



PS Audio PerfectWave Transport & DAC

TRANSPORT & DAC

The PS Audio PerfectWave Disc Transport is not an ordinary disc transport... it's an extraordinary disc transport! PS Audio's PerfectWave DAC isn't your ordinary DAC either, but it's not quite as unusual as the transport. But then I really wouldn't expect much less from US outfit PS Audio. Founded by Paul McGowan and Stan Warren in 1973, they were high-end from the outset, and I bought two of their first products, a step-up transformer and a phono pre-amp. I still own the transformer, so there may be some bias in this review!

However, it should be noted that the PS Audio of today is not *quite* the PS Audio of yesteryear, because both founders ended up leaving the company. Warren was the first to leave, after which he formed Superphon. McGowan followed fairly shortly after, to found Genesis Technologies with Arnie Nudell (ex Infinity). As often happens in such cases, without either of the founders at the helm, PS Audio 'lost its way' and after eight or ten years effectively stopped trading, at which point McGowan purchased the rights to the name and re-started the company on his own, taking over all design and man-

agement. He's since installed a CEO to run things, but is still very much hands-on in the design department.

PERFECTWAVE TRANSPORT

The PS Audio Perfect Wave transport (PWT) is out of the ordinary because it doesn't decode the signal from the disc. Instead a two-stage process takes place, where the digital data on the disc is read, then stored in solid-state memory. After this, the data in the memory is decoded into a digital signal that can be decoded by a digital-to-analogue converter.

To get the signal off the disc in the first place, the PWT uses a DVD ROM drive. This is actually a really obvious thing to do because the PWT isn't really 'reading' the data at all; it's just 'copying' the data to memory. This means that rather than depend on a disc's own error-correction (at least in the case of a CD) it can use a multiple-read technique to ensure exact data retrieval. PS Audio says it's developed its own version of this, which it calls MREC (Multiple Read Error Correction). While this system is superior, it's not perfect. If enough data is missing from the disc (because of a scratch), no amount of multiple reading can fix it, and either some

error correction (interpolation) has to take place, or there will be a 'tick' or 'gap' in the recovered sound.

In addition to reading ordinary CDs, the PWT can also play back DVD ROMs containing WAV files at up to 24-bit/192kHz. So where would you get these? From one of the many websites now offering high-resolution music files for download, such as HD Tracks. Simply download the high-res file to your computer, convert it to a WAV file, burn it to DVD, then play the DVD in the PWT. (Remember to use the UDF 2.0 file system when doing this.) Despite being a DVD drive, the Perfect Wave Transport WILL NOT play DVD-A, nor will it play the SACD layer on hybrid SACDs. It will however, play back the CD layer of an SACD.

Obviously, being a transport, the PWT has only digital outputs, provided by an AES/EBU XLR connector, a single gold-plated RCA socket, a standard Toslink optical link (24/96 max) or via PS Audio's own proprietary I2S link (which uses standard HDMI socket). If you're using a PS Audio DAC (as here) it's best to use the I2S link to connect the two. PS Audio says that by doing so, you essentially 'eliminate all jitter'. I was a little surprised

not to find a digital output via a BNC connector... not that it's that important, but simply because I prefer this connector type.

As you can see from the photograph, the review transport was fitted with an 'expansion port' which adds an RS-232 link, an infra-red link, and Ethernet capability. The SD card below the expansion port is used to store cover art and song title information as well as to program new firmware (about which more later).

PERFECTWAVE DAC/BRIDGE

The PerfectWave DAC (PWD) is available as a straight 'DAC' or, if you option in a 'Bridge' you will be able to connect the DAC to your home network, so that the PWD can play back music stored on your computer, NAS drive, or from the Internet. If you purchase a Bridge at the same time as the PWD, the cost is \$800. If you purchase a Bridge later, it will cost you \$899. (Don't worry if you do purchase one later, because installation is easy. You just remove the plate on the rear, insert the Bridge and that's it... except that if you want the Bridge to communicate wirelessly with your network, you'll also need a PS Audio 'Wireless Dongle'.)

In common with almost all high-end DACs, the PWD handles all the usual bit-rates and word-lengths. You can also get it to upsample (or downsample) if you want, though my recommendation (and PS Audio's) is to set the PWD to 'Native' whereby it will simply detect and use the original bit-rate and word-length of the digital data. In common with some DACs, PS Audio does allow you to choose what kind of filter you'd like to use. There are five choices. Filter 1 (MPAPOD) is a minimum phase apodising filter which features low pre-ringing, minimal group delay, minimised post ringing, good phase vs. frequency characteristics and a sharp filter cut-off. Filter 2 (MPSOFT) is a minimum

phase soft knee filter with low pre-ringing, minimal group delay, minimised post ringing, good phase vs. frequency characteristics and a softer filter cut-off. Filter 3 (LPAPOD) is a linear phase apodising filter with no group delay, perfect phase vs. frequency characteristics, minimal post ringing, some pre-ringing, and a sharp filter cut-off. Filter 4 (LPSOFT) is a linear phase soft knee filter with no group delay, perfect phase vs. frequency characteristics, minimal post ringing, some pre-ringing, and a softer filter cut-off. Filter 5 (MP1/2B) is a minimum phase recursive half-band symmetrical filter with minimised pre- and post-ringing, good group delay, good phase vs. frequency response, and a sharp cut-off. I'm not going to go into detail about this because PS Audio does in its manual, which is available on-line, and spends more than two A4 pages explaining the differences. You can choose whatever one you most like the sound of. PS Audio doesn't actually recommend one over the others, but does say that its favourite filter is Filter 1. We've included pics of how the filters affect square waves and impulses on page 33.

Before moving on to the listening sessions, I just have to mention the packaging system used by PS Audio, which is incredibly clever. Rather than simply using standard polystyrene 'end' extrusions, the components are instead supported on a 'trampoline' of polythene stretched across a cardboard frame. This is very 'green' of PS Audio, but also means there's minimal packaging to dispose of and that the components won't be 'jarred' so much if the boxes are dropped during transport.

IN USE & LISTENING SESSIONS

I didn't connect this Perfect Wave duo to the Internet (and so missed several software updates that occurred during the months I was

PS AUDIO

PerfectWave Transport & DAC

Brand: PS Audio

Model: PWT & PWD

Category: Transport/DAC

RRP: \$3,499/\$3,499*

Warranty: Three Years

Distributor: Magenta Audio Pty Ltd

Address: 74 Mount Barker Road

Stirling SA 5152

1300 785 205

(08) 8339 1000

(08) 8125 5850

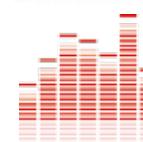
sales@magentaaudio.com.au

www.magentaaudio.com.au

* Price without Bridge installed. With the Perfect Wave Bridge installed, the price is \$4,299. (Bridge retails separately for \$899.) See copy.



- Amazing interface
- Expansion possibilities
- Overall performance



- Display shifting
- No SACD playback

LAB REPORT

Readers interested in a full technical appraisal of the performance of the PS Audio PerfectWave Transport and PerfectWave DAC should continue on and read the LABORATORY REPORT published on the page 32. 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.



Lab Report on page 32

reviewing it), but you'll find that if you connect them to the Internet (via a router and the Ethernet link), it will not only be able to get such updates, but will also automatically download cover art and song titles for any CD you load in the disc tray. (Note, however, that if you burn your own DVDs with high-res WAV files, this won't happen!).

I also couldn't get the Perfect Wave to 'play for several minutes' after removing a CD that was playing. The reason I tried this was that PS Audio says in its excellent manual: *'To demonstrate the transport's memory ability, simply eject the disc while it is playing (without pressing STOP), and the music will continue to play even though the disc is no longer in the transport... a standard audio CD can have up to several minutes to play.'* I couldn't get one to do this for more than a few seconds. Another disappointment was that I thought that the transport might be quieter than it is, because I imaged that once the buffer was full, the disc might 'spin down' until the buffer was depleted, then spin up again. Although I couldn't hear the transport operating from the listening position, I could hear it if I put my ear up against the case, and not once did I ever hear it stop while a disc was playing. (It was only with hindsight, as I was proof-reading this review, that I realised that since the Perfect Wave has only a 64MB buffer memory, this was never going to happen!)

PS Audio's display is fairly high resolution so when the one on the PWT is displaying cover art downloaded from the Internet, you'll see a clear image. The high resolution also means it is very easy to read all the status indicators. Even better, using the displays to control the components is very intuitive. I also loved the fact that there are some cool 'effects' built in so that, for example, when you touch a section of the display that's showing as a 'button', the 'button' will get a white tinge around it to show that you've 'pushed' it. This effect is so uncannily well done that it actually appears that the screen is 'bending' under your finger, when it's not doing that at all: it's an optical illusion. (What isn't an illusion is all the 'clicking'

that goes on behind the scenes when you activate various functions: PS Audio is using very noisy relays.) After a few weeks I became worried how I'd clean the screen before sending this duo back to the Magenta Audio (PS Audio's Australian distributor), because mine got quite greasy with fingerprints, but it appears that the screen can simply be wiped clean with a cloth dampened with a cleaning solution such as Windex. One thing I really didn't like at all about the display is that it constantly 'offsets' itself depending on what's being displayed, because the type and numerals aren't 'fixed width' but are dynamic depending on which numerals are being displayed. So, for example, when a track time changes, from 0:40 to 0:41, all the letters and the colon 'shift' to the right because the '1' takes up less of the screen than the '0'. This means that when the display is showing elapsed time, the display constantly shifts 'left' and 'right' across the screen as the time changes. (When the display shows remaining time, this doesn't happen as obviously because the numerals seem to be left-justified in this mode.) This screen movement affects lots of the PS Audio duo's display modes, even down to the Filter display modes.

One operational feature I absolutely loved was the way you can choose exactly where you want to be in a track. This is a bit difficult to explain, but once a track is playing, the transport shows a horizontal 'progress bar' (not unlike that on a computer) with the elapsed time at the left end of the bar and the remaining time at the right hand end. So if a four minute track has just started, and is one second in, the bar will show '0.01' at the extreme left and '3.59' at the right. If you wish to skip anywhere inside the track, just touch the progress bar where you'd like to go and it will go there instantly. So, if you press in the exact centre, for example, the transport will instantly skip two minutes into the track. Press three-quarters of the way along the bar and the player will skip instantly 3.00 minutes into the track.

And when I say 'instantly' I mean *instantly*—thanks to the solid-state buffer, skipping

inside a track (and also from track to track) is almost instantaneous.

I found the sound quality when playing back ordinary CDs was simply sensational. The tonal balance was exact, from the bottom-most octaves to the extreme treble, and bass was beautifully structured, with superb impact and dramatic depth. High-frequencies were crystal-clear, without any 'edge' at all, and completely transparent. I don't know how PS Audio came to a decision about which filter to use, because I found that my own filter preference changed from disc to disc, so I couldn't even decide on a single filter and stick with it. (Though curiously, when listening to some CDs I could discern little—if any—difference between any of the filter settings, so there's obviously more here than meets the ear!)

But if I thought CDs sounded sensational, even that didn't prepare me for the sound of hi-res files as reproduced by this PS Audio duo. The sound opened up dramatically, becoming all-enveloping. The sudden increase in auditory perception was akin to the moment when you're looking at one of those 'MagicEye' 3D stereograms and the 2D image suddenly snaps into 3D to occupy your whole visual sphere. This PS Audio duo delivers a similar effect to your ears, so that it's as if you've entered a whole 'nother aural world.

CONCLUSION

PS Audio's PWT is a superb transport—in every way—and the PWD is a superb DAC. No matter what checklist you use, or how long it is, you will have to 'tick all the boxes' in every department for both components. Built in the USA. Tick. Fully upgradeable (both software and hardware). Tick. Appearance. Tick. Easy to use. Tick. Fun to use. Tick. Multiple filters. Tick. Multiple sampling rates. Tick. Word-length options. Tick. Internet-capable. Tick. Controllable from iDevices. Tick. Sound quality. Tick. After-sales support. Tick. I could go on, but you get the idea. Would I buy these tomorrow and live happily ever after? You bet! But, as I said in the introduction, I'm biased!  **greg borrowman**



STOP PRESS

Two days before we went to press, and just prior to the Christmas break, PS Audio announced that it had upgraded the PWD, and that a new version, to be known as the Mark II Media DAC, would become available in 2012. Part of the announcement said: *'the Mark II version of the PWD represents a major leap forward in performance and features. The Mark II comes with a completely redesigned digital processing board, software, connecting cables and remote control. New features include 192kHz/24-bit asynchronous USB, NativeX mode, non-saturated logic data path, eleven additional power supplies, lower jitter, new clocks and a balance control for the output.'* Anyone who already owns a PWD will be able to upgrade their existing model by swapping over a single printed circuit board and the installation of this PCB, like the 'Bridge', can be done by owners. Cost should be around \$1,000.

CONTINUED FROM PAGE 28

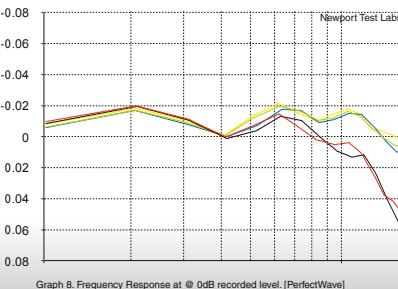
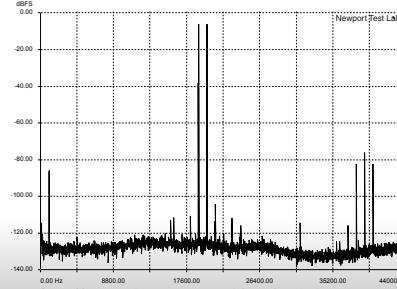
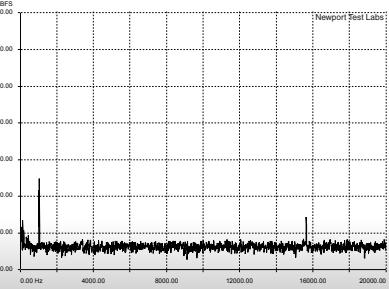
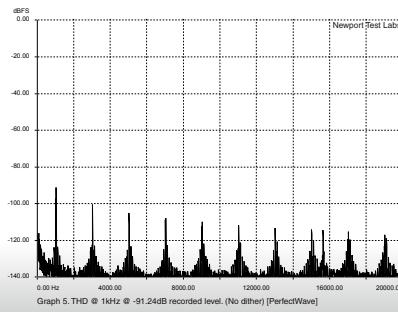
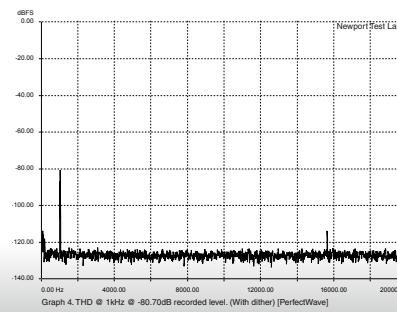
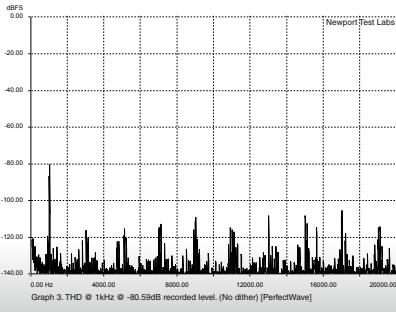
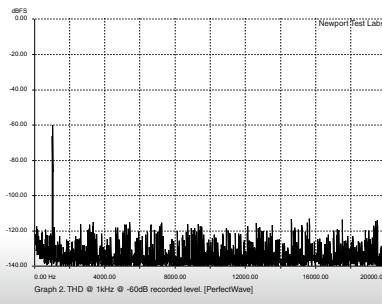
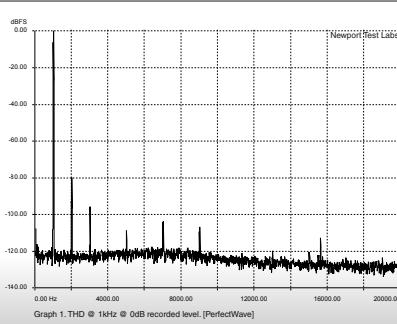
TEST REPORT

The PS Audio PWT/PWD pair performed very well through almost all *Newport Test Labs'* tests. The only area where it came up a little short was the result for channel separation at 20kHz, where it returned a result of 82dB. This is an excellent result, and is far more channel separation than is required at this frequency to give excellent stereo imaging and separation, but it's a little shy of what I expected. The test for de-emphasis errors (tabulated in the result chart) reveals that PS Audio has not implemented a de-emphasis circuit

■ Results will depend on the way you've set the PWD, most particularly the filter type chosen...

in the PWD. This means that if you play CDs pressed prior to 1985, their treble may sound a little forward in the overall balance. No other discs—of any type—will be affected. The tabulated results also show polarity as being 'Normal' but note that it's possible to invert phase manually. This result shows that the 'default' position results in normal polarity. In the case of the PWT/PWD the tabulated figures should only be taken as an overall 'guide' because in almost every case, the result will depend on the way you've set the PWD, most particularly the filter type you've chosen. By way of example, we've included two sets of oscilloscopes that show the effect of the five different filters

PS Audio Perfect Wave Transport and DAC		Test Results
Analogue Section	Result	Units/Comment
Output Voltage	2.8520/2.8522	volts (Left/Right)
Frequency Response:	See Graphs	dB (20Hz–20kHz)
Channel Separation:	134/111/82dB	16Hz/1kHz/20kHz
THD:	0.007%	@ 1kHz @ 0dBFS
Channel Balance:	0.0006dB	@ 1kHz @ 0dBFS
Channel Phase:	0.02/0.01/0.59	16Hz/1kHz/20kHz (degrees)
Group Delay	-148/+15	degrees (1k–20k/20k–1k)
S/N Ratio (No Pre/emphasis)	82dB/97dB	dB (unweighted/weighted)
De-Emphasis Error	0.36/3.16/8.57dB	(1kHz/4kHz/16kHz)
Linearity Error @ -60.00dB/-70.00dB	0.02/0.04	dB (Not Dithered)
Linearity Error @ -80.59dB/-85.24dB	0.06/0.09	dB (Not Dithered)
Linearity Error @ -89.46dB/-91.24dB	0.09/0.11	dB (Not Dithered)
Linearity Error @ -80.70dB/-90.31dB	0.00/0.03	dB (Dithered)
Digital Section	Result	Units/Comment
Digital Carrier Amplitude	78mV	Audioband
	1.06V/2.11V	Differential/Common Mode
Audioband Jitter	0.7/0.004	nS (p–p) / UI (p–p)
Data Jitter	1.1/0.006	nS (p–p) / UI (p–p)
Deviation	-6.8	ppm
Frame Rate	44099.700	
Eye-Narrowing (Zero Cross)	1.0/0.006	nS (p–p) / UI (p–p)
Eye-Narrowing (200mV)	6.6/0.038	nS (p–p) / UI (p–p)
Absolute Phase	Switchable	Normal/Inverted





on square waves and impulses. Graph 8 also shows the effect of the different filters on the frequency response. Looking at Graph 8, you can see that the 'worst case' response is still highly linear by any standards, extending from 20Hz to 20kHz +0.02dB/-0.06dB, for an overall response of 20Hz to 20kHz ± 0.04 dB. Non-linear distortion is very low, as you can see from the graphs showing distortion at -80.59dB (no dither applied to the test signal) and -80.70dB (dither applied). Even without dither, almost all non-linear products are more than 120dB down and the noise floor is more than 140dB down. With dither, the noise floor inevitably rises, but is still superbly low, at around -130dB and there is no distortion visible—harmonic or otherwise. The 'blip' just below 16kHz is breakthrough into the test equipment from a nearby computer with a CRT monitor and should be ignored. Similarly good results were obtained at recorded levels of -90dB, as you can see from the relevant graphs. Digital jitter is impressively low, so PS Audio's attention to detail in this area has obviously paid off big-time. This is an impressive set of test results! Excellent performance indeed.  **Steve Holding**

