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Arcemics
AS 60M
STEREO TUBE AMPLIFIER

JUST HOW GOOD ARE VALVE HIFI AMPS?



ARTEMICS AS60M STEREO VALVE POWER AMPLIFIER

How good were the best valve or 'tube' stereo amplifiers of the 1960's, before they were replaced by solid state designs? And how do today's 'new generation' valve amplifiers compare with the latest solid state amplifiers? This month Louis Challis tries to answer these and related philosophical questions, while simultaneously reviewing the impressive Artemics AS60M amplifier...

One of the deep questions which each of us has asked ourselves during our lifetime, and on which many religions are so firmly based, is 'whether there is a life after death'. If we set aside the immortality of our own lives, which most of us do at some stage, then one of the most outstanding, if not downright peculiar rebirths — after being pronounced dead by nearly all the relevant commentators — is that of valve amplifiers, which seemed to have been dealt a death blow by the development of outstanding transistor amplifiers.

Thirty years ago, transistor amplifiers were all the rage and valve amplifiers had become *passé*. Anybody who was *anybody* was discarding their large, hot and fragile valve amplifiers for small, cool, and — generally far more expensive — transistor amplifiers. Mullard and Philips had released their OC16's, which were then 'state of the art' power transistors, and I and many others used them to design and construct relatively simple push-pull amplifier output stages, which could easily produce 20 watts of relatively cool output.

Whilst the first and second generation power transistors proved to be well suited for loudhailers and other mundane undemanding PA applications, they had insidious characteristics which rendered them far less appropriate when attempts were made to apply them to high-quality applications. Those particular applications were only then being qualified by the four-letter word 'hifi' — whereas in contrast, the transistor amplifiers which were offered for similar applications were all too often labelled by far more pejorative four-letter words!

It took another 10 years, to a period somewhere between 1973 and 1975, before the majority of serious reviewers and equally serious consumers were prepared to accept transistor power amplifiers on an equal footing with the

best valve amplifiers, in the 'high fidelity stakes'. During that 10-year period from 1963 to 1973 a prodigious amount of research and development was applied to the development of low distortion, low noise transistor power amplifiers. The objective was to obviate the very clear problems which plagued the first, second and even third generation of these amplifiers.

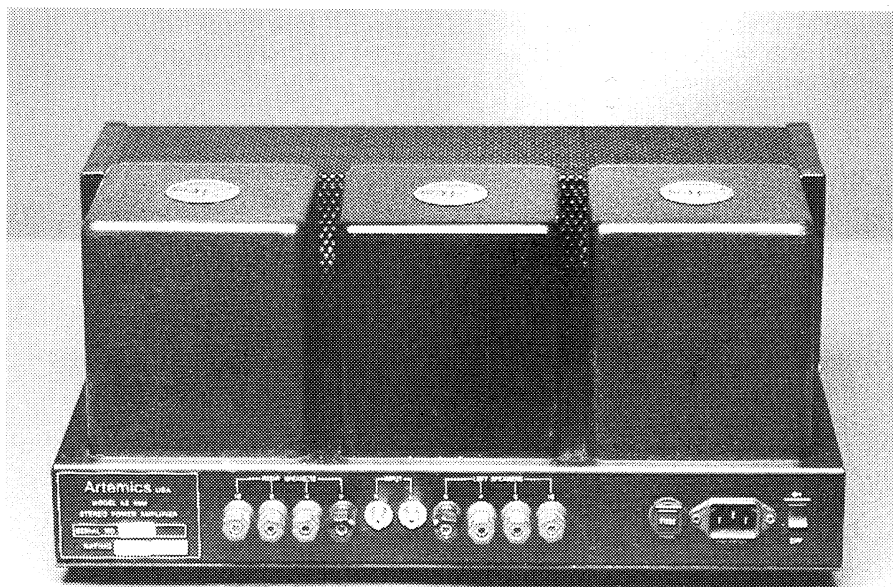
Valve amp features

Now the best valve power amplifiers had a number of significant attributes, the most important of which was most probably their adoption of 'Class A' circuitry. This ensured smooth, seamless crossover characteristics in push-pull output circuits, well controlled and reasonably low third-order harmonic distortion, and a 'mellow' sound which

everybody loved, and which evoked widespread acclaim.

That doesn't mean to say that *all* valve amplifiers were good. Rather, that the best amplifiers were exceptionally good, whilst the others were generally reasonably good.

In the decade between 1955 and 1965, high fidelity valve amplifier circuit design had made great strides, and the best of those amplifiers (like the ultra-linear amplifier designs developed by *Electronics Australia*, the high-powered KT66 amplifiers developed by AWA, and the Murray amplifiers developed by the Electrical Engineering Department at the University of Sydney), were all outstanding even when assessed by the higher standards that prevail today. The amplifier design techniques developed during that decade put the best valve amplifiers at the



The rear of the amplifier provides terminals for speakers of different load impedances, as you can see, plus the usual RCA input connectors and an IEC mains input connector with switch (far right).



very top of the class, so that the early transistor amplifiers faced what then seemed to be an almost insurmountable hurdle in bridging the gap.

But given sufficient time, when the relevant research is lubricated by appropriate funding, it is wonderful what can be achieved. In the following 20 years that gap was bridged, so that today the finest transistor amplifiers are every bit as good as (some say even better than) the best valve amplifiers of 1965.

By 1990, there were relatively few valve manufacturers left in the world, as relatively few people were either designing, let alone manufacturing valve operated equipment. If you had asked me in 1990, what the prospects were for somebody (anybody for that matter) marketing valve amplifiers in open competition to transistorised amplifiers, my response would have been courteous but brief.

If you had asked me the same question in 1993, the answer would still have been equally courteous, but it would no longer be as brief. I am now aware that for some almost inexplicable reason, valve amplifiers are suddenly the flavour of the month. But explaining *why* valve amplifiers have risen 'like the proverbial Phoenix from the grave', and have re-asserted a position in the marketplace, becomes a trifle more difficult for me to explain in objective and sensible terms.

As a child I was entranced by the soft

red glow of the valves installed in my family's radio in the living room. The feelings of wonderment and novelty that

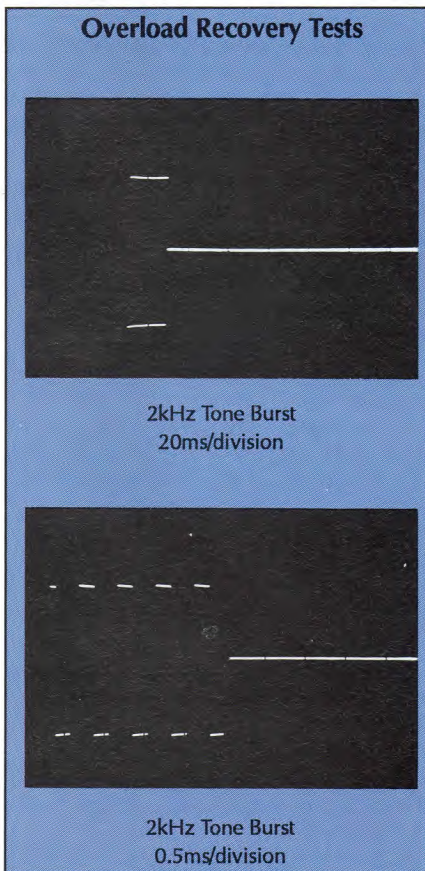
those valves imbued in most children (who became many of today's adults) were real, and perhaps still are the 'stuff from which legends are made'.

Transistors are relatively cold and metallic, and without any grace-saving visual attributes. Valves are warm, illuminated even when not working, and thus have the ability to excite both our auditory and visual senses. With that as a starting point, and when appropriately marketed on the basis of their 'newness', their 'difference' and their claimed 'superior characteristics' when compared with transistors, we have the makings here of a superior marketing program — one that no transistor amplifier can ever hope to match in quite the same way.

There are of course some relatively prestigious people who have jumped onto the valve bandwagon. In the developmental league, people like Bob Carver are now producing CD players with valves in them (what next!).

And as Selwyn Sayers of EA itself has joyfully pointed out to me, Edge of 'U2', Slash of 'Guns & Roses', Eddie Van Halen, Jimmy Barnes, John Entwistle of 'Who' and Brian May of 'Queen' all apparently use valve amplifiers in preference to transistor amplifiers — either for their own pleasure, or in some cases for live performances.

With that sort of recommendation, who am I to argue with the concept or the underlying philosophy of valves



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versus transistors (I'll have more to say about that later).

By now you must be starting to question my sanity (that is unless you are already sold on the concept of valve amplifiers and have traded in that ubiquitous 100 or 200 watt transistor amplifier for one of these new 'you beaut' valve amplifiers which are now turning up in increasing numbers at some of the better hifi retailers! Well, let's try to put the whole issue into some sort of perspective.

The Artemics amp

As it happens, EA's editor was recently offered for review an Artemics AS60M Stereo Tube Power Amplifier, which uses four KT88 pentodes in the output stages (two in each), and which is undoubtedly more attractively constructed than any valve amplifier that I have seen in recent years (let alone 30 years ago). Jim and I both thought this high-quality amp would make a good representative of the 'reborn' valve amps, both to evaluate their performance and to compare them with modern transistor technology.

The Artemics AS60M uses special oxygen-free copper (OFC) custom wound output transformers, 1% precision MIL

standard resistors and computer quality capacitors, for both the power supply filtering as well as for the active electronic circuitry.

I carefully read the brochure provided, did a double-take at the way some of the words were spelt, and then realised that the Artemics AS60M amplifier is manufactured in China. I suspect that a large proportion of the intending purchasers (quite apart from the manufacturer's personnel), may have not previously seen a valve amplifier, and would consequently regard this amplifier as being 'state of the art' esoteric equipment.

In their day, the KT88's were a mighty potent valve, and when appropriately configured, could provide power outputs of 60 - 70 watts. In those days this was regarded as BIG POWER...

Today many people are *blase* about power amplifiers which produce less than 200 watts continuous output and I note that the very same Bob Carver who has joined the valve band wagon, has just developed a new line of transistorised amplifiers, which are capable of delivering 800 watts into a four-ohm load. Power is obviously important; but potentially a smidgin less important than most people are prepared to accept, and especially where quality sound 'rules supreme'.

The Artemics AS60M is relatively neat, using a strong and beautifully constructed chassis, with three large and neatly boxed transformers along the back of the chassis. The internals of these transformers are permanently hidden from view, but they add so much weight that the amplifier's centre of gravity is disturbingly shifted towards the back.

In front of the two output transformers and central power transformer are the four bulbous KT88s, directly in front of which are pairs of 6DJ8 and 12AU7 driver valves — which I must admit I hadn't seen around for more than 20 years. On the neat front panel of the amplifier is a little green LED, whilst at the back are the power 'on/off' switch and multiple spring-loaded terminals providing the ability to match load impedances of 16, eight and four ohms respectively.

The valves are provided with a supplementary perforated cover which provides very essential physical protection, particularly when moving the amplifier. As I confirmed, its presence ensures that you don't destroy your brand new toy by dropping discs, records, or children's toys on top of those fragile glass envelopes. (Nowadays, valves like the KT88 are surprisingly expensive!)

Objective testing

The objective testing of the AS60M amplifier proved to be far more straightforward than I would have expected. As I soon discovered, the frequency response was far better than I would have expected in terms of my prior experience (which stems back more than 30 years, to the days when valves were 'King of the Castle').

The AS60M has an extremely smooth response over the critical frequency range of 25Hz-20kHz, with an overall deviation of generally far less than 0.1dB, whilst its overall frequency response is +/-1dB from 5.6Hz to 80kHz. I have to admit that I was impressed by that performance, as the majority of valve amplifiers I have tested in the past were hard pressed to achieve a 30kHz bandwidth.

I next progressed to assessing the amplifier's power output, which the glossy brochure claimed as being 70 watts per channel into an eight-ohm load. In contrast, my measurements revealed that the amplifier's output at the onset of saturation (as determined by comparing the output directly against the input using the X-Y display of the cathode ray oscilloscope, to detect the onset of clipping) was 41.4 watts per channel.

That power output figure left me a trifle disappointed, as I had visions of the early Japanese radios (circa 1960) for which the manufacturers measured and glibly quoted the square-wave output into a

Measured performance of Artemics AS60M Serial No. 00208

Frequency Response (-1dB re one watt) Input to Aux = 0.5V	Tone Controls Defeated					
Sensitivity	Left	5.6Hz to 80kHz				
	Right	5.8Hz to 81kHz				
Harmonic Distortion a) At a power of 41.4 watts into eight ohms = 18.2 volts b) At one watt into eight ohms	Auxiliary	142mV	127mV			
		dB	dB	dB	dB	
		100Hz	1kHz	6.3kHz		
	2nd	-45.5	-63.1	-54.5		
	3rd	-41.7	-40.5	-41.5		
	4th	-46.7	-48.7	-66.9		
	5th	-41.2	-41.5	-		
	THD	1.40%	1.32%	0.86%		
	2nd	-49.4	-60.9	-62.0		
	3rd	-63.6	-77.3	-67.4		
4th	-	-	-			
5th	-	-	-			
THD	3.45%	0.091%	0.09%			
Noise and Hum Levels Relative to one watt into eight ohms with volume control set for one watt output with 0.5V input (Aux input, shorted)	66dB(Lin)	90dB(A)				
Maximum Output Power at Clipping Point (IHF-A-202) 20ms burst repeated at 500ms intervals Therefore dynamic headroom	52V p-p = 42.3 watts = 0.1dB (re 41.4 watts)					
Channel Separation	20Hz	100Hz	1kHz	10kHz	20kHz	
	dB	dB	dB	dB	dB	
Right to left	73	74	98	84	78	
Left to Right	85	82	97	87	83	
Output Impedance (@ 1kHz)	826 milliohms					

resistive load, for a sinewave input signal — so that they could claim the then-magical 'one watt output'. Whilst the AS60M amplifier may well achieve 70 watts with a square-wave output, I place little importance on such figures.

I progressed to an assessment of the signal to noise characteristics of the AS60M amplifier, and was again impressed by its 90dB(A) weighted signal to noise ratio relative to one watt. But I was less impressed by its unweighted signal to noise ratio of 66dB, relative to one watt.

When these figures are related to the 40-watt output, the hum and noise figures are of course 16dB better. However the glossy brochure quotes hum and noise as being '84dB below rated output', which the measured A-weighted figures beat by a mile. But the unweighted figure is actually 2dB less than claimed.

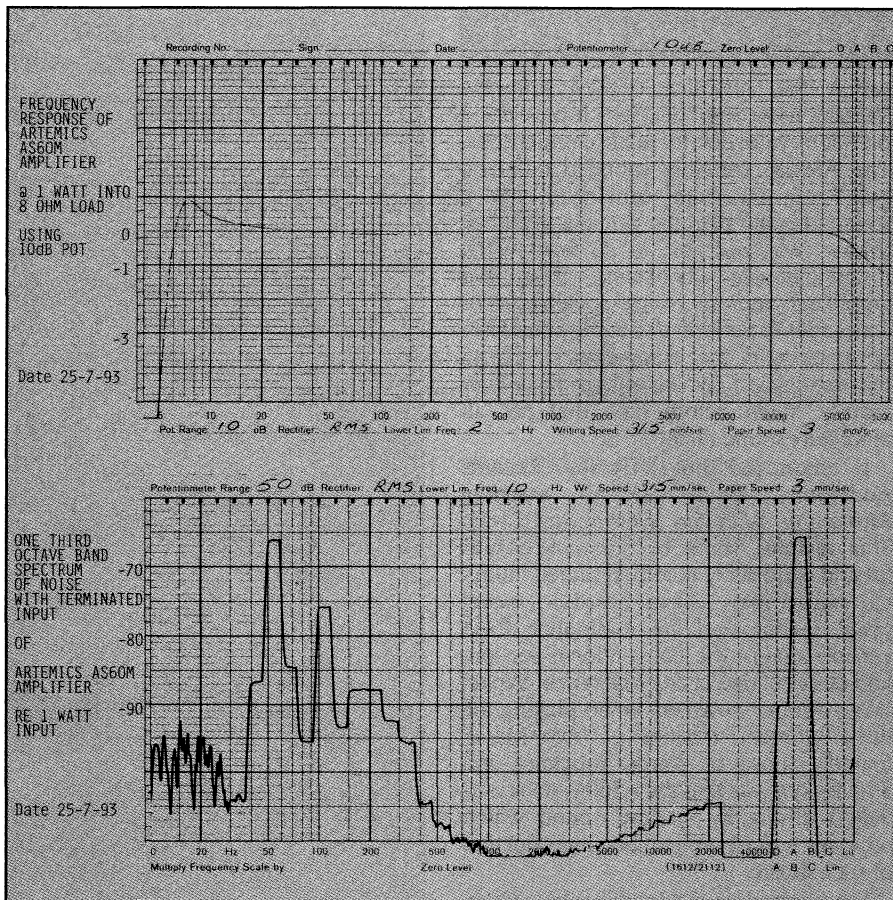
An examination of the one-third octave band frequency response with the input terminated reveals the classical dominant 50Hz hum (-66dB), significant quantities of 100Hz hum (-76dB) and high order harmonics still readily visible (although not audible).

The total harmonic distortion figures of the amplifier are reasonably good when compared to other valve amplifiers, but fall well short of the figures which I have come to expect from the better (let alone the best) transistor amplifiers. As you will note from the attached table, the third harmonic figures are significantly higher than I would have expected on the basis of the relevant classical theory, which says that valve amplifiers have lower third harmonic distortions, and that is what makes them sound so good. With distortion levels of less than 2 - 5%, a valve amplifier sounds great. When you push it any harder, like any other amplifier, the distortion becomes disturbing.

I measured the IEC high frequency total difference frequency distortion characteristics of the AS60M, and noted a smooth and gradual increase in the distortion characteristics right up until 42.3 watts into eight ohms — where there is a very sharp knee in the curve. At that point, the characteristic changes to an almost vertical line, and the subjective and audible characteristics of the amplifier become 'something else'.

The channel separation figures are considerably better than I would have expected, being better than -73dB for the right channel into the left at 20Hz, climbing up to -98dB at 1kHz, and dropping back to -78dB at 20kHz.

The measured output impedance of the amplifier is 826 milliohms, which is a trifle higher than the best output impedance figures that I can recall from other large valve amplifiers that I tested decades ago, but that figure is still quite acceptable.



The frequency response of the Artemics amplifier is commendably flat from 20Hz to 40kHz, with only small deviations at either end. As with other valve amplifiers, there are significant 50Hz and 100Hz hum components in the noise spectrum.

The last test I performed was the overload recovery test, using the IHF-A-202 test signal, which confirmed that the amplifier's recovery from overload is rapid and without any sign of instability.

Listening tests

I picked up the AS60M and discovered that its weight is a discouragement to moving it unless you really have to. Undaunted, I then lugged it home — where it replaced a Yamaha M40 amplifier which I have been using, and which has more than five times the power output capability per channel. I connected the amplifier's output to a pair of B & W 801M Series II monitor speakers, and subjected it to some mighty telling subjective evaluations for a period which extended over one month.

The software I used consisted of my standard repertoire of test discs, a number of vinyl records (for old times' sake) plus some exciting new CD software with which I had been specially provided for this particular subjective evaluation.

The first disc that I used is Claude Debussy's *The Martyrdom of Saint Sebastian*, which is incidental music to the mystery in five acts written by Gabriele D'Annunzio (Sony Classical SKJ48240).

This is hauntingly beautiful music, and has the added notoriety that the principal narrator is Leslie Caron, who many of you may well remember from her days of cinema stardom.

The amplifier's performance was excellent, and it provided a level of performance which was almost indistinguishable from the trusty and excellent transistor amplifier that it replaced. The orchestral and choral presentation in *Martyrdom of Saint Sebastian* was a good test, but because my French is not good enough, Leslie Caron's diction did not provide me with the voice content that I really needed for a full subjective evaluation of the human voice.

I then played Chesky Records latest 'potpourri' disc called *The Collection* (Chesky PJD 1000). This disc contains a number of my favourite vocal pieces from other Chesky discs which I had previously purchased, and includes amongst others on track No 3, the famed Sara K singing 'Wanna Spend More Time'. This is an excellent track with which to evaluate the spoken, (singing) voice, and I have used the original disc repeatedly for that purpose in the last few months.

With Sara K singing her number, I was able to hear subjective differences be-

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tween the Artemics AS60M and the Yamaha M40 amplifier, which provides a premium yardstick for such comparisons. The AS60M certainly sounded different, but I am far from convinced that it sounded better than the Yamaha amplifier. What I was *not* able to do was switch instantaneously between the two amplifiers and the same speakers. Nor was I able to perform a 'double blind test'. So in the end, that evaluation led me to the conclusion (which others have previously made before me), that not all amplifiers sound alike!

I progressed onto Chesky Records Audiophile Gold CD *O Magnum Mysterium*, with the Westminster Choir. This features some of the most beautiful and exquisitely recorded sacred liturgical music that I have heard in recent years. I compared the Audiophile Gold version against the conventional version, and couldn't detect any difference. What I was aware of however, when playing the three different versions of 'Ave Maria' (namely those by Verdi, Bruckner and Stravinsky), was that the AS60M does provide a distinctly 'mellow' sound which provides a most sympathetic reproduction of such music.

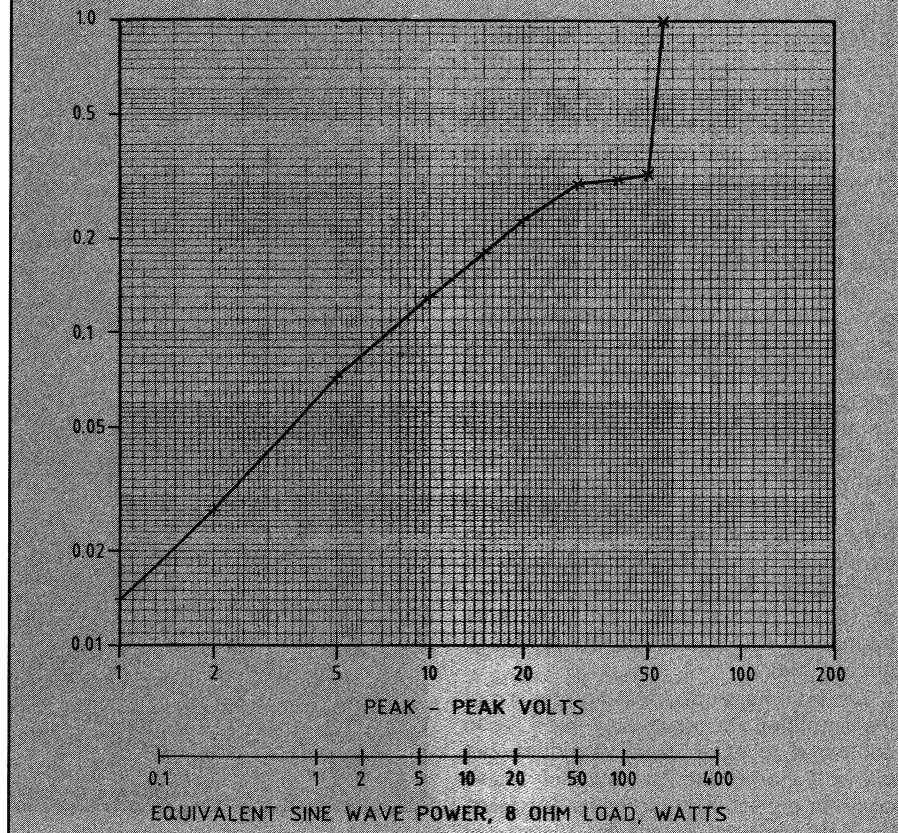
I progressed on to Mendelssohn's *Overture & Incidental Music to A Midsummer Night's Dream* with Yoel Levi conducting the Atlanta Symphony Orchestra (Telarc CD-80318), together with the *Italian Symphony No 4*. This is an absolutely delightful disc with beautifully recorded music, and in this the AS60M absolutely revelled. I was deftly transported out of my living room to another era, to share the excitement that this music first created when it entranced the London audience who were fortunate enough to hear its premiere performance.

Summarising...

Valve amplifiers have some perceived advantages, and some equally obvious limitations. Unlike transistors, valves tend to exhibit slow but gradual changes in their transfer characteristics with increasing age, and that factor tended to be the most telling and significant reason for many consumers to make the switch from valve operated equipment to transistorised equipment.

Valve amplifiers do sound 'different' from transistor amplifiers, and I have most certainly reconfirmed that fact during the subjective evaluation which I performed for this review. Valve amplifiers cannot currently produce power outputs comparable with the biggest transistor amplifiers, and consequently if power is the name of your game, then I suggest that valve amplifiers are not for you.

IEC HIGH FREQUENCY TOTAL DIFFERENCE FREQUENCY DISTORTION — 'ARTEMICS' AS60M AMPLIFIER



The distortion characteristics of the Artemics amplifier, as measured by Louis Challis using the IEC high frequency total difference method. The distortion level remains low until an output level of 42 watts is reached, and then rises steeply.

Of course the nub of this review is not whether valve amplifiers sound different, but rather whether they sound *better*. I realise that what I am about to say is heretical, but based on my subjective evaluation, I am simply unable to support the contention that they do.

The die-hard valve supporters will undoubtedly contest my conclusion, with suggestions that I have become inured to the characteristics of transistor amplifiers from more than 20 years of exposure. My response is that such criticism is basically correct, and like it or not, I have come to the point in time where I now prefer the aural characteristics of the best transistor amplifiers to those displayed by the best valve amplifiers.

As for the Artemics AS60M amplifier itself, it certainly provides an exceptionally smooth performance from very low listening levels (involving power outputs of a watt or more) all the way up to its peak output of 41 watts per channel — where supply rail clipping starts to limit its potential.

At low listening levels, the AS60M appears to be marginally smoother than transistor amplifiers against which I compared it. At modest listening levels (i.e., peak

outputs in my listening room of up to 105dB), it is almost indistinguishable from the transistor amplifiers — that is, until you start to make demands, as are created (for example) by the firing of the cannon in Tchaikovsky's *1812*.

This amplifier really achieves its *forte* with classical music, and preferably with speakers offering reasonable efficiency. It is really best at home, in a small house or apartment, where the *quality* of music is pre-eminent rather than its peak level.

But in order to make a valid and realistic decision on what will ultimately be perceived as a very personal issue, you will really have to sit down in a quiet listening room, and audition the Artemics AS60M yourself before you can either support or dispute the question as to whether there is 'a life after death for valve amplifiers'.

The dimensions of the Artemics AS60M Stereo Tube Power Amplifier are 204 x 475 x 330mm (H x W x D), and it weighs 27.2kg. The quoted recommended retail price is \$3890.

Further information is available from the distributor, A-One Electronics, 432-434 Kent Street, Sydney; phone (02) 267 4819, fax 267 4821. ♦