



# StyleAudio

## Carat HD1V TCXO Hi-Fi USB Audio DAC

### StyleAudio is a new brand to Australia.

The company proudly boasts: 'Carat Series are ambitious products of StyleAudio manufactured entirely within Korea from planning, development to production' (that) 'contains the pride of specialised hi-fi audio engineer who is seeking the high-end quality sound with endless passion.' We decided to put the purple prose to the test...

### The Equipment

A great many people—and if you're reading this you're likely to be one of them—are now storing their music on their computer... or, if they're more sensible, on a separate stand-alone hard-drive used only for this purpose (and that is backed-up regularly!). I have to say that I am not one of those audiophiles who thinks that when music is converted into a string of digits (that is, from analogue to digital) the essential soul of the music is destroyed. So far as I am concerned, if you do the analogue to digital conversion properly, and then follow up by handling the digital to analogue conversion just as well, you'll get out exactly what you put in, and the 'soul' of the music will remain intact.

In most cases, the analogue-to-digital conversion is out of your—and my!—hands. It's managed by the recording studio, which will (in most cases) be using the latest state-of-the-art equipment and will (mostly) do an excellent job of ensuring that accurate strings of 1s and 0s are recorded. If you then simply rip these same 1s and 0s off the CD and store them on your hard drive, it would seem a trivial matter to pull them off again and convert them back to analogue. Unfortunately, this is where it all falls in a heap. The digital-to-analogue converters that are found inside computers labour under several handicaps. The first is that they're sometimes of very poor quality in the first place. Computer

integrators/assemblers usually concentrate on processors, hard drives and RAM, rather than the quality of their sound cards. The second is that they're rarely accurately clocked. This means problems with jitter. The third is that they're always operating inside a hostile electromagnetic environment (i.e. your computer case!). Last, but not least, the stability of their power supply can be tenuous, due to the demands placed on the supply by all the other components inside the computer—and, if you use USB devices, on powering those external devices as well.

The foregoing comments notwithstanding, it would be remiss of me not to point out that my comments do not always apply, because some computers have truly excellent on-board DACs, and will certainly not apply at all if you have paid extra and deliberately installed a high-quality, high-spec soundcard.

It's for all these reasons that if you are after the ultimate sound quality—or even if you merely want to have a degree of control over that sound quality—you should at least consider using an external audio DAC... and preferably one with its own power supply. Although the StyleAudio Carat HD1V does not actually require an external power supply in order to operate (it can be powered via the USB cable), it is supplied with a tiny 240V Switch Mode Power Supply (SMPS) (often ingloriously referred to derisively as a 'wall wart') which—I was pleased to see—is actually approved for use in Australia, with a C-Tick label (N11652).

Although I recommend you use the supplied power adaptor, I need to warn you that if you use a SMPS adaptor to provide power, you should ALWAYS switch your computer off whenever you connect or disconnect this adaptor, as well as the power point into which you plug the adaptor. Also—and equally im-

portant—you should also switch off ALL hi-fi components that are connected to the line outputs of the Carat HD1V whenever you're switching the SMPS on or off. This advice regarding SMPS's is not exclusive to StyleAudio: It applies equally to *any* device in an audio system that uses an external SMPS power adaptor—a turntable, for example.

The reason for my warning is that the circuit design of SMPS power adaptors is such that in some extremely rare circumstances it is possible to create a very high-voltage—and potentially damaging—'spike' if the adaptor is plugged into the mains supply at the same time other components are also plugged in and switched on. To its credit, StyleAudio provides a warning in the Carat HD1V manual, though it specifies only that your computer should be switched off, whereas I personally recommend that all components should be switched off, as I have explained. (The reason this can happen is quite complex, but for those who are interested, well-known and highly respected Australian amplifier designer Rod Elliot, of Elliot Sound Products (ESP), has a technical explanation on his website rather ominously titled: 'Why SMPS Kill Equipment'. You can find it on the web at <http://sound.westhost.com/articles/external-psu.htm#kils>). Lest I be accused of being a scaremonger, I'd like to emphasise that it is *extremely unlikely* that any damage will occur as a result of plugging in an SMPS, even if you do so while other connected equipment is switched on, but it *is* a possibility. [Editor's Note: If it was up to me, I'd just power the Carat with a 9V battery!]

The tiny 'manual' (it's a sheet of A5 paper, printed on both sides) supplied by StyleAudio is surprisingly informative and rather well-written, though there are sufficient spelling and grammatical howlers to betray the fact

that it was written by someone for whom English was not their native language. ('Robber' feet... 'It is not harmed to pets'... 'where can be splattered the device' and so on...)

If you were wondering about that strange acronym in the heading of this review, 'TCXO' stands for Temperature Controlled Crystal Oscillator. The 12MHz TCXO inside the Carat HD1V is accurate to within 1.5 parts per million. Control oscillators of this sophistication are rarely found in products at the Carat HD1V's price-point, which is no doubt the reason StyleAudio has incorporated the acronym into the model number. The TCXO isn't the only sophisticated part inside the Carat HD1V—it's crammed with state-of-the-art components from the world's most highly-regarded component makers, including Burr-Brown (PCM2704 DAC and 2350 op-amp), Wima (MKP capacitors) and Vishay Dale (1pc mf resistors). The PCM2704 uses 128fs oversampling with second-order multi-bit noise shaping to provide extremely low quantisation noise in the audio band. It has a built-in analogue low-pass filter to remove the high-frequency components of the noise-shaping signal. An interesting feature of the PCM2704 is that it employs Texas Instruments' 'SpAct' architecture, which allows the chip to recover the audio clock from the USB packet data. It is a 16-bit chip that can operate at 32kHz, 44.1kHz or 48kHz.

Externally, there's not a lot to describe. The front panel has a gold-plated 6.5mm diameter stereo phone jack, a small chromed toggle switch that routes the audio signal to either the headphone jack ('up' position) or to a pair of gold-plated line-level RCA output jacks on the rear panel, a rotary volume control and a small LED for power indication. The rear panel contains the aforementioned RCA jacks, a 9Vdc input socket, a USB input socket and a Toslink optical digital output. The whole package is surprisingly small: Measuring just 75x30x110mm (WHD) it easily fits into the palm of one hand.

## Use and Listening Sessions


Obviously, I was quite careful when plugging the Carat HD1V into my system (see my earlier comment if you've skipped several paragraphs to get to the good bits), but I have to say that if you plan on repeatedly connecting and disconnecting the Carat HD1V, you're probably better-off relying on the USB bus to provide power. Although there is a slight improvement in sound when listening through speakers when using external power, I found that when I was listening through headphones, I could not hear any difference in the sound when using USB power compared to mains power.

For the headphone listening, I rigged up a simple switch that let me flick back and forward between the Carat HD1V and my computer's sound card, using the same pair of headphones—an A-B comparison that was made extremely easy thanks to the front-panel volume control, which allowed me to match volume levels exactly. (If you can't match volume levels to within about 0.1dB, A-B comparisons are a waste of time.) The StyleAudio Carat HD1V came out the clear winner, right across the board. The sound was clearer, richer and more full-bodied, with far less noise. The veritable 'chalk and cheese' rally. But interestingly, what I liked most about the set-up was the ability to switch off the headphones instantly (by flicking the front panel control from 'Phone' to 'Out') and also that I was able to adjust the volume using the Carat HD1V's rotary volume control, rather than having to adjust volume using my mouse. Funnily enough, I enjoyed this 'analogue' control over headphone volume and on/off switching so much that I would happily buy the Carat and use it to drive the headphones connected to my computer even if there was no difference in sound quality at all! There is one proviso, however, which is that I found that with the volume control at its absolute maximum clockwise position, the sound broke up badly and became unlisten-

able. This was strange, because if I backed up the volume control even as little as a millimetre, the sound became crystal clear once more. Perhaps this was just an issue in my set-up, or perhaps it's something StyleAudio should look into. In practise, it won't be an issue, since there should never be any need for you to operate the HD1V with its volume control wound wide open.

For the speaker sessions, I interposed the Carat HD1V between my computer and my 'den' system, which is simple but no slouch, being a pair of Paradigm Studio 20s driven by a pair of Marantz MA6100s. This time around, I rigged a switch so I could rapidly alternate between my usual M-Audio Audiophile USB DAC and the Carat HD1V. This worked well, but I was surprised—and somewhat disappointed—to find that the volume control did not affect the volume of the line outputs: it's only for the headphone output, so I couldn't do a level-matched A-B comparisons as easily this time around (I used a more complex work-around instead). After I'd set up the comparos I was further disappointed to find that the Carat HD1V sounded better than my M-Audio—disappointed because even back when I purchased the M-Audio, it cost me nearly twice as much as I'd have to pay if I bought the Carat HD1V tomorrow, using today's devalued dollars! This time around, however, the differences I noted did not amount to 'chalk and cheese', but they were certainly easily perceptible, with the Carat HD1V returning an overall smoother, more polished performance than the M-Audio.

## Conclusion

So, seeing as how the Carat HD1V outperformed my existing external DAC, at around half the money, would I buy one? Well I would, except that its performance impressed me so much that I'm going to check out the Carat Peridot, which has even better 24-bit/192kHz DACs and doesn't cost a whole lot more!  *Douglas Hughes*

## StyleAudio Carat HD1V

**Brand:** StyleAudio  
**Model:** Carat HD1V TCXO  
**Category:** USB DAC  
**RRP:** \$299  
**Distributor:** Sound Reference Pty Ltd  
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- Volume Control
- Output Switchable



- No data activity monitor
- No volume control on Line Out

## LAB REPORT

Readers interested in a full technical appraisal of the performance of the StyleAudio Carat HD1V USB DAC 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.

## Test Results

Graph 1 shows the output of the StyleAudio Carat HD1V when reproducing a computer-generated 1kHz test signal. You can see that there's just a single second harmonic distortion component visible above the noise floor, at a level of approximately  $-92\text{dB}$ , equivalent to 0.003% distortion. All the noise is more than 90dB down, but you can see that above 20kHz, the noise floor starts to rise, which is typical of a delta-sigma DAC.

Graph 2 shows the performance of the StyleAudio Carat HD1V's DAC when tested with a difficult 20kHz signal. Here you can see there's no second harmonic at all (at 40kHz) but there is some interaction with the 44.1kHz sampling frequency, which is why there's a signal at 24.1kHz approximately 50dB down. It serves to show the DAC's 'signature' but such a signal would never appear under actual use conditions with music and, in the event it did, would in any case be inaudible due to both its high frequency and low level.

CCIF intermodulation distortion is very low, as you can see in Graph 3. There are no IMD—or distortion—components visible in the audio band. The two signals approximately 70dB down are well above 30kHz and are, once more, the result of intermodulation with the 44.1kHz sampling frequency. The SMPTE distortion graph (Graph 4) is even cleaner, with just the two test signals clearly visible at the extreme left of the graph (60Hz) and to its right (7kHz).

The StyleAudio Carat HD1V's frequency response was extremely flat, extending from 20Hz to 20kHz  $\pm 0.1\text{dB}$ . You can see, however, that the overall 'trend' of the response runs from being  $+0.1\text{dB}$  at low frequencies to  $-0.1\text{dB}$  at high frequencies. Such a broad boost at low frequencies might give a slight enhancement to the bass, even though the boost level is only 0.1dB, ten times less than what I would otherwise consider the audible threshold.

The final graph in the series (Graph 6) shows the output, again with a 1kHz test signal, but this time with the DAC running at maximum output. You can see a second harmonic component at  $-62\text{dB}$  (0.07%), a third at  $-50\text{dB}$  (0.3%), a fourth at  $-78\text{dB}$  (0.01%) and a fifth at  $-65\text{dB}$  (0.05%). Although this is far from being excessive distortion, it shows you should operate the DAC within its limits, and avoid maximum clockwise rotation of the volume control.

Newport Test Labs found the StyleAudio Carat HD1V's headphone output can comfortably deliver 11mW into 32 $\Omega$  loads, so you will have no trouble driving any pair of conventional dynamic headphones to more than satisfactory volume levels.

Steve Holding

