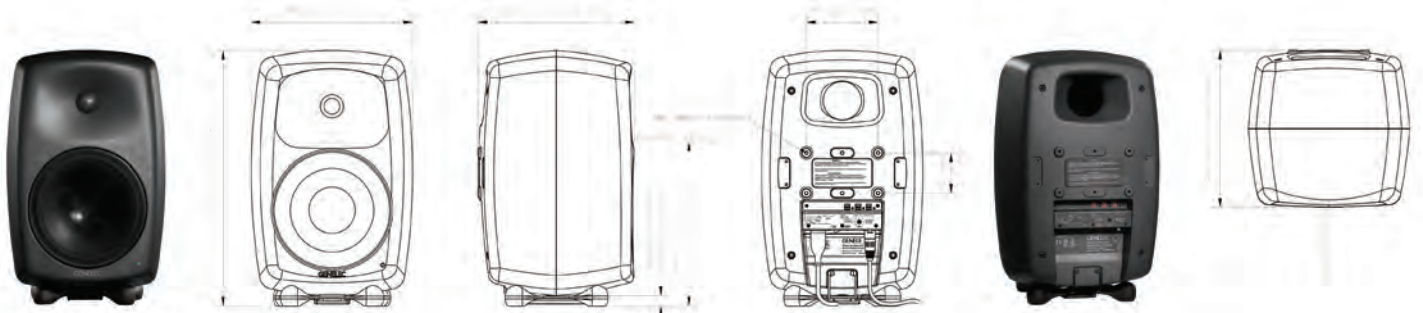


# HIFICRITIC



AUDIO REVIEW JOURNAL

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## REVIEWED THIS ISSUE:

AUDIO RESEARCH REFERENCE 5 SE  
AUDIO RESEARCH REFERENCE 150  
CAMBRIDGE AUDIO NP30  
AUDIOFLAT RUBIKON  
NAIM UNITISERVE  
NAIM UNITISERVE SSD  
WALLS OF SOUND  
MSB GALAXY CLOCK  
PARTINGTON HEAVI1  
GENELEC 8050A  
SONIC SOLUTIONS AMARRA  
REGA RP3  
HANSS T-10  
PRO-JECT XPERIENCE V PACK  
PROTEUS DIAMOND MKII  
ALTO EXTREMO NEO-FLEX  
ALTO EXTREMO LYD II  
ALTO EXTREMO FAT-BOY MKII  
ALTO EXTREMO LYD I  
ALTO EXTREMO EXACT  
BOWERS & WILKINS P5

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The latest Audio Research Reference pre- and power amps establish new standards

## NETWORK AUDIO UPDATE

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## WALLS OF SOUND

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## SECONDHAND NIRVANA

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## PROAUDIO MONITORING

Active ProAudio monitor speakers look excellent value, but does this Genelec cut it musically?

## MUSIC & MUCH MORE



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I must first apologise for the late appearance of your magazine. Ironically, the same thing happened exactly a year ago. Next year maybe I'll have the good sense not to upgrade my computer halfway through the schedule. I could come up with more excuses, but that's boring, so I'll just apologise, promise to try and do better next time, and set myself a proper deadline to do just that.

It ought not to be too difficult, as my close association with *Hi-Fi Choice* magazine (covering some 30 of the past 34 years) was terminated following the magazine's recent purchase by an organisation with the unlikely name of My Hobby Store (which also now owns *Hi-Fi News*).

Although the previous owners hadn't seemed in the least concerned, the new management was unhappy that *HIFICRITIC* was promoted on the basis that its freedom from advertising ensured superior independence from commercial pressures. I was effectively given an ultimatum that if I wanted to continue to work for *Choice*, I would have to give up editing *CRITIC*.

Even ignoring the fact that I react badly when someone tries to push me around, this was really no contest. I've always enjoyed editing as much as writing, so I like an arrangement that means I can edit *HIFICRITIC* while also contributing to it and other titles. Furthermore, I hoped that giving up *Choice* would give me more time to write for *CRITIC*.

I should add that getting off the *Hi-Fi Choice* treadmill after all these years has actually proved rather welcome. However, this change and the reason that lies behind it has also focused my attention on some of the less welcome politicking that goes on amongst the hi-fi media. It's almost as though we were actually important parts of the industry, rather than merely parasitic commentators!

It's part of my job as editor to choose and chase equipment for review. Unfortunately as *HIFICRITIC* is the newest magazine around with the smallest circulation, we're inevitably low down the pecking order when it comes to receiving review product.

I don't particularly mind that, as I'm not the least interested in trying to 'scoop' other magazines with 'first reviews'. Indeed, I'd much rather run a review conducted after due consideration by an expert, than rush into print in order to be first. What does rather alarm me is the rumour that some magazines refuse to review a product at all unless given first dibs.

The advertising and editorial departments had very little communication when I was working in publishing houses back in the 1970s and 1980s, but today the links between them do seem to have become an area of some sensitivity.

Maybe times have changed, but as far as I'm concerned an editor's sole responsibility should be to search out the very best possible content to suit his readership. We might be the new kids on the hi-fi magazine block, but I believe we're producing an interesting, varied and authoritative read for all hi-fi enthusiasts, and have managed to create a magazine that has its own distinctive identity.

*Paul Messenger*

**Editor**



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*Genelec 8050A, page 27*



*Turntables from Rega, Pro-Ject and Hanss come under scrutiny on page 36*

# Audio Research REF150

MARTIN COLLOMS EXAMINES THE LATEST HIGH POWER VALVE AMP FROM AUDIO RESEARCH



A decade or more ago it would have been difficult to predict that valve amplifier specialist Audio Research would still be innovating, making clear advances in engineering and the resulting sound quality. The company's established two-channel high-end *REF110* valve power amplifier has had a great run, following a distinguished series of designs, and it has now been replaced by this £12,000 *REF150*. Considerable ballyhoo surrounded the launch, with claims for better sound, more power and better valves. As usual the deciding factor will be how good it actually sounds, and to some extent how consistent it is in driving different speaker loads.

Its substantial frame comprises a 150W/channel stereo power amplifier, which at 34kg, 75lb (90lb boxed) constitutes a fair two-man lift. In the Audio Research tradition, the valves are standard types, recognising that a maintenance factor is inevitably involved in valve technology and both valve replacement and power consumption aspects need to be considered in a purchase decision. Valve replacement costs here are more sensible than with some designs.

The amplifier actually idles at a considerable 425W, though will not consume much more on typical music program, since the design has a generous Class A operating region. However, when driven to its limit with continuous tones on the test bench it will haul some 840W out of the wall socket. For reasons of both valve life and power draw, this amplifier should not be left powered up. Once run-in, the valves audibly warm up to around 80% of

their best in about 15 minutes, though critical users will hear further improvements during the next 15 - 30 minutes.

While the fascia conforms to the standard 19in/48cm width, the unit is nearly 19in high and 19.8in (50cm) deep, and may also benefit from a vibration controlling platform or floor stand. It may be ordered in variations and combinations of both silver and black anodised alloy. Described as 'cosmetically improved', this would merely appear to involve moving two legends to a neater location near the lower edge of the fascia!

We reviewed its *REF110* predecessor very favourably back in 2007 (*Vol1 No4*), and it has held up very well in the market over the past five years. At the time it achieved the historically highest *HIFICRITIC* sound quality score of 135, so it would be fun to discover whether Audio Research could push this further.

Boasting better sound (why would it not?) *REF150* also claims a significant increase in power output through replacing the previous *6550* output valves with the *KT120s*. The latter is a more powerful redesign of the *KT88*, here branded *TungSol* and made by Expo-Pul for the Russian 'New Sensor Group'; it necessarily draws more heater current to provide denser space charge for the greater anode current swing required. Now a *pair* of *KT120s* driven flat out on low bias will deliver 130W, so Audio Research is not being that ambitious in asking for a nominal 150W from *two* paralleled *KT120* sets per channel. (The *6550* valves in the *110* may gain some improvement if upgraded with *KT120s*, but this will not turn it into a *REF150*.)

That's a big power rating for a stereo chassis such as this; compared with *REF110*, the power supply reservoir (the 'watt seconds' storage rating) has been doubled to 1040joules, and all the transformers have been uprated. The patented output stage configuration, which wraps the multiple windings of the output transformer, primary and secondary, around the anode and cathode circuits of the output valves, establishes powerful local negative feedback and helps increase the clean power delivery. Measured distortion, and more particularly power bandwidth – the bane of many valve designs – is greatly improved by this means, thus easing the design of the whole project and allowing good load matching combined with a traditionally low 14dB of overall negative feedback. From one viewpoint it could be considered partly DC coupled, since the output valve cathodes do return their current through the secondary or loudspeaker winding of

the output transformer; potentially a small associated offset voltage could exist, depending on the balance of the bias current. (See Test Results.)

This fully balanced design has no normal single-ended (SE) inputs at all. While the circuitry has some internal balancing and common mode rejection action, it works at its best with balanced drive. To optimise the sound quality of valve sources, the input impedance is set to a high 300kohm, thus minimising loading on a pre-amp output. For Audio Research and similar pre-amps this constitutes a small bonus which known to increase both clarity and dynamics.

A couple of low noise internal fans blow cool air over the output valves, significantly increasing their operating life. Three fan speeds are provided, the switch accessible under the top cover; the highest is for warm ambient conditions, particularly if located in a confined space. In free space and cooler surroundings, slower, quieter settings may be used; in any case, better airflow design means this new model is substantially quieter than its predecessor. I found both transformer and fan noise very quiet on the lowest setting.

Audio Research claims a remarkably wide frequency response at full power, 150W/ch continuous from 20Hz to 20kHz (though distortion is not specified), plus 160W flat-out at 1kHz in the midband. An amazing -3dB power bandwidth of 5Hz to 80kHz is another indicator of high quality.

Many valve amplifiers require allowance for both power limit and matching issues when auditioning, which can make it difficult to separate these factors from their intrinsic sound, but there's hardly any such concern with the *REF150*. As with previous incarnations, Audio Research includes flexible output matching to suit various loudspeaker loads; these are nominally 4, 8 and 16ohm, and may provide some fine tuning in a given installation, but nominal recommendations do not always apply, and it's better to try the alternatives in practice.

It needs 2V *via* those XLR inputs, and provides an overall gain of 24dB (about 16x) for full output. Low and high voltage supplies are solid state, and solid state regulation is also used for the earlier amplification stages, the whole powered from a single, central, laminated core, low noise transformer. Mains is supplied via a horizontal three-pin 20A IEC connector. Valve life is monitored by an elapsed time meter accessible under the cover (and viewable from the outside with a torch).

Audio Research's limited edition *Anniversary Reference* two-box line pre-amplifier showed a significant sound quality improvement over the *REF5* pre-amp, in part due to a new design of

Teflon film coupling capacitor in the differential valve circuits. That component is now used in this *REF150* (and also the *REF5 SE*) for power supply decoupling. As before the driver stage of the power amp uses matched *6H30* double triodes (two per channel), while the differential lower level input stages use FETs, with FET constant current sources for improved common mode rejection (*ie* better differential common mode precision).

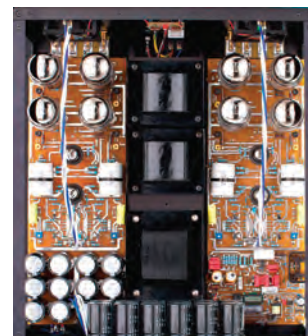
### Sound Quality

The *REF150* was initially placed on a Finite Elemente *Pagode MR* stand, on my woodblock over concrete floor, which is a quite inert support. The result was full of promise, elements of the sound clearly showing its impressive pedigree, but it was also somehow light in texture: elegant, distinguished, but not quite rocking. Had further work not been done on the amplifier support, the review would still have been very favourable: indeed, it could well have stopped there, with the usual justification for the particular qualities and inner poise of valve power amplification.

However, prompted by another's experience with Audio Research power amps, the FE floor frame was hauled out and the *REF150* dumped (sorry; placed!) directly on the floor. The sound quality changed, and all for the better. This floor location reinforced the sense of grip and stability, added dynamic foundation to the bass, seemed to increase the power output with no change in volume setting, and better rhythm and timing. If this was not enough there were improvements in image focus, front to back perspectives and overall scale; treble sounds were more natural, pure, vibrant and expressive. It kicked up a storm of a beat, raising much enthusiasm amongst the listeners.

So how good is this amplifier? Very very good indeed. In no way can it be seen as a classic zero feedback single-ended triode (SET) model: it is too powerful, and too 'connected' for that comparison. It is also sufficiently accurate that many desirable solid state virtues are readily apparent: grip, load control, and a consistency of performance with level and loading, assisted by the output matching options.

Yet it does also sound like valve technology, in that there's a turn of speed, a sense of agility when rendering the more subtle details, which seem to follow a musician's playing more precisely. In addition more notes and instruments somehow seem to be found, revealing detail lying below the familiar main themes. The stereo image is first rate: very deep, wide, fully spacious and well focused, with particularly strong, somewhat 'forward' central solidity. The bass is so good one often forgets this



*"The REF150 was initially placed on a Finite Elemente Pagode MR stand, on my woodblock over concrete floor, which is a quite inert support. The result was full of promise, elements of the sound clearly showing its impressive pedigree"*

**THE SYSTEM**

Meridian 200 and Marantz CD7 were used as CD drives, while most material, including hi-res up to 24/192kHz sampling, emanated from a Naim UnitiServe HDD, QNap 419 II (ARM uP) NAS with 4x 2T ECO Seagate HDD, via a Netgear local router and Cat6e UTP snagless Belkin net cable. Vinyl replay involved a Linn LP12/Keel/Radikal with Naim ARO, Koetsu Urushi Blue and Naim Superline/Supercap. Selected mains, S/PDIF and signal cables, including Transparent MM2, were used in a high end audio system that used an Audio Research Reference 5, Krell Evo 402e and Wilson Audio Sophia3.

amplifier uses valve technology: it's well timed, fluent, fast and has good impact, the emphasis (if you can call it that) leaning just slightly towards percussion rather than muscularity. If really fussy, just move the speakers a few inches back towards the wall to add a smidgeon of extra weight.

It does have some character. I found brass, cymbals and similarly lively treble sounds step forward somewhat in the soundstage. And while sibilants avoid grain or smear, they are a tad crisper than usual, while the midrange is a little leaner and sharper than the finely poised timbre of the Robert Koda Takumi, or for that matter the Krell 402e, and more so on the 8ohm than the 4ohm tap. These characterisations will be partly due to speaker matching, and may vary subtly with speaker choice. In its context, once again defining the well used Audio Research slogan 'high resolution', this power amplifier is completely comfortable in company with some of the best up to £20,000 in its exceptional ability to dig deep and retrieve musical information.

To put some flesh on that basic description, each one of a collection of different drums from bass to tabla seemed to have a clearer signature, with better differentiation about how they were struck and how the instruments were constructed. This amplifier captures the more subtle nuances of percussive dynamic attack and also that elusive and brief pitch or note that much percussion has, yet which is so often reproduced as the 'whack' but without the following 'ring'.

Similarly the more delicate and musically telling vibrato of voice or instrument is clearly read, adding

to the listening pleasure. Cymbals sound almost holographic: metallic, shimmering, complex, focused and full of varied character. The overall character is just a shade brilliant in the treble, but could not be described as metallic.

The bass quality was better than many of the top solid state designs, with firm depth and attack, and very good note playing that clearly illuminated the character of different bass instruments. Recordings I knew well genuinely sounded more detailed and informative. For example, where a particular orchestrated piano note had a subtle bright halo, thought hitherto to be a local reflection or perhaps imperfect instrument tuning, the REF150 readily resolved it as a very quiet triangle played exactly on that piano note: high resolution indeed.

The overall sound is lively, upbeat, transparent, infectiously involving, and always entertaining. It catches the leading edges well, and the percussive attack of sounds adds speed and drama, providing a lively effect that's somehow less compressed than previously experienced. The quality is undeniably high, and after much comparison and consideration we found it had hit a sound quality jackpot at 185 marks, the highest power amplifier mark yet set by HIFICRITIC.

**Lab Report**

The picture here is complicated by the three output taps, for 4, 8 and 16ohm load matching, the amplifier having the same power but different voltage, current, and impedance matching for each. The headline power figure (for 244V mains) is a maximum 178W per channel (1% THD, 8ohm into 8ohm), so this is certainly a powerful amplifier. Furthermore it has solid state like power bandwidth, contradicting preconceptions about output transformer and valve circuit limitations at the frequency extremes, so great is the control exerted by this closely coupled circuit. Pre-clipping it could provide two channels of 125W from 20Hz to 20kHz, as if the traditional output transformer bugbears of core saturation, leakage inductance and stray capacitance had been banished; this rises to 152W with one channel driven.

Music signals are rendered with considerable accuracy: at 1W the frequency response is +0.1 dB, -0.5dB from a very low 0.5Hz to 50kHz, though the moderate 0.6ohm typical output impedance means that the impedance characteristic of the particular loudspeaker used will be faintly reflected in the practical 'connected' frequency response. For example a '6ohm' nominal speaker with inherent impedance variations from 3.5 to 15ohms over the whole frequency range, and used on the 4ohm amplifier

POWER AMPLIFIER TEST RESULTS			
Make	Audio Research	Date:	10/2/2012
Model	REFERENCE 150	Ser. No.	71306002
POWER OUTPUT	20Hz	1kHz	20kHz
Continuous 8 ohm 2 channel	133 W	145 W	135 W
Continuous 4 ohm 1 channel (4 ohm tap)	112 W	153 W	131 W
Output impedance (ohms) 8ohm tap	0.68 ohms	0.79 ohms	1.2 ohms
Peak Current/Power 8ohm tap		7.5A	175W
Distortion, THD inc. noise (1W)	-74 dB	-80 dB	-64 dB
Distortion, THD inc. noise (rated power)	-68 dB	-70 dB	-60 dB
Channel separation	113 dB	91 dB	78 dB
Intermodulation Distortion 19.5kHz/20.5kHz 1:1 rated power, 8 ohms			-58 dB
Intermodulation Distortion 19.5kHz/20.5kHz 1:1 1W, 8 ohms			-85 dB
Signal to noise ratio (ref. 1W output)	CCIR Weighted	Unweighted (22Hz-22kHz)	A-weighted
Ref 1W Aux	84 dB	80.5 dB	89.4 dB
Ref full power	106 dB	106 dB	110 dB
Frequency Response 8ohm tap	+0.1 dB	0 dB	-0.34 dB
Channel Balance	0.033dB	0.033dB	0.025dB
Absolute Phase		correct	
Input Data	Socket	Sensitivity	Loading
Full Power 1W	XLR BAL	2.07 V	300 kohms
		178 mV	
DC offset	Left 3.5 mV	Right 3.8 mV	8 ohm taps
Size (W, H, D, mm)	483	220	495
Weight	34kg, 75lb		
Price	£ 12,000, various black and silver finish options		



tap, will then show small +0.5/-1dB variations over frequency, enough to alter the tonal balance mildly. Output impedance via the 4ohm tap is about 0.6ohms, comparable with a medium length of speaker cable.

There was no significant ultrasonic ringing and the transient damping was excellent for 0.1uF and 2uF simulated electrostatic speaker loads. (2uF resulted in a response error of less than 0.6dB by 20kHz.) A small distortion imbalance between channels was found (1W 20kHz, 0.08% left and 0.03% right), but both results are very good in any case. High frequency intermodulation was exceptionally good 0.12% at rated power and just 0.008% at 1W. The resulting spectrum also showed little 'hash' and very little mains frequency breakthrough.

Signal-to-noise, hiss and hum were close to the best solid state levels: relative to full power, hum and noise was -106dB, the A weighted figure 110dB and the CCIR (1kHz) result 106dB; the 89.4dB A-weighted 1W result was first class. It has a very light 300kohm input loading per phase, and requires just over 2V for full power – a dream for balanced pre-amps. This amplifier cruises at 0.04% total harmonic distortion, with a low order harmonic spectrum. Although push pull designs like this usually favour odd-order harmonics only, inherent to the symmetrical topology, second harmonic just dominates (and with a desirably monotonically decrementing spectrum where present at higher powers, eg above 10W). Channel balance (often a little 'out' with the matching requirements of valve designs) was a near perfect 0.03dB, 20Hz to 20kHz, while channel separation was also outstanding for the genre, measuring 113dB at 20Hz, 91dB at 1kHz and 78dB for 20kHz. The DC offset has been optimised for the 4ohm output and measures just 3.5/3.8mV, but is a little higher (up to 25mV) on the other taps, though still considered harmless.

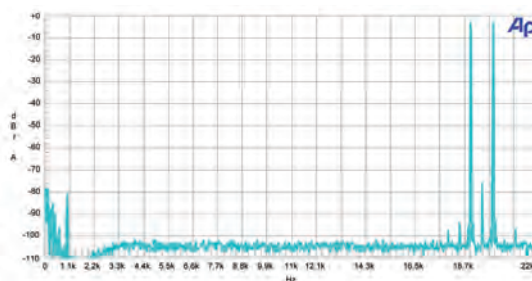
**Conclusions**

Reviewing very good equipment is so easy, as it inspires enthusiastic copy; 'also rans' are much harder to write up, as one attempts to damn them with fair but faint praise. This one was easy: the Audio Research REF150 is simply very, very good, no ifs or buts. It must be driven in balanced mode of course, though many high end control units have balanced outputs these days. It sailed through the lab tests, showing one of the most powerful, load tolerant and current capable outputs seen from a valve product, with very low noise and low distortion as well. High accuracy on measurement means that you largely see what you get with no unexpected interactions with more difficult loads, or when working at the frequency extremes.

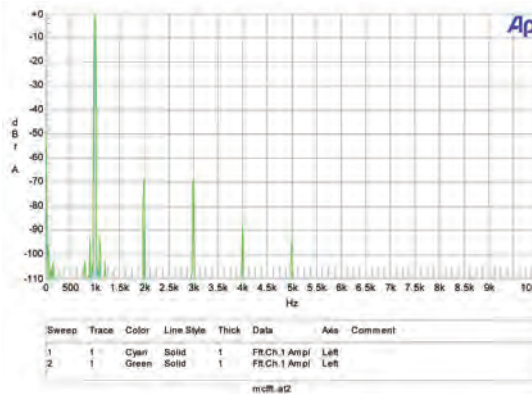
Scoring top marks, it somehow shines a bright light on the musical scene, illuminating the darker and more distant corners of the soundstage. It has depth width and focus in spades, is very detailed, and dynamic, upbeat and rhythmically involving to boot. Louder, clearer and more musical than before, the REF150 is a significant step forward in amplification in this price sector. Fun to be with, it is quite a music maker, is strongly recommended, and to my knowledge at least is the new leader of the pack.



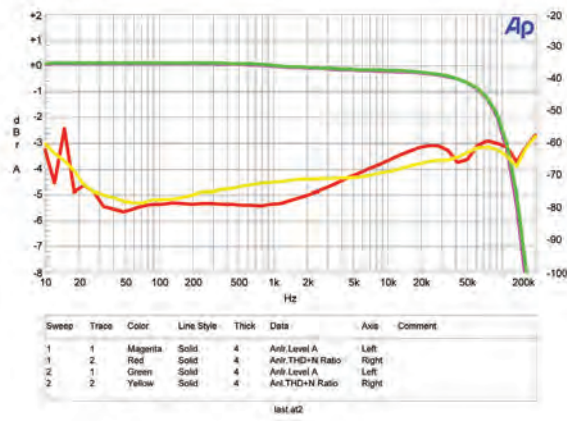
ARC150 1W I-M distortion spectrum 8 ohm load



ARC150 10W 1kHz distortion spectrum 8 ohm load



ARC150 L,R frequency response 20W 8ohm and distortion (400-15k filtered)



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# Subjective Sounds

PAUL MESSENGER

## HIFICRITIC

AUDIO AND MUSIC JOURNAL

BECAUSE HIFICRITIC IS FUNDED BY ITS READERS THE SUBSCRIPTION COST IS NECESSARILY HIGHER THAN FOR MAGAZINES SUBSIDISED BY ADVERTISING REVENUE, THOUGH CERTAINLY NOT AS HIGH AS PROFESSIONAL SPECIALIST JOURNALS.

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Our independence from product advertising allows us to criticise and comment without fear or favour. The HIFICRITIC team scrutinises interesting and internationally important issues and equipment in depth and detail, technically and subjectively, and provides comprehensive investigations into the key issues facing high quality stereo music recording and reproduction today.

*Martin Colloms, Publisher*

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Having regularly reviewed loudspeakers in *Hi-Fi Choice* for more than twenty years, it's quite a relief to take a bit of a break, sit back and just enjoy my hi-fi. It also gives me time to listen to the serious loudspeakers I keep around as a reference, but which often find themselves sitting in the cupboard (it's a large cupboard!) while I'm spending time with some newcomer.

I've somehow managed to accumulate a number of pairs of speakers over the years, but two pairs of large, current models serve as worthwhile references for whatever else arrives. Why two pairs? Simply because, as I've written too many times, there's no such thing as the perfect loudspeaker.

These two favourites are the PMC *IB2i* and the Bowers & Wilkins *800 Diamond*. Both are excellent loudspeakers that do nearly everything very well, but I'd actually like to take that magical midrange dome from the PMC and use it alongside the bass and top end of the B&W.

Both these may be regarded as mainstream 'high end' models, and indeed in room measurement terms both show rather too much bass output in relation to mid and top. That doesn't seem to be a problem in practice, however, because in both cases the bass quality is very good indeed, albeit for quite different reasons. If I had to choose just one, it would probably be the B&W, but whether it can justify costing more than twice the price of the PMC is certainly debatable.

The other issue occupying much of my attention this past quarter concerns connecting cables, and specifically those from a new company called Vertere founded by Touraj Moghaddam. He's best known in the industry as co-founder and engineer at Roksan, but left recently to pursue his interests in pushing the high end envelope.

I've been trying out a number of his various Pulse cables for some months now, with results that vary from the merely good to the downright revelatory. I'll put together a more comprehensive report in the next edition, but the short version is that the basic approach is to choose the cable to suit the type of signal it's carrying; to use a range of different diameter conductors in parallel in order to cover the full audio bandwidth; and to treat the earth/return/shield quite differently from the signal cable.

The biggest surprise came when I substituted the regular Naim cable used between the power supply of my *NAC552* pre-amp and the *NAP500* power amp. This cable doesn't often get substituted because it has a 4-pin DIN at one end and an XLR at the other. Obviously, the Pulse cables are much more costly than Naim's regular fare (around £1,300 and £2,100 for the two types I tried), but that seems somewhat irrelevant in the context of linking two components with a combined retail price just shy of £34,000.

In fact I tried two different Pulse grades – first Pulse *B* and later the more upmarket Pulse *R*. The initial move to Pulse *B* brought an immediate and obvious improvement over the standard cable, making one conscious of substantial extra coherent detail like instrumental textures, and helping make one aware of more individual strands and even individual performers in the music. It was impossible to avoid thinking: "Why didn't I try something like this years ago?"

The difference wasn't as great when moving from Pulse *B* to Pulse *R*, but it was still quite obvious nonetheless, and essentially amounted to rather more of the same, in terms of adding more texture and fine detail.

I've tried a number of Pulse cables for other applications, again mostly with very positive results, but these will have to wait for the next issue. I'm also waiting to receive a Chord *Sarum* pre-to-power link, which should provide a supporting context. In the meantime, Vertere Pulse cables are clearly welcome newcomers.