

HIFICRITIC



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Audio Research Reference 110

MARTIN COLLOMS EVALUATES AUDIO RESEARCH'S REFERENCE 110 STEREO VALVE POWER AMP, PARTNER TO THE REDOUBTABLE REFERENCE 3 PRE-AMP REVIEWED IN HIFICRITIC NO2

After two separate and distinct revivals since their original near demise in the 1960s, and just when you thought that valve (ie tube) amplifiers had finally had their day, this original amplifier technology bounces back yet again. Despite the heroic efforts of some specialist producers to maintain a presence in this market, the performance of some of the best full-on solid-state power amplifiers has succeeded in seducing this author and many others from the softer, sweeter sounding charms of free electrons wafting about in an evacuated glass bottle – a phenomenon intrinsically associated with the incandescent-filament lightbulb.

At their best, environmentally speaking at least, a well designed solid state 'transistor' amplifier can be very long lived, cool running and economical. Generally they are quite load tolerant and will happily drive a range of loudspeakers, despite the best efforts of most modern speaker designers to make life hard for both power amplifiers and cables.

Conversely, a valve or tube power amplifier will require servicing with new valves every two years or so for

optimum results, perhaps costing several hundred pounds, though this will depend on use: 1500 hours is typical for output tubes if the amplifier is not caned. When powered up, they will constantly consume hundreds of watts, and generally run quite hot. (In fairness, some solid states, such as the new Krell EVO series, also run at considerable standing power, while pure Class A types operate flat out all the time, with as much as 500W continuous power.)

Valve amps are tricky to make well, are rather less load tolerant than solid state models, and therefore show some variation in timbre and quality with different loudspeakers. Adverse loading will also impair maximum loudness. They generally require output transformers, which add weight and expense, and this component may also get in the way of the sound. Valve amps are not particularly powerful in any case, so headbangers might look elsewhere right away, though a more tolerable sound when overloaded helps deliver greater maximum loudness than might be expected from the specified rating.

I thought that I knew roughly what to expect when taking on the *Reference 110*, the latest mid-size stereo

power amplifier from Audio Research Corporation (ARC). Its substantial £8,490 pricetag – about double its non-*Reference* equivalent – places it firmly in the high end, and challenges us to fit it into the performance hierarchy of our review archive.

The user interfaces are simple. It has balanced inputs only, via gold-plated XLR sockets, is non-inverting, has the higher power 20A IEC mains input cable (which I did not change), a 12V link trigger connection for system power up, and solid copper binding posts in matt gold plate for speaker connection.

It provides a fully balanced 16 ohm output match ('4 ohm' is the centre tap), plus 8 and 4 ohm matches. Bi-wiring is possible, and some interesting results are available via the available output taps: '0 ohm' to '4 ohm' is for the bass connection, and '4 ohm' to '16 ohm' for the treble connection. (Due to the squared relationship for winding to impedance, the 4 ohm tap is electrically the centre tap for this part direct-coupled design.)

A pair of moderately quiet fans blow cooling air over the fairly tight grouping of eight Chinese 6550C output valves (four per channel), and experience has shown that the cooler the valves run, the longer their life. The higher fan speed is recommended for high ambient temperatures, but in cooler or air-conditioned climes, internal dip switches may choose a reduced fan speed for a lower but not quite inaudible noise level. It's more of a 'blowing' sound than a hum or whine. Power transformer vibration was low.

Such amplifiers may suffer from some acoustic vibration sensitivity, so for our tests it was properly spiked and levelled on a custom sound table. A check did show that casual placement on a shelf or other furniture could reduce sound quality.

About 110W of power is delivered into the range of loads. Distortion is low and frequency response and power bandwidth wide, in part thanks to the top quality output transformers. The classic ARC circuit design direct-couples the cathode loop of the output stage valves through the centre-tapped secondary winding, inferring moderate local negative feedback and a measure of direct coupling. This helps define an output impedance that's sufficiently low to obtain relatively consistent sound quality into a range of loudspeakers. Like all the new *Reference* series, a high performance 6550C based tube regulator supplies power to the input and driver stages, and this has a big effect on sound quality. Direct coupled balanced JFETs at the input lead to 6H30 gain stages and then more 6H30s as cathode follower drivers. Inside, a small display, just visible though the perforated top cover, monitors tube usage. Build quality and finish is to the usual high ARC standard, and the unit weighs some 31kg.

SOUND QUALITY

To use this power amp requires a balanced input drive with matching cable, (usually the redoubtable van den Hul *The Second Balanced* does fine, but here we were driven up to the Transparent *XL Reference*). And to find out just how good it is – and there were very positive indications of this – requires a preamplifier of comparable quality, such as the ARC *Reference 3* (fully assessed in *HIFICRITIC* issue 2). Having dealt with the input requirement, we also need to match the output, recognising that the output impedance will be somewhat higher than comparable solid state amplifiers.

Like others of its type, this valve amplifier requires additional care and attention when installing and matching, which is a demerit in a review context compared to more 'universal' solid-state designs like the Krell *FPB700cx*. Furthermore, output current reserve for the ARC will be less than 6 amps peak compared with the 30 or even 60 amps possible from many transistor amplifiers. Then there's that pair of cooling fans, which I reset to the lowest speed possible, but which still remained just audible with the volume well down.

A final twist is the matching options provided by this component, namely 4, 8, and 16 ohms, the latter option associated with a warning notice concerning the possible maximum audio voltage present across the gold plated output terminals (about 55V open circuit). Interactions with the speaker load may therefore be significant, and results will inevitably vary somewhat with the severity of the load. This amplifier will also have an easier time the greater the speaker's efficiency.

I ran it with several loudspeakers including the Wilson *System 8* (a tough load, but quite high efficiency), the *Avalon Diamond* (lower sensitivity but an easier load), and the 15ohm BBC *LS3/5a*. It also worked well with the *Quad 2805*.

We already knew that the *Reference 3* pre-amp was exceptional, but it was shocking to find, despite the forgoing caveats, that this matching power amp was absolutely in the same league.

However, a problem emerged at the outset. Intellectually we knew that the bigger loudspeakers were not being driven at their best in the bass: some loss of power and speed was evident in the low registers, and pedal drum impact was diluted. For a lesser amplifier this finding could simply have been reflected in the merit scoring. But once the system alignment had come fully into focus, an extra dimension emerged. This Audio Research amplifier communicates directly with the heart. Once it has made connection with the listener, its achievement is powerfully musical, and it is the musical event itself which tells you

“it delivers a highly natural musical performance, convincingly communicating the character, colour, and musicianship of great recordings”

how good it is. Sure, you can try and distance yourself to admire the deep lush and transparent soundfield, the exquisite image focus, the convincing layering of image depth, the delicately resolved detail presented in this wash of spacious, glowing sound. But most times you simply get lost in the music.

The Wilson *System 8*'s particular quality of natural spaciousness and precise depth plane perspective was perfectly illuminated by the *Reference 110* power amplifier. Likewise the near holographic vocal focus, natural presence and clear articulation of the Wilson loudspeaker seemed to find a matching partner in this amplifier. One might have predicted that the tough low frequency loading might have stressed an all-valve amplifier unduly, but we found the bass quite upbeat within sensible loudness limits. It was nicely percussive, if in a mildly valve-like softened manner, with notably clean tune playing for acoustic bass instruments – class bass by any standards.

Of the three impedance matches, the 4ohm terminals were used most of the time. Some degree of system equalisation was provided by the 8ohm set, with similar maximum sound levels. Presumably the higher impedance reacts with the loudspeaker load subtly to lighten the tonal balance, which was useful for the Wilson *8* in some rooms. This amplifier also loved the 15 ohm *LS3/5a*, making the best sound ever from this speaker.

While the triode like perfection of timbre and exceptionally natural midband is striking, what came across time again is the sense of performance. I had thought I was completely familiar with the Diana Kraal track *Peel Me A Grape*, but I was wrong. What I had previously judged to be a mildly flip studio take and a fairly casual performance was transformed by this amplifier into something altogether more intimate: a more precisely timed and compelling result that could not be halted until the last note had fully died away. With the Avalons and the full Audio Research *Reference* combo, Kraal's voice was reproduced with superior pitch, great articulation, remarkable presence, and sounded more convincingly 'live' than had previously been heard with other amplification. The double bass accompaniment was sharper clearer, better pitched, more realistic, providing a better foundation for the overall line. The sound as a whole was more upbeat, more involving and more dynamic, with wonderfully resolved dynamic contrasts. No recording we tried escaped the positive musical ministrations of this wholly surprising power amplifier.

Despite a moderate loss of power and attack in the low bass with the bigger speakers, the mid and upper bass was very good, with good speed and timing – about the best heard in commercial designs. And with smaller two-way speakers, the bass shortfall would likely pass unnoticed.

It should be remembered that this is not a hugely powerful amplifier, and while PM might remind us that the first watt is the most important, this amplifier will not provide the biggest bang for your buck. It does play loud, approaching its limit with a mild but progressive loss of clarity and composure, but this amplifier is not primarily about sheer loudness and impact-driven excitement. Rather, it delivers a highly natural musical performance, convincingly communicating the character, colour, and musicianship of great recordings. Think of it as a smaller amplifier, but one with a good reserve: conversely with a genuinely high sensitivity speaker, you can have it all.

The *Reference 3* pre-amplifier was found to generate mild hiss when operated single-ended with a sensitive power amplifier and speakers; used in combination with the *Reference 110* in balanced connection, it was gratifyingly silent.

Because of matching issues and their reflection on music types, the scores are split according to musical preference. On precisely timed, powerful rock material the score is a very special 125; on jazz, less demanding rock and classical programme the result is a record breaking 140, absolutely state of the art. I am left with a wonderful impression of a sweet yet lively, sparkling yet sumptuous, gracious yet upbeat sound, with top class stereo imaging

POWER AMPLIFIER TEST RESULTS

Make Audio Research Corporation	Date: 10/04/07		
Model Reference 110	Ser. No. 06503803		
POWER OUTPUT	20Hz	1kHz	20kHz
Continuous 8 ohm 2 channel	105 W	108 W	110 W
Continuous 4 ohm 1 chan (8 ohm tap)	110 W	120 W	112 W
Pulsed 2 ohm 1 channel (8 ohm tap)	-	40 W	-
Output impedance (ohms)	0.60 ohms	0.62 ohms	0.92 ohms
Peak Current	-	5.5 A	-
Distortion, THD inc. noise 1 W 8 ohms	-50.4 dB	-65.3 dB	-57.6 dB
Channel separation	95 dB	91 dB	70 dB
Channel Balance Right is ref at 0dB	0.022 dB	0.029 dB	0.053 dB
Frequency response	10Hz, -0.13 dB	0 dB	-0.34 dB
Intermodulation Distortion 19.5kHz/20.5kHz 1:1 rated power, 8 ohms			-66.1 dB
Intermodulation Distortion 19.5kHz/20.5kHz 1:1 1W, 8 ohms			-80.5 dB
Signal to noise ratio ref. 1W 8ohms	76.2 dB Unwtd.	89.2dB 'A'wtd.	90dB CCIR (1kHz)
Signal to noise ratio ref. rated power	96.7dB Unwtd.	109.7dB 'A'wtd.	
110.2dB CCIR (1kHz)			
DC offset	Left 2.6 mV	Right 5.1 mV	
Input Data	Socket	Sensitivity	Loading
Aux input balanced	XLR	1.83 V for 110W	300k ohms - nF
		177 mV for 1W	
Aux input single ended	n/a (XLR only)	- mV	- ohms - nF
Absolute Phase	correct		
Size W x H x D	48.3 cm/19 in	22.2 cm/8.75 in	49.5 cm/19.5 in
Weight	30.7 kg/67.4 lbs		
Price	£8,490 (UK inc VAT)		
Contact	www.audioresearch.com UK: www.absolutesounds.com		
Tel (UK)	00 44 (0)208 971 3909		

and exceptional dynamic resolution – all mighty impressive. My overall score is therefore 135.

LAB REPORT

ARC knows how to design and measure so there are no surprises here. It meets the specified power into the specified loads while its reasonable load tolerance means that there is no harm in experimenting with load matching to see if there is an optimum with your loudspeaker choice. I have a notion that the 16 ohm output is actually the very best sounding but for that you will need sensitive 16 ohm speakers, a rare thing these days.

Total harmonic distortion results are fine, though the swept measurement with frequency shows some imbalance between the channels. The cruising level spectrum for 1kHz shows the classic monotonic harmonic result with second inaudible at -58dB and third at -78dB, with nothing visible afterwards. For high frequency intermodulation the results are very good at all powers. Properly matched, the rated 110W was available but this was the absolute limit and given line voltage variations this amplifier could have been rated at 100W with more security. You could squeeze 120W out with a 4 ohm load on the 8ohm tap, but the familiar solid state doubling of power into lower loads will not occur with a valve amplifier. 5.5A peak is available which suggests kinder loads and/or higher speaker sensitivities, if you can get them.

The frequency response was wide and flat, only -0.13dB at a low 10Hz, and -0.31dB at 20kHz; -3dB occurs at about 90kHz with a smooth phase response, no ringing and a high stability margin. Channel separation was very good; still a high 70dB even at 20kHz while channel balance was excellent. Signal-to-noise ratios were fine. It has a very low but measurable DC offset. You will need 1.8 V balanced input for full power, 177mV for a rated watt output, while the impedance loading is kind at 300 kOhm. Output impedance is fairly low, for the 8-Ohm tap about 0.6 Ohm, and is in proportion for the other taps. It consumes about 400W in idle, perhaps 500W on normal programme, and 800W driven flat out in the laboratory. It warms up fairly quickly, about 20 minutes, and should be powered down when not in use.

CONCLUSIONS

ARC have long known how to crack the technical problems of valve amplifiers and this one is no exception. It performs with sufficient accuracy and low distortion not to present any difficulties when interpreting the subtleties of sound quality. At high level it may well current clip into difficult loads, but this moderate feedback design

clips sweetly, recovers quickly, and as such mild overload passes largely unnoticed. In the lab it measures as well as any valve amplifier you could find. It is accurate and surprisingly load tolerant for the type.

While I have considered some of the potential difficulties in optimising the performance of such a design, the results speak for themselves. This is unquestionably a remarkable device of outstanding musical quality which quickly seduces the listener with essentially limitless sound experiences. It's all about the music: how well the *R110* communicates the message, without getting in the way. It provides upbeat replay with all the classic audiophile virtues in place: very high resolution, layered, deep stereo images, very fine width and focus and beguilingly natural timbre. It performs beautifully with the *Reference 3* pre-amplifier, while in absolute terms (and I cannot quite believe I am saying this), it is actually good value. On the assumption that it will match your system, and that you are prepared for some medium term maintenance, with relatively easily replaced tubes, the *Reference 110* gets our top recommendation.

"It provides upbeat replay with all the classic audiophile virtues in place"

