impact from each soundtrack... and even this switching became more than a little 'more-ish'. I did appreciate the fact that you can use the remote to switch off the rather large and rather bright display

on the top of the front panel because in my listening room the sub sits directly below my screen, so I would otherwise have found the bright blue glow more than a little distracting. However I also appreciated the fact that the display was so large and bright when I did want to read it, because I found it easy to read from clear across the room, even without my glasses!


I thought the most important test I could make first-up was to establish whether Velodyne's high-tech circuitry actually made a difference to the sound. So to evaluate this, I first listened to the CHT-12Q set to Jazz/Classical when it was fresh out of the box, using the 'factory' setting, then without changing anything at all, I equalised it for my room and then listened again. Right from the get-go, it was immediately obvious that the sound had improved. It wasn't, perhaps, quite the earth-shaking difference I thought it might be, but then again I thought the CHT-12Q sounded very good straight 'out-of-the-box' and my listening room is a particularly subwoofer-friendly one, being of good proportions and equipped with properly-positioned bass absorbers.

Having established the CHT-12Q's high-tech credentials, the next step was to listen to see how well it delivered its bass. I quickly discovered that its bass response extended further towards single-figure frequency figures than was necessary for any of the CDs or DVDs I have in my collection. By way of example, one of my all-time favourite CDs, Enya's 'Watermark', digs down to 27Hz, which may come as a surprise to many of you. (Those of you with similarly discerning musical tastes to my own will be able to check this out by replaying your own copy: it's Track 10—*The Longships*). Another surprise can be found on jazz pianist Warren Bernhardt's album 'Reflections' (DMP). Listen to *Stone Ground* and you'll hear a sustained synthesised note at 23Hz! Then again, maybe the deep bass on this disc isn't so surprising, because DMP also makes the disc that I understand has the

lowest bass of any available musical recording: 'Big Notes' (DMP CD-454). You have to like Flim and the BBs, but if you do, about five minutes into *Funhouse* you'll hear a note at 5Hz.

My favourite deep bass movie is still Jurassic Park, and I can confirm that when listening through the Velodyne, T Rex really stomps! Yes, Maria, the earth truly does move... but it's not just the depth of the bass, even with movies that don't have extended bass, the Velodyne's performance was such that it always provided a superb foundation for car crash scenes, explosions, special effects... all manner of cataclysmic events. Throughout it all, I have to say that with rare exceptions, no matter what preset I started on, I always gravitated back to Preset 1 when watching movies, and most of the time, the Preset remained on 1 even when I was listening to music.

Conclusion

Music or movies, Velodyne's CHT-12Q is a great little subwoofer that will always have a place in my heart as the subwoofer responsible for converting me to the joys of remote-controlled subwoofering.  **Paul Cameron**

Velodyne CHT-12Q Subwoofer

Brand: Velodyne
Model: CHT-12Q
Category: Subwoofer
RRP: \$1,399
Warranty: Two Years
Distributor: Revolution Technologies
Address: 30 Miller Street
Murarrie, QLD 4172
T: (07) 3902 8051
F: (07) 3902 8050
E: sales@avtpl.com.au
W: www.revolutiontechnologies.com.au



- Auto - Eq
- Very small
- Remote control



- 'Backwards'
Lo-pass filter


Test Results

Velodyne's CHT-12Q Subwoofer proved to have a very flat and extended response in the Jazz/Classical position, which is shown in *Graph 1*. This trace, measured at three metres, using pink noise as the test signal, is shown unsmoothed (red trace) and smoothed to one-third octave (black trace). You can see that the frequency response extends from 30Hz to 130Hz ± 3 dB. Velodyne specifies response as 25Hz to 120Hz ± 3 dB, so you can see that *Newport Test Labs'* result shows the Velodyne exceeds the specification at the high end, and comes up only 5Hz short in the bass. Although these differences between the spec and the measurement are so small as to be completely insignificant, I should point out that the 'Movies' preset boosts the low bass considerably, so that using the 'Movies' equalisation preset extends the bass down to 20Hz within the ± 3 dB tolerance. (The lift is shown clearly on *Graph 3*, and this trace is of the bass driver only, without the contribution from the bass reflex port.)

The second graph (*Graph 2*) shows the nearfield responses of the bass driver and the slot-shaped bass reflex port. You can see that Velodyne's engineers have got the port working beautifully, with its maximum output almost shelved between 30Hz and 50Hz. The roll-off at high frequencies is smooth and controlled and almost identical to the woofer

roll-off, so the re-inforcement between the two is perfect. The roll-off below 30Hz is also well-contoured.

Graph 3 shows the equalisation applied by using the different presets, as well as the differences in level between them. You can see that if you are listening to the Jazz/Classical preset (black trace) and switch to any of the others, you get not only different frequency contouring, but also a boost in output level. Obviously the boost varies with frequency but on average the increase is around 2.5dB. Note that all these traces are of the bass driver only: the contribution from the port has not been factored in as it has been in *Graph 1*.

The final graph (*Graph 4*) shows the effect on the frequency response of the bass driver of using the maximum and minimum settings of the low-pass filter. This shows exactly what I would have expected, so Velodyne's specifications are spot-on. Although the port's output is shown on this graph, you should note that its output has not been scaled to compensate for the difference in radiating area between it and the bass driver. However, the extended horizontal scale of this graph, compared to the other three graphs, has the advantage of showing that the bass reflex port does not produce any unwanted resonances or 'leaks' at high frequencies. Overall, an excellent set of results.  **Steve Holding**

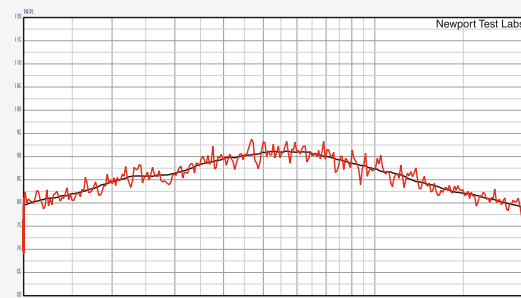
Location, Location, Location

It's important to remember that having an onboard subwoofer calibration system such as the one that is fitted to Velodyne's CHT-12Q is not a universal panacea. If you put any subwoofer with an automatic equaliser in a position in the room for which it's totally unsuited, the circuit will be able to make the best of it, but you'd be far better advised to first find the position in the room where the subwoofer sounds the best, and then use the circuitry to make a good thing even better.

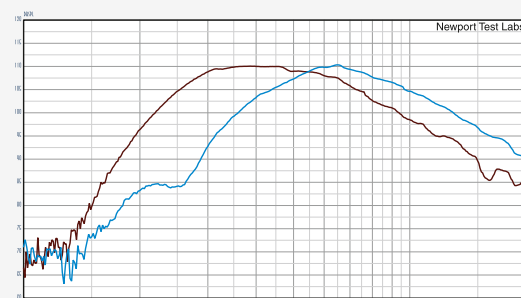
The two main culprits that affect the response of any subwoofer are room modes (eigentones) and room loading. Let's look at loading first. If you suspended an EQ-equipped subwoofer in the middle of your room, well clear of any boundaries, the computer would quickly work out that this was a terrible position and would dial in maximum low bass boost. This means the internal amplifier would likely be working flat-out

all the time, with the result that dynamics would suffer. Obviously, in a real situation, the subwoofer will at least be sitting on the floor, so the low bass will be helped along by being close to one boundary. However, if you move an EQ-equipped subwoofer close to a wall, so it's interacting with two boundaries, it will deliver even more bass as a result, so less equalisation would be required and the internal amplifier would have to work less hard. If you place the subwoofer in a corner, where it would 'see' three boundaries, the computer would then very likely be able to attenuate volume at low frequencies, rather than boost it, which would have the effect of freeing up amplifier power, and increasing dynamic ability.

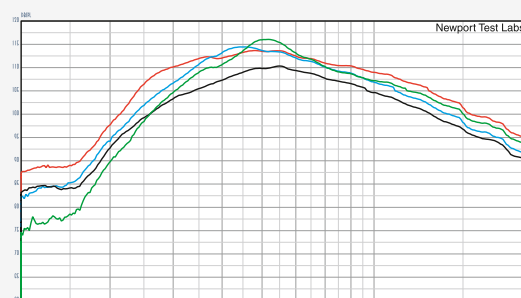
As for eigentones, they're what result when low frequencies interact with the physical dimensions of your room, so they're very difficult to eliminate—or even modify—without resorting to moving walls and raising ceilings.



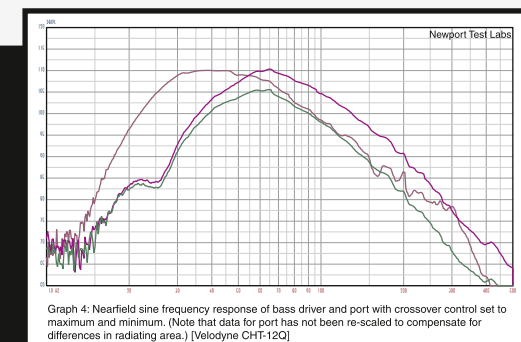
Graph 1: Pink noise frequency response (unsmoothed and smoothed), after auto-equalisation measured at a distance of 3.0 metres with crossover control at maximum. [Velodyne CHT-12Q]



Graph 2: Nearfield sine frequency responses showing bass driver and port. (Note that data for port has not been rescaled to compensate for differences in radiating area.) [Velodyne CHT-12Q]



Graph 3: Nearfield sine frequency response of bass driver showing all available equalisation settings: Preset 1 - Movies (Red); Preset 2 - R'nB/Rock (Blue); Preset 3 - Jazz/Classical (Black); Preset 4 - Games (Green). [Velodyne CHT-12Q]



Graph 4: Nearfield sine frequency response of bass driver and port with crossover control set to maximum and minimum. (Note that data for port has not been re-scaled to compensate for differences in radiating area.) [Velodyne CHT-12Q]

The best way of dealing with them is to use multiple subwoofers (at least two, but ideally four!) but since this solution doesn't appeal to many people for reasons of both cost and aesthetics, the next best option is to position the subwoofer where you don't excite any. The only way to do this is by putting the subwoofer in all the places you'd like it to go, and choosing the position where it sounds the best, and this is the technique you'll need to use with all subwoofers, no matter whether they're equipped with auto-equalisation circuits or not. 