australian hi-fi

SONY GEN 4

New leader in true wireless buds

REVIEWED

Russian Doll

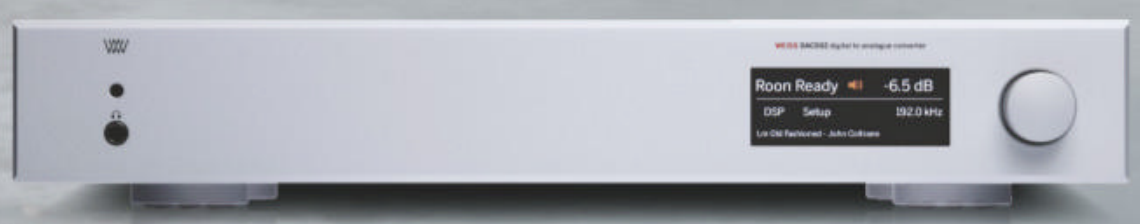
Unique cabinet design banishes resonances

BUDGET-BEATER FROM AUDIO TECHNICA

REVIEWED

WEISS DAC502

Creative control over your music



FUTURE

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ISSUE 520 JULY/AUGUST 2021 A$9.99

DALI

IN ADMIRATION OF MUSIC

OBERON SERIES

DALI OBERON is a breakthrough: it's the first entry-level loudspeaker to incorporate DALI's patented SMC technology, drastically reducing non-linear magnetic distortion – so you can hear your favourite music like you've never heard it before.

With new oversized tweeters, wide-dispersion wood-fibre woofers and striking Danish cabinet design, DALI OBERON sets a new benchmark for affordable audiophile speakers. It's time to rediscover the magic of music.

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DIGITAL FACTS (NOT)

There are facts and there are facts. Or, as the Kellyanne Conway would have said, 'alternative facts.' Oh no, wait, she *did* actually specifically state that there were such things as alternative facts.) And there are words and there are words, as Lewis Carroll pointed out in his book *Alice in Wonderland*. "When I use a word," Humpty Dumpty said in rather a scornful tone, "it means just what I choose it to mean — neither more nor less."

These are all thoughts that came immediately to mind when I read a list (on the internet, of course) that purported to identify 'Ten facts about digital'. I say 'purported' because if you google the phrase and discover the particular list I ran across, you will discover that several of the ten so-called 'facts' have nothing whatsoever to do with digital at all, so the list is not, and never could be, 'Ten facts about digital'. But accurate or not, the list identified several issues related to audio that are good topics for 'please discuss' audio sessions. For example: "Is the listening room the largest influence on sound quality?" It is certainly a huge influence, as anyone who's ever listened to a pair of Wamm Master Chronosonics in a bathroom would already know. But if we assume that your listening room has a reasonable acoustic signature, I'd have to disagree that the room is the largest influence.

How about: "The quality of the music is more important than the quality of the recording?" The author of the list says "Yes". Which could mean that he would prefer to listen to Brahms' Hungarian Dance No. 1 played by the composer himself rather than to, say, the same work played by any competent modern pianist. You can decide the answer to this for yourself by listening here — www.tinyurl.com/brahmsquality.

How about the so-called 'fact:' "The quality of the amplification is more important than the DAC." If you have ever heard the sound of an eight-bit DAC, I think you'd be saying that the DAC is far, far more important than the quality of the amplification. On the other hand, if you've heard a high-quality 24-bit DAC played through a five-dollar amp from e-bay and then through an Audio Research pre/power combo, you're very likely to reach exactly the opposite conclusion. It's pretty much the same difference as you hear between low and high bit-rate MP3 files. Try this comparison: www.tinyurl.com/low-bit-rate

Another 'fact' from the list: "CD-quality files created from 24-bit masters are lossy." This is one for Humpty-Dumpty: What exactly is meant by the word 'lossy'? It's usually used to describe music files where an algorithm has analysed the music and removed sounds at specific frequencies it has determined would not be audible. However, when you convert a 44.1kHz/24-bit file to a 44.1kHz/16-bit file there's no decision-making algorithm in place and absolutely no frequency data is removed at all. All that is changed is the precision of the different volume levels able to be played back, from 16 million down to 65 thousand. If you think this difference might be significant, sit down at a piano (it doesn't matter if you can't play) and push down a key as hard as you possibly can. That's the loudest you can play. That's 1. Now do it again, but a bit softer. That's 2. Then again, a bit softer. That's 3. Keep going, and keep count. If you manage to press that key 65,000 times and you can still hear any sound at all at the end, you should only listen to 24-bit files.

Another failing of the list is that it doesn't take into account the findings of psychologists Daniel Kahneman and Angus Deaton who surveyed nearly half-a-million people to find out if having money created happiness. Their survey proved that happiness increases with levels of income until our basic needs are met. Poor people are unhappy because they can't afford food, shelter and health care. Once these are provided, they're just as happy as the middle-class and the wealthy. Their conclusion? "Once our basic needs are met, happiness plateaus."

The same is true of sound quality. If signal source quality and/or system quality and/or room quality are inadequate to provide enjoyable sound, listeners will be unhappy. But once each and all of these three factors in sound quality is lifted to a level that enables music playback to be enjoyed, then that level of enjoyment has reached a plateau that can be elevated only by publishing your theories on the internet. ***greg borrowman***

australian hi-fi

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EQUIPMENT REVIEWS

MUSIC

66 RE-ISSUES
The 50th Anniversary Deluxe Edition of Crosby, Stills, Nash and Young's Déjà Vu is more than just a re-issue: It's packed with tons of extras including 38 extra tracks (count 'em!) many of which are here for the first time. As for Black Sabbath's Deluxe re-issue...

68 LEFT FIELD
Where do you go to find great music Spotify won't suggest based on your listening habits? Left Field is a good place to start! But maybe you're already listening to Wolf Alice, Dennis DeYoung, Danney Elfman, Arielle, and Monster Magnet?

70 MIXED BAG
New Zealand's The Datsuns have broken a seven-year drought, Ayron Jones has finally signed with a major label, Nancy Wilson goes out on her own, without sister Ann, The Damn Truth reprise their analogue rock'n'soul, and Mojothunder's debut, 'Hymns from the Electric Church' will have you on your knees.

71 TOP PICKS
Two of Australia's greatest musicians have joined forces and the result is an album that's bigger than both of them. Amends has done the same without changing its line-up: their new album is jaw-droppingly good.

82 ROCK ON
Blackberry Smoke's latest album, 'You Hear Georgia', proves that they've finally perfected a winning balancing act between their two chief influences. And New Model's Justin Sullivan's first solo album is a triumph.

FEATURES

6 SOUND BITES
Estalon XB Diamond MkIIs in Oz for first time, BlueSound updates Node and PowerNode, DALI announces Oberon 7, Yamaha releases three new Adventage AVRs, Spendor Classic Range, Cambridge Audio's EVO does it all, M2Tech announces Young MkIV 'Rock Star' DAC, Polk Audio releases its 'Reserve Series' range and more . . .

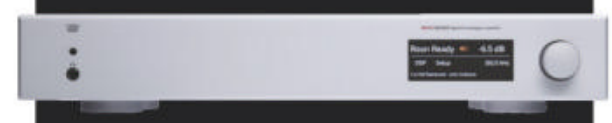
64 OBITUARY
Lou Ottens, the inventor of the compact cassette (but not the tape cassette itself) for Philips has died, aged 94. But despite being the inventor, history reveals that he wasn't a fan...

3 EDITOR'S LEAD-IN
Ten reasons lists about ten digital audio facts are useless. Well, not quite ten, but then the original list didn't have ten either!

esoterica

42 SOUND TRAVELS
It's not unusual for audiophiles to build their own loudspeakers, but it is unusual for them to build their own pre and power amplifiers. In this issue, we interview an audiophile who's built his own system, except for the sources.

46 HIGH END REVIEW
Most high-end hi-fi components keep the audio signal as pristine as possible, to the extent of making sure even capacitors are not in the signal path. We review one that gives you almost as much control over the audio signal as the original recording engineer.



DEPARTMENTS

OUR FRONT COVER

AudioSolutions' 0305F loudspeakers use a unique 'Russian Doll' approach to cabinet design that improves sound by reducing resonances. See page 16.

ESTELON XB DIAMOND MKII

The Mk II models of German manufacturer Estalon's high-end X Diamond Series loudspeakers are now available in Australia.

To look at the X Diamond Mk II you'd see no difference between it and its predecessor, because externally, it's the same gorgeously sculpted exterior, so graceful one would hesitate to call it an 'enclosure'. Internally, however, it has a new ultra-hard diamond inverted dome tweeter and a new crossover network with improved components for wider dynamic range and transparency and new cabling (Kubala-Sosna Pure Copper) to connect that network with the drivers and the rear terminals.

The bass driver of the X Diamond Mk II is a 280mm ceramic sandwich coned transducer made by Accuton. The midrange driver, which is also made by Accuton, has a pure ceramic cone that's 173mm in diameter. The cabinet, which is available in a wide range of finishes, including silver, is a marble-based composite that is the major contributor to the speaker's overall weight of 86 kilograms.

Estelon rates the new X Diamond Mk II with a frequency range of 22Hz to 60kHz and a sensitivity of 88dBSPL (2.83V/1m). The nominal impedance is 6Ω with a minimum impedance of 3.5Ω (at 50Hz). The speakers sell for around $100,000 per pair, depending on the selected finish.

The new XB Diamond Mk II is very similar visually and acoustically to the X Diamond Mk II, but is designed for smaller listening spaces. It has the same diamond tweeter but matches it with a smaller midrange driver (158mm) and a smaller bass driver (220mm). All drivers are made by German driver specialist Accuton. As with the XB Diamond MkII, the Mk II version of the X Diamond also has a new crossover with upgraded components, and new internal wiring. Estelon states the same frequency response for the XB Diamond as for the X Diamond, as well as the same impedance, but rates the sensitivity lower, at 87dBSPL (2.83V/1m). The recommended retail price is around $75,000 per pair (RRP), depending on selected finish.

For more information, contact Advance Audio Australia on (02) 9561 0799 or at www.advanceaudio.com.au

NODE AND POWERNODE UPDATED

Canadian manufacturer Bluesound has released a new generation of its best-selling Node Wireless Hi-Res Multi-Room Music Streamer and Powernode Wireless Hi-Res Multi-Room Streaming Amplifier.
Both models have been upgraded with new digital-to-analogue converters, more powerful DSP processors, and have touch panel controls with presets and proximity sensors. The power output of the Powernode's onboard stereo amplifier has been increased to 80-watts per channel, both channels driven into 8Ω.

The Bluesound Node and Powernode unlock the world of hi-res music streaming and multi-room audio to modernise any existing system by allowing you to stream music from your own digital music library, from your own computer or portable device or from the Internet. The Node is designed to be added to an existing hi-fi system or used with a pair of powered loudspeakers, while the Powernode, with its built-in amplifier, needs only a pair of speakers to become a complete audio system. Both devices are controlled by a sophisticated BluOS Controller app that's available for iOS, Android, Mac and PC.

The new DAC supports up to 24-bit/192kHz audio as well as MQA. Music can be delivered to either device via Wi-Fi, Ethernet, Apple AirPlay 2, aptX HD Bluetooth, or USB Type A, so you can hear audio content from streaming services, internet radio and your own music library and in answer to users wanting to play back audio from their TVs, both new models now have an HDMI eARC input. There's also an analogue input (RCA) and a digital input (Toslink).

"With BluOS built-in, you can easily create a DIY multi-room hi-res audio system with a few taps of the BluOS Controller app," said **Martin Ireland**, National Sales & Marketing Manager of Convoy, which distributes Bluesound in Australia, "plus additional hands-free controls are available through voice assistants such as Siri, Google Voice and Alexa while for professional smart home installers, full-featured drivers are available for Lutron, Crestron, RTI, Elan, and other popular control systems."

Both new Nodes incorporate DSP controllers to enable control over bass, treble and other controls as well as subwoofer crossover optimisation circuitry, as well as the ability to create presets, so you can instantly select a specific customisation to suit your signal source (music, movies, gaming, etc). "Both units enable bit-perfect music listening around the home, using the Node or Powernode as your multi-room hub," said Ireland. "Bluesound's award-winning BluOS platform is the only one in the world that can support up to 64 players, all streaming in 24-bit hi-res audio, and with a growing stable of brands and devices being added to the BluOS platform, these Nodes open up a world of hi-res listening options throughout your home that no other player can."

The Bluesound Node, which retails for $999 (RRP) and the Bluesound Powernode ($1,499) are available now, in your choice of a black or a white satin finish.

For more information, contact Convoy International on (02) 9774 9900 or at www.convoy.com.au

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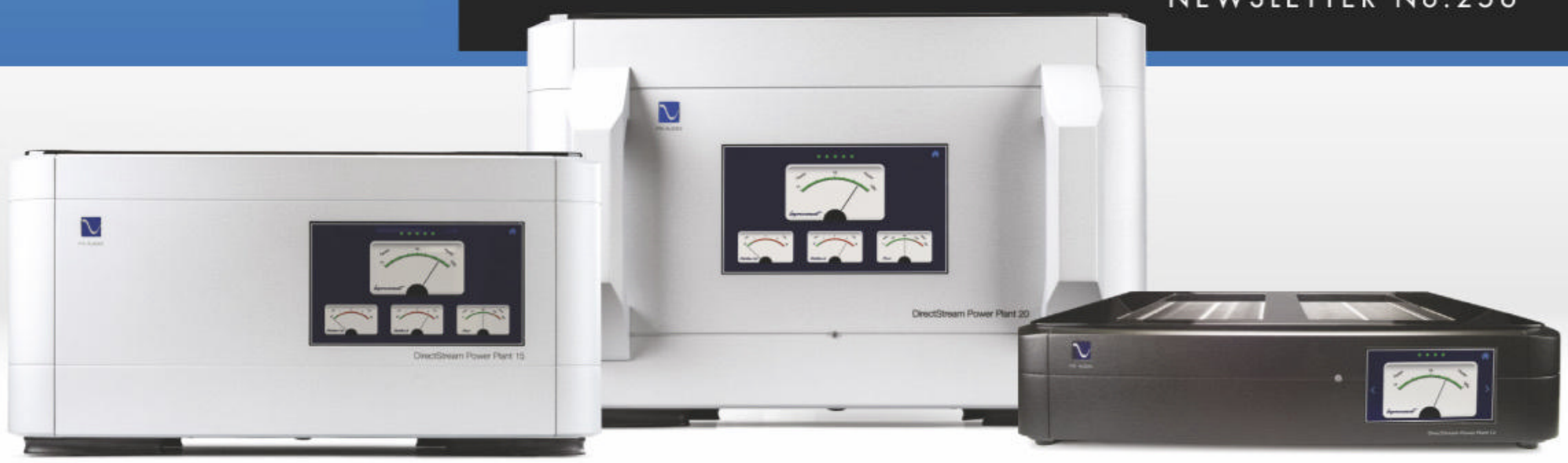
THE HI–FI HEADLINES

NEWSLETTER No.256



SAVE 20% ON PS AUDIO POWER REGENERATORS

The 20% discount on the range of Power Regenerators from PS Audio continues. This category was invented by PS Audio, and they remain at the forefront of the technology. From their compact Stellar P3 though to the impressive P20 PS Audio have a PowerPlant that is right for your system.

Even their smallest offering, the Stellar PowerPlant3, designed for small to medium systems, will give a notable boost to your system. You could expect better dynamics, more authoritative bass and a more expansive, open soundstage. The protection from spikes etc. is almost a bonus!

THERE ARE FOUR MODELS AVAILABLE:

Stellar PowerPlant3:	now $3,116	(RRP: $3,895)
PowerPlant 12:	now $6,716	(RRP: $8,395)
PowerPlant 15:	now $10,396	(RRP: $12,995)
PowerPlant20:	now $13,596	(RRP: $16,995)

NEW STAX SRM-400S EARSPEAKER DRIVER

Stax have just released a replacement for the popular SRM-353X electrostatic earspeaker driver. This is complete revamp with new circuitry, including reengineered power supplies.

Stax have, for good reason, been regarded as the holy grail of headphones for many decades. Ranging in price from $1,000 for the portable SRS-002 compact system through to $17,000 for their reference system they represent the best of what the category offers. The SRM-400s shows that Stax have no intention of basking in past glories but are committed to continually advancing the technology.

If you have never listened to a pair of Stax Electrostatics do yourself a favor – but be careful, you could end up owning a pair!

NEW SERHAN SWIFT MU2 MK11 SPEAKER RELEASED

Our respect for this bookshelf speaker is well documented. Designed and manufactured here in Australia it is the brainchild of Brad Serhan, who we believe to be one of the finest speaker designers in Australia, if not the world. It is a great example of a loudspeaker that is accurate, spacious and yet is emotionally involving. Diminutive in size this speaker produces a large footprint. It is precise, dynamic, plays loud, and has remarkable bass or a speaker of its size. Most importantly it is a speaker that will draw you into almost any musical genre you wish to throw at it. The original Mu2 speaker was one of our favorites in its category. The Mk11 is notably better. If you are looking for a compact speaker that captives, the Mu2 MK11s must be top of your audition list!

CEDIA MEMBER

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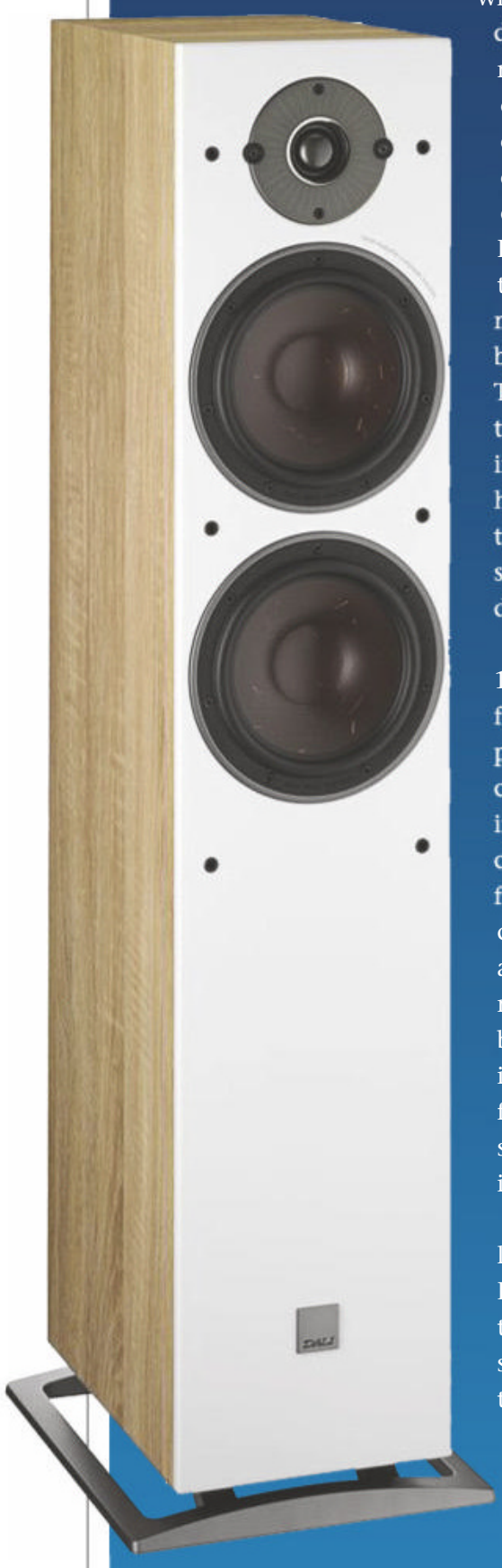
DALI OBERON 7

DALI's Oberon 7 gains its model name because it uses a pair of bass drivers each of which the company rates with a diameter of seven inches (178mm). The odd diameter comes about because DALI is one of the few manufacturers that builds its own drivers and it wanted to create a driver with a larger surface area than the standard 165mm (6½ inch) driver that most other speaker designers are using. "DALI's 178mm driver's cone is 15 per cent larger in dimension than those drivers and the resulting larger cone area allows a lower voice coil excursion at the same sound pressure level, as well as a higher maximum sound pressure level, which leads to an effortless reproduction of the dynamics in the music," said **Andrew Richter** of Amber Technology, which distributes DALI in Australia. The drivers' performance is further enhanced though the use of DALI's patented SMC magnetic technology which greatly reduces mechanical distortion caused by hysteresis and eddy currents. These combined improvements in the magnet motor system result in a reduction of third order harmonic distortion which in turn enables a relaxed midrange sound and a surprising amount of detailing for the class.



The motor system of the 178mm driver comprises a large ferrite magnet that surrounds a pole-piece made with a unique combination of hard magnetic iron and DALI'S soft magnetic compound (SMC). The iron ferrite forms the lower base of the pole cylinder, which is topped with a 10mm SMC disk. This combination equalises the flux field by placing the SMC disk right in the main working area of the four-layer voice coil so the coil sees a more constant flux field as it moves backwards and forwards.

"Basically, with the Oberon loudspeaker series, this famous Danish manufacturer has picked the best elements from its current speakers and brought them together in a series that delivers on audio quality, looks and versatility," said Richter. "When the driver technologies are incorporated into a large but elegant cabinet, as they are in the Oberon 7, the combination delivers the very best in deep bass and large room performance so it's perfect for almost any audio setup and any music or movie style."

Available now, the DALI Oberon 7s sell for $1,999 per pair (RRP) and are available now.

For more information, contact Amber Technology on (02) 9998 7600 or at www.ambertech.com.au

GRADO UPGRADES PRESTIGE PHONES

Grado, which has been manufacturing headphones at its own wholly-owned facility in Brooklyn, New York, for more than thirty years, having started with phono cartridges more than sixty years ago, has introduced a new range of Prestige Series headphones. In fact, the original Prestige was the first headphone designed by **John Grado**. This latest Prestige X Series has enhanced drivers, enhanced cable designs and more comfortable headbands.

The drivers in all five models in the Prestige X Series use newly designed voice-coils and diaphragms along with a magnetic circuit that has been revised in such a way as to improve efficiency, reduce distortion and linearise the frequency response. "The result of these changes in the new Prestige series is not only improved audio performance," says **George Poutakidis**, of BusiSoft, which distributes Grado in Australia, "but also that all five models are easier to drive across a variety of portable devices."

Poutakidis says the new cable designs are more durable and more flexible than before. "The 8-conductor (SR125X, SR225X, SR325X) and 4-conductor (SR60X, SR80X) cables now feature super-annealed copper wire to deliver an improved purity of the audio signal," he said. "Being faithful to the recorded event is and always will be a priority for Grado."

The re-design of the headbands sees all but one model in the Prestige X Series use a synthetic, headband material which looks and feels like leather, despite being vegan-friendly. The exception in the range is the top-line RS325X model, which has a headband made from real leather.

"Grado believes owning a pair of its headphones is a life-long investment," said Poutakidis. "This is characterised by the iconic Grado industrial design which follows the mantra of form follows function which is carried further by optimising the sonic performance of form and materials and making sure that spare parts are always available for all of its models." The five models in the new Grado Prestige X series are the SR60x ($139), SR80x ($179), SR125x ($249), SR225x ($319) and SR325x ($419).

For more information, contact BusiSoft AV on (03) 9810 2900 or at www.busisoft.com.au

NEW YAMAHA AVENTAGES

Yamaha has upped the ante with three totally new Aventage AV receivers, RX-A8A, RX-A6A and RX-A4A — offering 11, 9 and 7 channels respectively — to join the recently released RX A2A.

The user experience enabled by these new models is significantly upgraded thanks to a simplified, modern design, a new, high-resolution LCD display, a rotary jog dial, touch-sensitive buttons and a centrally located volume knob. The sound quality is also enhanced on these three new models, thanks to the use of the Qualcomm QCS407 smart audio platform, whose powerful quad-core audio processing offers both superior sound quality and cinematic listening experiences. It's also able to decode and play back a rich variety of audio content as well as support immersive 3D audio with Dolby Atmos, DTS:X and Dolby Atmos with Height Virtualization.

Picture quality is also improved, because the seven HDMI 2.1 inputs and three HDMI 2.1 outputs fitted to all three new models will support 8K60/4K120 (via sa oftware upgrade at a date yet to be announced) enabling everything from room-filling, crystal clear cinematic experiences to blazing fast, immersive game play that puts you in the centre of the action.

"We broke the mould when we premiered our flagship Aventage series in 2010. Now we've re-engineered it from the ground up, shattering expectations for what's possible for an AV receiver to reproduce True Sound," said **Yoshi Tsugawa**, of Yamaha. "Not only do these new Aventage AV receivers stay in lockstep with emerging tech — such as the latest gaming consoles and rising resolution of TV screens — but they also stay one step ahead in anticipating customers' future needs."

HDMI 2.1 means faster, smoother and uninterrupted entertainment and game play with Auto Low Latency Mode (ALLM), Variable Refresh Rates (VRR), Quick Frame Transport (QFT) and Quick Media Switching (QMS).

All Aventage models feature Surround:AI, a proprietary Yamaha technology that can optimise the sound quality of dialogue, background music and sound effects, in real time. All also include Yamaha's room acoustics optimizer (YPAO) that optimises the performance of your speakers to best-suit your room's acoustical qualities.

Yamaha's unique multi-room MusicCast capabilities and app control, including Wi-Fi, AirPlay2, Spotify Connect, built-in music streaming services (Amazon Music, Deezer, Spotify, Tidal etc), multi-room audio and voice control via Alexa, Google and Siri-enabled devices are all built-in, along with full two-way remote control via software integration.

The Yamaha RX-A8A comes with a 10-year manufacturer's warranty, while the RX-A6A, RX-A4A and RX-A2A each have a five year warranty. The Yamaha RX-A2A is available now, at $1,599 (RRP), but the on-sale dates for the RX-A8A ($6,299), RX-A6A ($3,699) and RX-A4A ($2,399) had yet to be announced at the time of going to press.

For more information, call Yamaha Music Australia on 1300 739 411 or visit au.yamaha.com

ELAC The life of sound.

SOLANO 280

High-End German Audio Engineering

Handcrafted in Kiel Germany, the Solano series introduces three new models to the ELAC family, the FS 278 floorstander, the BS 283 bookshelf and the CC 281 centre speaker.

Compact, attractive, and high in performance, each model boasts ELAC's renowned JET5c air motion tweeter and a ten year warranty.

The new Solano series marks a new reference in loudspeaker design, performance, and value. The range is second-to-none offering astonishing performance.

Available in limited quantities.

To find your nearest stockist, visit **synergyaudio.com** 03 9459 7474 /synergyaudiovisual SYNERGY AUDIO VISUAL

SPENDOR CLASSICS

In all the time since the company was first established by famous British BBC engineer **Spencer Hughes**, Spendor loudspeakers have always been designed and built entirely in the United Kingdom, with all models being assembled at the company's production facilities in Sussex, with the avowed aim of creating timeless, elegant loudspeakers that are easy to live with in any setting. Indeed the company claims it is the only British speaker manufacturer that designs, builds, and manufactures everything in its models, including the cabinetry, in its own factory.

Spendor's current owner, **Philip Swift**,

says that isn't about to change. "Over five decades Spendor Classic loudspeakers have earned iconic status as the ultimate reference for many audiophiles, musicians, and professional sound engineers," he said. "Spendor loudspeakers are easy to set up, work perfectly with whatever hi-fi equipment you have, and transform the way you hear and enjoy every kind of music. Best of all, they deliver a true, transparent, and musical sound 'way beyond their price point."

Paul Riachi, managing director of Indi Imports, which distributes Spendor in Australia, says the company is one of the few that makes it easy for consumers to decide which model will suit them best. "Spendor has only three distinctive product lines carefully tailored for different preferences, needs and budgets," he said. "The A-Line models offer captivating performance in compact, elegant designs suitable for smaller spaces. Spendor's Classic line delivers an immersive listening experience that many listeners find missing in other speakers, whilst the D-Line delivers resolution, accuracy and scale to bring out the very best in high-performance audio systems."

Although the Classic series has its roots in the speakers designed in the 70s, many of which are still in use today, the new Classic models are built around a totally new generation of Spendor drive units that feature advanced polymer and Kevlar cones, cast magnesium alloy chassis, high-efficiency motor systems, and optimised electro-dynamic damping.

The top-line model in the range, the Classic 200, is a three-way, four-driver floor-standing model using an infinite baffle low-frequency alignment. It uses two 310mm diameter bass drivers with Kevlar composite stabiliser domes, a 180mm polymer midrange driver and a 22mm dome tweeter to deliver a claimed frequency response of 20Hz to 25kHz ±3dB with an efficiency of 89dBSPL/w/m. Nominal impedance is a very amplifier-friendly 8Ω. It's optionally available with a Titanium front baffle (Classic 200 Ti).

The entry-level model in the Classic range, the Classic 1/2, is also a three-way, three-driver bass reflex model using a 210mm diameter bass driver, a 150mm midrange driver and the same 22mm tweeter. It is rated with a frequency response of 30Hz to 25kHz ±3dB and an efficiency of 87dBSPL/w/m. "No matter which model you choose from Spendor's range, you will experience truly captivating sound with unprecedented transparency and dynamic contrast," said Riachi. "Their simply brilliant loudspeakers have set the bench-mark in studios and homes across the globe as far back as the late 60s."

For more information, contact Indi Imports on (03) 9416 7037 or www.indimports.com

SOUND UNITED DOWN UNDER

One of Australia's largest hi-fi distributors, QualiFi, has been purchased by Canadian-based company Sound United. QualiFi is the Australian distributor for Denon and Marantz, companies that are owned by Sound United, as well as the distributor for many other brands. Following this acquisition, Sound United has merged the operations of Bowers & Wilkins Australia (which it also owns), with those of QualiFi.

The new company, Sound United Sales & Marketing, is now the distributor for Bowers & Wilkins, Classé Audio, Definitive Technology (DefTech), Denon, HEOS, Marantz, Polk Audio, Boston Acoustics, Blustream, Elan, Furman, SpeakerCraft and Xantech.

Sound United Sales & Marketing will operate from both the former offices of B&W Australia in Chatswood, NSW, and also from the offices and warehouses of QualiFi in Mt Waverly, Victoria. **Philip Newton**, CEO of the newly-created entity, commented: "The bringing together of the various elements of the Sound United family under one roof here in Australia, announced some months ago, has now been finalised. The combined strengths of our brand portfolio bring together an enterprise of significant scale, the likes of which has rarely been seen in the specialty audio channel." He added "Our collective resources are substantial, and we believe our customer-centric approach combined with our expertise in the premium audio channel, will ensure the local market benefits from unprecedented levels of choice and service."

Two brands, Jamo and Klipsch, which were previously distributed by QualiFi, are now distributed in Australia by the Premium Audio Company, a wholly-owned subsidiary of Voxx International, which owns Klipsch Group, which manufactures speakers for both brands.

For more information, please contact Sound United Sales & Marketing on (02) 9196 8990.

MUSICAL FIDELITY PRICES DROP!

'Grey' importing, or 'parallel importing' where a company imports and sells brands it is not authorised to sell by the manufacturers of those brands, has become a serious issue in the hi-fi industry.

As 'grey' importers do not offer demonstration facilities and can be difficult to track down in the event that service or spare parts are required, they are essentially prospering from the investment that the authorised distributor has put into the brand — an investment that has included the cost of Australian electrical safety and compliance certifications, and local stock of spare parts and accessories. "In the past this was merely an annoyance, but today with the increasing effectiveness of social media and other digital marketing platforms it is possible for a grey importer to become very disruptive with little expense or support," said **Tim Wallis**, of Audio Marketing, the sole Australian authorised distributor for Musical Fidelity. "We have decided to meet fire with fire and so we have drastically reduced prices of all Musical Fidelity components to combat the threat."

"We are aware that our newly-announced pricing is unsustainable in the long run but we believe that it is important that our dealer network reaps the benefit of their investment, demonstrations and brand commitment, rather than see their work picked off by faceless third-parties based on price alone." Audio Marketing says the new Musical Fidelity prices are now the same or very close to those offered by grey importers, while still offering full brand support. "In fact Musical Fidelity is possibly now cheaper in Australia than anywhere else in the world," said Wallis. "For example their 500-watt integrated amp, the M6Si 500 has a recommended price set by Musical Fidelity of $US4,999 (A$7,937 at current exchange rate) — plus relevant taxes. It is now available in Australia for $5,890."

Some other price changes are:
MX Vinyl was $1,750 — Now $1,390
M3si was $2,500 — Now $1,950
M6si was $5,000 — Now $3,860
M8xi was $12,000 — Now $9,450

For more information, contact Audio Marketing on (02) 9882 3877 or at www.audiomarketing.com.au

Some things are worth the wait

GFA-585se $5799 rrp

AMPLIFIER CLASS
A/B

POWER RATING
450 watts continuous average power into 8 ohms at any frequency between 20Hz and 20kHz with both channels driven at less than 0.05% THD.

600 watts continuous average power into 4 ohms at any frequency between 20Hz and 20kHz with both channels driven at less than 0.07% THD.

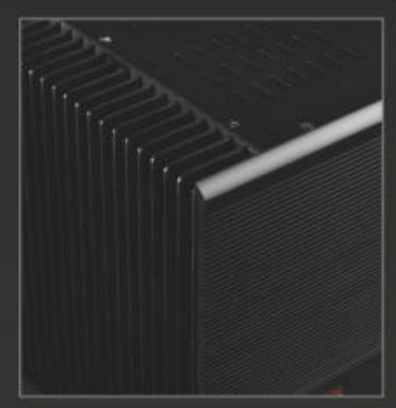
1000 watts continous average power into 8 ohms at any frequency between 20Hz and 20kHz at less than 0.10% THD, bridged.

FREQUENCY RESP.
@ 1watt, 8-ohms:
+0. -0.25dB, 10Hz to 20kHz

INPUT SENSITIVITY
2.681V rms, 450 watts into 8 ohms.
126 mV rms, 1 watts into 8 ohms.

POWER BANDWIDTH (0.25DB):
20Hz to 20kHz

DAMPING FACTOR
>800, 20Hz to 20kHz



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CAMBRIDGE EVO SYSTEM

Cambridge Audio has released a single-chassis audio component that does it all. All you need to add is a pair of speakers. Designed in London by Ged Martin, the Evo's chassis has an aluminium cabinet to which can be attached your choice of side panels — walnut or a new material made from recycled paper called Richlite. The front panel is dominated by a large 173mm full-colour LCD display and a multi-function dual-concentric rotary control that supplements the unit's ability to be controlled from your phone or tablet. "Cambridge Audio has been at the forefront of British audio innovation for over 50 years," said **Philip Sawyer**, of Synergy AV, which distributes the brand in Australia. "This new Evo represents an evolution in hi-fi: an all-in-one music player that combines timeless design, cutting-edge technology, streaming smarts, and incredible audio performance into one streamlined and compact box. You simply need to add speakers to start enjoying music."

Two differently-powered versions of the Evo are available, both of which use Hypex NCore Class-D modules.

The Evo 150 is rated with an output of 150-watts per channel. The Evo 75 is rated at 75-watts per channel. Both models use ESS Sabre DACs in concert with Cambridge Audio's own 'StreamMagic' platform, optimised for streaming, as you'd expect, so you can stream Qobuz, Tidal Connect, MQA, Roon Ready, Spotify Connect, AirPlay 2, Bluetooth (aptXHD), Chromecast built-in and internet radio. "Whether you use Roon to organise your digital library or stream high-resolution MQA tracks using TIDAL Connect — Evo can play it all,' says Sawyer. "And StreamMagic will ensure that you hear your music in the best possible sound quality, no matter where you're playing it from."

You can also integrate the Evo with your existing equipment, using its digital and analogue inputs, which include line-level and phono analogue inputs (phono only on 150) and coaxial, optical and USB (150 only) digital inputs as well as an HDMI ARC input for your TV's audio. Available now, the Cambridge Audio Evo 150 retails for $4,299 (RRP) and the Evo 75 for $3,299 (RRP).

For more information, contact Synergy AV on (03) 9459 7474 or at www.synergyaudio.com

BELT UP REGA!

Or should that be 'upgrade your Rega belt'? Yep, just in case you've been living on another planet (Rega Planet, that is), Rega has recently, in what it says "is the culmination of years of materials and tooling research and development" released what it states is "the most accurate drive belt we have ever produced." The new Rega Reference EBLT belt can be retro-fitted to all Rega turntables, will be fitted as standard to all Planar 8 and Planar 10 turntables and can be optioned for all other currect (and future) Rega models. "The Reference belt is suitable for all Rega turntables and highly recommended for the Planar 6 or Planar 3 using the Rega Neo PSU," says **Philip Sawyer**, of Synergy Audio Visual, which distributes Rega in Australia.

Available now, the Rega Reference EBLT drive belt sells for $75 (RRP). A lower-specified version, the Advanced EBLT drive belt, retails for $45. The 'Advanced' version is the one being fitted as standard to current Planar 1, Planar 1 Plus, Planar 2, Planar 3 and Planar 6 turntables.

For more information, contact Synergy AV on (03) 9459 7474 or at www.synergyaudio.com

M2TECH YOUNG MKIV DAC

Italian manufacturer M2Tech has released its Young MkIV DAC/Preamplifier, the latest model in its 'Rock Star' range, which is a three-in-one device that combines the functions of a DAC, a preamplifier and a headphone amplifier. Its DAC handles PCM 32/768kHz, DSD Native 512 and 256 (DOP), and MQA, plus it also has AptX Bluetooth on board. The headphone amplifier has both single-ended and balanced outputs. Control is via the Young MkIV's own remote, via the front panel itself, or via app (Android/iOS).

"The fast-paced world of Digital development has left many bewildered, not only with choice but with technology too," says **Ian Ross-Brown** of New Zealand-based Critical Sound Information which distributes M2Tech in Australia as well as New Zealand. "M2Tech endeavours to futureproof consumer needs, whilst offering wide compatibility with all music sources and formats, in a package so small (200×200×50mm) that it requires minimal shelf space."

The M2Tech Young MkIV comes with its own external power supply, but Ross-Brown says its performance will be enhanced if you instead power it with M2Tech's dedicated Van der Graaf power supply.

Available now, the M2Tech Young MkIV DAC/Pre retails for $4,150 (RRP) and the VdG PSU for $1,645 (RRP).

For more information, contact Critical Sound Information at www.criticalsound.co.nz

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MCINTOSH BLUETOOTH TRANSCEIVER

McIntosh has released a Bluetooth transceiver, MB20, which can be used to add a wireless streaming capability to any existing audio system and is one of the few devices of its type that has balanced inputs and outputs in addition to unbalanced. It also has both coaxial and optical digital inputs and outputs.

As a transceiver, the MB20 can function as either a Bluetooth Receiver or Transmitter (but not both at the same time). Simply set the switch on the back panel to the proper setting for the desired Receiver or Transmitter usage.

Although it is a transceiver, so it can be used to transmit and receive Bluetooth signals, it cannot do both simultaneously. When used in its receiver mode, you can stream audio to the MB20 via Bluetooth from any compatible device with Bluetooth streaming capabilities and send this audio on to your amplifier.

When switched to its transmitter mode, any audio signals you connect to the MB20's analogue or digital inputs will be sent wirelessly via Bluetooth to any Bluetooth-capable devices, such as Bluetooth headphones or wireless Bluetooth speakers.

"If you have more than one audio system in your home, neither of which have a wireless capability, you can add an MB20 to each system with one set as a transmitter mode and the other as a receiver, and stream music from one system to the other," said **Philip Sawyer**, of Synergy Audio Visual, which distributes McIntosh in Australia. "Or if you need a high-performance audio link from one part of your house to another and running cables is not possible, two MB20s will create a full wireless encode/decode bridge."

The McIntosh MB20 uses Bluetooth 5.0 and supports aptXHD, aptXLL and AAC. In its receiver mode the MB20 makes use of a 32-bit/192kHz DAC for optimum sound quality but the MB20's digital output is fixed at 96kHz. Despite the onboard devices the MB20 cannot be used as a stand-alone DAC. It's a Class 1 Bluetooth device, so that under ideal conditions it has a range ten times greater than Class 2 devices, enabling operation over distances up to 45 metres.

With a footprint not much larger than a smartphone, the MB20 has a typically McIntosh finish (a black, custom aluminium chassis with a black glass top panel) and is powered via a wall-mount plug-pack. Available now, the McIntosh MB20 Bluetooth Transceiver sells for $995 (RRP).

For more information, contact Synergy AV on (03) 9459 7474 or at www.synergyaudio.com

POLK RESERVE SERIES

Polk's new premium Reserve Series speakers use the same custom-made drivers originally developed for its award-winning Legend Series loudspeakers, including the proprietary Pinnacle tweeter and turbine cone midrange, but at a much lower price-point. "This new Reserve Series executes on Polk's mission to create premium-quality speakers at accessible prices through the application of extensive research and development in advanced materials and acoustics," said **Paul Astbury**, of Sound United Australia, which is the new Australian distributor for Polk.

There are nine new models in all, and all are available in matte black, matte brown and matte white finish. There are three floor-standers, two bookshelf/standmount models, three centre-channels and a height model for home theatre applications. "While Reserve does use the same transducers as Legend, it also features multiple new developments of its own, including a new patent-pending X-Port filter and advanced cabinet construction to minimize undesirable resonances" said Polk's **Scott Orth**. "In return, you get a classic Polk Audio loudspeaker that is amazingly balanced, offers an expansive sound stage, detailed imaging, smooth midrange and deep effortless bass."

Polk Audio's Pinnacle tweeter is a ring radiator design, whose 25mm diaphragm features a waveguide to improve high-frequency dispersion and a critically damped rear-chamber to control unwanted resonances. "This high-res certified driver delivers ultra-clear, crisp highs without unwanted colouration or distortion," said Astbury, "and the turbine cone driver's specially moulded cone has a foam core that dramatically increases stiffness and damping which delivers smooth, detailed sound across the driver's entire bandwidth."

New in the Reserve Series is Polk Audio's patent-pending X-Port technology, which uses a set of closed-pipe absorbers precisely tuned to eliminate unwanted cabinet and port resonances which, in the R600 and R700 is combined with Polk's Power Port 2.0 design in a manner that Polk says "enables bass frequencies to extend more deeply and at higher output levels than traditional ported speakers."

The top-line R700 tower combines a Pinnacle ring radiator tweeter with a single 165mm turbine cone midrange driver and two 203mm polypropylene bass drivers to deliver a claimed frequency response of 38Hz to 38kHz –3dB at an efficiency of 88dBSPL. It stands 1144mm high and is 321mm wide and 429mm deep. The dual X/PP2.0 bass reflex port is down-firing. Available now, the Polk Audio R700 sells for $3,299 per pair (RRP).

For more information, please contact Sound United Sales & Marketing on (02) 9196 8990 or visit www.facebook.com/PolkAudioAustralia

audio-technica

ATH-WP900
MAPLE

ATH-AWAS
ASADA ZAKURA

ATH-AWKT
KOKUTAN

森林浴
伝統

Shinrin-Yoku or Forest Bathing is a Japanese traditional. Walking and spending time in the forest brings a peace and calmness that relieves the stresses of daily life.

Audio-Technica's new AW Series headphones combine innovation, craftmanship and analogue purity with sustainably forested, hardwood housings.

Handcrafted in Tokyo, Japan, ATH-**AWKT** features prized *Kokutan* (striped ebony), and the ATH-**AWAS** features rare *Asada Zakura* (Ostrya Japonica, Ironwood).

For more information on the AW range, visit audio-technica.com.au

AUDIOSOLUTIONS O305F

LOUDSPEAKERS

The new AudioSolutions O305F is a bit like a Russian doll, despite being made in Lithuania, because it has two cabinets, one inside the other, in what founder and lead design engineer Gediminas Gaidelis calls a 'box in a box' design. It's also the forerunner of a whole new series for AudioSolutions which sees all the previous O2xx designs replaced by O3xx designs, so the O305F reviewed here replaces the old O205F. That the design is completely new is no better illustrated by fact that whereas the old O205F was a five-driver, three-way design the new O305F is, as you can see, a four-driver, three-way design.

EQUIPMENT

The tweeter is a 25mm silk dome type custom-made for AudioSolutions by Swedish manufacturer SEAS. It's fitted with what AudioSolutions calls a 'mini-horn' that has two purposes. The main one is to reduce distortion at high volume levels which occurs when the mass of air in front of the peak of the dome becomes sufficient to prevent it moving as fast as the sides of the dome. This is a problem solved in various different ways by different manufacturers. A common one is to attach the peak of the dome to a 'bridge' spanning the tweeter, or simply to damp the peak using a similar bridge method. Gaidelis says that although both techniques are effective, they're very expensive solutions, because it's so difficult to ensure that electrical and acoustical parameters do not differ between samples. He says his 'mini-horn' solution achieves the same result, with the added advantage that it effectively increases the efficiency of the tweeter, so it doesn't have to work as hard to produce the same sound pressure levels as it would without the horn-loading.

You can see that the O305F uses a fairly unusual 'inverted' driver array, where the tweeter is mounted below the midrange driver. On the O305F this is done partially to avoid the high-frequency flutter echoes that can occur when a tweeter is close to a ceiling, partially to reduce time delay over the operating bandwidth and partially to ensure that the tweeter was positioned closer to the ear level of a seated listener.

Midrange frequencies between 500Hz and 3kHz are handled by a single 152mm paper-coned midrange driver made for AudioSolutions by SB Acoustics, a division of Malaysian company Sinar Baja Electric. The paper used to make the cone is what AudioSolutions calls an ER or 'Extra Rigid' formulation. Although they're manufactured in Malaysia, all SB Acoustic drivers are designed by Ulrik Schmidt and Frank Neilsen of Danesian Audio in Denmark, a company founded by the pair after leaving their previous employers (Scanspeak and Tymphany).

As for the O305F having a single driver dedicated to producing midrange signals, it is very important (to the point of being essential) for any true hi-fi loudspeaker to use one because of an effect that I once used to call Doppler Distortion but I now call Phase Modulation Distortion, thanks to the work of people far more experienced in technology than me (notably Rod Elliott, Siegfried Linkwitz and Art Ludwig). Phase modulation occurs when a single speaker cone is called upon to reproduce low and high frequencies simultaneously, which is what happens in any two-way loudspeaker.

If a driver is required to produce a single low-frequency sound (at, let us say 55Hz), its cone will move backwards and forwards fifty-five times per second and your ear would hear the resulting movement of air caused by this movement as the musical note 'A1'. This pitch is an octave above the lowest A on a piano keyboard and also the one to which the second string of a double-bass is tuned. So far so good.

But if that same driver is also asked to produce another musical note, let us say middle-C, which has a frequency of 261.63Hz, it would have to move backwards and forwards 261.63 times per second at the same time that it's also moving backwards and forwards 55 times per second. This means the frequency of what should be 'middle-C' will actually not always be precisely 261.63Hz but will be shifted higher or lower depending on the direction the cone is moving as a result of having to produce the 55Hz signal at the same time. It's because of phase modulation distortion (PMD) that it's preferable that a low frequency driver (or drivers) be used to produce low frequencies and for a completely separate loudspeaker to be used to produce midrange frequencies. (I would advise anyone interested in this type of distortion to read the article 'Doppler distortion in loudspeakers — Real or Imaginary?' by Rod Elliott, at *https://sound-au.com/doppler.htm* in which he not only discusses and explains phase modulation distortion, but demonstrates the effect by measuring it on a loudspeaker.)

Low frequencies are handled by two 'ER' paper-coned drivers with diameters of 183mm, both of which were also designed by Danesian Audio and manufactured by SB Acoustic. The drivers are operated in parallel, which is primarily the reason for the O305F's relatively low impedance, which SoundSolutions rates as being 'nominally 4Ω.' Using two drivers increases the efficiency of the design, enables a higher power-handling capability (because amplifier power is distributed over two voice-coils, rather than just the one) and, most importantly, means the cones can move more air, which improves the realism of the bass. The low-bass output also gets an assist by virtue of a rear-firing bass-reflex port.

The speaker terminals on the new O305F benefit from having been upgraded from the ones on the previous model to large multi-way types finished in frosted satin silver, which AudioSolutions says "can take even thickest high-end cable manufactured today" (obviously having not seen the cables we manufacture here in Australia!) "and provide proper grip for tightening and most importantly, a proper path for signal travel without any losses."

Internally, the terminals are connected to the drivers via heavy-duty wire and a phase-linear crossover whose printed circuit board has extra-thick copper traces and uses high-grade air-cored inductors.

The O305F stands 1.11 metres tall on its 'outrigger-style' stand which in turn stands on four carpet-piercing M6-threaded spikes.

For users who have a solid floor of some type (timber, granite, tile…) AudioSolutions provides protective caps so the spikes can't mark the surface. The fact that a standard M6 thread is used means you can substitute feet from other manufacturers if you wish. You will, however, have to use the outrigger stand because the O305 is so tall and narrow that it's quite unstable without the stand fitted.

Your choice of cabinet finish will affect the price you have to pay for a pair of O305Fs. The standard finish is a painted baffle in white or black both with charcoal sides. Speakers in these finishes retail for $8,900 per pair. If you'd prefer a real wood finish, you can optionally choose between three species — Oak, Mahogany and Wenge — but doing so will add $1,780 to the asking price. That asking price includes a nice set of grilles that attach magnetically, so no fixings will show on the baffle if you prefer your speakers 'naked'. (Don't underestimate this inclusion, an increasing number of — in my opinion misguided — speaker manufacturers are either not providing grilles for their speakers at all, or charging extra for them.)

> You'll be pinching yourself at the perfection of it all. This is sound quality at its very finest.

'BOX-IN-A-BOX' DESIGN

Gaidelis originally developed his 'box in a box' cabinet design for AudioSolutions's more expensive Virtuoso series, but with this new 03xx series, he decided to trickle-down the technology to improve performance. The box-in-a-box design comprises two independent structures, a lightweight inner cabinet and a heavier, outer one.

Between the two is a very thin layer of polyurethane, which Gaidelis says acts as dampening material. "The thin but stiff inner cabinet provides the necessary support for the structure itself as well as transfers the energy of radiated back-wave to the outer cabinet layers without storing energy inside the material and preventing the back-wave from being reflected to the listener," says Gaidelis. "Fast energy transfer is essential in order to prevent low-Q oscillations which can last relatively long and ruin precise sound reproduction."

Gaidelis says that in order for the box-in-a-box technology to work it is essential that the two 'boxes' be separated by the thin (less than a millimetre thick) layer of polyurethane. "The polyurethane layer not only acts as an additional barrier for energy to be dissipated into heat while travelling from the inner box to the outer box but also helps the outer high-mass box to quickly stop its movement," he says. "To illustrate its working principle you should imagine a child's swing being suddenly stopped with the help of a soft pillow."

LISTENING

The rear-firing bass reflex port means that the low-frequency sound O305F will be more dependent on the cabinets' proximity to a rear wall (and the material of which that wall is constructed) than a bass reflex design with a front-firing port, or a sealed enclosure, so some room positioning experimentation will be required, possibly a bit more than is the norm.

However, optimum placement will pay off, because when you attain that position, you'll find that the bass extension of the new O305F is impressive, with the speakers digging deep into the bottom-most octave, and delivering solid, tight and tuneful bass right up to where those twin bass drivers hand over to the midrange driver.

Listen to the O305Fs and you'll be left in no doubt that designer Gediminas Gaidelis has a very clear and coherent concept of how he wants his designs to sound, because despite the enormous differences in the sizes of the cabinets, and the complete change of manufacturer for the bass driver, and the difference in the number of drivers used, I thought that the O305F's tonal character was uncannily similar to that of the O202B design, which I reviewed some time ago for another magazine.

I personally found this immensely reassuring, because if speakers from the same manufacturer sound completely different, the designer obviously has no idea of how music should sound!

When I am reviewing loudspeakers, I normally try to single out the strongest point of that speaker's performance to focus on it, and highlight it as the focal point of my review. With the AudioSolutions O305F, however, I was not able to do that, because their performance was so strong across so many important areas.

So let's start with the most important, which is the midrange, because that's where the human ear is most sensitive and most discriminating, so if a speaker does not deliver realistic midrange sound, it really doesn't matter if it has great bass and superlative treble. And I am happy to report that the midrange of the O305F is outstandingly good, being pure, clean and well-balanced and with no distortion that I could hear. I wasn't overly surprised, mind you, because most of these benefits will be delivered by a well-designed three-way loudspeaker system that's using a high-quality midrange driver. Nonetheless, I was still impressed by the O305F's midrange delivery because of its very melodic quality. It just sounds totally musical and super-easy on the ears.

Using female vocalists to test midrange sounds like a cliché, but it's really no more than using snow to test snow-skis. And how many female vocalists are out there in the 'top ten' of any genre you care to mention? Listening to female vocalists will be a major part of your day-to-day listening, so you want it to be good. k.d. Lang's gorgeous mezzo-soprano voice is always a good place to start for me, but I'm not really a fan of her own compositions, so my go-to album of hers is always 'Hymns of the 59th Parallel', where she covers songs made famous by other Canadian musicians, including Neil Young, Joni Mitchell and Leonard Cohen. (OK, it does include one song she wrote, but it was a co-write with David Piltch and it's my least favourite song on the album.)

Just as an aside, I was going to mention that David Piltch was once the bassist for Blood Sweat and Tears, but since almost every bassist in the US has played for BST at one time or the other, this wouldn't exactly be overly informative. OK, so writing 'every bassist' in that sentence was an exaggeration, but they've had 15 bass players so far, including the current one, Ric Fierabracci. (At least he was at the time of writing!)

If you listen to Lang's versions of Neil Young's *Helpless* (Track 1) or *A Case of You* (Track 3), you will never listen to any other versions of it. She interprets these songs beautifully, with an out-of-this-world cadence that just throbs of heart-ache. When she sings "something about a queen" the AudioSolution O305Fs delivered the turn of her voice on the word 'queen' like few other speakers are capable. And later, when she sings "floating on the breeze" the vibrato she adds to the word "breeze" is again delivered by the O305Fs so clearly, so articulately, and so pitch-perfectly that you'll be pinching yourself at the perfection of it all. This is sound quality at its very finest. This revelatory sound quality does come at a cost, because listening to the O305Fs was the very first time I have ever noticed that when Lang sings "there was a band playing in my head / and I felt like getting high" she sings the word "getting" just a little flat. Such is the price of high fidelity, I guess.

My first test for bass was with those two fathers of dub techno, Moritz von Oswald and Mark Ernestus. Their track *Mango Drive* at first listen sounds repetitive, but if you listen closely and your speakers' bass delivery is sufficiently revealing you'll be able to hear that the seemingly repetitive bass is actually being altered slowly and subtly as the track progresses. I was able to hear this when listening to the AudioSolutions 0305Fs, plus at the same time the cleanliness of the midrange and high-frequency stabs and reverberations were also revealed. Great performance from the Lithuanian pair.

Next up was the soundtrack to one of my favourite modern science fiction movies,

'Inception', created by the same director who created one of my all-time favourite movies, 'Momento'. It's reported that composer Hans Zimmer wrote the music while watching the movie (or at least only after watching the movie) and it's certainly very brooding and ethereal, well-suited to the film, though I find it more than a little reminiscent of the atmospherics Vangelis created for Scott Ridley's epic movie 'Bladerunner'. (Zimmer says the score is multiple elements of parts from Édith Piaf's "Non, je ne regrette rien"). Whatever the genesis of the soundtrack, there's massive amounts of deep and not-so-deep bass and all of it was reproduced wonderfully well by the 0305Fs. The clarity of the AudioSolutions' bass delivery made it easy to hear and appreciate the subtle changes in pitch and intonation in the bass. The ability of a speaker to do this is essential to enable the mystery of the work's best-known track, *Time*, but it's also crucial for what's probably my favourite track, which is the earlier *Dream is Collapsing*. Marvellous stuff!

One of my test tracks for high-frequencies is Laurie Anderson's 'Big Science' (the remaster) because the synthesisers on it are absolutely out of this world, particularly on its most popular track, *O Superman*. But it's just as good for lots of other evaluations, not least because on most tracks, not least the introductory *From The Air* we get to hear Anderson speaking, so there are multiple opportunities to evaluate the clarity and audibility of the diction against a huge variety of background sounds. In my opinion, the ability of the O305Fs to deliver exactly the sound of her voice in all these circumstances was exemplary. The title track that follows has her singing as well as speaking and her breathy vocals were extraordinarily-well realised by the AudioSolutions speakers. The background percussion in this track is precise and the way the speakers delivered the sound of the 'bounce' of the skin on the drums was a joy for me. Rarely do I hear this done so well.

I also use another of Anderson's albums ('Songs from the Bardo') to evaluate a loudspeakers' reproduction of the sound of violin, cello and piano but also for a quiet contemplation of death, because on this album (which I admit is not for the faint of heart) Anderson reads passages translated from 'The Tibetan Book of the Dead' ('The Bardo Thodol') aided by musical accompaniment from Tibetan singer and musician Tenzin Choegyal (he plays the dranyen, a Tibetan stringed instrument, and Tibetan singing bowls), Rubin Kodhel (cello) and Jesse Paris Smith (piano).

The sound of the bowl singing is perfectly resonant and the O305F reveals the pitch pulsing in concert with the pulsing volume.

I thought I'd better finish this review with a more 'fun' album, so it was time for what's likely the best album so far for the year, which is Olivia Rodrigo's 'Sour'. If you've been put off this album by listening to *Drivers Licence*, which is the track that gets the most airplay, forget that one and make a point of listening to the entire album, because *Good 4 u* is a stunning track, as are *Traitor* and *Brutal* both. I'd add *Déjà vu* to these three except that Rodrigo's taken a leaf from Billie Eilish's play book and included some horrible distortions on it that make it a difficult listen. What's most impressive when you listen to 'Sour' is that when the album delivers power and drama, the AudioSolutions O305F delivers that power and drama, but when it switches to 'soft and girly' the O305F also moves straight into 'soft and girly', so becoming a perfect mirror to the music.

CONCLUSION

Actually, to reprise those final words from that previous paragraph, "mirror to the music" is a fitting way to describe this superlative third-generation design from Gediminas Gaidelis, whose signature sound is writ large in the O305F's acoustic DNA. Whatever speakers you thought you might be looking for for your own listening room, you owe it to yourself to audition this new model from AudioSolutions.

CONTACT DETAILS

Brand: AudioSolutions
Model: O305F
Price: $8,900 per pair (RRP)
Warranty: Five Years
Distributor: Absolute Hi End
Address: PO Box 370
Ormond
VIC 3204
T: (04) 8877 7999
E: info@absolutehiend.com
W: www.absolutehiend.com

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- Very efficient
- Excellent deep bass

- Bi-wiring
- Low impedance

Readers interested in a full technical appraisal of the performance of the AudioSolutions O305F 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.

LABORATORY TEST REPORT

Newport Test Labs evaluated the overall frequency response of the AudioSolutions O305F loudspeakers by combining an in-room low-frequency measurement with a gated (anechoic) measurement and the result is shown in Graph 1. You can see that the response remains very comfortably within an 8dB envelope from 44Hz up to 34kHz, which is excellent, so the normalised frequency response measured by the lab was 44Hz to 34kHz ±4dB. This represents excellent frequency extension at both ends of the audio spectrum and excellent linearity.

You can see from Graph 1 that the response is not spectrally tilted at all, which is excellent, but also that there are very slight lifts in the response between 70Hz and 150Hz and again between 4kHz and 14kHz which are responsible for the ±4dB envelope. Were it not for these slight excursions, the frequency response would have been 44Hz to 34kHz ±3dB, which would have been outstandingly good, rather than just excellent. These lifts, along with the slight suck-out in the response centred at 2kHz would give the sound of the speaker a distinctive characteristic for a trained listener.

The effect of using a grille on the AudioSolutions O305F is shown in Graph 2, where the black trace shows the response without the grille fitted and the green trace the response with it on. You can see that the grille is almost totally acoustically transparent, so you will hear exactly the same sound balance irrespective of whether you use the speakers with or without the grilles. This is excellent design work by AudioSolutions' design team. Yes, there are some tiny discrepancies, particularly at 4.6kHz and at 24kHz,

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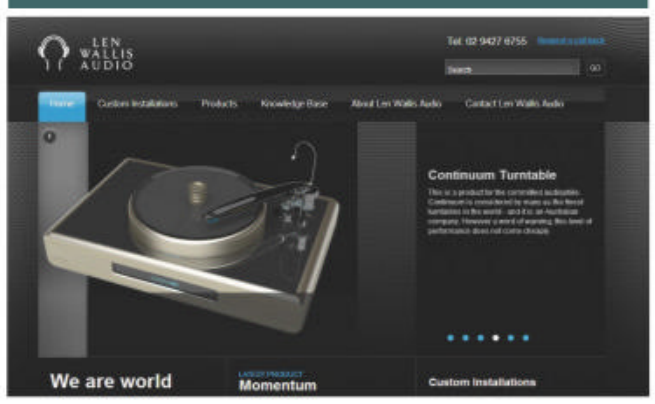

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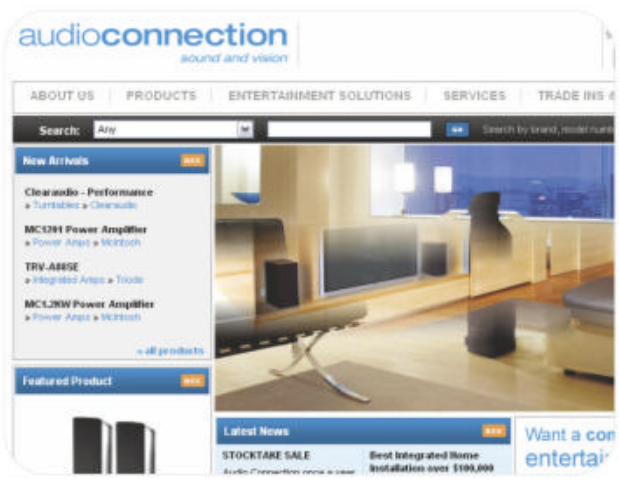

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but these are so high in frequency and affect so little of the bandwidth that they would not be audible, even to a trained listener in a direct A–B comparison.

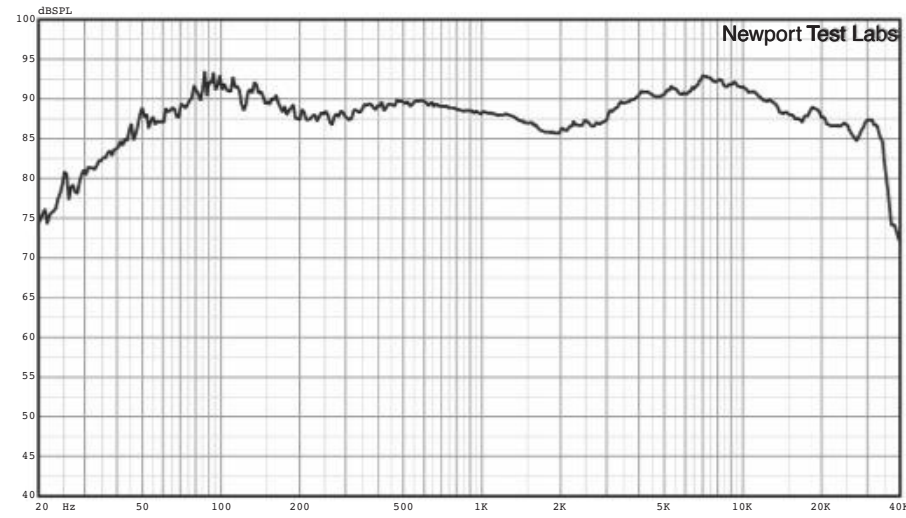
Graph 3 shows the near-field responses for the rear-firing bass reflex port, the two bass drivers and the midrange driver. This measurement technique is not particularly suited to a midrange driver, but *Newport Test Labs* has included it here because it shows that AudioSolutions has decided to simplify the crossover network either by letting the midrange driver's response roll off naturally, or use a very shallow 6dB/octave slope, which would seem to account for the lift in the on-axis response around 70–150Hz noted previously.

The port delivers low frequencies over a wider bandwidth than I might have expected, so the tuning is a little unusual. The port rolls off nicely to 200Hz, but as you can see, there's considerable energy coming out of it at 300Hz which is leakage from the rear of the bass driver cones. You can see that despite being identical, the output of the two bass drivers diverges at 450Hz, with a substantial difference just above 1kHz which is due to the differences in their location on the baffle.

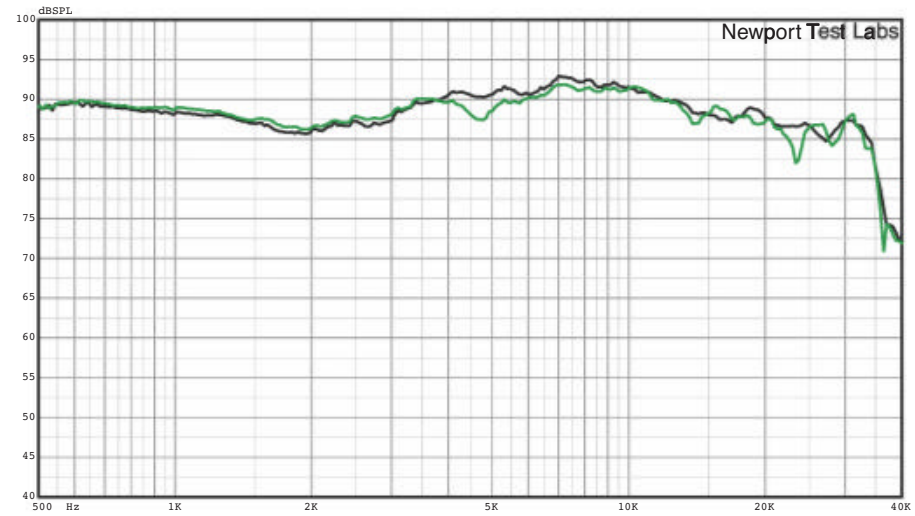
The impedance of the AudioSolutions O305F shown by the red trace in Graph 4 is overall so low that if it is indeed representative it would be a stretch to call this design a 4Ω one, as AudioSolutions has done, even if it's qualified by the word "nominally." You can see that the impedance is below 5Ω from 75Hz to 30kHz except for a small rise between 350Hz and 950Hz where it almost manages to peak at 7Ω. It drops below 3Ω between 95Hz and 200Hz, and again is essentially less than 3Ω from around 1.7kHz up to 7kHz. At around 130Hz it's around 2.4Ω and at 3kHz it's closer to 2.3Ω. This means the speaker will demand quite some current from the driving amplifier, though it's not a 'difficult' load as such, because the phase angle (represented by the light blue trace) at both these extremes is less than –15°.

A very well-designed loudspeaker that has a linear, extended frequency response and is highly efficient

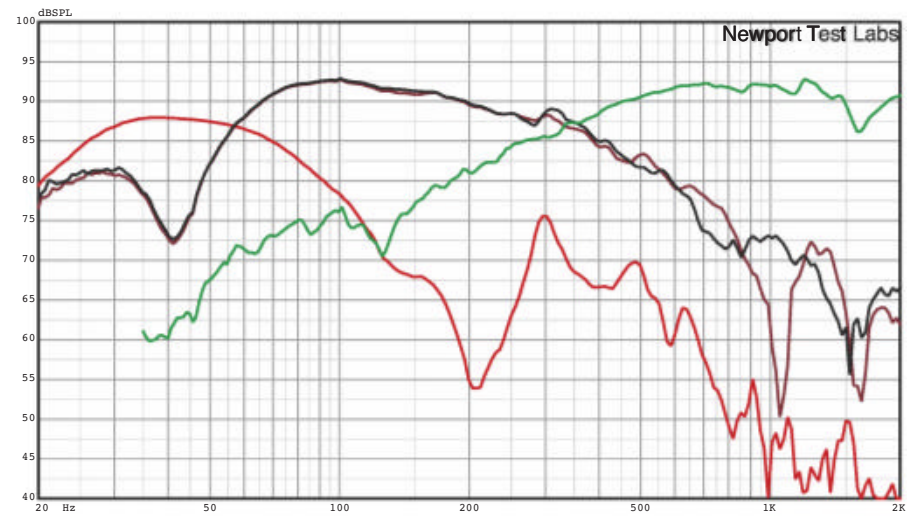
Graph 1: Frequency response. Trace below 600Hz is the averaged result of nine individual frequency sweeps measured at three metres, with the central grid point on-axis with the tweeter using pink noise test stimulus with capture unsmoothed. This has been manually spliced (at 600Hz) to the gated high-frequency response, an expanded view of which is shown in Graph 2.



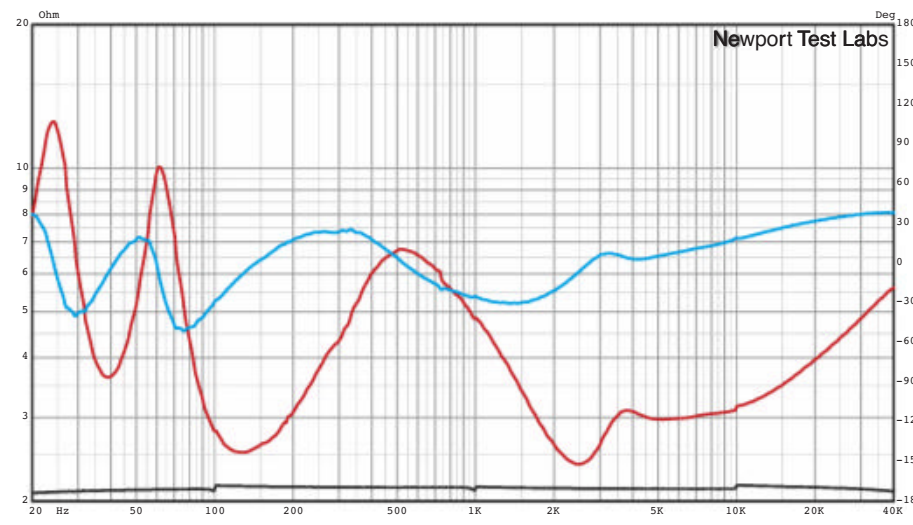
Graph 2: High-frequency response, expanded view, grille on (black trace) vs grille off (green trace). Test stimulus gated sine. Microphone placed at three metres on-axis with dome tweeter. Lower measurement limit 500Hz.



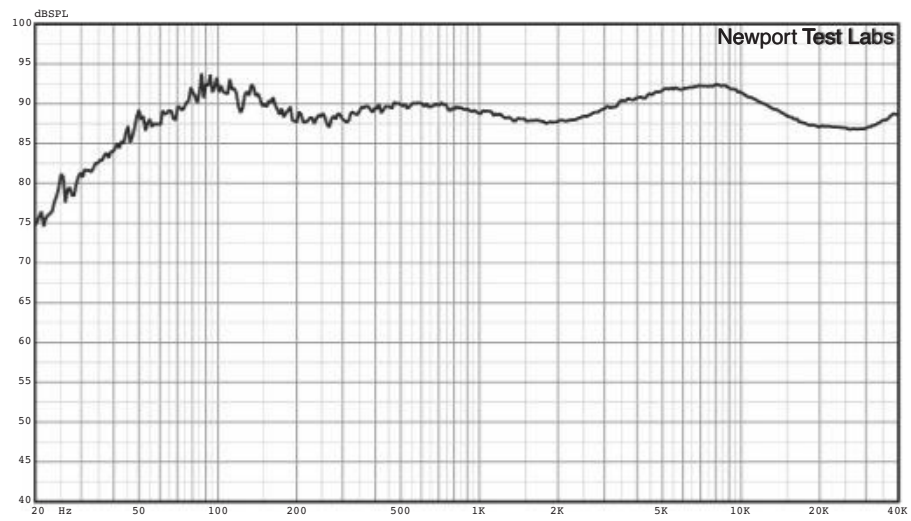
Graph 3: Low frequency response of front-firing bass reflex port (red trace), bass drivers (black and brown traces) and midrange driver. Nearfield acquisition. Levels not compensated for differences in radiating areas.



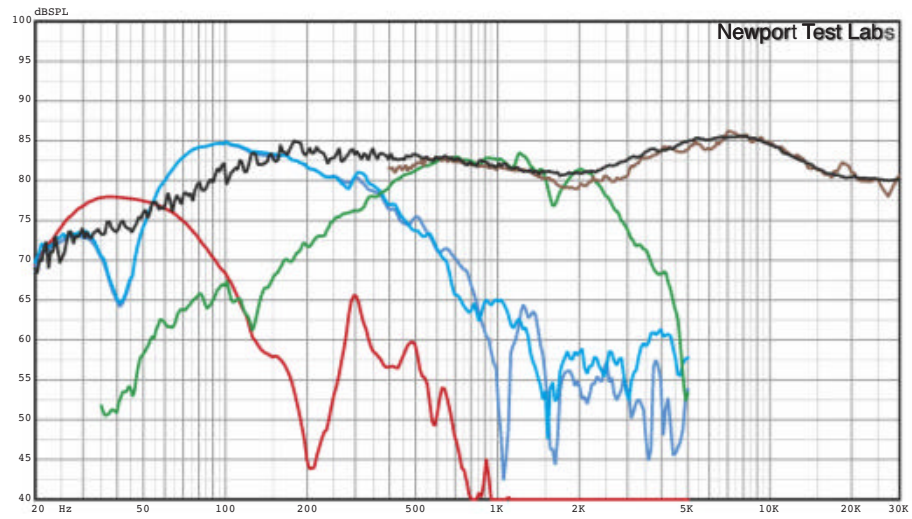
Graph 4: Impedance modulus (red trace) phase (blue trace). Black trace under is reference 2 ohm precision calibration resistor (see copy).



Note that because the measurement set-up used is not totally accurate at very low impedances, *Newport Test Labs* has included a measurement of a precision 2Ω resistor (the black trace at the bottom of the graph) to show that the 2Ω graphing line is actually a little lower than 2Ω, so you'd need to take this into account when looking at the O305F's impedance values in relation to the graphing calibration values.



Graph 5: Averaged in-room frequency response using pink noise test stimulus with capture unsmoothed.



Graph 6: Composite response plot. Red trace is output of bass reflex port. Light and dark blue traces are anechoic responses of bass drivers. Green trace is sine response of midrange driver. Brown trace is gated (simulated anechoic) response above 400Hz. Black trace is averaged in-room pink noise response.

Graph 5 shows the averaged in-room frequency response of the AudioSolutions O305F when using pink noise and you can see that the response above 600Hz is rather less 'lumpy' than in Graph 1, and this is the response that would be perceived by the human ear. Of course below 600Hz, the graph is identical to that shown in Graph 1.

Graph 6 is a composite plot where *Newport Test Labs* has overlaid the various response plots so you can see the 'fit' between the different measurement techniques used to create the various graphs. This also shows more exactly how the in-room response at high frequencies is smoother than the anechoic response.

AudioSolutions rates the sensitivity of the O305F design at 91dBSPL at one metre for a 2.83V input. *Newport Test Labs* does not use quite the same measurement technique as the Lithuanian company, but the result it obtained using its standard measurement methodology was remarkably similar, at 90.5dBSPL for 2.83Veq. This makes the O305F a very efficient loudspeaker that will be able to produce very high sound pressure levels with only a minimum amount of amplifier power. However, given the low impedance of that design, it would have to be high-quality amplifier power.

The AudioSolutions O305F is a very well-designed loudspeaker that has a linear and extended frequency response and proved to be a highly efficient design — more efficient than most, in fact — in *Newport Test Labs'* acoustical assessments. ***Steve Holding***

ELECTROCOMPANIET ECI 6 DX MKII

INTEGRATED AMPLIFIER/DAC/STREAMER

It was only after I pressed that golden power button in the centre of the EC's front panel and saw the stylised 'E' that is Electrocompaniet's logo flash into being in the display that I realised exactly how similar it is to the symbol that is used to represent the currency of the European Union: the Euro (€). This could hardly be deliberate, since the Norwegian manufacturer was building amplifiers twenty years before the EU came into being. But it is bemusing, because Norway is still not a member of the EU, so the country's currency remains the Krone, as it has since 1875.

EQUIPMENT

As the product name suggests, the Electrocompaniet ECI 6 DX MkII has it all!
It's not only a hugely competent integrated amplifier with a rated output of 125-watts continuous per channel into 8Ω, it's also a full-featured digital-to-analogue converter and an equally full-featured streamer.

A power output of 125-watts into 8Ω from such a compact (and, it just has to be said, stunningly beautiful) chassis is an impressively high power output.

But even more impressive is that it can also deliver 200-watts per channel into 4Ω loads and 370-watts per channel into 2Ω loads. That 2Ω specification is particularly noteworthy, because very few — if any — integrated amplifiers can drive such low impedances at all, much less at power levels approaching 400-watts. It means that the amplifier can not only provide ample voltage to your speakers, but ample current as well. In fact, Electrocompaniet claims a peak current ability of more than 100-amps.

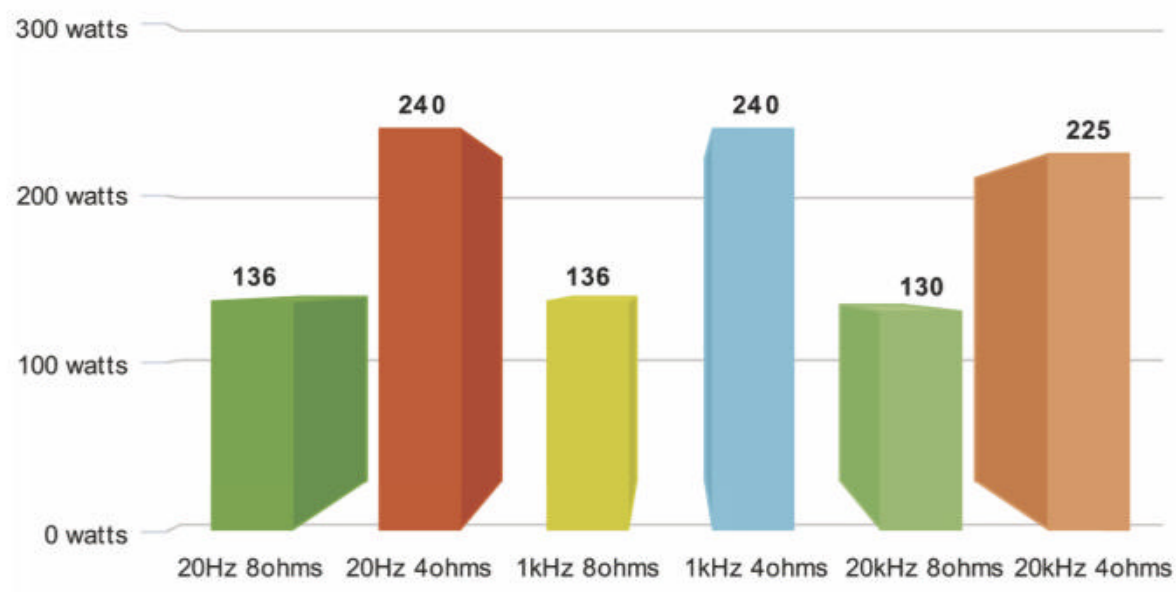
As for control, Electrocompaniet is one of the very few high-end manufacturers that provides both iOS and Android apps so that you can control the ECI 6 DX MkII not only from the supplied dedicated remote control, but also from your phone or pad. But that's not all. This forward-thinking Norwegian company also allows control via a standard web interface, so you can use your computer to control it if you wish, and from anywhere in the world there's an internet connection.

And when I say 'control' I am not just talking about control over volume, input selection and so forth, I'm talking about the ability to select, play and pause (etc) tracks from all of the most popular streaming formats and services, including Spotify, Tidal and Qobuz, plus the system also has built-in internet radio. You can also stream via Airplay and Bluetooth. It's also Roon-ready as well, so if you subscribe to Roon, it will seamlessly connect and let you play and control it via Roon.

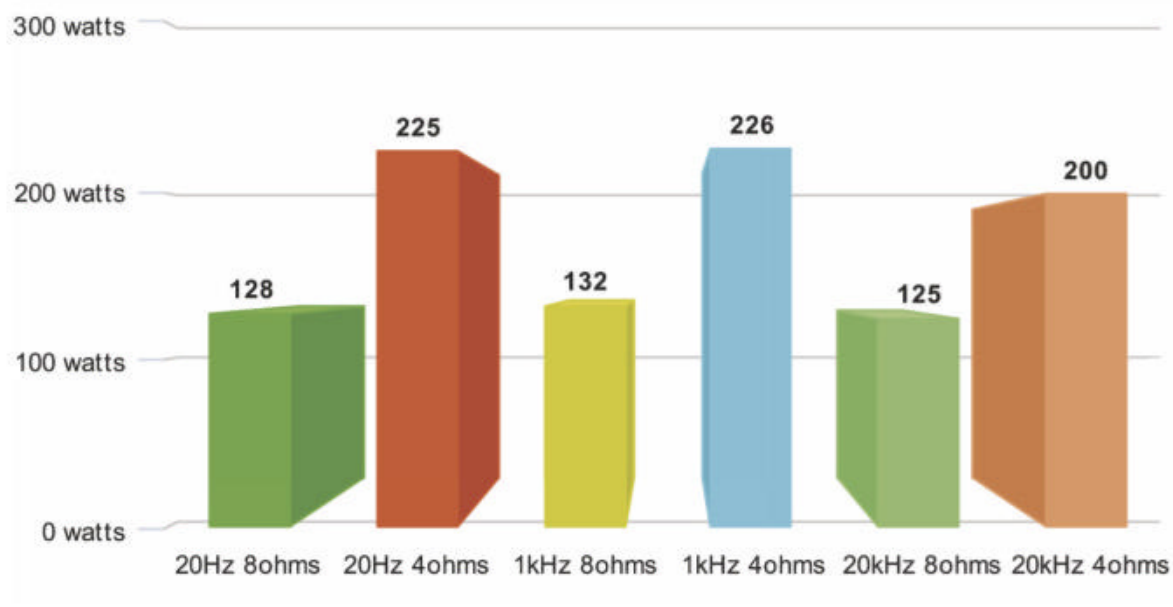
The app in combination with Electrocompaniet's 'EC Software Engine', which is built into the ECI 6 DX MkII also lets you index play, pause, (etc) tracks from your own music collection stored on your network.

It would seem that Electrocompaniet is expecting all owners to use one or more of the apps to control the ECI 6 DX MkII because the screen on the front panel is a relatively coarse dot-matrix display (dot size of around 1mm), blue on black, so the letters that indicate the active input — CD, DVD, AUX, HT, COAX1, COAX2, TOSLNK1, TOSLNK2, USB — have staircases in place of curves, but the letters are so large that they're easy enough to read, even from many metres away. The misspelling of Toslink1 and Toslink2 in the previous paragraph is not a typographic error. The display can show only seven characters, so they've had to abbreviate Toslink to Toslnk.

Power output single channel driven



Power output both channels driven



The characters are all upper-case, too, because of the display resolution. Curiously, however, if the HT input is muted the display will, when you select it, show HT (MUTED) with the 'Muted' all in upper-case, but in very small lettering, so the display itself is obviously capable of another, higher-resolution display mode.

The display shows only the input that is active; there is no digital indication of volume level. Instead, volume is indicated analogously — and rather ingeniously — via a method I cannot ever recall seeing previously. Electrocompaniet's engineers have put a motorised potentiometer behind the glass front panel and fitted it with a bright blue LED. So, as you raise and lower the volume, either via the 'Up' and 'Down' push-buttons on the front panel, or with those on the remote control (or via any of the other control methods), you can see the blue LED move clockwise (or anticlockwise) behind the front panel. At least you can if you're directly in front of the amplifier. If you're off to the left, you can't see it at all. If you're off to the right, you can see a faint blue halo reflection. If you're above the amplifier, it really depends on the position of the LED as to whether you can see it or not.

Although this method of display is ingenious, it means that you can't really get an identical listening level across multiple sources because you can't say, turn the volume to 4, or 6, because there are no markings. The volume also doesn't re-set itself when you power down. It always powers up at the same volume level that was being used when it was powered down.

Handily, if the amplifier powers up at a volume level you're not comfortable with, you can use the ECI 6 DX MkII's 'Mute' function to quickly drop it down. This circuit is perfectly implemented, so that when activated, the word MUTE shows in the front panel display. The circuit also correctly cancels itself whenever the volume is adjusted and also, of course, cancels itself whenever the amplifier is switched off.

I didn't really like the fact that the power button is an old-fashioned make/break control, so if it's in the 'On' position, the amplifier will power-up the instant the mains power is switched on (actually, not quite instantly, the ECI 6 DX MkII does a self-test routine first, which takes around 30 seconds) so my advice would be to get into the routine of reducing volume level to minimum before you switch the amplifier off. And you should indeed switch the amplifier off whenever you're not using it, because there is no stand-by circuitry inside. It is precisely because there is no stand-by circuitry inside the ECI 6 DX MkII that the bright red 'Standby' button that's prominently positioned at the top right of the infra-red remote control supplied with 6 DX MkII does absolutely nothing at all.

On the digital side, the ECI 6 DX MkII will handle pretty much any kind of digital

signal at all, right up to 24-bit/192kHz, in any format —WAV, PCM, FLAC, DSD128 (etc) — but I'll let you check the specs to make sure your favourite format is there.

LISTENING

Whenever you turn it on, the ECI 6 DX MkII automatically defaults to MEDIA so it's pretty obvious that Electrocompaniet thinks most users will be streaming their music, rather than hard-wiring it. So it would have been nice if the infra-red remote had a 'MEDIA' input selector. (Or failing that, that the manual had told me that you can access it by pressing the Stop/Eject' button, because it took me quite some time to work this out for myself.)

Right from switch-on it was immediately obvious that the Electrocompaniet ECI 6 DX MkII isn't just a pretty face. It was able to drive my hopelessly inefficient loudspeakers to more-than-adequate volume levels (much higher than I'd ever listen) without even raising a sweat (though the amplifier's casing did become rather warm, so make sure it's well ventilated).

And it wasn't just the power levels that impressed. The sound is so super-clean that distortion is clearly totally under control (i.e. inaudibly low) and the noise levels are also below the vanishing point. Whenever music wasn't playing, I couldn't hear a thing from my speakers — no hiss, no buzz, no unwanted background noise of any type whatsoever.

The Electrocompaniet ECI 6 DX MkII was not the first product of Norway to arrive in my home. I've been a fan of that country's band Jaga Jazzist for many years. As their name suggests, they play a lot of jazzy music, but I wouldn't categorise it as jazz myself, and they seem to change their style with each new album. You could start with their latest album ('Pyramid') but I'd recommend 2005's 'What We Must' as the ideal entry point to their *oeuvre*.

The Electrocompaniet ECI 6 DX MkII made Jaga Jazzist's music sound absolutely fabulous. The sound of Martin Horntveth's drum kit was stunningly good, particularly when he's taking it out on his cymbals, which he does often. The sound of the saxophones on *For All You Happy People* is revelatory, but tear yourself away from concentrating on this to listen to the differently programmed sounds in the left and right channels and the singing sound of the guitars. The extraordinarily complex soundscape of this track was delivered perfectly by the ECI 6 DX MkII and, in the closing moments, you'll hear what I said about the silence of the amplifier's noise floor.

Swedenborgske rom (Track 5) is one of the most beautiful songs I've ever heard, and the wordless vocal 'choir' that comes in around two minutes in always makes me sigh. Jaga Jazzist uses synthesised sounds better than any band I've ever heard, and you'll hear why listening to this track via the ECI 6 DX MkII. The purity of the sound is so sensational it'll have you gasping for breath. Listen to the way the Electrocompaniet still lets you hear the vocal line in the background even at the height of the crescendo. There's another signature close-out too. Listen to the sound of the piano decay. The ECI 6 DX MkII's total command of rhythm and pace is more than amply demonstrated by *Mikado*, with its staccato cross-beats, percussion and plucked string effects. You can also hear the amplifier's total control over the bass as well as the treble.

Perhaps best of all, all the great sound I heard from the Electrocompaniet ECI 6 DX MkII I heard irrespective of whether I was using its analogue inputs, its digital inputs or via wi-fi or ethernet. To my ears, the only limitation on the quality of the sound you will hear from this Norwegian marvel will be the quality of the audio signal you supply to it.

CONCLUSION

Electrocompaniet's ECI 6 DX MkII is a rare find. It's that classic case of a steel fist in a velvet glove. You really would not expect that such a powerful, great-sounding and full-featured multi-functional piece of electronics could be contained within such a modestly-sized chassis whose shiny black exterior does, in fact, remind one of velvet. ***David Cooke***

CONTACT DETAILS

Brand: Electrocompaniet
Model: ECI 6 DX MkII
Price: $11,949 (RRP)
Distributor: Audio Dynamics
Address: 5/3 Wellington Street
Kew
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E: info@audiodynamics.com.au
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Readers interested in a full technical appraisal of the performance of the Electrocompaniet ECI 6 DX MkII 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.

LABORATORY TEST REPORT

Newport Test Labs' measurements of the power output of the ECI 6 DX MkII show that Electrocompaniet is either flying very close to the wind with its specifications or has supreme confidence in its quality control procedures. Rated by Electrocompaniet with a power output of 125-watts per channel into 8Ω, *Newport Test Labs* reported that its test sample delivered exactly this output at a test frequency of 20kHz, and just a little more (128-watts per channel) at a test frequency of 20Hz, when both channels were driven. At a test frequency of 1kHz, the ECI 6 DX MkII maxxed out at 132-watts per channel, both channels driven into 8Ω. When only a single channel was driven, output crept up to more than 130-watts right across the frequency band. ***(Continued on page 28...)***

Into 2Ω loads, the Electrocompaniet delivered more than 300-watts at all frequencies

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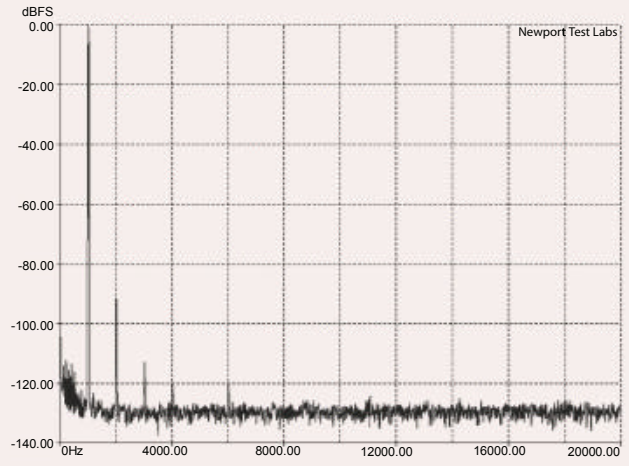
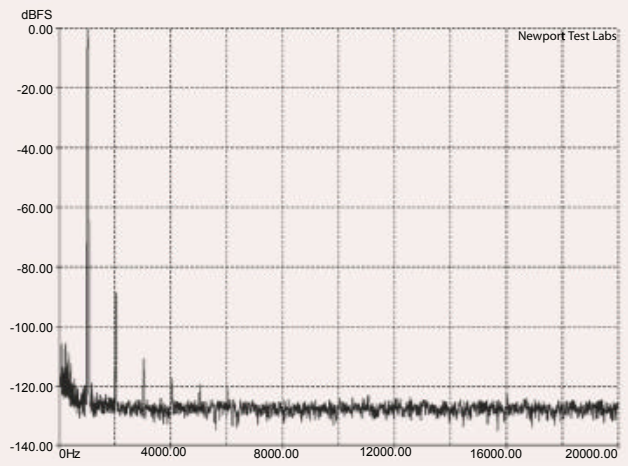
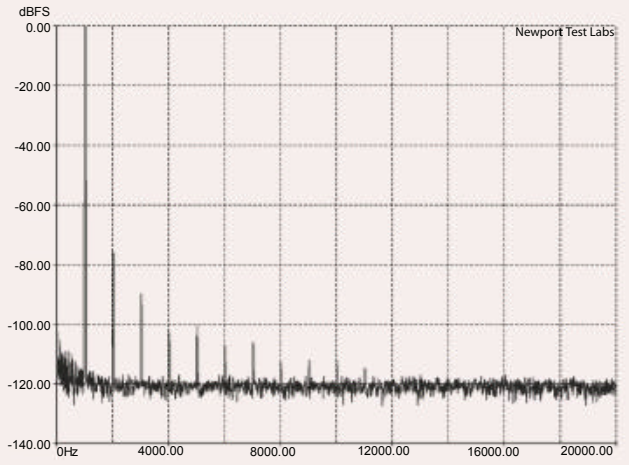
Graph 1: Total harmonic distortion (THD) at 1kHz at 1-watt into an 8-ohm non-inductive load.



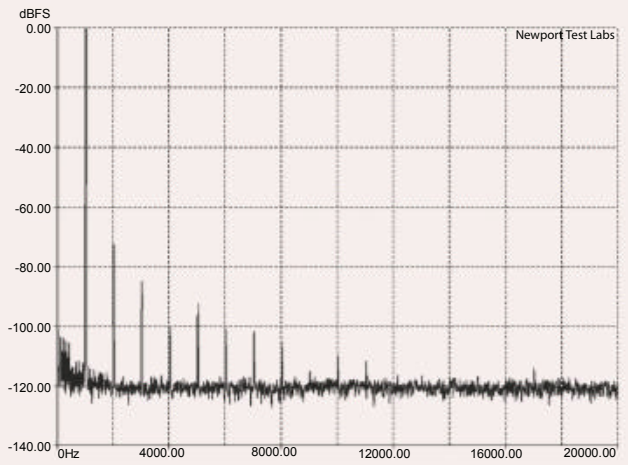
Graph 2: Total harmonic distortion (THD) at 1kHz at 1-watt into a 4-ohm non-inductive load.



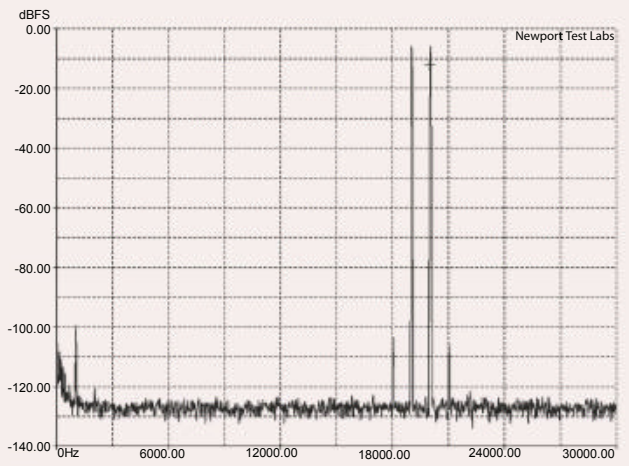
Graph 3: Total harmonic distortion (THD) at 1kHz at 20-watts into an 8-ohm non-inductive load.



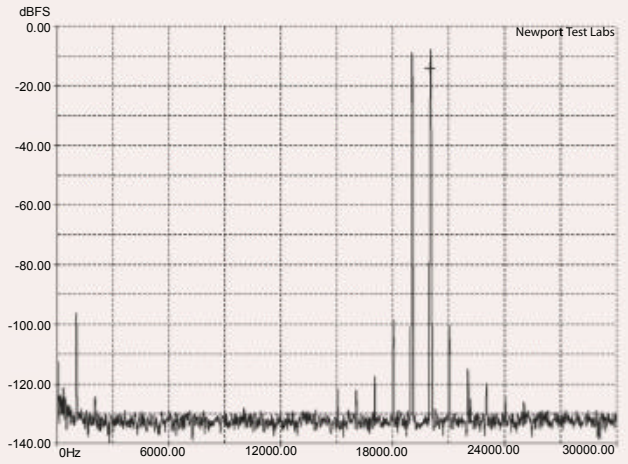
Graph 4: Total harmonic distortion (THD) at 1kHz at 20-watts into a 4-ohm non-inductive load.



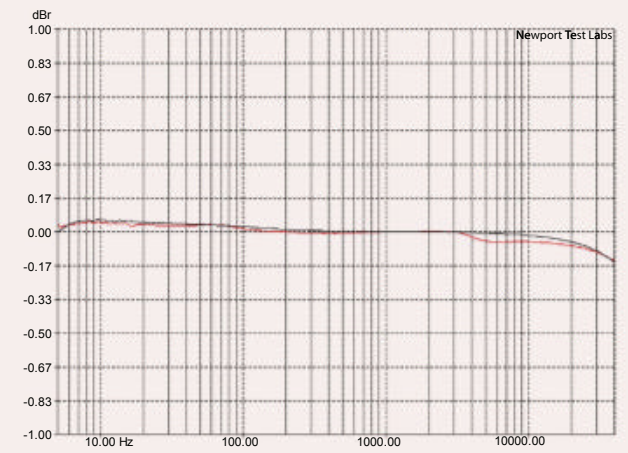
Graph 5: Intermodulation distortion (CCIF) at 1-watt into an 8-ohm non-inductive load.



Graph 6: Intermodulation distortion (CCIF) at 20-watts into an 8-ohm non-inductive load.



Graph 7: Frequency response into 8-ohm non-inductive (black trace) and simulated spkr (red).



The same performance was reprised when *Newport Test Labs* dropped the load resistance down to 4Ω. Electrocompaniet rates power output into this load as 200-watts per channel, both channels driven, and this is exactly the output the lab measured when using a 20kHz test signal. Power output at 1kHz was 226-watts per channel and at 20Hz, 225-watts per channel. Again, there were handy increases in output when only a single channel was driven, as you can see from the tabulated results, as well as from the bar graphs.

When tested into 2Ω loads, the Electrocompaniet delivered more than 300-watts at all frequencies tested whether or not one or both channels were being driven, except when both channels were being driven with a 20kHz test signal, where *Newport Test Labs* measured power output at 220-watts per channel. These results are very important, because most integrated amplifiers cannot drive 2Ω loads at all — at any power level — due to protection circuitry intervening. That the ECI 6 DX MkII can deliver such high power outputs right across the frequency range into such a low resistance is indicative of an outstanding output stage and an equally impressive power supply.

The Electrocompaniet also has an extraordinarily wide passband, with *Newport Test Labs* reporting that its frequency response extends from below 1Hz right up to 110kHz –3dB. The low-frequency 6dB down-point is also below 1Hz (so, essentially, d.c.) and down 6dB at 180kHz. Separation between the two channels was measured at 112dB at 1kHz, increasing to 115kHz at 20kHz. These are outstanding results. Separation diminished at low frequencies, but was still an outstandingly good 75dB at 20Hz. Channel balance was also outstandingly good, with the lab measuring a minuscule 0.156dB difference between them at 1kHz. The same was true of inter-channel phase, with the Electrocompaniet returning a set of the best results I think I have ever seen for this test, with only 0.05° and 0.04° errors at 20Hz and 1kHz, and a 0.93° error at 20kHz. Most amplifiers return results that are no-where near as good for this parameter, particularly at 20kHz.

Signal-to-noise ratios were excellent, either referred to one watt, where *Newport Test Labs* measured 91dB A-weighted, or to rated output, where the lab measured 106dB A-weighted. Referenced to the higher level, the Electrocompaniet returned a result of 101dB even without the benefit of A-weighting. ***(Continued on page 30...)***

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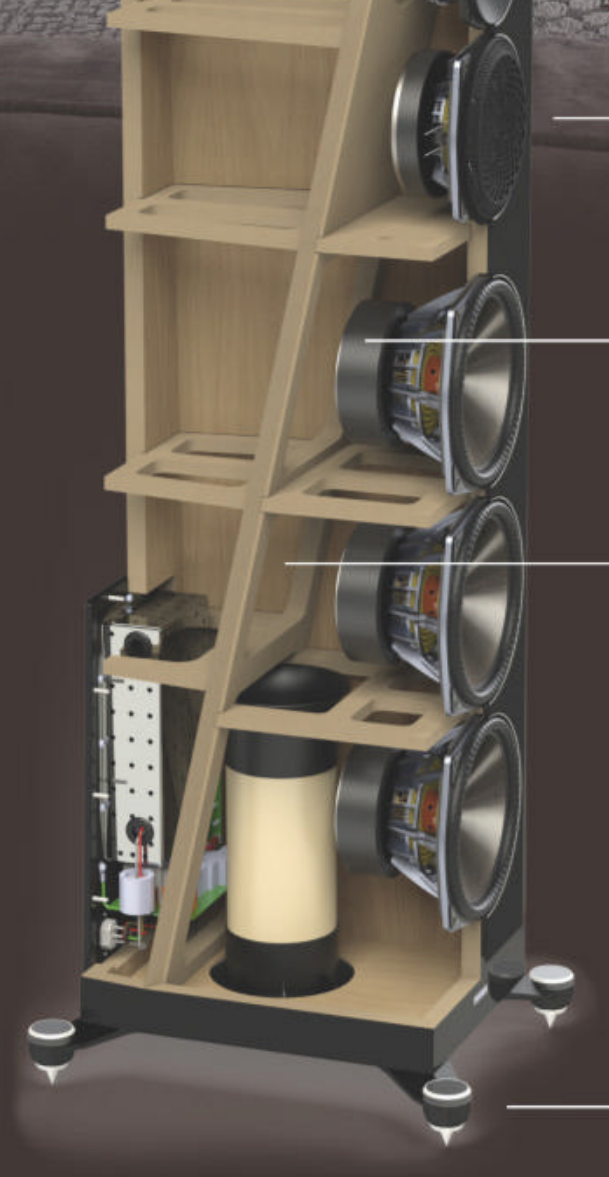

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Output impedance was measured at a very, very low 0.024Ω (at 1kHz) which means the ECI 6 DX MkII's damping factor (DF) comes in at a very high 333.33. And no, my keyboard didn't repeat, that's five threes with a decimal point after the first three! It's an outstandingly good result.

Square waves are an extraordinarily revealing test signal for any hi-fi component, but particularly so for amplifiers. A square wave will tell you the extent of an amplifier's low-frequency response, its high-frequency response, how flat that frequency response is across its passband, the phase accuracy, stability and more, all in a single image. And it's such a simple test. All that's required is a square wave generator and an oscilloscope. I am constantly amazed it's not a common test.

Newport Test Labs' square wave testing of the ECI 6 DX MkII proved its performance to be outstanding! You can see that at 100Hz the square wave is perfectly flat-topped, which means excellent low-frequency extension and zero phase shift.

Square wave testing of the ECI 6 DX MkII proved its performance to be outstanding!

Electrocompaniet ECI 6 DX MkII – Test Results – Power Output

Channel	Load (Ω)	20Hz (watts)	20Hz (dBW)	1kHz (watts)	1kHz (dBW)	20kHz (watts)	20kHz (dBW)
1	8 Ω	136	21.3	136	21.3	130	21.1
2	8 Ω	128	21.0	132	21.0	125	20.9
1	4 Ω	240	23.8	240	23.8	225	23.5
2	4 Ω	225	23.5	226	23.5	200	23.0
1	2 Ω	380	25.8	380	25.8	312	24.9
2	2 Ω	302	24.8	320	25.0	220	23.4

Note: Figures in the dBW column represent output level in decibels referred to one watt output.

Electrocompaniet ECI 6 DX MkII – Laboratory Test Results

Test	Measured Result	Units/Comment
Frequency Response @ 1 watt o/p	<1Hz – 110kHz	–1dB
Frequency Response @ 1 watt o/p	<1Hz – 180kHz	–3dB
Channel Separation (dB)	75dB / 112dB / 115dB	(20Hz / 1kHz / 20kHz)
Channel Balance (Direct/Tone)	0.156	dB @ 1kHz
Interchannel Phase (Direct)	0.05 / 0.04 / 0.93	degrees (20Hz / 1kHz / 20kHz)
THD+N	0.005% / 0.008%	@ 1-watt / @ rated output
Signal-to-Noise (unwghted/wghted)	85dB / 91dB	dB referred to 1-watt output
Signal-to-Noise (unwghted/wghted)	101dB / 106dB	dB referred to rated output
Input Sensitivity	108mV / 1.2V	(1-watt / rated output)
Output Impedance	0.024Ω	at 1kHz
Damping Factor	333.33	@1kHz
Power Consumption	na / 84	watts (Standby / On)
Power Consumption	105 / 427	watts at 1-watt / at rated output
Mains Voltage Variation during Test	234 – 253	Minimum – Maximum

The 1kHz square wave is also perfectly flat-topped, so it's equally good, despite being at ten times the frequency. It's actually a perfect square wave, as if it had come straight from the square wave generator.

At 10kHz, we can see that the leading edge of the square wave is bending away from the vertical which shows that we've started to run into rise-time issues, as one would expect, but it's still an excellent waveform, far better than most, indicating a very extended high-frequency response.

Newport Test Labs tests the stability of an amplifier by putting a 2µF capacitor in parallel with an 8Ω load and then asking the amplifier to drive this load with a 1kHz square wave. You can see the result in the last of the square wave sequences, and it shows excellent performance. There's a slight quarter-height overshoot that's completely damped within three cycles and no other aberrations at all. This indicates that the Electrocompaniet will be completely stable into all loudspeaker loads, including difficult electrostatic designs.

Spectrum analysis of the Electrocompaniet ECI 6 DX MkII's distortion with a 1kHz test signal is shown in Graphs 1 through 4 across two different power levels and two different loads. Graph 1 shows performance at an output of one watt into an 8Ω load and you can see that there's very little distortion and an impressively low noise floor. The second (good-sounding) distortion component is sitting at –93dB (0.00223% THD). There's a third-order component at –111dB (0.00028% THD) then fourth- and sixth-order components at –120dB (0.0001% THD) and that's it. Nothing else. Equally important you can see that the noise floor across almost the entirety of the audio band is close to 130dB down, and that's below a 1-watt reference. This is a super-quiet amplifier! Even the inevitable mains-related noise at low frequencies (extreme left of graph) is mostly more than 110dB down.

Graph 2 shows the Electrocompaniet ECI 6 DX MkII's performance when load impedance is halved, down to 4Ω and you can see that it's almost identical to the amplifier's performance into the 8Ω load. The second harmonic component has risen very slightly, to around –88dB (0.00398% THD), and the third and fourth harmonics have also crept up ever so slightly. The main difference is the appearance of a 5th-order harmonic, but at –119dB (0.00011% THD) down, it would be completely inaudible.

Graph 3 shows the the Electrocompaniet ECI 6 DX MkII's performance at an output of 20-watts per channel into 8Ω.

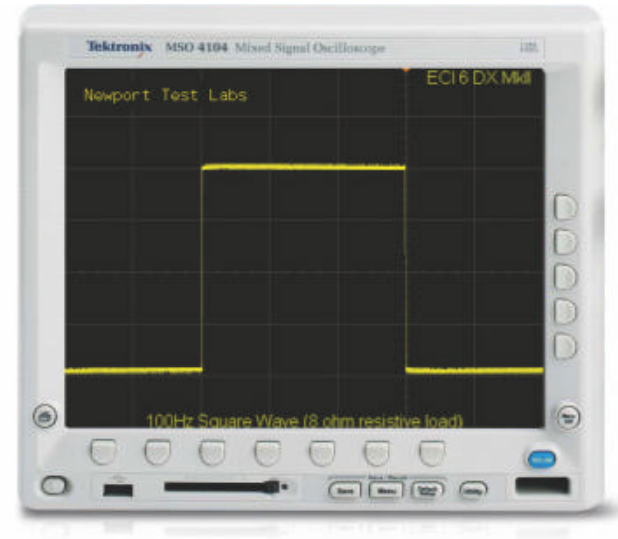
As expected, distortion has increased, both in terms of the level of the individual components and the appearance of higher-order distortion components. The good-sounding second harmonic is at –75dB (0.01778% THD) while the third is at –88dB (0.00398% THD). After that, the fourth and fifth components are both around 100dB down (0.001% THD) and the sixth and seventh at around –105dB (0.00056% THD). There are then only four higher-order components visible above the noise floor and all are more than 110dB down (0.00031% THD).

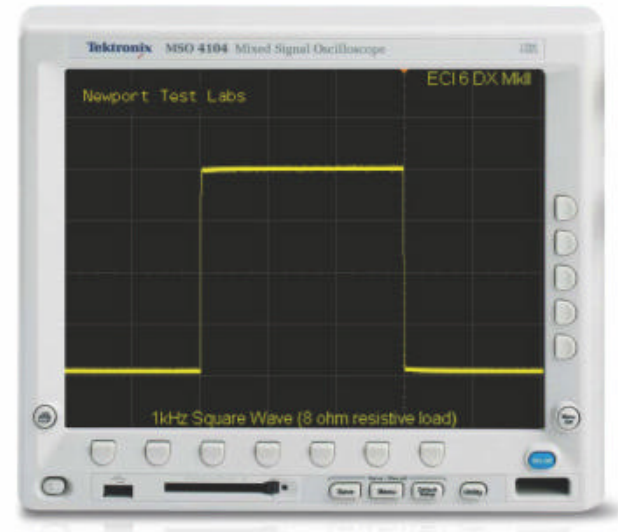
Graph 4 shows the Electrocompaniet ECI 6 DX MkII's performance at an output of 20-watts per channel into 4Ω and although distortion has risen very slightly, the overall sonic signature is the same as for when the amplifier is driving an 8Ω load.

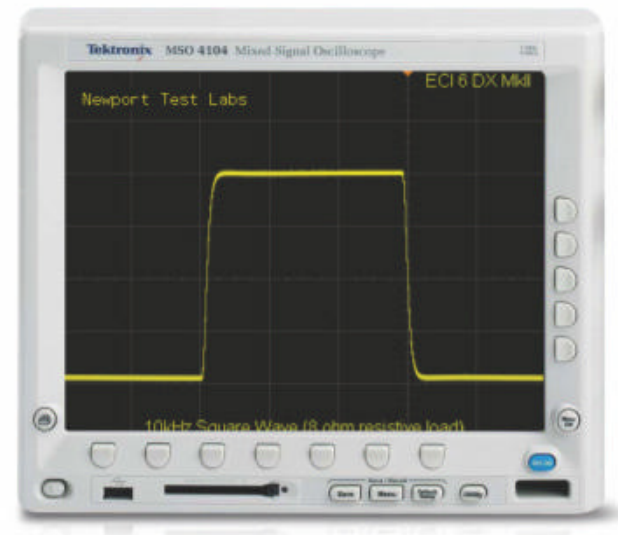
Newport Test Labs tests intermodulation using the CCIF twin-tone technique, using 19kHz and 20kHz test tones at the same level. Graph 5 shows the Electrocompaniet ECI 6 DX MkII's performance when it's delivering one watt into 8Ω. You can see the two test signals right of graph centre. There are only two sidebands (at 18kHz and 21kHz) and both are around 110dB down, so around 0.00031% THD. This is excellent performance. Also excellent is that the unwanted difference signal, down at 1kHz, is 100dB down (0.001% THD). Also good.

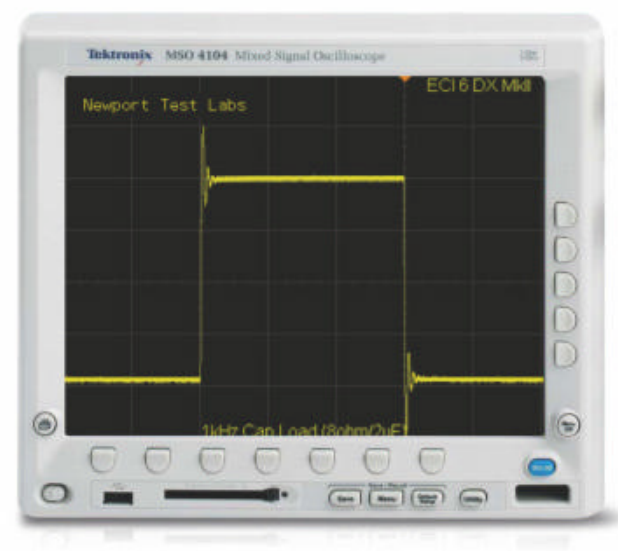
The result of taxing the Electrocompaniet's output stage by increasing power to 20-watts per channel is shown in Graph 6. Again the amplifier's performance is excellent, though you can see there are slight increases in the level of the 18kHz and 21kHz sidebands as well as in the regenerated 1kHz signal but they're still down at around –100dB (0.001% THD) and –96dB (0.00158% THD) respectively, so would be completely inaudible. The same would be true of the additional h.f. sidebands which are down at –115dB and –120dB.

The Electrocompaniet ECI 6 DX MkII's frequency response across the audio band is shown in Graph 7 when it's driving a purely resistive load (black trace) and a load that simulates the one that would be presented by a typical two-way bookshelf loudspeaker (red trace). Note that the trace isn't totally visually flat because of the extreme vertical scale of the graph, which *Newport Test Labs* deemed necessary in order to show the vanishingly small differences between the two measurements. The lack of differences means that the amplifier will 'sound' the same no matter what the impedance of the speakers it's driving and that it will have total control over the back-emf of those speakers.









Electrocompaniet has designed an extremely wide-band amplifier that has very low noise, very low distortion (either THD or IMD) that will deliver very high levels of power into any conceivable load.

Its ECI 6 DX MkII is a state-of-the-art design in every respect. ***Steve Holding***

ROGERS LS 5/9

LOUDSPEAKERS

Rogers was founded in the UK in the 1970s by Jim Rogers and, back in the day, was one of the top-three speaker manufacturers in the UK, not least because the company owned licences to sell speakers designed by the British Broadcasting Corporation, of which the tiny shoebox-sized LS 3/5A is probably the best-known and is certainly the best-selling of the BBC designs. But one of the best-sounding of the BBC-designed models for Rogers was the LS 5/9 that is the subject of this review. The very best-sounding of the BBC designs was the large LS 5/8, but it never really took off because (1) it was so large and (2) it was an active design, with amplifiers built in.

The LS 5/9 has been out of production for many years, not least because the Chinese company that now owns Rogers, the Wo Kee Hong Group, stopped UK production in the 90s and, when it moved Rogers production to China, simply ceased making this and many other classic Rogers designs, instead developing lower-priced models sold exclusively into the Chinese domestic market.

The great news is that the Rogers LS 5/9 is once more back in production, and that it's being produced in the UK under the guidance of one of the design engineers who was working for Rogers back in the early 90s, Andy Whittle (See Interview).

EQUIPMENT

The Rogers LS 5/9 is a classic two-way bass reflex design that sees a 34mm diameter soft dome tweeter matched to a 210mm diameter polypropylene-coned bass/midrange driver.

The tweeter is an Audax TWO34XO that's made in France, to the front face of which Rogers fits what it calls a 'dispersion loading protective plate' in the form of an enormously strong non-ferrous perforated dome. The dome not only protects the 34mm soft dome from potential damage, but also modifies its high-frequency output and dispersion. I suspect that back in the day the BBC engineers added the dome simply to protect the tweeter from being damaged, because the LS 5/9 was intended to be used as a broadcast monitor in mobile studios, though I have no doubt that its effect on sound quality was factored in. It's said that the dome was designed to be able to support the entire weight of the speaker cabinet, should it accidentally fall forward, and judging by the protective dome's construction, I'm sure it could do that… and more! In any event, the dome is able to be removed, so you can choose to use it or not.

The TWO34XO is actually a replacement for the original tweeter that was used on the LS 5-9 in the 90s, which was an Audax HD13D34H.

This new version has a higher power-handling capacity (despite not using ferrofluid) along with a more extended and rather more linear high-frequency response. But its frequency response is not that much more extended, because the operating bandwidth of the TWO34XO is rather different to that of most tweeters, since its very low resonance frequency (800Hz) enables it to be used down to a much lower frequency than most tweeters, the result of which is that it doesn't go quite as high in frequency as most tweeters. It's also rather unusual in that it has a replaceable voice-coil.

My recollection was that the original bass/midrange driver in the LS 5/9 was made by KEF, though I stand to be corrected. The one that's now fitted to the Rogers LS 5/9 is one that Andy Whittle says he 'reverse-engineered' from the original and is having made in China. The cone certainly looks like the original, with an almost-see-through opaque polypropylene cone that despite being rated by Rogers with a diameter of 210mm has an actual cone diameter of 155mm. Even if it were 210mm in diameter, the driver is mounted from behind the baffle, so it has to deliver its sound through a hole cut in that baffle, and that hole has a diameter of 175mm which would therefore be a limiting factor. (The Theile/Small diameter of the driver is around 160mm, for an Sd of 202cm^2.) At the centre of the cone is a black fabric dustcap whose diameter of 30mm would seem to suggest that that this is also the diameter of the voice-coil.

Rogers LS 5/9 owners have the ability to modify the high-frequency output of their loudspeakers

The frame (chassis) of the bass/midrange driver in the new LS 5/9 is completely different from that of the original, because whereas the original driver had a cast alloy frame, the one on this new LS 5/9 is made from pressed steel.

But if the tweeters are a newer version of the original, and the bass/midrange drivers are a reverse-engineered version of the original, the crossover networks on my review samples were totally original, having been manufactured back in the 80s by Rogers itself (actually, they were manufactured by Swisstone, which owned the Rogers brand at the time). This means that they use the famous Evox MMK capacitors which were made by Evox Rifa but became unavailable after that manufacturer was purchased by Kermet Capacitors. Whereas the original Evox MMK capacitors used metalized paper, the ones that are now available use metalized polyester. The paper versions are prized by audiophiles for their sound quality and go for big bucks on Ebay.

I was a bit surprised to find thirty-year-old crossover networks inside a loudspeaker made in 2020 so I asked Australian Hi-Fi editor Greg Borrowman to do some digging for me. It turns out that when Rogers decided to put the LS 5/9s back into production it had a considerable quantity of the original crossovers still in stock (New Old Stock, or NOS as it's known in the trade) so it used these old crossovers in its initial production run, of which my review samples (CLS30A/CLS30B) must have been a part. They have apparently since run out of these already, but according to Andy Whittle, of Rogers, the new crossovers "are essentially the same" and deliver 18dB/octave slopes either side of a 3kHz crossover frequency. "Essentially the same" would mean three iron-cored inductors, five wirewound resistors, seven MMK capacitors and eight carbon resistors — so quite a complex design.

Whether it's new or old, the crossover design itself is unchanged, and this design includes the ability to adjust the tweeter level though four different settings — +1dB, 0dB, –0.5dB, –1dB.

However, if you want to make the adjustment you're going to have to be pretty handy with a soldering iron, because in order to make it, you have to de-solder a fly-wire from one terminal on a printed circuit board fitted to the front of the front baffle, then re-solder it to whichever of the other three terminals you wish to use. And of course you have to do this for both speakers.

I have to admit that this is one aspect of the LS 5/9's design that I personally would have updated, possibly by using gold-plated sockets and a re-insertable fly-lead, so changes could be made quickly, and no soldering would be required. But I guess that Rogers was aiming for authenticity. As for why a monitor speaker, designed and engineered for the highest accuracy possible, would have enabled the level of its high-frequency output to be adjusted in the first place is a bit of a mystery.

One long-toothed engineer of my acquaintance told me that the adjustment was provided to account for sample-to-sample variations (aka inconsistencies!) in the original Audax tweeter but I personally doubt this would have been the case, because it would have been easier and cheaper for Rogers to simply measure all the tweeters and reject the ones that were out of specification. Or if this was true, and Rogers had to work around inconsistent tweeters, it still would have been easier and cheaper to measure them individually add the necessary attenuation resistor to the tweeter itself. But whatever the reason was back in the day, it is highly likely that brand-new modern Audax tweeters are far more consistent than the originals. But this is all idle speculation. I suppose the take-away from the provision of the adjustment is that irrespective of whether it makes sense or not, Rogers LS 5/9 owners have the ability to modify the high-frequency output of their loudspeakers.

The front-firing bass reflex port on the LS 5/9 also appears to be identical to the original: a simple black plastic tube that is 64mm in diameter and 95mm in length. Again, I would have been tempted to flare the port at both ends, but Rogers is once again being faithful to the original design.

The cabinets are also built in the great 'BBC' tradition, being made of very thin material (9mm Russian birch ply) whose top, bottom and sides are all butt-joined and reinforced by four struts running front-to-back. As for the baffle and the rear panel, these slide inside the resulting structure where they're fixed to struts running top-to-bottom and side-to-side.

ROGERS HISTORY

There are two great resources available to anyone interested in the history of Rogers leading up to its purchase by the current owner, Richard Lee of the Wo Kee Hong Group. One of these, written by an ex-managing director of Rogers, is here: **www.tinyurl.com/rogersinfo2** The other is here: **www.tinyurl.com/rogersinfo1**
Plus, of course, there is a lot of information at the official Rogers website: **www.rogers-hifi.uk**

Bituminous pads (from Clarity Acoustics) are stapled to all panels (including the baffle) to provide damping, and all panels except the baffle have egg-crate foam slabs glued over the damping. There's also damping material sandwiched between the rear of the Audax tweeter's magnet and the crossover PCB. Three standard wood veneer finishes are available for the LS 5/9 cabinets — olive, rosewood and walnut — but Rogers says other finishes are available via special order should you so wish.

The frame that supports the thick, fairly rough-weave cloth used for the speaker grille is a 'picture-frame' style so there are no cross-struts to affect dispersion.

The cloth on my sample was Black Tygan which is a heavyweight woven nylon. My understanding is that this cloth is no longer made, so presumably Rogers had some of this in stock as well. The grille attaches via Velcro strips that run around the entire periphery. Removing the grille requires that you grasp a small cloth loop that protrudes from the bottom of the grille and pull moderately hard. Sustained pressure does the trick, so the Velcro loosens its grip gradually. I personally would have modified the design by replacing the velcro with magnets.

The rear of the speaker is almost completely smooth, because there are no protruding speaker terminals to be seen. Instead there are just two 4mm-diameter banana sockets that are almost completely recessed inside the cabinet, meaning that no matter what type of speaker cables you use, you're going to have to terminate them in banana plugs.

As for the cabinets themselves, they're 460×275×285mm (HWD) and each one weighs 12kg. When the BBC used the LS 5/9s they placed them either on open stands or on open frames fixed to a wall, so both are viable options for home use.

LISTENING

I can guarantee that the first time you listen to a pair of Rogers LS 5/9s you will immediately wonder to yourself how so much great sound could be issuing from such a relatively small pair of loudspeakers. I will also guarantee that once you've listened just a little longer, you'll have forgotten your immediate wonderment, indeed you'll have forgotten about the speakers altogether. You'll instead be just lying back, with your eyes closed, totally relaxed, enjoying the music that's issuing from them.

Because that's what these speakers do. Their delivery of music is so smoothly presented, so beautifully balanced and so sweetly delivered that they'll just sing to you in your listening room.

The level and extension of the bass you will achieve in your room from the Rogers 5/9s will of course depend on how you decide to mount them and where in your room they're positioned, but if you get it right, you're unlikely to yearn for more unless you're into pipe organ music, techno or classical orchestral music at high volume. And if you do fall into one or more of these categories I would suggest adding a subwoofer. I used my review pair of LS 5/9s on open metal frames a friend of mine welded up for me for use with a similarly-sized pair of UK speakers that I have long since sold. (The buyer wanted the speakers, but not the frames… and I have to admit they looked a bit rough, even though I thought I'd painted them beautifully.)

I found the Rogers 5/9s were more than capable of delivering the sound of a kick drum at usefully high volume levels and also the lowest notes on an electric bass guitar at similar levels, which in real terms means that the bass delivery will be more than sufficient to cover the lowest frequencies most people are going to need to replay when playing their favourite music at the levels they're most likely to be playing it. Not only can the 5/9s deliver great bass at these levels, they do so with impressively low distortion and more than a goodly amount of speed.

INTERVIEW

ANDY WHITTLE

Andy Whittle, who worked for Rogers in the early 90s before it shut down its UK operation and moved to China, is now back working for Rogers. Andrew Murphy asked him how it came to be that Roger is now once again manufacturing speakers in the UK.

Andy Whittle: Michael O'Brien, who owned Rogers, sold the company to the Wo Kee Hong Group in Hong Kong. They ran it for four or five years before the big financial crisis in the late 90s when they pulled the plug on the UK manufacture. They weren't making those products in Hong Kong or China, they were basically making their own products and introducing them to the domestic market; so they moved a bit more mainstream, doing more AV stuff. But that was all kept in the domestic China market.

After that (Rogers' UK closure), I ran Exposure for about five years, and then for the past ten years, I've been working with Audio Note UK. I kept in touch with the Rogers people, and a few years ago they contacted me and said they were looking to make a small batch of speakers in the UK for Rogers' 70th anniversary.

We got those made, then I said to Richard Lee, the chairman of Wo Kee Hong, 'Why don't you just start making the 5/9 and 3/5A back in the UK?' My friend Kevin from Talk Electronics has a factory, so I spoke to him and that's what we did. We have a BBC licence for the 3/5A and for the LS5/9.

Andrew Murphy: Why did you want to start making these BBC speakers again?

There still seemed to be an appetite for BBC-designed products. I was in the audio industry, travelling around to shows and, without being arrogant, most of what I heard didn't actually sound that good.

I'd start listening to the older stuff and think, that sounds better than some of the newer stuff. Why not make the old stuff again? It has a certain character you don't get with modern products. Maybe it's a bit like driving a Morgan car: it's not going to set the world alight with its 0–60mph stats or top speed, nor is it the last word in handling, but it still provides a purpose.

If you look at the quality of the R&D and the resources available to the BBC at the time, there must have been millions of pounds spent on developing the 3/5A — or certainly a considerable amount in today's money. These days I wouldn't know, but I don't think so much is invested in the acoustics of the speaker.

Andrew Murphy: You talk about the character of these speakers; how would you describe it, and what makes that BBC character so special?

I don't have a BBC background on the design side, but ultimately, it's all about the vocal and the voicing. If it's for an outside broadcast van and they are mixing, the vocals have to be 100 per cent spot on. If you get that right in the critical mid-band, the bass and top aren't so critical. Get it right and you're pretty much home and dry.

In terms of the driver development and crossover integration, it's seamless and you can't hear the join. So there's no phase, there's no funny off-axis performance, it's easy to hear the layers — which, again, is quite important for recording.

It comes back to the tonality. It's easy to design speakers to try and chase more detail and a brighter-edged sound, but it's like putting more salt on your dinner — you just upset the balance of the flavours. Ultimately, it's about that presentation, that tonality and the ability to reproduce the human voice. #

Indeed I would be more than happy to describe the bass as being lively to the point of being bouncy!

And if you don't know what I mean by lively, or bouncy, if you play Paul McCartney's *Silly Love Songs* (the 2014 re-master on 'Wings at the Speed of Sound', and track 6, not the demo) through the Rogers 5/9s you will know what I mean immediately, because not only will you hear the bounce in the music, but you too will also be bouncing around in your chair and tapping your foot. The bass line on this song (played by McCartney of course) is absolutely fabulous, a real masterclass in bass playing for both the composition and the performance. McCartney himself was really pleased with it. When he was telling *Billboard* magazine that he wrote the song to answer people who accused him of being soppy, he felt he had to add an end note: "By the way," he told them "*Silly Love Songs* has a good bass line." It also has some superb drumming from Joe English who, despite his surname, was an American. Incidentally, the backing vocals are by Linda McCartney and there's not an out-of-tune note there, it's quite lovely, in fact.

There's also a bouncy bass line (and more bass) on 'Forget Me Nots' by Patrice Rushen, most particularly on the title track, but this is a good album to also appreciate the midrange qualities of the 5/9s using the crystal-clear sound of Patrice's voice, beautifully recorded. You can also hear the incredible speed of the speakers, those handclaps are right out there, then how about the sound of the sax break around three minutes in? Wow! But it's the bass that's the star, a totally unique and instantly memorable contribution to the album by none other than Freddie Washington. You'll know this song even if you haven't heard the album by the way, because it features on the Tom Hanks film 'Big' and Will Smith's film 'Men in Black' while jazz guitarist Lee Ritenour has a cover version on his album 'Smoke 'n Mirrors.'

Speaking of crystal-clear sound and midrange, one of my favourite testers for these traits is The Soul Sessions, an album recorded by Joss Stone back in 2003. If your speakers are at all errant across the midrange, this album is going to reveal it bigtime. If the mids are peaky, it's just going to sound edgy. If they're forward, it's going to sound bright. If they're recessed, it's just going to sound lifeless. It didn't take me more than spinning up the very first track, *The Chokin' Kind*, to hear that the Rogers 5/9s had the right stuff to deliver tuneful, accurate midrange and that I'd be right to listen to the album all the way through. While I was enjoying her voice and the sound of the backing band, it did seem a little unfair that it's now the most famous version of this song despite Joe Simon having won a Grammy for it. It's also a little incongruous that an album titled 'Soul Sessions' (and the follow-up 'Soul Sessions 2') should be recorded by a lass born in Kent, in the UK, whose real name is Joscelyn Eve Stoker. But I guess if you're as talented as she is (and she's also a well-known actress) who was singing soul and R&B as a small child, it's really not all that surprising.

Despite the success of *The Chokin' Kind* for her, it was the second track on this album, *Super Duper Love*, that was the biggest hit from it. Listen and you'll hear why.

Yet another great bass line, whose rhythm and pace are delivered with penache by the Rogers 5/9s, a stonkingly great Hammond sound and a lead guitar that is oh-so-precisely pitched are just the start. Listen to how the 5/9s deliver Stone's breath gasps, and the way she twists her inflexions and the way she forces her voice and you'll know immediately why midrange accuracy is so important, and that these speakers have it in spades. My favourite track on this is actually *Fell in Love with a Boy*, but they're all good.

I personally find that I can test the high-frequency performance of any loudspeaker with recordings that have violins or a drum-kit, which means I have a lot of choice. If the violin sound is realistic, and the cymbals of the kit sound like cymbals, that's mostly all I need. But if I want to get all fancy I'll use one of my favourite albums, the original of which I've owned for nigh-on twenty years (and the 'audiophile' version since it was released). I was somewhat pleased that The Guardian once included this album on its list of 'The 101 strangest records on Spotify.'

OK, I'll put you out of your misery, my 'fancy' h.f. tester is David Hyke's album 'Hearing Solar Winds' recorded with The Harmonic Choir. The entire album revolves around an ancient form of singing practised within tantric Tibetan Buddism that's usually called 'throat singing' or Mongolian Khöömii (pronounced hoo-mee). The throat singing technique requires the singer to create first create a single low-frequency sound, then add a second one. The two low-frequency sounds then mix to create a third, extremely high-frequency sound, so high it sounds like someone running their finger around the edge of a crystal glass. Not only are these high frequency sounds perfect for loudspeaker testing because they're so high in frequency and so pure, their very purity also makes them glorious to listen to. But don't take my word for it. This is what *The Guardian's* Rob Fitzpatrick said of the album: "The Harmonic Choir were artists-in-residence at New York's Cathedral of St John the Divine for ten years and this was recorded live there. The church's rich reverb makes the choir's incredible music sound like a Gregorian chant, albeit one performed by an alien race. Frankly, Hearing Solar Winds will blow your mind. And you'll like it."

Listening to this album via the Rogers LS 5/9s, I was not only captivated by the sound, as always, but also captivated by the LS 5/9s' presentation of it. All the sounds on the album were there, from the very lowest to the very highest, at the correct pitch and at the correct volume.

Also, and all the while, the speakers delivered the incredible sense of space and ambience of the cathedral itself. And in the moments of silence, the acoustic emptiness is complete, while not being totally empty. You have to experience it for yourself. It is truly otherworldly. Turn up the volume and have your mind blown.

CONCLUSION

'Way back in 1533, Sir Thomas More wrote "*And as he myght tell vs, that of Poules chyrch we may well se the stones, but we can not se the chyrce. And then we may well tell hym agayne, that he can not se the wood for the trees*."

These days, a great many audiophiles are falling into that trap of which Sir Thomas warned nearly 500 years ago — of not being able to see the wood for the trees — or, if you'd like me to put it another way, of getting so mixed up in technology and specifications of audio components that they lose sight of the fact that the entire audiophile ecosphere is intended to do one thing and one thing only, which is to allow us to enjoy music in our own homes as authentically as possible.

I think that were he alive today, Sir Thomas would have approved of the Rogers LS 5/9s, because their performance is such that they reveal the trees, the woods, the forest and all that lies beyond! *Dan Taylor*

CONTACT DETAILS

Brand: Rogers
Model: LS 5/9
RRP: $9,490
Warranty: Five Years
Distributor: Audio Magic Pty Ltd
Address: 482 High Street
Northcote
VIC 3070
T: (03) 9489 5122
W: www.audiomagic.com.au

- True monitor sound
- Modern classic
- BBC Heritage

- h.f. adjustment
- Speaker terminals

Readers interested in a full technical appraisal of the performance of the Rogers LS 5/9 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.

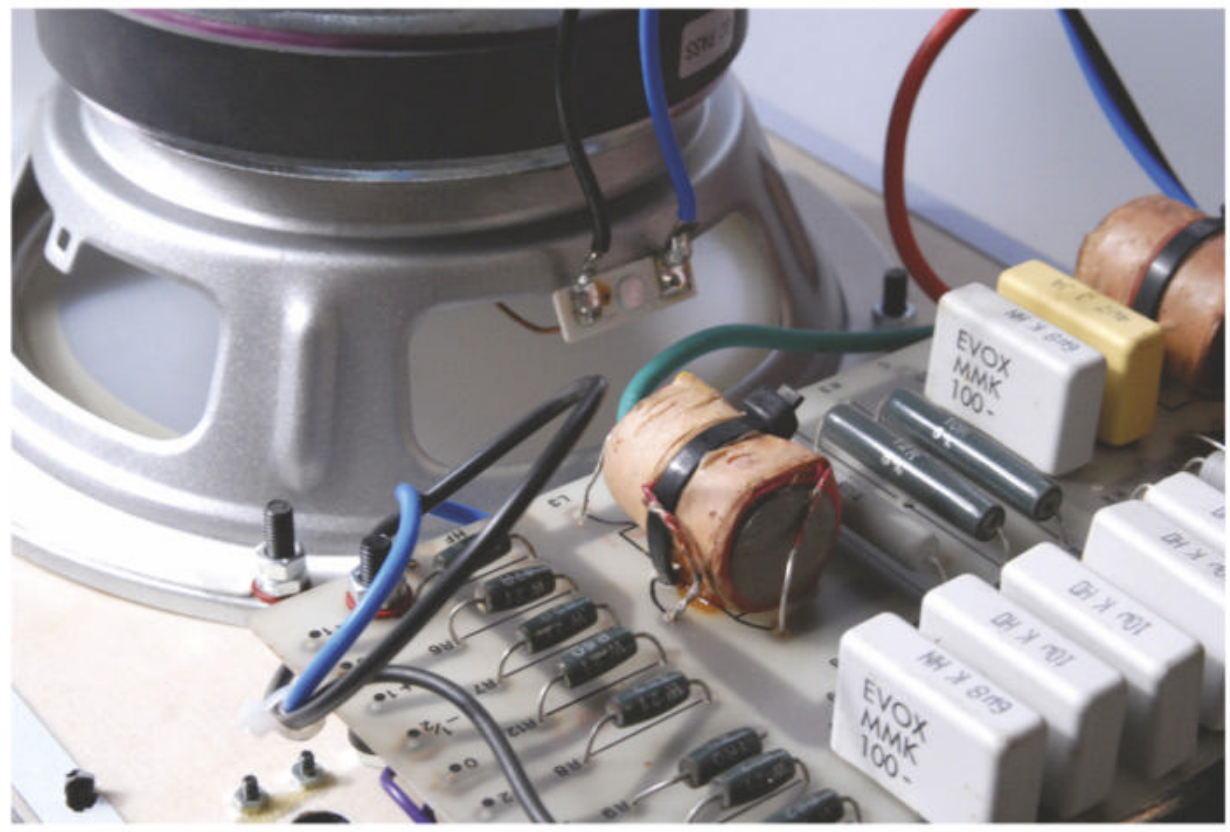
LABORATORY TEST REPORT

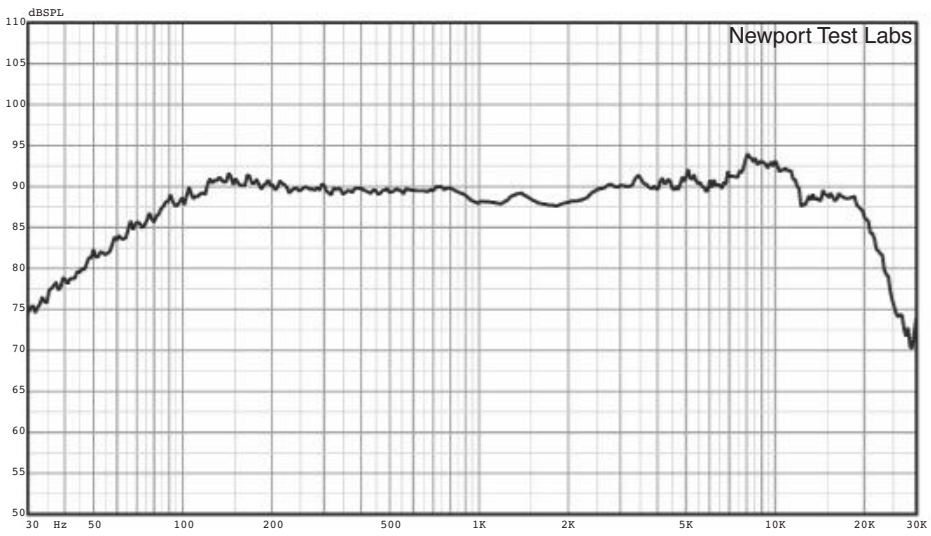
Newport Test Labs measured the frequency response of the Rogers LS5/9 as being 65Hz to 21kHz ±4dB with the tweeter's level set to 0dB, which is the response that's shown in Graph 1. You can see that the frequency response almost tracks the 90dBSPL graphing line right up to 6.5kHz after which there's a slight lift in the tweeter response that comes back down to the 90dBSPL line at about 12kHz then drops below it and remains at the same level out to 18kHz after which it starts rolling off. If one were to remove this lift between 6.5kHz and 12kHz, the overall frequency response would have been 65Hz to 21kHz ±3dB. You can see that the response is spectrally balanced, and across the most important region of the audio band, from 85Hz to 6.5kHz, the response is within ±2dB, which is super-linear. Graph 2 shows the anechoic high-frequency response in more detail, thanks to zooming in on the high-frequency region, plus it also shows the effect on the response of the loudspeaker grille.

You can see that using the grille largely removes that high-frequency lift referred to in the first paragraph, but introduces a significant dip in the response centred at around 16kHz. Notwithstanding that the high-frequency lift could be compensated for by adjusting the tweeter level, I would suggest using these speakers with their grilles on, despite the dip that's introduced by doing so, not least because the dip is so high in frequency and so small that I expect it would not be audible to the ear, even in a direct A–B comparison.

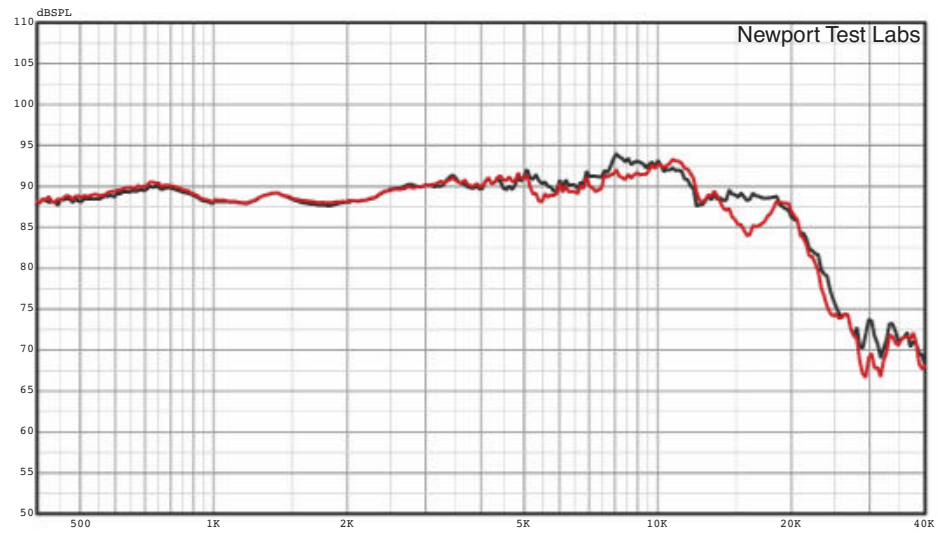
The low-frequency output of the Rogers LS5/9 design is shown in Graph 3, using a nearfield measurement technique that simulates the response that would be obtained in an anechoic chamber. You can see that the bass driver starts rolling off below 100Hz to a minima at 46Hz. Normally, I would expect maximum output from the port at this same frequency but as you can see from the red trace showing the port's output, it peaks somewhat lower in frequency, down at 38Hz. The port also has a wider than normal operating bandwidth, delivering considerable output from 30Hz right out to 100Hz.

The impedance of the Rogers LS5/9 is shown in Graph 4 and you can see straight away that it's a relatively high modulus, right across the audio band, which is a little unusual to see these days. Modern designs tend to have rather lower overall impedances. The classic double-hump characteristic of the bass reflex alignment has the peaks at 35Hz (19Ω) and 90Hz (32Ω) with the saddle between them at 47.5Hz just dipping below 7Ω indicating the frequency below which the design would not deliver any appreciable output.

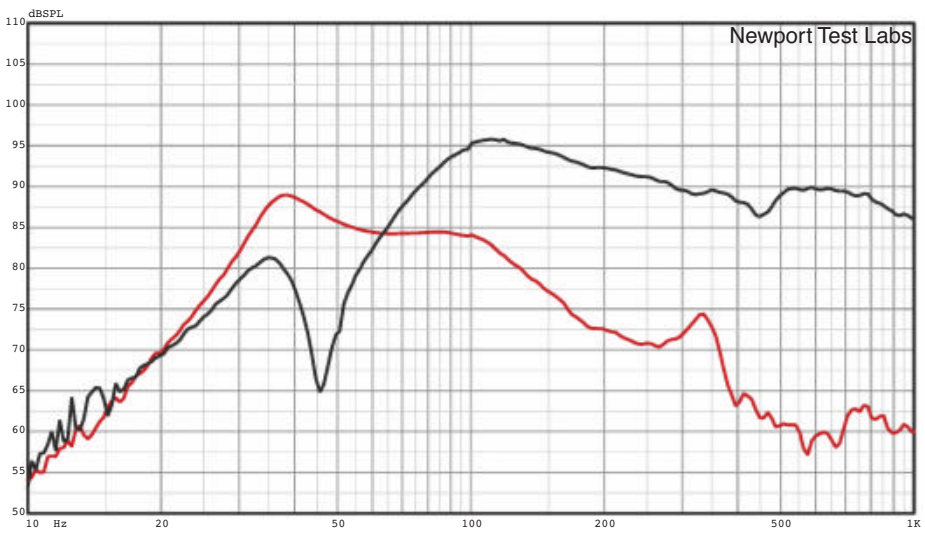




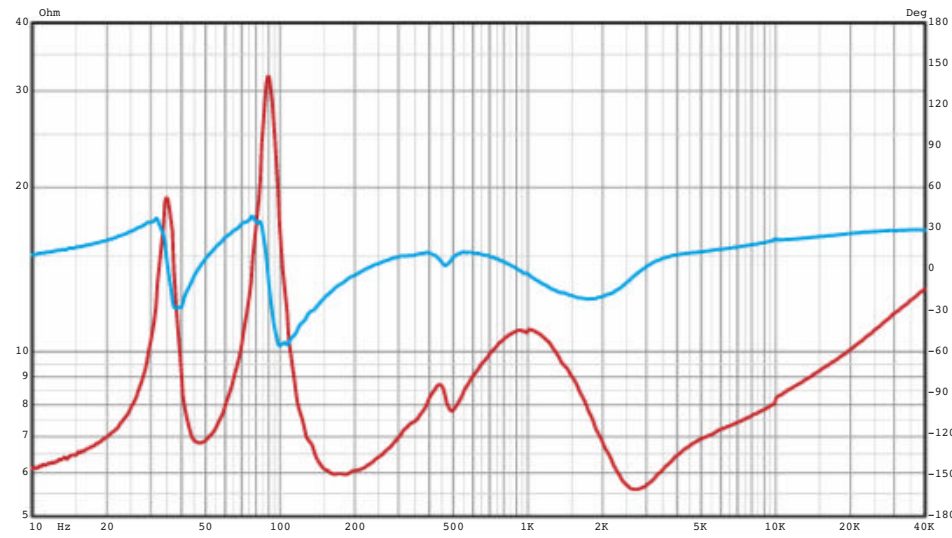
Graph 1: Frequency response. Trace below 650Hz is room response. Trace above 650Hz is the anechoic response. Tweeter level 0dB.



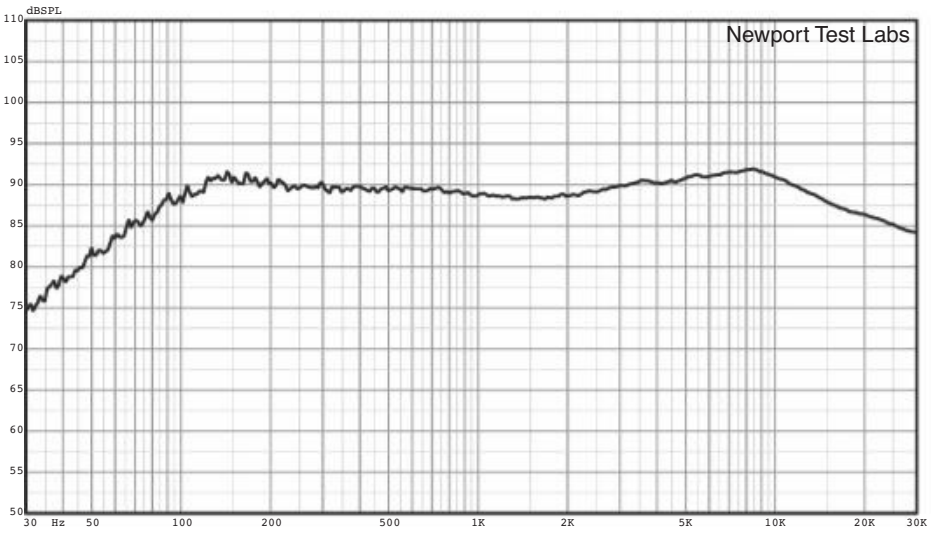
Graph 2: Anechoic high-frequency response, expanded view showing response with grille off (black trace) and with grille in place (red trace). Lower measurement limit 400Hz.



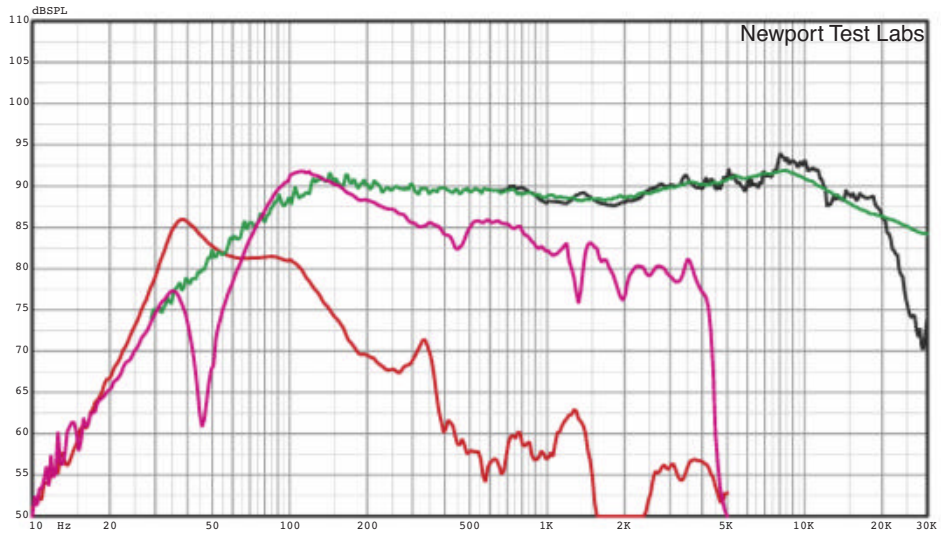
Graph 3: Low frequency response of front-firing bass reflex port (red trace) and woofer. (Nearfield) Port/woofer levels not compensated for differences in radiating areas.



Graph 4: Impedance modulus (red trace) plus phase (blue trace).



Graph 5: In-room frequency response using pink noise test signal 1/3rd octave smoothed



Graph 6.: Composite response plot. Red trace is output of bass reflex port. Pink trace is anechoic response of bass driver. Green trace is room response. Black trace is anechoic high-frequency response.

At you can see, the impedance remains entirely above 6Ω except between 2.3kHz and 3.4kHz where it drops slightly below to a minimum of 5.6Ω at 2.6kHz. There's a significant kink in the impedance trace at 400–500Hz which would suggest a cabinet resonance, the effect of which is shown in Graph 3. The phase of the speaker is very well-controlled, as you can see from the blue trace representing it.

Graph 5 shows the in-room response *Newport Test Labs* measured for the Rogers LS5/9. It's this response that would reflect what you would hear when the speakers are on stands in your listening room. You can see this response is 70Hz to 20kHz ±3dB. You could gain some low-frequency extension by either by moving the stands closer to a rear wall, or by positioning the speakers on wall-mounts.

Newport Test Labs has included a composite response (Graph 6) that overlays the various graphs discussed so far, but extends the capture for the low-frequency driver and the port. You can see the resonance doesn't affect the on-axis response. However, you can see a sight affect on the on-axis response caused by a port resonance at around 1.3kHz. It is, however, very small.

Newport Test Labs measured the sensitivity of the Rogers LS5/9 as being 88.2dBSPL at one metre for 2.83Veq using its standard technique, which is a result that's 1.2dB higher (better!) than the 87dBSPL claimed by Rogers, and puts the design into 'above average efficiency' territory, so it will make best use of your amplifier power. Indeed, this excellent efficiency, combined with the higher-than-usual impedance, and the fact that the impedance continues to rise after crossing through 8Ω at 10kHz, will make the LS5/9 an exceptionally easy load for all amplifiers no matter what output devices they might use, or the type of output stage.

The Rogers LS 5/9 is a classic example of what every loudspeaker engineer aims for in a design: a smooth extended frequency response, above-average efficiency and an easy load for any amplifier type.

Those BBC engineers certainly knew what they were doing, and Rogers has done them proud. ***Steve Holding***

SONY WF-1000XM4

TRUE WIRELESS EARPHONES

How do you improve on arguably the best all-round true wireless earphones on the market? Sony has gone back to the drawing board and its new pair — the WF-1000XM4s — look nothing like their predecessors, the WF-1000XM3s.
Is this a brave move? Definitely.
A crazy one? Quite possibly.

What has happened is that instead of making the odd refinement here and there, Sony's engineers have gone to town on the WF-1000XM4 with an all-new design, a new charging case and a new audio processor. The new model also features a new eartip material, appearing here for the first time on a pair of Sony earbuds.

THE EQUIPMENT

Your initial contact with the WF-1000XM4 will be a surprising one. Sony has ditched the usual glossy box and instead presents your purchase in recycled packaging made from a special blend of paper.

This makes for a more compact package (fully 34 per cent smaller than the WF-1000XM3s), and one that does not use plastic.

That's great news for the environment, though it doesn't really give off the vibe that you've just bought a pair of premium noise-cancelling earphones.

Once you have liberated the WF-1000XM4s from their packaging, you're greeted by a small, black charging case. It's a full 40 per cent smaller than the charging case that came with earlier models, so it's positively tiny by comparison. The case also introduces wireless charging to the WF-1000X range for the first time — though you do need to invest in a compatible Qi charging pad. Otherwise you can charge the case via USB-C or battery share with compatible smartphones and piggyback off their power supply, too.

You shouldn't have to worry too much about the battery life. Sony's new buds might come with a smaller case, but Sony claims that the XM4's battery life is actually greater than that of the XM3, with the specifications proclaiming that you will get eight hours of play from the earbuds even with the noise-cancelling turned on.
A fully-charged case can then supply enough power for two more eight-hour sessions before you'll need to find an alternative source of power or recharge from the mains. This means more battery life from a single charge than their rivals — three more hours than AirPod Pros, two more than QuietComforts and one more than Momentum True Wirelesses. If you don't use the noise-cancelling, you'll add a further four hours of play time, increasing it from eight to twelve hours.

And if you need to quickly add a bit of play time, a five-minute quick charge will give you an extra hour.

You can see the battery life remaining in both the buds and the case by using Sony's 'Headphones Connect' app, which will also give you a reminder when the case drops below a 30 per cent charge.

As you'd expect, the times Sony quotes for battery life are 'best-case' scenarios. The battery life actually depends on a variety of factors, including the type of files you're using and the volume at which you're listening and how old the battery is. During the time I was reviewing them, which meant the battery had barely been used, I found that the battery life was almost always good enough to get me through the day.

EARBUD DESIGN

The new earbud design of the WF-1000XM4 was apparently arrived at as a result of a combination of customer feedback about the XM3 and research into the human ear, with the result being a rounder body that sits more inside the ear than previously.

The matte finish on each earbud gives the headphones a premium feel, while the small accents around the microphone and sensor holes add a tiny splash of colour. Speaking of which, if you're planning on using them as sports earphones you'll be pleased to know they claim an IPX4 rating, which makes them "resistant to splashing from any angle" — which is an improvement over the XM3s. So far as colour is concerned, they come in black or white, with gold-coloured highlights for both colour choices.

Besides the new-look earpieces, the XM4s also have new eartips. They're made from polyurethane which, when they're in your ear, feels like a cross between silicone and foam. Sony claims they help secure a tighter, more stable fit. The only downside here is that you only get three differently-sized tips to choose from — small, medium and large. Sony claims you will get years of use out of one pair, and says that extra tips will be available for separate purchase if you need them.

I did not have any major problems sliding the earbuds in and twisting them into place in my ears, but if you are struggling for a seal in your ears, you're able to pinch the tips to compress them in order to slide them into your ear canal, after which they will expand. I found that not only did they sit snugly in my ears with a good seal, but also that they remained comfortable even over longer listening sessions.

If you're not sure what a good fit is, or if you have managed to achieve one after inserting the buds, Sony has come to the rescue with a new "air-tightness" test, accessible through its 'Headphones Connect' app.

The app fires out a test tone and reports back on whether or not you need to make any adjustments. If you feel the sound is lacking bass or there is outside noise leaking in, I'd recommend using the app to test for air tightness. In fact, I'd recommend installing the 'Headphones Connect' app anyway, because it gives you direct access to all the key features and functions of the earbuds so you can choose which ones to enable or disable. It also helps you get set up for listening to music in Sony's 360 Reality Audio format (available when listening to Tidal or Deezer).

FEATURES

The circular outer surface of each earpiece is a touchpad and, by using the Headphones Connect app, you can customise the functionality of each one. They can control volume and playback or switch between noise-cancelling and ambient sound modes through the usual combination of taps, presses and long holds — and the headphones are quick to respond to these actions. Switching between sound modes, changing volume and activating and deactivating features such as Quick Attention (which drops the volume of what you're listening to, so you can have a quick conversation without having to remove the earbuds from your ears) happen with minimal fuss.

The Sony WF-1000XM4s borrow the 'Speak-to-Chat' function that debuted in the WH-1000XM4 wireless headphones. This feature allows you to talk to someone while the earbuds are still in place and is triggered when you start talking. It works well, although as is the case with the over-ears, it's only triggered a second or so after you start talking.

This slight delay can be frustrating, as can the tendency for the feature to be triggered by a cough or by mumbling to yourself. You can reduce the sensitivity of the feature, or turn it off completely, after which you could use the "Quick Attention" feature. Alternatively, if you pull one of the earbuds from your ears, play will be paused automatically.

The Sony XM4s use an improved DAC and analogue amplifier and are powered by a new Integrated Processor V1. Sony claims these all combine to provide a clearer sound and superior noise-cancelling than the XM3s. This new model also gets Sony's DSEE Extreme audio processor with Edge-AI, which is claimed to upscale low bit-rate music files to "near hi-res" quality.

The 6mm driver used inside the XM4 is similar in size to the one used in the previous model, but it's made from a new material and features a larger magnet, which Sony claims helps improve sound quality and noise-cancelling.

There is no aptX support onboard, but the XM4s support Sony's LDAC file format, which, streamed over Bluetooth from a compatible source, allows hi-res audio files up to 24-bit/96kHz to be transmitted at data rates of up to 990kbps. Without LDAC, you're left with SBC and AAC codecs.

Sony has also aimed to deliver clearer call quality with new features, including beam-forming and the use of a bone conduction sensor that stops the microphones from picking up distracting ambient sounds while you're talking. There's even an automatic wind noise reduction mode which attempts to cut out swirls of noise passing through the headset and into your ears.

All of this works with Sony's Precise Voice Pickup technology, originally introduced in the WH-1000XM4. The net effect is an impressive call quality for a pair of wireless earbuds. The technologies all combine to do a solid job of dampening down outside noise and interference, especially for the person on the other end of the call.

The general level of noise-cancelling is excellent, especially for a pair of wireless earbuds. Not everyone likes that 'vacuum' feeling you get when it's turned on, but it's extremely effective through the Sonys and you'll struggle to find better noise cancellation at this level.

Android users will be pleased to hear the Sonys are compatible with 'Fast Pair' so you can get up and running with minimal fuss but Sony has not included its 'Multipoint' feature that enables you to connect to two different Bluetooth devices simultaneously, which can come in handy if you're working on a laptop but still want to be connected to your phone. This is a great shame. Here's hoping it can be added at a later date. When you do connect to your smartphone you'll receive a battery notification pop-up, and should you misplace the XM4s you can track them down via Google's 'Find My Device' app.

SOUND QUALITY

Before I get to the WF-1000XM4's immense musicality and expressive dynamics, I should note first that the sound quality will of course depend on the Bluetooth codec you're using and if your device doesn't have the high-quality LDAC codec, it's likely it will default to the lower-quality AAC codec, or even further, to SBC. Sony should really think about biting the bullet and providing if not aptX HD, then at the very least aptX.

Keen to hear how the earbuds handled one of my favourite bass-heavy test tracks, I fired up Massive Attack's *Angel* and was blown away by the confidence with which the song was dispatched.

The quality and clarity of their bass is stunning. There's such a fantastic level of detail on display that it makes rival earphones sound congested in comparison. Every element of that pulsing bass line was precisely deployed and dripping in texture. It's the clarity around the notes that really grabs you — it allows the WF-1000XM4 to communicate intricacies in the bass notes that other earphones struggle to uncover.

But it's not a sound that purely favours low frequencies. There's clarity across the board and a sense of rhythmic precision that allows the Sonys to switch pace effortlessly. They sound as at home keeping up with — and succeeding in not being tripped up by — Radiohead's *15 Step* as they are dispatching the slow, deliberate swagger of Nina Simone's *Feeling Good*. Simone's effortless vocals ooze class and sophistication, and the Sonys laid every nuance in her delivery bare. Combine the emotion in her voice with the impact of the piano, percussion and wind section and the Sony XM4s created a captivating sound that swept me away.

If you were wondering whether the WF-1000XM4s would be a step up from the WF-1000XM3s, I can confirm that they are. The newer model sounds more informative and uncovers more subtle detail. Bass notes are better defined and the overall sound is better balanced.

I could hear that refinement and natural tone shine through as I listened to Ludovico Einaudi's *Experience*. From the delicate, deliberate piano notes at the start to the soaring strings at the climax, the Sonys bring the individual personalities to life and mix them together like the ingredients of a fine cocktail.

CONCLUSION

Sony has absolutely nailed it with these new WF-1000XM4s. These wireless earphones deliver a satisfying user experience, class-leading battery life, some of the best noise-cancelling I have heard in this category and, if you're using the LDAC codec, absolutely stunning sound quality. They're one of the most feature-packed, user-friendly and sonically gifted pair of wireless earbuds I have reviewed.

You won't find many true wireless earbuds that come close to matching the all-round brilliance of these Sony WF-1000XM4s. ***Bill Heffernan-Fanning***

CONTACT DETAILS

Brand: Sony
Model: WF-1000XM4
RRP: $449.95
Warranty: One Year
Distributor: Sony Australia Pty Ltd
Address: Level 3/165 Walker Street
North Sydney
NSW 2060
T: 1300 137 669
W: www.sony.com.au

+
- Musicality and comfort
- Clear, detailed bass
- Battery life

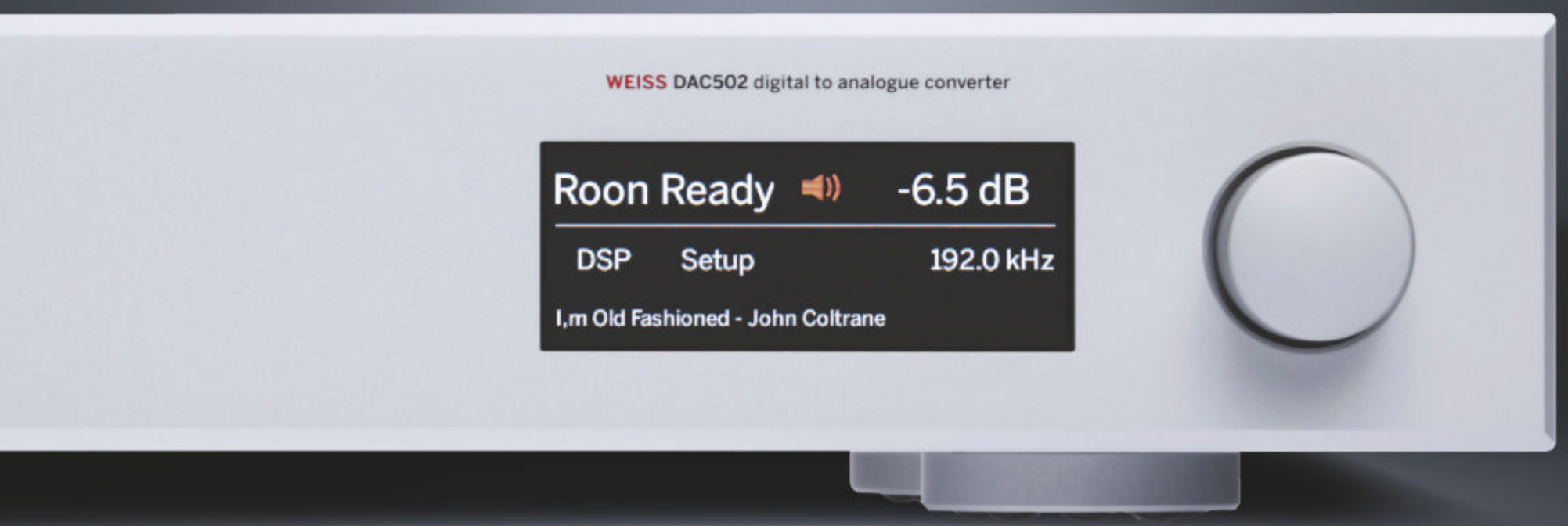
—
- AptX
- Multipoint Bluetooth
- Ear tip choices

No 83. July/August 2021

esoterica

THE BEST DAC ON THE PLANET!

(But there's a cheaper version of it available)



SOUND TRAVELS

A BBC engineer builds his own!

SOUND TRAVELS

STORY **PETER XENI** | INTERVIEW **PETER XENI** WITH **PAUL BOON**
PHOTOGRAPHY BY **PAUL BOON**

Alistair is a hands-on innovator. He builds his own hi-fi equipment: from the phono stages to the pre and power amplifiers to the loudspeakers. That's not uncommon, every audiophile knows a hobbyist, some bloke working in a back shed with a soldering iron, a hacksaw and a vision. But few hobbyists travel overseas to learn their craft and even fewer have worked in responsible engineering positions at the British Broadcasting Corporation. Alistair has. A physicist by training, then a professional engineer who, now that he's back home in Melbourne, enjoys freely teaching others the craft of high-end audio in his spare time.

"A key thing I've learnt in my work," he says somewhat modestly, "is that design is not so much about the quality of the components: it's about the quality of the implementation, it's about the wiring detail of the circuit board. Not just the schematic and how the components are connected together — it's about innovation, using new ideas to solve old problems. Ultimately a good design will provide a clean signal from the outset and eliminate subtle distortions, those aural effects that we hear subliminally."

Alistair's designs are the result of years of trial and error. A bit like Newton's "standing on the shoulders of giants," he says with a chuckle. He spent years learning to avoid messy circuitry, the spider labyrinths that can attract all kinds of sonic interference, and common in complex circuits. Sitting back in his comfortable inner-urban home, he offers a memorable example. "One time at the BBC, we couldn't get the hum out of a recording console; we tried everything — isolation transformers, you name it, we even moved the equipment about, end to end. Eventually we looked at the building plans and we found a huge transformer on the floor directly below the unit! You can guess what became of that." As a New Zealand engineer, you couldn't afford to embarrass the Queen and her subjects with hum in their television sets. "Believe me," he says, "those glitches made me jittery about live broadcasts."

Alistair graduated from Auckland University in Science with a major in

semiconductor engineering, and then moved to the UK where he parlayed his talent to good effect. He handled "the finest audio equipment" as a young man and had acquired the skills to build excellent audio equipment "at less than a fraction of the price", so he says, because of expertise acquired at the BBC.

Alistair "bagged a job", he says, with the BBC world service in 1995 after working as a voluntary audio technician at the student radio station, 95 BMF at Auckland University. His gilded application landed him a plum novice job with what he calls "the technically challenged BBC World Service" saying that the organization was BBC One's poor cousin, and was in desperate need of updated technology: "They even asked if I could align reel-to-reel tape recorders which, of course, I could. The job meant I could communicate with people all around the world. People such as that legend of music, John Peel, and others. I met a lot of interesting personalities."

Meanwhile he learned about the vagaries of sound, how to optimize top-end equipment such as LS3/5as, LS5/8s, and Nagra portable field recorders. He grew up with fine audio. His parents in New Zealand had a Rega turntable and KEF speakers, a modest but nice sound, though nothing like the supernova of sound he heard at the BBC. "There I was servicing this cutting-edge equipment of the time, like a kid in a lolly shop." It sparked a lifetime passion for good quality sound, in studios without resonances, where the recording sounded like the artist was in the room and, he says, "you felt engaged with the artist."

A few years later he sent an updated application, with his new credentials, to Anglia Television in Norwich and was hired as a Broadcast Engineer. "I started mostly installing and commissioning new equipment while working directly under the chief engineer who designed the multi-million pound investments using the latest Canon, Sony, and Panasonic innovations. It was big-budget stuff. I remember driving four professional video machines in the back of my car, worth the cost of a small house, some £100,000 in those days."

"In my flat in the late '90s, I had a reasonable Cambridge audio amplifier, an Arcam CD player and I built a pair of kit-set speakers. That's where I first acquired the satisfaction of building my own equipment. My trained ears told me that what I had built was worth three times the price, given my background in pricing electronics."

PX: *You eventually returned with your ex-wife and child to Australia.*

Alistair: Yes, you couldn't raise a child in a flat, away from family, and enjoy the remarkable music scene in England. We could no longer go out any night of the week as a couple to enjoy blues, reggae and world music events.

PX: *I assume the shift from analog to digital in the late 90s affected your job prospects on returning to Australia?*

Alistair: I saw my original skill set go obsolete. So I took a step backwards and to the side. Luckily in the UK I had done some electronics work while working in television — such as creating custom units to handle the introduction of wide-screen broadcasts. In effect, I was re-skilling from electronics engineering to systems engineering. By doing this, I was able to obtain other roles designing equipment rather than servicing and installing it.

PX: *Given that new-found knowledge, tell us about your own choice of audio components?*

Alistair: I chose the Oppo 105 Blu-ray player because it's so versatile. It's not only a Blu-ray player but also a media centre; I can screen video to the projector and to the television; it has a decent CD player and has inputs for an external hard drive. I have ripped all my CDs to the hard drive, but I've kept them as well. I like hard copies.

PX: *Can you describe your other equipment for us?*

Alistair: I own an original Linn LP12 with a vintage Grado moving-iron cartridge on a Grace arm. The rest is my design: an op-amp-based pre-amp that I built that drives a Class-D class power amp that I also built which uses a power IC from Texas Instruments. It's rated at 150 watts per channel. I built it using the best engineering practices and to my ears it sounds neutral and balanced.

I also designed and built my own phono preamp. It has two inputs — one for moving-magnet which has 45dB of gain and uses a JFET, and one for moving-coil with 65dB of gain that uses a pair of ultra-low-noise bipolar transistors. I believe you can't get the optimum performance if MM and MC share the same input. Then there are the RIAA equalization and line output stages. The first stage of amplification is critical. You can't get rid of noise down the line. The power supply is in a separate die-cast metal box to reduce hum and noise.

PX: *Your speakers certainly look impressive; standing sturdy on their metal stands!*

Alistair: The speakers are styled on the retro Harbeth and ATC monitors. I always loved that English look. I've used a Raal ribbon tweeter (Serbian origin), and an AudioTechnology 5-inch midrange (Denmark). For the bass drivers I use custom-made 12-inch models from John Janowitz of Acoustic Elegance in the USA. They are a sealed-box design for best transient response and produce bass down to 40Hz, clean and fast. With 91–92dBSPL efficiency, they're not hard to drive. They sit in a 100-litre volume cabinet made out of bamboo plywood, with light polyester hollow fill packing inside.

PX: *And your musical tastes?*

Alistair: I love blues. I've been to the Byron Bay Blues Fest several times. There are so many great blues singers I enjoy — Junior Wells, John Lee Hooker, Albert Collins, Howling Wolf, Muddy Waters, Stevie Ray Vaughn. Tesky Brothers. A lot of Flying Nun label artists too.

PX: *What way does music affect your life, your emotions and the way you feel?*

Alistair: It's an escape from daily life, it emotionally engages me and uplifts me — it's the blues for me and pop for my feet.

PX: *And can you tell us what you think the future of music might be?*

Alistair: Streaming. That's it. For the general public, it's all about music on demand — a subscription will get them any music on Earth; just click and it's available. The streaming providers data-mine your musical tastes to define your identity and then serve up music they think you will want to hear. But with a record, it's tangible; it's something you specifically bought for yourself from a bricks and mortar music store. It's tangible and it's yours.

Alistair takes pride in ownership and that's why he uses his considerable experience to make things that are tangible and uniquely his. And they sound pretty damn good too.

EQUIPMENT LIST

Linn Sondek LP12 Turntable (Grace tonearm/Grado moving-iron cartridge)

Oppo BDP-105 BD Player (plus a Music Library on an external HDD)

Phono Preamp Own design with discrete JFET MM head amp, bipolar MC head amp, and op-amp-based RIAA equalisation and output stage. Separate box houses ultra-low noise linear power supply. Cartridge loading and gain is adjustable for each input.

Preamplifier Own design using National Semiconductor LM4562 op-amps, Greyhill input selector switch, Alps Blue Velvet volume control, and low-noise linear power supply.

Power Amplifier Own design with Texas Instruments TPA3251 Class-D amplifier and linear power supply.

Loudspeakers Own design. 3-way sealed box (100-litres) made from bamboo plywood on sand-filled steel stands. Raal 70-20XR ribbon tweeter, AudioTechnology C-Quenze 5-inch midrange, AE Speakers TD12S 12-inch bass driver. Passive 4th order Linkwitz-Riley crossover at 270Hz and 3kHz.

Cables & Interconnects Hand-made using Mogami cable terminated with Amphenol plugs plus Mogami speaker cable.

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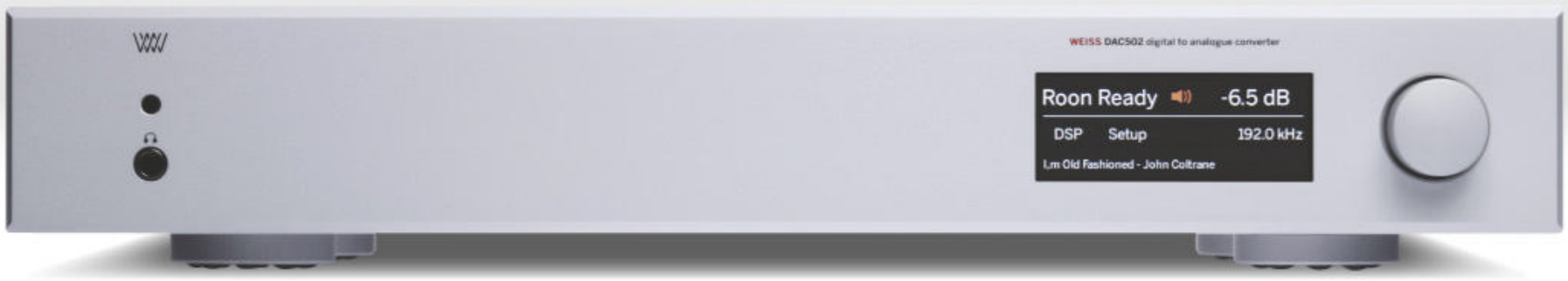

WEISS DAC 502

DIGITAL TO ANALOGUE CONVERTER

You can tell that designer Daniel Weiss has spent his life at the creative end of audio engineering, in the control room of a studio, because the Weiss DAC 502 isn't so much a DAC as a creative tool that allows you to modify what's going through it to best suit your system, your hearing and your preferences in music. It's so much more than 'just a DAC'. And if you need any more proof about Weiss's background, there's the fact that he's the proud winner of a Technical GRAMMY, awarded to him for Special Merit (Technical). [*See Inset Box*]

For example although the Weiss DAC 502 reviewed here is listed in Weiss's catalogue as a DSP D/A Converter and Network Renderer, that description understates its abilities by an enormous margin, because it's an enormously complex device that's capable of parametric equalisation, room equalisation, crosstalk cancellation, vinyl emulation, de-essing, dynamics compensation, balance, volume and tone control and much, much more, including a fabulous 'constant volume' circuit that ensures the volume level of your system will remain the same from track to track, which is a boon to those of us who like to play music in the background whilst entertaining. Plus its firmware is continuously upgradable, so Weiss can add new features and processes at any time to any of these models.

There are so many options that it can take some time to set them all and so if you want different settings for different scenarios, re-setting could become a pain, so as the *pièce de résistance*, Weiss has included a "Snapshot Mode" so that after you have set the parameters for each of these functions, they can be saved and recalled at the touch of a button.

EQUIPMENT

The simplicity of the Weiss DAC 502's front panel belies the complexity of what lies beneath, but thanks to the sophistication of the software, the DAC 502 is still very easy to use because it can be totally controlled either by the LCD touch screen and rotary knob on the front panel, by the handsome infra-red remote control that comes supplied with it, or via a built-in web interface (to access which you only need enter the address http://dac502-serial number.local into your web browser).

But at its heart, the Weiss DAC 502's primary function is to operate as a DAC, so let's look at its capabilities in this regard. It has five digital inputs, all of which accept professional AES/EBU or consumer (S/PDIF) digital signals via XLR, RCA, Toslink, USB (Type B) and Ethernet inputs. The AES/EBU and S/PDIF inputs accept 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz, and 192kHz signals up to 24-bits. The USB and RJ45 Ethernet inputs do all those same sampling rates, but add 176.4kHz, 192kHz, 352.8kHz, 384kHz, DSD64, and DSD128 as well. The optical (Toslink) input does only 44.1kHz, 48kHz, 88.2kHz, and 96kHz rates.

There are no digital outputs, so whatever digital signal you input must come out as analogue, which it can do via the front-panel headphone output, which can be used 'straight' or routed through a crossfeed circuit (about which more later), or from XLR (balanced) or RCA (unbalanced) outputs on the rear panel. There's also a four-pin balanced headphone output on the rear panel.

If you use the XLR outputs (which would be my preference) you can adjust the maximum output voltage through four different settings — 0dB, –10dB, –20dB and –30dB which the specifications say will result in maximum output voltages of 6.8-volts, 2.2-volts, 0.68-volts and 0.22-volts (but see the test results from *Newport Test Labs*).

Weiss says that the setting you use should be dictated by the input impedance of the amplifier you're using with the DAC 502. They say it should be 0dB if the amplifier's input impedance is 900Ω or more, –10dB if it's 100Ω or more, –20dB if it's 60Ω or more and –30dB if it's 40Ω or higher. You can see from this that Weiss's background in studio equipment design, which relies on precise impedance and voltage matching, has also crept into his domestic designs. Even if you use the RCA outputs, you also have four volume settings available.

Arguably far more useful, given the enormous variations in headphone impedance, is that you also have four volume settings for the headphone output. In this case, the 0dB setting would be used for headphones with an impedance of 200Ω or more, –10dB for headphones with an impedance of 30Ω or more, –20dB for headphones with an impedance of 10Ω or more, and the –30dB setting for headphones with an impedance of 4Ω or more. If you factor in the fact that there's also a dedicated headphone crossfeed circuit built in, plus that a dedicated headphone equaliser circuit is soon due to be added, you have capabilities on board that would put most dedicated headphone amplifiers to shame.

CROSSTALK CANCELLING & CROSSFEED

One of the circuits fitted to the Weiss DAC 502 probably says more about the habits of its designer, Daniel Weiss, than it does about the average audiophile, because the only purpose of the DAC 502's crosstalk cancelling circuit is to allow you to play back recordings made with dummy heads (which

The Weiss DAC 502 isn't so much a DAC as a creative tool that allows you to modify what's going through it to best suit your system, your hearing and your preferences in music

are intended to be played back exclusively via headphones) to be played back through ordinary loudspeakers, and the number of recordings using dummy heads fitted with microphones rather than conventional microphones is infinitesimally small.

Indeed, although I own a dummy head demo album (and it's the only dummy head recording I own), I could not think of a single commercial recording made using the technique. Even a Google search revealed only two, one of which is a solo album by Tangerine Dream's leader Edgar Froese, titled 'Aqua', and the other is an experimental album from 2015 titled 'From M.E. to Myself' by Singaporean singer-songwriter JJ Lin which Wikipedia says "is the first album in pop music industry using this technology."

So suffice it to say that you are not going to get the opportunity to use this particular circuit very often!

The same is not true of Weiss's crossfeed circuit, which does the exact opposite to the crosstalk cancelling circuit. Its purpose is to re-engineer the sound of music that was intended to be played through loudspeakers (which is pretty much all recordings except those made with dummy heads!) to make it sound more realistic when listening via headphones.

One of the common problems with modern music is that recording engineers often introduce extreme separation between left and right stereo channels to make the music sound more exciting and more involving. This works well when you are listening to loudspeakers because as both your ears always hear the music coming from both the left and right speakers, the result is that the music does sound more dynamic and exciting, but the separation is not overly obvious, and becomes less and less obvious the further away you are from your loudspeakers.

However, if you play back exactly the same music via headphones, the left ear cannot hear any audio that's playing from the right channel nor the right ear any music from the left channel, which makes the music sound completely unrealistic. And it causes another problem which is that if the signal is in both channels, but there's a time delay in one or the other channels that causes the sounds not to arrive at both ears simultaneously, the music will sound syncopated.

Weiss's crossfeed circuit selectively 'bleeds' some of the music from the right channel into the left channel, and *vice versa*. Crossfeed circuits are fairly common, but most are relatively simple analogue affairs. Indeed one of the first, designed by Siegfried Linkwitz and published in the December 1971 issue of *Audio* magazine, was so simple it was designed to be built by DIYers of the day. Weiss's crossfeed circuit, on the other hand, uses digital signal processing and users have 100 different crossfeed settings available to them.

Crossfeed can also prevent the all-too-common effect often perceived when listening to headphones, which is that that the music is coming from inside your head, rather than from outside it, which tends to centre the sound so you perceive a monaural rather than a stereo sound.

VINYL EMULATION

Vinyl emulation? A circuit that emulates the sound of vinyl. All those clicks and pops you love, along with the hiss of vinyl and the rumble of platter bearings and drive motors? That is not what I meant at all; That is not it, at all, as T. S. Eliot once said (though not of vinyl emulation). What Weiss intends its vinyl emulator to do is, quote: "get that special sonic character of a record player-based playback chain" unquote.

To do this, Weiss says he uses an algorithm that affects the frequency response, distortion patterns, resonance frequencies, noise at various frequencies, crosstalk between left and right channels, and takes into account other effects caused by RIAA emphasis and amplitude modulation effects. "The key to a good emulation is to achieve the right amounts and characteristics and sequence of all these effects," says Weiss.

Weiss's brochure says the DAC 502 also employs an emulation of the DMM-CD procedure offered by the German recording label Stockfisch but I think something was lost in the translation to English here, because Stockfisch's DMM-CD process is not an emulation, it's the real deal. The company records an album, then cuts a 45rpm direct metal master (DMM) of that album, which it than plays back using an EMT TSD-15 phono cartridge in an EMT 997 tonearm in an EMT 950 turntable. The resulting output signal is fed to an EMT JPA66 valve pre-amplifier whose analogue output is then fed to a Meitner EMM Labs ADC8 Mk IV for conversion to DSD, after which the company presses SACDs and standard Red Book CDs. So the signal on a Stockfisch DMM-CD is not an 'emulation' of vinyl sound, it's actually the real, 'true' sound of recorded vinyl.

I can only assume that what Weiss meant to say is that its vinyl emulation circuit is designed to deliver the sound quality found on DMM-CDs, rather than simply a generic 'vinyl' sound. (A little-known fact about the direct metal masters Stockfisch uses to create its CDs and SACDs is that it has to create multiple metal masters for each album, because it only creates grooves in those positions on the master where the tonearm tracking error is at 0° — or at least very close to it.)

DE-ESSER CIRCUITRY

If you're not a recording engineer, it's likely you've never heard of a 'de-esser' but you will find at least one of these devices in every recording studio on the planet.

Its name describes its operation perfectly. It is intended to remove sibilant sounds (such as 'S') from vocal tracks.

Technically, a sibilant is a coronal consonant (a description that means the sound is made with the tip or front part of the tongue) and the reason they're so annoying for recording engineers is that not only are they louder than non-sibilants but their acoustic energy at higher frequencies is also greater than non-sibilants, so that even if a singer has excellent control over their singing volume, and the recording levels are set correctly for this volume, any sibilants will always seem to sound 'louder' and will therefore be immediately noticeable.

'S' isn't the only sibilant of course, 'Z' is also a sibilant as, too, is the 'SH' sound, and de-essers are designed to ameliorate (not remove, note!) these sibilants as well, but calling the device a 'de-esser' rather than a 'desibilanter' is obviously a no-brainer because it's not only easier to say, and easier to spell, but more fun, since the word itself is inherently sibilant.

I do not have the space in this review to describe exactly how Weiss's de-esser operates, and even Daniel Weiss's own incomplete description occupies three pages of fine print and multiple diagrams, but I will say that you can choose between two completely different operational modes — 'Surgical' and 'Smooth' — and you can also vary the 'amount' of de-essing applied.

'Surgical' is specifically intended to constrain brief, occasional sibilants without affecting the rest of the music too much while 'Smooth' constrains sibilants but also rolls off high frequencies generally.

Weiss says of the differences between the two modes: "If you want a more general diminution of the high-frequency content the mode 'Smooth' is the proper choice. For example if you are listening with headphones the mode 'Smooth' can enhance your listening experience. But it is also well-suited when listening with loudspeakers, if you like to have a more mellow sound of the high frequency content."

WATCH THIS SPACE?

I said in the introduction to this review that the upgradeable nature of the DAC 502's software and firmware means that Weiss is able to upgrade or modify existing features as well as add totally new features. Three that were being promised at the time I was reviewing the 502 were a 'Loudness' control, a 'Headphone Equaliser' and an 'M/S' Control.

The first two potential features need no explanation but the last will only be familiar to recording engineers. M/S stands for 'Mid/Side' (more commonly abbreviated to M-S) and applies to a special recording technique using two microphones where the one for the 'Mid' channel can have any polar pattern, but the one for the 'Side' has to have a Figure-8 pattern.

Unlike a standard stereo set-up, where the left channel microphone captures sound on the left and the right channel microphone the sound on the right, in an M/S set-up the 'Mid' mic captures information that's common to the left and right sides, while the 'Side' mic captures the information that's different between the left and and the right sides. In this way the level of the signal from the 'Side' mic determines not only how wide the stereo image is, but also the amount of room ambience you will hear in the recording. One of the major advantages of this technique from an engineer's point of view is that she or he can adjust the stereo width of their recording after the fact, by turning the 'Side' signal up or down in volume.

So it would appear that Weiss' forthcoming M/S control will allow you to alter the width of the stereo image of any music you play through it.

Rather annoyingly, despite not yet being available, these options are already displayed in the menu. If you try to select them, by changing Plugin Enable from 'Bypass' to 'Enable' and then use the 'Amount' slider to dial in your preferred value of 'enablement', (0 to 100), the value will stick, but when you refresh the screen, the Plugin Enable will have reset itself to 'Bypass'. It would be better if these options had been hidden until they were useable.

WEISS ROOM EQUALIZER

A room equalizer is one that's specifically intended to tame room modes, which are resonances caused by the fact that you're listening to music in a relatively small room, so that at certain frequencies the distances between the walls (and the floor and the ceiling) will either sum (and get louder), or subtract (and get quieter). If you've ever altered the pitch of your voice in a long tunnel, and found that a particular pitch will suddenly become incredibly loud and take on a life of its own, you've experienced the effect of a room (tunnel) resonance.

The best way to prevent or ameliorate resonances is to build a correctly sized room in the first place and then to use physical absorbers or diffusers to add the final touches that will be inevitable due to the relatively small dimensions of the rooms in a typical dwelling. If you have to work with an existing room, you'd still be best-advised to first address resonances with absorbers and diffusers before trying to do it with electronics.

Your final port of call should be a room equalizer. The one fitted to the DAC 502 works, but it's a work in progress, because it depends on you to work out the various resonant frequencies present in your room, then calculate and apply the boost and cut that's required at those frequencies. Weiss does provide a link to a room mode calculator (www.amcoustics.com/tools/amroc) and advice on how to find room modes but there is no automation. Weiss says that it is working with the Illusonic company to license its room measuring software for the purpose of calculating the necessary room EQ settings, but for the foreseeable future, if you're going to use the built-in room equaliser, you'll need to do it all manually and mostly by trial and error.

CREATIVE EQ

Whereas a room equaliser is designed to control room resonances, a parametric equaliser, such as the one fitted to the Weiss DAC 502 that it calls 'Creative EQ', is ideally suited for a much wider range of operations, though it, too, can of course be used to control room modes.

But a parametric equaliser can also be used to adjust for irregularities in the frequency response of your loudspeakers, or used as an ultra-sophisticated tone control that not only gives you total control over bass, treble and midrange frequencies, but total control over any (or all) frequency bands you choose. It's arguably the most sophisticated type of equaliser available.

The parametric equaliser in the DAC 502 is a three-band type but whereas most three band equalisers offer only peaking filters, Weiss's parametric EQ also offers high-pass and low-pass filters, so you get the complete parametric toolbox. The peaking filter allows you to set the frequency you'd like adjusted, the level you'd like to adjust it to, and the range of frequencies either side of your selected frequency that you'd like the filter to affect (otherwise known as the 'Q' of the filter). The high-pass and low-pass filters allow you to choose the high and low-pass frequencies, the boost and cut of the shelves and the filter slopes to those shelves.

Weiss's parametric filter is complex enough that it could be difficult to get your head around initially, but after you've read the two-page explanation in the Owners' Manual and examined the various graphs and charts, you will easily be able to start building and using your own filters.

When it comes to setting the filters, I really liked the effect that if you sweep your finger horizontally along the display you can instantly set the amount of boost or cut (or whatever) you want with the value showing in white letters, but when you lift your finger, the display then resets itself and slowly ramps up to your chosen value, with a red horizontal bar extending (or contracting) as a visual indication.

DYNAMICS ADAPTION

I think that this is yet another Weiss feature that has suffered in translation to English (but since Daniel Weiss is Swiss, I don't know if the translation is from French or German). It should really be called a Dynamics Adaptor, or perhaps a Dynamic Range Controller. In some of its literature, Weiss instead refers to it as a 'Constant Volume Controller' which is actually likely the best description of what the circuit actually does, which is to keep the overall volume of any track you play at around the same volume as the track you were playing earlier. (And, if you want to go all Zen about it, the volume of the track you're about to play!)

This means that if you are using music for background to a dinner party, or as background while you're working or reading, or listening from another room — or even from outside your home — you won't have to worry about some tracks being too loud and others too soft. You have probably already run across this 'feature' as offered by your music player software or your streaming service, where it's usually called 'Volume Normalisation.'

Of course because volume normalisation works by reducing the levels of the loudest sounds and increasing the levels of the softest sounds, it's actually squashing dynamic range and squeezing the life-blood from your music, but given that most modern pop music has already had its dynamic range squashed flat before it even gets to you, it's arguable whether it's possible to kill something that's already dead. (For background information about this, just Google 'Dynamic Range Wars').

As you'd expect, Weiss's take on the circuitry required to normalise volume is not only cleverer than most in how it goes about it, but also offers you the choice of how dynamic you'd like your music to be via the provision of a 'Dynamic Level' control that basically allows you to set your 'preferred' level of control over the dynamic range of the music you're playing to suit either the genre of music you're playing and/or the situation in which you're playing it.

The only way I thought the 'Dynamics Adaption' menu could be improved is by adding a 'Centre' button to allow you to instantly select 0.0dB, which is a feature of several other of the menus on the DAC 502 but — somewhat strangely — not this one.

INTERNALS

Inside the Weiss DAC 502 you'll find a pair of 32-bit ESS Sabre ES9018K2M DACs and a fourth-generation Analog Devices SHARC DSP running Weiss's own digital filter and a Texas Instruments Arm Cortex-A8 microprocessor. The DACs are controlled by a high-precision, low-jitter clock that runs at, according to Weiss, "about 195kHz". Initially I thought this was a double misprint because a clock that runs at "about" a frequency doesn't sound as though it would be too stable, and the frequency is neither a multiple of either 44.1kHz or 48kHz and is most certainly not the most common clock frequency used by DACs (which is 192kHz).

Daniel Weiss says that both the "about" and the 195kHz figures are correct and adds that the DSP algorithms also run at that frequency. He says that using this particularly unusual *schema* "helps significantly reduce jitter-related effects to deliver optimal signal quality."

The circuit boards are beautifully laid out and populated with only the highest-quality state-of-the-art components including a pair of toroidal transformers and separate voltage regulators for the left and right channels.

All incoming digital signals are re-sampled to PCM at 195kHz before being presented to

> Circuit boards are beautifully laid out and populated with only the highest-quality state-of-the-art components

DANIEL WEISS BIOGRAPHY

If you know anything at all of the history of Daniel Weiss, the founder and owner of the Swiss firm Weiss Engineering, you will realize why the company for many years designed and manufactured only professional digital electronics intended for use in recording and mastering studios. It's because after graduating from HTL Rapperswil in 1979 with a BSEE, Weiss joined Studer/Revox where he designed analog anti-aliasing filters, test signal generators, sampling frequency converters and digital audio processors for one of the first digital recorders.

He left Studer/Revox in 1985 to found Weiss Engineering and after first creating the famous modular 102 Series system that's still used by Sony Music in New York, he followed up with a range of specialist stand-alone studio components that included dynamics processors, de-noiser/de-clickers, A/D and D/A converters, and sampling rate converters, all of which used 40-bit floating point processors and sampling rates of up to 96kHz. In the pro audio field, Weiss Engineering is recognized as a leading company when it comes to signal processing. It's quite likely many of the CDs in your collection were mastered using Weiss equipment and many of the downloads and streams on the Internet were also mastered using equipment from Weiss.

Indeed it wasn't until the turn of the century that Weiss entered the high-end hi-fi market with a CD transport (Jason) and a DAC (Medea).

the DACs (including DSD).

LISTENING SESSIONS

If, by now, you're feeling rather blown away by how much the DAC 502 can do, you're in good company, because I was too, but if you're wondering how you might go about controlling it, I have to tell you that it's as easy as falling off a log. The menuing software that controls it all is totally thought-out.

So well thought-out in fact, that you'll likely be able to set every single adjustable parameter to your liking without ever having to open the User's Manual. But that would be a pity, because that Manual contains a wealth of easy-to-read information. So does Weiss's website, which is also well worth a look. (Plus you can download the Owner's Manual before-hand, should you so wish, along with a number of White Papers that explain the various unique aspects of the DAC 502's circuitry.)

However, although I am happy to praise the menu system, I do think that there has been an oversight with its execution, which is that if you're in the main DSP settings menu, the list of bars you have to scroll through is just an empty bar with a > mark in it to show that you need to click on it to see the next screen which then shows if it's enabled or not (along with other settings).

This means that this screen does not actually show you if a particular feature is enabled or not. You instead need to go to another screen to find out this information. This means potentially having to press 21 buttons just to see which circuits are enabled and which are not. If the colour of the > showed red for enabled and white for bypass, it could instead have be done with just a simple menu scroll — no button pressing whatsoever required! Luckily this should be an easy firmware fix, so hopefully someone at Weiss will read this review and take the hint!

Operation is a combination of using the rotary control and the touch-screen. When to use which is mostly intuitive, but I occasionally tried to use the screen instead of the control and *vice versa*, so perhaps it's not quite as easy as falling off a log.

In use, the touch-screen displays the source, whether the line or headphone outputs are selected or muted, the sample rate of the incoming selected source, the metadata text when the DAC is receiving network data, as well as DSP and setup information. Was it perfect? Not quite.

I found the four-colour front panel display rather too small, at just 80×30mm. It's not too small to read — I had no problems with that. The problem for me was that it's a touch-screen and I found that I had to be very precise about where I put my finger on the screen surface to get the DAC 502 to do what I wanted, particularly when I was working in the 'Main Settings' screen.

Which seems like an ideal time to mention that Weiss makes another DAC, the Weiss 501, which is exactly the same as this 502 model except that it doesn't have a balanced headphone output on its rear panel (no room, because it's built on a half-size chassis), with a different form factor that, in photographs, makes the touch screen of the 501 appear to be much larger than that of the 502. It's not: it's the same size.

I must admit that I was really keen to see how the de-esser worked, so this was one of the first things I tried out with the Weiss DAC 502. I was disappointed that it didn't work as effectively as I'd hoped. I tried two recordings that have what are, in my opinion, excessive levels of sibilance on the part of the vocalists, and I deliberately chose to use both a female voice (Alanis Morissette) and a male one (George Michael), on the basis that the frequencies of the sibilances of males and females were likely to be in different parts of the audio spectrum. (The albums were, respectively, 'Pretty Forks in the Road' and 'Listen without Prejudice').

As I said, the Weiss DAC 502's de-esser circuit did not work as effectively as I had hoped it might, because it did not remove the sibilances from either of those two performers and using the circuit also affected sounds other than sibilances I'd wanted it to remove. I guess I should not have been too surprised by either result. The reason de-essers work so well in the recording studio environment is that when they're being used, they operate on the track of the multi-track recording that contains the vocal — there are no other sounds on that track at all. This means the circuit can 'recognise' and remove sibilances more effectively, and its operation can have no effect on the sound of any other vocalists or instruments because those sounds are tucked away on other, separate, tracks.

As used here, the de-esser can't separate out the vocal from the other sounds, so it's difficult for the circuit to recognise a particular sound as a sibilance created by a voice, and so it will inevitably recognise (and try to treat) the sounds that it misinterpreted as sibilances. And, of course, whatever it does will affect the sounds made by instruments, as well as those made by the human voice.

You can, as Weiss suggests, just use the de-esser to adjust the tonal quality of the music, such as to make it sound more 'mellow', but if you do this, you need to be aware that if you also use the vinyl emulation circuit, the two different circuits will interact with each other, so that every time you adjust the de-esser, you'll have to the re-adjust the vinyl emulator, after which you will need to re-jig the de-esser, and so on, going back and forth. Which is all very interesting, but also rather time-consuming!

As for the Vinyl Emulator, I confess that I was half-expecting it to add clicks and pops to the music but of course it didn't! I also found that its effect was variable, depending on the music that was playing. On some recordings it seemed to add what initially seemed like surface noise, but more intensive listening sessions merely showed that it was accentuating noise that was already present in the recording itself, not actually adding noise *per se*. Various settings obviously rolled off the treble, while still others reduced the separation between the left and right stereo channels, (though this last effect also varied depending on the recording being played). My main take-away from all my experimentation was that for best results you should make only very subtle adjustments — if you're too heavy-handed, you'll never get the sound you want.

Once I had finished playing around with

> Quite simply, the Weiss DAC 502 is the best DAC I have ever heard

TECHNICAL GRAMMY WINNER

Daniel Weiss was recognized at the 63rd Annual GRAMMY Awards on Sunday, March 14, 2021, with the Recording Academy bestowing him with a Technical GRAMMY in the 2021 Special Merit Awards division.

Technical GRAMMY Award recipients are voted on by the Academy's Producers & Engineers Wing Advisory Council and Chapter Committees, and are ratified by the Academy's Trustees. The award is presented to individuals and companies who have made contributions of outstanding technical significance to the recording industry.

"As we welcome the new class of Special Merit Award honorees, it gives us a chance to reward and recognise the influence they've had in the music community regardless of genre," said Harvey Mason for the Recording Academy. "Daniel Weiss is one of the true pioneers of digital technology. In 1985, he founded Weiss Engineering Ltd in Zurich, Switzerland. The company has designed and manufactured groundbreaking digital audio equipment for mastering studios, including the IBIS digital mixing console and the ultra-high-quality Gambit Series digital products."

all the variables on offer with the DAC 502 and listened to the sound of it totally unadorned, with every single circuit bypassed, I was pleased that I had done all my playing around with the vinyl emulator and de-esser first, because if I'd listened to it simply as a DAC in the first place I don't think I would ever have thought about trying to adjust its sound quality at all!

Quite simply, the Weiss DAC 502 is the best DAC I have ever heard.

Or, to put that another and rather better way, this is the very first time I have not 'heard' a DAC in my system. Whereas every other DAC I have ever reviewed has imposed its particular sonic signature on the audio signal passing through it, such as to modify the sound in some way, the Weiss DAC 502 had absolutely no influence at all on the sound of the music going passing through it.

So ultimately, it was as if my amplifier and my loudspeakers were connected via a direct line to the recording studio. I was hearing what the engineer was hearing, except through my own amp and loudspeakers. (And considering the quality of the amplification and loudspeakers used in some studios, I was definitely the one hearing the more accurate representation of the music).

The best way to prove this to yourself, of course, is by listening to the Weiss 502 using your favourite music tracks, ones that you know the sound of well, because they will almost certainly be different to the tracks I used. It also helps if you play recordings of instruments the live sound of which you know intimately.

For example, I am most familiar with the sound of the piano on its own, so I do a great deal of my critical listening by playing solo piano compositions. I nearly always start by listening to Claude Debussy's *La Cathédrale Engloutie* (The Submerged Cathedral), which is the tenth work in Book I of his famous *Preludes*. I like the recording Paul Jacobs made for Nonesuch in the 70s, but this could be difficult to find. Luckily, it's such a famous work (and relatively simple to play!) that almost every world-famous pianist has recorded it. If you can't find Paul Jacobs, I would instead suggest Krystian Zimerman on DG.

Debussy based this work on the ancient Breton legend of Ys, a mythical city off the coast of France that was submerged then rose from the sea, only to sink back once more beneath the waves. The musical impressionism is uncannily precise, you can hear the lapping of the water in the sea at the beginning of the work. If you're listening via the DAC 502, pay careful attention to the very lowest notes and the sonorities of the piano strings, as well as to the tinkling right-hand figurations. Then listen to the gradually increasing volume as the cathedral starts rising from the depths and to how the pianist starts hammering those low notes, and the way the Weiss responds so beautifully. At around 3.59, where the sound of the piano disappears almost completely, you can hear the total lack of noise from the DAC 502, and also that despite the low volume, the tone of the piano remains exactly the same. As the work comes to a close and the cathedral sinks once more under the water, listen to the way the sustained pedals mean that the sounds just continue to overlay each other, submerging the original notes which are still, however, audible, so you're essentially aurally following the cathedral down into the depths.

This work is unique for many reasons, one of which is that you can hear how Debussy's own piano (a Pleyel) would have sounded playing it by listening to Japanese pianist Hiroko Sasaki's version, which she plays on a Pleyel piano built in 1873. Another of the reasons is that you can actually listen to Debussy himself playing it by searching out the version he recorded in 1913 for a piano roll that was subsequently transferred to LP. Of course the player-piano technology of the day limits what you'll hear, but it's very interesting to hear his tempi.

I then listened to a wonderful recording of works written in the last century by American pianist and composer Amy Beach, recorded on the Gould label by Kirstin Johnston. I listened to the third disc in Johnson's series of recordings 'The Mature Years' which contains all the works Beach wrote between 1907 and 1924. Her *Prelude and Fugue, Op. 81* is simply magnificent, as is her *Fantasia Fugata*, but the smaller works on this album are extraordinarily beautiful. I am embarrassed to say that I had not even heard of Amy Beach until a year or two ago and am rather disappointed that the works of such an extraordinarily great composer are so hard to obtain. Trust me, it will be worth your while searching out what you can of hers! And if you listen to whatever works you can locate via the Weiss DAC 502 you will be doubly rewarded, because the intricacies of the compositions and the delicacy of the pianism will be revealed in all their glories.

Listening to more modern Aussie fare the DAC 502 had absolutely no issues delivering not only the totally synthesised sounds on Kevin Parker's album 'The Slow Rush (Tame Impala)' from back in 2020 but also the real instrumental sounds, of which there are many more than there were on, say, 'Currents'. However, it did reveal that Parker should really have re-recorded the basslines on *Borderline* (unless he was aiming for distortion, which is possible, because he's an admitted fan of lo-fi) and should have also re-mixed *Posthumous Forgiveness* to get rid of the weird phasing effects (though again, maybe these effects were intended). Either way, the Weiss DAC 502 will reveal all!

But you also need to listen past the sonics, be they hi-fi or lo-fi, to the music itself, which is masterful. Listen to the keyboard loop on *On Track*, for example, or the siren sound on *It Might Be Time*. As for that piano melody on *Breathe Deeper*, it marks that we're in the presence of genius. And the way the percussion propels this track to its sudden conclusion is so, so clever.

The elephant in the room regarding the Weiss DAC 502 (and 501) is that unlike most high-end DACs, which offer choices of multiple output filters — fast roll-off, linear phase; slow roll-off, linear phase; fast roll-off, minimum phase; slow roll-off, minimum phase; apodizing, fast roll-off, linear phase etc for PCM data and a choice

of low-pass filters for DSD data — the Weiss DAC 502 offers none of these.

It also doesn't offer MQA, if this is a deal-breaker for you (it certainly isn't for me). It does, however, have Roon.

But as I hope I have made clear by my comments about the sound quality, I am totally happy with the choice Daniel Weiss has made for the output filter (whatever it is) on the Weiss DAC 502 because it's transparent.

CONCLUSION

The Weiss DAC 502 is the best DAC I have ever heard in my own home yet it's by far and away one of the least expensive of the 'high-end' DACs that I have had in my home.

It not only sounds good, but also has a shed-load of useful features, facilities and adjustments available that make it so much more than just a DAC, plus offers the option to add more in the future.

But I would not buy one. I really don't want or need a balanced headphone output and I am not that keen on the shape. I'd instead buy the slightly cheaper Weiss DAC 501. As for you, no matter which one ot the two you buy, you'll be the proud owner of the best DAC on earth. *Hugh Douglas*

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Model: 502
RRP: $14,000
Warranty: Five Years
Distributor: Sound Gallery
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VIC 3204
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Readers interested in a full technical appraisal of the performance of the Weiss DAC 502 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.

LABORATORY TEST REPORT

Graph 1 shows the Weiss DAC 502's distortion and noise contributions when replaying a 1kHz test signal at 0dB. It's remarkably good for many reasons. The first is that there's almost no mains-related low-frequency noise visible and such noise as there is is close to 120dB down, evidenced by the single spike at the extreme left of the graph that's almost obscured by the graph line itself.

Then there's the complete lack of noise. Or rather, such noise as there is is sitting down at –140dB right across the audio band. This makes the DAC 502 quieter than any music signal you might play through it, and quieter than all but a handful of the world's quietest power amplifiers. As you can see, there are some distortion components, but the two most prominent are a second harmonic at –112dB (0.00025% THD), and a third at –101dB (0.00089% THD) — all the other harmonic distortion components are more than 120dB down, equivalent to around 0.0001% THD.

Graph 2 shows distortion for a 1kHz test signal at –20dB recorded level, which is more representative of a typical music signal level and you can see that the DAC 502's performance is absolutely outstanding. I think this may be the best result I have ever seen for a DAC on this test. Again, note the lack of mains noise at the extreme left and that the noise floor is still 140dB down right across the audio spectrum. And, of course, there's basically only that single obvious harmonic, a third-order component at 3kHz that's sitting down at –120dB (0.0001% THD). There are a two odd-order harmonics just creeping above the noise floor at 7kHz and 9kHz but both are more than 130dB down (0.00003% THD).

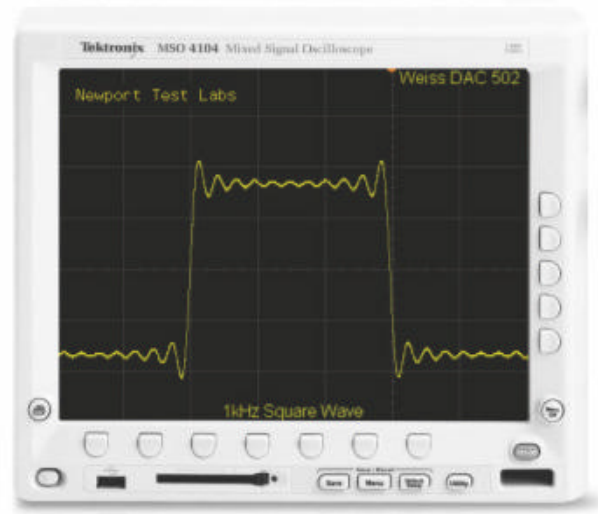
Graph 3 is a tough test for any digital-to-analogue converter, because the test signal at –60B is not dithered, so it's going to cause problems for the D–A conversion process, but again the Weiss DAC 502 shows outstandingly good performance with no harmonically-related distortion components visible at all, and all converter errors more than 120dB down.

Graph 4 sees the level of the test signal drop down to –90dB, again without dithering and you can see that the overall noise floor is now more than 140dB down. This time there are some odd harmonics visible but this is an excellent result. It also would not occur in ordinary use because all music signals would be dithered, the result of which is shown in Graph 5.

Graph 5 shows the same test frequency (1kHz) and the same test level (–90dB) but this time the test signal has been dithered. The result is that the distortion components have disappeared completely. The noise level has increased, but since it's down at –140dB, it's so low that it's of absolutely no consequence.

Graph 6 shows how the Weiss DAC 502 handles a 20kHz test signal at 0dB and, once again, I think this is the best result I have seen for any DAC that's been measured by *Newport Test Labs*, with just two sampling-related h.f. components, both more than 115dB down in level.

CCIF (twin-tone) intermodulation performance is shown in Graph 7, which has 19kHz and 20kHz test signals, each at –6dB in a 1:1 ratio. Yet again the performance from the Weiss DAC 502 is exemplary with just two high-frequency sidebands at



18kHz (–120dB/0.0001% THD) and 20kHz (–116dB/0.00015% THD). There is a small regenerated difference signal down at 1kHz, but it's around 125dB down (0.00005% THD).

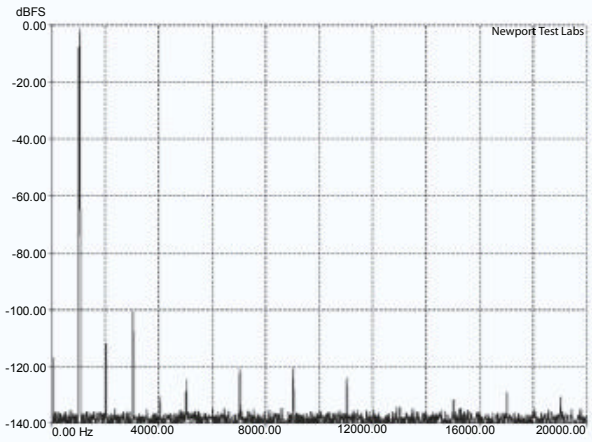
SMPTE (Society of Motion Picture and Television Engineers) intermodulation performance for the Weiss DAC 502 is shown in Graph 8. This time the two test frequencies are 60Hz and 7kHz and they're mixed in a 4:1 ratio. There are some tiny sidebands and some sampling-related spuriae visible on the graph, but yet again, all unwanted signals are more than 120dB down (0.0001% THD).

Graph 9 shows the distortion introduced when the Weiss DAC 502 is in its maximum vinyl emulation mode and you can see that it's significant. There's a third harmonic at –28dB (3.98% THD) a fifth at –47dB (0.44668% THD), a seventh at –63dB (0.07079% THD) then there's a spray of odd harmonics that continues right out to the 19th. These are about the levels of distortion I'd expect to see from a phono cartridge, though it's rare to see exclusively odd harmonics —most phono cartridges I've seen have significant second-order and fourth-order harmonic distortion components in their output, both of which are missing from the Weiss emulation. Basically, if you want to add distortion, the vinyl emulator will do it.

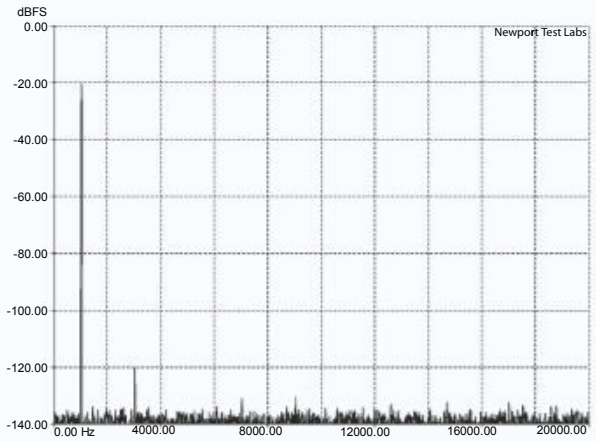
The impulse train of Graph 10 in effect reflects the Weiss DAC 502's frequency response, showing a steep roll-off above 20kHz due to the test signal being used being a Redbook standard 44.1kHz/16-bit data stream. You can see that the roll-off is exceptionally clean and that there are no unwanted signals at higher frequencies.

Graph 11 shows the typical presentation of a measured frequency response, again with a standard 44.1kHz/16-bit test signal, as measured by *Newport Test Labs*. The response is ultra-flat up to 2kHz, after which it steps down a little to be –0.08dB at 10kHz, then –0.25dB at 20kHz. This is an exceptionally linear response whose 'roll-off' is visually exaggerated by the extreme vertical scale of the graph. If you use higher sampling rates, the extension increases significantly, so the frequency response is just 2.5dB down at 45kHz with 96kHz data and 7.5dB down at 90kHz with 192kHz data.

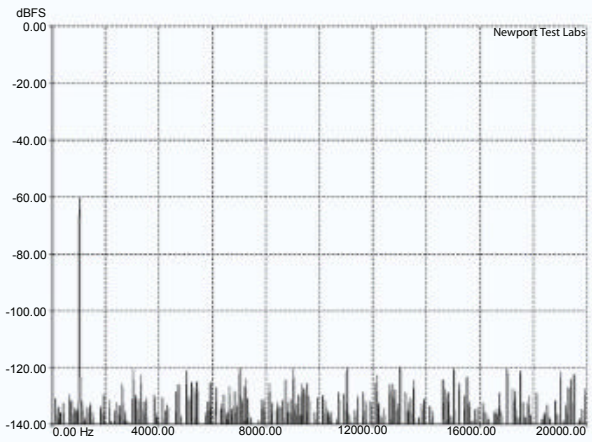
Separation between stereo channels was also amazingly good, with *Newport Test Labs* measuring it as 155dB at 16Hz, 161dB at 1kHz and 148dB at 20kHz. Channel phase was also nigh-on perfect, as you can see from the tabulated chart, and balance between the stereo channels was 0.1dB.
The figures shown in the tabulated chart for



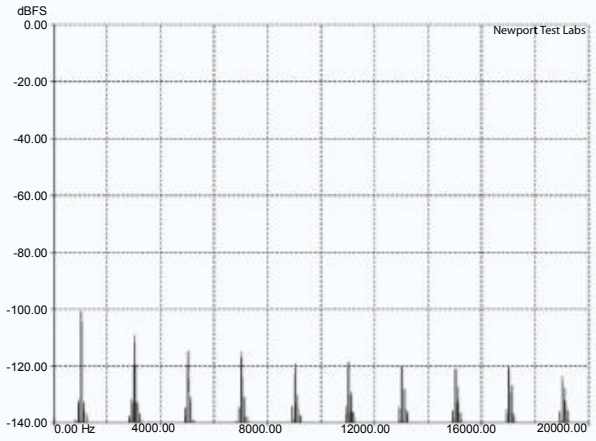
Graph1: THD @ 1kHz @ 0dB recorded level.



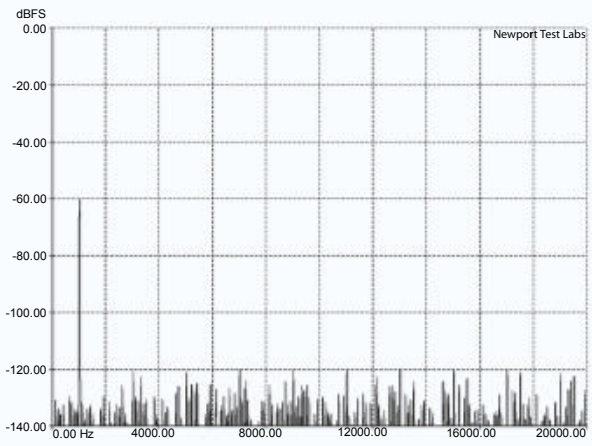
Graph 2: THD @ 1kHz @ -20dB recorded level.



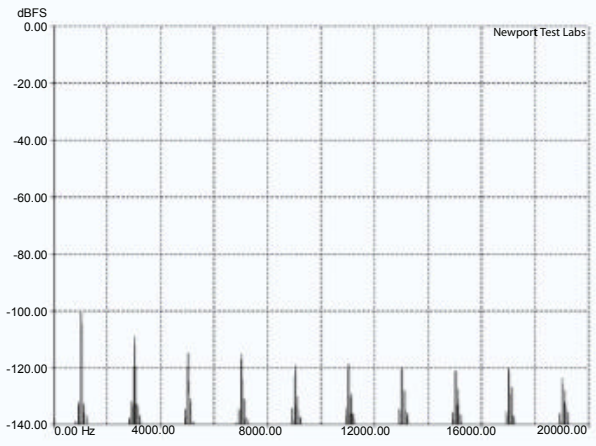
Graph3: THD @ 1kHz @ -60dB recorded level.



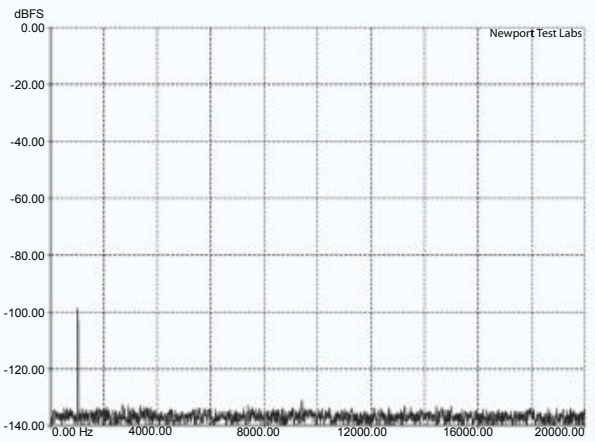
Graph 2: THD @ 1kHz @ -90dB recorded level (no dither).



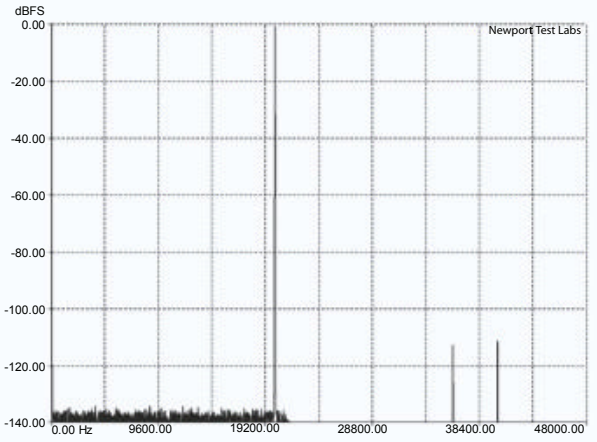
Graph3: THD @ 1kHz @ -60dB recorded level.



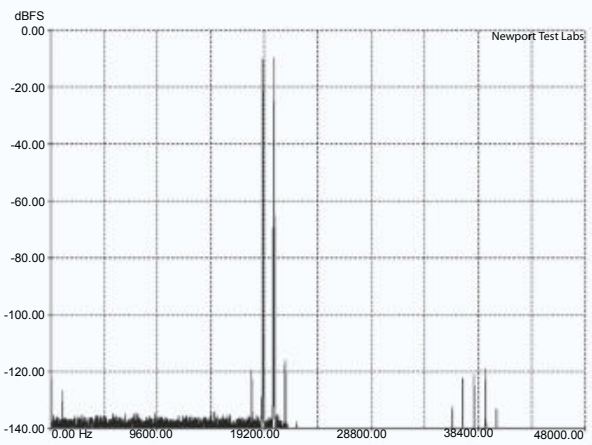
Graph 4: THD @ 1kHz @ -90dB recorded level (no dither).



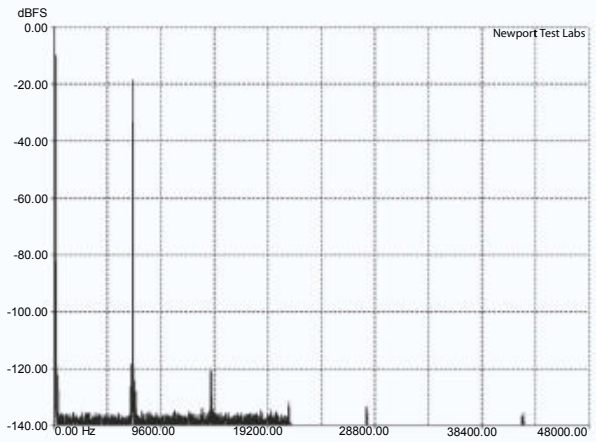
Graph5: THD @ 1kHz @ -90dB recorded level (with dither).



Graph 6: THD @ 20kHz @ 0dB recorded level.



Graph7: CCIF Distortion @ 0dB (19kHz and 20kHz test signals in 1:1 ratio).



Graph 8: SMPTE IMD @ 0dB (60Hz and 7kHz test signals in 4:1 ratio).

de-emphasis error show that Weiss has not included a de-emphasis circuit at all, so you will hear some frequency response errors if you play digital recordings that were made prior to 1990, and in this event, you could correct for it by using the DAC 502's on-board creative equalisation.

Newport Test Labs has again shown the Weiss DAC 502's native frequency response in Graph 12 (green trace) but this time has shown the effect of four different settings for the Vinyl Emulator circuit. The red trace shows that the +9.0 setting introduces a low-frequency boost below 500Hz, then a roll-off above this frequency that causes the response to be 5dB down at 20kHz. The dark blue trace shows that a 0dB setting boosts frequencies below 40Hz, but rolls them off above this frequency to be around 12dB down at 20kHz. The black trace shows the effect of a setting of 9.0: effectively the response above 20Hz is completely rolled off, to end up more than 20dB down at 20kHz. The light blue trace shows that setting the control to 20.0 delivers an even-more dramatic roll-off, so the frequency response is 10dB down at 250Hz, 15dB down at 1kHz and 20dB down at 3kHz.

Invoking Weiss's Vinyl Emulation mode also results in considerably increased noise levels in the output, most significantly at low frequencies, as you can see from Graph 13, where the DAC 502's 'native' noise floor is shown as the black trace, where it's down at –140dB as on all the earlier graphs. Activate Vinyl Emulation, however, and noise increases to just –60dB at very low frequencies, then gradually decreases to around –120dB at 600Hz where it shelves out to around 3kHz before rolling off to be –140dB at 6kHz.

The spectrograms showing the performance of the Weiss DAC 502 with an impulse response (which exhibits equal pre- and post-ringing either side of the impulse itself), shows that the output filter being used has a medium to steep roll-off, and is a linear phase type. These characteristics are also shown on the square wave response.

Linearity error was vanishingly low. Yet again, I think it's the best result I have seen in this area for any DAC, ever. At two levels there was no error at all, and the maximum error was a tiny 0.06dB at –80.70dB. It really doesn't get any better than this.

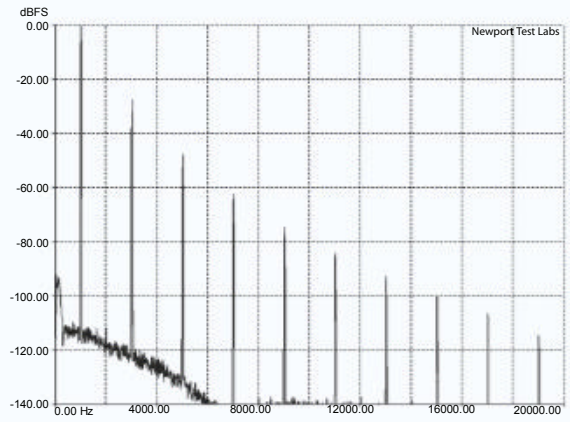
The same was true of the signal-to-noise ratios measured by *Newport Test Labs*, with the lab measuring 122dB unweighted, increasing to 128dB with A-weighting.

Maximum output voltage from the balanced outputs is a shade over 6 volts, as you can see from the tabulated results. The –10dB setting delivered an output voltage of 2.12V, the –20dB setting an output of 664mV and the –30dB setting an output of 211mV.

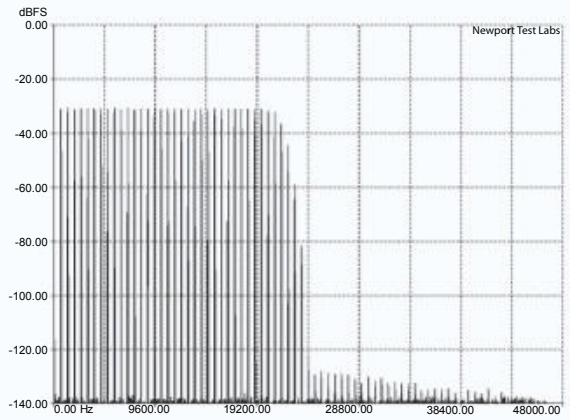
As you've no doubt gathered, the Weiss DAC 502 delivered phenomenally good performance across all the tests performed by *Newport Test Labs*. Across nearly all parameters, the Weiss DAC 502 delivered the best performance I have seen from any DAC... period. A stunning achievement indeed! ***Steve Holding***

Weiss DAC 502 DAC — Laboratory Test Results

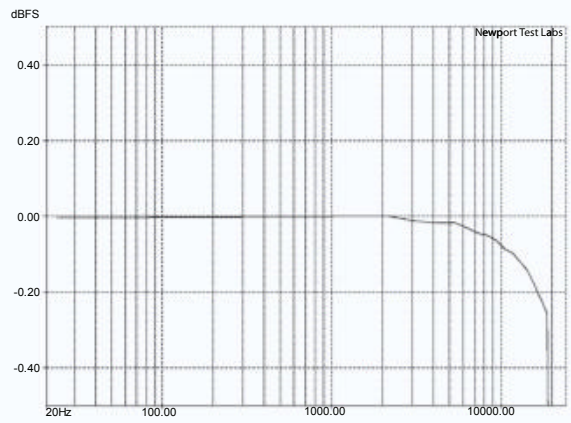
Analogue Section	Result	Units/Comment
Output Voltage	6.5860 / 6.6695	volts (Left Ch/ Right Ch)
Frequency Response	-0.25 / -2.5 / -7.5	dB @ 20kHz / 45kHz / 90kHz
Channel Separation	155 / 161 / 148	dB at 16Hz / 1kHz / 20kHz
THD+N	0.001	@ 1kHz @ 0dBFS
Channel Balance	0.1	@ 1kHz @ 0dBFS
Channel Phase	0.01 / 0.00 / 0.51	degrees at 16Hz / 1kHz / 20kHz
Group Delay	180 / 5.3	degrees (1–20kHz / 20–1kHz)
Signal-to-Noise Ratio (No Pre-emph)	122dB / 128dB	dB (unweighted/weighted)
De-Emphasis Error	0.37 / 3.52 / 8.85	at 1kHz / 4kHz / 16kHz
Linearity Error @ –60.00dB / –70.00dB	0.01 / 0.05	dB (Test Signal Not Dithered)
Linearity Error @ –80.59dB / –85.24dB	0.00 / 0.02	dB (Test Signal Not Dithered)
Linearity Error @ –89.46dB / –91.24dB	0.02 / 0.00	dB (Test Signal Not Dithered)
Linearity Error @ –80.70dB / –90.31dB	0.06 / 0.04	dB (Test Signal Dithered)
Power Consumption	0.75/ 16.62	watts (Standby / On)
Mains Voltage During Testing	235 – 246	(Minimum – Maximum)



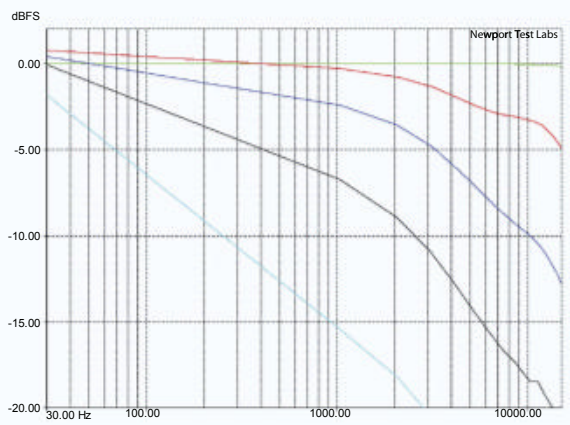
Graph9: Vinyl Emulation Mode distortion at saturation.



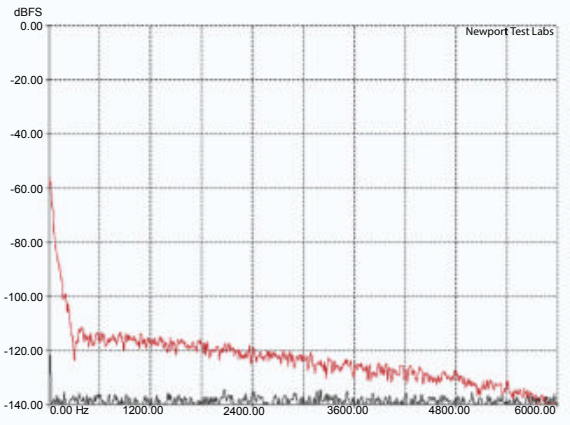
Graph10: Impulse Train. (One maximum amplitude positive sample every 70 samples).



Graph11: Frequency Response at @ 0dB recorded level.



Graph12: Frequency response, vinyl emulation mode. Red (-9.0); Blue (0.0); Black (9.0); Light Blue (20.0)



Graph13: Noise floor with vinyl emulation (red trace) vs without emulation (black trace).

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AUDIO TECHNICA AT-LPW50PB

TURNTABLE

It is said that good things come to those who wait, and it's a good thing that Audio Technica's AT-LPW50PB turntable is finally available in Australia, because I have been anticipating its arrival since its launch in the USA last year at CES 2020 — a show that, due to Covid-19, was a 'virtual' event, so that it was not possible for me to see or hear it in the flesh.

My anticipation was partly because of Audio Technica's unrivalled reputation in the field of all things vinyl, particularly phono cartridges, but more recently, turntables. This famous Japanese company has been in the business for more than half-a-century, after all. But it was also because with the AT-LPW50PB, Audio Technica has finally released a turntable in my wife's preferred finish (piano black), that's also a turntable that's a no-frills, belt-driven model that has been designed for out-and-out performance with vinyl. So I don't have to pay for a USB output (which I don't want) nor do I have to pay for Bluetooth connectivity (which I also don't want).

OK, so it does come with an in-built phono stage, which I personally do not need, being the owner of several external phono stages, both active and passive, as well as owning two amplifiers with phono stages already built in, but I guess that I am not Audio Technica's typical customer, and that the company has figured out that most of the people catching the wave that is the vinyl resurgence would rather have the convenience of an in-built phono stage, so that they can connect it to, well, pretty much any type of component that has a line-level input, be it an amplifier or a powered loudspeaker.

EQUIPMENT

The first thing I have to say about the new Audio Technica AT-LPW50PB is that it is simply gorgeous! If we were to go on looks alone, there isn't a single turntable for sale for under $1,000 that looks anywhere near as good as the LPW50PB. Indeed it looks a whole lot like Yamaha's GT-5000 and that unit will set you back the best part of $13,000!

But important though looks might be, it is performance that counts, and when you look how the LPW50PB is put together, you will quickly gain the impression that it's built in such a way that it will be able to deliver very high performance indeed. Let's take the plinth for a start. It not only looks good, it is also very solidly built, at 30mm thick. And there's a good chunk of wood involved in building it, not some flimsy bit of plastic. Indeed most of the turntable's not insubstantial weight (5.5kg) is due to the plinth. A good solid plinth means less resonance and improved resistance to airborne vibration, which is exactly what you want in a turntable. The plinth is supported by four feet that are slightly flexible, but not 'springy' as such.

The first thing I have to say about the new Audio Technica AT-LPW50PB is that it is simply gorgeous!

The AT-LPW50PB has two speeds on tap — 33.33 and 45 rpm — selected via the rotary switch at the front left of the plinth. Although the switch has a central 'Off' position, this simply stops platter rotation. To switch the turntable off you need to access a small press-button that is rather inconveniently located at the rear of the turntable. It's a low-voltage switch because power for the Audio Technica AT-LPW50PB is supplied by a switch-mode power supply plug-pack that plugs into a 240V power socket and it's this that provides the 12-volts of direct current the turntable's motor requires. Although the plug-pack is branded 'Audio Technica' it is actually made by a company going by the name of Golden Profit Electronics.

As mentioned in the introduction to this review, the Audio Technica AT-LPW50PB has a phono pre-amplifier built in, the output of which is at the rear of the turntable.
I was pleasantly surprised to discover that you don't have to use it if you don't want to, because there's a slider switch alongside the two gold-plated RCA outputs that allows you to take the output directly from the cartridge and send it to your own external phono preamplifier if you'd prefer. These two gold-plated RCA outputs have a diameter that is very slightly smaller than standard, so using standard RCA plugs results in a rather 'loose' fit and a tenuous electrical connection. You can easily fix this by squeezing in the outer (negative) ring of the plugs on the cable before you use them.

The Audio Technica AT-LPW50PB's lightweight aluminium platter comes standard with a rubber mat, but you can optionally purchase one that's made from anti-static fibre. The two mats have different thicknesses, which mean you will be able to adjust the vertical tracking angle of the cartridge using the mats. Audio Technica's Australian distributor, Technical Audio Group, kindly included the anti-static fibre mat with my review sample. The Audio Technica AT-LPW50PB comes with a clear Perspex dustcover and spring-loaded hinges.

It's nice that these are provided standard, rather than as an optional extra. The spring-loading of the hinges means that if you give the lid a slight push when you first lift it, it will rise automatically to the fully open position without further input from you. The spring loading also prevents the cover from dropping too quickly. You need to manually close the lid at least to the 45° position, after which it will descend fairly gracefully by itself until it comes to a stop on small rubber stoppers (which are attached to the cover, not the turntable).

TONEARM

The tonearm is a straight-line carbon-fibre, statically-balanced type with spring-applied anti-skating. It's fitted with a universal headshell mount which makes it a snack to swap headshells fitted with different phono cartridges. The counterweight is the standard type, with a separate ring to indicate down-force. I first used this to apply the recommended down-force for the cartridge (2.0 grams) and then checked the down-force with a digital stylus gauge, which showed down-force at 2.1 grams, proving that you'll be able to accurately adjust down-force even without a separate gauge. The spring-loaded anti-skating force is applied by a small rotary dial at the base of the tonearm mount.

The design of the AT-LPW50PB's tonearm pivot makes it difficult to use cartridge alignment protractors that depend on you finding the centre of the pivot from above (for example the alignment gauges made by Feickert or Brinkmann) so you'd be better to use one that uses sighting lines, such as the Mo-Fi Geo-Disc. However, when I checked the alignment of the AT-VM95E cartridge that's supplied pre-installed in Audio Technica's upgraded AT-HS4 universal-mount headshell I was pleasantly surprised to find that it had been perfectly aligned at the factory, so if you don't ever replace the cartridge, you won't need to invest in an alignment tool. (Actually, I would not expect that you would have to invest in one anyway — hi-fi retailers should provide this alignment as a free service.)

The cartridge fitted to the end of this tonearm is, of course, made by Audio Tech-

nica itself and is included in the price of the turntable. It's an AT-VM95E moving-magnet cartridge with an elliptical stylus. This particular design has quite an interesting back-story because although it was released only about two years ago, it is really an evolution of (and the replacement for) Audio Technica's AT-95E cartridge, a model that had been in continuous production for almost 40 years as a part of the '95' series, about which more in a moment.

CARTRIDGE

The new AT-VM95 Series cartridges all feature the same dual-magnet design which, according to Audio Technica "duplicates the 'V'-shaped arrangement of the magnets in the cutter-head [of the recording lathe] and precisely positions the magnets to match the positions of the left and right channels in the groove walls."

The Audio Technica AT-VM95E moving-magnet cartridge not only sounds very good but also tracks very well

The primary technical difference between the new AT-VM95 Series and the older AT-95 Series is that the new cartridges have newly-designed aluminium cantilevers and re-designed coils. Together, these two improvements have enabled increased output voltage, so output voltage is now 4mV, up from 3.5mV (measured at 1kHz for a recorded velocity of 5cm per second.)

However if you get the opportunity to see the two models side by side, you'll see a great many cosmetic changes. The body of the cartridge has been completely redesigned, and is now the 'modern' shape that's used by most manufacturers of moving-magnet cartridges. The removable stylus has a new 'slider' that makes it easier to remove and replace, and there's a centring guide to help you do this. The new model is also 'way easier to install and align than the older one, because whereas with the original AT-95 you had to fiddle around with bolts, nuts and washers, the new AT-VM95 has threaded brass sockets moulded into the cartridge body, so all you have to do is insert and tighten two screws. The only slight hiccup is that Audio Technica is using a 2.6mm Löwenherz thread which is a precision thread developed in Germany, rather than the standard 2.5mm metric thread, so you'll need to use screws provided by Audio Technica. However, since the AT-LP50PB comes with an AT-VM95E already installed, this is a moot point.

One thing that hasn't changed is that the stylus of the AT-VM95 Series cartridges is not only removable, but you can also use different diamond profiles. Audio Technica makes replacement styluses with conical diamonds (VNM95C), elliptical diamonds (VNM95E), nude-mounted elliptical diamonds (VNM95EN), nude-mounted microline diamonds (VNM95ML) and a diamond with a line contact Shibata stylus (VNM95SH). This last profile was originally developed for the four-channel LPs that made a brief appearance in the late 70s, but many audiophiles prefer the sound of its extended high-frequency response.

Every one of these different styluses slides into the standard AT-VM95 cartridge body. But the esoteric diamond shapes come at a price. Whereas the VNM95C and VNM95E replacement styluses retail for $39.95 and $49.95 respectively, a VNM95EN retails for $199, a VNM95ML for $279 and a VNM95SH for $299. This makes it a no-brainer to reserve your MicroLine stylus for use on pristine LPs that are clean and have no scratches and reserve your standard conical or elliptical stylus for use with vinyl that's seen better days.

If those prices I have listed for the conical and elliptical replacement styluses seem rather low, this is because the price of a complete AT-VM95E cartridge itself — including the stylus — is just $79.95, which is something of a bargain in today's market.

LISTENING

The Audio Technica AT-LPW50PB was super-easy to set up, primarily because there is so little to do. The rubber drive belt comes already fitted to the under-surface of the platter, so there's none the usual 'belt-wrapping fiddle' associated with belt-drive turntables. And, as stated earlier, the cartridge is already fitted and aligned in the headshell, so all you need to do here is plug the headshell into the tonearm, fit the counterweight and then balance the arm and set the anti-skating. You can choose to fit the dust-cover or not, but I would advise it, because your LPs will stay cleaner and the arm and cartridge will be completely protected whenever the lid is closed.

The most important task of any turntable is to rotate any LP you place on it at the correct speed and, since most LPs are recorded at 33.33 rpm, I think this is more important than the 45 rpm speed, so this is what I looked at most closely. My strobe disc (and associated strobe light) told me that the AT-LPW50PB's platter was rotating just very slightly under the correct speed at 33.33 rpm and, when I checked 45 rpm, the same was true of this speed as well. However, it was very, very, slight. Instead of the strobe marks being stationary, they were edging backwards ever so slowly. So slowly, as a matter of fact, that I guessed that correct musical pitch would not be affected. My guess proved to be correct because when I then checked for musical accuracy by using one of my 'test' LPs that has a 440Hz tone recorded on it and played the corresponding note "A" above middle C on my piano, which also has a frequency of 440Hz, to my ear, they were perfectly in tune.

So because rotational speed was musically accurate, I then decided to check for wow and flutter, for which slow piano music is the best to reveal if either or both are present, and one of the best slow piano works I know of is Erik Satie's *Gymnopédies*. There are literally dozens of LPs you could use, as it has been recorded by far more than that number of well-known pianists.

It's also a piece that's played by almost every amateur pianist on the planet because of all the most well-known piano pieces, it seems to be the easiest to play because if you look at the score, you'll see it's almost blank, with some spaced-out chords that don't require much of a finger-stretch and then only crotchets everywhere else — there's not a quaver to be seen, much less a hemidemisemiquaver. But when you try to play it… wow! It's so difficult to make it flow.

One of my favourite recordings was recorded by Dutch pianist Jeroen Van Veen in two different versions, both of which are on a double-LP set pressed by Brilliant Classics titled 'Erik Satie Slow Music: Gymnopedies, Gnossiennes, And Other Works.' Van Veen achieves a sublime perfection that eludes most pianists. I suspect his success might be a bit because he's not only also a composer but is also considered by many experts to be one of the leading exponents of minimalism in the world today. These traits, along with him being a great pianist, are obviously what's required to make the music work!

On this album van Veen stretches the concept of slowness to the extreme. One critic wrote of it that: "he creates an hallucinatory effect, a kind of minimal music *avant la lettre*."

I don't know if that's strictly true, but despite his incredibly slow tempi, I could not perceive any wow and flutter from the Audio Technica AT-LPW50PB at all… not a skerrick. And if I couldn't hear it with this performance, it will never become audible at all, with any type of music.

The same album is also excellent for evaluating the contributions from background noise which, for a turntable, will always be rumble caused by either the motor or the platter bearing… or both. Despite the quietness of the music and the silences between the notes, and the high quality of the pressing, I could not hear any rumble at all, so for me the AT-LPW50PB has a clean slate in this department as well.

So far as the sound of the Audio Technica AT-VM95E cartridge is concerned, it's immediately obvious why it has been one of the world's best-selling models for almost four decades! (In fact, prestigious UK magazine *Hi-Fi Choice* identified it as "one of the best-selling cartridges of all time"). It has a smooth, rich sound quality that makes for very easy and very enjoyable listening, particularly on well-worn records, where there seemed to be less high-frequency noise than I heard when listening to the same recording using one of my moving-coil cartridges (in my own arm and turntable, not the Audio Technica, but both played A–B style through the same amplifier and loudspeakers).

I found that the Audio Technica AT-VM95E not only sounds very good but also tracks very well, and coped nicely with all the music LPs I use to test tracking, as well as performing decently on my Shure Trackability Test Record.

But then it was back to music music and Neil Young's wonderful 'Harvest' particularly its most inappropriately-named track, *Needle and the Damage Done*, because the AT-VM95E tracks so beautifully that it will not do your albums any harm at all.

The songs on this particular album, such as that one, plus the title track, *Heart of Gold*, *Alabama*, and *Old Man*… are all amongst Young's finest songs but of course if you were going for Olympics-style placings, that would be *Helpless*, *After the Goldrush* and *Only Love Can Break Your Heart*.

The Audio Technica AT-VM95E delivered all the songs on 'Harvest' smoothly, fluidly and very musically, and you can't really ask for much more than that.

Playing back Mary J. Blige's *No Drama* also saw the Audio Technica combo turning in a cohesive and musical performance with a surefooted and robust presentation that remained unflustered even as the song became more demanding. I was hearing plenty of fine detail and the music was rendered with a lovely composure, though this was perhaps partly because it was just a little toned-down in the extreme highs.

Deciding to test the AT-VM95E's ability to deliver fine music whilst also having the cartridge track at the extremes saw me spin up Beethoven's *Fifth* and it did a fine job rendering the scale and power of this mighty symphony. The extraordinary dynamics were delivered fluidly, yet with the appropriate force and the resolution was such that I could follow subtle instrumental strands even during the most climactic moments. I was particularly impressed by the stereo image the Audio Technica was able to deliver in my listening room; it was so precise I was able to easily identify the position of instruments anywhere across the sound stage.

CONCLUSION

Oddly enough, given that I am a hi-fi reviewer and should have given some thought to such things, I have never really thought about whether there is a 'sweet spot' in terms of price when it comes to matching a cartridge with a turntable, even though I kind of do this as a matter of course when it comes to amplifiers, loudspeakers and source components.

I imagine that Audio Technica has given the topic some thought and if it has applied that thinking to the review product, it would appear the company seems to think that a ratio of about 6:1 is about right, so if you spend $600 on a turntable, you should be spending around $100 on the cartridge. Or, to put it another way, for every dollar you spend on your cartridge, you should spend six dollars on your turntable. That formula certainly works for me, though I think that I would personally stretch it out to 6:2 so the formula would enable me to buy my favourite budget cartridge, the Ortofon 2M Red. But actually, since I'd already be getting an AT-VM95E free with the AT-LPW50B, I'd get a 2M Red anyway as a second cartridge.

Audio Technica's AT-LPW50B is an excellent, good-looking and well-priced turntable that I am very happy to recommend, just as I am very happy to recommend you use the AT-VM95E cartridge in it, not only for its sound quality and tracking ability, but also because of the availability of different diamond stylus profiles and the very low cost of replacement styluses. *Neil Phillips*

CONTACT DETAILS

Brand: Audio Technica
Model: AT-LPW50PB
RRP: $699 (inc. AT-VM95E cartridge)
Warranty: Two Years
Distributor: Technical Audio Group
Address: Unit 19, 43–53 Bridge Road
Stanmore
NSW 2048
T: (02) 9519 0900
E: service@tag.com.au
W: www.tag.com.au

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- RCA terminals

Readers interested in a full technical appraisal of the performance of the Audio Technica AT-LPW50B turntable and AT-VM95E phono cartridge 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.

LABORATORY TEST REPORT

Newport Test Labs first tested the speed stability of the AT-LPW50PB's platter rotation and found it to be extremely stable at both fitted speeds. Tested with a 3kHz signal at 33.33 rpm, the speed of the Audio Technica AT-LPW50B varied such that the frequency of the test signal was measured as varying only between 2997Hz and 3000Hz, with wow accounting for the minuscule 3Hz variance, though one also has to factor in that the test record itself would have some inherent wow.

Measured at 45 rpm, the AT-LPW50B's platter speed was even more stable, so that the measured frequency varied only between 2998Hz and 3000Hz. Again, this is an excellent result. *Newport Test Labs* has plotted these variations in the speed histogram (Graph 2). The light blue dashed vertical line at the centre shows the mean actual speed, which you can see is very slightly lower than 33.33 rpm at 33.324 rpm, so 0.006 rpm slow. Not significant. The purple and red dashed vertical lines show the wow measured according to DIN IEC 386 using both the dynamic method (purple dashes) and the 2Σ method (red dashes). In terms of percentages, the measured wow using the DIN IEC 386 2Σ method was 0.08% at 33.33 rpm and 0.07% at 45 rpm.

Flutter was measured separately for both speeds, again using both CCIR and DIN measurement techniques. At 33.33 rpm *Newport Test Labs* measured flutter at 0.05% (CCIR) and 0.045% (DIN). At 45 rpm, flutter was measured at 0.055% (CCIR) and 0.05% (DIN).

Newport Test Labs also measured combined wow and flutter (W&F) for three different standards — CCIR-weighted, DIN-weighted and RMS unweighted. At 33.33 rpm the AT-LPW50B returned the following results — 0.045% (CCIR), 0.065% (DIN) and 0.05% (RMS).

At 45 rpm the measured wow and flutter figures were 0.07% (CCIR), 0.07% (DIN) and 0.05% (RMS).

Wow and flutter results have been plotted graphically in Graph 3 over a period of 30 seconds.

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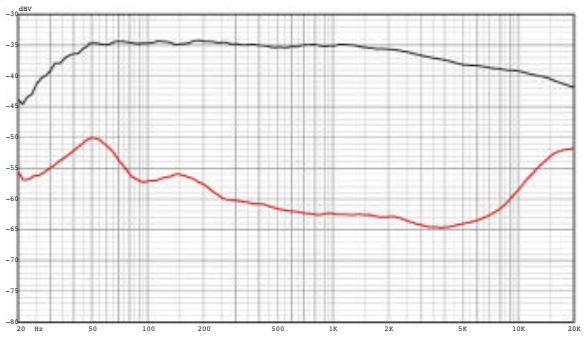
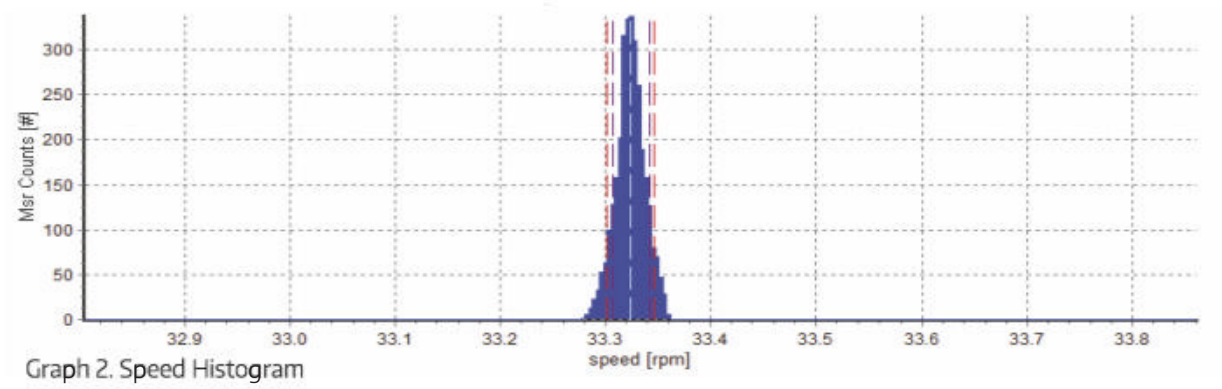
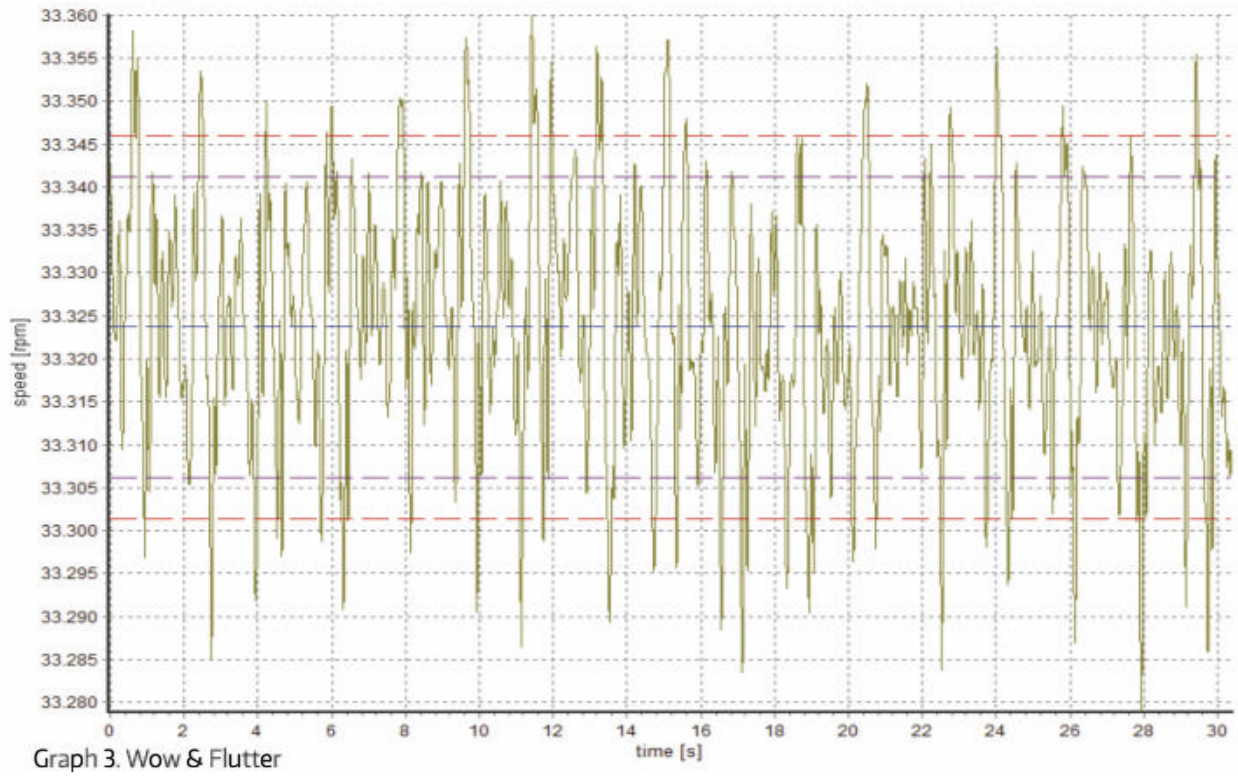


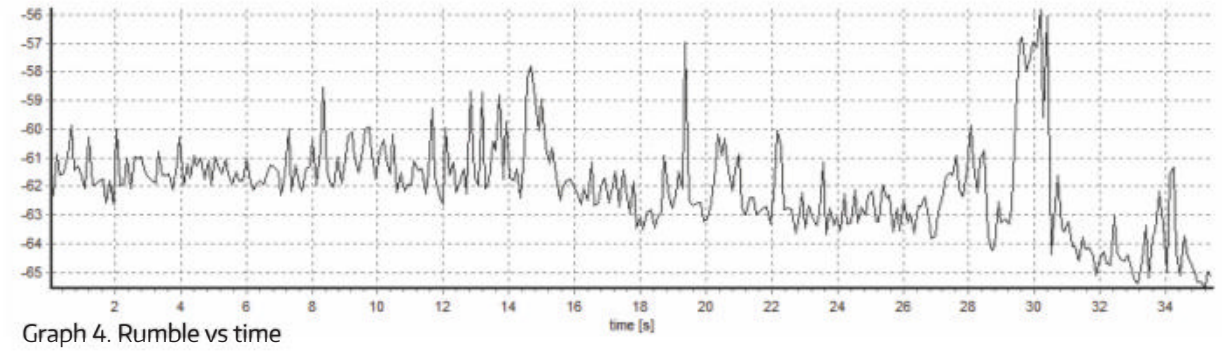
Graph 1. Pink noise frequency response (black trace) and channel separation (red trace).



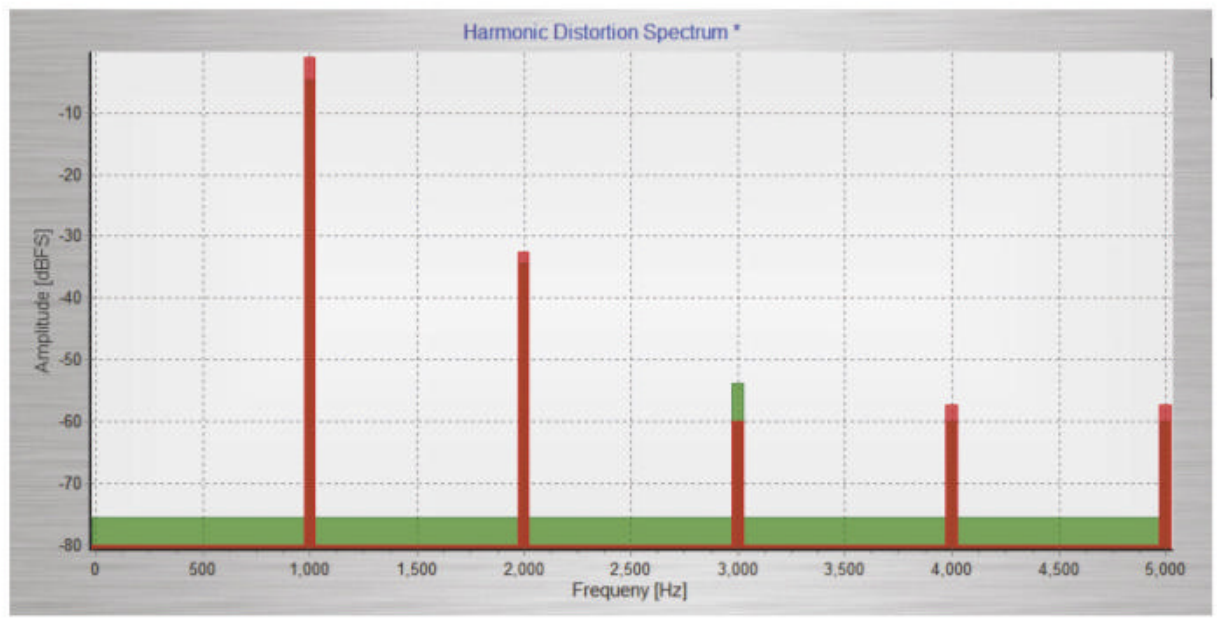
Graph 2. Speed Histogram



Graph 3. Wow & Flutter



Graph 4. Rumble vs time



Graph 5. THD @ 1kHz

As in Graph 2, you can see the average according to DIN IEC 386 using the dynamic method (purple dashes) and the 2Σ method (red dashes).

Rumble was handily more than 60dB down and so better than specification, as shown in Graph 4 which shows the rumble as measured over a duration of around 35 seconds. You should ignore the spikes in the trace at around 15, 19.5 and 30 seconds as these were the result of external environmental noises, which are almost impossible to eliminate in a rumble measurement, due to the very nature of what's being measured.

Newport Test Labs measured the frequency response of the Audio Technica AT-VM95E phono cartridge as 25Hz to 20kHz ±3.5dB using a wideband pink noise signal, which is an excellent result. However, as you can see from the black trace of Graph 1, the 3.5dB variations in the response were not spread equally across the audio spectrum, but are positioned in such as way as to emphasise the upper bass and midrange regions. You can see that the response is 7dB down at 25Hz then rises quickly to 50Hz after which it's very linear out to around 1.5kHz after which it rolls off very slowly and gradually to be 4dB down at 10kHz, 5.5dB down at 15kHz and 7dB down at 20kHz.

The red trace on Graph 1 shows channel separation vs. frequency and you can see that channel separation reaches a best result of 27dB at 1kHz (7dB better than specification), and maintains this level of performance out to around 6kHz before diminishing to around 20dB at 10kHz and down to 10dB at 20kHz.

It is worth noting that the frequency response and separation traces shown in Graph 1 are 'worst-case' figures because a pink noise test signal requires the phono cartridge to simultaneously produce all audio frequencies at the same time, which is obviously far more stressful than either music or by using a testing method that measures frequency response one frequency at a time (i.e., discrete or swept frequency measurements.)

Phono cartridge distortion is shown in Graph 5 for a 1kHz test signal. You can see that second harmonic distortion is very slightly higher in the left (red bar) channel than the right (green bar), but both are sitting down at around –34dB (1.99% THD). Third harmonic distortion was a little higher in the right channel than the left, with the right channel coming in at –54dB (0.19% THD) and the left at –60dB (0.1% THD). The fourth and fifth harmonic distortion components were around 60dB down for both left and right channels though, as you can see from the graph, distortion was very slightly higher in the left channel than the right. All these results are typical for a phono cartridge.

Newport Test Labs measured the voltage at the line output of the AT-LPW50PB as 157mV for a 1kHz test signal at a recorded velocity of 3.54cm per second, which is about that specified by Audio Technica but appears lower simply because Audio Technica uses a higher recorded velocity than *Newport Test Labs* (Audio Technica's specification is 200mV at 1 kHz at 5cm per second). It's a good result. Overall, both the Audio Technica AT-LP-W50PB turntable and the AT-VM95E phono cartridge returned excellent performance on *Newport Test Labs*' test bench.

Steve Holding

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21.6.1926 – 6.3.2021

Lou Ottens, the Dutch engineer often credited with inventing the compact cassette has died, aged 94.

Born on 21 June 1926, Ottens showed an early interest in electronics and, during the second world war, whilst still a teenager, built a radio with a directional antenna so his family could listen to Radio Oranje, a Dutch radio program broadcast by the BBC European Service to the German-occupied Netherlands during World War II.

Ottens obtained a degree in engineering and gained employment at Philips' factory in Hasselt, Belgium, in 1952. By 1960 he was heading up Philips' product development department and was instrumental in developing the first Philips portable tape recorder (EL 3585). Despite being portable, it was an open-reel tape machine, using two spools of tape, which meant that users had to thread tape past the heads and drive rollers and be careful that tape on unused spools did not unravel. Ottens was aware that other manufacturers had eliminated the problem of loose tape by putting the reels containing the tape into a single enclosed housing, which was then called a 'tape cartridge' or 'tape cassette'. US company RCA had introduced just such a cartridge in 1958, however the cassette RCA developed was very large, because it used the same quarter-inch wide tape that was used on open-reel machines. RCA's cassette offered different speeds, as well, just like open-reel machines of the day. The standard speed was 9.5cm per second (3.75 inches per second), but there was a half-speed mode available (4.75cm per second) to allow extended record/playback time, because RCA had intended its machine to be used in the language labs of schools and educational institutions.

Ottens basically miniaturised the RCA cassette. Instead of using quarter-inch tape he used eighth-inch tape (3.81 millimetres wide). He also elected to have only one speed — the slower 4.75cm per second speed — in order to reduce costs and complexity and to ensure maximum record/playback time. He said that his aim was to have a cassette that was small enough to fit into the top pocket of a business shirt.

He succeeded, of course, because the 'compact' cassette is 100×63×13mm. The first Philips compact cassette machine, the EL3300, was developed just in time to be exhibited at the Berlin Electronics Fair in 1963, with the cassette it used being advertised with the slogan 'Smaller than a pack of cigarettes! The narrow tape width and the slow speed of the tape meant that it could only really be used to record speech, and the take-up was so slow that just one year later Philips decided to make public all the technologies it used in the EL3300 — bias, equalisation, head gap, etc — to encourage other manufacturers to make their own machines. It also decided to begin making pre-recorded tapes, called MusiCassettes. Because the music for these was recorded on professional machines, it was of much higher quality than music recorded on the EL3300 itself. Music that was recorded and played back on the EL3300 itself suffered from high levels of wow and flutter, and high levels of background hiss, or 'tape noise'.

The first Philips compact cassette machine, the EL 3300, was developed just in time to be exhibited at the Berlin Electronics fair in 1963. It was intended to be used to record and play back voice, not music.

Interestingly, some manufacturers decided that musicians might want to use the cassette format to record their own music, so they developed 'home studio' machines that used the compact cassette, the most famous of which was Tascam's Portastudio. However these 'home studio' machines ran the cassettes at twice the normal speed in order to improve quality and either used the full width of the narrow cassette tape to record two tracks or record four tracks simultaneously.

Although most musicians used these machines only for demos, Keith Richards is said to have used a Portastudio to record the guitar solos for *Street Fighting Man* and *Jumpin' Jack Flash* because he liked the distortion. Richards was also a fan of the ordinary cassette recorder for its ability to be used as an 'audio diary.' In his autobiography 'Life' Richards wrote that without his cassette recorder the Stones' hit song *(I Can't Get No) Satisfaction* might never have been written. "I wrote the song 'Satisfaction' in my sleep. I didn't know at all that I had recorded it; the song only exists, thank God, to the little Philips cassette recorder. I looked at it in the morning — I knew I had put a new tape in the night before — but it was at the very end. Apparently, I had recorded something. I rewound and then *Satisfaction* sounded… and then 40 minutes of snoring!"

The saviour for the commercial success of the compact cassette was the development of Dolby-B noise reduction, which reduced the tape hiss to acceptably low levels to make music playback possible. English inventor Ray Dolby had already developed a noise reduction system for open-reel tape recorders, called Dolby-A. Although enormously effective at reducing noise the circuitry was very expensive and required almost-continuous calibration. Recognising the potential of a similar circuit for use with compact cassettes, Dolby developed a much less costly system that required almost no calibration at all, which he called Dolby-B, and released in 1968. Unlike Philips, Dolby required any manufacturer using his invention to buy a licence. Initially, many manufacturers baulked at paying the licensing fee, but the Dolby-B noise reduction circuit was so effective that consumers would not purchase any tape machine without it, so manufacturers were forced to pony-up for licences. Dolby later went on to develop Dolby-C, which was even more effective at eliminating tape noise.

Despite being credited with its development, Ottens was not a fan of the compact cassette. Zack Taylor, who interviewed Ottens for his film 'Cassette: A Documentary Mixtape', says that of all the musicians and historians he interviewed for the film, Ottens was by far the most critical of the format. Taylor told *Rolling Stone* "When I arrived on his doorstep, I expected to find a proud engineer, ready to take a bow and talk about the revolution he helped start. In reality, Lou couldn't understand why people were still talking about the primitive, lo-fi cassette, even as the format celebrated its 50th anniversary. As an engineer, he was always focused on fidelity and reliability — two things that cassettes aren't exactly famous for."

Ottens was, however, a fan of the compact disc, which he also had a hand in developing during his tenure at Philips. "Nothing can match the sound of the CD," he told the Dutch newspaper *NRC Handelsblad*. "It is absolutely noise and rumble-free. That was never the case with cassette tape."

Cassette tape had been around for many years before Lou Ottens developed the 'compact' cassette tape format for Philips. Below right is the 'Sound Tape Cartridge' RCA developed in 1958, five years before the appearance of the compact cassette (left).

BLACK SABBATH

Sabotage: Super Deluxe Edition [BMG]

Sabotage is the sound of indignant fury. From the opening battle cry of *Attack!* to the riotous opening pair *Hole In The Sky* and *Symptom Of The Universe*, separated by the brief flamenco interlude *Don't Start (Too Late)* or the album's twin epics *The Writ* and *Megalomania* — which at one point has Ozzy growling "Suck me!" like Satan himself. Even the lesser tracks — the ballsy boogie *Thrill Of It All*; Ozzy's hit single attempt *Am I Going Insane (Radio)*; and the choral *Supertzar* — top most tracks on subsequent albums. Disc 1, the original album newly remastered, now plays better than ever. The bonus carrot — the 100-minute, two-disc live album — is magnificent. This is the classic Ozzy line-up playing 10 of the biggest hitters from Sabbath's first five albums plus *Hole In The Sky*, *Symptom Of The Universe* and *Megalomania* from the freshly minted Sabotage. Today, 1975 sounds like Sabbath at their peak.

CLUTCH

Songs Of Much Gravity 1993–2001 [HNE/Cherry Red]

Clutch weren't born fully formed, but they weren't far off, as this four disc compilation of their early years shows. The Maryland band's debut album, 1993's Transnational Speedway League, bristles with a gnarled punkrock malevolence, from the coiled grooves of *Binge And Purge* to frontman Neil Fallon's vividly skewed lyrical imagery on *A Shogun Named Marcus*. Their self-titled second album dialled back the belligerence in favour of the lumberjack psychedelia of *Texan Book Of The Dead* and *Escape From The Prison Planet*. By the time of 2001's Pure Rock Fury, they'd fully mutated into a backwoods ZZ Top, right down to the tips of their increasingly luxuriant beards. Songs Of Much Gravity isn't the complete story — 1998's *The Elephant Riders* and the following year's less sparkling *Jam Room* are missing, although an EP of B-sides and rarities goes some way to plugging the gaps, but it does capture America's greatest cult band.

CREAM

The Goodby Tour — Live at the Forum [UCM/Polydor]

The full 1968 show is now available on double blue vinyl. Cream might have released just six sides of studio vinyl and two live sides during a supernova career that lasted less than two years, but they really did change the game, their influence immediate, hard-hitting, wide-ranging and enduring. Lifted from last year's full version of Goodbye Tour Live 1968 and pressed on a pair of blue vinyl platters, The Goodbye Tour — Live At The Forum is the same show that *Politician*, *I'm So Glad* and *Sitting On Top Of The World* on the original '69 Goodbye album were taken from. They're included here, shimmering with a combination of virtuosity, invention and power. Playing live, one thing you could never accuse Cream of is consistency, such as when Clapton fluffs the intro to *Sunshine* or Jack Bruce sings the first couple of words of *White Room* in the wrong key. But even a little off-colour or jaded, Cream could still be magnificent.

CROSBY, STILLS, NASH & YOUNG

Déjà Vu: 50th Anniversary Deluxe Edition [Rhino]

The only CSNY album that matters, now packed with tons of extras. How do you supersize a supergroup? The answer, for an initially reluctant Crosby, Stills & Nash, was to bring in Neil Young. The result was full of inspired songs and sold in its millions, justifying the line-up tweak on both critical and commercial levels. Half a century on, the highlights have lost none of their lustre, be it Young's expansive *Helpless*, David Crosby's title track, or the leaping harmonies of Stephen Stills's masterly *Carry On*. The selling point of this four-disc set, though, is the addition of 38 extra tracks many of which appear for the first time. Clearly each of the band members was squirrelling away material for their own solo projects (Young's exquisite *Birds*; Crosby's attempts at *Laughing*; Nash's delicate prototype of *Sleep Song)* while Stills' contributions that missed the cut for the album prove he was amongst the most gifted blues-rockers of a golden generation.

VARIOUS

Chigaco/The Blues/Today [Craft]

In late 1965 Samuel Charters got nine of the foremost Chicago blues exponents to record short studio sets for the Vanguard Records samplers that became a seminal trilogy. The albums introduced many to electric blues, including future rock gods and 1968's British blues boom. The full band style dominated by electric guitars and harmonica is captured perfectly by Junior Wells's Chicago Blues Band, whose *Help Me* and *It Hurts Me Too* provided well-trodden set staples (the former for Ten Years After), while *Vietcong Blues* reflects the era's more global storm clouds. Otis Rush's brass-garnished *I Can't Quit You, Baby* unleashes a master class in soul-tearing drama, Homesick James slides up Robert Johnson's *Dust My Broom*, and Jimmy Cotton and his harmonica hop aboard rock'n'roll's birth boogie *Rocket 88*; just six of 42 magic tracks that also include J.B. Hutto, Otis Spann, Johnny Young, Big Walter Horton and Johnny Shines.

THE WHO

The Who Sell Out [UMC/Polydor]

The Pop Art structure of The Who Sell Out was born out of necessity. Pete Townshend didn't think he had enough songs for a full album, so it was filled out with mock jingles for acne treatment, Charles Atlas's "dynamic tension" course, and baked beans. As a successful and much-consumed pop band, The Who in late 1967 were nicely positioned between commercial commodity and ambitious purveyors of a more expansive, spiritualist psychedelic vision, see *Armenia City In The Sky* and the horizon-scraping *I Can See For Miles*. The additional CDs here include both stereo and mono recordings of the original album, alternative takes, and very rough run-throughs. Much of this is completism for completism's sake, but there are pearls amid the sweepings. Perhaps this was The Who's finest period, caught between pop and a harder place, still light and mobile in feel, wide-eyed, bristling with cheek and charm, weightless rather than weighty.

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WOLF ALICE

Blue Weekend [Dirty Hit]

'Great guitar hopes' does a reductive disservice to the brilliance of Wolf Alice. They've bagged two No.2 albums and the 2018 Mercury Prize (for 2017's Visions Of A Life) by being the evolutionary leap into an era where alt.rock, psychedelia, dream pop, grunge, punk and intergalactic next-gen shoegaze intermingle on a binary-defying sonic spectrum. Their third and finest album ventures further still, folding Kate Bush's operatic mistiness, minimalist art-pop and the odd R&B intonation into a flavoursome stew. Befitting an album about escapism (*The Beach* dreams wistfully of an exotic postlockdown bender; lustrous, *Delicious Things* is an ode to the Hollywood high life) and the turbulent tides of love, an oceanic crescendo is never far away. More vulnerable moments (*Feeling Myself*, *Safe From Heartbreak*) are appropriately tender. Another near-faultless Wolf Alice wonder and a contender for album of the year.

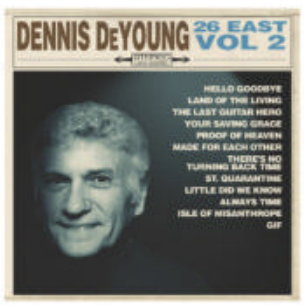
THE BLACK KEYS

Delta Kream [Nonsuch]

Giving credit where it's due is not something the music industry has always been the best at, particularly when it comes to blues artists, who seem to have been ripped off more than most over the years. With Delta Kream The Black Keys pay tribute to the Mississippi hill country bluesmen who inspired them most. Loping and swaggering, relaxed yet thrillingly live, with a loose, heady groove, this love letter to Junior Kimbrough and RL Burnside — with a little John Lee Hooker and Mississippi Fred McDowell thrown in for good measure — is like being bathed in hazy sunshine, and just as good for the soul. Guitarist Kenny Brown and bassist Eric Deaton join the duo, and in their expert hands songs like *Poor Boy A Long Way From Home* jump like crickets. The Black Keys found fame on the back of this music, and this joyous tribute is the perfect way to send a whole new generation scurrying back to discover the source of it all.

DENNIS DEYOUNG

26 East Vol 2 [Frontiers]



As a young man he wrote and sang the hit songs that made Styx one of America's biggest rock bands — those magical power ballads, and Mr. Roboto, the kookiest of all 80s rock anthems. Now, aged 74, Dennis DeYoung is taking his final bow as a recording artist. 26 East Vol 2 is both a swansong and a companion piece to 2020's Vol 1. Again it features songs written and performed by DeYoung with another Chicago-born AOR icon, Jim Peterik, formerly of Survivor. There is also a surprise guest appearance from Rage Against The Machine guitarist Tom Morello. And throughout, DeYoung is inspired, giving everything he's got this one last time. *Hello Goodbye* is a joyous Beatles homage, *Made For Each Other* his last great ballad, *The Isle Of Misanthrope* a glorious pomp-rock epic. And to finish, his *Grand Finale*, with lyrics referencing past Styx classics. With 26 East Vol 2 the old master goes out on a high.

DANNY ELFMAN

Big Mess [Anti/Epitaph]

Best known these days as an Oscar-nominated score composer, especially his multiple collaborations with director Tim Burton, Danny Elfman returns to his surrealist avant-rock roots on his first solo album in four decades. The former Oingo Boingo frontman and unlikely new-wave pop star conceived Big Mess with help from LA musician friends including drummer Josh Freese and guitarist Robin Fink, whose long list of shared credits include Devo, Guns N' Roses and Nine Inch Nails. Mixing industrial metal textures with orchestral strings, sharp pop hooks and sinister mood shifts, in places this sprawling double album feels like a vaudevillian glam-punk opera, mixing gnarly guitar blast with Sparks-style electro-cabaret archness on gloriously profane confessionals such as *Kick Me*, *Sorry* and *Happy*. Big Mess is dense and discordant but also a richly original and ambitious musical response to a nightmarish pandemic.

ARIELLE

Girl In A Digital World [Noonchorus]

She can't remember the 60s, but she's right there. After the sound of her computer dialling up and logging on, Arielle cuts straight to the chase, yearning for a world before the internet in a song that's wrapped around the Who's Baba O'Riley. An American anglophile with a strong, clear guitar style and a voice to match, Arielle transports herself back to the 60s on her latest album and revels in the sound separation that the stereo breakthrough enabled, best demonstrated on the vibrant, Chuck Berry-styled *You're Still A Man*. It also suits her careful chord picking on P*eace Of Mind*, where her voice rises and falls with the mood of the song, and *This Is Our Intervention* where her voice gradually gives the song an urgency and then drives it over the line. The rollicking, folksy *I'd Rather Be In England* catches that country's national idiosyncrasies, along with a novelty clip of the national anthem.

MONSTER MAGNET

A Better Dystopia [Napalm]

It's an album of covers, but you probably won't notice. Monster Magnet mainman Dave Wyndorf spent the pandemic doing the same as most of us — pining for the good ol' days. Naturally, he did it louder and flashier than the rest of us, and the result is the band's first covers album. One of rock'n'roll's greatest cultural anthropologists, Wyndorf chose to avoid easy targets and instead dug deep into his dusty crates for protometal nuggets such as Poobah's *Mr. Destroyer* and Dust's *Learning To Die* to revamp. It's a testament to his unrelenting vision that they both sound like MM songs. In fact the whole album does, really. Which is remarkable, given that *Hawkwind* and *The Scientists* — both of whom are covered here in majestic fashion — sound nothing alike on any other day. Ignore the fact that most of these songs are 50 years old and you have the best new Monster Magnet album since 2001's God Says No.

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BILLY F. GIBBONS

Hardware [Concord]]

It was rather late in the day for ZZ Top's Billy Gibbons to start a solo career as he did in 2015 with the Latin-tinged Perfectamundo and The Big Bad Blues. Album #3 was recorded in the Californian desert with former Guns N' Roses/Velvet Revolver drummer Matt Sorum, one-time Slick Lilly leader Austin Hanks and, on the whip-smart *Stackin' Bones*, Larkin Poe. Hardware is a riff-strewn feast of scuzz. Gibbons is back to songwriting too, having a hand in everything bar Augie Meyers's *Hey Baby, Que Paso*, which he transforms into a cousin of Dire Straits's *Walk Of Life*. The desert looms large, and not just in some of the Queens Of The Stone Age-style guitar, or *Desert High*, where you can almost feel the sand in your throat: it's everywhere, just under the surface. Gibbons sounds like he's having a ball, finally making the desert-rock album he's hinted at since ZZ Top's First Album's Goin' Down To Mexico. Hats off.

THE DAMN TRUTH

Now Or Nowhere [Spectra Musique/Sony]

A big noise in their native Quebec, Canadian quartet The Damn Truth unashamedly idolise that hazy lost era when heavy metal, hard rock and blues were all part of the same long-haired hippie love-in, as evidenced by the impassioned Janis Joplin-style vocals of their powerhouse frontwoman Lee-la Baum. Most of the band's third album was produced in Vancouver by fellow Canadian and studio legend Bob Rock, renowned for his long associations with Metallica, Mötley Crüe, The Cult and The Offspring. Covid-19 restrictions ultimately limited Rock to finishing only six of this album's nine tracks, but his flair for alchemising fairly generic raw material into dynamic pop-metal gold is clear on the chiming, soaring, lighters-aloft power ballad *Everything Fades* and the ballsy, driving, multi-tracked guitar stampede *This Is Who We Are Now*. Although it's unlikely to win prizes for originality, Now Or Nowhere is a solid exercise in analogue rock'n'soul.

AYRON JONES

Child Of The State [Big Machine/John Varvatos]

Having spent years releasing his music independently under the radar, Ayron Jones's label debut has the confidence of a performer who has spent decades owning arena stages — which is perhaps unsurprising given the fact that Guns N'Roses' Duff McKagan and Pearl Jam's Mike McCready are among his admirers. From the full-fat riffage and punk-blues vocal of swaggering opener *Boys From The Puget Sound* to the grunge blast of *Killing Season*, to the good old-fashioned raunch of *Supercharged*, this album feels like a showcase of every aspect of his character. At times it can make it a little unfocused — the apologetic *My Love Remains* is a blowsy slab of classic rock balladry that lands just the wrong side of Bon Jovi-sickly — but, stuffed with Zeppelin-worshipping riffs, attitude and soul, it's mainly a grand showcase of an ambitious and natural talent. A powerful portrait of life as a black man in modern-day America.

MOJOTHUNDER

Hymns From The Electric Church [Self-released]

Two years in the making and well worth the wait, this spectacular debut album from Kentucky rockers Mojothunder will immediately bring to mind Money Maker-era Black Crowes and the swinging, good-time hard rock of the Georgia Satellites. It might also remind you of the bluesy stomp of latter-day AC/DC in places. These are all good things. The band are also graced with the honey-dripping vocals of frontman Sean Sullivan, who sounds like he was born to rattle arenas with this stuff. Lead-off single *Soul* is a slowburning, slide-guitar wailing ballad, epic in both scale and intent. But it's the full-on rockers that really make this album, fleet-footed roof shakers such as *Jack's Axe* and the infectious *Rising Sun*. The jewel of the album, however, is *Fill Me Up*, a ridiculously catchy, Americana-tinged fist puncher that practically radiates positive energy and the promise of endless summer nights. A truly remarkable introduction. More, please.

THE DATSUNS

Eye To Eye [Hellsquad]

It's been seven years since New Zealand's The Datsuns — frontrunners of the 00s Antipodean blues rock revival that also gave us Jet, and Kiwi kissing cousins The White Stripes back in 2004 — released their sixth album Deep Sleep, and this seventh doesn't exactly rocket straight off the launchpad. Even when debating the technological erosion of humanity, blues-heavy AC/DC garage rock remains the day's order, albeit with krautpsych touches (*Brain To Brain*), a synthetic Muse metal feel (*Suspicion, Sweet Talk*) or seemingly played 20rpms or so too fast on a turntable on fire (*Dehumanise*). It wasn't broke, they didn't fix it, but more engrossing are the moments when they embrace prog, mating Deep Purple with Can for the compulsive *In Record Time* (complete with authentic 70s poltergeist solos) or, on *Moongazer*, imagining what Pink Floyd's *Money* might have sounded like if David Bowie had replaced Syd.

NANCY WILSON

You And Me [Carry On Music]

After a lifetime as sister Ann Wilson's right-hand woman, guitarist Nancy Wilson ventures yet further outside the boundaries of Heart. The wispy *You And Me* and *I'll Find You* project romantic idyll for a love that transcends any borders. *We Meet Again* is pensive, while on *The Inbetween* synth melds with a laid-back message of compromise. Of the covers, Springsteen's *The Rising* layers acoustic guitar over foundational distortion, while Simon and Garfunkel's *The Boxer* and The Cranberries' *Dreams* blend seamlessly with Wilson's serene originals. A grungy offshoot features Pearl Jam's *Daughter*, and *Party at the Angel Ballroom* cameos Duff McKagan and Taylor Hawkins. *The Dragon* pays tribute to Layne Staley, and *4 Edward* is a thoughtful nod to the late Eddie Van Halen. A mélange of ethereal acoustic ballads, eclectic covers and thoughtful tributes, this solo studio debut bleeds authenticity and does Wilson credit as an independent artist.

SLY WITHERS

Gardens [Dew Process]

Sly Withers have undergone a seismic transmutation. Gone is the loose 'n' livid shredding and abrasive DIY tracking — Gardens plays out with huge emotional stakes, captivating story beats and seven-figure production. Instantly striking is how dynamic and three-dimensional the LP is; the band wade through peaks and valleys across its 12 tracks, ebbing and flowing between heartrending slow-burners and big, mosh-ready punk anthems. The guitars are tighter, brighter and more tasteful, and on the moodier and more emotive tracks — the strained *Glad* or poignant *Turns Out* — the lead work is prickly and warm, cutting turf for the pensive musings on the vocal front to really cut deep. But on *My Bullshit* or *Constant Wreck*, the riffs and ruminations are in mortal combat, dense and driving riffs jutting up against angular, angst-driven vocal hooks that weigh as heavy on the mind as they will on cranked stereos. A wide-screen punk epic.

AMENDS

Tales Of Love, Loss, And Outlaws [Resist]

Meddling fierce emotional strain with raw, whiskeyed angst *à la* belting blues-rock riffs, Amends hit a staunch ream of jaw-dropping highs on the suitably titled Tales Of Love, Loss, And Outlaws, which is their follow-on to their 2019 debut, So Far From Home. It's impressive, the dexterity with which the band play into the smokiness and sleaze of their Southern influences — had we not known any better, we'd swear these Western Sydney vagabonds were hard-worn Nashville lifers. The tense emo slick they pierce it with fits unyieldingly, too, injecting into the mix a pertinent sense of umbrage and despair that makes their songs infinitely more impactful. Top-loaded with hits, our choice pick is the Laura Jane Grace-starring *Walking Backwards*, a barnyard banger carried by bold and balmy semi-hollow jutting, roaring harmonicas and deeply emotive, duelling vocals, but it's all good — picking a best was an exercise in angst.

THE SMALL CALAMITIES

Moments Of Impact [Independent]

At an hour long, The Small Calamities only left us wanting more with the equal-parts offbeat and opulent Moments Of Impact. Not a second is wasted on this unwaveringly bold and kaleidoscopic journey through genre, teetering between simmering midwest emo and a bright, folky twang, with enchanting tinges of Van Morrison-esque diner-pop and scruffy '90s-channelling pop-punk. Guitars on the record are mostly sweet and summery, lingering with a tasteful touch of crunch — and the interplay between them and a horn section, keys or a whistling fiddle is always effortlessly hypnotic. It's the buoyant and booming singalongs that we're drawn to most — *Pavlov* and *Fairy Lights*, in particular — but there truly is something for everyone here. And who couldn't love a lyric that runs: "Hate and indifference, with moments of interest / We fall in the summer and break in the fall?"

DROWN THIS CITY

Colours We Won't Know [UNFD]

By way of her rich, incandescent storytelling, Drown This City frontwoman Alex Reade seeks the beauty in darkness. It's with this in mind that Colours We Won't Know, the landmark new EP from the Melbournian metal warriors (and the follow-up to their 2019 EP, Alpha/Survivor), truly clicks: at once ethereal and acerbic — halcyon and silvery, while steeped in raw, ravenous savagery — the record spends 20 mind-melting, boundary-breaking minutes freezing its listener into a trance. From the opener *Gemini* through *Beyond The Glare* to the closer *New Burn Order*, through all six tracks it's a paradoxic onslaught of brutally distorted, downtuned riffs and concrete-shattering roars accented with angelic, soaring melodies over which Reade beams radiantly with a voice suited more for the opera than a mosh pit, helped out by new bassist/vocalist Toby Thomas. Repeat listens are crucial to appreciate these layered and luminous soundscapes.

THE SONG CLUB

Felicity Urquhart & Josh Cunningham [ABC]

Though each of its 11 cuts were penned as part of a songwriting challenge for which the LP is named, not a word nor a strum of The Song Club feels even mildly haphazard. The Waifs' Josh Cunningham has found not only a new love but also a blossoming musical partnership with Central Coast-based country artist Felicity Urquhart, and on this album she and he wield an incandescent chemistry with their honeyed yin-yang vocals, soaring over a bright and vibrant palate of acoustic guitars wavering between summery and dry. The soundscapes are warm and feel lived-in, with an emphasis on minimalism and rawness to allow the new couple's natural, duly emphatic talents to shine. It's a hopeful record, not only in its lyrical themes but in the honest and animated performances. And there's plenty of stylistic terrain explored, from the rowdy and joyful *Spare Parts* to the goosebump-inducing *Rain Fall*.

PAPER CITIZEN

Wandering Ghost [Independent]

On her poignant and prismatic third EP as Paper Citizen, Claire Gohst (vocals, guitars, synths) along with Connor Frawley (bass), Sean Cahalin (drums), Colin Fleming (percussion) and Ainjel Emme (additional vocals and guitar) delivers a riveting slate of bold, punchy alt-rock hooks slathered in overdrive, soaring and impassioned singing that tears through the mix with electrifying aplomb, and even a slither of dreamy, weathered acoustic folk balladry. Too short at 20 minutes, Gohst unfurls a sprawling musicality, taking listeners on a soulful and sinuous journey that starts powerfully with the brash and boisterous six-string calisthenics of *Scratching The Surface*, dips into a jammy power-pop lustre with *Lifeline,* then winds into the deeply emotive, heartrending blossom of the filmy *Indigo September* and hypnotic, slowburning *Won't Be Losing Sleep.* We're dying to see what Gohst can achieve on a full-length album.

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BLACKBERRY SMOKE

You Hear Georgia [3 Legged]

Blackberry Smoke's latest proves that they've perfected a winning balancing act between their two chief influences, rock and country. Opener *Live It Down* is a fine rocker. A lean, funky central riff and a muscular rhythm section set us off nicely, before Stonesy gospel backing vocals boost an anthemic, party-tonight, sleep-tomorrow chorus. Another up-tempo highlight is *All Over The Road*. Given the title, a classic high-octane stomper. Elsewhere, though, such as on the title track, the pace is more laid back. *Lonesome For A Living* sees Nashville star Jamey Johnson take the mic. The folky guitar ballad *Old Enough To Know*, is another down-home gem, offering choice cautionary lines such as 'Don't trust a grown man with a nickname' and 'Nothing worth a damn happens after two a.m.' A few weak tracks means that this new album falls just short of being a stunner, but for the most part Blackberry Smoke have done Georgia proud.

KANSAS

Point Of Know Return [Inside Out]

Wayward sons, still carrying on. At the coal face for more than half a century without ever quite becoming giants, Kansas deserve reconsideration, and this double live album shows why. Still with original drummer Phil Ehart and Rich Williams, lead guitarist since 1973, their Covid-19-halted 2019–20 tour was a showcase for Point Of Know Return, their best and best-selling album, plus assorted catalogue picks from 1974's Lonely Wind to the 2016 pair Refugee and the elegiac Summer. The band are musically impeccable, of course, and they're on inspired and spirited form. Vocalist Ronnie Platt is Steve Walsh-esque without being a clone, David Ragsdale's violin adds depth, and Williams still sizzles. *Carry On Wayward Son* retains its magnificence, but *Closet Chronicles* and the epic *Miracles Out Of Nowhere* run it close, while *Hopelessly Human* climaxes with tubular bells, and *Dust In The Wind*, their only US Top 10 hit. Excellent.

JUSTIN SULLIVAN

Surrounded [Earmusic]

Would New Model mainmain Justin Sullivan have written this solo album had there not been a pandemic? Probably, although he really didn't seem to be in any hurry to follow up his first solo record, 2003's Navigating By The Stars. Nevertheless, despite the 18 years between them, the feel and approach is very familiar and utterly captivating. Aided strategically by various muso mates, it's mostly just guitar and voice, and a seemingly endless supply of stories to be told, most of them dark, stark and haunting. Sullivan's command of atmosphere and emotion is a peerless master class in songwriting. Whether he's highlighting the achievements of extraordinary men (the chilling *Amundsen*) or soul gazing (*Clean Horizon* and *Stone and Heather*), the attention to lyrical detail is second to none, the execution immaculately intimate. Elemental, enthralling, essential, Surrounded is fire and ice in equal measure.

FEAR FACTORY

Aggression Continuum [Nuclear Blast]

Completed against the odds, due in part to the sudden departure of frontman Burton C. Bell, Fear Factory's tenth studio album can hardly avoid being a pivotal moment in their story. Bell recorded his vocals before leaving, which ensures that Aggression Continuum sounds as it should, like the next last word in extreme metal futurism, with guitarist and driving force Dino Cazares serving up countless new variations on his still unique robot-riff formula. The tunes are huge, too: *Disruptor* and *Monolith* are instant classics and will plainly bring houses down on future tours, irrespective of who is gripping the mic at the time. Elsewhere, *Fuel Injected Suicide Machine* and *Manufactured Hope* embrace a more cinematic vibe, with echoes of the Californians' *Demanufacture* peak. This is the sound of a band with shitloads of rocket fuel left in the gleaming titanium tank. Confusing times, killer record.

GARBAGE

No Gods No Masters [Stunvolume/Infectious]

Their first album in five years sticks it to The Man. Garbage are here to reveal that capitalism, racism and sexism are wrong. And if they go about this bold mission with a production that sounds overly compressed and lacking in actual human fire, it's the message that counts, right? Even if Shirley Manson's continual repetition of the F-word on *The Men Who Run The World* evokes a crusty teenager trying too hard to shock daddy. Once the album stops yelling and stamping for attention, the strong suits of this outfit come through, and dark, sinister atmospheres trademarked by Depeche Mode and The Banshees are allowed to thrive. *Wolves* has surprising hairpin bends, and *Waiting For God* an alluring restraint. *Godhead* questions gender stereotypes, while *Anonymous XXX* is Roxy Music's *Angel Eyes* fed through a shredder by Curve. It's not news that the world has gone nuts, but Garbage present their bulletin with controlled rage.

CROWN

Kings In The North [Frontiers]

What do you get when a member apiece from H.e.a.t, Europe, Art Nation and The Poodles is thrown into a musical blender, along with a dash of seasoning provided by Dynazty? The answer is a Scandinavian melodic rock supergroup of almost unparalleled class. With H.e.a.t (suppliers of keyboard player, rhythm guitarist and producer Jonah Tee) and Art Nation (whose Alexander Strandell is the project's frontman and composer of a sizeable chunk of the songs) infusing their own firebrand AOR with pop, Crowne were never going to be a by-the-numbers proposition. And so it proves. Europe bassist John Levén and Poodles drummer Christian Lundqvist provide a thumping rhythm section, scorching lead solos come from Dynazty's Love Magnusson. Kings In The North is as powerful and committed an introductory statement as one could reasonably have wished for that includes some supermemorable songs.

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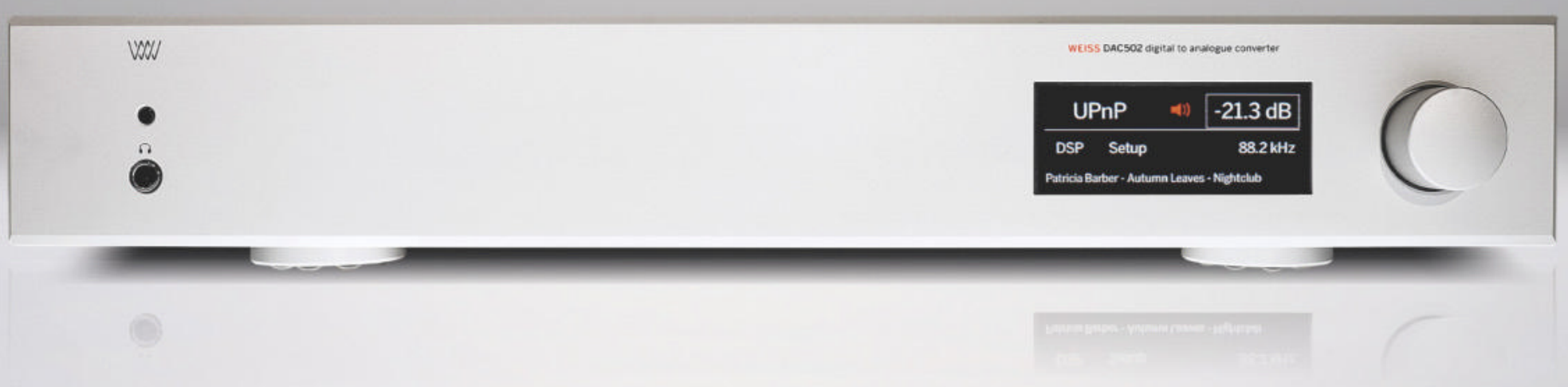

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